Foundations of Technology

SEMESTER A

Montgomery County Public Schools
January 2010

Student Review
Foundations of Technology Semester A 2010

Test Description

Length: 2 hours

Points: 61 Selected Responses (61 x .5 = 30.5 Points)

3 Brief Constructed Responses (3 x 4 = 12 Points) Total = 42.5 Points

Topic	Approximate Number of Selected Response Items	Approximate Number of Constructed Response Items
Characteristics and scope of technology	4	1
Core concepts of technology	10	
Relationships among technologies and other fields	4	
Cultural, social, economic, and political effects of technology	4	1
Effects of technology on the environment	6	
Society in the development and use of technology	3	
Influence of technology on history	9	
Attributes of design	4	1
Engineering design	4	
Troubleshooting, research and development, invention and innovation, and experimentation in problem solving	4	
Sub Totals	**52**	**3**
9 Maryland Core Technologies	9	0
Totals	**61**	**3**

Some Vocabulary for the Examination

The vocabulary includes words that students may encounter when reading examination items.

Characteristics and scope of technology

ability
apply
batches
brainstorming
charts
communicate
complex models
concept generation
conceptual model
constraints
creative thinking
criterion
decision-making
design
design problem

design process
deductive thinking
development
diagrams
diffusion
discarded
disposability
economic analysis
engineering drawings
experiment
evaluation
factors
final results
final solutions
fiscal matters
functional analysis
generating ideas
graphic communication
graphic models
human factors analysis
information gathering
innovation
invention
investigate
limitations
market analysis
market forces
marketing
mathematical model
mock-ups
modeling
models
modifications
modify
observations
optimization
physical model
plan
preference
problem solving
product
production
proposed
prototypes
production
quality
quality control
quantitative
real world
refine
research
resources
simulation
single quantity
solid model
solution
specification analysis
surface models
system
tolerances
trade-off
three dimensional
two dimensional
synthesize
verbal communication
virtual
volume production
wire frame model

Core concepts of technology

accident-free
analyze
architectural drawings
assembly drawings
biotechnology
CAD
calculator
closed system
closed-Loop system
complex system
component
computer
computer-aided design
constraints
conversion
core technologies
criteria
detailed drawings
diagnose
diagnostic tools
digital meter
directions
documentation
drawings
electrical technology
electronic technology
energy
engineering drawings
feedback
feedback loop
flow charts
fluid technology
forecasting
function
graphs
graphics
input
integrated system
interface
internet
ISO 9000
machines
malfunction
maintain
maintenance
materials
materials technology
mechanical technology
one-view drawing
open systems
open-loop System
optical technology
optimization
oral techniques
output
orthographic projection
phenomena
process
power
procedures
phenomena
process
quality control
repair
requirements
safe

software
spreadsheets
stability
structural technology
symbols
system
systems
systems drawings
systems failure
systems thinking
technology system
technological
technological system
thermal technology
three-view drawing
time charts
tools
trade-offs
troubleshoot
two-view drawing
word processing
working environment
World Wide Web
written techniques

Relationships among technologies and other fields

altering
assessment
assessment techniques
binary language
codified sets
compare
consequences
contrast
cultural impact
dangerous
data
decision-making
deductive thinking
design forecasting
economic impacts
effects of technology
environmental impacts
evaluate
evaluation techniques
forecasting
forecasting techniques
humanities information
impacts
information
innovation
invention
investigation
iterative steps
knowledge
natural systems
political impacts
quality
relevancy
risk management
scientific information
societal impacts
spin-offs
synthesize data
synthesis techniques
synthesizing
technological development
technological information
technological innovation
technological progress
technological systems
technology transfer
testing
trademark
trend analysis
trends
symbol

Cultural, social, economic, and political effects of technology

absorption
anti-pathogenic
biochemistry
capabilities
chemotherapy
clinical pharmacology
copyright
diagnosing
diagnostic visits
disabled
diseases
disease predisposition
disease state
distribution
DNA
drug composition
drug rehabilitation
enviropig
ethics
excretion
forensic medicine
genetic engineering
genetic information
genetic material
genetically modified crops
GMC
incidence of testing
informatics
interactions
interferences
mandates
medical applications
medical care
medical technologies
metabolism
molecular biology
neurology
organic material
patient condition
parameter
paraplegic
patent
patent examiner
penicillin
pharmaceuticals
pharmacology
physical medicine
physical rehabilitation
physical therapy
polio vaccine
PRDV
prevention
primary prevention
Primary Remote

psychopharmacology
rehabilitation
recombinant DNA
remission
screening
secondary prevention
super rice
surgical procedures
telemedicine
tertiary prevention
test results
therapy
toxicology
transgenic engineering
treatment
vaccines
video conferencing

Effects of technology on the environment

acid rain
averse effects
agribusiness
agriculture
agricultural practices
agriscience
altering
artificial
bacteria
“Bad" ozone
beverages
biodegradation
bio-products
bioreactors
biotechnology
biosphere 2
catalyst
chemical processing
chlorofluorocarbons
conservation
crops
crop production
distribution
drought
ecosystem
environment
environmental resources
erosion
exhaustible resources
fauna
fermentation
fertilizers
fiber
flora
food
genetically modified
generic engineering
gene splicing
grains
growth processes
hydroponics
hydroponics station
infestations
land management
livestock
marine phytoplankton
marketing
mechanical processing
microbial applications
natural disasters
natural process
organisms
ozone
particulate matter
pests
pesticides
pH
physical technologies
plants
precipitation
produce
purification techniques
recombinant
regulations
renewable resources
run-off
sediment
seeds
separation techniques
smog
soil
stratosphere
technological capability
technological process
thermal processing
troposphere
water quality

Society in the development and use of technology

air conditioning
alternate
biofuels
biogas
biomass
biomass resources
chemical
chemical energy
closed system
coal
combustion
condition
conservation of energy
conversion
cooling system
create
degradation
destroyed
efficiency
electrical
electrical energy
energy
entropy
fission
force
fossil fuels
fuel
fusion
generator
generation plant
heating system
isolated system
kinetic energy
Law of Conservation of Energy
Law of Conservation of

Matter
Law of Thermodynamics
loads
mechanical
mechanical energy
methane
natural gas
nonrenewable
nuclear
nuclear energy
open system
peat
perpetual motion
petroleum
pollution
potential energy
power
power systems
process
radiant
radiant energy
renewable
resistance
solar
solar panel
sources
sustainable
thermal
thermal dynamics
thermal energy
transfer
transmitting
transporting
uranium

Influence of technology on history

accuracy
analog
binary
binary code
Bronze Age
capacity
chip
communication
communication systems
communication-technology
completeness
complex systems
computer
cultural value
data
data processing
design
development
digital
electronic communications
emerging technologies
entertainment
facsimile
feedback
gigabyte
graphic communications
hard drive
icon
Industrial Revolution
information
Information Age
information processing
information systems
input
interactive
interference
international
interruption
internet
Iron Age
keyboard
machine to machine
machine to person
measurement
memory
message
Middle Ages
multi-media
output
person to machine
person to person
photochemical
photochemistry
printing
process
production
radio
receiver
receiving
relevance
Renaissance
sender
sending
signal
stimuli
Stone Age
storage devices
symbols
systems
telegraph
telephone
television
transmitter
truth
visual messages

Attributes of design

air lanes
air transportation
aerospace
aviation
constraints
control systems
criteria
design process
design solution
escalator
elevator
energy
environments
environmental factors
fixed route
goods
guidance systems
heavier than air
inland
inland waterways
intelligent systems

intelligent transportation
interconnected
intermodal
intermodalism
interstate
iterative
lighter-than air
manned
marine transportation
materials
modes
non-intelligent systems
oceans
pedestrian
people
pipeline
political influence
power
propulsion system
ransom route
roadways
seas
sea-lanes
service
shipping lanes
space transportation
structural systems
subsystems
support systems
suspension system
systems
technical systems
terrestrial transportation
transcontinental
transoceanic
transportation
unmanned

Engineering design

acoustical properties
advertising
altering
assembly
assembly line
automation
batch manufacturing
breadboard model
chemical technologies
CIM
computer integrated
conceptual designs
consumables
continuous manufacturing
continuous production
corporations
custom-made
custom manufacturing
design factors
design principles
diagnosing
direct sales
distribution
durable
efficiency
ergonomics
fabric
firms
flexible manufacturing
franchised business
goods
installing
interchangeable
interchangeable parts
intermittent manufacturing
international
international standards
magnetic properties
maintenance
manufacturing
marketing
marketing process
market research
mass production
material properties
material science
mechanical properties
mixed materials
model
natural
non-durable
obsolesce
optical properties
optimization
physical properties
primary process
production
processing plant
prototype
quality control
recalling
repairing
retrofitting
robots
robotics
sales
secondary processing
servicing
standards
synthetic
textiles
thermal properties
troubleshooting
upgrading

Troubleshooting, research and development, invention and innovation, and experimentation in problem solving

alteration
appreciative inquiry
architecture
architect
blue prints
buildings
CAD
codes
communication system
computer aided design
construction
cooling system
design
design constraints
engineers
ethical problem

Student Review
Foundations of Technology Semester A 2010

green construction
heating system
heavy construction
HVAC
fasteners
framework
framing
foundations
infrastructure
inspections
installations
intelligent buildings
intended use
LEED
maintenance
materials
model
modular
overruns
permits
phenomena
prefabricated
problem solving
production
regulations
renovation
requirements
residential
scientific problem
shelter
social problem
structures
systems
technological design
technological problems

Upon successful completion of Semester A, the student should be able to:

Characteristics and scope of technology

- explain the characteristics and scope of technology
- explain that the nature and development of technological knowledge and processes are functions of the setting
- describe how the tractor, plow, and hay bailer are designed specifically for use around farms, while the pick-up truck, tanker, and tractor-trailer are vehicles commonly used to move goods from farms to other areas
- defend that the rate of technological development and diffusion is increasing rapidly
- describe how the rate of development of inventions and innovations is affected by many factors, such as time and money
- explain how new technologies are built on previous technologies, often resulting in quick development and dispersion
- defend that inventions and innovations are the results of specific, goal-directed research
- describe that most of the technologies developed these days is driven by the profit motive and the market
- describe how the success of a technology is often determined by whether or not it is affordable and whether or not it works
- identify meaningful, answerable, technological questions
- identify and consider trade-offs among the proposed solutions
- explain why design solutions are measured against criteria and constraints and why this is central to the evaluation process
- explain why some products are designed for eventual obsolescence
- account for product obsolescence
- make clear the role of marketing

Core concepts of technology

- explain the core concepts of technology
- explain how systems-thinking applies logic and creativity with appropriate compromises in complex real-life problems
- explain simulation and mathematical modeling to identify conflicting considerations before the entire system is developed
- defend that systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems
- defend how the stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop
- make clear that selecting resources involved trade-offs between competing values, such as availability, cost, desirability, and waste
- explain how requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development
- explain why sometimes requirements can be constraints, criteria, or both and that balancing the two is the optimum
- define optimization as an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints
- explain that optimization is used for a specific design purpose to enhance or make small gains in desirable characteristics
- defend that an optimum design is most possible when a mathematical model can be developed so that variations can be tested
- explain how new technologies create new processes
- elaborate on the development of the computer has led to many new processes, such as the development of silicon chips, which in turn has led to even smaller components
- define quality control as a planned process to ensure that a product, service, or system meets established criteria
- define management is the process of planning, organizing, and controlling work
- make clear that complex systems have many layers of controls and feedback loops to provide information
- read and interpret technical information
- identify the controls in a system
- identify the components in a system
- define an open-loop and closed-loop system
- defend brainstorming as an excellent technique for generating ideas and encouraging creative thinking
- test, experiment with, select, and use a variety of resources to optimize the development of the design
- illustrate a two-dimensional and three dimensional drawing
- use computer-aided design software
- defend when sufficient resources are not available how existing resources could be modified or new ones could be identified
- identify and consider trade-offs among the proposed solutions
- plan and select the best possible solution that takes into account the constraints and criteria

obtained from research and personal preference
- defend that the final results should be compared to the original goals, criteria, and constraints
- identify energy resources as renewable or nonrenewable
- identify alternate and sustainable energy resources
- explain that information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information
- identify examples of graphic systems
- give reasons why materials have different qualities
- classify materials as natural, synthetic, or mixed
- group durable goods and non-durable goods

Relationships among technologies and other fields

- explain the relationships among technologies and the connections between technology and other fields of study
- define technology transfer which occurs when a new user applies an existing innovation developed for one purpose in a different function
- define technological innovation which often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields
- explain that technological ideas are sometimes protected through the process of patenting
- express how technological progress promotes the advancement of science and mathematics
- defend that progress in science and mathematics leads to advances in technology

Cultural, social, economic, and political effects of technology

- explain the cultural, social, economic, and political effects of technology
- explain how changes caused by the use of technology can range from gradual to rapid and from subtle to obvious
- defend that making decisions about the use of technology involves weighing the trade-offs between positive and negative effects
- explain why technological decisions can have lasting impacts, sometimes affecting living habitats and cultural patterns on a global scale
- describe how ethical considerations are important in the development, selection, and use of technologies
- defend how high-tech medicine has transformed the philosophy of doing everything possible to prolong life into a consideration that living longer may not necessarily mean living better
- define transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies to varying degrees
- identify and consider trade-offs among the proposed solutions

Effects of technology on the environment

- explain the effects of technology on the environment

- describe how humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling
- explain water treatment and filtering technologies which facilitate the reuse of water
- describe how wind and water erosion can be reduced by no-till farming
- explain how products like aluminum containers can be recycled
- defend when new technologies are developed to reduce the use of resources, considerations of trade-offs are important
- defend with the aid of technology, various aspects of the environment can be monitored to provide information for decision-making
- explain how the alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment
- explain how buildings can be strategically oriented to the sun to maximize solar gain, and biodegradable materials can be used as compost to make soil more productive
- defend that humans devise technologies to reduce the negative consequences of other technologies
- define trade-offs as the decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment
- demonstrate forecasting techniques to evaluate the results of altering natural systems
- differentiate why power systems should be designed to conserve energy and to provide maximum efficiency with minimal environmental degradation

.

Society in the development and use of technology

- explain the role of society in the development and use of technology
- explain that different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values
- defend that the decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures
- defend how technological expertise to develop a particular product or system may be available, but if the public reaction to such development is in opposition, or if a corporation refuses to adjust to new complex ideas, the development is most often limited of stopped
- defend that a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads contribute to shaping the design of and demand for various technologies
- expound on the regulation of design and construction of structures by laws, codes, and professional standards

Influence of technology on history

- make clear the influence of technology on history
- detail that most technological development has been evolutionary, the result of a series of refinements to a basic invention
- explain that the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials

- explain that throughout history, technology has been a powerful force in reshaping the social, cultural, political, and economic landscape
- defend how the study of technology helps determine possible scenarios for the future
- describe how early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how
- explain that the Stone Age started with the development of stone tools used for hunting, cutting and pounding vegetables and meat and progressed to the harnessing of fire for heating, cooking, and protection
- explain that the Bronze Age began with the discovery of copper and copper-based metals and agricultural techniques were developed to improve the cultivation of food and its supply
- describe further that this period also involved the development of better ways to communicate through the development of paper, ink, and the alphabet, to navigate with boats made of timbers, and to understand human anatomy with the aid of an embalming process
- make clear that the Iron Age was defined by the use of iron and steel as the primary materials for tools
- explain that the Middle Ages saw the development of many technological devices that produced long-lasting effects on technology and society
- describe this period which saw the development of the waterwheel, the block printing process, paper money, the magnetic compass, and the printing press
- defend how the devices from the Middle Ages are nn many ways, still being used today, although they have been greatly modified from their earlier designs
- expand on The Renaissance, as a time of rebirth of the arts and humanities, was also an important development in the history of technology
- explain that Leonardo DaVinci, an Italian painter, architect, and engineer, created drawings and written descriptions of the human flying machine, a helicopter, parachutes, diving bell suit, articulated chains, a giant crossbow, and circular armored vehicles
- expand on gunsmiths, while seeking a means to adjust their gun mechanisms, the telescope, the submarine, the hydraulic press, and the calculating machine also were developed during this time period
- define the Industrial Revolution as the era that saw the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time
- explain that major developments of the Industrial Revolution included the continuous-process flourmill, power loom and pattern-weaving loom, steam engine, electric motor, gasoline and diesel engines, vulcanized rubber, airplane, telegraph, telephone, radio, and television defend that the concepts of Eli Whitney's interchangeable parts and Henry Ford's movable conveyor added to the advances made in the production of goods
- defend that extended free time was possible as a result of increased efficiency, and consequently, widespread education became possible because children were not needed on the farm and could stay in school longer
- explain that the Information Age places emphasis on the processing and exchange of information
- explain when previously favored design solutions are discarded, they may still be appropriate for consideration later in the design process
- explain how historical events, global trends, and economic factors are used to evaluate and consider how to manage the risks incurred by technological development

- expound on the interchangeability of parts to increase the effectiveness of manufacturing processes
- classify manufacturing systems such as customized production, batch production, and continuous production
- describe customized production
- define batch production

Attributes of design

- explain the attributes of design
- explain that the design process which includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results
- define the design process as a systemic, interactive approach to problem solving that promotes innovation and yields design solutions
- defend that the goal of design is to systematically seek an optimum design solution, engineers and other design professionals use experience, education, established design principles, creative intuition, imagination, and culturally specific requirements
- defend that design problems are seldom presented in a clearly defined form
- make clear why design goals and requirements must be established and constraints must be identified and prioritized during the time when designs are being developed
- defend that design decisions typically involve individual, familial, economic, social, ethical, and political issues.
- explain that design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved
- defend that the design process also involves considering how designs will be developed, produced, maintained, managed, used, and assessed
- elaborate that more knowledge or competing technologies cause a design to change with time
- express where requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other
- identify appropriate methods for conducting a design solution
- identify the appropriate instruments and materials needed to conduct a design problem
- research, investigate, and generate ideas for the design
- identify criteria and constraints and determine how these will affect the design process
- make a model and prototype
- apply the technological design process
- plan and select the best possible solution that takes into account the constraints and criteria obtained from research and personal preference
- evaluate proposed or existing designs in the real world
- explain when previously favored design solutions are discarded, they may still be appropriate for consideration later in the design process
- develop and produce a product or system using a design process

- use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate
- assess the impact of products and systems
- expound on the development of the computer which has spurred new terminology
- illustrate innovative designs that capitalize on natural designs that capitalize on natural settings and provide convenience
- explain the importance of constraints to include appearance, strength, longevity, maintenance, and available utilities

Engineering design

- explain engineering design
- make clear that established design principles are used to evaluate existing designs, to collect data, and to guide the design process
- describe the design principles to include flexibility, balance, function, and proportion
- explain that the design principles can be applied in many types of design and are common to all technologies
- give reasons why engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly
- define a prototype as a working model used to test a design concept by making actual observations and necessary adjustments
- defend that prototyping helps to determine the effectiveness of a design by allowing a design to be tested before it is built
- express why prototypes are vital to the testing and refinements of a product or system with complicated operations
- explain the process of engineering design takes into account a number of factors
- define engineering design factors to include safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human engineering (ergonomics)
- recognize safe laboratory procedures
- distinguish between an engineering and technological design problem
- synthesize research and development and specify the goals of a design
- use deductive thinking processes to limit the possible solutions to a few good ones
- consider concept generation, development, production, marketing, fiscal matters, use, and disposability of a product or system
- make a model and prototype
- defend the need for verifiable data
- organize data using appropriate techniques
- identify technological trends revealed by data
- analyze data to form conclusions
- use analyzed data to confirm, modify or reject a design solution
- plan and select the best possible solution that takes into account the constraints and criteria obtained from research and personal preference
- refine a design by using prototypes and modeling to ensure quality, efficiency, and

productivity of the final product
- evaluate proposed or existing designs in the real world
- evaluate a design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed
- assess previously ignored solutions, perhaps with modifications, as possible choices
- explain the role of quality control and tools they use
- evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models
- document processes and procedures and communicate them to different audience
- use appropriate oral and written techniques
- describe communication techniques that include flow charts, drawings, graphics, symbols, spreadsheets, graphs, time charts, and World Wide Web pages
- use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate
- assess the impact of products and systems
- collect information and evaluate its quality
- synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment
- exercise deductive thinking and synthesis techniques
- use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology
- use assessment techniques to evaluate involving iterative steps and procedures that requires analyzing trade-offs, estimating risks, and choosing a best course of action
- defend the assessment of a product or system which can prove that it is dangerous, but it cannot prove that it is safe
- check graphs to determine that they do not misrepresent results
- illustrate innovative designs that capitalize on natural designs that capitalize on natural settings and provide convenience
- check graphs to determine that they do not misrepresent results
- explain the importance of constraints to include appearance, strength, longevity, maintenance, and available utilities

Troubleshooting, research and development, invention and innovation, and experimentation in problem solving

- explain the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- define research and development as a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace
- defend that research on specific topics of interest to the government or business and industry can provide more information on a subject, and, in many cases, it can provide the knowledge to create an invention or innovation
- describe development as a means to help prepare a product or system for final production

- make clear that product development of this type frequently requires sustained effort from teams of people having diverse backgrounds
- explain that technological problems must be researched before they can be solved
- defend that not all problems are technological, and not every problem can be solved using technology
- explain that technology cannot be used to provide successful solutions to all problems or to fulfill every human need or want
- detail that many technological problems require a multidisciplinary approach
- synthesize various factors, including the constraints, criteria, and information gathered by research
- refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product
- evaluate proposed or existing designs in the real world
- modify a design solution so that it more effectively solves a given problem by taking into account the design constraints in order to consider the next step
- assess previously ignored solutions, perhaps with modifications, as possible choices
- describe the process where items can be produced in single quantity, while others can be made in batches or volume production
- demonstrate basic knowledge in how to use and maintain technological systems
- diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it
- demonstrate proper use of diagnostic tools in the maintenance of a system
- troubleshoot, analyze, and maintain given technological systems to ensure safe and proper function and precision
- monitoring the operation, adjusting the parts, cleaning, and oiling of a given system
- explain examples of how a given product or system can be properly maintained
- operate pre-determined systems so that they function in the way they were designed
- describe safety procedures and how following directions is key to ensuring an accident-free working environment
- use methods comparing and contrasting sources, examining relevancy, and investigating the background of experts to determine accuracy of information

Maryland Core Technologies

- describe the core technologies (mechanical, structural, electrical, electronic, thermal, fluid, optical, bio, and material) as they are applied in the designed world
- analyze the functioning of the core technologies in the designed world in terms of common components, basic system design, safety, simple controls and system performance evaluation
- identify and describe applications of mechanical technology in the designed world such as levers, inclined planes, wedges, wheels and axles, pulleys, screws, gears, cams and linkages
- explain science concepts and mathematic processes applied in mechanical technology such as force, motion, energy, work, power, efficiency, gravity and friction
- identify and describe applications of structural technology in the designed world such as post and beam structures, frame structures, suspension structures, cantilever structures, mass structures, and pressurized structures

- explain science concepts and mathematical concepts applied in mechanical technology such as compression, tension, efficiency, and center of gravity
- identify and describe applications of materials technology in the designed world such as metals, alloys, nonmetals, composites, and biomaterials
- explain science concepts and mathematical concepts applied in materials technology such as strength of shapes, forces, center of gravity, moments of inertia, stress, strain, deflection, and efficiency
- identify and describe applications of electrical technology in the designed world such as generators, electric motors, alarm systems, and automobile electrical systems
- explain science concepts and mathematical concepts applied in electrical technology such as measure resistance, conduction, semi-conduction, current (alternating and direct), voltage, power, circuits, magnetism, Ohm's law, and ratio
- identify and describe how various types of electric circuits (i.e., series and parallel) provide a means of transferring and using electrical energy to produce heat, light, sound, as well as chemical changes
- make clear the magnetic effects of current (i.e., electromagnet) and the electric effects of magnets (i.e., motors)
- solve for the unknown in a linear equation related to electrical technology
- identify and describe applications of electronic technology in the designed world such as computers, telephones, radio, and television
- explain science concepts and mathematical concepts applied in electronic technology such as electromagnetic waves, digital logic, binary numbers, frequency, and amplification
- identify and describe applications of thermal technology in the designed world such as thermometer, refrigerator, furnace, air conditioner, and heat engines
- explain science concepts and mathematical concepts applied in thermal technology such as convection, conduction, radiation, insulation, and efficiency
- identify and describe applications of fluid technology in the designed world such as air pumps, water pumps, automobile brakes, and airfoils
- explain science concepts and mathematical concepts applied in fluid technology such as pressure, vacuum, volume, area, and ratio
- identify and describe applications of optical technology in the designed world such as microscope and magnifier, laser, fiber optics, optical telescope, bar code reader, and scanner
- explain science concepts and mathematical concepts applied in optical technology such as light waves, frequency, period, reflection, refraction, diffraction, proportion (direct and indirect), superposition, interference, and Doppler effect
- identify and describe applications of biotechnology in the designed world such as genetically modified food, DNA fingerprinting, oil biodegradation, insulin production, and bioethics
- explain science concepts and mathematical concepts applied in biotechnology such as genes, genetic code, DNA structure, enzymes, proteins, cloning, mutations, chromosome number, genetic recombination, anaerobic conversion, and fermentation
- explain the application of biotechnology processes and products including agricultural, pharmaceuticals, food and beverages, medicine, and energy
- explain that agriculture includes a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemicals, and other useful products
- explain that biotechnology has applications in such as agriculture, pharmaceuticals, food and

beverages, medicine, energy, the environment, and genetic engineering

- explain that energy cannot be created nor destroyed; however, it can be converted from one form to another
- explain that energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others
- explain why it is impossible to build an engine to perform work that does not exhaust thermal energy to the surroundings
- explain that energy resources can be renewable or non-renewable
- explain that power systems must have a source of energy, a process, and loads
- explain the production, conversion, transmission, and application of different forms of energy such as mechanical, radiant, chemical, thermal, electrical, and nuclear

Useful Websites:

This review can be found online at:
http://www.montgomeryschoolsmd.org/curriculum/science/classroom/assessment/

The format of the MCPS semester examination mirrors the Public Release Version (PRV) of the Biology High School Assessment. The PRV items can be viewed at:
http://www.mdk12.org/assessments/high_school/look_like/biology/intro.html