# Summative Multiple Choice

**Unit 1- Introduction to Invention and Innovation**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 1-1. The definition that best describes innovation is:

1. The process of modifying an existing product or system to improve it
2. The process of manufacturing a new product
3. The process of turning ideas into devices or systems
4. The process of designing technologies that have never existed before

\_\_\_\_ 1-2. The statement below that is NOT a characteristic of brainstorming is:

A. The more ideas an individual or team thinks of, the more likely they are to be quality ideas

B. Develop a hypothesis to generate ideas

C. Spontaneous thoughts to generate numerous ideas to solve a problem

D. Write each spoken idea down as it is given, and move on

\_\_\_\_ 1-3 Of the qualities listed below, which would an inventor most likely have

1. Wealthy
2. Humorous
3. Curiosity
4. Writer

\_\_\_\_ 1-4. The definition that best describes invention is:

1. Invention is the first product produced on an assembly line
2. Invention is having a desired goal to achieve something
3. Invention is changing the size of an existing product
4. Invention is a process of turning ideas into devices or systems

\_\_\_\_ 1-5. Your uncle, an aerospace engineer, has just described the newest design version of a device to launch rockets. This would be an example of:

1. Manufacturing
2. Invention
3. Innovation
4. Prototyping

\_\_\_\_ 1-6. Your team has just finished a presentation of your new desk design to a group of furniture buyers. Which step of the Engineering Design Process did you just complete?

A. Identify the Challenge

B. Test and Evaluate

C. Present the Solution

D. Explore Ideas

\_\_\_\_ 1-7. The engineering design process involves:

A. Asking questions to find answers

B. A series of steps that lead to the development of a new product or system

C. Creating a flow chart for a process

D. A process for experimenting that results in a new product or system

\_\_\_\_ 1-8. The principal has asked the 8th grade students to help solve the problem of 1st

grade students misplacing or losing their pencils. They have identified their challenge and the limitations. What would be best for them to do at this point?

1. Explore ideas
2. Start creating their solution
3. Buy more pencils
4. Test their ideas

\_\_\_\_ 1-9 By observing a group of children playing using the new pencil holder you have

built, you would be participating in which step of the Engineering Design Process?

1. Present the solution
2. Identify the challenge
3. Plan and develop
4. Test and evaluate

\_\_\_\_ 1-10 Inventors are:

1. Flexible thinkers, willing to explore and research things from a variety of different resources
2. Willing to explore any idea, no matter how impossible it may seem
3. Insightful, persistent people who view obstacle or problems that occur through the inventive process as challenges to overcome
4. All of the above

\_\_\_\_ 1-11 An inventor is a person who devises creative solutions to problems based on the needs of the world they live in. Of the examples below, which is most like an inventor?

1. A woman who removes the lining of her winter coat so that she may wear it in the spring.
2. A resident of a community who creates a system to help elderly people move about their home more easily.
3. A teenager who installs a speaker system in the trunk of their car.
4. A gardener who places stepping stones in his garden so his feet don’t get muddy.

\_\_\_\_ 1-12. In order to build a dog house, which of the following would be best to do first?

1. Choose the kind of material you will use
2. Test different designs
3. Make a drawing of the dog house
4. Determine what the limitations

\_\_\_\_ 1-13 Contributing to a group endeavor by offering useful ideas is an example of:

1. Experimentation
2. Brainstorming
3. Scampering
4. Innovating

\_\_\_\_ 1-14. If you significantly improve a design based on prototype testing and evaluation, you would be participating at which step of the design process?

1. Plan and develop
2. Testing and evaluating
3. Refining the design
4. Exploring ideas

\_\_\_\_ 1-15. The best description of Scamper is:

1. **A technique that is used before using the design process**
2. A technique **based on the notion that everything new is a modification of something that already exists**
3. **A technique most often used by scientists when experimenting**
4. **A technique based on the notion that there will always be new things to invent**

**\_\_\_\_ 1-16.** Bob and his uncle have researched ideas for a new quad trailer and have gathered the tools and materials needed to build it. They are participating at which step of the Engineering Design Process?

1. Present the solution
2. Identify a challenge
3. Plan and develop
4. Test and evaluate

\_\_\_\_ 1-17 It has been six years since Gina has presented her new tool prototype to the

company that decided to manufacture and sell it. Since that time, sales have steadily declined. If she is following the engineering design process, at this point, it would be best for Gina to:

1. Make sketches of new ideas
2. Examine the tool’s competition
3. Start a new advertising campaign
4. Test new tool prototypes

\_\_\_\_ 1-18 Which example below is NOT true regarding the development of technologies?

1. New products and processes are the result of persistent people who view obstacles as challenges that must be overcome
2. People began inventing in the early 20th century
3. Creativity is closely linked to the development of technology
4. There is no perfect design

**Unit 2 – The Engineering Design Process**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 2-1 An example of a design constraint is:

1. Materials that can be used
2. Testing
3. Benchmarks
4. Controls

\_\_\_\_ 2-2 Design criteria define:

1. Constraints
2. What the product should be able to do
3. How to do market research
4. All of the above

\_\_\_\_ 2-3 Recording of data collected on an experiment or test is best done using:

1. A four function calculator
2. Pencil and paper
3. A spreadsheet
4. A graphics program

\_\_\_\_ 2-4 Troubleshooting is:

1. Eliminating a problem in a system
2. A systematic method of finding a problem in a system
3. Never necessary if the design is perfect
4. Repairing a malfunction in a system.

\_\_\_\_ 2-5 Marketing involves

1. Informing the public
2. Sales
3. Distribution
4. All of the above

\_\_\_\_ 2-6 Which of the following is not an outcome of using chemical technologies

1. Polyethylene
2. Kevlar
3. Gypsum
4. Nylon

\_\_\_\_ 2-7 Symbols, drawings and measurement

1. Brainstorm ideas for a design
2. Provide a common language in which to express ideas
3. Are used in the distribution of a product for sale
4. Are only used if communication about the product is unclear

\_\_\_\_ 2-8 A three dimensional representation is

1. A drawing produced on the computer.
2. A model, often a prototype
3. A drawing with an x and y axis
4. A finished product

\_\_\_\_ 2-9 The field of Biotechnology

1. Is responsible for creating robotic devices
2. Applies the principles of biology to create commercial products
3. An important part of communications
4. Is responsible for taking mechanical things apart

\_\_\_\_ 2-10 Invention:

1. Uses the engineering design process
2. Is the creative application of ideas to generate new products and systems.
3. Often must work within design criteria and constraints
4. All above

**Unit 3 – Invention and Innovation in the Designed World**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 3-1 Which of the following is NOT a core concept of technology?

1. Systems
2. Resources
3. Benchmarks
4. Controls

\_\_\_\_ 3-2 The Design Process includes:

1. Brainstorming
2. Prototyping
3. Evaluating
4. All of the above

\_\_\_\_ 3-3 Malfunctions in a part of a system:

1. usually impact the system as a whole.
2. are easily identified.
3. can be repaired without troubleshooting.
4. have no impact on the system as a whole.

\_\_\_\_ 3-4 Trade-offs:

1. Are related to the sale of equipment.
2. Sacrificing or modifying one design element in order to achieve another one.
3. Are never necessary if the design is well done.
4. Only occur in a perfect design.

\_\_\_\_ 3-5 Technology systems include:

1. Information
2. Transportation
3. Manufacturing
4. All of the above

\_\_\_\_ 3-6 The process of modifying an existing product or system to improve it is called:

1. Invention
2. Innovation
3. Reclaiming
4. Technology

\_\_\_\_ 3-7 The parameters placed on the development of a product or system are called:

1. Ideas
2. Malfunctions
3. Requirements
4. Modifications

\_\_\_\_ 3-8 A subsystem is:

1. Something that is always below the earth’s surface.
2. A part of a larger system.
3. Has to do with warships.
4. Is independent of all other systems.

\_\_\_\_ 3-9 A closed loop system:

1. Is inferior to an open loop system.
2. Provides for feedback of system operations.
3. An important part of the design process.
4. Is a geometric construct.

\_\_\_\_ 3-10 Invention:

1. Is limited to scientists and engineers.
2. Is the creative application of ideas to generate new products and systems.
3. Must be done within an open-loop system.
4. Requires little or no experimentation.

**Unit 4 – Using Design and Creativity to Help Others**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 4-1. Rube Goldberg was not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. A practicing engineer
2. A cartoonist
3. A sculpture
4. An author

\_\_\_\_ 4-2. Rube Goldberg became famous.

1. While living in San Francisco.
2. While working at San Francisco’s Water and Sewer Department.
3. After working at the Evening Mail as a cartoonist.
4. After living in Chicago.

\_\_\_\_ 4-3. Rube Goldberg is best known for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* 1. Engineering buildings.
  2. Designing simple contraptions.
  3. Contraption cartoons.
  4. Building contraptions.

\_\_\_\_ 4-4. Work equals

* 1. Force X mass
  2. Mass X distance
  3. Force X distance
  4. Mass X weight

\_\_\_\_ 4-5. Mechanical Advantage equals

* 1. Resistance force X effort force
  2. Resistance force ÷ effort force
  3. Resistance effort X resistance force
  4. Resistance effort ÷ resistance force.

\_\_\_\_ 4-6. MA is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* 1. Mass.
  2. Metric arithmetic.
  3. Mechanical mass.
  4. Mechanical advantage.

\_\_\_\_ 4-7. MA equals

* 1. Length of incline ÷ height of incline.
  2. Mass of load X length of incline.
  3. Length of incline ÷ height of load lifted
  4. Length of incline X height of load

\_\_\_\_ 4-8. The greater the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the easier it is to do the work.

* 1. Mechanical advantage
  2. Load
  3. Mass load
  4. Mass advantage

\_\_\_\_ 4-9. How much force must be exerted on a 15-gram ball that is sitting on the end of a lever that is 10 cm from the fulcrum? The distance from the fulcrum to the force is 20 cm.

* 1. 3 .0
  2. 30.0
  3. 300.0
  4. 3000.0

\_\_\_\_ 4-10. When using he Engineering Design Process to solve a design problem, \_\_\_\_\_\_\_\_\_ is one of the first steps in solving the challenge.

* 1. Brainstorming
  2. Making a Model or Prototype
  3. Testing and Evaluating the Design using Specifications
  4. Creating or Making it

\_\_\_\_ 4-11. When using he Engineering Design Process to solve a design problem, \_\_\_\_\_\_\_\_\_ is one of the last steps in solving the challenge.

* 1. Brainstorming
  2. Selecting an Approach
  3. Developing a Design Proposal
  4. Communicating Processes and Results

\_\_\_\_ 4-12. When using he Engineering Design Process to solve a design problem, \_\_\_\_\_\_\_\_\_ involves selecting a promising solution based on a thorough analysis of criteria and constraints.

* 1. Identifying Criteria and Specifying Constraints
  2. Exploring Possibilities
  3. Selecting an Approach
  4. Developing a Design Proposal

\_\_\_\_ 4-13. Creativity is defined as the \_\_\_\_\_\_\_\_\_ to create.

* 1. Desire
  2. Ability
  3. Quality
  4. Initiative

\_\_\_\_ 4-14. Technology is defined as the practical application of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ especially in a particular area such as engineering or medical technology.

* 1. Skills
  2. Engineering
  3. Knowledge
  4. Inventions

\_\_\_\_ 4-15. Inventions and Innovations are developed to satisfy a \_\_\_\_\_\_\_\_\_\_\_or want.

* 1. Desire
  2. Requirement
  3. Idea
  4. Need

\_\_\_\_ 4-16. Many inventions or innovations require creativity. Corporations can often create demand for a product by bringing it onto the market and \_\_\_\_\_\_\_\_\_\_ it.

* 1. Advertising
  2. Showing
  3. Show casing
  4. Documenting

\_\_\_\_ 4-17. Technological ideas are sometimes protected through the process of \_\_\_\_\_\_\_\_\_\_.

* 1. Copy writing
  2. Patenting
  3. Designing
  4. Construction

\_\_\_\_ 4-18. Criteria and \_\_\_\_\_\_\_\_\_ establish the requirements of the design.

* 1. Requirements
  2. Design
  3. Constraints
  4. Sketches

\_\_\_\_ 4-19. Evert problem is unique, and engineers and designers may choose to approach the design process in different ways.

* 1. Different
  2. Similar
  3. Unique
  4. Unusual

\_\_\_\_ 4-20. Brainstorming is a group problem-solving process in an open forum without \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* 1. Complaining
  2. Drawing
  3. Sketching
  4. Criticism

**Unit 5 – Technology and Society**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 5-1. The acceptance and use of products is driven by

1. Inventor expectations
2. Societal expectations
3. Business expectations
4. Government expectations

\_\_\_\_ 5-2. Desirable and undesirable consequences of technology are determined by

* 1. If the prototype was made safely or not
  2. How previous products were used
  3. How humans use technology
  4. How the newest innovation has been developed

\_\_\_\_ 5-3 Analyzing trends in technology helps identify

1. The history of a technology
2. The link between creativity and product development
3. Positive or negative effects of a technology
4. All of the above

\_\_\_\_ 5-4. Inventions and innovations have evolved by

1. Scientific experimentations to determine a product’s safety
2. Processes of testing over periods of time
3. Consumer approval of past inventions
4. Identifying impacts either positive or negative

\_\_\_\_ 5-5. Past inventions and innovations didn’t rely on knowledge of \_\_\_\_\_\_\_\_ when in development.

1. History
2. Inventing
3. Technology
4. Science

\_\_\_\_ 5-6. The best description of specialization of function is:

1. **Using prototypes to test new technologies**
2. Developing technologies with a specific function in mind
3. **A technique most often used by scientists when experimenting**
4. **Developing a creative innovation**

\_\_\_\_ 5-7. Using an iPod to download music illegally without permission is a/an

1. Political issue
2. Ethical issue
3. Cultural issue
4. Societal issue

\_\_\_\_ 5-8. An example of technological systems interacting with one another is

1. USB devices and computers
2. The ecosystem and water
3. Satellites and space
4. Cell phones and refrigerators

\_\_\_\_ 5-9 The development of technological devices are influenced by

1. Politics and environment
2. Government practices
3. Cultures of third world nations
4. Society and culture

\_\_\_\_ 5-10 When people look at the history of a product to determine positive or negative effects of its development, we call this

1. Trend analysis
2. Exploration of an idea
3. Persistence of innovation
4. Insightful research

\_\_\_\_ 5-11 A scientist finds a medical treatment that can cure an illness but its use can cause major damage to organs in the human body. This is an example of

1. How a product, system, or environment developed for one setting can be used in another setting
2. How technology, by itself, is neither good nor bad, but how humans use it can result in desirable or undesirable consequences.
3. How decisions to develop and use technologies can create competition between environmental and economic concerns.
4. How previous inventions or innovations weren’t usually developed with the knowledge of science.

\_\_\_\_ 5-12. Which of the following is an example of a technology repairing damage caused by disasters?

1. Electric drill
2. Space shuttle
3. Vacumn cleaner
4. Oil booms

\_\_\_\_ 5-13 The current iPod innovation is exponentially different from the original design. This is an example of

1. Scientific experimentation of new devices
2. Product design influenced by human needs and wants
3. Engineering capabilities of new materials
4. Creative solutions to problems

\_\_\_\_ 5-14. If you focus on a certain outcome happening during innovation of a technology, this would be called

1. Function development
2. Specialization of function
3. Refining the design
4. Identifying the function

\_\_\_\_ 5-15. Which of the following would be an example of how environment and economics compete with each other?

1. Innovations in wind energy and past history of wind energy
2. Mining for iron ore and mining for gold
3. The global demand for oil and consequences of offshore oil drilling
4. Collecting the sun’s energy and storing it for later use

**\_\_\_\_ 5-16. Continuous** innovation of the iPod over several years is an example of

1. Specialization of function
2. Refining the design
3. Societal expectations drive technology
4. All of the above

\_\_\_\_ 5-17 Technologies developed for one use can be applied to another use. An example of this is

1. Innovative transitioning
2. Learning a foreign language using an iPod
3. Starting a new advertising campaign
4. Testing new product prototypes

\_\_\_\_ 5-18 Emission standards that require specific limits to the amount of pollutants that can be released into the environment is an example of

1. New products and processes are the result of societal influence
2. Government influence on transportation design
3. There is no perfect design
4. Politics is closely linked to the development of technology

**Unit 6 – Creating a Space Exploration Infrastructure**

*Directions:*  Select the response that best answers the question or statement.

\_\_\_\_ 6-1. Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in:

A. Desirable consequences

B. Both desirable consequences and undesirable consequences

C. Neither desirable consequences nor undesirable consequences

D. Undesirable consequences

\_\_\_\_ 6-2. Which of the following is not a reason for systems failure:

1. They were poorly designed to begin with
2. Because they have faulty or poorly matched parts
3. They were used in ways that exceeded what was intended
4. The materials used exceeded the design criteria

\_\_\_\_ 6-3. When compared to the Earth, the moon is:

1. Twice the size
2. Just a little larger
3. Same size
4. Smaller

\_\_\_\_ 6-4. From Earth, it is possible to see the far side of the moon:

1. Never
2. During a new moon
3. During a full moon
4. We can always see the far side

\_\_\_\_ 6-5. The moon’s atmosphere is made up of mostly:

1. Methane
2. The moon has no atmosphere
3. Nitrogen
4. Hydrogen

\_\_\_\_ 6-6. Products and services that originated from space technologies are called:

1. Trade offs
2. Spin offs
3. Buzz offs
4. Turn offs

\_\_\_\_ 6-7. The Constellation Program vehicle that was meant to carry cargo into space was called:

1. Ares V
2. Ares 1
3. Altair
4. Orion

\_\_\_\_ 6-8. The function of the Earth Departure Stage was to:

1. Carry crew into orbit
2. Support space station operations
3. Carry crew and cargo out of Earth orbit
4. De-orbit and return the crew to Earth

\_\_\_\_ 6-9. Knowledge gained from other fields of study:

1. Never effects the development of technological products and systems
2. Always effects the development of technological products and systems
3. Has little effect on the development of technological products and systems
4. Has no effect on the development of technological products and systems

\_\_\_\_ 6-10. Economic, political, and cultural issues:

1. Are influenced by the development and use of technology
2. Have no influence on the development and use of technology
3. Always determine which technologies will be developed and used
4. Never determine which technologies will be developed and used

\_\_\_\_ 6-11. The use of technology has positive and negative consequences. Which of the following is a positive and negative consequence of using solid propellants:

1. More expensive and faster burning
2. More expensive but harder to store
3. Less expensive and cleaner burning
4. Less expensive but more polluting

\_\_\_\_ 6-12. The Federal Aviation Administration has control of air space over the United States:

1. But has no concerns over the design and operation of space vehicles
2. But has no jurisdiction over the design and operation of space vehicles
3. And has some influence over the design and operation of space vehicles
4. But has no influence over the design and operation of space vehicles

\_\_\_\_ 6-13. Transportation vehicles are made up of sub-systems that must function together effectively. Which of the sub-systems below is not a transportation sub-system?

1. Chemical
2. Propulsion
3. Suspension
4. Guidance

\_\_\_\_ 6-13. The correct name for the loose particles that make up the surface of the moon is:

1. Monolith
2. Regolith
3. Dirt
4. Soil

\_\_\_\_ 6-14. The moon has:

1. Liquid water under the surface
2. Liquid water above the surface
3. Water ice below the surface
4. Here is no water on the moon

\_\_\_\_ 6-15. To live on the Moon and at destinations beyond, we must:

1. Bring everything we need with us
2. Identify resources that will support human life
3. Depend on resupply from Earth
4. Learn to do without

\_\_\_\_ 6-16. The Earth is protected from the solar wind by its magnetic field. The moon:

1. Has no protection
2. Is always protected by the Earth’s magnetic field
3. Is sometimes protected by the Earth’s magnetic field
4. Has its own magnetic field

\_\_\_\_ 6-17. Every object exerts gravitational force on every other object. The force depends on:

1. The mass of the objects and their distance apart
2. Only the weight of the objects
3. Only the distance apart
4. The weight and the mass of the objects and their distance apart

Answer Key: 100 Multiple Choice Items for Course by Unit

**Unit 1- Introduction to Invention and Innovation**

1.1 A

1.2 B

1.3 C

1.4 D

1.5 C

1.6 C

1.7 B

1.8 A

1.9 D

1.10 D

1.11 B

1.12 D

1.13 B

1.14 C

1.15 B

1.16 C

1.17 B

1.18 B

**Unit 2- The Engineering Design Process**

2.1 A

2.2 B

2.3 C

2.4 B

2.5 D

2.6 C

2.7 B

2.8 B

2.9 B

2. 10 D

**Unit 3- Invention and Innovation in the Designed World**

3.1 C

3.2 D

3.3 A

3.4 B

3.5 D

3.6 B

3.7 C

3.8 B

3.9 B

3.10 B

**Unit 4- Using Design and Creativity to Help Others**

4.1 A

4.2 C

4.3 D

4.4 C

4.5 B

4.6 D

4.7 C

4.8 A

4.9 B

4.10 A

4.11 D

4.12 C

4.13 B

4.14 C

4.15 D

4.16 A

4.17 B

4.18 C

4.19 A

4.20 D

**Unit 5- Technology and Society**

5.1 B

5.2 C

5.3 C

5.4 B

5.5 D

5.6 B

5.7 B

5.8 A

5.9 D

5.10 A

5.11 B

5.12 D

5.13 B

5.14 B

5.15 C

5.16 D

5.17 B

5.18 B

**Unit 6- Creating a Space Exploration Infrastructure**

6.1 B

6.2 D

6.3 D

6.4 A

6.5 B

6.6 A

6.7 A

6.8 C

6.9 B

6.10 A

6.11 D

6.12 C

6.13 A

6.14 B

6.15 C

6.16 B

6.17 A