

PROPOSED RULEMAKING

DEPARTMENT OF HEALTH

[4 PA. CODE CH. 259]

[28 PA. CODE CHS. 701 AND 703]

Drug and Alcohol Facilities and Services— Standards for Approval of Prevention and Intervention Activities

The Department of Health (Department) proposes to delete 4 Pa. Code Chapter 259 and 28 Pa. Code § 701.13 and Chapter 713 (relating to prevention and training; contact person; and standards for approval of prevention and intervention activities) and amend § 701.1 (relating to general definitions) under the authority of the Pennsylvania Drug and Alcohol Abuse Control Act (71 P.S. §§ 1690.101—1690.115) (Act 63), Reorganization Plan No. 2 of 1977 (71 P.S. § 751-25) and Reorganization Plan No. 4 of 1981 (71 P.S. § 751-31). The portions being deleted include the regulations relating to prevention activities in 4 Pa. Code and regulations relating to education, information and alternative activities in 28 Pa. Code to read as set forth in Annex A. The regulations being deleted pertain to standards for approval of drug and alcohol abuse prevention and intervention activities. These activities are generically referred to as prevention activities.

A. Purpose of the Proposed Rulemaking

The purpose of this proposed rulemaking is to delete the regulations relating to approval of prevention and intervention activities. A key benefit of this proposed rulemaking is that Department staff and other limited resources will no longer need to review prevention and intervention activities and, therefore, may be directed toward oversight of entities providing substance abuse treatment services. This rescission will increase the efficiency of the Division of Drug and Alcohol Program Licensure and allow for better regulatory oversight of the substance abuse treatment delivery system. It will also result in the redirection of State government efforts from general prevention activities to specific treatment activities to ensure the safe and effective delivery of substance abuse treatment services.

The Department is proposing to delete these regulations because regulation of the substance abuse service delivery system has changed significantly over the past few years. More changes are predicted in the coming years based on current plans to change the health care delivery system at both the State and Federal levels. Even now, much is being done in the field of substance abuse prevention which does not fit within the current definitions of prevention activities, and hence, are not regulated, but yet which are completely appropriate and relevant prevention activities. Further, much of what is defined and regulated is no longer being conducted due to the evolving nature of drug and alcohol abuse prevention services.

To better address the needs of the substance abuse service delivery system and maximize existing resources, it is necessary to modify regulatory oversight and cease the approval of prevention activities. This elimination will reduce the overload on survey staff resources and enable the Department to focus its attention on the oversight of activities which actually provide treatment to the substance abusing client.

The activities that the Department will cease approving do not provide treatment to clients. The Department's resources will be better used by focusing on activities by which specific substance abuse treatment services are being provided. Prevention activities and services generally provide to the general population and special high risk groups only information regarding the nature and extent of alcohol and other drug abuse and addictions and their effects on individuals, families and communities. Currently, the Department approves approximately 100 prevention activities.

B. Requirements of the Proposed Rulemaking

The following provisions would be deleted:

1. 4 Pa. Code Part XI (relating to Governor's Council on Drug and Alcohol Abuse).

Chapter 259 would be deleted. These sections deal with the prevention activities in 28 Pa. Code which are proposed to be deleted.

2. 28 Pa. Code Part V (relating to drug and alcohol facilities and services). The definitions relating to prevention activities in § 701.1 would be deleted. Chapter 713 would be deleted in its entirety.

C. Affected Persons

The proposed rulemaking will become effective upon publication of final-form rulemaking. At that time, there will no longer be any regulations governing the activities to which the regulations applied. Thus, approvals for prevention activities addressed in the affected regulations will expire at the time of the publication of these regulations in final-form. Further, no new prevention activities will be approved as of the effective date of the final-form regulations. The lack of any Department approval, however, will not prohibit the continuation of these activities. They will merely no longer be licensed or approved by the Department.

D. Fiscal Impact

The deletion of the standards for approval of drug and alcohol abuse prevention and intervention activities will have no measurable fiscal impact on the Commonwealth, local government, the private sector or the general public.

E. Cost and Paperwork Estimate

There will be neither additional costs nor additional paperwork to the Commonwealth, local governments or the private sector resulting from the deletion of these regulations.

F. Effective Date/Sunset Date

The deletion of the relevant portions of 4 Pa. Code and 28 Pa. Code will be effective upon final publication in the *Pennsylvania Bulletin*. No sunset date is necessary.

G. Statutory Authority

The Department was authorized by the General Assembly under Reorganization Plan No. 2 of 1977, Reorganization Plan No. 4 of 1981 and amendments to Act 63 to assume the functions and responsibilities of the Governor's Council on Drug and Alcohol Abuse (Council). The Council's authority to regulate and promulgate rules and regulations was transferred to the Department through those reorganization plans. See Reorganization Plan No. 2 of 1977 (transferring duties under the Public Welfare Code with regard to regulation, supervision and licensing of drug and alcohol facilities to the Council), Reorganiza-

tion Plan No. 4 of 1981 (transferring the functions of the Council to the Department and establishing the Council as an advisory council) and the 1985 Amendments to Act 63 as amended by the act of December 20, 1985 (P. L. 529, No. 119) (amending Act 63 to reference the Pennsylvania Advisory Council on Drug and Alcohol Abuse (Advisory Council)).

H. *Regulatory Review*

Under section 5(a) of the Regulatory Review Act (71 P. S. § 745.5(a)), on April 11, 2001, the Department submitted a copy of the proposed rulemaking to the Independent Regulatory Review Commission (IRRC) and to the Chairpersons of the House Committee on Health and Human Services and the Senate Committee on Public Health and Welfare. In addition to submitting the proposed rulemaking, the Department has provided IRRC and the Committees with a copy of a detailed Regulatory Analysis Form prepared by the Department in compliance with Executive Order 1996-1, "Regulatory Review and Promulgation." A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, if IRRC has any objections to any portion of the proposed rulemaking, it will notify the Department within 10 days of the close of the Committees' review period. The notification shall specify the regulatory review criteria which have not been met. The Regulatory Review Act specifies detailed procedures for review, prior to final publication of the regulations, by the Department, the General Assembly and the Governor, of objections raised.

I. *Contact Person*

Interested persons are invited to submit all questions, comments, suggestions or objections in writing regarding the proposed rulemaking to John C. Hair, Director, Bureau of Community Program Licensure and Certification, 132 Kline Plaza, Suite A, Harrisburg, PA 17104, (717) 783-8665, within 30 days after publication of this notice in the *Pennsylvania Bulletin*. Persons with a disability who wish to submit questions regarding the proposed rulemaking may do so by using V/TT (717) 783-6514 for speech and/or hearing impaired persons or the Pennsylvania AT&T Relay Service at (800) 654-5984[TT]. Persons who require an alternative format of this document may contact John Hair so that necessary arrangements may be made.

ROBERT S. ZIMMERMAN, Jr.,
Secretary

Fiscal Note: 10-164. No fiscal impact; (8) recommends adoption.

Annex A

TITLE 4. ADMINISTRATION

PART XI. GOVERNOR'S COUNCIL ON DRUG AND ALCOHOL ABUSE

CHAPTER 259. [PREVENTION AND TRAINING] (Reserved)

(Editor's Note: As part of this proposed rulemaking, the Department is proposing to delete the text of Chapter 259 which appears at 4 Pa. Code pages 259-1 and 259-2, serial pages (235169) and (235170).)

§ 259.1. (Reserved).

§ 259.2. (Reserved).

TITLE 28. HEALTH AND SAFETY

PART V. DRUG AND ALCOHOL FACILITIES AND SERVICES

CHAPTER 701. GENERAL DEFINITIONS

Subchapter A. DEFINITIONS

§ 701.1. **General definitions.**

The following words and terms, when used in this part, have the following meanings, unless the context clearly indicates otherwise:

[*Alternative activity*—The provision of work-oriented, recreational, and other experiences to fill the physical, emotional, social, and spiritual needs of the individual, family, and community.]

* * * * *

[*Certificate of approval*—A certificate which indicates that the Department has found a prevention/intervention activity to be in full or substantial compliance with standards established under this part.]

* * * * *

[*Education/information activity*—The provision of activities and factual data aimed at the development of decision-making skills, goal setting, values awareness and clarification, personal motivation, meaning and purpose, and development of communication and interpersonal skills to increase knowledge and understanding about drugs and alcohol and their effect.]

* * * * *

[*Prevention level*—Planned strategies designed to preclude or reduce those uses of drugs and alcohol which have a negative impact on the individual, the family, and the larger society. Negative impact includes the physical, mental, or social consequences which result in the reduction of optimum functioning at home, in school, at work, or in the community. Research and experience have shown that an approach to prevention which promotes positive behaviors is defined as that which includes increased self-understanding, improved interpersonal and human relations skills, enhanced ability to relate to social institutions, and effective coping behaviors to deal with stress. Prevention activities are targeted at the total population with emphasis on delivery of those services prior to the manifestation of inappropriate behaviors. Prevention activities can be delivered through schools, media, family or community agencies, and groups.]

* * * * *

§ 701.13. [*Contact person*] (Reserved).

[Questions concerning this part should be directed to the Office of Policy and Planning, Office of Drug and Alcohol Programs, Department of Health, Health and Welfare Building, Harrisburg, Pennsylvania 17120.]

**CHAPTER 713. [STANDARDS FOR APPROVAL OF
PREVENTION AND INTERVENTION ACTIVITIES]
(Reserved)**

(Editor's Note: As part of this proposed rulemaking, the Department is proposing to delete the text of Chapter 713, which appears at 28 Pa. Code pages 713-1—713-10, serial pages (238471) to (238480).)

§§ 713.1—713.5. (Reserved)

§§ 713.11—713.18. (Reserved)

§§ 713.21—713.29. (Reserved)

§§ 713.41—713.43. (Reserved)

[Pa.B. Doc. No. 01-679. Filed for public inspection April 20, 2001, 9:00 a.m.]

[28 PA. CODE CH. 27]

**Reporting of AIDS, HIV Test Results, CD4
T-Lymphocyte Counts and Perinatal Exposure of
Newborns to HIV**

The Department of Health (Department), with the approval of the Advisory Health Board (Board), proposes to amend Chapter 27 (relating to communicable and noncommunicable diseases). The proposed amendments are to read as set forth in Annex A.

A. Purpose of the Proposed Amendments

The Department is proposing regulations which would require name reporting of individuals: (1) who have had positive test results established from any test approved by the Food and Drug Administration (FDA) to establish the presence of the Human Immunodeficiency Virus (HIV); (2) who have low CD4 T-lymphocyte cell counts as described in this Preamble; and (3) who are pregnant women who have had positive HIV test results and whose newborns have been perinatally exposed to HIV. The Department also proposes to clarify that cases of Acquired Immune Deficiency Syndrome (AIDS) are reportable based on the case definition of the Centers for Disease Prevention and Control (CDC). These reports would include presumptive diagnoses of AIDS based on the presence of an AIDS defining illness (for example, Kaposi's sarcoma) with laboratory confirmation of HIV.

The Department's decision to propose amendments requiring reporting of these test results and conditions by name is based on the recommendations of the CDC for reporting HIV infection and AIDS. See MMWR 1999; 48 (No. RR 13) "Guidelines for Human Immunodeficiency Virus case surveillance, including monitoring for HIV infection and AIDS" (Guidelines, p. 12). It is also consistent with the Department's requirements for the 52 other diseases and conditions (including AIDS, which is reportable by name), currently reportable in this Commonwealth. The Commonwealth would join 34 states that require confidential name-based reporting for HIV infection. The Ryan White CARE Act (42 U.S.C.A. §§ 300ff-21—300ff-37), one of the Department's primary funding streams for HIV services, requires the inclusion of HIV incidence data in determining the funding formula for State grants. Having accurate data obtained through name reporting will help assure that the Department receives the full funding to which it is entitled.

Collecting this data systematically would provide the Department with the most accurate picture of the prevalence of HIV/AIDS. This will enhance the Department's

ability to develop, implement and evaluate community-based public health interventions for HIV-infected persons and at-risk partners. The proposed information will also provide the Department and local health departments with enhanced opportunities to provide case management services for HIV-infected persons and their at-risk partners. These services include helping assure that HIV-infected persons are linked into appropriate community-based medical and social service support systems, including partner notification services, thus helping slow the progression of HIV infection to life-threatening AIDS and preventing the further spread of disease.

Background

HIV is a virus transmitted by sexual exposure or exposure to blood or tissue of an infected person. HIV replicates itself within the infected person continuously during the lifetime of the infection, and, in the process, kills white blood cells called CD4 T-lymphocytes. Damage to the immune system occurs because the T-lymphocyte cell count within the body of an infected individual eventually falls below a critical level. The critical level is the point at which the CD4 T-lymphocyte count falls to less than 200 of these cells per 1 microliter of blood, or the CD4 T-lymphocyte percentage of all lymphocytes falls below 14%. At that point, the individual will almost always lose immune response capabilities and become increasingly susceptible to infection by disease. The late clinical stage of infection with HIV is called AIDS. During the AIDS phase there is progressive damage to the immune and other organ systems, including the central nervous system. HIV infection is generally fatal. There is no vaccination and no cure for HIV infection, although drug therapies have been developed which, when taken appropriately, slow the progression of the disease from HIV to AIDS in many persons.

The seriousness of the HIV/AIDS epidemic should not be underestimated. Because HIV can be spread by individuals who are infected, but do not appear to be ill in any way, and because it is spread, in part, through consensual acts including unprotected sexual intercourse or intravenous needle sharing, controlling the spread of the disease requires active public health measures. Public health efforts to control the disease include encouraging individuals engaging in or subject to behavior which would create a risk of infection to be tested and counseling them, as well as their needle sharing or sexual partners, about how to change risky behavior. Counseling of persons who are to be tested for HIV infection regarding risk behaviors is required in this Commonwealth in an effort to educate those persons regarding the danger of continuing to engage in behavior that could put them and others at risk for contracting HIV. See the Confidentiality of HIV-Related Information Act (35 P. S. §§ 7601—7612) (Act 148). Active public health measures also include finding infected individuals, recommending testing and counseling, and offering assistance to private sector providers who may be unaware of the services available to HIV infected patients, or who may have limited experience in dealing with this particular infection.

New and Clarified Reporting Requirements

AIDS defined by the CDC Case Definition

The Department is proposing to clarify that the definition of "AIDS" is the CDC case definition. The CDC's case definition for "AIDS," simply put, includes the presence of HIV infection plus one of several specified infections, conditions or diseases. Each of the specified infections is an AIDS defining illness. The Department expects the reporting of AIDS in accordance with this case definition.

Positive HIV Diagnostic Test Results

The Department is proposing to require reporting of positive test results of any test approved by the Food and Drug Administration (FDA) to establish the presence of HIV, including serologic, virologic, nucleic acid (DNA or RNA) or other tests the FDA may approve for that purpose. The HIV test results that the Department is proposing be reported are not preliminary inconclusive HIV tests. Rather, they are either considered to be confirmatory of the presence of HIV, or so reliable that further confirmatory testing is unnecessary. This is in accord with Act 148, which states that no test shall be considered to be positive, and no positive result shall be revealed, without confirmatory testing if that testing is required by generally accepted medical standards. See section 5(c) of Act 148 (35 P. S. § 7605(c)).

CD4 T-Lymphocyte Counts of Less than 200 Cells per Microliter of Blood or T-Lymphocyte Percentage of Less than 14% of Total Lymphocytes

The Department is also proposing reporting of a CD4 T-lymphocyte count of less than 200 cells per microliter or a CD4 T-lymphocyte percentage of total lymphocytes of less than 14%. The Department intends to use the reporting of CD4 T-lymphocyte results to enable it to find cases of HIV and AIDS that might not otherwise be reported. For example, a physician could choose to order a CD4 T-lymphocyte count on an individual and not an HIV test. A low CD4 T-lymphocyte count could be indicative of a suppressed immune system for reasons other than HIV infection. Cancer, for example, could lead to a low CD4 T-lymphocyte count. The Department and local health departments would take this information and, depending upon the circumstances of the case, contact the provider to ask whether that provider has considered ordering an HIV test for the individual in question. Determining that the patient has HIV may cause the provider to refer the individual for more specialized treatment, or enable the provider to offer the individual the opportunity to begin treatment for the disease.

As of January 1, 2001, 27 states required CD4 T-lymphocyte reporting, including New York, New Jersey and Texas. In this Commonwealth, Philadelphia has also instituted a program for reporting CD4 T-lymphocyte counts below a certain level. In New Jersey and Texas, approximately 60% to 70% of CD4 T-lymphocyte reports result in the finding of HIV cases. In California, which also requires CD4 T-lymphocyte reporting, although it does not currently have a requirement that makes HIV reportable, approximately 90% to 95% of reported CD4 T-lymphocyte reports result in HIV and AIDS case finding.

The Department is proposing that both laboratories and providers be required to report CD4 T-lymphocyte test results. The Department would be able to analyze the data obtained through these reports and make determinations about what types of treatment are effective in arresting disease. That information could be shared with the provider community in this Commonwealth.

Requiring reporting of low CD4 T-lymphocyte counts, which reveals dangerous levels of immunodeficiency in the population, fulfills a public health function. Increased incidence of compromised immune systems in a population as shown by low CD4 T-lymphocyte counts in that population could be indicative of problems in addition to HIV, and could necessitate a public health intervention that focuses on more than HIV infection. For example, a continual decrease in CD4 T-lymphocyte levels could be

connected to an increasing incidence of tuberculosis, sexually transmitted diseases and other infections.

Perinatal Exposure of a Newborn to HIV

Newborn infants can be infected with HIV if it is passed to them during pregnancy by an infected mother. The Council of State and Territorial Epidemiologists (CSTE) and the American Academy of Pediatrics have recommended that states and territories conduct pediatric HIV surveillance that includes perinatally exposed infants. The CDC and CSTE recommend reporting of perinatal exposure to HIV. (Guidelines, p. 11). The CDC notes in its Guidelines that states with confidential name-based surveillance systems have used data on children perinatally exposed to HIV to track the trend of the epidemic in that population. Information these states have collected includes information used to document the sharp decline in perinatally acquired HIV infection in those states, the increase in proportion of infected pregnant women who have been tested before delivery and the high proportion of these women who have accepted treatment before giving birth. (Guidelines, p. 5).

Requiring reporting of the perinatal exposure of newborns to HIV would enable the Department and local health departments to follow up on children known to be exposed to HIV at birth and to ensure that the child and mother are linked to a provider, in case the child is infected with HIV. A child born to a mother infected with HIV will have antibodies to HIV, since the baby will have its mother's antibodies to the virus. However, not all babies born to infected mothers are actually infected with HIV. The departments would be able to follow the child to recommend additional testing to determine whether or not the child is HIV-positive following delivery, and to aid in the referral of that mother and child for treatment.

Reporting Process

Under the Department's proposed amendments, reports of these four conditions would be made by providers to one of the local morbidity reporting offices (LMROs), which consist of the Department's six district offices and the ten county or municipal health departments (local health departments). The provider would make the report to the LMRO with responsibility for the geographic area in which the patient was provided testing services or diagnosed with AIDS.

This differs from the Department's proposed requirement that laboratories report directly to the Department. See proposed amendments to § 27.22 (relating to reporting laboratory results indicative of certain infections or conditions). From the standpoint of efficiency, the requirement would provide the information to enable and expedite case tracking and other services by the local health departments and Department staff that do the actual case investigation and follow-up, and assist in counseling, referral and partner notification.

Laboratory Reporting

The Department has been encouraging electronic reporting to one location by laboratories because many of the laboratory's reports could be reports of repeat tests. Providers will often order repeat CD4 T-lymphocyte tests for purposes of clinical patient care management and disease progression monitoring. Patients may also visit more than one provider and be tested multiple times. The laboratory has no way of knowing whether a test is the initial test a provider orders on a patient or a repeat test, or a test ordered by a second provider. The Department has software to electronically match information in those reports with information from reports it already received

and placed in its Statewide reporting databases. The Department can then identify multiple reports on the same individual and consolidate unduplicated useful information in one case record. Local health departments and the Department's district offices do not now have this capability.

Provider Reporting

The Department is proposing to require reporting by physicians, hospitals and other persons and entities, diagnosing AIDS, or providing or receiving reportable HIV or CD4 T-lymphocyte test results. This will undoubtedly generate multiple reports on the same case from various providers and laboratories, as has been discussed. However, the Department does not want possible reporters to self-censor, based on their assumption that another person will make the report. That could lead to under-reporting and jeopardize the ability of the public health system to positively impact the health of infected individuals and their contacts. If the departments are unaware of cases, they will be unable to offer or provide counseling and referral information services to the providers who treated those cases.

Reports being received by LMROs from providers of the diseases and conditions addressed in these proposed amendments would be handled in the same manner as reports of other reportable diseases are currently processed by the Department and local health departments on a local level, with the exception that the Department intends to require that providers as well as laboratories begin to report electronically. As with laboratories, the Department will provide providers with the necessary software package, and make available training on its use.

Once a provider makes a report to the LMRO, that report would be entered into the local database, and matches would be done by the LMRO against local data to eliminate any data on an individual that may be redundant due to an earlier report. For purposes of confidentiality, a LMRO will only have access to reports of cases from that LMRO's jurisdiction. This data would then be transferred to the Department electronically. The Department would then perform a Statewide match of the information against data included in its Statewide data banks. The information would be returned to the LMRO with any additional information the Department may be able to add to it for case investigation, if necessary. This type of match cannot be done exclusively at a county level, since it would not result in the purging of duplicate results collected Statewide. This needs to be done by a single entity having access to Statewide information for the most effective results. Further, performing this type of match at the State level would ensure that the only information sent to the local health departments or district offices by the Department for purposes of follow-up with providers would be a unique report, so that staff do not waste time and resources reinvestigating a previously reported case.

Once the case investigation is concluded, the information would be returned to the Department by the LMRO. Following review by the Department, the information would be sent, with identifying information purged, to the CDC for National comparisons.

Dual Reporting

A "dual pathway" of reporting, with reports transmitted by both providers and laboratories, is not unique to this Commonwealth. It is the National standard for ensuring completeness of reports in active case investigation for HIV/AIDS, and is utilized in most high and moderate

morbidity states comparable to this Commonwealth. Ideally, the diagnosing provider should make the initial case report. Through the identification of providers in laboratory reports, the Department is able to contact providers and obtain from them a completed case report on a particular patient whose test result has been reported to the Department by a laboratory, but for whom no report has been made by the provider. This approach is consistent with the CDC and with protocols in other states.

Confidentiality

Like all information reported to the Department under the Disease Prevention and Control Law of 1955 (35 P. S. §§ 521.1—521.21) (act), the confidentiality of the information reported under these proposed regulations would be strictly maintained by the Department and local health departments. The act prohibits the Department from releasing information secured under the statute, even in the face of a subpoena, with few exceptions. Section 15 of the act (35 P. S. § 521.15) provides as follows:

State and local health authorities may not disclose reports of diseases, any records maintained as a result of any action taken in consequence of such reports, or any other records maintained pursuant to this act or any regulations, to any person who is not a member of the department or a local board or department of health, except where necessary to carry out the purpose of the act.

The Supreme Court of the Commonwealth has stated that the purpose of the act is to aid the Department and local health departments to prevent and control the spread of disease. See *Commonwealth v. Moore*, 584 A.2d 936, 940 (Pa. 1991). In *Moore*, the Supreme Court held that release of information collected under the act to aid a criminal prosecution did not carry out the purpose of the act. The Department may disclose aggregate information on disease cases for research purposes, but will only do so without including case-identifying information.

The Department will disclose identifying information with a valid consent from the subject whose information is being requested. In the case of HIV and AIDS-related information, that consent would need to comply with the requirements of section 7 of Act 148 (35 P. S. § 7607). Under Act 148, information may not be released by any person who has obtained the HIV-related information in the course of providing a health or social service, except in two instances. First, confidential HIV-related information may be released without written consent if the person to whom the release is being made fits within one of twelve categories of persons specifically listed in Act 148. Release to another person requires a very specific written consent. Secondly, the subject of the information may consent to its release. See section 7(a) of Act 148. The consent, however, must include specific requirements listed in Act 148, including a specified time or event upon which the consent is revoked (see section 7(c) of Act 148), and a statement prohibiting redisclosure unless redisclosure is made in accordance with that act. See section 7(e) of Act 148. A general authorization for the release of medical or other information is not sufficient for the purposes of Act 148. *Id.*

The Department takes its responsibilities to maintain confidentiality very seriously. The decision to release information would not be made without serious discussion at every relevant level of the Department.

Because the Department and local health departments take the responsibility to protect the information reported under the act very seriously, it has, on several occasions,

engaged in litigation in State and Federal court rather than release information reported under the act. The Department will treat the information that would be reported under these proposed regulations no less carefully than the information it currently protects.

B. Requirements of the Proposed Rulemaking

Subchapter A. General Provisions

Section 27.1. Definitions.

The Department is proposing to add several definitions to this section. The Department would add acronyms for "CDC" and "FDA" so that the acronyms may be used throughout the regulations and readers would understand what they refer to. The Department would define "district office," "LMRO—local morbidity reporting office" and "local health department" so that when these terms are used in the regulations it will be clear to which health authority the person required to report is to make the report.

The Department is also proposing to add a definition for "perinatal exposure of a newborn to HIV." The Department is proposing to define this reporting requirement so that it is clear that a report should be made if there is any risk to the fetus during any part of pregnancy, regardless of the final outcome of the pregnancy or the final serostatus of the newborn if the pregnancy results in a live birth. This definition would result in more complete reporting of perinatal exposure and also enable the Department to monitor potential adverse effects among women who may have received prenatal preventive antiretroviral treatment including both those who have livebirths, and those who have not carried their pregnancies to full term.

Section 27.2. Reportable diseases.

The Department is proposing to add HIV, CD4 T-lymphocyte test results with counts less than 200 cells/ μ L or less than 14% of total lymphocytes, and perinatal exposure of newborns to HIV to the general list of diseases and conditions required to be reported within this Commonwealth. The Department is proposing to clarify that AIDS is to be reported as defined by the CDC case definition. These requirements would be effective as of January 1, 2002. The Department has already discussed the need for the reporting of these test results and conditions.

This section does not address the type of information needed regarding HIV infection to trigger a reporting responsibility. The Department proposes to address that matter in § 27.22 (relating to reporting results indicative of certain infections or conditions by laboratories) and § 27.32 (relating to reporting AIDS, HIV, CD4 T-lymphocyte counts, and perinatal exposure of newborns to HIV by physicians, hospitals, persons or entities, who diagnose AIDS or who receive or provide HIV and CD4 T-lymphocyte test results).

Subchapter B. Reporting of Diseases

Section 27.21. Physicians who treat patients with reportable diseases including tuberculosis.

The Department is proposing to delete subsection (e) of this section as redundant, since the Department is proposing that all AIDS reporting requirements, including those for physicians, be included in proposed § 27.32 (relating to reporting AIDS), which would be amended and retitled "Reporting AIDS, HIV, CD4 T-lymphocyte counts, and perinatal exposure of newborns to HIV by

physicians, hospitals, persons or entities, who diagnose AIDS or who receive or provide HIV and CD4 T-lymphocyte test results."

Section 27.22. Reporting results indicative of certain infections or conditions by laboratories.

This section addresses the reporting responsibilities of laboratories. Subsection (a) specifies the circumstances under which a laboratory has a duty to report. The Department is proposing to amend subsection (a) to add virologic and nucleic acid (DNA or RNA) to the description of the types of testing information that is reportable. The Department would also replace the word "examination" in this subsection with the word "test," a more accurate term.

The Department is proposing to amend subsection (b) to require laboratories to report CD4 T-lymphocyte test results with counts less than 200 cells/ μ L or a CD4 T-lymphocyte percentage of total lymphocytes that is less than 14%. The Department is also proposing to amend subsection (b) to require laboratories to report HIV. Under the proposed amendments to § 27.2, neither a low CD4 T-lymphocyte count nor HIV infection would be reportable by laboratories until January 1, 2002. The type of information to be included in these reports would be specified in subsections (c) and (d). Subsection (d)(5) would clarify that laboratories are to report HIV infection only when the laboratory secures positive results on a test approved by the FDA to establish the presence of HIV. The laboratory would have no duty to report preliminary HIV test results that the FDA does not recognize to be conclusive.

Subsection (c) would be amended to add a paragraph (2), which would set out the demographic information that must be included by the laboratory in its report to the Department of a positive HIV test result or a CD4 T-lymphocyte count. As previously explained, the more specific the information received by the Department from all reporters, the more likely it is that the Department would be able to extract information obtained from all reporting sources and compile a complete record on each reported case.

The Department is proposing to amend subsection (d) to require electronic laboratory reporting directly to the Department's Bureau of Epidemiology for almost all diseases reported by laboratories under Chapter 27. Subsection (d)(1) would be amended to require all reports by laboratories, except for reports of hypothyroidism and phenylketonuria and certain reports of sexually transmitted diseases, to be made electronically to the Bureau of Epidemiology. Hypothyroidism and phenylketonuria are currently, and would continue to be, reported directly to the Department's Division of Maternal and Child Health. Lead and lead toxicity reports, however, which are currently reported elsewhere, would be reported electronically directly to the Department's Bureau of Epidemiology. See proposed subsection (d)(1). Reports of sexually transmitted diseases would be reported not only to the Department electronically, but also to the local health departments of Allegheny and Philadelphia counties, as they are currently.

For smaller laboratories that are not currently reporting to the Department electronically, and do not have the necessary software, the Department would make software available along with training on its use.

The Department is also proposing to revise subsection (d) to include specific requirements for the reporting of HIV and CD4 T-lymphocyte counts. Subsection (d)(4)

would be amended to delete references to lead poisoning and lead toxicity. As revised, subsection (d)(4) would require a laboratory to report CD4 T-lymphocyte counts as set forth in subsection (b) within 5 days of the laboratory obtaining the test result.

Subsection (d)(5), also new, would include requirements for reporting HIV by a laboratory. As discussed previously, a laboratory would be required to report the results of any test approved by the FDA to establish the presence of HIV including serologic, virologic, nucleic acid (DNA or RNA) or other tests approved by the FDA for that purpose. This would include tests such as the ELISA, Western blot or viral load tests.

New subsection (e) would require a person or entity that requests a laboratory test for HIV or CD4 T-lymphocyte counts to provide the laboratory with all the demographic information the laboratory would be required to include in its report. This promotes completeness of laboratory reporting.

Section 27.32. Reporting AIDS, HIV, CD4 T-lymphocyte counts and perinatal exposure of newborns to HIV by physicians, hospitals, persons or entities, who diagnose AIDS or who receive or provide HIV and CD4 T-lymphocyte test results.

This section pertains to reporting by persons that are not laboratories. The Department is proposing to replace requirements in the current section for reporting AIDS with more specific requirements for reporting AIDS based on the CDC case definition. This section would require the reporting of the results of any test approved by the FDA to establish the presence of HIV, including serologic, virologic, nucleic acid (DNA or RNA) or any other test that the FDA may approve for this purpose. It would include reporting of CD4 T-lymphocyte counts of a certain level, and reporting of the perinatal exposure of a newborn to HIV. Subsection (a) would require physicians, hospitals and other persons or entities providing HIV services, that make a diagnosis of AIDS, or who receive HIV and CD4 T-lymphocyte test results for patients or provide these results to patients, to report these conditions and test results. In the case of perinatal exposure, reporters would be required to report the name of the mother with an identification of the child in that report. If the child would then test positive for HIV at a later date, the Department would include that information in its case record for the mother, and a separate case record would be kept under the child's name.

The Department has included persons or entities providing HIV services that receive HIV and CD4 T-lymphocyte test results or provide HIV and CD4 T-lymphocyte test results to patients in the list of required reporters to ensure that the reporting duty applies to all possible persons or entities with relevant information. Entities like case management organizations, drug and alcohol abuse treatment facilities, mobile vans and small clinics that do not have a physician present on a continuous basis would also be required to report under these proposed amendments. Again, this proposed reporting requirement would enable the Department to receive information from the widest range of sources. This proposed reporting requirement is designed to provide, once the case investigations are undertaken, and the data received reviewed to consolidate duplicate case reports into one case record, the most accurate count of all HIV/AIDS cases, and the most complete data possible on each reported case. Nothing in this section should be

construed to permit persons to order or receive HIV test results if they are not otherwise authorized by law to do so.

The Department is proposing in subsection (a) that all of the reports that would be added through the proposed amendments to this section be made to the LMRO in the area in which the patient is tested or diagnosed. The LMRO would then report electronically to the Department.

Subsection (b) would include the list of information providers would be required to report. This information would include, among other things, the name of the individual tested.

The Department is also proposing to require reporting of data elements similar to those required to be reported by laboratories, however, the Department would also require the reporting of additional data elements by physicians, hospitals, and other persons and entities, who diagnose AIDS, or receive or provide HIV and CD4 T-lymphocyte test results to patients. These additional elements would include the probable mode of transmission; treatment provided; name, address and telephone number of the physician, hospital, or other person or entity which secured the specimen from the individual and provided it for testing; name, address and telephone number of the entity in which the diagnosis was made, or by which the HIV test results or CD4 T-lymphocyte counts were received; and any other information the Department determines to be relevant. This information would not be readily available to laboratories, but would be available to providers. Like the information that would be required of laboratories, this information would provide the Department with a specific demographic picture of the individual, and enable the Department to track the trends of the disease throughout this Commonwealth. The information would also enable the Department to more easily contact the provider treating the patient, and provide that individual with information regarding the disease, help in counseling and partner notification, and referral options.

Subsection (c) would require providers to report to the Department within 5 business days of the reportable diagnosis or receipt of the test result. The Department would probably receive the laboratory reports before the provider received them. The Department proposes allowing this 5-day period to enable the provider to provide results to the patient, and to begin the process of counseling and referral, before reporting to the LMRO. The Department would be available after that period (or before if requested by the provider to perform results counseling) to aid the provider by providing information regarding the disease if that is requested, to perform partner notification if the patient is willing, and to provide information regarding referral options and services open to the patient, for example, the Special Pharmaceutical Benefits Program.

Subsection (c) would also require providers to make reports to the Department electronically. In addition to the electronic report, the Department is also proposing to require that providers maintain in the patient file a hard copy of the HIV/AIDS report form provided by the Department and completed by the provider. This would aid the departments in case investigation and follow-up if there is a need to review the patient file, as well as in reviewing compliance with reporting requirements under the proposed regulations.

The substance of new subsection (d) is substantially contained in current subsection (b). Minor revisions would

be made to replace the phrase "local health authority" with "LMRO" and to require that reports be made electronically.

As proposed in § 27.2, neither a low CD4 T-lymphocyte count, a positive test result on a test establishing the presence of HIV, or a perinatal exposure of a newborn to HIV would be reportable until January 1, 2002. The Department also proposes that its clarification regarding reporting of AIDS based on the CDC case definition become effective on that same date.

Section 27.32a. Confidential and anonymous testing.

This section would be new. Subsection (a) would require testing done at sites other than State-designated anonymous testing sites to be done confidentially but not anonymously. Anonymous testing is testing done without the tester obtaining the name of the individual being tested. The Department is making anonymous testing sites available in accordance with CDC recommendations, and to avoid creating a situation in which those at-risk individuals who would refuse to be tested confidentially would simply not be tested and, therefore, continue to place themselves and others at risk.

However, because the Department believes that name reporting is a very important component of the public health strategy as outlined by the CDC for addressing the disease, the Department is limiting anonymous testing to Department-designated sites. The Department and local health departments are able to become involved in counseling, partner notification and referral in these public sector testing sites without name reporting, since the individual has physically come into the public health system funded and, in some cases, operated by the departments.

The results of blinded HIV testing authorized under section 5(f) of Act 148 (35 P. S. § 7605(f)) would not be reportable under this proposed section. See proposed subsection (a).

Subsection (b) would require anonymous test sites to report results to the Department in accordance with proposed § 27.32 using an anonymous code rather than the name of the individual. The code would be assigned at the anonymous testing site, using a Department-approved algorithm.

Section 27.32b. Counseling, testing, referral and partner notification services.

This section would be new. It would require that counseling, testing, referral and partner notification services be done in accordance with the requirements of Act 148. It is proposed for the purpose of emphasizing the connection between Act 148 and the act to ensure that all confidentiality requirements are followed, and to stress that nothing in the proposed amendments is to be construed in a manner inconsistent with Act 148. The Department has also proposed language reminding providers that the Department will provide assistance with counseling, testing, referral and partner notification if requested.

Section 27.32c. Department authority to require complete reporting.

This section would be new. The Department has, in the past, encountered resistance from providers who hesitate to allow Department staff to review patient records to complete case investigations for reportable diseases and conditions. The act gives both the Department and local health departments the authority to undertake these reviews. Sections 3 and 5 of the act (35 P. S. §§ 521.3 and

521.5) give the Department and the local health departments the responsibility for the prevention and control of the spread of disease (see section 3(a) and (b) of the act) and the authority to take any disease control measure necessary to protect the public health upon receipt of a report of a disease (see section 5 of the act). Section 16 of the act (35 P. S. § 521.16) gives the Department, through the Board, the ability to promulgate whatever regulations are necessary to prevent and control the spread of disease. See section 16(a) and (b) of the act. Further, The Administrative Code of 1929 (71 P. S. §§ 1—732) (AC) gives the Department the ability to take the most efficient and practical means necessary for the prevention and suppression of disease. See section 2102(a) of the AC (71 P. S. § 532(a)). Since the reviews proposed in this section are necessary for locating cases and controlling and preventing the spread of disease, the Department and local health departments are authorized by the act to undertake the reviews, and to promulgate regulations concerning those reviews.

Further, since section 4 of the act (35 P. S. § 521.4) places reporting responsibilities on certain persons, and section 16(a) and (b) of the act gives the Department the authority to promulgate regulations to effectuate these reporting requirements, the Department has the authority to review these records to ensure that reporting is occurring appropriately.

Proposed subsection (a) would clearly state this authority to eliminate further confusion on the part of providers. Subsection (b) would clarify the Department's authority to require special reports from providers and laboratories in order to ensure reporting compliance.

Section 27.32d. Record audits.

This section would be new. The Department is proposing to review records of physicians, hospitals and other persons or entities who diagnose cases of AIDS, or provide or receive HIV and CD4 T-lymphocyte test results. The Department's audit would extend back to January 1, 2000. These audits would allow the Department to collect information to complete HIV and CD4 T-lymphocyte case reports, enabling it not only to track disease trends, but to complete case investigations and obtain information necessary to complete applications for Federal funding grants from the CDC and from the United States Department of Health and Human Services (HHS). The Ryan White CARE Act amendments of 2000 ((Pub. L. No. 106-345) (114 Stat. 1319, 1323—1325)) require the Secretary of the Federal Department of Health and Human Services to determine by July 1, 2004, if HIV case data provided by states is sufficiently accurate and reliable to use in the grant formula. If it is not, the Department will be able to use only live AIDS case data in its Fiscal Year 2005 (April 1, 2005 to March 31, 2006) application for grant allocations. Because AIDS case numbers have fallen, as discussed previously, this could decrease the amount of funding received by the Commonwealth. The Department is proposing this review of case information back to January 1, 2000, to ensure that it has the most accurate and reliable data available.

C. Affected Persons

These proposed amendments would affect physicians, hospitals and other persons or entities providing HIV services, who diagnose AIDS or who provide or receive HIV and CD4 T-lymphocyte test results. They will be required to report diagnosed cases of AIDS, HIV test results, low CD4 T-lymphocyte counts and perinatal exposure of newborns to HIV. The amendments would also

affect laboratories, which will be required to report certain positive HIV tests and CD4 T-lymphocyte counts of a certain level.

The proposed amendments would also affect local health departments that are involved in the reporting system, particularly the local health departments for Allegheny and Philadelphia Counties, which are currently considering or which have already implemented CD4 T-lymphocyte reporting. The proposed amendments would also impact persons with AIDS, persons with HIV infection and at risk for contracting HIV, persons with low CD4 T-lymphocyte counts, and pregnant women at risk for HIV or who test positive for HIV and their newborn children. Required reporting of the conditions and test results included in this proposed rulemaking would permit the Department to obtain more accurate information regarding the trends of the disease, and therefore to target funding to programs that would provide maximum benefit to these individuals. Further, reporting of cases to the Department would enable public health professionals to provide counseling, testing, and referral to infected persons, and with the individual's permission, to conduct contact tracing which can lead to early detection and treatment.

D. Cost and Paperwork Estimate

1. Cost

The proposed amendments would have no measurable fiscal impact on local government, the private sector or the general public, because the disease reporting system already exists in this Commonwealth. There would be an increase in cost of \$500,000 to the Commonwealth, since the Department anticipates spending that amount for additional positions in the ten local health departments for staff to carry out case management activities, including counseling, testing, referral and partner notification. The Department anticipates this increase in personnel would be necessary because of the increase in the number of actual cases that would be seen once the addition of the conditions proposed by this rulemaking to the list of reportable diseases becomes final. The Department believes that this increase in cost to the Commonwealth would be outweighed by the savings from these proposed amendments, caused by reporting of information that would enable the Department to focus prevention efforts on the most at-risk populations. Over time these activities should cause a reduction in the number of HIV cases in this Commonwealth. This would reduce health care costs.

No additional cost would accrue from the Department's provision of software for electronic reporting, since the Department obtains that software for these purposes free-of-charge from the CDC. It is anticipated that any additional modification to the software necessary to suit the Department's purposes would be done either in-house or at no additional charge to the Department by current contractors.

2. Paperwork Estimates

Because the disease reporting system is already in place in this Commonwealth, the addition of other diseases and conditions to the list of reportable diseases and conditions should create no measurable increase in paperwork. Cases of HIV, low CD4 T-lymphocyte counts and perinatal exposure of newborns to HIV would be reported and investigated in a similar manner to cases of currently listed diseases, infections and conditions using National case definitions and a reporting format similar to that currently used to report AIDS. The Department is requiring electronic reporting, but is offering the software to those required to report free-of-charge.

E. Statutory Authority

The Department obtains its authority to promulgate regulations relating to reporting of communicable and noncommunicable diseases from the act. The act provides the Board with the authority to issue rules and regulations on a variety of matters relating to communicable and noncommunicable diseases, including which diseases are to be reported, the methods of reporting diseases, the contents of reports and the health authorities to whom diseases are to be reported, what control measures are to be taken with respect to which diseases, and any other matters the Board may deem advisable for the prevention and control of disease, and for carrying out the provisions and purposes of the act. See section 16(a) of the act. Section 16(b) of the act gives the Secretary of Health (Secretary) the authority to review existing regulations and make recommendations to the Board for changes the Secretary considers to be desirable.

The Department also finds general authority for the promulgation of its regulations in the AC. Section 2102(g) of the AC gives the Department this general authority.

Section 2111(b) of the AC (71 P.S. § 541(b)) provides the Board with additional authority to promulgate regulations deemed by the Board to be necessary for the prevention of disease, and for the protection of the lives and the health of the people of this Commonwealth. That section further provides that the regulations of the Board shall become the regulations of the Department.

Section 2106(a) of the AC (71 P.S. § 536(a)) provides the Department with additional authority to declare diseases to be communicable, and to establish regulations for the prevention and control of disease.

Several statutes provide the Department with authority to command disease prevention and control measures within certain institutions. Section 803 of the Health Care Facilities Act (35 P.S. § 448.803) provides the Department with the authority to promulgate regulations relating to the licensure of health care facilities, and allows the Department to require that certain actions relating to disease control and prevention occur within health care facilities. Articles IX and X of the Public Welfare Code (62 P.S. §§ 901—922 and 1001—1087), which provide the Department with the authority to license inpatient drug and alcohol abuse treatment facilities, play the same role with respect to the Department's ability to require certain disease prevention and control measures in those facilities.

F. Effectiveness/Sunset Dates

The proposed amendments will become effective upon publication of final-form rulemaking in the *Pennsylvania Bulletin*, with exception of the reporting duties expressly made effective on January 1, 2002. No sunset date has been established. The Department will continually review and monitor the effectiveness of these regulations.

G. Regulatory Review

Under section 5(a) of the Regulatory Review Act (71 P.S. § 745.15(a)), on April 10, 2001, the Department submitted a copy of these proposed amendments to the Independent Regulatory Review Commission (IRRC) and to the Chairpersons of the House Health and Human Services Committee and the Senate Public Health and Welfare Committee. In addition to submitting the proposed amendments, the Department has provided IRRC and the Committees with a copy of a Regulatory Analysis Form prepared by the Department in compliance with

Executive Order 1996-1, "Regulatory Review and Promulgation." A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, if IRRRC has objections to any portion of the proposed amendments, it will notify the Department within 10 days of the close of the Committees' review period. The notifications shall specify the regulatory review criteria which have not been met by that portion. The Regulatory Review Act specifies detailed procedures for review, prior to final publication of the regulations by the Department, the General Assembly and the Governor, of objections raised.

H. Contact Person

Interested persons are invited to submit written comments, suggestions or objections regarding the proposed amendments to Joel H. Hersh, Director, Bureau of Epidemiology, Department of Health, P. O. Box 90, Harrisburg, PA 17108, (717) 783-4677, within 30 days after publication of this notice in the Pennsylvania Bulletin. Persons with a disability who wish to submit comments, suggestions or objections regarding the proposed regulations may do so by using V/TT (717) 783-6514 for speech and/or hearing impaired persons or the Pennsylvania AT&T Relay Service at 800-654-5984[TT]. Persons who require an alternative format of this document may contact Joel Hersh so that necessary arrangements may be made.

ROBERT S. ZIMMERMAN, Jr., Secretary

Fiscal Note: 10-166; (1) General Fund; (2) Implementing Year 2001-02 is \$500,000; (3) 1st Succeeding Year 2002-03 is \$500,000; 2nd Succeeding Year 2003-04 is \$500,000; 3rd Succeeding Year 2004-05 is \$500,000; 4th Succeeding Year 2005-06 is \$500,000; 5th Succeeding Year 2006-07 is \$500,000; (4) 2000-01 Program—\$44,561,100; 1999-00 Program—\$45,953,750; 1998-99 Program—\$45,737,700; (7) AIDS Program—Enhanced HIV Services; (8) recommends adoption.

Annex A

TITLE 28. HEALTH AND SAFETY
PART III. PREVENTION OF DISEASES
CHAPTER 27. COMMUNICABLE AND NONCOMMUNICABLE DISEASES
Subchapter A. GENERAL PROVISIONS

§ 27.1. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

* * * * *

CDC—Centers for Disease Control and Prevention.

* * * * *

District office—One of the district headquarters of the Department located within this Commonwealth.

FDA—The Food and Drug Administration.

* * * * *

LMRO—Local morbidity reporting office—A district office of the Department or a local health department.

* * * * *

Local health department—Each county department of health under the Local Health Administration Law (16 P. S. §§ 12001—12028), and each department of health in a municipality approved for a Commonwealth grant to provide local health services under section 25 of the Local Health Administration Law (16 P. S. § 12025). The Department will maintain a list of local health departments and revise the list when new local health departments are established.

* * * * *

Perinatal exposure of a newborn to HIV—The subjecting to risk of HIV infection of a fetus during the pregnancy of an HIV-positive woman regardless of the final outcome of the pregnancy or the final serostatus of the newborn if the pregnancy results in a live birth.

* * * * *

§ 27.2. Reportable diseases.

The Board declares the following communicable diseases, unusual outbreaks of illness, noncommunicable diseases and conditions to be reportable:

AIDS (Acquired Immune Deficiency Syndrome) as defined by the CDC case definition (effective January 1, 2002).

* * * * *

CD4 T-lymphocyte test result with a count of less than 200 cells/µL or less than 14% of total lymphocytes (effective January 1, 2002).

* * * * *

HIV (Human Immunodeficiency Virus) (effective January 1, 2002).

* * * * *

Perinatal exposure of a newborn to HIV (effective January 1, 2002).

* * * * *

Subchapter B. REPORTING OF DISEASES
GENERAL

§ 27.21. Physicians who treat patients with reportable diseases including tuberculosis.

* * * * *

[(e) Physicians shall report cases of AIDS under § 27.32 (relating to reporting AIDS).]

§ 27.22. Reporting [laboratory] results indicative of certain infections or conditions by laboratories.

(a) A person who is in charge of a laboratory in which a laboratory [examination] test of a specimen derived from the human body yields microscopical, cultural, immunological, serological, chemical, virologic, nucleic acid (DNA or RNA) or other evidence significant from a public health standpoint of the presence of a disease listed in subsection (b) shall report promptly the findings, not later than the next working day after the close of business on the day on which the [examination] test was completed, except as noted otherwise in this chapter.

(b) The conditions or diseases to be reported include the following:

* * * * *

CD4 T-lymphocyte test result with a count of less than 200 cells/ μ L or less than 14% of total lymphocytes.

* * * * *

HIV (Human Immunodeficiency Virus).

* * * * *

(c) Reports shall include the following information:

(1) **Reports of test results other than HIV and CD4 T-lymphocyte test results.** The report shall give the name, age and address of the person from whom the specimen was obtained, and the name and address of the physician for whom the examination or test was made.

(2) **Reports of HIV and CD4 T-lymphocyte test results.** Laboratories shall report electronically to the Department's Bureau of Epidemiology. The report shall include the following information:

(i) The individual's name and the address, city, county and zip code of the individual's residence.

(ii) The patient identifying number assigned by the physician or at the facility requesting the laboratory test.

(iii) The individual's date of birth (month, day, year).

(iv) The individual's sex.

(v) The individual's race/ethnicity.

(vi) The date of each test performed.

(vii) The type of test performed.

(viii) The results of the tests.

(ix) A CD4 T-lymphocyte test result with a count of less than 200 cells/ μ L or a CD4 T-lymphocyte percentage of less than 14% of total lymphocytes.

(x) The name of the person or entity submitting the specimen for testing.

(xi) The address of the person or entity submitting the specimen for testing, including the zip code, physical address and telephone number of the submitter.

(d) The [report shall be submitted by the] person in charge of a laboratory shall submit the report as follows:

(1) *Reports except for venereal diseases, hypothyroidism in infants up to 24 months old[,] and phenylketonuria [and lead poisoning or lead toxicity.* Reports shall be made to the appropriate health authority of Philadelphia or the county department of health if the patient resides in such an area. Other reports shall be sent to the Division of Epidemiology, Department of Health, Post Office Box 90, Harrisburg, Pennsylvania 17108]. Laboratory test results shall be reported directly to the Department's Bureau of Epidemiology through secure electronic mechanisms in a manner specified by the Department.

(2) *Venereal disease (including positive dark fields).* Reports shall be made to the appropriate health authority of Philadelphia when the patient resides in Philadelphia and to the health authority in Allegheny County when the patient resides in Allegheny County. Other reports shall be sent to the [Division of Communicable Disease Control and Surveillance, Bureau of Epide-

miology and Disease Prevention, Department of Health, Post Office Box 90, Harrisburg, Pennsylvania 17108, unless otherwise directed by the Secretary] Department as required in paragraph (1).

* * * * *

(4) [*Lead poisoning or lead toxicity.* Reports shall be made to the Division of Environmental Health, Department of Health, Post Office Box 90, Harrisburg, Pennsylvania 17108-9990 on forms developed and supplied by the Division of Environmental Health.] *Reports of CD4 T-lymphocyte test result.* A laboratory shall report to the Department CD4 T-lymphocyte test result under subsection (b) within 5 days of obtaining the test result.

(5) *Reports of HIV.* A laboratory shall report to the Department positive results of any test approved by the FDA to establish the presence of HIV including a serologic, virologic, nucleic acid (DNA or RNA) or any other type of test the FDA approves to establish the presence of HIV within 5 days of obtaining the test result.

(e) To enable the laboratory to complete the report it is required to file with the Department, a person or entity that requests a laboratory test for HIV or a CD4 T-lymphocyte count shall provide to the laboratory the information listed in subsection (c)(2), with the exception of subparagraphs (vi)—(ix). In addition to the information included in subsection (c)(2), a person or entity that requests a laboratory test for HIV or a CD4 T-lymphocyte count shall provide to the laboratory the date each test was requested, and the type of test or tests requested.

§ 27.32. Reporting AIDS, HIV, CD4 T-lymphocyte counts, and perinatal exposure of newborns to HIV by physicians, hospitals, persons or entities, who diagnose AIDS or who receive or provide HIV and CD4 T-lymphocyte test results.

(a) [Physicians and hospitals shall report cases of AIDS promptly to the Department of Health, Division of Acute Infectious Disease Epidemiology, Post Office Box 90, Harrisburg, Pennsylvania 17108, or to the local health department in the counties of Allegheny, Bucks, Chester, Erie and Philadelphia and in the cities of Allentown, Bethlehem and York when the individual who is the subject of the report is a resident of the county or city.]

A physician, hospital, or person or entity providing HIV services, who makes a diagnosis of AIDS or who receives HIV or CD4 T-lymphocyte test results or provides HIV or CD4 T-lymphocyte test results to patients shall report the following to the LMRO responsible for the geographic area in which the person is tested or diagnosed:

(1) A diagnosis of AIDS based on the CDC case definition.

(2) A positive result of any test approved by the FDA to establish the presence of HIV, including a serologic, virologic, nucleic acid (DNA or RNA) or any other type of test the FDA approves to establish the presence of HIV.

(3) A CD4 T-lymphocyte test result with a count of less than 200 cells/ μ L or a CD4 T-lymphocyte percentage of less than 14% of total lymphocytes.

(4) A perinatal exposure of a newborn to HIV.

(b) [Local health authorities receiving reports of AIDS shall forward completed case report forms to the Department of Health in a timely manner. Completed forms shall provide identifying information, including but not limited to, the name of the case, the individual's address and telephone number, the name of the individual's medical provider and the reporting source.]

A report of an HIV test result, CD4 T-lymphocyte count, AIDS case based on the CDC case definition, or perinatal exposure of a newborn to HIV shall include the following information:

(1) The individual's name and the address, city, county and zip code of the individual's residence.

(2) The patient identifying number assigned by the physician or at the facility requesting the laboratory test.

(3) The individual's date of birth.

(4) The individual's sex.

(5) The individual's race or ethnicity.

(6) The date of each test performed.

(7) The type of test performed.

(8) A positive result of any test approved by the FDA to establish the presence of HIV including a serologic, virologic, nucleic acid (DNA or RNA) or any other type of test the FDA approves to establish the presence of HIV.

(9) A CD4 T-lymphocyte test result with a count of less than 200 cells/uL or a CD4 T-lymphocyte percentage of less than 14% of total lymphocytes.

(10) The probable mode of transmission.

(11) The treatment provided.

(12) The name, address and telephone number of the physician, hospital, or other person or entity that secured a specimen from the individual and submitted it for laboratory testing.

(13) The name, address and telephone number of the entity in which the diagnosis was made, or that received the HIV test result or CD4 T-lymphocyte count.

(14) Other information the Department determines to be relevant.

(c) The reporter shall maintain the data required in subsection (b) in the patient file on the Department's HIV/AIDS report form. In addition to completing that form, the reporter shall transmit the report electronically to the LMRO through a secure electronic mechanism specified by the Department within 5 business days of the diagnosis of AIDS or receipt of the results of the test.

(d) An LMRO receiving reports of diagnoses of AIDS, positive HIV test results, reportable CD4 T-lymphocyte counts, and perinatal exposures to HIV shall forward completed case reports containing the information included in subsection (b) electronically to the Department's Bureau of Epidemiology.

§ 27.32a. Confidential and anonymous testing.

(a) Anonymous testing for HIV, except for blinded HIV testing authorized under section 5(f) of the Confidentiality of HIV-Related Information Act (35 P. S. § 7605(f)), may only be provided at State-designated anonymous testing sites. Anonymous testing is testing provided to an individual without collecting the individual's name. All other HIV testing shall be conducted confidentially with the name of the tested individual collected, and the name of the individual reported when the result of the test is reportable. Persons or entities reporting as required in this section shall offer all HIV and AIDS-related services confidentially and may not provide anonymous testing, or consider any test or its results to be anonymous.

(b) Anonymous test results shall be reported in accordance with § 27.32 (relating to reporting AIDS, HIV, CD4 T-lymphocyte counts and perinatal exposure of newborns to HIV by physicians, hospitals, persons or entities, who diagnose AIDS or who receive or provide HIV and CD4 T-lymphocyte test results) without a patient name but with an anonymous code assigned at the time the specimen is collected in accordance with a Department-approved anonymous test site algorithm.

§ 27.32b. Counseling, testing, referral and partner notification services.

Counseling, testing, referral and partner notification services shall be performed in accordance with the Confidentiality of HIV-Related Information Act (35 P. S. §§ 7601—7612) (Act 1990-148). A person providing HIV test results to a patient may ask for the Department's assistance with counseling if the person chooses to do so, and if doing so would not violate Act 1990-148.

§ 27.32c. Department authority to require complete reporting.

To conduct case investigations, to determine whether under-reporting is occurring, to investigate reporting delays, and to investigate other reporting problems the Department will have access to and may review the patient records of physicians, hospitals, and other persons and entities providing HIV services, who make diagnoses of AIDS or who receive or provide HIV and CD4 T-lymphocyte test results.

§ 27.32d. Record audits.

(a) The Department may conduct record audits of the records of physicians, hospitals, and other persons and entities providing HIV services, who make diagnoses of AIDS, or who receive or provide HIV test results for the purpose of obtaining information allowing the Department to complete HIV and CD4 T-lymphocyte case reports to aid it in tracking trends in disease and obtaining additional funding for prevention and treatment programs. The Department may audit records going back to January 1, 2000, for this purpose.

(b) The Department may require special reports of persons or entities required to report under this chapter ensure compliance with this chapter.

[Pa.B. Doc. No. 01-680. Filed for public inspection April 20, 2001, 9:00 a.m.]

STATE BOARD OF EDUCATION

[22 PA. CODE CH. 4]

Academic Standards and Assessment

The State Board of Education (Board) proposes to amend Chapter 4 (relating to academic standards and assessment) to add academic standards in science and technology and environment and ecology, to read as set forth in Annex A, under authority of the Public School Code of 1949 (24 P. S. §§ 1-101—27-2702).

Purpose

Proposed amendments to Chapter 4 will add academic standards in science and technology and environment and ecology. The purpose of adding these requirements is to specify academic standards to be achieved by students enrolled in the public schools (including public charter schools) of this Commonwealth.

Requirements of the Proposed Amendments

Proposed amendments to Chapter 4 define the standards in science and technology and environment and ecology to be achieved by students in the public schools. Standards for science and technology are organized in eight areas: (1) unifying themes of science; (2) inquiry and design; (3) biological sciences; (4) physical science, chemistry and physics; (5) earth sciences; (6) technology education; (7) technological devices; and (8) science, technology and human endeavors. Specific standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade.

Standards for environment and ecology are organized in nine areas: (1) watersheds and wetlands; (2) renewable and nonrenewable resources; (3) environmental health; (4) agriculture and society; (5) integrated pest management; (6) ecosystems and their interaction; (7) threatened, endangered and extinct species; (8) humans and the environment; and (9) environmental laws and regulations. Specific standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade.

Affected Parties

The proposed amendments to Chapter 4 affect the students and professional employees of the public schools of this Commonwealth (including intermediate units, area vocational-technical schools, public charter and alternative schools).

Cost and Paperwork Estimates

Costs to implement this proposed rulemaking may include curriculum development and the professional development of teachers. These costs vary by school district. Curriculum development is an ongoing activity for schools and is typically part of their normal budgeting. Costs associated with aligning curricula with these standards at the local level will be minimized by the following efforts: technical assistance in curriculum development provided by Department staff; detailed implementation kits provided to school districts by the Department; and the Standards Implementation Project which funds intermediate unit services throughout this Commonwealth supporting the implementation of these and other standards. Current year funds available to the Department to support curriculum alignment is \$1 million.

Professional development of teachers is an ongoing activity for schools and is addressed in the normal budgeting of school districts. Specific programs designed to support the implementation of these standards will minimize any financial impact on school districts. These programs include professional development provided through the Standards Implementation Project and Governor's Academies for Teachers (currently provided in the Life Sciences, Physical Sciences and Environment and Ecology). Current year funds available to the Department to support professional development is \$539,000. In addition, the act of November 23, 1999 (P. L. 529, No. 48) (Act 48) establishing a requirement for all educators to engage in continuing professional education, further requires the Department to provide 40 hours of professional development annually at no cost to teachers. It is expected that online, professional development activities will be developed in science and technology and environment and ecology.

Effective Date

These amendments to Chapter 4 will become effective upon final publication in the *Pennsylvania Bulletin*.

Sunset Date

The effectiveness of Chapter 4 will be reviewed by the Board every 4 years, in accordance with the Board's policy and practice respecting all regulations promulgated by the Board. Thus, no sunset date is necessary.

Regulatory Review

Under section 5(a) of the Regulatory Review Act (act) (71 P. S. § 745.5(a)), on April 11, 2001, the Board submitted a copy of these proposed amendments to the Independent Regulatory Review Commission (IRRC) and to the Chairpersons of the House and Senate Committees on Education. In addition to submitting the proposed amendments, the Board has provided IRRC and the Committees with a copy of a detailed Regulatory Analysis Form prepared by the Board in compliance with Executive Order 1996-1, "Regulatory Review and Promulgation." A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, if IRRC has objections to any portion of the proposed amendments, it will notify the Board within 10 days of the close of the Committees' review period. The notification shall specify the regulatory review criteria which have not been met by that portion. The Regulatory Review Act specifies detailed procedures for review, prior to final publication of the regulations, by the Board, the General Assembly and the Governor of objections raised.

Public Comments and Contact Person

Interested persons are invited to submit written comments, suggestions or objections regarding this proposal to Peter H. Garland, Executive Director of the State Board of Education, 333 Market Street, Harrisburg, PA 17126-0333 within 30 days following publication in the *Pennsylvania Bulletin*.

Persons with disabilities needing an alternative means of providing public comment may make arrangements by calling Dr. Peter Garland at (717) 787-3787 or TDD (717) 787-7367.

PETER H. GARLAND,
Executive Director

Fiscal Note: 6-273. (1) General Fund;

	<i>State</i>	<i>Federal</i>
(2) Implementing Year 2000-01 is	\$540,000	\$1 million
(3) 1st Succeeding Year 2001-02 is	\$600,000	-0-
2nd Succeeding Year 2002-03 is	\$600,000	-0-
3rd Succeeding Year 2003-04 is	\$600,000	-0-
4th Succeeding Year 2004-05 is	\$600,000	-0-
5th Succeeding Year 2005-06 is	\$600,000	-0-

(4) 1999-00 Program—\$360,000; 1998-99 Program—\$360,000; 1997-98 Program—\$0; (7) Teacher Professional Development and Federal—Educate America Act—Local—Implementing Year Only; (8) recommends adoption.

- Technology Education 3.6.**
 - Biotechnology
 - Information Technology
 - Physical Technologies
 - (Construction, Manufacturing, and Transportation)
- Technological Devices 3.7.**
 - Tools
 - Instruments
 - Computer Operations
 - Computer Software
 - Computer Communication Systems
- Science, Technology and Human Endeavors. 3.8.**
 - Constraints
 - Meeting Human Needs
 - Consequences and Impacts
- Glossary IX.**

Annex A
TITLE 22. EDUCATION
PART I. STATE BOARD OF EDUCATION
CHAPTER 4. ACADEMIC STANDARDS AND ASSESSMENT
APPENDIX B
ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY AND ENVIRONMENT AND ECOLOGY
Proposed Academic Standards for Science and Technology

VII. TABLE OF CONTENTS

Introduction.....	VIII.
THE ACADEMIC STANDARDS	
Unifying Themes.....	3.1.
Systems	
Models	
Patterns	
Scale	
Change	
Inquiry and Design.....	3.2.
Nature of Scientific Knowledge	
Process Knowledge	
Scientific Method	
Problem Solving in Technology	
Biological Sciences.....	3.3.
Living Forms	
Structure and Function	
Inheritance	
Evolution	
Physical Science, Chemistry and Physics.....	3.4.
Matter	
Energy	
Forces and Motion	
Astronomy	
Earth Sciences.....	3.5.
Land Forms and Processes	
Resources	
Meteorology	
Hydrology and Oceanography	

VIII. INTRODUCTION

This document describes what students should know and be able to do in the following eight areas:

- 3.1. Unifying Themes of Science
- 3.2. Inquiry and Design
- 3.3. Biological Sciences
- 3.4. Physical Science, Chemistry and Physics
- 3.5. Earth Sciences
- 3.6. Technology Education
- 3.7. Technological Devices
- 3.8. Science, Technology and Human Endeavors

These standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress through school.

This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

Standards are arranged by categories, for example, 3.5 Earth Science. Under each category are standard statements that are preceded by a capital letter; for example, in 3.1 Unifying Themes, grade 10.B, "Describe concepts of models as a way to predict and understand science and technology." Following the standard statements are bulleted standard descriptors, which explain the nature and scope of the standard. Descriptors specify the nature of the standard and the level of complexity needed in meeting that standard in a proficient manner. Descriptors serve to benchmark the standard statement. Curriculum, instruction and assessment should focus on meeting the standard statement. Technology Education, computer applications and science are separate curricular areas. Meeting standards should be approached as a collaborative effort among all curricular areas.

The following descriptors explain the intent of each standard category:

3.1. Unifying Themes

Unifying themes of science and technology provide big ideas that integrate with significant concepts. There are only a few fundamental concepts and processes that form the framework upon which science and technology knowledges are organized—motion and forces, energy, structure of matter, change over time and machines. These themes create the context through which the content of the disciplines can be taught and are emphasized in each standard.

- 3.2 Inquiry and Design** The nature of science and technology is characterized by applying process knowledge that enables students to become independent learners. These skills include observing, classifying, inferring, predicting, measuring, computing, estimating, communicating, using space/time relationships, defining operationally, raising questions, formulating hypotheses, testing and experimenting, designing controlled experiments, recognizing variables, manipulating variables, interpreting data, formulating models, designing models, and producing solutions. Everyone can use them to solve real-life problems. These process skills are developed across the grade levels and differ in the degree of sophistication, quantitative nature and application to the content.
- 3.3 Biological Sciences** Biology concerns living things, their appearance, different types of life, the scope of their similarities and differences, where they live and how they live. Living things are made of the same components as all other matter, involve the same kinds of transformations of energy and move using the same basic kinds of forces as described in chemistry and physics standards. Through the study of the diversity of life, students learn to understand how life has changed over a long period of time. This great variety of life forms continues to change even today as genetic instructions within cells are passed from generation to generation, yet the amazing integrity of most species remain.
- 3.4 Physical Science Chemistry and Physics** Physics and chemistry study properties of objects. Students examine changes to materials during mixing, freezing, heating and dissolving and then learn how to observe and measure results. In chemistry students study the relationship between matter, atomic structure and its activity. Laboratory investigations of the properties of substances and their changes through a range of chemical interactions provide a basis for students to understand atomic theory and a variety of reaction types and their applications in business, agriculture and medicine. Physics deepens the understanding of the structure and properties of materials and includes atoms, waves, light, electricity, magnetism and the role of energy, forces and motion.
- 3.5 Earth Sciences** The dynamics of earth science include the studies of forces of nature that build the earth and wear down the earth. The understanding of these concepts uses principles from physical sciences, geography and mathematics.
- 3.6 Technology Education** Technology education is the use of accumulated knowledge to process resources to meet human needs and improve the quality of life. Students develop the ability to select and correctly use materials, tools, techniques and processes to answer questions, understand explanations and solve problems encountered in real life situations. These overriding themes require students to design, create, use, evaluate and modify systems of Biotechnologies, Information Technologies, and Physical Technologies.
- 3.7 Technological Devices** Students use tools to observe, measure, move and make things. New technological tools and techniques make it possible to enact far-reaching changes in our world. Technology enhances the students' abilities to identify problems and determine solutions. Computers play an integral role in every day life by extending our abilities to collect, analyze and communicate information and ideas.
- 3.8 Science, Technology and Human Endeavors** Scientific knowledge and societal needs often create a demand for new technology. Conversely, new technology advances scientific knowledge. Both influence society through the impact of their products and processes.

What Is Science? Any study of science includes the search for understanding the natural world and facts, principles, theories and laws that have been verified by the scientific community and are used to explain and predict natural phenomena and events.

Acquiring scientific knowledge involves constructing hypotheses using observation and knowledge in the content area in order to formulate useful questions that provoke scientific inquiry. As a result of repeated, rigorous testing over time and applying multiple perspectives to a problem, consistent information emerges. A theory describes this verifiable event or phenomena. Theories are powerful elements in science and are used to predict other events. As theories lose their ability to predict, they are modified, expanded or generalized or incorporated into a broader theory.

Knowledge of what science is incorporates carefully developed and integrated components:

- **Nature of science**—the ways in which scientists search for answers to questions and explanations of observations about the natural world; includes process

knowledge of observing, classifying, inferring, predicting, measuring, hypothesizing, experimenting and interpreting data

- **Unifying themes of science**—concepts, generalizations and principles that result from and lead to inquiry

- **Knowledge**—facts, principles, theories and laws verifiable through scientific inquiry by the world community of scientists; includes physics, chemistry, earth science and biological sciences

- **Inquiry**—an intellectual process of logic that includes verification of answers to questions about and explanations for natural objects, events and phenomena

- **Process skills**—Recognition by students how knowledge is acquired and applied in science by observing, classifying, inferring, predicting, measuring, computing, estimating, communicating, using space/time relationships, defining operationally, formulating hypotheses, testing and experimenting, designing controlled experiments, recognizing variables, manipulating variables, interpreting data, formulating models, designing models and producing solutions

• **Problem solving**—application of concepts to problems of human adaptation to the environment that often leads to recognition of new problems; has social implications and leads to personal decision-making and action; a process which forms the link for interactions between scientific and technological results or findings; involves operational definitions, recognizing variables, formulating models and asking questions

• **Scientific thinking**—the disposition to suspend judgment, not make decisions and not take action until results, explanations or answers have been tested and verified with information

What Is Technology Education? It is the means by which we teach Technology. Technology is a body of knowledge separate from but related to the sciences, with specific content, curriculum and specific certification requirements. Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. We use technology in an attempt to improve our environment. These improvements may relate to survival needs (e.g., food, shelter, defense) or they may relate to human aspirations (e.g., knowledge, art, control). They can include unexpected benefits, unexpected costs and unexpected risks. Technology education involves a broad spectrum of knowledge and activities. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous

academic concepts through practical, hands-on applications. Instructional technology on the other hand, deals specifically with use of computers and different software to solve problems and communicate effectively. Knowledge of content, process and skills should be used together to effectively engage students and promote a complete understanding of the sciences, related technologies and their interrelationship. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories.

Knowledge of content, process and skills in technology involves learning processes that include these components:

- Methods of designing and developing solutions
- Standards for selecting and using appropriate materials, tools and processes
- Experimental and design specifications for testing and evaluating solutions
- Criteria for judging the performance and impact of the solutions
- Evaluating the impact of modifying a system to improve performance

Technology Education can be divided into three main systems that include biotechnological, informational, and physical technologies:

Biotechnological Systems

Bioconversion
 Bioprocessing
 Environment
 Ergonomics
 Engineering/Design Systems
 Research and Development

Informational Systems

Computer-Aided Drafting/Design (CADD)
 Drafting & Design
 Desktop Publishing
 Electronic Communications
 Engineering/Design Systems
 Graphic Communications
 Communications Systems
 Multimedia Technology
 Networking Systems
 Research and Development
 Video and Television Production
 World Wide Web Design & Publishing

Physical Systems

Automation/Robotics
 Computer-Aided and Integrated Manufacturing (CAM/CIM)
 Construction
 Electronic Circuits/Control Systems
 Energy Systems
 Architecture and Community Planning
 Engineering/Design Systems
 Enterprise Organization & Operation
 Manufacturing
 Material Processes
 Research and Development
 Transportation

3.1. Unifying Themes			
3.1.4. GRADE 4	3.1.7. GRADE 7	3.1.10. GRADE 10	3.1.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Know that natural and human-made objects are made up of parts.</p> <ul style="list-style-type: none"> Identify and describe what parts make up a system. Identify system parts that are natural and human-made (e.g., ball point pen, simple electrical circuits, plant anatomy). Describe the purpose of analyzing systems. Know that technologies include physical technology systems (e.g., construction, manufacturing, transportation), informational systems and biochemical-related systems. <p>B. Know models as useful simplifications of objects or processes.</p> <ul style="list-style-type: none"> Identify different types of models. Identify and apply models as tools for prediction and insight. Apply appropriate simple modeling tools and techniques. Identify theories that serve as models (e.g., molecules). 	<p>A. Explain the parts of a simple system and their relationship to each other.</p> <ul style="list-style-type: none"> Describe a system as a group of related parts that work together to achieve a desired result (e.g., digestive system). Explain the importance of order in a system. Distinguish between system inputs, system processes and system outputs. Distinguish between open loop and closed loop systems. Apply systems analysis to solve problems. <p>B. Describe the use of models as an application of scientific or technological concepts.</p> <ul style="list-style-type: none"> Identify and describe different types of models and their functions. Apply models to predict specific results and observations (e.g., population growth, effects of infectious organisms). Explain systems by outlining a system's relevant parts and its purpose and/or designing a model that illustrates its function. 	<p>A. Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.</p> <ul style="list-style-type: none"> Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch). Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems. Explain the concept of system redesign and apply it to improve technological systems. Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems. Analyze and describe the effectiveness of systems to solve specific problems. <p>B. Describe concepts of models as a way to predict and understand science and technology.</p> <ul style="list-style-type: none"> Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability). Apply mathematical models to science and technology. 	<p>A. Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.</p> <ul style="list-style-type: none"> Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems. Apply systems analysis to predict results. Analyze and describe the function, interaction and relationship among subsystems and the system itself. Compare and contrast several systems that could be applied to solve a single problem. Evaluate the causes of a system's inefficiency. <p>B. Apply concepts of models as a method to predict and understand science and technology.</p> <ul style="list-style-type: none"> Evaluate technological processes by collecting data and applying mathematical models (e.g., process control). Apply knowledge of complex physical models to interpret data and apply mathematical models. Appraise the importance of computer models in interpreting science and technological systems.

3.1. Unifying Themes			
3.1.4. GRADE 4	3.1.7. GRADE 7	3.1.10. GRADE 10	3.1.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Illustrate patterns that regularly occur and reoccur in nature.</p> <ul style="list-style-type: none"> Identify observable patterns (e.g., growth patterns in plants, crystal shapes in minerals, climate, structural patterns in bird feathers). Use knowledge of natural patterns to predict next occurrences (e.g., seasons, leaf patterns, lunar phases). <p>D. Know that scale is an important attribute of natural and human made objects, events and phenomena.</p> <ul style="list-style-type: none"> Identify the use of scale as it relates to the measurement of distance, volume and mass. Describe scale as a ratio (e.g., pipe fittings). Explain the importance of scale in producing models and apply it to a model. 	<p>C. Identify patterns as repeated processes or recurring elements in science and technology.</p> <ul style="list-style-type: none"> Identify different forms of patterns and use them to group and classify specific objects. Identify repeating structure patterns. Identify and describe patterns that occur in physical systems (e.g., construction, manufacturing, transportation), informational systems and biochemical-related systems. <p>D. Explain scale as a way of relating concepts and ideas to one another by some measure.</p> <ul style="list-style-type: none"> Apply various applications of size and dimensions of scale to scientific, mathematical, and technological applications. Describe scale as a form of ratio and apply to a life situation. 	<p>C. Apply patterns as repeated processes or recurring elements in science and technology.</p> <ul style="list-style-type: none"> Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order. Examine and describe stationary physical patterns. Examine and describe physical patterns in motion. <p>D. Apply scale as a way of relating concepts and ideas to one another by some measure.</p> <ul style="list-style-type: none"> Apply dimensional analysis and scale as a ratio. Convert one scale to another. 	<p>C. Assess and apply patterns in science and technology.</p> <ul style="list-style-type: none"> Assess and apply recurring patterns in natural and technological systems. Compare and contrast structure and function relationships as they relate to patterns. Assess patterns in nature using mathematical formulas. <p>D. Analyze scale as a way of relating concepts and ideas to one another by some measure.</p> <ul style="list-style-type: none"> Compare and contrast various forms of dimensional analysis. Assess the use of several units of measurement to the same problem. Analyze and apply appropriate measurement scales when collecting data.

3.1. Unifying Themes			
3.1.4. GRADE 4	3.1.7. GRADE 7	3.1.10. GRADE 10	3.1.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>E. Recognize change in natural and physical systems.</p> <ul style="list-style-type: none"> • Recognize change as fundamental to science and technology concepts. • Examine and explain change by using time and measurement. • Describe relative motion. • Describe the change to objects caused by heat, cold, light or chemicals. 	<p>E. Identify change as a variable in describing natural and physical systems.</p> <ul style="list-style-type: none"> • Describe fundamental science and technology concepts that could solve practical problems. • Explain how ratio is used to describe change. • Describe the effect of making a change in one part of a system on the system as a whole. 	<p>E. Describe patterns of change in nature, physical and man made systems.</p> <ul style="list-style-type: none"> • Describe how fundamental science and technology concepts are used to solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, atomic theory, theory of relativity, Pasteur's Germ Theory, Galileo's Heliocentric Solar System, gas laws, feedback systems). • Recognize that stable systems often involve underlying dynamic changes (e.g., a chemical reaction at equilibrium has molecules reforming continuously). • Describe the effects of error in measurements. • Describe changes to matter caused by heat, cold, light or chemicals using a rate function. 	<p>E. Evaluate change in nature, physical systems and man made systems.</p> <ul style="list-style-type: none"> • Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories). • Analyze how models, systems and technologies have changed over time (e.g., germ theory of disease, solar system, cause of fire). • Explain how correlation of variables does not necessarily imply causation. • Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2. Inquiry and Design			
3.2.4. GRADE 4	3.2.7. GRADE 7	3.2.10. GRADE 10	3.2.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Identify and use the nature of scientific and technological knowledge.</p> <ul style="list-style-type: none"> • Distinguish between a scientific fact and a belief. • Provide clear explanations that account for observations and results. • Relate how new information can change existing perceptions. <p>B. Describe objects in the world using the five senses.</p> <ul style="list-style-type: none"> • Recognize observational descriptors from each of the five senses (e.g., see-blue, feel-rough). • Use observations to develop a descriptive vocabulary. 	<p>A. Explain and apply scientific and technological knowledge.</p> <ul style="list-style-type: none"> • Distinguish between a scientific theory and a belief. • Answer "What if" questions based on observation, inference or prior knowledge or experience. • Explain how skepticism about an accepted scientific explanation led to a new understanding. • Explain how new information may change existing theories and practice. <p>B. Apply process knowledge to make and interpret observations.</p> <ul style="list-style-type: none"> • Measure materials using a variety of scales. • Describe relationships by making inferences and predictions. • Communicate, use space/time relationships, define operationally, raise questions, formulate hypotheses, test and experiment. • Design controlled experiments, recognize variables, manipulate variables. • Interpret data, formulate models, design models, and produce solutions. 	<p>A. Apply knowledge and understanding about the nature of scientific and technological knowledge.</p> <ul style="list-style-type: none"> • Compare and contrast scientific theories and beliefs. • Know that science is limited to the study of observable aspects of the world and the universe. • Integrate new information into existing theories and explain implied results. <p>B. Apply process knowledge and organize scientific and technological phenomena in varied ways.</p> <ul style="list-style-type: none"> • Describe materials using precise quantitative and qualitative skills based on observations. • Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions. • Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally. 	<p>A. Evaluate the nature of scientific and technological knowledge.</p> <ul style="list-style-type: none"> • Know and use the ongoing scientific processes to continually improve and better understand how things work. • Critically evaluate the status of existing theories. <p>B. Evaluate experimental information for appropriateness and adherence to relevant science processes.</p> <ul style="list-style-type: none"> • Evaluate experimental data correctly within experimental limits. • Judge that conclusions are consistent and logical with experimental conditions. • Interpret results of experimental research to predict new information or improve a solution.

3.2. Inquiry and Design			
3.2.4. GRADE 4	3.2.7. GRADE 7	3.2.10. GRADE 10	3.2.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Recognize and use the elements of scientific inquiry to solve problems.</p> <ul style="list-style-type: none"> • Generate questions about objects, organisms and/or events that can be answered through scientific investigations. • Design an investigation. • Conduct an experiment. • State a conclusion that is consistent with the information. <p>D. Recognize and use the technological design process to solve problems.</p> <ul style="list-style-type: none"> • Recognize and explain basic problems. • Identify possible solutions and their course of action. • Try a solution. • Describe the solution, identify its impacts and modify if necessary. • Show the steps taken and the results. 	<p>C. Identify and use the elements of scientific inquiry to solve problems.</p> <ul style="list-style-type: none"> • Generate questions about objects, organisms and/or events that can be answered through scientific investigations. • Evaluate the appropriateness of questions. • Design an investigation with limited variables to investigate a question. • Conduct a two-part experiment. • Judge the significance of experimental information in answering the question. • Communicate appropriate conclusions from the experiment. <p>D. Know and use the technological design process to solve problems.</p> <ul style="list-style-type: none"> • Define different types of problems. • Define all aspects of the problem, necessary information and questions that must be answered. • Propose the best solution. • Design and propose alternative methods to achieve solutions. • Apply a solution. • Explain the results, present improvements, identify and infer the impacts of the solution. 	<p>C. Apply the elements to scientific inquiry to solve problems.</p> <ul style="list-style-type: none"> • Generate questions about objects, organisms and/or events that can be answered through scientific investigations. • Evaluate the appropriateness of questions. • Design an investigation with adequate control and limited variables to investigate a question. • Conduct a multiple step experiment. • Organize experimental information using a variety of analytic methods. • Judge the significance of experimental information in answering the question. • Suggest additional steps that might be done experimentally. <p>D. Identify and apply the technological design process to solve problems.</p> <ul style="list-style-type: none"> • Examine the problem, rank all necessary information and all questions that must be answered. • Propose and analyze a solution. • Implement the solution. • Evaluate the solution, test, redesign and improve as necessary. • Communicate the process and evaluate and present the impacts of the solution. 	<p>C. Apply the elements of scientific inquiry to solve multi-step problems.</p> <ul style="list-style-type: none"> • Generate questions about objects, organisms and/or events that can be answered through scientific investigations. • Evaluate the appropriateness of questions. • Design an investigation with adequate control and limited variables to investigate a question. • Organize experimental information using analytic and descriptive techniques. • Evaluate the significance of experimental information in answering the question. • Project additional questions from a re-search study that could be studied. <p>D. Analyze and use the technological design process to solve problems.</p> <ul style="list-style-type: none"> • Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered. • Propose, develop and appraise the best solution and develop alternative solutions. • Implement and assess the solution. • Evaluate and assess the solution, redesign and improve as necessary. • Communicate and assess the process and evaluate and present the impacts of the solution.

3.3. Biological Sciences			
3.3.4. GRADE 4	3.3.7. GRADE 7	3.3.10. GRADE 10	3.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Know the similarities and differences of living things.</p> <ul style="list-style-type: none"> Identify life processes of living things (e.g., growth, digestion, react to environment). Know that some organisms have similar external characteristics (e.g., anatomical characteristics; appendages, type of covering, body segments) and that similarities and differences are related to environmental circumstances. Describe basic needs of plants and animals. <p>B. Know that living things are made up of parts that have specific functions.</p> <ul style="list-style-type: none"> Identify examples of unicellular and multicellular organisms. Determine how different parts of a living thing work together to make the organism function. 	<p>A. Describe the similarities and differences that characterize diverse living things.</p> <ul style="list-style-type: none"> Describe how the structures of living things help them function in unique ways. Explain how to use a dichotomous key to identify plants and animals. Account for adaptations among organisms that live in a particular environment. <p>B. Describe the cell as the basic structural and functional unit of living things.</p> <ul style="list-style-type: none"> Identify the levels of organization from cell to organism. Compare life processes at the organism level with life processes at the cell level. Explain that cells and organisms have particular structures that underlie their functions. Describe and distinguish among cell cycles, reproductive cycles and life cycles. Explain disease effects on structures or functions of an organism. 	<p>A. Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> Identify and characterize major life forms according to their placement in existing classification groups. Explain the relationship between structure and function at the molecular and cellular levels. Describe organizing schemes of classification keys. Identify and characterize major life forms by kingdom, phyla, class and order. <p>B. Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Identify the specialized structures and regions of the cell and the functions of each. Explain how cells store and use information to guide their functions. Explain cell functions and processes in terms of chemical reactions and energy changes. 	<p>A. Explain the relationship between structure and function at all levels of organization.</p> <ul style="list-style-type: none"> Identify and explain interactions among organisms (e.g., mutually beneficial, harmful relationships). Explain and analyze the relationship between structure and function at the molecular, cellular and organ-system level. Describe and explain structural and functional relationships in each of the five (or six) kingdoms. Explain significant biological diversity found in each of the biomes. <p>B. Analyze the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> Identify and describe factors affecting metabolic function (e.g., temperature, acidity, hormones). Evaluate metabolic activities using experimental knowledge of enzymes. Evaluate relationships between structure and functions of different anatomical parts given their structure. Describe potential impact of genome research on the biochemistry and physiology of life.

3.3. Biological Sciences			
3.3.4. GRADE 4	3.3.7. GRADE 7	3.3.10. GRADE 10	3.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to. . .</i>			
<p>C. Know that characteristics are inherited and thus offspring closely resemble their parents.</p> <ul style="list-style-type: none"> • Identify characteristics for animal and plant survival in different climates. • Distinguish between learned and inherited characteristics. 	<p>C. Know that every organism has a set of genetic instructions that determines its inherited traits.</p> <ul style="list-style-type: none"> • Identify and explain inheritable characteristics. • Identify that the gene is the basic unit of inheritance. • Identify basic patterns of inheritance (e.g., dominance, recessive, codominance). • Describe how traits are inherited. • Distinguish how different living things reproduce (e.g., vegetative budding, sexual). • Describe how selective breeding and genetic technologies can change genetic makeup of organisms. 	<p>C. Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast mitosis and function and process. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. 	<p>C. Explain gene inheritance and expression at the molecular level.</p> <ul style="list-style-type: none"> • Analyze gene expression at the molecular level. • Describe the roles of nucleic acids in cellular reproduction and protein synthesis. • Describe genetic engineering techniques, applications and impacts. • Explain birth defects from the standpoint of embryological development and/or changes in genetic makeup. • Describe the factors affecting gene frequency in a population over time and their consequences. • Describe and differentiate between the roles of natural selection and genetic drift.

3.3. Biological Sciences			
3.3.4. GRADE 4	3.3.7. GRADE 7	3.3.10. GRADE 10	3.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to. . .</i>			
<p>D. Identify changes in living things over time.</p> <ul style="list-style-type: none"> • Compare extinct life forms with living organisms. • Know that differences in individuals of the same species may give some advantage in surviving and reproducing. 	<p>D. Explain basic concepts of natural selection.</p> <ul style="list-style-type: none"> • Identify adaptations that allow organisms to survive in their environment. • Describe how an environmental change can affect the survival of organisms and entire species. • Describe the role that fossils play in studying the past. • Explain how biologic extinction is a natural process. 	<p>D. Explain the mechanism of the theory of evolution.</p> <ul style="list-style-type: none"> • Analyze evidence of fossil records, similarities in body structures, embryological studies and DNA studies that support or do not support the theory of evolution. • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible accounts for their present appearance. • Distinguish between inherited characteristics and learned behaviors in life forms. • Describe changes that illustrate major events in the earth's development based on a time line. • Apply the concept of natural selection to illustrate and account for a species' survival, extinction or change over time. 	<p>D. Analyze the theory of evolution.</p> <ul style="list-style-type: none"> • Analyze the impact of new scientific facts on the theory of evolution. • Examine human history by describing the progression from early hominids to modern humans. • Evaluate the concept of natural selection in illustrating evolution theory.
Ecosystem Standards are in the Environment and Ecology Standard Category (4.6).			

3.4. Physical Science, Chemistry and Physics			
3.4.4. GRADE 4	3.4.7. GRADE 7	3.4.10. GRADE 10	3.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Recognize basic concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Describe properties of matter (e.g., hardness, reactions to simple chemical tests). • Know that combining two or more substances can make new materials with different properties. • Know different material characteristics (e.g., texture, state of matter, solubility). 	<p>A. Describe concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Identify elements as basic building blocks of matter that cannot be broken down chemically. • Distinguish compounds from mixtures. • Describe and conduct experiments that identify chemical and physical properties. • Describe reactants and products of simple chemical reactions. 	<p>A. Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable. • Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table. • Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations. • Describe phases of matter according to the Kinetic Molecular Theory. • Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent). • Recognize formulas for simple inorganic compounds. • Describe various types of chemical reactions by applying the laws of conservation of mass and energy. • Apply knowledge of mixtures to appropriate separation techniques. • Understand that carbon can form several types of compounds. 	<p>A. Apply concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Apply rules of systematic nomenclature and formula writing to chemical substances. • Classify and describe, in equation form, types of chemical and nuclear reactions. • Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials. • Explain how the forces that bind solids, liquids and gases affect their properties. • Characterize and identify important classes of compounds (e.g., acids, bases, salts). • Apply the conservation of energy concept to fields as diverse as mechanics, nuclear particles and studies of the origin of the universe. • Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes. • Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas.

3.4. Physical Science, Chemistry and Physics			
3.4.4. GRADE 4	3.4.7. GRADE 7	3.4.10. GRADE 10	3.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>B. Know basic energy types, sources and conversions.</p> <ul style="list-style-type: none"> Identify energy forms and examples (e.g., sunlight, heat, stored, motion). Know the concept of the flow of energy by measuring flow through an object or system. Describe static electricity in terms of attraction, repulsion and sparks. Apply knowledge of the basic electrical circuits to design and construction simple direct current circuits. Classify materials as conductors and non-conductors. Know and demonstrate the basic properties of heat by producing it in a variety of ways. Know the characteristics of light (e.g., reflection, refraction, absorption) and use them to produce heat, color or a virtual image. 	<p>B. Relate energy sources and transfers to heat and temperature.</p> <ul style="list-style-type: none"> Identify and describe sound changes in moving objects. Know that the sun is a major source of energy that emits wavelengths of visible light, infrared and ultraviolet radiation. Explain the conversion of one form of energy to another by applying knowledge of each form of energy. Explain the parts and functions in an electrical circuit. 	<p>B. Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none"> Determine the efficiency of chemical systems by applying mathematical formulas. Use knowledge of chemical reactions to generate an electrical current. Evaluate energy changes in chemical reactions. Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). Explain resistance, current and electromotive force (Ohm's Law). 	<p>B. Apply and analyze energy sources and conversions and their relationship to heat and temperature.</p> <ul style="list-style-type: none"> Determine the heat involved in illustrative chemical reactions. Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems. Use knowledge of oxidation and reduction to balance complex reactions. Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

3.4. Physical Science, Chemistry and Physics			
3.4.4. GRADE 4	3.4.7. GRADE 7	3.4.10. GRADE 10	3.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Observe and describe different types of force and motion.</p> <ul style="list-style-type: none"> • Identify characteristics of sound (pitch, loudness and echoes). • Recognize forces that attract or repel other objects and demonstrate them. • Describe various types of motions. • Compare the relative movement of objects and describe types of motion that are evident. • Describe the position of an object by locating it relative to another object or the background (e.g., geographic direction, left, up). 	<p>C. Identify and explain the principles of force and motion.</p> <ul style="list-style-type: none"> • Describe the motion of an object based on its position, direction and speed. • Classify fluid power systems according to fluid used or mode of power transmission (e.g., air, oil). • Explain various motions using models. • Explain how convex and concave mirrors and lens change light images. • Explain how sound and light travel in waves of differing speeds, sizes and frequencies. 	<p>C. Distinguish among the principles of force and motion.</p> <ul style="list-style-type: none"> • Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force. • Identify elements of simple machines in compound machines. • Explain fluid power systems through the design and construction of appropriate models. • Describe sound effects (e.g., Doppler effect, amplitude, frequency, reflection, refraction, absorption, sonar, seismic). • Describe light effects (e.g., Doppler effect, dispersion, absorption, emission spectra, polarization, interference). • Describe and measure the motion of sound, light and other objects. • Know Newton's laws of motion (including inertia, action and reaction) and gravity and apply them to solve problems related to forces and mass. • Determine the efficiency of mechanical systems by applying mathematical formulas. 	<p>C. Apply the principles of motion and force.</p> <ul style="list-style-type: none"> • Evaluate wave properties of frequency, wavelength and speed as applied to sound and light through different media. • Propose and produce modifications to specific mechanical power systems that will improve their efficiency. • Analyze the principles of translational motion, velocity and acceleration as they relate to free fall and projectile motion. • Analyze the principles of rotational motion to solve problems relating to angular momentum, and torque. • Interpret a model that illustrates circular motion and acceleration. • Describe inertia, motion, equilibrium, and action/reaction concepts through words, models and mathematical symbols.

3.4. Physical Science, Chemistry and Physics			
3.4.4. GRADE 4	3.4.7. GRADE 7	3.4.10. GRADE 10	3.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to. . .</i>			
<p>D. Describe the composition and structure of the universe and the earth's place in it.</p> <ul style="list-style-type: none"> • Recognize earth's place in the solar system. • Explain and illustrate the causes of seasonal changes. • Identify planets in our solar system and their general characteristics. • Describe the solar system motions and use them to explain time (e.g., days, seasons), major lunar phases and eclipses. 	<p>D. Describe essential ideas about the composition and structure of the universe and the earth's place in it.</p> <ul style="list-style-type: none"> • Compare various planets' characteristics. • Describe basic star types and identify the sun as a star type. • Describe and differentiate comets, asteroids and meteors. • Identify gravity as the force that keeps planets in orbit around the sun and governs the rest of the movement of the solar system and the universe. • Illustrate how the position of stars and constellations change in relation to the Earth during an evening and from month to month. • Identify equipment and instruments that explore the universe. • Identify the accomplishments and contributions provided by selected past and present scientists in the field of astronomy. • Identify and articulate space program efforts to investigate possibilities of living in space and on other planets. 	<p>D. Explain essential ideas about the composition and structure of the universe.</p> <ul style="list-style-type: none"> • Compare the basic structures of the universe (e.g., galaxy types, nova, black holes, neutron stars). • Describe the structure and life cycle of star, using the Hertzsprung-Russell diagram. • Describe the nuclear processes involved in energy production in a star. • Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement. • Compare absolute versus apparent star magnitude and their relation to stellar distance. • Explain the impact of the Copernican and Newtonian thinking on man's view of the universe. • Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe. 	<p>D. Analyze the essential ideas about the composition and structure of the universe.</p> <ul style="list-style-type: none"> • Analyze the Big Bang Theory's use of gravitation and nuclear re- action to explain a possible origin of the universe. • Compare the use of visual, radio and x-ray telescopes to collect data regarding the structure and evolution of the universe. • Correlate the use of the special theory of relativity and the life of a star.
Refer to Technology Standard Category 3.6 for applied uses of these concepts and principles.			

3.5. Earth Sciences			
3.5.4. GRADE 4	3.5.7. GRADE 7	3.5.10. GRADE 10	3.5.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Know basic landforms and Earth history.</p> <ul style="list-style-type: none"> • Describe earth processes (e.g., rusting, weathering, erosion) that have affected selected physical features in students' neighborhoods. • Identify various earth structures (e.g., mountains, faults, drainage basins) through the use of models. • Identify the composition of soil as weathered rock and decomposed organic remains. • Describe fossils and the type of environment they lived in (e.g., tropical, aquatic, desert). 	<p>A. Describe earth features and processes.</p> <ul style="list-style-type: none"> • Describe major layers of the earth. • Describe the processes involved in the creation of geologic features (e.g., folding, faulting, volcanism, sedimentation) and that these processes seen today (e.g., erosion, weathering crustal plate movement) are similar to those in the past. • Describe the processes that formed Pennsylvania geologic structures and resources including mountains, glacial formations, water gaps and ridges. • Explain how the rock cycle affected rock formations in the state of Pennsylvania. • Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes (e.g., weathering). • Identify living plants and animals that are similar to fossil forms. 	<p>A. Relate earth features and processes that change the earth.</p> <ul style="list-style-type: none"> • Illustrate and explain plate tectonics as the mechanism of continental movement and sea floor changes. • Compare examples of change to the earth's surface over time as they related to continental movement and ocean basin formation (e.g., Delaware, Susquehanna, Ohio Rivers system formations, dynamics). • Interpret topographic maps to identify and describe significant geologic history/ structures in Pennsylvania. • Evaluate and interpret geologic history using geologic maps. • Explain several methods of dating earth materials and structures. • Correlate rock units with general geologic time periods in the history of the earth. • Describe and identify major types of rocks and minerals. 	<p>A. Analyze and evaluate earth features and processes that change the earth.</p> <ul style="list-style-type: none"> • Apply knowledge of geophysical processes to explain the formation and degradation of earth structures (e.g., mineral deposition, cave formations, soil composition). • Interpret geological evidence supporting evolution. • Apply knowledge of radioactive decay to assess the age of various earth features and objects.

3.5. Earth Sciences			
3.5.4. GRADE 4	3.5.7. GRADE 7	3.5.10. GRADE 10	3.5.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>B. Know types and uses of earth materials.</p> <ul style="list-style-type: none"> Identify uses of various earth materials (e.g., buildings, highways, fuels, growing plants). Identify and sort earth materials according to a classification key (e.g., soil/rock type). <p>C. Know basic weather elements.</p> <ul style="list-style-type: none"> Identify weather patterns from data charts (including temperature, wind direction and speed, precipitation) and graphs of the data. Explain how the different seasons effect plants, animals, food availability and daily human life. 	<p>B. Recognize earth resources and how they affect everyday life.</p> <ul style="list-style-type: none"> Identify and locate significant earth resources (e.g., rock types, oil, gas, coal deposits) in Pennsylvania. Explain the processes involved in the formation of oil and coal in Pennsylvania. Explain the value and uses of different earth resources (e.g., selected minerals, ores, fuel sources, agricultural uses). Compare the locations of human settlements as related to available resources. <p>C. Describe basic elements of meteorology.</p> <ul style="list-style-type: none"> Explain weather forecasts by interpreting weather data and symbols. Explain the oceans' impact on local weather and the climate of a region. Identify how cloud types, wind directions and barometric pressure changes are associated with weather patterns in different regions of the country. Explain and illustrate the processes of cloud formation and precipitation. Describe and illustrate the major layers of the earth's atmosphere. Identify different air masses and global wind patterns and how they relate to the weather patterns in different regions of the U.S. 	<p>B. Explain sources and uses of earth resources.</p> <ul style="list-style-type: none"> Compare the locations of strategic minerals and earth resources in the world with their geologic history using maps and global information systems. Demonstrate the effects of sedimentation and erosion before and after a conservation plan is implemented. Evaluate the impact of geologic activities/hazards (e.g., earthquakes, sinkholes, landslides). Evaluate land use (e.g., agricultural, recreational, residential, commercial) in Pennsylvania based upon soil characteristics. <p>C. Interpret meteorological data.</p> <ul style="list-style-type: none"> Analyze information from meteorological instruments and online sources to predict weather patterns. Describe weather and climate patterns on global levels. Evaluate specific adaptations plants and animals have made that enable them to survive in different climates. 	<p>B. Analyze the availability, location and extraction of earth resources.</p> <ul style="list-style-type: none"> Describe how the location of earth's major resources has affected a country's strategic decisions. Compare locations of earth features and country boundaries. Analyze the impact of resources (e.g., coal deposits, rivers) on the life of Pennsylvania's settlements and cities. <p>C. Analyze atmospheric energy transfers.</p> <ul style="list-style-type: none"> Describe how weather and climate involve the transfer of energy in and out of the atmosphere. Explain how unequal heating of the air, ocean and land produces wind and ocean currents. Analyze the energy transformations that occur during the greenhouse effect and predict the long-term effects of increased pollutant levels in the atmosphere. Analyze the mechanisms that drive a weather phenomena (e.g., El Nino, hurricane, tornado) using the correlation of three methods of heat energy transfer.

3.5. Earth Sciences			
3.5.4. GRADE 4	3.5.7. GRADE 7	3.5.10. GRADE 10	3.5.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>D. Recognize the earth's different water resources.</p> <ul style="list-style-type: none"> • Know that approximately three-fourths of the earth is covered by water. • Describe locations of fresh and salt water in or near the state of Pennsylvania. • Identify examples of water in the form of solid, liquid and gas on or near the surface of the earth. • Explain and illustrate evaporation and condensation. • Recognize other resources available from water (e.g., energy, transportation, minerals, food). 	<p>D. Explain the behavior and impact of the earth's water systems.</p> <ul style="list-style-type: none"> • Explain the water cycle using the processes of evaporation and condensation. • Describe factors that affect evaporation and condensation. • Distinguish salt from fresh water (e.g., density, electrical conduction). • Compare the effect of water type (e.g., polluted, fresh, salt water) and the life contained in them. • Identify ocean and shoreline features (e.g., bays, inlets, spit, tidal marshes). 	<p>D. Assess the value of water as a resource.</p> <ul style="list-style-type: none"> • Compare specific sources of potable water (e.g., wells, public systems, rivers) used by people in Pennsylvania. • Identify the components of a municipal/ agricultural water supply system and a wastewater treatment system. • Relate aquatic life to water conditions (e.g., turbidity, temperature, salinity, dissolved oxygen, nitrogen levels, pressure). • Compare commercially important aquatic species in or near Pennsylvania. • Identify economic resources found in marine areas. • Assess the natural and man-made factors that affect the availability of clean water (e.g., rock and mineral deposits, man-made pollution). 	<p>D. Analyze the principles and history of hydrology.</p> <ul style="list-style-type: none"> • Analyze the operation and effectiveness of a water purification and desalination system. • Evaluate the pros and cons of surface water appropriation for commercial and electrical use. • Analyze the historical development of water use in Pennsylvania (e.g., recovery of Lake Erie). • Compare the marine life and type of water found in the intertidal, neritic and bathyal zones.
Refer to Environment and Ecology Standards Categories 4.1, 4.3, 4.8 for standards that deal with environmental impact of Earth structures and forces.			

3.6. Technology Education			
3.6.4. GRADE 4	3.6.7. GRADE 7	3.6.10. GRADE 10	3.6.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to. . .</i>			
<p>A. Know that biotechnologies relate to propagating, growing, maintaining, adapting, treating and converting.</p> <ul style="list-style-type: none"> • Identify agricultural and industrial production processes that involve plants and animals. • Identify waste management treatment processes. • Describe how knowledge of the human body influences or impacts ergonomic design. • Describe how biotechnology has impacted various aspects of daily life (e.g., health care, agriculture, waste treatment). 	<p>A. Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.</p> <ul style="list-style-type: none"> • Identify the environmental, societal and economic impacts that waste has in the environment. • Identify and explain the impact that a specific medical advancement has had on society. • Explain the factors that were taken into consideration when a specific object was designed. • Define and describe how fuels and energy can be generated through the process of biomass conversion. • Identify and group basic plant and animal production processes. 	<p>A. Apply biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.</p> <ul style="list-style-type: none"> • Apply knowledge of plant and animal production processes in designing an improvement to existing processes. • Apply knowledge of biomedical technology applications in designing a solution to a simple medical problem (e.g., wheel chair design, artificial arteries). • Apply knowledge of how biomedical technology affects waste products in designing a solution that will result in reduced waste. • Apply ergonomic engineering factors when devising a solution to a specific problem. • Describe various methods of biochemical conversion. 	<p>A. Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.</p> <ul style="list-style-type: none"> • Analyze and solve a complex production process problem using biotechnologies (e.g., hydroponics, fish farming, crop propagation). • Analyze specific examples where engineering has impacted society in protection, personal health application or physical enhancement. • Appraise and evaluate the cause and effect and subsequent environmental, economic and societal impacts that result from biomass and biochemical conversion. • Evaluate and apply biotechnical processes to complex plant and animal production methods. • Apply knowledge of biochemical-related technologies to propose alternatives to hazardous waste treatment.

3.6. Technology Education			
3.6.4. GRADE 4	3.6.7. GRADE 7	3.6.10. GRADE 10	3.6.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to. . .</i>			
<p>B. Know that information technologies involve encoding, transmitting, receiving, storing, retrieving and decoding.</p> <ul style="list-style-type: none"> • Identify electronic communication methods that exist in the community (e.g., digital cameras, telephone, internet, television, fiber optics). • Identify graphic reproduction methods. • Describe appropriate image generating techniques (e.g., photography, video). • Demonstrate the ability to communicate an idea by applying basic sketching and drawing techniques. 	<p>B. Explain information technologies to encoding, transmitting, receiving, storing, retrieving and decoding.</p> <ul style="list-style-type: none"> • Demonstrate the effectiveness of image generating techniques to communicate a story (e.g., photography, video). • Analyze and evaluate the effectiveness of a graphic object designed and produced to communicate a thought or concept. • Apply basic technical drawing techniques to communicate an idea or solution to a problem. • Apply the appropriate method of communications technology to communicate a thought. 	<p>B. Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.</p> <ul style="list-style-type: none"> • Describe the proper use of graphic and electronic communication systems. • Apply a variety of advanced mechanical and electronic drafting methods to communicate a solution to a specific problem. • Apply and analyze advanced communication techniques to produce an image that effectively conveys a message (e.g., desktop publishing, audio and/or video production). • Illustrate an understanding of a computer network system by modeling, constructing or assembling its components. 	<p>B. Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.</p> <ul style="list-style-type: none"> • Apply and analyze advanced information techniques to produce a complex image that effectively conveys a message (e.g., desktop publishing, audio and/or video production). • Analyze and evaluate a message designed and produced using still, motion and animated communication techniques. • Describe the operation of fiber optic, microwave and satellite informational systems. • Apply various graphic and electronic information techniques to solve real world problems (e.g., data organization and analysis, forecasting, interpolation).

3.6. Technology Education			
3.6.4. GRADE 4	3.6.7. GRADE 7	3.6.10. GRADE 10	3.6.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Know physical technologies of structural design, analysis and engineering, finance, production, marketing, research and design.</p> <ul style="list-style-type: none"> • Identify and group a variety of construction tasks. • Identify the major construction systems present in a specific local building. • Identify specific construction systems that depend on each other in order to complete a project. • Know skills used in construction. • Identify examples of manufactured goods present in the home and school. • Identify basic resources needed to produce a manufactured item. • Identify basic component operations in a specific manufacturing enterprise (e.g., cutting, shaping, attaching). • Identify waste and pollution resulting from a manufacturing enterprise. • Explain and demonstrate the concept of manufacturing (e.g., assemble a set of papers or ball point pens sequentially, mass produce an object). • Identify transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Identify and experiment with simple machines used in transportation systems. • Explain how improved transportation systems have changed society. 	<p>C. Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.</p> <ul style="list-style-type: none"> • Use knowledge of material effectiveness to solve specific construction problems (e.g., steel vs. wood bridges). • Differentiate among the different types of construction applications (e.g., microwave tower, power plants, aircrafts). • Explain basic material processes that manufactured objects undergo during production (e.g., separating, forming, combining). • Evaluate a construction activity by specifying task analyses and necessary resources. • Explain the relationships among the basic resources needed in the production process for a specific manufactured object. • Explain the difference between design engineering and production engineering processes. • Analyze manufacturing steps that affect waste and pollutants. • Explain transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Identify and explain the workings of several mechanical power systems. • Model and explain examples of vehicular propulsion, control, guidance, structure and suspension systems. • Explain the limitations of land, marine, air and space transportation systems. 	<p>C. Apply physical technologies to structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.</p> <ul style="list-style-type: none"> • Describe and classify common construction by their characteristics and composition. • Compare and contrast specific construction systems that depend on each other in order to complete a project. • Evaluate material failure common to specific applications. • Demonstrate knowledge of various construction systems by building or interpreting models. • Select and apply the necessary resources to successfully conduct a manufacturing enterprise. • Apply concepts of design engineering and production engineering in the organization and application of a manufacturing activity. • Apply the concepts of manufacturing by re-designing an enterprise to improve productivity or reduce or eliminate waste and/or pollution. • Evaluate the interrelationship of various transportation systems in the community. • Analyze the impacts that transportation systems have on a community. 	<p>C. Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.</p> <ul style="list-style-type: none"> • Apply knowledge of construction technology by designing, planning and applying all the necessary resources to successfully solve a construction problem. • Compare resource options in solving a specific manufacturing problem. • Analyze and apply complex skills needed to process materials in complex manufacturing enterprises. • Apply advanced information collection and communication techniques to successfully convey solutions to specific construction problems. • Assess the importance of capital on specific construction applications. • Analyze the positive and negative qualities of several different types of materials as they would relate to specific construction applications. • Analyze transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Analyze the concepts of vehicular propulsion, guidance, control, suspension and structural systems while designing and producing specific complex transportation systems.

Refer to Physical Science Standard Category 3.4 for concepts that deal with Technology Standards.

3.7. Technological Devices

3.7.4. GRADE 4	3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12
-----------------------	-----------------------	-------------------------	-------------------------

Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .

<p>A. Explore the use of basic tools, simple materials and techniques to safely solve problems.</p> <ul style="list-style-type: none"> • Describe the scientific principles on which various tools are based. • Group tools and machines by their function. • Select and safely apply appropriate tools and materials to solve simple problems. <p>B. Select appropriate instruments to study materials.</p> <ul style="list-style-type: none"> • Develop simple skills to measure, record, cut and fasten. • Explain appropriate instrument selection for specific tasks. 	<p>A. Describe the safe and appropriate use of tools, materials and techniques to answer questions and solve problems.</p> <ul style="list-style-type: none"> • Identify uses of tools, machines, materials, information, people, money, energy and time that meet specific design criteria. • Describe safe procedures for using tools and materials. • Assess materials for appropriateness of use. <p>B. Use appropriate instruments and apparatus to study materials.</p> <ul style="list-style-type: none"> • Select appropriate instruments to measure the size, weight, shape and temperature of living and non-living objects. • Apply knowledge of different measurement systems to measure and record objects' properties. 	<p>A. Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.</p> <ul style="list-style-type: none"> • Select and safely apply appropriate tools, materials and processes necessary to solve complex problems. • Apply advanced tool and equipment manipulation techniques to solve problems. <p>B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.</p> <ul style="list-style-type: none"> • Describe and use appropriate instruments to gather and analyze data. • Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation. • Explain the need to estimate measurements within error of various instruments. • Apply accurate measurement knowledge to solve everyday problems. • Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines). 	<p>A. Apply advanced tools, materials and techniques to answer complex questions.</p> <ul style="list-style-type: none"> • Demonstrate the safe use of complex tools and machines within their specifications. • Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution. • Evaluate and use technological resources to solve complex multi-step problems. <p>B. Evaluate appropriate instruments and apparatus to accurately measure materials and processes.</p> <ul style="list-style-type: none"> • Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment. • Evaluate the appropriate use of different measurement scales (macro and micro). • Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.
---	---	---	---

Computer literacy, including the use of hardware and software in standard statements C, D, and E, should be integrated across all content areas.

3.7. Technological Devices			
3.7.4. GRADE 4	3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Identify basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Identify the major parts necessary for a computer to input and output data. • Explain and demonstrate the basic use of input and output devices (e.g., keyboard, monitor, printer, mouse). • Explain and demonstrate the use of external and internal storage devices (e.g., disk drive, CD drive). <p>D. Use basic computer software.</p> <ul style="list-style-type: none"> • Apply operating system skills to perform basic computer tasks. • Apply basic word processing skills. • Identify and use simple graphic and presentation graphic materials generated by the computer. • Apply specific instructional software. 	<p>C. Explain and demonstrate basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Know specialized computer applications used in the community. • Describe the function of advanced input and output devices (e.g., scanners, video images, plotters, projectors) and demonstrate their use. • Demonstrate age appropriate keyboarding skills and techniques. <p>D. Apply computer software to solve specific problems.</p> <ul style="list-style-type: none"> • Identify software designed to meet specific needs (e.g., Computer Aided Drafting, design software, tutorial, financial, presentation software). • Identify and solve basic software problems relevant to specific software applications. • Identify basic multimedia applications. • Demonstrate a basic knowledge of desktop publishing applications. • Apply intermediate skills in utilizing word processing, database and spreadsheet software. • Apply basic graphic manipulation techniques. 	<p>C. Apply basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Identify solutions to basic hardware and software problems. • Apply knowledge of advanced input devices. • Apply knowledge of hardware setup. • Describe the process for basic software installation and demonstrate it. • Analyze and solve basic operating systems problems. • Apply touch keyboarding skills and techniques at expectable speed and accuracy. • Demonstrate the ability to perform basic software installation. <p>D. Utilize computer software to solve specific problems.</p> <ul style="list-style-type: none"> • Identify legal restrictions in the use of software and the output of data. • Apply advanced graphic manipulation and desktop publishing techniques. • Apply basic multimedia applications. • Apply advanced word processing, database and spreadsheet skills. • Describe and demonstrate how two or more software applications can be used to produce an output. • Select and apply software designed to meet specific needs. 	<p>C. Evaluate computer operations and concepts as to their effectiveness to solve specific problems.</p> <ul style="list-style-type: none"> • Describe and demonstrate atypical software installation. • Analyze and solve hardware and advanced software problems. • Assess and apply multiple input and output devices to solve specific problems. <p>D. Evaluate the effectiveness of computer software to solve specific problems.</p> <ul style="list-style-type: none"> • Evaluate the effectiveness of software to produce an output and demonstrate the process. • Design and apply advanced multimedia techniques. • Analyze, select and apply the appropriate software to solve complex problems. • Evaluate the effectiveness of the computer as a presentation tool. • Analyze the legal responsibilities of computer users.

3.7. Technological Devices			
3.7.4. GRADE 4	3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>E. Identify basic computer communications systems.</p> <ul style="list-style-type: none"> • Apply a web browser. • Apply basic electronic mail functions. • Use on-line searches to answer age appropriate questions. 	<p>E. Explain basic computer communications systems.</p> <ul style="list-style-type: none"> • Describe the organization and functions of the basic parts that make up the World Wide Web. • Apply advanced electronic mail functions. • Apply basic on-line research techniques to solve a specific problem. 	<p>E. Apply basic computer communications systems.</p> <ul style="list-style-type: none"> • Identify and explain various types of on-line services. • Identify and explain the function of the parts of a basic network. • Describe and apply the components of a web page and their function. • Explain and demonstrate file transfer within and out side of a computer network. • Identify, describe and complete advanced on-line research. 	<p>E. Assess the effectiveness of computer communications systems.</p> <ul style="list-style-type: none"> • Assess the effectiveness of a computer based communications system. • Transfer files among different computer platforms. • Analyze the effectiveness of on-line information resources to meet the needs for collaboration, research, publications, communications and productivity. • Apply knowledge of protocol standards to solve connectivity problems.

3.8. Science, Technology and Human Endeavors			
3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>A. Know that people select, create and use science and technology and is limited by social and physical restraints.</p> <ul style="list-style-type: none"> • Identify and describe positive and negative impacts that influence or result from new tools and techniques. • Identify how physical technology (e.g., construction, manufacturing, transportation), informational technology and biotechnology are used to meet human needs. • Describe how scientific discoveries and technological advancements are related. • Identify interrelationships among technology, people and their world. • Apply the technological design process to solve a simple problem. 	<p>A. Explain how sciences and technologies are limited in their effects and influences on society.</p> <ul style="list-style-type: none"> • Identify and describe the unavoidable constraints of technological design. • Identify changes in society as a result of a technological development. • Identify and explain improvements in transportation, health, sanitation and communications as a result of advancements in science and technology and how they effect our lives. 	<p>A. Analyze the relationship between societal demands and scientific and technological enterprises.</p> <ul style="list-style-type: none"> • Identify past and current tradeoffs between increased production, environmental harm and social values (e.g., increased energy needs, power plants, automobiles). • Compare technologies that are applied and accepted differently in various cultures (e.g., factory farming, nuclear power). • Describe and evaluate social change as a result of technological developments. • Assess the social impacts of a specific international environmental problem by designing a solution that applies the appropriate technologies and resources. 	<p>A. Synthesize and evaluate the interactions and constraints of science and technology on society.</p> <ul style="list-style-type: none"> • Compare and contrast how scientific and technological knowledge is both shared and protected. • Evaluate technological developments that have changed the way humans do work and discuss their impacts (e.g., genetically engineered crops). • Evaluate socially proposed limitations of scientific research and technological application.

3.8. Science, Technology and Human Endeavors			
3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>B. Know how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <ul style="list-style-type: none"> • Identify and distinguish between human needs and improving the quality of life. • Identify and distinguish between natural and human-made resources. • Describe a technological invention and the resources that were used to develop it. 	<p>B. Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <ul style="list-style-type: none"> • Identify interrelationships between systems and resources. • Identify and describe the resources necessary to solve a selected problem in a community and improve the quality of life. 	<p>B. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <ul style="list-style-type: none"> • Identify several problems and opportunities that exist in your community, apply various problem-solving methods to design and evaluate possible solutions. • Analyze a recently invented item, describing the human need that prompted its invention and the current and potential social impacts of the specific invention. • Apply knowledge of oceanography, meteorology, geology and human anatomy to explain important considerations that need to be made for construction of homes, buildings and businesses in the United States. 	<p>B. Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.</p> <ul style="list-style-type: none"> • Apply appropriate tools, materials and processes to solve complex problems. • Use knowledge of human abilities to design or modify technologies that extend and enhance human abilities. • Apply appropriate tools, materials and processes to physical, informational or biotechnological systems to identify and recommend solutions to international problems.

3.8. Science, Technology and Human Endeavors			
3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .</i>			
<p>C. Know the pros and cons of possible solutions to scientific and technological problems in society.</p> <ul style="list-style-type: none"> • Compare the positive and negative expected and unexpected impacts of technological change. • Identify and discuss examples of technological change in the community that have both positive and negative impacts. 	<p>C. Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.</p> <ul style="list-style-type: none"> • Describe the positive and negative expected and unexpected effects of specific technological developments. • Describe ways technology extends and enhances human abilities. 	<p>C. Evaluate possibilities, consequences and impacts of scientific and technological solutions.</p> <ul style="list-style-type: none"> • Relate scientific and technological advancements in terms of cause and effect. • Describe and evaluate the impacts that financial considerations have had on specific scientific and technological applications. • Compare and contrast potential solutions to technological, social, economic and environmental problems. • Analyze the impacts on society of accepting or rejecting scientific and technological advances. 	<p>C. Evaluate the consequences and impacts of scientific and technological solutions.</p> <ul style="list-style-type: none"> • Propose solutions to specific scientific and technological applications, identifying possible financial considerations. • Analyze scientific and technological solutions through the use of risk/benefit analysis. • Analyze and communicate the positive or negative impacts that a recent technological invention had on society. • Evaluate and describe potential impacts from emerging technologies and the consequences of not keeping abreast of technological advancements (e.g., assessment alternatives, risks, benefits, costs, economic impacts, constraints).

IX. GLOSSARY

Allele:	Any of a set of possible forms of a gene.
Biochemical conversion:	The changing of organic matter into other chemical forms.
Biomass conversion:	The changing of organic matter that has been produced by photosynthesis into useful liquid, gas or fuel.
Biomedical technology:	The application of health care theories to develop methods, products and tools to maintain or improve homeostasis.
Biomes:	A community of living organisms of a single major ecological region.
Biotechnology:	The ways that humans apply biological concepts to produce products and provide services.
Carbon chemistry:	The science of the composition, structure, properties and reactions of carbon based matter, especially of atomic and molecular systems; sometimes referred to as organic chemistry.
Construction technology:	The ways that humans build structures on sites.
Desalinization:	To remove salts and other chemicals from sea or saline water.
Dichotomous:	Divided or dividing into two parts or classifications.
Electronic communication:	System for the transmission of information using electronic technology (e.g., digital cameras, cellular telephones, Internet, television, fiber optics).
Embryology:	The branch of biology dealing with the development of living things from fertilized egg to its developed state.
Engineering:	The application of scientific, physical, mechanical and mathematical principles to design processes, products and structures that improve the quality of life.
Enzyme:	A protein that increases the rate of a chemical reaction without being changed by the reaction; an organic catalyst.
Ergonomical:	Of or relating to the design of equipment or devices to fit the human body's control, position, movement and environment.

Geologic hazard:	A naturally occurring or man-made condition or phenomenon that presents a risk or is a potential danger to life and property (e.g., landslides, floods, earthquakes, ground subsidence, coastal and beach erosion, faulting, dam leakage and failure, mining disasters, pollution and waste disposal, sinkholes).
Geologic map:	A representation of a region on which is recorded earth information (e.g., the distribution, nature and age relationships of rock units and the occurrences of structural features, mineral deposits and fossil localities).
Hydrology:	The scientific study of the properties, distribution and effects of water on the earth's surface, in the soil and underlying rocks and in the atmosphere.
Information technology:	The technical means that humans create to store and transmit information.
Inquiry:	A systematic process for using knowledge and skills to acquire and apply new knowledge.
Instructional technology:	Any mechanical aid (including computer technology) used to assist in or enhance the process of teaching and learning.
Manufacturing technology:	The ways that humans produce goods and products.
Mitosis:	The sequential differentiation and segregation of replicated chromosomes in a cell's nucleus that precedes complete cell division.
Model:	A description, analogy or a representation of something that helps us understand it better (e.g., a physical model, a conceptual model, a mathematical model).
Nova:	A variable star that suddenly increases in brightness to several times its normal magnitude and returns to its original appearance in a few weeks to several months or years.
Patterns:	Repeated processes that are exhibited in a wide variety of ways; identifiable recurrences of the element and/or the form.
Physical technology:	The ways that humans construct, manufacture and transport products.
Radioactive isotope:	An atom that gives off nuclear radiation and has the same number of protons (atomic number) as another atom but a different number of neutrons.
Relationship between science and technology:	Science builds principles or theories while technology is the practical application of those principles or theories.
Scale:	Relates concepts and ideas to one another by some measurement (e.g., quantitative, numeral, abstract, ideological); provides a measure of size and/or incremental change.
Science:	Search for understanding the natural world using inquiry and experimentation.
System:	A group of related objects that work together to achieve a desired result.
Open Loop system:	A group of related objects that do not have feedback and cannot modify themselves.
Closed Loop system:	A group of related objects that have feedback and can modify themselves.
Subsystem:	A group of related objects that make up a larger system (e.g., automobiles have electrical systems, fuel systems).
Technology education:	The application of tools, materials, processes and systems to solve problems and extend human capabilities.
Technological design process:	Recognizing the problem, proposing a solution, implementing the solution, evaluating the solution and communicating the problem, design and solution.
Topographic map:	A representation of a region on a sufficient scale to show detail, selected man-made and natural features of a portion of the land surface including its relief and certain physical and cultural features; the portrayal of the position, relation, size, shape and elevation of the area.
Transportation systems:	A group of related parts that function together to perform a major task in any form of transportation.
Transportation technology:	The physical ways humans move materials, goods and people.
Tool:	Any device used to extend human capability including computer-based tools.

Proposed Academic Standards for Environment and Ecoogy

X. TABLE OF CONTENTS

Introduction XI.
THE PROPOSED ACADEMIC STANDARDS
Watersheds and Wetlands..... 4.1.
 Cycles

Physical Factors
 Organisms and Ecosystems

Renewable and Nonrenewable Resources 4.2.
 Uses
 Availability
 Management
 Influential Factors

Environmental Health 4.3.
 Environmental Health Issues
 Human Actions
 Biological Diversity

Agriculture and Society 4.4.
 Society's Needs
 Agricultural Systems
 Technology

Integrated Pest Management 4.5.
 Effects, Benefits and Impacts
 Health Risks
 Management Practices
 Balance

Ecosystems and their Interactions 4.6.
 Living and Nonliving Components
 Cycles
 Change over Time

Threatened, Endangered and Extinct Species... 4.7.
 Diversity
 Adaptation
 Management Strategies

Humans and the Environment..... 4.8.
 Societal Needs
 Sustainability
 Human Impacts
 Supply and Demand

Environmental Laws and Regulations..... 4.9.
 Environmental Laws and their Impact
 Factors Affecting Laws

GlossaryXII.

XI. INTRODUCTION

This document includes Environment and Ecology standards that describe what students should know and be able to do in these areas:

- 4.1. Watersheds and Wetlands
- 4.2. Renewable and Nonrenewable Resources
- 4.3. Environmental Health
- 4.4. Agriculture and Society
- 4.5. Integrated Pest Management
- 4.6. Ecosystems and their Interactions
- 4.7. Threatened, Endangered and Extinct Species
- 4.8. Humans and the Environment
- 4.9. Environmental Laws and Regulations

The Declaration of Rights, Article I of the Pennsylvania Constitution states in Section 27: "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and aesthetic values of the

environment. Pennsylvania's public natural resources are the common property of all people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people." To this end it is our responsibility to develop a citizenry that is aware of and concerned about the total environment and has the knowledge and skills to work toward solutions to current problems and the prevention of new ones.

Environment and Ecology is grounded in the complexity of the world we live in and our impact on its sustainability. The human interactions with the ecosystem and the results of human decisions are the main components of this academic area. Environment and Ecology examines the world with respect to the economic, cultural, political and social structure as well as natural processes and systems. This integration across systems is what sets this academic area apart from all others.

Environment and Ecology places its main emphasis in the real world. It allows students to understand, through a sound academic content base, how their everyday lives evolve around their use of the natural world and the resources it provides. As we move into a more technologically driven society, it is crucial for every student to be aware of his/her dependence on a healthy environment. The 21st century will demand a more sophisticated citizen capable of making sound decisions that will impact our natural systems forever.

These standards establish the essential elements of what students should know and be able to do at the end of grades four, seven, ten and twelve. The sequential nature of this document reflects the need for rigorous academic content that students will be expected to achieve. The standards will help students understand decision-making processes, the art of compromise and problem solving skills. The document reinforces all areas across the grade levels with increasing degrees of difficulty as the students mature intellectually.

Environment and Ecology is a very engaging academic area that captivates students' innate interests in their surroundings of the natural and built environment. The skills and knowledge that are addressed in this area of study will serve as tools for student participation in a democratic world of constantly evolving issues and concerns. As they achieve these standards, students will become aware of the role they play in the community in reaching decisions related to the environment.

The study of Environment and Ecology will allow students to be active participants and problem solvers in real issues that affect them, their homes, schools and communities.

A glossary is included to assist the reader in understanding terminology contained in the standards.

4.1. Watersheds and Wetlands			
4.1.4. GRADE 4	4.1.7. GRADE 7	4.1.10. GRADE 10	4.1.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Identify various types of water environments.</p> <ul style="list-style-type: none"> • Identify the lotic system (e.g., creeks, rivers, streams). • Identify the lentic system (e.g., ponds, lakes, swamps). <p>B. Explain the differences between moving and still water.</p> <ul style="list-style-type: none"> • Explain why water moves or does not move. • Identify types of precipitation. 	<p>A. Explain the role of the water cycle within a watershed.</p> <ul style="list-style-type: none"> • Explain the water cycle. • Explain the water cycle as it relates to a watershed. <p>B. Understand the role of the watershed.</p> <ul style="list-style-type: none"> • Identify and explain what determines the boundaries of a watershed. • Explain how water enters a watershed. • Explain factors that affect water quality and flow through a watershed. 	<p>A. Describe changes that occur from a stream's origin to its final outflow.</p> <ul style="list-style-type: none"> • Identify Pennsylvania's major watersheds and their related river systems. • Describe changes by tracing a specific river's origin back to its headwaters including its major tributaries. <p>B. Explain the relationship among landforms, vegetation and the amount and speed of water.</p> <ul style="list-style-type: none"> • Analyze a stream's physical characteristics. • Describe how topography influences streams. • Explain the influence of mountains on precipitation. • Explain how vegetation affects storm water runoff. • Delineate the boundaries of a watershed. • Describe factors that affect the quality of groundwater. • Explain how the speed of water and vegetation cover relates to erosion. 	<p>A. Categorize stream order in a watershed.</p> <ul style="list-style-type: none"> • Explain the concept of stream order. • Identify the order of watercourses within a major river's watershed. • Compare and contrast the physical differences found in the stream continuum from headwater to mouth (e.g., the velocity; volume of water). <p>B. Explain the relationships that exist within watersheds in the United States.</p> <ul style="list-style-type: none"> • Understand that various ecosystems may be contained in a watershed. • Examine and describe the ecosystems contained within a specific watershed. • Identify and describe the major watersheds in the United States.

4.1. Watersheds and Wetlands			
4.1.4. GRADE 4	4.1.7. GRADE 7	4.1.10. GRADE 10	4.1.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>C. Identify living things found in water environments.</p> <ul style="list-style-type: none"> Identify fish, insects and amphibians that are found in fresh water. Identify plants found in fresh water. 	<p>C. Explain the effects of water on the life of organisms in a watershed.</p> <ul style="list-style-type: none"> Explain how water is necessary for all life. Explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations. Describe the life cycle of organisms that depend on water. Identify organisms that have aquatic stages of life and describe those stages. 	<p>C. Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments.</p> <ul style="list-style-type: none"> Describe and explain the physical factors that affect a stream and the organisms living there. Identify terrestrial and aquatic organisms that live in a watershed. Categorize aquatic organisms found in a watershed continuum from headwater to mouth (e.g., shredder, predator, decomposer). Identify the types of organisms that would live in a stream based on the stream's physical characteristics. Explain the habitat needs of specific aquatic organisms. 	<p>C. Analyze the parameters of a watershed.</p> <ul style="list-style-type: none"> Interpret physical, chemical and biological data as a means of assessing the environmental quality of a watershed. Apply appropriate techniques in the analysis of a watershed (e.g., water quality, biological diversity, erosion, sedimentation).
<p>D. Identify a wetland and the plants and animals found there.</p> <ul style="list-style-type: none"> Identify different kinds of wetlands. Identify plants and animals found in wetlands. Explain wetlands as habitats for plants and animals. 	<p>D. Explain and describe characteristics of a wetland.</p> <ul style="list-style-type: none"> Identify specific characteristics of wetland plants and soils. Recognize the common types of plants and animals. Describe different types of wetlands. Describe the different functions of a wetland. 	<p>D. Describe the multiple functions of wetlands.</p> <ul style="list-style-type: none"> Describe wetlands in terms of their effects (e.g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas). Explain how a wetland influences water quality, wildlife and water retention. Analyze wetlands through their indicators (e.g., soils, plants, hydrology). 	<p>D. Analyze the complex and diverse ecosystems of wetlands.</p> <ul style="list-style-type: none"> Explain the functions of habitat, nutrient production, migration stopover and groundwater recharge as it relates to wetlands. Explain the dynamics of a wetland ecosystem. Describe and analyze different types of wetlands.
<p>E. Recognize the impact of watersheds and wetlands on animals and plants.</p> <ul style="list-style-type: none"> Explain the role of watersheds in everyday life. Identify the role of watersheds and wetlands for plants and animals. 	<p>E. Describe the impact of watersheds and wetlands on people.</p> <ul style="list-style-type: none"> Explain the impact of watersheds and wetlands in flood control, wildlife habitats and pollution abatement. Explain the influence of flooding on wetlands. 	<p>E. Identify and describe natural and human events on watersheds and wetlands.</p> <ul style="list-style-type: none"> Describe how natural events affect a watershed (e.g., drought, floods). Identify the effects of humans and human events on watersheds. 	<p>E. Evaluate the trade-offs, costs and benefits of conserving watersheds and wetlands.</p> <ul style="list-style-type: none"> Evaluate the effects of natural events on watersheds and wetlands. Evaluate the effects of human activities on watersheds and wetlands.

4.2. Renewable and Nonrenewable Resources			
4.2.4. GRADE 4	4.2.7. GRADE 7	4.2.10. GRADE 10	4.2.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Identify needs of people.</p> <ul style="list-style-type: none"> Identify plants, animals, water, air, minerals and fossil fuels as natural resources. Explain air, water and nutrient cycles. Identify how the environment provides for the needs of people. <p>B. Identify products derived from natural resources.</p> <ul style="list-style-type: none"> Identify products made from trees. Identify by-products of plants and animals. Identify the sources of manmade products (e.g., plastics, metal, aluminum, fabrics, paper, cardboard). 	<p>A. Know that raw materials come from natural resources.</p> <ul style="list-style-type: none"> Identify resources used to provide humans with energy, food, housing and water. Explain how plants and animals may be classified as natural resources. Compare means of growing or acquiring food. Identify fiber and other raw materials used in clothing and shelter production. Identify types of minerals and fossil fuels used by humans. <p>B. Examine the renewability of the resources.</p> <ul style="list-style-type: none"> Identify renewable resources and describe their uses. Identify nonrenewable resources and describe their uses. Compare finished products to their original raw material. Identify the water derived from the use of renewable and nonrenewable resources. Determine how consumption may impact the availability of resources. Compare the time spans of renewability for fossil fuels and alternative fuels. 	<p>A. Explain that renewable and nonrenewable resources supply energy and materials.</p> <ul style="list-style-type: none"> Identify alternative sources of energy. Identify and compare fuels used in industrial and agricultural societies. Compare and contrast the cycles of various natural resources. Explain food and fiber as renewable resources. <p>B. Evaluate factors affecting availability of natural resources.</p> <ul style="list-style-type: none"> Describe natural occurrences that may affect the natural resources. Analyze technologies that affect the use of our natural resources. Evaluate the effect of consumer desires on various natural resources. 	<p>A. Analyze the use of renewable and nonrenewable resources.</p> <ul style="list-style-type: none"> Explain the effects on the environment and sustainability through the use of nonrenewable resources. Evaluate the advantages and disadvantages of reusing our natural resources. <p>B. Analyze factors affecting the availability of renewable and nonrenewable resources.</p> <ul style="list-style-type: none"> Evaluate the use of natural resources and offer approaches for using them while diminishing waste. Compare the economics of different areas based on the availability and accessibility of the natural resources.

4.2. Renewable and Nonrenewable Resources			
4.2.4. GRADE 4	4.2.7. GRADE 7	4.2.10. GRADE 10	4.2.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>C. Know that some natural resources have limited life spans.</p> <ul style="list-style-type: none"> • Identify renewable and nonrenewable resources used in the local community. • Identify various means of conserving natural resources. • Know that natural resources have varying life spans. <p>D. Identify by-products and their use of natural resources.</p> <ul style="list-style-type: none"> • Understand the waste stream. • Identify those items that can be recycled and those that can not. • Identify use of reusable products. • Identify the use of compost, landfills and incinerators. 	<p>C. Explain natural resource distribution.</p> <ul style="list-style-type: none"> • Distinguish between readily available and less accessible resources. • Identify the locations of different concentrations of fossil fuels and mineral resources. • Analyze the effects of management practices on air, land and water in forestry, agriculture, fisheries, wildlife, mining and food and fiber production that is unique to different climates. <p>D. Describe the role of recycling and waste management.</p> <ul style="list-style-type: none"> • Identify materials that can be recycled in the community. • Explain the process of closing the loop in recycling. • Compare the decomposition rates of different organic materials. • Describe methods that could be used to reuse materials for new products. • Evaluate the costs and benefits of disposable products. 	<p>C. Analyze how man-made systems have impacted the management and distribution of natural resources.</p> <ul style="list-style-type: none"> • Explain the complete cycle of a natural resource, from extraction to disposal, detailing its uses and effects on the environment. • Analyze energy uses and energy conservation in different regions. • Examine conservation practices in different countries. • Analyze the costs and benefits of different man-made systems and how they use renewable and nonrenewable natural resources. • Analyze the impact of information systems on management and distribution of natural resources. <p>D. Explain different management alternatives involved in recycling and solid waste management.</p> <ul style="list-style-type: none"> • Analyze the manufacturing process (before, during and after) with consideration for resource recovery. • Compare various methods dealing with solid waste (e.g., incineration, compost, land application). • Differentiate between pre/post-consumer and raw materials. • Illustrate how one natural resource can be managed through reduction, recycling, reuse or use. 	<p>C. Analyze factors that influence the availability of natural resources.</p> <ul style="list-style-type: none"> • Compare the use of natural resources in different countries. • Determine how delivery systems influence the availability of resources at the local, regional and national level. <p>D. Evaluate solid waste management practices.</p> <ul style="list-style-type: none"> • Examine and explain the path of a recyclable material from collection to waste, reuse or recycling identifying the market forces. • Understand current regulations concerning recycling and solid waste. • Research new technologies in the use, reuse or recycling of materials.

4.3. Environmental Health			
4.3.4. GRADE 4	4.3.7. GRADE 7	4.3.10. GRADE 10	4.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Know that plants, animals and humans are dependent on air and water.</p> <ul style="list-style-type: none"> • Know that all living things need air and water to survive. • Describe potentially dangerous pest controls used in the home. • Identify things that cause sickness when put into the air, water or soil. • Identify different areas where health can be affected by air, water or land pollution. • Identify actions that can prevent or reduce waste pollution. 	<p>A. Identify environmental health issues.</p> <ul style="list-style-type: none"> • Identify various examples of long-term pollution and explain their effects on environmental health. • Identify diseases that have been associated with poor environmental quality. • Describe different types of pest controls and their effects on the environment. • Identify alternative products that can be used in life to reduce pollution. 	<p>A. Describe environmental health issues.</p> <ul style="list-style-type: none"> • Identify the effects on human health of air, water and soil pollution and the possible economic costs to society. • Describe how indoor pollution may affect human health (e.g., dust mites, fumes, cat dandruff). • Explain the costs and benefits of cleaning up contaminants. • Explain how common household cleaning products are manufactured and how to dispose of their by-products after use. 	<p>A. Analyze the complexity of environmental health issues.</p> <ul style="list-style-type: none"> • Identify environmental health issues and explain how they have been addressed on a worldwide level. • Analyze efforts to prevent, control and/or reduce pollution through cost and benefit analysis and risk management. • Describe the impact of occupational exposures as they relate to environmental health issues. • Identify invisible pollutants and explain their effects on human health. • Explain the relationship between wind direction and velocity as it relates to dispersal and occurrence of pollutants. • Explain the different disposal methods used for toxic and hazardous waste.

4.3. Environmental Health			
4.3.4. GRADE 4	4.3.7. GRADE 7	4.3.10. GRADE 10	4.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>B. Identify how human actions affect environmental health.</p> <ul style="list-style-type: none"> • Identify pollutants. • Identify sources of pollution. • Identify litter and its effect on the environment. • Describe how people can reduce pollution. <p>C. Understand that the elements of natural systems are interdependent.</p> <ul style="list-style-type: none"> • Identify some of the organisms that live together in an ecosystem. • Understand that the components of a system all play a part in a healthy natural system. • Identify the effects of a healthy environment on the ecosystem. 	<p>B. Describe how human actions affect the health of the environment.</p> <ul style="list-style-type: none"> • Identify land use practices and their relation to environmental health. • Explain how natural disasters affect environmental health. • Identify residential and industrial sources of pollution and their effects on environmental health. • Explain the difference between point and nonpoint source pollution. • Explain how nonpoint source pollution can affect the water supply and air quality. • Explain how acid deposition can affect water, soil and air quality. • Explain the relationship between resource use, reuse, recycling and environmental health. <p>C. Explain biological diversity.</p> <ul style="list-style-type: none"> • Explain the complex, interactive relationships among members of an ecosystem. • Explain how diversity affects ecological integrity of the natural resources. 	<p>B. Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.</p> <ul style="list-style-type: none"> • Explain how human practices affect the quality of the water and soil. • Identify evidence of natural events around the world and their effects on environmental health (e.g., Yellowstone National Park fires). • Identify local and state environmental regulations and their impact on environmental health. • Analyze data and explain how point source pollution can be detected and eliminated. • Identify and explain ways of detecting pollution by using state-of-the-art technologies. <p>C. Explain biological diversity as an indicator of a healthy environment.</p> <ul style="list-style-type: none"> • Explain species diversity. • Analyze the effects of species extinction on the health of an ecosystem. 	<p>B. Analyze the local, regional and national impacts of environmental health.</p> <ul style="list-style-type: none"> • Analyze the cost of natural disasters in both dollars and loss of natural habitat. • Research and analyze the local, state and national laws that deal with point and nonpoint source pollution; evaluate the costs and benefits of these laws. • Explain mitigation and its role in environmental health. • Explain industry's initiatives to meet state and federal mandates on clean air and water. • Describe the impacts of point and nonpoint source pollution on the Chesapeake Bay. • Identify and evaluate the costs and benefits of laws regulating air and water quality and waste disposal. <p>C. Analyze the need for a healthy environment.</p> <ul style="list-style-type: none"> • Research the relationship of some chronic diseases to an environmental pollutant. • Explain how man-made systems may affect the environment.

4.4. Agriculture and Society			
4.4.4. GRADE 4	4.4.7. GRADE 7	4.4.10. GRADE 10	4.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Know the importance of agriculture to humans.</p> <ul style="list-style-type: none"> • Identify people's basic needs. • Explain the influence of agriculture on food, clothing, shelter and culture from one area to another. • Know how people depend on agriculture. <p>B. Know that food and fiber originate from plants and animals.</p> <ul style="list-style-type: none"> • Define and identify food and fiber. • Identify what plants and animals need to grow. • Identify agricultural products that are local and regional. • Identify an agricultural product based on its origin. • Describe several products and tell their origins. • Describe the journey of a local agricultural product from production to the consumer. 	<p>A. Explain society's standard of living in relation to agriculture.</p> <ul style="list-style-type: none"> • Compare and contrast agricultural changes that have been made to meet society's needs. • Compare and contrast how animals and plants affect agricultural systems. • Compare several technological advancements and their effect(s) on the historical growth of agriculture. • Compare different environmental conditions related to agricultural production, cost and quality of the product. <p>B. Explain agricultural systems' use of natural and human resources.</p> <ul style="list-style-type: none"> • Analyze the needs of plants and animals as they relate to climate and soil conditions. • Identify the plants and animals that can be raised in the area and explain why. • Identify natural resources necessary for agricultural systems. • Compare the need for crop production to the need for animal production. • Define issues associated with food and fiber production. 	<p>A. Describe the importance of agriculture to society.</p> <ul style="list-style-type: none"> • Identify the major cash crops of Pennsylvania. • Identify what percentage of the United States' population is involved in the food and fiber industry. • Compare and contrast the influence of agriculture on a nation's culture, standard of living and foreign trade. • Identify laws that affect conservation and management of food and fiber production in the local area and analyze their impact. • Compare a contemporary economic issue in agriculture to its historical origin. <p>B. Explain the functions of the components of the food and fiber system.</p> <ul style="list-style-type: none"> • Compare and analyze different growing conditions throughout the United States to determine which plants and animals are most suitable to each region. • Compare the different management practices needed for a commodity including production, processing, research and development, marketing, distribution and regulations. • Identify a commodity, its origin and its steps of production. • Compare and analyze the cost of a commodity to its production cost. • Identify and describe how food safety issues have impacted production in agriculture. 	<p>A. Analyze the management practices in the agriculture business.</p> <ul style="list-style-type: none"> • Define the components of an agriculture system that would result in a minimal waste of resources. • Identify the diversity in crop production and analyze the advantages and disadvantages of such diversity. • Research and analyze environmental practices related to agricultural systems. • Analyze the effects of agricultural practices on the economy. • Analyze the impact of nutrient management laws on Pennsylvania agriculture. • Assess the role of agriculture cooperatives. <p>B. Analyze and research the social, political and economic factors that affect agricultural systems.</p> <ul style="list-style-type: none"> • Analyze the costs and benefits associated with agriculture practices and how they affect economic and human needs. • Analyze the costs and benefits of agriculture research practices in society. • Research the use of by-products that are the results of agriculture production (e.g., manure handling, bird feathers).

4.4. Agriculture and Society			
4.4.4. GRADE 4	4.4.7. GRADE 7	4.4.10. GRADE 10	4.4.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>C. Identify technology and energy use associated with agriculture.</p> <ul style="list-style-type: none"> Identify the various tools and machinery necessary for farming. Identify the types of energy used in producing food and fiber. Identify tools and machinery used in the production of agricultural products. 	<p>C. Explain the improvement of agricultural production through technology.</p> <ul style="list-style-type: none"> Compare the technologies that have advanced agricultural production. Explain how energy sources have changed to meet agricultural technology. 	<p>C. Analyze the efforts of increased efficiency in agriculture through technology.</p> <ul style="list-style-type: none"> Compare various technological advancements and analyze each for its contribution toward labor and cost efficiency. Compare the current market value of both natural and alternative energy sources involved in the production of food and fiber. 	<p>C. Analyze research and development activities as they relate to agriculture.</p> <ul style="list-style-type: none"> Analyze the role of research, development and technology as it relates to the food and fiber system. Research and analyze energy sources used and/or generated by producing, processing and marketing agricultural products.

4.5. Integrated Pest Management			
4.5.4. GRADE 4	4.5.7. GRADE 7	4.5.10. GRADE 10	4.5.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Know types of pests.</p> <ul style="list-style-type: none"> Identify classifications of pests. Identify and categorize pests. Know how pests fit into a food chain. 	<p>A. Explain benefits and harmful effects of pests.</p> <ul style="list-style-type: none"> Identify different examples of pests and explain the beneficial or harmful effects of each. Identify several locations where pests can be found and compare the effects the pests have on each location. 	<p>A. Identify similar classifications of pests that may or may not have similar effects on different regions.</p> <ul style="list-style-type: none"> Identify environmental effect(s) of pests on different regions of the world. Identify introduced species that are classified as pests in their new environments. 	<p>A. Research integrated pest management systems.</p> <ul style="list-style-type: none"> Analyze the threshold limits of pests and the need for intervention in a managed environment. Research the types of germicides and analyze their effects on homes, industry, hospitals and institutions. Design and explain an integrated pest management plan that uses a range of pest controls.

4.5. Integrated Pest Management			
4.5.4. GRADE 4	4.5.7. GRADE 7	4.5.10. GRADE 10	4.5.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>B. Explain pest control.</p> <ul style="list-style-type: none"> • Know reasons why people control pests. • Identify different methods for controlling specific pests in the home, school and community. • Identify chemical labels (e.g., caution, poison, warning). <p>C. Understand society's need for integrated pest management.</p> <ul style="list-style-type: none"> • Identify integrated pest management practices in the home. • Identify integrated pest management practices outside the home. 	<p>B. Explain how pest management affects the environment.</p> <ul style="list-style-type: none"> • Explain issues related to integrated pest management including biological technology, resistant varieties, chemical practices, medical technology and monitoring techniques. • Describe how integrated pest management and related technology impact human activities. • Identify issues related to integrated pest management that affect the environment. <p>C. Explain various integrated pest management practices used in society.</p> <ul style="list-style-type: none"> • Compare and contrast integrated pest management monitoring methods utilized in different community settings. • Compare integrated pest management to past practices. • Compare and analyze the long-term effects of using integrated pest management products. 	<p>B. Analyze health benefits and risks associated with integrated pest management.</p> <ul style="list-style-type: none"> • Identify the health risks associated with chemicals used in common pesticides. • Assess various levels of control within different integrated pest management practices including increased immunity to pesticides, food safety, sterilization, nutrient management and weed control. <p>C. Determine the effects of integrated pest management practices on society over time.</p> <ul style="list-style-type: none"> • Analyze the risks to the environment and society associated with alternative practices used in integrated pest management. • Analyze the benefits to the environment and society associated with alternative practices used in integrated pest management. 	<p>B. Research and analyze integrated pest management practices globally.</p> <ul style="list-style-type: none"> • Research worldwide integrated pest management. • Research and analyze the international regulations that exist related to integrated pest management. • Explain the complexities associated with moving from one level of control to the next with different integrated pest management practices and compare the related costs of each system. <p>C. Analyze the historical significance of integrated pest management on society.</p> <ul style="list-style-type: none"> • Explain the dynamics of integrated pest management practices and their relative effects upon society. • Identify historic events affecting integrated pest management and cite the practices used (e.g., avian flu, bubonic plague, potato blight). • Research and analyze the long-term effects of pest management practices on the environment.

4.6. Ecosystems and their Interactions			
4.6.4. GRADE 4	4.6.7. GRADE 7	4.6.10. GRADE 10	4.6.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Understand that living things are dependent on nonliving things in the environment for survival.</p> <ul style="list-style-type: none"> Identify and categorize living and nonliving things. Describe the basic needs of an organism. Identify basic needs of a plant and an animal and explain how their needs are met. Identify plants and animals with their habitat and food sources. Identify environmental variables that affect plant growth. Describe how animals interact with plants to meet their needs for shelter. Describe how certain insects interact with soil for their needs. Understand the components of a food chain. Identify a local ecosystem and its living and nonliving components. Identify a simple ecosystem and its living and nonliving components. Identify common soil textures. Identify animals that live underground. <p>B. Understand the concept of cycles.</p> <ul style="list-style-type: none"> Explain the water cycle. Explain the carbon dioxide/oxygen cycle (photosynthesis). 	<p>A. Explain the flows of energy and matter from organism to organism within an ecosystem.</p> <ul style="list-style-type: none"> Identify and explain the characteristics of biotic and abiotic. Describe and explain the adaptations of plants and animals to their environment. Demonstrate the dependency of living components in the ecosystem on the nonliving components. Explain energy flow through a food web. Explain the importance of the predator/prey relationship and how it maintains the balances within ecosystems. Understand limiting factors and predict their effects on an organism. Identify niches for producers, consumers and decomposers within an ecosystem. Compare and contrast the major ecosystems of Pennsylvania. Identify the major characteristics of a biome. Compare and contrast different biomes and their characteristics. Identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem. Explain how different soil types determine the characteristics of ecosystems. <p>B. Explain the concepts of cycles.</p> <ul style="list-style-type: none"> Identify and explain cycles within an ecosystem. Analyze the role of different cycles within an ecosystem. 	<p>A. Explain the biotic and abiotic components of an ecosystem and their interaction.</p> <ul style="list-style-type: none"> Identify the major biomes and explain their similarities and differences. Compare and contrast the interactions of biotic and abiotic components in an ecosystem. Analyze the effects of abiotic factors on specific ecosystems. Describe how the availability of resources affects organisms in an ecosystem. Explain energy flow in a food chain through an energy pyramid. Evaluate the efficiency of energy flow in a food chain. Explain the concept of carrying capacity in an ecosystem. Explain trophic levels. Identify a specific environmental impact and predict what change may take place to affect homeostasis. Examine and explain how organisms modify their environments to sustain their needs. Assess the effects of latitude and altitude on biomes. Interpret possible causes of population fluctuations. Explain how erosion and sedimentation have changed the quality of soil related habitats. <p>B. Explain how cycles affect the balance in an ecosystem.</p> <ul style="list-style-type: none"> Describe an element cycle and its role in an ecosystem. Explain the consequences of interrupting natural cycles. 	<p>A. Analyze the interdependence of an ecosystem.</p> <ul style="list-style-type: none"> Analyze the relationships among components of an ecosystem. Evaluate the efficiency of energy flow within an ecosystem. Explain limiting factors and their impact on carrying capacity. Understand how biological diversity impacts the stability of an ecosystem. Analyze the positive or negative impacts of outside influences on an ecosystem. Analyze how different land use practices can affect the quality of soils. <p>B. Analyze the impact of cycles on the ecosystem.</p> <ul style="list-style-type: none"> Evaluate the materials necessary for natural cycles. Explain the processes involved in the natural cycles.

4.6. Ecosystems and their Interactions			
4.6.4. GRADE 4	4.6.7. GRADE 7	4.6.10. GRADE 10	4.6.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
C. Identify how ecosystems change over time.	C. Explain how ecosystems change over time. <ul style="list-style-type: none"> • Explain how ecosystems change. • Identify the succession stages of a given ecosystem. • Explain how specific organisms may change an ecosystem. • Explain a change in an ecosystem that relates to humans. 	C. Analyze how ecosystems change over time. <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • Analyze consequences of interrupting natural cycles. 	C. Analyze how human action and natural changes affect the balance within an ecosystem. <ul style="list-style-type: none"> • Analyze the effects of substances that move through natural cycles. • Analyze the effects of natural occurrences and their effects on ecosystems. • Analyze effects of human action on an ecosystem. • Compare the stages of succession and how they influence the cycles existing in an ecosystem.

4.7. Threatened, Endangered and Extinct Species			
4.7.4. GRADE 4	4.7.7. GRADE 7	4.7.10. GRADE 10	4.7.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
A. Identify differences in living things. <ul style="list-style-type: none"> • Explain why plants and animals are different colors, shapes and sizes and how these differences relate to their survival. • Identify characteristics that living things inherit from their parents. • Explain why each of the four elements in a habitat is essential for survival. • Identify local plants or animals and describe their habitat. 	A. Describe diversity of plants and animals in ecosystems. <ul style="list-style-type: none"> • Select an ecosystem and describe different plants and animals that live there. • Identify adaptations in plants and animals. • Recognize that adaptations are developed over long periods of time and are passed on from one generation to the next. • Understand levels of ecosystem organization (e.g., individuals, populations, species). 	A. Explain the significance of diversity in ecosystems. <ul style="list-style-type: none"> • Explain the role that specific organisms have in their ecosystem. • Identify a species and explain what effects its increase or decline might have on the ecosystem. • Identify a species and explain how its adaptations are related to its niche in the environment. 	A. Analyze biological diversity as it relates to the stability of an ecosystem. <ul style="list-style-type: none"> • Examine and explain what happens to an ecosystem as biological diversity changes. • Explain the relationship between species' loss and bio-diversity. • Examine and explain how a specialized interaction between two species may affect the survival of both species.

4.7. Threatened, Endangered and Extinct Species			
4.7.4. GRADE 4	4.7.7. GRADE 7	4.7.10. GRADE 10	4.7.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>B. Know that adaptations are important for survival.</p> <ul style="list-style-type: none"> • Explain how specific adaptations can help a living organism to survive. • Explain what happens to a living thing when its food, water, shelter or space is changed. 	<p>B. Explain how species of living organisms adapt to their environment.</p> <ul style="list-style-type: none"> • Explain the role of individual variations in natural selection. • Explain how an adaptation is an inherited structure or behavior that helps an organism survive and reproduce. • Describe how a particular trait may be selected over time and account for a species' adaptation. • Compare and contrast animals and plants that have very specific survival requirements with those that have more general requirements for survival. • Explain how living things respond to changes in their environment. • Explain how one species may survive an environmental change while another might not. 	<p>B. Explain how structure, function and behavior of plants and animals affect their ability to survive.</p> <ul style="list-style-type: none"> • Describe an organism's adaptations for survival in its habitat. • Compare adaptations among species. 	<p>B. Examine the effects of extinction, both natural and human caused, on the environment.</p> <ul style="list-style-type: none"> • Predict how human or natural action can produce change to which organisms cannot adapt. • Identify species that became extinct through natural causes and explain how that occurred. • Identify a species that became extinct due to human actions and explain what occurred.

4.7. Threatened, Endangered and Extinct Species			
4.7.4. GRADE 4	4.7.7. GRADE 7	4.7.10. GRADE 10	4.7.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>C. Define and understand extinction.</p> <ul style="list-style-type: none"> Identify plants and animals that are extinct. Explain why some plants and animals are extinct. Know that there are local and state laws regarding plants and animals. 	<p>C. Explain natural or human actions in relation to the loss of species.</p> <ul style="list-style-type: none"> Identify natural or human impacts that cause habitat loss. Explain how habitat loss can affect the interaction among species and the population of a species. Analyze and explain the changes in an animal population over time. Explain how a habitat management practice affects a population. Explain the differences among threatened, endangered and extinct species. Identify Pennsylvania plants and animals that are on the threatened or endangered list. Describe state laws passed regarding threatened and endangered species in Pennsylvania. Explain why one species may be more susceptible to becoming endangered than another species. 	<p>C. Identify and explain why adaptations can lead to specialization.</p> <ul style="list-style-type: none"> Explain factors that could lead to a species' increase or decrease. Explain how management practices may influence the success of specific species. Identify and explain criteria used by scientists for categorizing organisms as threatened, endangered or extinct. 	<p>C. Analyze the effects of threatened, endangered or extinct species on human and natural systems.</p> <ul style="list-style-type: none"> Identify and explain how a species' increase, decline or elimination affects the ecosystem and/or human social, cultural and economic structures. Explain why natural populations do not remain constant. Analyze management strategies regarding threatened or endangered species. Identify laws, agreements or treaties at national or international levels regarding threatened or endangered species. Analyze the role of zoos and wildlife preserves on species that have been identified as threatened or endangered. Examine the influence of wildlife management in preserving different species in Pennsylvania (e.g., bobcat, elk, bald eagle).

4.8. Humans and the Environment			
4.8.4. GRADE 4	4.8.7. GRADE 7	4.8.10. GRADE 10	4.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Identify the biological requirements of humans.</p> <ul style="list-style-type: none"> • Explain how a dynamically changing environment provides for sustainability of living systems. • Identify several ways that people use natural resources. <p>B. Know that environmental conditions influence where and how people live.</p> <ul style="list-style-type: none"> • Identify how regional natural resources influence what people use. • Explain the influence of climate on how and where people live. <p>C. Explain how human activities may change the environment.</p> <ul style="list-style-type: none"> • Identify everyday human activities and how they affect the environment. • Identify examples of how human activities within a community affect the natural environment. 	<p>A. Describe how the development of civilization relates to the environment.</p> <ul style="list-style-type: none"> • Explain how people use natural resources in their environment. • Locate and identify natural resources in different parts of the world. • Compare and contrast how people use natural resources throughout the world. <p>B. Explain how people use natural resources.</p> <ul style="list-style-type: none"> • Describe how natural resources are used for survival. • Explain how natural resources and technological changes have affected the development of civilizations. • Explain how climate and extreme weather events (e.g., drought, flood) influence people's lives. <p>C. Explain how human activities may affect local, regional and national environments.</p> <ul style="list-style-type: none"> • Describe what effect consumption and related generation of wastes have on the environment. • Explain how a particular human activity has changed the local area over the years. 	<p>A. Analyze how society's needs relate to the sustainability of natural resources.</p> <ul style="list-style-type: none"> • Explain why some societies have been unable to meet their natural resource needs. • Compare and contrast the use of natural resources and the environmental conditions in several countries. • Describe how uses of natural resources impact sustainability. <p>B. Analyze the relationship between the use of natural resources and sustaining our society.</p> <ul style="list-style-type: none"> • Explain the role of natural resources in sustaining society. • Analyze the effects of a natural resource's availability on a community or region. <p>C. Analyze how human activities may cause changes in an ecosystem.</p> <ul style="list-style-type: none"> • Analyze and evaluate changes in the environment that are the result of human activities. • Compare and contrast the environmental effects of different industrial strategies (e.g., energy generation, transportation, logging, mining, agriculture). 	<p>A. Explain how technology has influenced the sustainability of natural resources over time.</p> <ul style="list-style-type: none"> • Describe how technology has changed the use of natural resources by business and industry. • Analyze the effect of natural resource conservation on a product over time (e.g., automobile manufacturing, aluminum can recycling, paper products). <p>B. Analyze technology's role on natural resource sustainability.</p> <ul style="list-style-type: none"> • Explain how technology has decreased the use of raw natural resources. • Explain how technology has impacted the efficiency of the use of natural resources. • Analyze how technology has improved agricultural productivity. • Analyze the role of technology in the reduction of pollution. <p>C. Analyze how pollution has changed in quality, variety and toxicity as the United States developed its industrial base.</p> <ul style="list-style-type: none"> • Analyze historical pollution trends and project them for the future. • Compare and contrast historical and current pollution levels at a given location.

4.8. Humans and the Environment			
4.8.4. GRADE 4	4.8.7. GRADE 7	4.8.10. GRADE 10	4.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>D. Know the importance of natural resources in daily life.</p> <ul style="list-style-type: none"> • Identify items used in daily life that come from natural resources. • Identify ways to conserve our natural resources. • Identify major land uses in the community. 	<p>D. Explain the importance of maintaining the natural resources at the local, state and national levels.</p> <ul style="list-style-type: none"> • Explain how human activities and natural events have affected ecosystems. • Explain how conservation practices have influenced ecosystems. • Define the roles of Pennsylvania agencies that deal with natural resources. 	<p>D. Explain how the concept of supply and demand affects the environment.</p> <ul style="list-style-type: none"> • Identify natural resources for which societal demands have been increasing. • Identify specific resources for which human consumption has resulted in scarcity of supply (e.g., buffalo, lobsters). • Describe the relationship between population density and resource use and management. 	<p>D. Analyze the international implications of environmental occurrences.</p> <ul style="list-style-type: none"> • Identify natural occurrences that have international impact (e.g., El Nino, volcano eruptions, earthquakes). • Analyze environmental issues and their international implications.

4.9. Environmental Laws and Regulations			
4.9.4. GRADE 4	4.9.7. GRADE 7	4.9.10. GRADE 10	4.9.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Know that there are laws and regulations for the environment.</p> <ul style="list-style-type: none"> • Identify local and state laws and regulations regarding the environment. • Explain how the recycling law impacts the school and home. • Identify and describe the role of a local or state agency that deals with environmental laws and regulations. 	<p>A. Explain the role of environmental laws and regulations.</p> <ul style="list-style-type: none"> • Identify and explain environmental laws and regulations (e.g., Clean Air Act, Clean Water Act, Recycling and Waste Reduction Act, Act 26 on Agricultural Education). • Explain the role of local and state agencies in enforcing environmental laws and regulations (e.g., Department of Environmental Protection, Department of Agriculture, Game Commission). 	<p>A. Explain why environmental laws and regulations are developed and enacted.</p> <ul style="list-style-type: none"> • Explain the positive and negative impacts associated with passing environmental laws and regulations. • Understand conflicting rights of property owners and environmental laws and regulations. • Analyze the roles that local, state and federal governments play in the development and enforcement of environmental laws. • Identify local and state environmental regulations and their impact on environmental health. • Explain the positive and negative impacts of the Endangered Species Act. 	<p>A. Analyze environmental laws and regulations as they relate to environmental issues.</p> <ul style="list-style-type: none"> • Analyze and explain how issues lead to environmental law or regulation (e.g., underground storage tanks, regulation of water discharges, hazardous, solid and liquid industrial waste, endangered species). • Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy. • Research and describe the effects of an environmental law or regulation and how it has impacted the environment.

Proposed Academic Standards for Environment and Ecology**XII. GLOSSARY**

Abiotic:	A nonliving factor or element (e.g., light, water, heat, rock, energy, mineral).
Acid deposition:	Precipitation with a pH less than 5.6 that forms in the atmosphere when certain pollutants mix with water vapor.
Biological diversity:	The variety of species, their generic make-up, and the natural communities in which they occur.
Biotic:	An environmental factor related to or produced by living organisms.
Closing the loop:	A link in the circular chain of recycling events that promotes the use of products made with recycled materials.
Composting:	The process of mixing decaying leaves, manure and other nutritive matter to improve and fertilize soil.
Delineate:	To trace the outline; to draw; to sketch; to depict or picture.
Ecosystem:	A community of living organisms and their interrelated physical and chemical environment.
Equilibrium:	The ability of an ecosystem to maintain stability among its biological resources (e.g., forest, fisheries, crops) so that there is a steady optimum yield.
Groundwater:	Water that infiltrates the soil and is located in underground reservoirs called aquifers.
Homeostasis:	The tendency for a system by resisting change to remain in a state of equilibrium.
Incinerating:	Burning to ashes; reducing to ashes.
Integrated pest management:	A variety of pest control methods that include repairs, traps, bait, poison, etc. to eliminate pests.
Lentic:	Relating to or living in still water.
Lotic:	Relating to or living in actively moving water.
Mitigation:	The policy of constructing or creating man-made habitats, such as wetlands, to replace those lost to development.
Niche (ecological):	The role played by an organism in an ecosystem; its food preferences, requirements for shelter, special behaviors and the timing of its activities (e.g., nocturnal, diurnal), interaction with other organisms and its habitat.
Nonpoint source Pollution:	Contamination that originates from many locations that all discharge into a location (e.g., a lake, stream, land area).
Nonrenewable resources:	Substances (e.g., oil, gas, coal, copper, gold) that, once used, cannot be replaced in this geological age.
Point source pollution:	Pollutants discharged from a single identifiable location (e.g., pipes, ditches, channels, sewers, tunnels, containers of various types).
Pest:	A label applied to an organism when it is in competition with humans for some resource.
Recycling:	Collecting and reprocessing a resource or product to make into new products.
Renewable:	A naturally occurring raw material or form of energy that will be replenished through natural ecological cycles or sound management practices (e.g., the sun, wind, water, trees).
Risk management:	A strategy developed to reduce or control the chance of harm or loss to one's health or life.
Stream order:	Energy and nutrient flow that increases as water moves toward the oceans (e.g., the smallest stream (primary) that ends when rivers flow into oceans).
Succession:	The series of changes that occur in an ecosystem with the passing of time.
Sustainability:	The ability to keep in existence or maintain. A sustainable ecosystem is one that can be maintained.
Trophic levels:	The role of an organism in nutrient and energy flow within an ecosystem (e.g., herbivore, carnivore, decomposer).
Waste Stream:	The flow of (waste) materials from generation, collection and separation to disposal.
Watershed:	The land area from which surface runoff drains into a stream, channel, lake, reservoir or other body of water; also called a drainage basin.
Wetlands:	Lands where water saturation is the dominant factor determining the nature of the soil development and the plant and animal communities (e.g., sloughs, estuaries, marshes).

[Pa.B. Doc. No. 01-681. Filed for public inspection April 20, 2001, 9:00 a.m.]

STATE BOARD OF MEDICINE

[49 PA. CODE CHS. 16 AND 18]

Licensure, Certification, Examination and Registration Fees

The State Board of Medicine (Board) proposes to amend §§ 16.13, 16.13a, 16.17 and 18.303, by revising certain application fees to read as set forth in Annex A.

A. Effective Date

The proposed amendments will be effective upon publication of the final-form regulations in the *Pennsylvania Bulletin*.

B. Statutory Authority

The proposed amendments are authorized under section 6 of the Medical Practice Act (act) (63 P. S. § 422.6).

C. Background and Purpose

Section 6 of the act requires the Board to set fees by regulation so that revenues meet or exceed expenditures over a biennial period. General operating expenses of the Board are funded through biennial license renewal fees. Expenses related to applications or services which are provided directly to individual licensees or applicants are excluded from general operating revenues and are funded through fees in which the cost of providing the service forms the basis for the fee.

In a recent systems audit of the operations of the Board within the Bureau of Professional and Occupational Affairs, the fees for services for licensees and applicants were analyzed to determine if the fees reflected the actual cost of providing the services. Actual cost calculations are based upon the following formula:

$$\text{Number of minutes to perform the function} \times$$

Pay rate for the classification of the personnel performing the function

+

A proportionate share of administrative overhead

As a result of the audit, the Board proposes to increase 16 existing fees and to decrease 2 fees. The analysis determined that current fees do not accurately reflect the actual cost of processing applications and providing other services. In this proposal, fees for the services identified would be adjusted to allocate costs to those who use the service or submit an application. The Board would continue to apportion its enforcement and operating costs to the general licensing population when the Board makes its biennial reconciliation of revenues and expenditures.

The Board is also taking this opportunity to consolidate its fees under one section. The Board is also eliminating references to Nationally established examination fees over which the Board has no control or involvement.

The General Assembly has indicated its preference for the recognition of National uniform examinations and grading services in accordance with section 812.1 of The Administrative Code of 1929 (71 P. S. § 279.3a). Over the past several years, National uniform examinations have been developed for every category of license the Board issues. The fees for the examinations are established by the National examiners and communicated directly to the applicants. Applicants for these exams pay the examination fees directly to National examiners. Thus, it is unnecessary and impractical for the Board to continue to publish the National examiners' examination fees in the Board's regulations. Since examination fees are no longer established by the Board, section 6 of the act is inapplicable as to national uniform examinations. Thus, the Board is eliminating reference to these examination fees.

D. Description of Proposed Amendments

The following table outlines the affected application fees, proposed changes and date the indicated fee was last changed:

<i>Fee Type</i>	<i>Current Fee</i>	<i>Effective Date</i>	<i>Proposed Fee</i>
1. Application, License w/o Restriction: accredited school (MD)	\$20.00	12/31/86	\$35.00
2. Application, License w/o Restriction: non-accredited school (MD)	\$80.00	01/19/91	\$85.00
3. Application, Extraterritorial License (XT)	\$10.00	12/31/86	\$30.00
4. Application, Graduate License: accredited college (MT)	\$15.00	12/31/86	\$30.00
5. Application, Graduate License: non-accredited college (MT)	\$80.00	01/19/91	\$85.00
6. Application, Temporary License	\$35.00	12/31/86	\$45.00
7. Application, Interim Limited License (ML)	\$10.00	12/31/86	\$30.00
8. Application, Midwife License (MW)	\$20.00	12/31/86	\$30.00
9. Application, Physician Assistant Certificate (PA)	\$15.00	12/31/86	\$30.00
10. Registration, Physician Assistant Supervisor (MX)	\$55.00	12/31/86	\$35.00

<i>Fee Type</i>	<i>Current Fee</i>	<i>Effective Date</i>	<i>Proposed Fee</i>
11. Application, Satellite Location	\$45.00	08/14/93	\$25.00
12. Acupuncture Registration (AK)	\$15.00	08/14/93	\$30.00
13. Acupuncture Supervisor Registration (MK)	\$15.00	08/14/93	\$30.00
14. Resp. Care Temp. Permit	\$15.00	11/16/96	\$30.00
15. Resp. Care Initial Cert. (YM)	\$15.00	11/16/96	\$30.00
16. Radiology Exam App.	\$0.00		\$25.00
17. Certification of License, Scores, Permit, Registration	\$0.00		\$25.00
18. Verification of License, Registration, Certificate, Permit	\$10.00	06/23/90	\$15.00

E. Compliance with Executive Order 1996-1

In accordance with Executive Order 1996-1 (February 6, 1996), in drafting and promulgating this proposed rulemaking the Board considered the least restrictive alternative to regulate costs for services requested by licensees and applicants.

F. Fiscal Impact and Paperwork Requirements

The proposed amendments will have no adverse fiscal impact on the Commonwealth or its political subdivisions. The fees will have a modest fiscal impact on those members of the private sector who apply for services from the Board. The amendments will impose no additional paperwork requirements upon the Commonwealth, political subdivisions or the private sector.

G. Sunset Date

The Board continuously monitors the cost effectiveness of its regulations. Therefore, no sunset date has been assigned.

H. Regulatory Review

Under section 5(a) of the Regulatory Review Act (71 P. S. § 745.5(a)), on March 27, 2001, the Board submitted a copy of these proposed amendments to the Independent Regulatory Review Commission (IRRC) and the Chairpersons of the House Professional Licensure Committee and the Senate Consumer Protection and Professional Licensure Committee (Committees). In addition to submitting the proposed amendments, the Board has provided IRRC and the Committees with a copy of a detailed regulatory analysis form prepared by the Board in compliance with Executive Order 1996-1, "Regulatory Review and Promulgation." A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, if IRRC has objections to any portion of the proposed amendments, it will notify the Board within 10 days of the close of the Committees' review period. The notification shall specify the regulatory review criteria which have not been met by that portion. The Regulatory Review Act specifies detailed procedures for review, prior to final publication of the amendments, by the Board, the General Assembly and the Governor, of objections raised.

I. Public Comment

Interested persons are invited to submit written comments, suggestions or objections regarding the proposed amendments to Amy L. Nelson, Counsel, State Board of

Medicine, 116 Pine Street, Post Office Box 2649, Harrisburg, PA 17105-2649, within 30 days of publication of this proposed rulemaking. Please reference No. 16A-4910 (Fees), when submitting comments.

CHARLES D. HUMMER, Jr., M.D.,
Chairperson

Fiscal Note: 16A-4910. No fiscal impact; (8) recommends adoption.

Annex A

TITLE 49. PROFESSIONAL AND VOCATIONAL STANDARDS

PART I. DEPARTMENT OF STATE

Subpart A. PROFESSIONAL AND OCCUPATIONAL AFFAIRS

CHAPTER 16. STATE BOARD OF MEDICINE

Subchapter B. GENERAL LICENSURE, CERTIFICATION EXAMINATION AND REGISTRATION PROVISIONS

§ 16.13. Licensure, certification, examination and registration fees.

[(a) The examination fee for the December 1995, and following administrations of the USMLE Step 3 examination is \$375.

(b) The fee for a license without restriction for a graduate of an accredited medical college is \$20. The fee for a license without restriction for a graduate of an unaccredited medical college is \$80. The biennial registration fee for a license without restriction is \$125.

(c) The fee for an institutional license is \$35.

(d) The fee for an extraterritorial license is \$10. The biennial registration fee for an extraterritorial license is \$80.

(e) The fee for a graduate license for a graduate of an accredited medical college is \$15. The fee for a graduate license for a graduate of an unaccredited medical college is \$80. The fee to renew a graduate license is \$10.

(f) The fee for a temporary license is \$35.

(g) The fee for an interim limited license is \$10. The fee to renew an interim limited license is \$10.

(h) The fee for a midwife license is \$20. The biennial registration fee for a midwife license is \$40.

(i) The fee for a physician assistant certificate is \$15. The biennial registration fee for a physician assistant certificate is \$40.

(j) The fee for registration as a supervising physician of a physician assistant is \$15.

(k) The fee for registration as a physician assistant supervisor of a physician assistant is \$55.

(l) The application fee for satellite location approval is \$45.

(m) The fee for an acupuncturist registration is \$15. The biennial registration fee for an acupuncturist registration is \$40.

(n) The fee for an acupuncturist supervisor registration is \$15.

(o) The biennial registration fee for a drugless therapist license is \$35.

(p) The biennial registration fee for a limited license—permanent—is \$25.

(q) There is no initial registration fee for a license, certificate or registration subject to biennial registration requirements.

(r) The fees for examination in radiologic procedures are listed in this subsection.

(1) The fee for the ARRT Examination in Radiography is \$30.

(2) The fee for the ARRT Examination in Radiation Therapy Technology is \$30.

(3) The fee for the ARRT Examination in Nuclear Medicine Technology is \$30.

(4) The fee for the ARRT Limited Examinations in Radiography is \$35. Study material may be purchased from the Board for \$21.

(5) The fee for the ARRT Limited Examination in Radiography—Skull and Sinuses is \$35.

(s) The fee for SPEX (Special Purpose Examination) is \$550.]

(a) *Medical Doctor License:*

License Without Restriction:

Application, graduate of accredited medical college	\$35
Application, graduate of unaccredited medical college	\$85
Biennial renewal	\$125

Extraterritorial License:

Application	\$30
Biennial renewal	\$80

Graduate License:

Application, graduate of accredited medical college	\$30
Application, graduate of unaccredited medical college	\$85
Annual renewal	\$15

Interim Limited License:

Application	\$30
Biennial renewal	\$10

Miscellaneous:

Application, institutional license	\$35
Application, temporary license	\$45
Biennial renewal, limited license (permanent)	\$25

(b) *Midwife License:*

Application	\$30
Biennial renewal	\$40

(c) *Physician Assistant Certificate:*

Application	\$30
Biennial renewal	\$40
Registration, physician assistant supervisor	\$35
Registration of additional supervisors	\$ 5
Satellite location approval	\$25

(d) *Acupuncturist Registration:*

Application	\$30
Biennial renewal	\$40
Registration, acupuncture supervisor	\$30

(e) Drugless Therapist License:	
Biennial renewal	\$35
(f) Radiology Technician:	
Application for examination	\$25
(g) Respiratory Care Practitioner Certificate:	
Application, temporary permit	\$30
Application, initial certification	\$30
Biennial renewal	\$25
(h) Verification or Certification:	
Verification of status	\$15
Certification of records	\$25
(i) Examination Fees:	

The State Board of Medicine has adopted Nationally recognized examinations in each licensing class. Fees are established by the National owners/providers of the examinations and are indicated in the examination applications.

§ 16.13a. [Temporary waiver of biennial registration fees] (Reserved).

[Biennial registration fees in § 16.13 (relating to licensure, certification, examination and registration fees) are waived until the expiration of the 1987-88 biennial registration period.]

§ 16.17. Certification of license, certificate or registration status.

(a) The status of a license, certificate or registration issued by the Board will be certified by the Board to other jurisdictions or persons upon formal application and payment of [\$10] the fee indicated under § 16.13 (relating to licensure, certification, examination and registration fees).

* * * * *

(c) A request to certify the status of a person's license, certificate or registration or information regarding a person's license, certificate or registration status shall be forwarded to the Board, accompanied by [a] the fee [of \$10] indicated under § 16.13 in the form of a certified

check, cashier's check, money order or personal check payable to the Commonwealth of Pennsylvania.

**CHAPTER 18. STATE BOARD OF MEDICINE—
PRACTITIONERS OTHER THAN MEDICAL
DOCTORS**

**Subchapter F. RESPIRATORY CARE
PRACTITIONERS**

§ 18.303. [Fees] (Reserved).

[The following is the schedule of fees charged by the Board:

(1) Temporary permit	\$15
(2) Initial certification	\$15
(3) Certification examination	\$90
(Effective 7-96)	\$100
(4) Reexamination	\$60
(5) Biennial renewal of certification	\$25]

[Pa.B. Doc. No. 01-682. Filed for public inspection April 20, 2001, 9:00 a.m.]