FILE B

Science and Technology:
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Science and Technology

Item Information and Scoring Guide Reference Sheet and Quantities of Items by Type

Item Information and Scoring Guide Reference Sheet

The following pages are designed to assist you in understanding how Maine Educational Assessment (MEA) items are scored. These pages contain the text for each item accompanied by the following information.

- **MC#:** the multiple-choice item position
- **Key:** the letter of the correct answer for the multiple-choice item
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured

- **SA#:** the short-answer item position
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured
- **Short-Answer Scoring Guide:** the two-point description used to determine the score
- **Training Notes:** in-depth descriptions or particular information used to determine the score

- **CR#:** the constructed-response item position
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured
- **Constructed-Response Scoring Guide:** the four-point description used to determine the score
- **Training Notes:** in-depth descriptions or particular information used to determine the score

MAINE 2001–2002

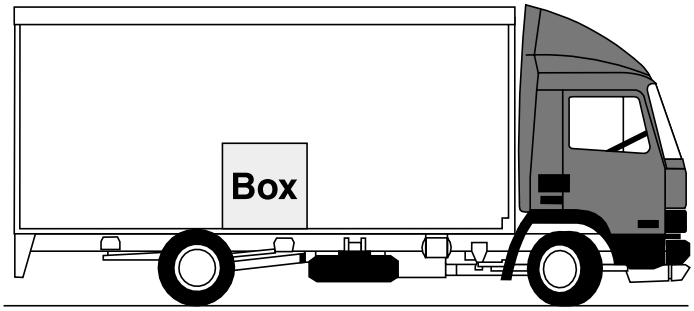
Science and Technology Grade 8

The table below shows the quantities of released items for each item type. Item information for all item types and scoring information (guides and training notes) for all short-answer and constructed-response items follow.

QUANTITIES OF ITEMS BY TYPE

MC	SA	CR
20	5	5

Items with Keys, Learning Results, Scoring Guides, Training Notes, and Student Responses



1. Suppose you place a box of weights in the middle of a truck and quickly accelerate the truck forward. How will the box move relative to the truck?

   A. forward
   B. backward
   C. to the left
   D. to the right

MC#: 1
Key: B
Learning Results: I-1
Motion
I Students will understand the motion of objects and how forces can change that motion. Students will be able to
1 describe the motion of objects using knowledge of Newton's Laws.

2. Which space object is **most** comparable to a rock?

A. a comet
B. a pulsar
C. a quasar
D. an asteroid

MC#: 2
Key: D
Learning Results: G-4
The Universe
G Students will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates. Students will be able to
4 describe scientists' exploration of space and the objects they have found (e.g., comets, asteriods, pulsars).

3. Native Americans planted corn, beans, and squash together in hills. The broad leaves of the squash kept weeds from growing by blocking the sunlight. The relationship between the squash plants and the weeds is an example of

A. predator-prey.
B. parasitism.
C. competition.
D. mutualism.

MC#: 3
Key: C
Learning Results: B-4
Ecology
B Students will understand how living things depend on one another and on non-living aspects of the environment. Students will be able to
4 generate examples of the variety of ways that organisms interact (e.g., competition, predator/prey, parasitism/mutualism).

4. The color of the fur of rabbits living in the wild changes from brown to white in the winter months. A convincing argument to explain this adaptation might be that white rabbits

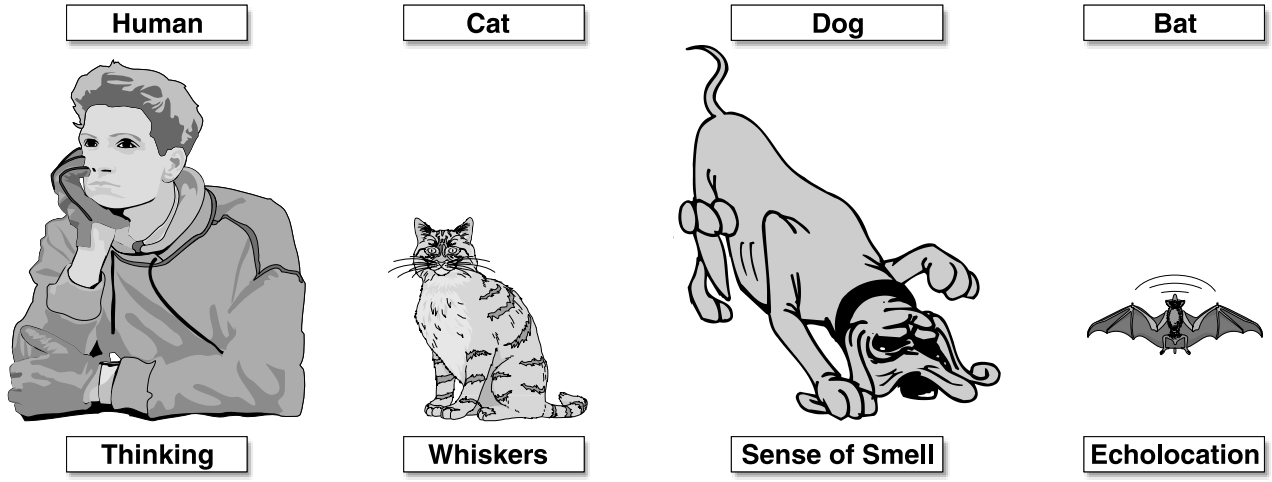
   A. find more food in the winter.
   B. are more difficult to trap in the winter.
   C. absorb more solar energy in the winter.
   D. are more difficult for predators to find in the winter.

MC#: 4
Key: D
Learning Results: L-1
Communication
L 1 Students will communicate effectively in the application of science and technology. Students will be able to discuss scientific and technological ideas and make conjectures and convincing arguments.

5. A student lab team was given a candle to burn. The team was asked to observe the candle while it burned for 10 minutes. All of the following statements are observations **except**,

   A. "The candle is 6.0 cm tall."
   B. "Candles need air to burn."
   C. "The candle flickers as it burns."
   D. "There is a pool of liquid at the wick's base."

MC#: 5
Key: B
Learning Results: J-1
Inquiry and Problem Solving
J Students will apply inquiry and problem-solving approaches in science and technology. Students will be able to
1 make accurate observations using appropriate tools and units of measure.



6. Which system is involved with thinking, whiskers, sense of smell, and echolocation?
   A. nervous
   B. muscular
   C. endocrine
   D. circulatory

MC#: 6
Key: A
Learning Results: C-1
Cells
C Students will understand that cells are the basic units of life. Students will be able to
1 compare and contrast human organ systems with those of other species.

7. Which of the following shows the order of size from the smallest to the largest?

A. galaxy, solar system, star
B. star, galaxy, solar system
C. star, solar system, galaxy
D. solar system, galaxy, star

MC#: 7
Key: C
Learning Results: G-2
The Universe
G Students will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates. Students will be able to
2 describe the concept of galaxies, including size and number of stars.

8. Scientists consider the giant water bug and the lobster to be members of the same group of animals because

   A. they both live in water.
   B. they both have jointed legs.
   C. they both can be seen without a microscope.
   D. they both are nearly the same color.

MC#: 8
Key: B
Learning Results: A-1
Classifying Life Forms
A Students will understand that there are similarities within the diversity of all living things. Students will be able to
1 compare systems of classifying organisms including systems used by scientists.

9. Plants get the energy they need to live and grow from

A. air.
B. soil.
C. water.
D. sunlight.

MC#: 9
Key: D
Learning Results: B-1
Ecology
B Students will understand how living things depend on one another and on non-living aspects of the environment. Students will be able to
1 describe in general terms the chemical processes of photosynthesis and respiration.

10. Scientists have proposed generating electricity in space by using solar panels and then sending the electricity to Earth by microwaves. Which would be an impact of this technological development on society?

A. less space for government weather satellites
B. more dependence on natural resources
C. increased cost of research and development
D. greater probability of destructive weather phenomena

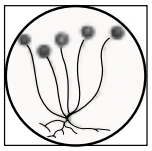
MC#: 10
Key: C
Learning Results: M-1
Implications of Science and Technology
M Students will understand the historical, social, economic, environmental, and ethical implications of science and technology. Students will be able to
1 research and evaluate the social and environmental impacts of scientific and technological developments.

11. Which organism is the **largest** when viewed without a microscope?

A. ⊢7.5 mm⊣

4X

B. ⊢0.75 mm⊣



40X

C. ⊢0.3 mm⊣

100X

D. ⊢.075mm⊣

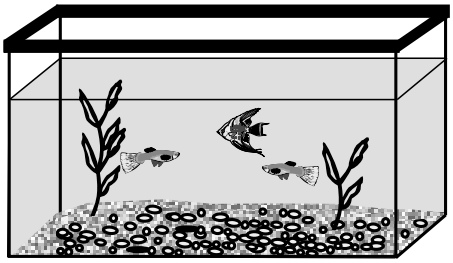
400X

MC#: 11
Key: A
Learning Results: L-4
Communication
L 4 Students will communicate effectively in the application of science and technology. Students will be able to make and use scale drawings, maps, and three-dimensional models to represent real objects, find locations, and describe relationships.

12. Joanna is designing an experiment to see how force affects the motion of more massive and less massive carts. Which variable must she control?

A. the distance each cart moves
B. the mass of each cart
C. the time each cart moves
D. the amount of force on each cart

MC#: 12
Key: D
Learning Results: J-2
Inquiry and Problem Solving
J Students will apply inquiry and problem-solving approaches in science and technology. Students will be able to
2 design and conduct scientific investigations which include controlled experiments and systematic observations. Collect and analyze data, and draw conclusions fairly.



13. Which item would be the **best** choice to add to the aquarium to increase the chances of the goldfish's survival?

    A. snails
    B. more fish
    C. green plants
    D. more gravel

MC#: 13
Key: C
Learning Results: L-1
Communication
L 1 Students will communicate effectively in the application of science and technology. Students will be able to discuss scientific and technological ideas and make conjectures and convincing arguments.

14. Musk oxen circling their young for protection against a predator is an example of

A. parasitism.
B. behavioral adaptation.
C. structural adaptation.
D. mutualism.

MC#: 14
Key: B
Learning Results: A-3
Classifying Life Forms
A Students will understand that there are similarities within the diversity of all living things. Students will be able to
3 describe some structural and behavioral adaptations that allow organisms to survive in a changing environment.

15. In which pair of kingdoms are the organisms mainly single-celled?

A. animal and plant
B. bacteria and protists
C. protists and fungi
D. fungi and bacteria

MC#: 15
Key: B
Learning Results: A-1
Classifying Life Forms
A Students will understand that there are similarities within the diversity of all living things. Students will be able to
1 compare systems of classifying organisms including systems used by scientists.

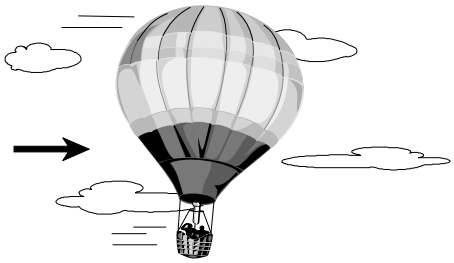
16. Which of the following cannot be seen by the Hubble Space Telescope?

A. a comet
B. a nebula
C. an asteroid
D. a black hole

MC#: 16
Key: D
Learning Results: G-4
The Universe
G Students will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates. Students will be able to
4 describe scientists' exploration of space and the objects they have found (e.g., comets, asteroids, pulsars).

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

17. A hot air balloon moves 500 meters in 100 seconds. What is the speed of the hot air balloon?



SA#: 17
Learning Results: I-2
Motion
I Students will understand the motion of objects and how forces can change that motion. Students will be able to
2 use mathematics to describe the motion of objects (e.g., speed, distance, time, acceleration).

SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student responds 5 m/s.
1	Student responds 5. OR Student responds m/s.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Short-Answer #17

Correct answer: 5 m/s (1 point for “5” and 1 point for “m/s”)

Student Responses for Short-Answer #17 for Score Points 2 and 1

17.

2

Speed = $\frac{\text{distance}}{\text{Time}}$ distance = 500 meters Time = 100 seconds $\frac{500}{100} = 5$

The speed is 5 m/s

17.

2

The speed of the hot air balloon is 5 m/s.

17.

1

The speed of the hot air balloon is five.

17.

1

The hot air balloon is going 5 mph.

18. Susie says that the life cycle and structure of a butterfly are more like a chicken's than a human being's. List **two** pieces of evidence that support this argument.

SA#: 18
Learning Results: L-1
Communication
L Students will communicate effectively in the application of science and technology. Students will be able to
1 discuss scientific and technological ideas and make conjectures and convincing arguments.

SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student lists two correct pieces of evidence to support the argument.
1	Student lists one correct piece of evidence to support the argument.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Short-Answer #18

2 points:
- chicken and butterfly both have wings
- life span of butterfly and chicken is much shorter than that of a human being
- butterfly and chicken lay eggs and human being bears live young
- butterfly and chicken do not care for young
- human being is covered by skin and hair whereas chicken has feathers and butterfly's wings are covered with scales

1 point: minimal response

Student Responses for Short-Answer #18 for Score Points 2 and 1

18. **2**

They both have wings and they both come from a egg.

18. **2**

The butterfly has to hatchout of eggs, and lays eggs like a chicken.

18. **1**

They both achout of eggs,

18. **1**

because thay both grow outside there moms

19. Name **two** defense mechanisms the body uses to fight off microorganisms.

SA#: 19
Learning Results: C-4
Cells
C Students will understand that cells are the basic units of life. Students will be able to
4 identify the causes and effects of diseases, explain their transmission, and identify prevention strategies.

SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student responds with two defense mechanisms.
1	Student responds with one defense mechanism.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Short-Answer #19

Answers: skin, mucus, white blood cells, antibodies, acquired immunity

Student Responses for Short-Answer #19 for Score Points 2 and 1

19. **2**

white blood cells and antibodies.

19. **2**

White Blood Cells attack the germ that get into the body, and Skin Cells help keep out germs too.

19. **1**

White blood cells and vitamins

19. **1**

The body uses white blood cells to fight off microorganisms and it, also, uses different medicines.

20. Based on the motion of Earth's Moon, name **two** motions a moon of Jupiter should be expected to have.

SA#: 20
Learning Results: K-9
Scientific Reasoning
K 9 Students will learn to formulate and justify ideas and to make informed decisions. Students will be able to apply analogous reasoning.

SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student responds that a moon of Jupiter would rotate (spin), revolve (orbit) around Jupiter, and revolve around the Sun with Jupiter (any two).
1	Student responds with one correct motion.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Short-Answer #20

2 points: rotates or spins on its axis, revolves around or orbits Jupiter, and/or revolves around the Sun with Jupiter

1 point: one correct motion

Student Responses for Short-Answer #20 for Score Points 2 and 1

20. **2**

It will orbit around Jupiter, and spin around its own axis.

20. **2**

A moon of Jupiter should be expected to rotate around an axis and orbit Jupiter

20. **1**

Rotates around Jupiter and Shines bright

20. **1**

it should go around jupiter and it should be dark.

21. List **one** way the periodic table groups elements by their characteristics.

SA#: 21
Learning Results: E-3
Structure of Matter
E 3 Students will understand the structure of matter and the changes it can undergo. Students will be able to use the Periodic Table to group elements based on their characteristics.

SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student responds metals or nonmetals or # of electrons in outer ring or man-made vs. naturally occurring. (See additional answers below.)
1	Student gives a partial answer.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Short-Answer #21

Possible answers:
2 points: metals or nonmetals **or** number of electrons in outer ring (shell or orbit) **or** number of protons or atomic number **or** reactions with acids **or** very active versus less active elements **or** man-made versus naturally occurring **or** elements in the same column form similar compounds **or** the mass of elements tends to increase as you move to the right or from the top to the bottom of a column.

1 point: partial answer: electrons or protons

Student Responses for Short-Answer #21 for Score Points 2 and 1

21. **2**

The periodic table groups the elements by whether they are metal or a non-metal which is a characteristic.

21. **2**

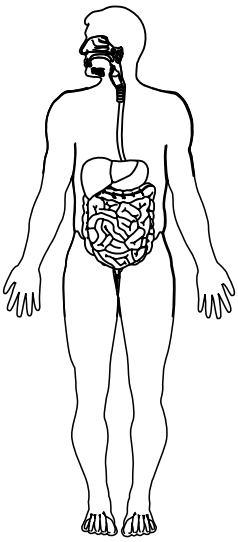
They are grouped by their atomic number

21. **1**

Be the atomic numbers and weight.

21. **1**

By the number of electrons



22. One of the human organ systems is the digestive system.
    a. Name three organs of this system.
    b. Describe the structure of each organ you have named and how it contributes to the function of the digestive system.

CR#: 22
Learning Results: C-3
Cells
C 3 Students will understand that cells are the basic units of life. Students will be able to describe the structure and function of major organs in human systems.

CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Response demonstrates an in-depth understanding of structure and function of a major human organ system. Student correctly names three organs of the digestive system and describes in detail the structures of each organ and its contribution to the function of the system.
3	Response demonstrates a general understanding of structure and function of a major human organ system. Student names three organs of the digestive system and broadly describes the structure of each organ and its contribution to the function of the system.
2	Response demonstrates a simplistic understanding of structure and function of a major human organ system. Student names three organs of the digestive system and partially describes the structure of each organ and its contribution to the function of the system.
1	Response demonstrates an in-depth understanding of structure and function of a major human organ system. Student names two or three organs of the digestive system and minimally describes the structure of each organ and its contribution to the function of the system.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response #22

Score	Description
4	Student correctly names three organs of the digestive system and completely describes the structure of each organ and how it contributes to the function of the system. Response is well developed and contains no errors.
3	Student names three organs of the digestive system and generally describes the structure of each organ and how it contributes to the function of the system. Response contains an error.
2	Student names three organs of the digestive system and partially describes the structure of each organ and how it contributes to the function of the system. Response contains errors.
1	Student names two or three organs of the digestive system and may or may not minimally describe the structure of the organ and/or how it contributes to the function of the system. Response contains errors.

Minor error: leaving out one part of the digestive system

Possible answers:

Part a: Mouth (oral cavity), esophagus, liver, gallbladder, stomach, pancreas, small intestine, and large intestine

Part b:
- mouth—has teeth to chew food and provides saliva to break down starches
- esophagus—is a long tube with muscles to push food down
- liver—contains glands that produce digestive juices
- gallbladder—stores digestive juices produced by liver
- stomach—muscled pouch that allows food to be churned and contains juices for digestion
- pancreas—produces juices that digest proteins, carbohydrates, and fats
- small intestine—long tube with large surface area so nutrients can be absorbed with some digestive juices added
- large intestine—tube with permeable membrane that allows for absorption of water

22. The mouth is a very important organ. Without it, we couldn't get food into our body. It grinds the food, and combines it with saliva. Then it swallows it, and it passes through the asophogus, into the stomach. The stomach breaks down the food even more, and mixes it with stomach acid. It squeezes and churns the food, until it is a thick liquid. The food then moves through a valve into the small intestine. The intestestine absorbs the food through villi, little finger-like things, and transfers it to energy for the body to use. I think that these are the most important parts of the digestive system.

4

22. a) esophogus, stomach, mouth (salivery gland, teeth)

b) Food keeps our bodies energized and our minds working. The food we eat first travels to our mouth. There our teeth chew it into smaller pieces with the help of our salivery gland, which moistens it. The tongue lets you swallow it down the esophogus, whis is like a long tube leading from your mouth to your stomach. Inside the esophogus are muscles that move when you swallow something, pushing the food into the stomach by passing it down to one another. For that reason, a person could still swallow something even if they were standing on their head. Next comes the stomach. The acids and juices inside your stomach break down your food while the walls of the stomach move to churn your food up. The sound of your stomach growling comes from that movement, and it means your stomach is healthy. Food is then passed on to the small intestine where it can be absorbed into the bloodstream.

4

22. a) Three organs in the digestive system are the small intestine, the mouth, and the stomach.
b) The stomach is where the food travels to after it goes down your throat. In the stomach, acids break down the food, until it has a mushy consistency. The structure of the stomach is a small pouch connected to the intestines. In the small intestine the food is broken down even more. The structure of the small intestine is a long tube (over 40ft) that is stacked layer apon layer in the central part of your body. The mouth is where the food first enters your body. Your teeth chew the food and the saliva begins to break it down. The mouth is made up of the tongue, teeth, and skin.

3

22. One of the organs in the digestive system is the mouth. The mouth is like a gate way to this system because it is the first place that the food goes through. It uses the teeth inside to help chew the food until it can swallow. Also in the digestive system is the stomache. The stomache has liquids that help break up the food so that it may enter the intestines. The intestines are long tubes in our body that carry the digested food through the body and desposes of it.

3

22.

2

one whould be the liver? and the other to would be the small intestine and large intestine.

Well the liver helps cut fat it lets out a greenish liquid. The small intestine is where most of the digesting happins and it is long. The large intestine orbsorbs water and is also very long.

PS. salava glands and esofogi's are also a part of the digetive system

22.

2

A.) Mouth, liver, large intestine

B.) The mouth is the starting point of the digestive system. the mouth chews the things we eat and swallows. The liver takes out the toxins in the food you eat and gets rid of them. The large intestine carries the digested food out of the system.

22.

1

A. 1. Big intestine
2. little intestine
3. Liver
B. the intestine is where your food goes.

22.

1

a. Kidney, liver, and the Intestines

23. You and your friend are planning a garden. The only space that you have to plant on is on the side of a hill. Your friend hypothesizes that if the rows are put across the hill the plants will grow better. You hypothesize that the rows should go up and down the hill.

Design a controlled experiment to test which hypothesis is correct.

CR#: 23
Learning Results: J-2
Inquiry and Problem Solving
J Students will apply inquiry and problem-solving approaches in science and technology. Students will be able to
2 design and conduct scientific investigations which include controlled experiments and systematic observations. Collect and analyze data, and draw conclusions fairly.

CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Response demonstrates an in-depth understanding of designing a controlled experiment to test a hypothesis. Student designs a sophisticated controlled experiment.
3	Response demonstrates a general understanding of designing a controlled experiment to test a hypothesis. Student designs a sound controlled experiment.
2	Response demonstrates a simplistic understanding of designing a controlled experiment to test a hypothesis. Student designs a rudimentary controlled experiment.
1	Response demonstrates a minimal understanding of designing a controlled experiment to test a hypothesis. Student designs an inadequate controlled experiment.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response #23

Score	Description
4	Student designs a controlled experiment to test each hypothesis. Response is well developed and contains no errors.
3	Student designs a controlled experiment to test each hypothesis. Response is general and may contain minor errors.
2	Student designs a controlled experiment to test each hypothesis. Response lacks detail and contains errors.
1	Student minimally designs a controlled experiment to test each hypothesis. Response contains errors.

Part a:

- Student designs a test for both situations.
- All variables, except the row design, should be held constant.
- Student conducts multiple trials.

23. **4**

An experiment you could do would be to get two long flower planting tubs. You would fill each with same type of soil and the same ~~amount~~ amount of soil, you would then plant each tub with the same type of plants. Then you would tilt one of the tubs at the exact same angle as the hill, and put it horizontally to the hill. To the other tub you would do the same, but you would place vertically to the hill. Over a several week period you would make sure they got the same ammount of water and sunlight. Also you would make sure no other variables would affect your plants. After the experiment is finished you will have an answer. This answer will have to be tested several more times before you can prove it.

23. **4**

The find out if a garden would grow better going horizontal on a hill or veritcle on a hill. First you would dig the exact same 3X3 ft garden use same soil one going verticle, one going horizontal. then you place the exact same plants in the exact same places. water all the plants once a day useing 1oz of water on each plant. put the gardens on the same part of the hill too so they get the same amount of sun. After two weeks see who has a better garden. then repeat the same experiment.

23. Find two hills which are the same height, have the same slope, the same type of soil, that receive the same exact amount of daylight. On one hill make five rows horizontally, and one the make five rows vertically. Plant the same amount plants in each row ;on each hill. Make sure each plant receives the same exact amout of water and sunlight. Also, when upu're planting the seeds, place them the same distance away from the surface. If everything is controlled, except for the direction of the rows, we will find the right answer

3

23. You could plant one row of the garden across the hill and one row up and down the hill. The rows would have to be the same length and have the same thing planted in them. You would have to plant the exact same number of plants in each row and have the plants be the same distance from one another. You and your friend would have to make sure that both rows got the same amounts of water and sunlight. Decide on how long you will let the plants grow, then when the time is up, check to see which grew better.

3

23.

2

Fist we should divid the garden in half, since its all the space we have On one half of the garden, we should make the rows going across and on the other half, we should put rows going up and down the hill. Once a week, after the seeds have sprouted, we will measure the plants and record the data. At the end of the growing season we will compare data to find out who was right.

23.

2

Plant a colum of of seeds accross the hill and another up and down the hill. Each day check and record the growth of the plants for 2 weeks. With the data you collect make a line graph, wich will show you wich hypothisis is right

23.

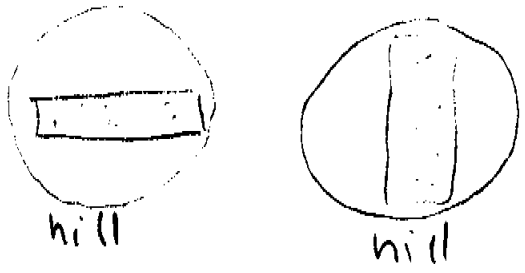
1

If we both disagree with each other, we should split the land in half. I would plant my plants up and down the hi and my friend should plant his/her plants going across. After we plant the plants we would watch them and find out what way is better.

23.

1

Plant one garden across a hill and another up and down a hill. See which one grows better (each hill must be close if not the same).



States of Matter

Solid	Liquid	Gas	Plasma

24. Compare the relative motion of particles in each state of matter. You may use labeled diagrams to support your answer.

CR#: 24
Learning Results: E-5
Structure of Matter
E 5 Students will understand the structure of matter and the changes it can undergo. Students will be able to describe how the motion of the particles of matter determines the state of that matter (e.g., solid, liquid, gas, plasma) and vice versa.

CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Response demonstrates an in-depth understanding of how the motion of the particles determines the state of that matter. Student correctly compares the relative motion of particles in each state of matter.
3	Response demonstrates a general understanding of how the motion of the particles determines the state of that matter. Student broadly compares the relative motion of particles in each state of matter.
2	Response demonstrates a simplistic understanding of how the motion of the particles determines the state of that matter. Student partially compares the relative motion of particles in each state of matter.
1	Response demonstrates a minimal understanding of how the motion of the particles determines the state of that matter. Student minimally compares the relative motion of particles in each state of matter.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response #24

Score	Description
4	Student correctly compares the relative motion of particles in each state of matter. Response is well developed and contains no errors.
3	Student broadly compares the relative motion of particles in each state of matter. Response is general and may contain an error.
2	Student partially compares the relative motion of particles in each state of matter or describes the motion of two states of matter. Response may be vague for either the solid or the liquid or both and may contain errors.
1	Student minimally compares the relative motion of particles in each state of matter or describes the motion of one state of matter. Response is minimal and contains errors.

Solid	**Liquid**
Shape is definite. (physical)	Shape is that of the container. (physical)
Volume is definite. (physical)	Volume is definite. (physical)
Particles vibrate slowly about a position or are fixed in position.	Particles move slowly or flow with some randomness.

Gas	**Plasma**
Shape is that of the container. (physical)	Shape is that of the container. (physical)
Volume-gas expands to fill space of container. (physical)	Volume-plasma expands to fill space of container. (physical)
Particles move rapidly with randomness.	Particles move very rapidly with randomness.

4 points: Student correctly compares the relative motion of all four states of matter.
2 points: Student correctly compares the relative motion of two states of matter or answers half of the question correctly.

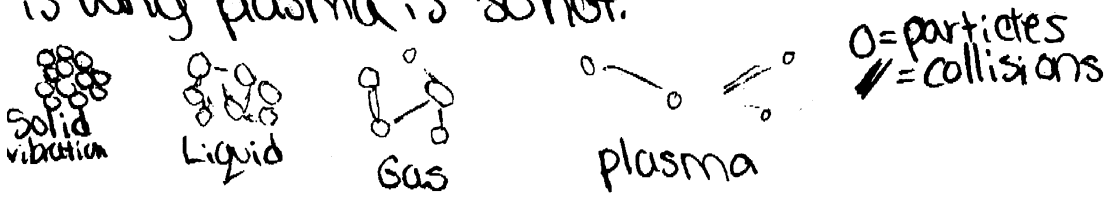
Diagrams may be used to support the student's answer.

Additional information:
Plasma is composed of charged particles and can conduct a current.

24.

4

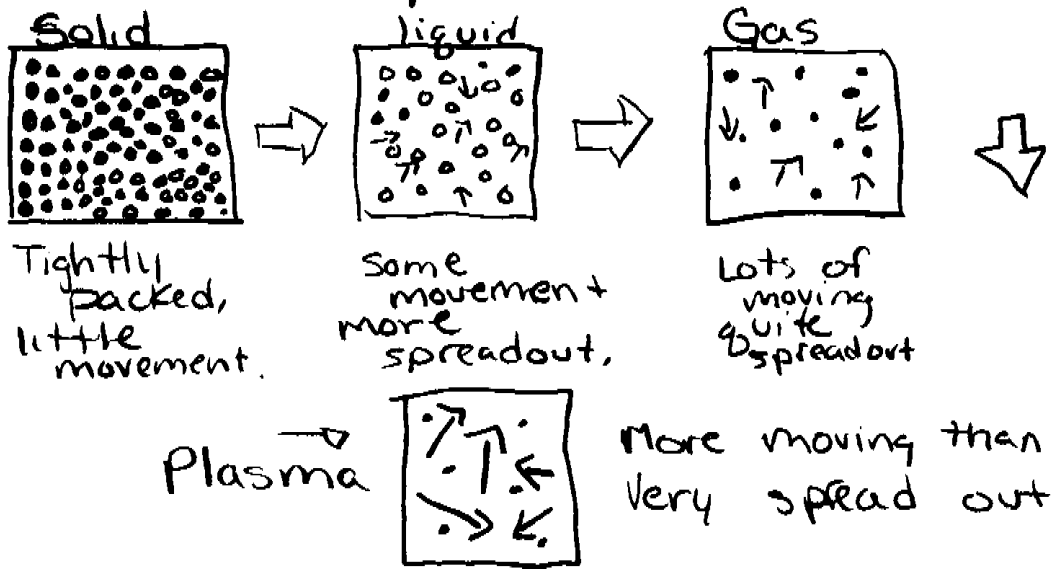
As each state of matter becomes more fluid, the particles begin to move faster. In solids, the particles are crammed so close together that the only collisions and movement that they can perform result in vibration. The particles in a liquid have room to move freely and perform collisions. The particles in a gas move even faster and perform even more collisions than a liquid. The particles in plasma move around extremely fast, constantly colliding into each other. This is why plasma is so hot.



24.

4

The relative motion of particles in solids, liquids, gases, and plasmas looks like this;



24.

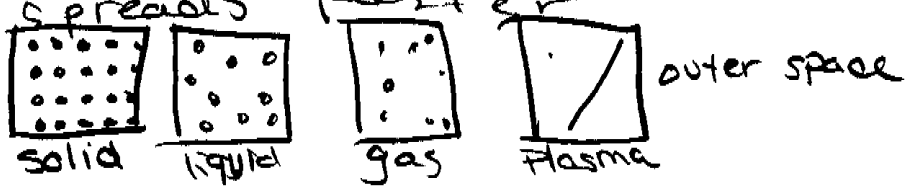
3

The particles in solids can only vibrate. The particles in water move faster, they slide over eachother. Gas particles move very fast, they fly through the air and crash into one another. In plasma the particles move extremely fast, they explode.

24. Relative Motion of Particles:

3

Solid in the state which 3 can form from the particles are slower and have stronger forces of attractions. Liquid is a little faster due to weaker forces of attraction so the matter loses shape. Gas is faster and has no shape and spreads faster.



Plasma is a state which stars are made of and isn't found on Earth.

24.

2

In a solid particles don't move at all. and are close together.

In a liquid particles move a little and are some what close together.

In a gas particles move a lot and aren't close together.

24.

2

The Differences in the motion of particles are that some move fast (plasma) or Some move slow (liquid, gas) or they move very slow like a solid. All matter moves even though it maybe very slow.

24.

1

in solid matter they don't move very fast.
in liquid matter they move real fast.

in gas they move real fast.

in plasma they move kinda slow.

24.

1

The relative motion of particles in solids don't move at all, in liquid theyslow down, in gas they speed up, and in plasma the particles slow down and than speed up again.

tapeworm **louse** **hookworm** **flea**

25. The above living things are examples of
    A. insects.
    B. parasites.
    C. decomposers.
    D. arthropods.

MC#: 25
Key: B
Learning Results: B-4
Ecology
B Students will understand how living things depend on one another and on non-living aspects of the environment. Students will be able to
4 generate examples of the variety of ways that organisms interact (e.g., competition, predator/prey, parasitism/mutualism).

26. What is the **best** explanation to support the fact that a relatively small number of naturally occurring elements result in a large variety of substances?

A. Elements are made up of many atoms.

B. Atoms are made up of many particles.

C. Elements combine in many ways to make many substances.

D. Molecules are made up of many particles.

MC#: 26
Key: C
Learning Results: E-6
Structure of Matter
E 6 Students will understand the structure of matter and the changes it can undergo. Students will be able to explain how the relatively small number of naturally occurring elements can result in the large variety of substances found in the world.

27. A dam is built to produce electrical energy. The greatest negative impact of this technological development is the

A. flooding behind the dam.
B. silt that builds up behind the dam.
C. production of electricity for industry.
D. traffic from construction vehicles.

MC#: 27
Key: A
Learning Results: M-1
Implications of Science and Technology
M Students will understand the historical, social, economic, environmental, and ethical implications of science and technology. Students will be able to
1 research and evaluate the social and environmental impacts of scientific and technological developments.

28. Alex changed his car's oil and dumped the used oil in the backyard. What is the **most likely** environmental impact of this action?

A. The oil will pollute the air.
B. The oil will fertilize the soil.
C. The oil will cause global warming.
D. The oil will drain into the groundwater.

MC#: 28
Key: D
Learning Results: M-4
Implications of Science and Technology
M Students will understand the historical, social, economic, environmental, and ethical implications of science and technology. Students will be able to
4 describe an individual's biological and other impacts on an environmental system.

40. Imagine that at one time there were only blue flowers and blue butterflies. Over many years, several new colors of flowers developed.

    a. Describe the changes that may have occurred in the butterflies over time.

    b. Explain in detail how those changes occurred, keeping in mind the processes of natural and artificial selection.

CR#: 40
Learning Results: D-3
Continuity and Change
D Students will understand the basis for all life and that all living things change over time. Students will be able to
3 provide examples of the concept of natural and artificial selection and its role in species changes over time.

CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Response demonstrates an in-depth understanding of natural selection and its role in species changes over time. Student correctly describes and explains in detail the genetic changes that may have occurred in the butterflies.
3	Response demonstrates a general understanding of natural selection and its role in species changes over time. Student broadly describes and explains the genetic changes that may have occurred in the butterflies.
2	Response demonstrates a simplistic understanding of natural selection and its role in species changes over time. Student partially describes and explains the genetic changes that may have occurred in the butterflies.
1	Response demonstrates a minimal understanding of natural selection and its role in species changes over time. Student minimally describes and explains in detail the genetic changes that may have occurred in the butterflies.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response #40

Score	Description
4	Student describes the genetic changes that may have occurred in the butterflies and explains in detail how those changes occurred. Response is well developed and contains no errors.
3	Student describes the genetic changes that may have occurred in the butterflies and explains generally how those changes occurred. Response contains minor errors.
2	Student describes the genetic changes that may have occurred in the butterflies and explains how those changes occurred. Response lacks detail and contains errors.
1	Student describes minimally a genetic change that may have occurred in the butterflies. Response contains errors. OR Student explains minimally how changes may have occurred. Response contains errors.

Parts a and b:
As new colors of flowers evolved, yellow butterflies were more conspicuous to predators. Some butterflies may have arisen through mutation and their color allowed them to blend with the new colors of the flowers, thus protecting them from predators and allowing their color to be passed on to their offspring.

40. **4**

Take for example in london when there were white moths. They were white and the comoflaged well with the birches. if a black one was born do to genetic changes. it got eaten. After the industrial ~~coa~~ started, the smog colors the birches black. Suddenly the white ones were eaten and the black ones survived to breed. It was survival of the fittest. If for some reason the flowers started changing colors, then the yellow butterflies wouldn't be as sheltered so the small percentage of colored butterflies would thrive and carry on the colored genes.

40. **4**

A genetic change inside of a butterfly, for example, would be that it was born red when the colors of the flowers changed red. Even though the other butterflies were yellow, this one was still red. The red butterfly blended in better on the red flowers than the yellow ones did, so it survived and had offspring. The red butterfly past her genetic material for red to her offspring. Slowly, through natural selection, the yellow butterflies, along with their genetic material, were killed by preditors, and the red butterflies, along with their genetic material, survived and kept passing on their red genetic material.

40. The butterflies would have been yellow so they could blend in with the flowers so predators wouldn't get them. Now that there are different color flowers the butterflies would evolve so they could still camoflauge This means since they didn't have what they need to survive in thier new environment each generation would gain a little of what they need, in this case a slight color change, until a long time later when they were completely evolved and can now blend in with the new color flowers.

3

40.

3

a. Some butterflies may adapt or evolve to have similar colors that hide it.

b. The way a butterfly may do this is by evolution. Some random butterfly has a new color, the same as a flower. It survives because it can hide well. It mates and more butterflies like it are born. The same continues to happen and the new colored butterfly is born.

40.

2

a. The butterflies probaly adapt new colors because if they were yellow and the flower was red predetors would spot out those butterflies first and eat them other than a red butterfly on a red flower.
b. Those butterflies would have to change the color over many generations or there population would parish.

40.

2

The butterflies probably had to change so the could blend in with other colors so they don't get eaten or from genetic mutation, these things change because somewhese in the DNA there is a messup and it causes the color to change. Also after a period of time the color just changes to fit in with the sorrounding enivronment

40.

1

a. The genes changed so the color of the butterfly changes then when they mate their are diffrent colored ones.

40.

1

A- The butterflies first probably started pollinating the different colored flowers more, because they attracted their attention. The butterflies then began to chang color.
B- Over years, a few butterflies became colored. These colored butterflies attracted mates more effectively, creating colored offspring. These offspring attracted mates affectively, creating more colorful butterflies, and so on and so forth.

41. One scientific idea being proposed is to generate electricity in space by using solar panels and then send it to Earth via microwaves. This may result in some positive and some negative changes.

Other scientific ideas being proposed include

- an early warning system for detecting and destroying Earth-bound asteroids,
- a car that runs on energy from hydrogen reacting in fuel cells,
- a base on the Moon to mine resources, conduct research, and support space travel, and
- a faster-growing tree resulting from genetic engineering.

These ideas also may result in some positive and negative changes.

a. Choose **one** of the above scientific or technological ideas and describe **two** changes that may either positively or negatively impact society and/or the environment.

b. Construct a logical argument either for or against the idea.

CR#: 41
Learning Results: K-8
Scientific Reasoning
K Students will learn to formulate and justify ideas and to make informed decisions. Students will be able to
8 construct logical arguments.

CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Response demonstrates an in-depth understanding of how to construct logical arguments. Student chooses an idea, describes two logical changes that may impact society and/or the environment either positively or negatively, and constructs a logical argument either for or against the idea.
3	Response demonstrates a general understanding of how to construct logical arguments. Student chooses an idea, describes two logical changes that may impact society and/or the environment either positively or negatively, and constructs a fairly logical argument either for or against the idea.
2	Response demonstrates a simplistic understanding of how to construct logical arguments. Student chooses an idea, describes two logical changes that may impact society and/or the environment either positively or negatively, and constructs a somewhat logical argument either for or against the idea.
1	Response demonstrates a minimal understanding of how to construct logical arguments. Student chooses an idea, describes two logical changes that may impact society and/or the environment either positively or negatively, and constructs an illogical argument either for or against the idea.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response #41

Score	Description
4	Student correctly describes two changes that may impact society and/or the environment either positively or negatively and constructs a logical argument either for or against the idea. Response is well developed and contains no errors.
3	Student broadly describes two changes that may impact society and/or the environment either positively or negatively and constructs a fairly logical argument either for or against the idea. Response is general and may contain minor errors.
2	Student partially describes one or two changes that may impact society and/or the environment either positively or negatively and constructs a somewhat logical argument either for or against the idea. Response lacks detail and contains errors.
1	Student minimally describes one or two changes that may impact society and/or the environment either positively or negatively and constructs an illogical argument either for or against the idea. Response is minimal and contains errors.

41. a) For this discussion, I choose the early-warning system for detecting and destroying Earth-bound asteroids. One good thing about this idea is that should an asteroid come along, we could easily destroy it, saving Earth from possible doom or severe casualties to plant, animal, human, and our creations' life. These creatio include everything that man has invented. One bad thing is that all the money invested in this invention may have just been wasted. I mean, how often do we encounter Earth-bound asteroids?

b) All in all, I think that it would be a worthy investment Even though the chances of such an asteroid may be slim it would be better if we had the technology to warn us about it, and save us from the disaster it would cause should it hit Earth.

4

41. a. A technological idea that would be good is "a base on the moon to mine resources, conduct research, and support space travel". One change that would impact society is that it would be harder to overpopulate. If scientific research got so far that people were able to live on the moon, there would be much less overpopulation. Another change that would have a good impact would be that if they found necessary resources, we would be able to conserve the earth for so much longer.

b. A base on the moon is such a good idea. If americans are able to find resources, we wouldn't have to destruct the earth for them nearly as much. And if we could research and support space travel, we could come up with some incredible breakthroughs that no one ever thought were possible. And they can be a reality if this proposition is passed

4

41. (a) Two changes that may result from having a base on the moon to mine resources, conduct research, and support space travel are: a great dip on our budget from spending billions of dollars to form the space station; and general outrage from the public because the project will take so long.

(b) I believe that building a station on the moon is a ridiculous idea. To spend billions of dollars on a project that may never even get off the Earth is preposterous. Apart from the money issue, sending people - even if they are trained astronauts - into a climate which can change in a moment's notice seems dangerous and stupid. There is no guarantee that there will even be anything to mine or research there anyway. Besides, the moon, at this point, is somewhat undisturbed. If humans have already screwed up the Earth, why let them do the same thing again?

3

41.

a. If we perfected a car that runs soely on energy from hydrogen reacting in fuel cells it would change the way we live, for the better. It would cut back on the need for fossil fuels. In turn slowly down the greenhouse effect and reducing pollution.

b. The price of gas is so high today, and things are so spred out that we spend a good part of our day in the car. Every time we use our car we give off toxic fumes that are harmful to use and our enviorment. Why not stop that and make the world a cleaner place.

3

41.

2

A. If we could find a way to make a faster-growing tree resulting from genetic engineering it would help the world greatly. When people clear cut areas if they re-planted with a faster-growing tree then clear cutting wood would no longer be a problem.

B. This could only help us because we would not have to worry about destroying rain forests because we could grow it back as fast as we cut it down.

41.

2

a) a car that runs on energy from Hydrogen reacting in fuel cells would have many positive changes to society and the environment. Some changes are there would be There would be more fuel for other needs, less air pollution due to less exhaust, better health and perhaps longer lives because of less pollution.

b) We should have this type of car because of no fuel being used there would be less air pollution, hence a better environment and better health in society.

41.

1

A- The rescources on the moon could run out. and things could be destroyed.

B- I believe that if you put a base on the moon to mine rescources, the rescources could run out and things could happen that the moon could collapse

41.

1

(A) I pick the early warning system for detecting asteroids, because if you get an early warning people will have a better chance to get to safety. Then you could shoot missles at the asteroids hoping they will hit, and destory it before it reaches earth.

(B) It would give people a chance to get to safety. Then shoot some missles at it hoping for it to destory it. If it misses the people would be in the safe place already so no one would hurt or killed. It might destory a couple of buildings, but thats better than letting people die.