

CONTESTANT NUMBER:

**FOR GRADER USE ONLY**

Score Test Below:

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Papers contending to place:

\_\_\_\_\_ Initials \_\_\_\_\_



**University Interscholastic League  
A+ Science Contest • Answer Sheet**

*Write your contestant number in the upper right corner and circle your grade level below.*

**Circle Grade Level:**

6th grade

7th grade

8th grade

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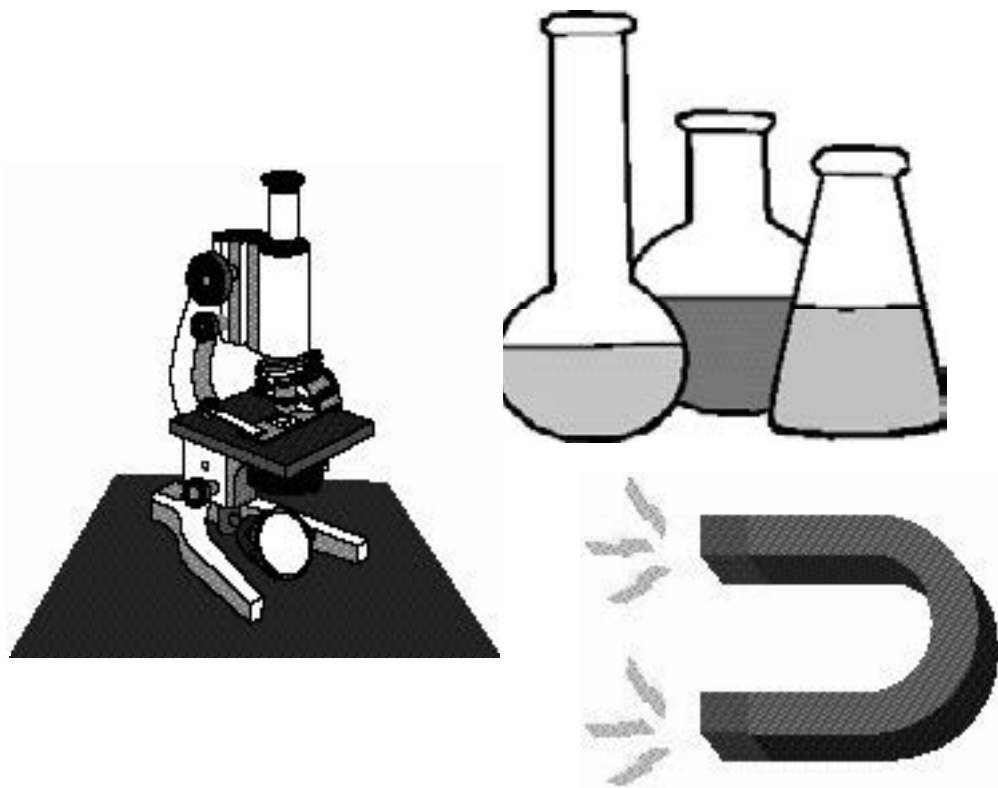
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**INVITATIONAL 2023-2024**

**A+ ACADEMICS**



University Interscholastic League



# Science

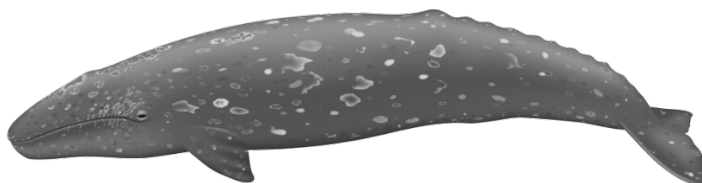
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# UNIVERSITY INTERSCHOLASTIC LEAGUE

## 2022-2023 SCIENCE

### INVITATIONAL TEST

1. Use the image and the Dichotomous key to correctly identify the whale shown.



|  |                    |
|--|--------------------|
| 1a. Mouth with baleen (no teeth).....                                  | 6                  |
| 1b. Mouth with teeth (no baleen).....                                  | 2                  |
| 2a. Large melon (head) .....   | Sperm Whale        |
| 2b. Small rounded head.....  | 3                  |
| 3a. Distinct black and white markings on body.....                     | Orca               |
| 3b. Body mostly gray .....   | 4                  |
| 4a. Has defined beak or “snout” .....                                  | Bottlenose Dolphin |
| 4b. No beak, rounded “snout” .....                                     | 6                  |
| 5a. Speckled markings on sides.....                                    | Harbor Porpoise    |
| 5b. Body all gray, usually cover with scratches.....                   | Risso’s Dolphin    |
| 6a. Long pectoral fin/flippers with knobs on fins & head.....          | Humpback Whale     |
| 6b. Shorter pectoral fin/flippers, smooth fins and head.....           | 7                  |
| 7a. White band on pectoral fin/flipper .....                           | Minke Whale        |
| 7b. No white band on pectoral fin/flipper.....                         | 8                  |
| 8a. Body covered in barnacles, no dorsal fin, has dorsal knuckles..... | Gray Whale         |
| 8b. No barnacle growth on body, dorsal fin present.....                | 9                  |
| 9a. Body solid blue color .....  | Blue Whale         |
| 9b. Body with gray and white patterns .....                            | Fin Whale          |

- A. Orca
- B. Gray Whale

- C. Fin Whale
- D. Minke Whale

2. Which of the following is not an element?

- A. Sodium
- B. Oxygen

- C. Chlorine
- D. Water

3. A student finds a solid, reflective material laying on the ground. After experimenting with the material, it is determined that it is not a good conductor of electricity and it is not ductile. The material is most likely –
- A. Metal  
B. Metalloid  
C. Non metal  
D. New state of matter

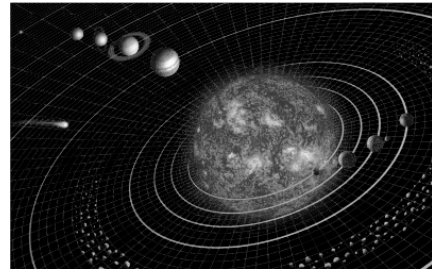
4. An industry needs a metal with a density of 3.6 g/cm<sup>3</sup>. Which sample was selected based on the data shown?

|                | Mass | Volume |
|----------------|------|--------|
| <b>Metal 1</b> | 5    | 2.5    |
| <b>Metal 2</b> | 8    | 1.2    |
| <b>Metal 3</b> | 3    | 6      |
| <b>Metal 4</b> | 9    | 2.5    |

- A. Metal 1  
B. Metal 2  
C. Metal 3  
D. Metal 4
5. Which energy transformation produces electricity without causing pollution?
- A. Using a natural gas heart during the winter  
B. Using coal in a power plant  
C. Using wind to turn a windmill  
D. Using gas to power a generator while camping
6. When a truck hydroplanes on water, it is difficult to control the motion of the truck. Which statement best explains this?
- A. An applied force pushes the car in the opposite way  
B. The input force exceeds the output force  
C. The water supplies an unbalanced force to the tires  
D. The water doesn't supply enough friction to the tires
7. Many common objects are simple machines or compound machines. Which of the following uses a pulley system?
- A. Flag pole  
B. See saw  
C. Wheelbarrow  
D. Yo-yo
8. What type of heat transfer is responsible for a radiator heating the room in a house during the winter?
- A. Thermal energy  
B. Convection  
C. Conduction  
D. Radiation

9. Which best defines the type of rock that completely melts and then cools?  
 A. Metamorphic C. Basalt  
 B. Igneous D. Sedimentary
10. Which of the following is not caused by the movement of the crustal plates?  
 A. Volcanic eruption C. Mountain formation  
 B. Hurricanes D. Seismic activity

11. Based on the order of the planets in the milky way galaxy; which planet will have the shortest year?  
 A. Mars  
 B. Earth  
 C. Mercury  
 D. Venus



12. Blue Origin is a company that intends on sending humans to space. Which of the following would not a concern for this company?  
 A. The position of Earth in its revolution around the Sun  
 B. The weather conditions at the time of the launch  
 C. Angle of reentry to the atmosphere  
 D. Resources needed for the entire mission

13. What basic characteristic divides the organisms in Kingdom A and B?

| Kingdom A | Kingdom B |
|-----------|-----------|
| Oats      | Cat       |
| Sunflower | Tick      |
| Tree      | Worm      |

- A. A is multicellular and B is unicellular  
 B. A is unicellular and B is multicellular  
 C. A is autotrophic and B is heterotrophic  
 D. A is heterotrophic and B is autotrophic
14. Thinking of *Homo sapiens*, at which classification level would you be able to determine if the organism is living?  
 A. Domain C. Class  
 B. Kingdom D. Phylum
15. Which of the following elements does not make up a significant part of sea water?  
 A. Cl B. P C. Mg D. S



16. Yuccas are a dominant vegetation in Big Bend National Park. All the yuccas collectively make up the –

- A. Community
- B. Ecosystem
- C. Population
- D. Niche

17.



Based on the equation provided, why is it necessary to have radiant energy?

- A. Sunlight uses carbon dioxide and water to make glucose
- B. The arrow represents the flow of energy in the system
- C. The process cannot occur without sunlight
- D. The arrow shows the direction of the sunlight

18. What provides the body with the energy it needs for growth, movement, and repair?

- A. Fiber
- B. Glucose
- C. Nucleic acids
- D. Water

19. Which of the following items needs to switch places?

| Physical Changes                       | Chemical Changes         |
|--|--------------------------|
| 1. Stirring hot chocolate with a spoon | 4. Precipitate formation |
| 2. Freezing a liquid                   | 5. Eggs cooking          |
| 3. Bubbles releasing during a reaction |                          |

- A. 1
- B. 2
- C. 3
- D. 5

20. Gazelles are prey for lions in the savannah. A drought would most likely cause a herd of gazelles to –

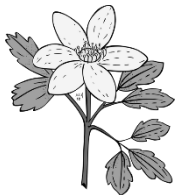
- A. Migrate a farther distance
- B. Become more deer like in nature
- C. Begin to hunt predators like lions
- D. Produce a larger herd

21. In 2018, NASA released that one of Jupiter's moons might be a good place to look for possible life. Why would this be a possible place to look for life based on our current understanding?

- A. The moon has an iron core similar to Earth
- B. The moon is a comparable size to Earth
- C. The moon has a liquid ocean
- D. The moon is within the habitable zone

22. If a natural disaster occurred killing many organisms in a small aquatic environment. Which would most likely restore the biodiversity of this aquatic environment?
- A. Introduce an invasive species to the environment
  - B. Reintroduce native species to the environment
  - C. Survey the aquatic organisms
  - D. Limit fishing in the environment
23. Frogs communicate by croaking. If a frog can to make this sound, they are less likely to find a mate to be able to reproduce. If the frog can not make a sound this would be an example of which of the following –
- A. Learned behavior
  - B. Genetic replication
  - C. Natural selection
  - D. Succession
24. Plants do not have a circulatory system. What have they developed instead to transport carbohydrates instead?
- A. Cork cells
  - B. Chlorophyll
  - C. Xylem
  - D. Phloem
25. The nucleus is the control center of the cell and directs all cellular activities. Which human body system is most like this?
- A. Central nervous system
  - B. Digestive system
  - C. Excretory system
  - D. Integumentary system
26. Humans need to maintain a relatively constant internal body temperature. Which way would the body most likely respond when suddenly placed in a frigid environment?
- A. Begin to sweat and increase in metabolism
  - B. Begin to shiver and increase in metabolism
  - C. Begin to sweat and decrease in metabolism
  - D. Begin to shiver and decrease in metabolism

27. A student hypothesizes that the color red in flowers is dominant and white is recessive. Which would disprove this hypothesis?

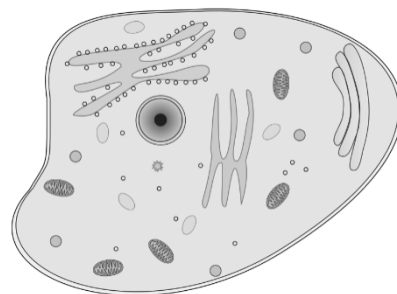


- A. Two white flowers produce offspring with red flowers
- B. Two red flowers produce offspring with red flowers
- C. Two red flowers produce offspring with white flowers
- D. Two white flowers produce offspring with white flowers

28. The respiratory system and the circulatory systems both move oxygen in the human body. Which best explains why there are two body systems to move oxygen in the human body?
- A. One transports oxygen into the body and one transports oxygen out of the body
  - B. One transports oxygen into the torso and one transports oxygen into the legs
  - C. One transports oxygen into the body and one transports oxygen inside of the body
  - D. One transports oxygen while in motion and one transports oxygen while stationary

29. When a river is dammed, it will change the sediment flow in the area. Which change of sediment would be a result a result of a dam being built?
- A. Increase in sediment down river
  - B. Increase in sediment just after the dam
  - C. No change in sediment deposition
  - D. Increase in sediment in the lake

30. Based on the image, which organelle will only be found in plant cells?
- A. Nucleus
  - B. Cytoplasm
  - C. Cell wall
  - D. Vacuole



31. In a neutrally charged atom, protons, neutrons, and electrons have the same mass. This incorrect description was provided by a student. Which statement best supports why this is incorrect?
- A. The mass number is determined by adding the number of protons and electrons
  - B. Protons and neutrons have atomic mass units of one while electrons are much smaller
  - C. The number of protons is equal to the number of neutrons in the atom
  - D. Protons and electrons are subatomic particle inside the nucleus
32. An unknown element is tested and is found to have properties similar to tin and germanium. Which element could the unknown be?
- A. Silicon
  - B. Arsenic
  - C. Selenium
  - D. Gallium
33. Which of the following does not show a chemical reaction?
- A. Burning wood
  - B. Lighting a firework
  - C. Opening a carbonated drink
  - D. Baking cookies



34. On a speed-time graph, how does the slope of the line show that an object is slowing down?

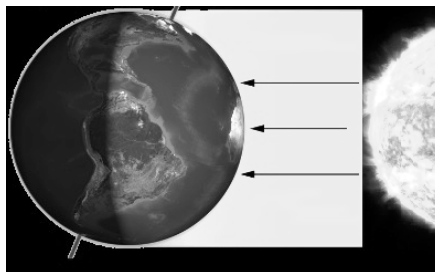
- A. A straight line
- B. A positive slope in a diagonal line
- C. A slope of zero
- D. A negative slope in a diagonal line

35. Four different carts each with the same mass were pushed by students during a race. The time it took for the students to complete the race is listed in the data table. Which student pushed the cart with the least amount of force?

|        | Time (s) |
|--------|----------|
| Cart A | 12       |
| Cart B | 8        |
| Cart C | 17       |
| Cart D | 14       |

- A. 12 seconds
- B. 8 seconds
- C. 17 seconds
- D. 14 seconds

36. The diagram shows winter in South America. How would the diagram be different if it was summer in South America?



- A. It would be tilted towards the sun
- B. It would be tilted away from the sun
- C. The tilt would be fluctuating
- D. There is no tilt

37. As our sun nears the end of its life cycle, it will become a red giant and eventually a –

- A. Super nova
- B. Black hole
- C. Super giant
- D. White dwarf

38. Since 1990, this telescope has been most useful for scientist studying how stars are formed.

- A. Webster Telescope
- B. Spritzer Space Telescope
- C. Hubble Space Telescope
- D. Chandra

39. A radiator and the sun are similar in the way heat energy is transferred.



- A. Heat energy from both cause air molecules to increase in density, contract, and sink
- B. Heat energy from both cause air molecules to increase in density, expand, and rise
- C. Heat energy from both cause air molecules to decrease in density, contract, and sink
- D. Heat energy from both cause air molecules to decrease in density, expand, and rise

40. Which best explains how the oceans effect the range of daily temperature fluctuations on Earth?

- A. Ocean currents carry water from cold to warm areas
- B. Ocean currents carry water which absorbs heat during the day and releases it at night
- C. Ocean currents carry water contracts when heated and expands when cooled
- D. Ocean currents carry water evaporates during the day and condenses at night

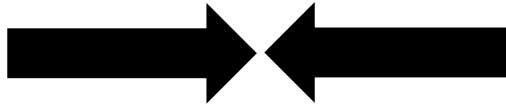
41. Which relationship is similar to a dog and a tick?

- A. Clown fish and anemone
- B. Malaria in humans
- C. Cow and grass
- D. Bee and flowers

42. Since telescopes on Earth can only observe waves that can penetrate the atmosphere, which waves would not be observed using a telescope on the surface of Earth?

- A. Infrared
- B. Radio
- C. Ultraviolet
- D. Visible light

43. A student makes a model of a plate boundary as shown.



Which crustal feature would be most likely to be found at this location?

- A. Seafloor spreading
- B. Mid ocean ridge
- C. Fault line
- D. Mountains

44. What happens to an air mass moving from the south pole towards the equator based on the spin of the Earth?

- A. It would move eastward
- B. It would move westward
- C. It moves back to the South
- D. It moves to the nearest body of water

45. Which statement best describes the chemical formula shown?



- A. 8 oxygen atoms
- B. 20 total atoms
- C. 3 different elements
- D. Doesn't contain organic elements

46. Which picture best shows the way to properly store test tubes during an laboratory experiment?

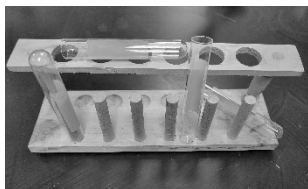
A.



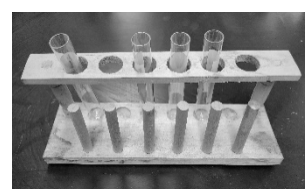
C.



B.



D.



47. To make a map of a local swimming hole, students measure the depth of water at different locations by using a weighted rope to determine the measure to the bottom of the hole. What other data is needed to make the best complete map of this area?
- A. Water temperature
  - B. Water pressure
  - C. Position relative to the shore
  - D. Depth of sunlight
48. Scientists believe that atomic interactions depend on the valence electrons in each atom. This theory is best supported by similar reactions among elements –
- A. With similar atomic numbers
  - B. With similar atomic masses
  - C. In the same period
  - D. In the same group
49. Which scientist listed is most famous for their work with atoms?
- A. Darwin
  - B. Einstein
  - C. Rutherford
  - D. Mendeleev
50. A biology class does a field experiment to observe the creek that is located on school grounds. Which tool should not be used to analyze the sample mentioned?
- A. Insect net
  - B. Specimen jar
  - C. Thermometer
  - D. pH paper

**UNIVERSITY INTERSCHOLASTIC LEAGUE  
2023-2024 SCIENCE  
INVITATIONAL TEST**

**Answer Key**

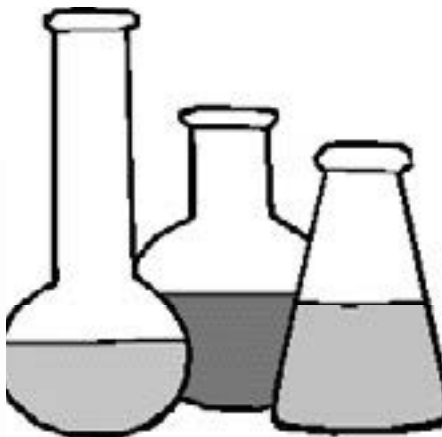
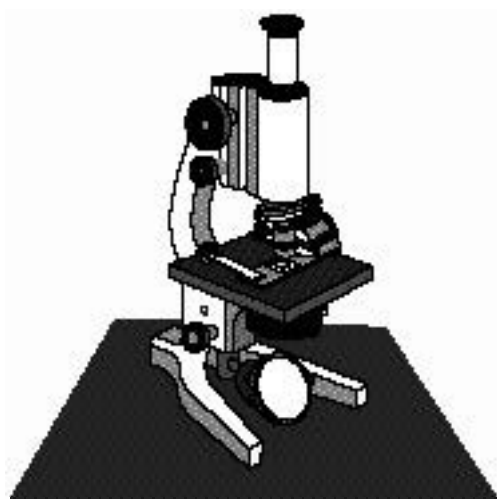
|      |      |      |
|------|------|------|
| 1. B | 18.B | 35.C |
| 2. D | 19.C | 36.A |
| 3. B | 20.A | 37.D |
| 4. D | 21.C | 38.C |
| 5. C | 22.B | 39.D |
| 6. D | 23.C | 40.B |
| 7. A | 24.D | 41.B |
| 8. B | 25.A | 42.A |
| 9. A | 26.B | 43.D |
| 10.B | 27.A | 44.A |
| 11.C | 28.C | 45.C |
| 12.A | 29.D | 46.D |
| 13.C | 30.C | 47.C |
| 14.A | 31.B | 48.D |
| 15.B | 32.A | 49.C |
| 16.C | 33.C | 50.A |
| 17.C | 34.D |      |

**FALL/WINTER DISTRICT 2023-2024**

**A+ ACADEMICS**



University Interscholastic League

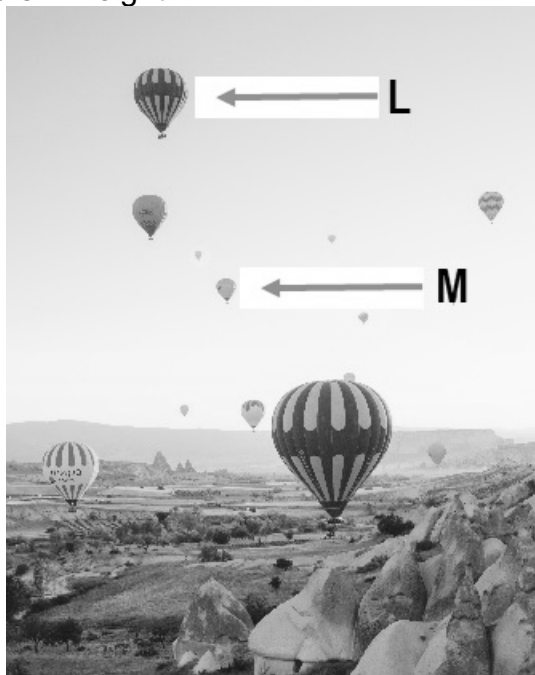


# Science

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**UNIVERSITY INTERSCHOLASTIC LEAGUE  
2023-2024 SCIENCE  
FALL/WINTER TEST**

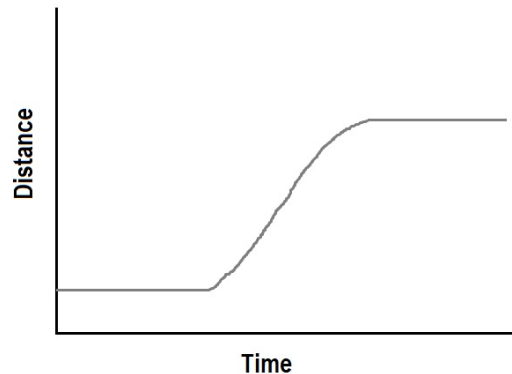
1. In order to best represent an element a teacher gathers the following materials: a box and a pack of marbles. Which of the following would be represent an element given the materials listed?
  - A. Fill the box randomly with two different colors of marbles
  - B. Fill the box with two different colors of marbles arranged in two columns
  - C. Fill the box with one color of marbles arranged in two rows
  - D. Fill the box with three different colors of marbles arranged in three columns
2. Diamonds are ranked a ten on the Mohs hardness scale. Which other mineral is also at the top of this same scale?
  - A. Fluorite
  - B. Quartz
  - C. Calcite
  - D. Corundum
3. The graphic shows two identical hot air balloons traveling at the same speed but separated by 75 meters in height.



Which of the following states applies the most?

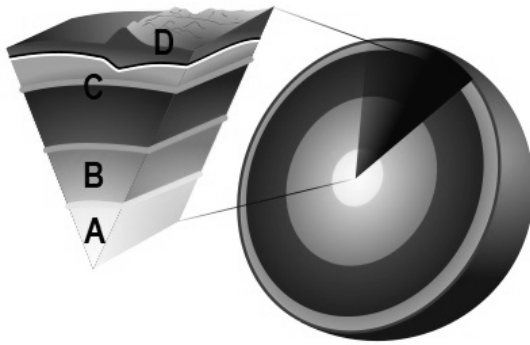
- A. L has a higher kinetic energy
- B. Both have the same gravitational potential energy but different kinetic energy
- C. L has a higher gravitational potential energy
- D. Both have the same kinetic energy but different gravitational potential energy

4. The motion of a car on a straight section of road is recorded and graphed as shown.



- Which best describes the motion that is represented?
- A. The speed increases then slows down
  - B. The speed decreases then the car moves backwards
  - C. It starts at rest and then moves at a constant speed; slows down and then stops
  - D. It starts at a constant speed; increases speed; stops, and then moves forward
5. What best describe what happens to the motion of particles in the air as the air temperature drops below 0° Celsius?
- A. The speed of the particles decreases
  - B. The speed of the particle's vibration increases
  - C. The speed of the particles increases
  - D. The particles move randomly
6. Which of the following does not occur during an energy transformation?
- A. Energy is not created
  - B. Energy changes form
  - C. Matter is created from energy
  - D. Energy is not destroyed
7. Which tectonic plates is located primarily in the Northern Hemisphere?
- A. Nazca
  - B. Juande Fuca
  - C. Indo – Australian
  - D. Pacific Plate
8. Which of the following celestial object has the most gravity?
- A. Sun
  - B. Jupiter
  - C. Earth
  - D. Mercury



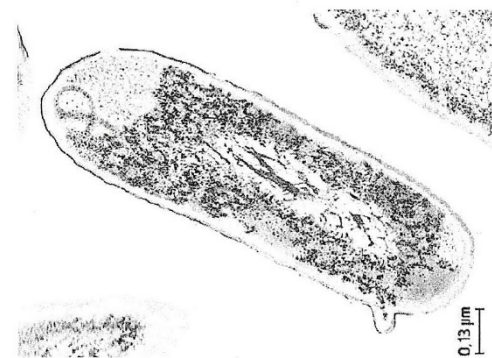


9. Using the illustration shown, what layer is best represented in C?

- A. Crust
- B. Outer core
- C. Inner core
- D. Mantle

10. Bacteria cells are best matched to which type of cell?

- A. Fungal
- B. Eukaryote
- C. Prokaryote
- D. Virus



11. Which of the following best represents an abiotic change?

- A. Cloud covered sky during the day keeps the temperature lower
- B. Elephants consuming 8 kg of hay
- C. Increase in coyote population followed by a reduction in deer populations
- D. Decline in flowers due to decrease in natural pollinators

12. Plans for a new subdivision are being developed. The city council wants it to run on “green” energy, meaning the energy must not come from fossil fuels. Based on your understanding of energy resources, which of the following would be most practical for the new subdivision?

- A. Use a coal burning plant to generate electricity
- B. Only use wind energy to generate electricity
- C. Use mostly solar energy to generate electricity
- D. Use a nuclear power plant to generate electricity

13. What is the speed of a vehicle that travels for thirty minutes and is displaced fifteen miles?

- |           |            |
|-----------|------------|
| A. .5 mph | C. 2 mph   |
| B. 30 mph | D. 450 mph |

14. Some trucks require gasoline to be put into the tank to burn in order for it to operate and move. The battery provides the energy for other functions of the vehicle. Which type of energy is not used in the description provided?

- A. Chemical
- B. Electrical
- C. Kinetic
- D. Nuclear

15. Based on the following descriptions, which type of plate boundary does it most likely refer to?

- Quakes shaking the ground
- Creation of a fault line
- Plates sliding past one another

- A. Convergent
- B. Transform
- C. Divergent

16. What part of a seedling demonstrates a negative response to a gravitational force?

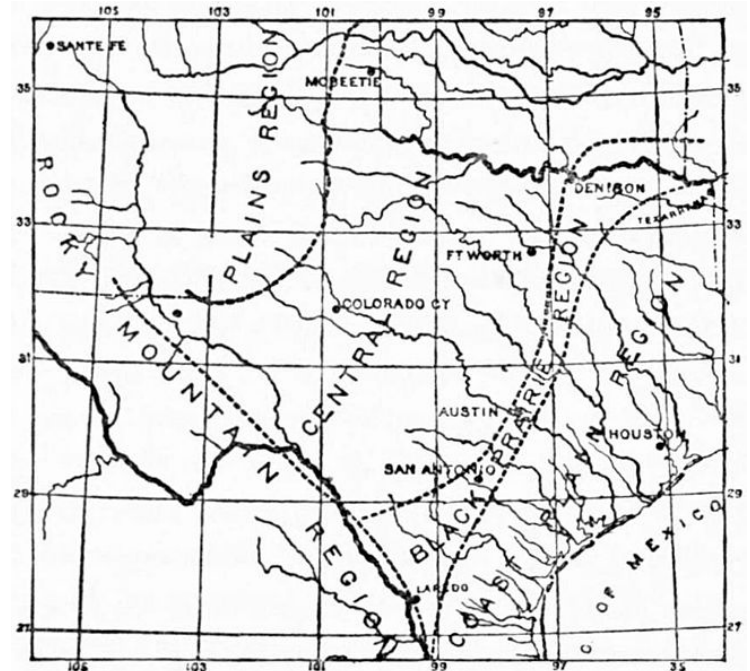
- A. Stem
- B. Leaves
- C. Roots
- D. Shoot

17. When space crafts reenter the atmosphere, the kinetic energy is transformed into thermal energy to aide in slowing down the space craft. Which of the following will allow the craft to survive the heat experienced during reentry?

- A. Guidance system
- B. Heat shield
- C. Parachute
- D. Air conditioner

18. Dallas and Fort Worth are both in the same drainage basin. What is the most likely reason the water in the Trinity River is dirtier in Houston as opposed to in the DFW metroplex?

- A. Pollutants from the coastal line enter the river
- B. Cross contamination from other pollutants
- C. Increased pollutants from humans
- D. Decreased pollutants from wildlife



19. Which plants would most likely be found in a deciduous forest?

|                        |   |
|------------------------|---|
| Biome 1<br>Description | Most of the trees are broadleaf trees such as oak, maple, beech, hickory and chestnut. There are also several different kinds of plants like mountain laurel, azaleas and mosses that live on the shady forest floor.   |
| Biome 2<br>Description | It is known for its dense canopies of vegetation that form three different layers. The top layer or canopy contains giant trees that grow to heights of 75 m (about 250 ft) or more. This layer of vegetation prevents much of the sunlight from reaching the ground. Thick, woody vines are also found in the canopy. They climb trees in the canopy to reach for sunlight. The middle layer, or understory, is made up of vines, smaller trees, ferns, and palms. The bottom layer or floor of the rainforest is covered with wet leaves and leaf litter. |
| Biome 3<br>Description | The shrublands are made up of shrubs or short trees. Many shrubs thrive on steep, rocky slopes. There is usually not enough rain to support tall trees. Shrublands are usually fairly open so grasses and other short plants grow between the shrubs.   |
| Biome 4<br>Description | Consist mostly of conifers, which are trees that grow needles instead of leaves and cones instead of flowers. Conifers tend to be evergreen—they bear needles all year long. These adaptations help conifers survive in areas that are very cold or dry. Some of the more common conifers are spruces, pines, and firs.   |

- A. Biome 1
- B. Biome 2
- C. Biome 3
- D. Biome 4

20. Some species of flowers have markings that are visible only to organisms with the ability to see in the ultraviolet light part of the electromagnetic spectrum. These marks help the plant to:

- A. Avoid predation
- B. Attract pollinators
- C. Obtain nutrients
- D. Create pungent smells

21. Which human body system performs a function most similar to that of the vascular system of a plant?

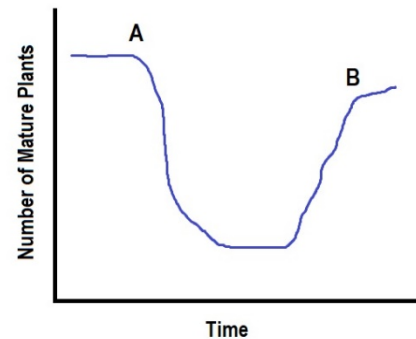
- A. Immune
- B. Circulatory
- C. Digestive
- D. Respiratory

22. On the first day of track practice, the coach made everyone run 800 meters to warm up. When finished, most everyone was breathing heavily and sweating. Which of these doesn't explain why this occurred?

- A. Running requires increases oxygen; it also produces increased carbon dioxide waste
- B. Running requires energy, burning more stored energy, which generates increased body heat
- C. Breathing brings in more carbon dioxide and removes excess oxygen from the body
- D. Perspiration cools the body by evaporating water from the sweat glands

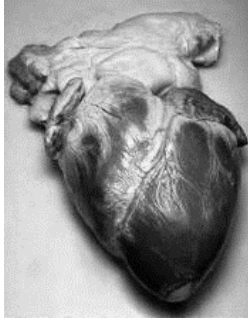
23. Which of the following best explains what most likely occurred during the time from A to B shown in the graph?

- A. At "A" a natural disaster, such as a fire, occurred and succession is taking place between time A & B.
- B. At "A" clear cutting for a parking lot occurred and grass begins to grow between time A and B
- C. At "B" a natural disaster, such as a fire, occurred and succession is taking place between time A & B.
- D. At "B" clear cutting for a parking lot occurred and grass begins to grow between time A and B



24. Which is an advantage of sexual reproduction over asexual reproduction?

- A. Allows offspring to look just like the parent
- B. Ensures all offspring survive a natural disaster
- C. Allows the species to adapt to environmental changes
- D. Transfers genetic information from only one parent to the offspring

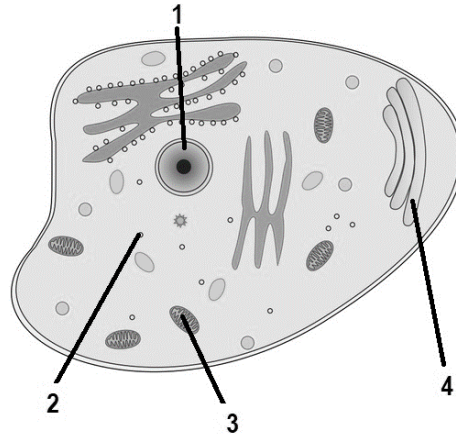


25. This image best represents which part of the cell theory?

- A. All cells come from preexisting cells
- B. All organisms are composed of one or more cells
- C. A cell is the basic unit of structure and function
- D. All cells have the ability to adapt

26. Which part of a cell determines the sex of the organisms?

- A. 1
- B. 2
- C. 3
- D. 4



27. Which of the following converts light energy to chemical energy?

- A. Light bulb in a lamp
- B. Battery of a portable gaming device
- C. Solar panels
- D. Leaf on a tree

28. An example of an organism that breaks down organic material could be called —

- A. Autotroph
- B. Decomposer
- C. Predator
- D. Scavenger

29. A cube of sugar is placed in a pot of water. Initially, the sugar is at the bottom of the pot but once gradually heated it disappears. Which statement best explains what type of change occurred?

- A. chemical, irreversible change
- B. physical, irreversible change
- C. physical, reversible change
- D. chemical, reversible change

30. Which of the following is an example of a physical change?

- A. Milk going sour
- B. Mixing together several ingredients to make cookies
- C. Cooking breakfast
- D. Digestive system breaking down food

31. Based on the periodic table which elements are highly reactive?

The periodic table shows elements grouped by their chemical properties. Elements in Group 1 (alkali metals) and Group 17 (halogens) are highly reactive. In this table, the following elements are circled: Li (Lithium, Group 1), Al (Aluminum, Group 13), Cl (Chlorine, Group 17), and Ne (Neon, Group 18).

- A. Li & Al  
B. Cl & Li

- C. Al & Pb  
D. Ne & Cl

32. Which of the following lists all the elements that are present in a molecule of sulfuric acid,  $\text{H}_2\text{SO}_4$ ?

- A. Oxygen & Sulfur  
B. Hydrogen & Sulfate  
C. Hydrogen, Selenium, Oxide  
D. Hydrogen, Sulfur, Oxygen

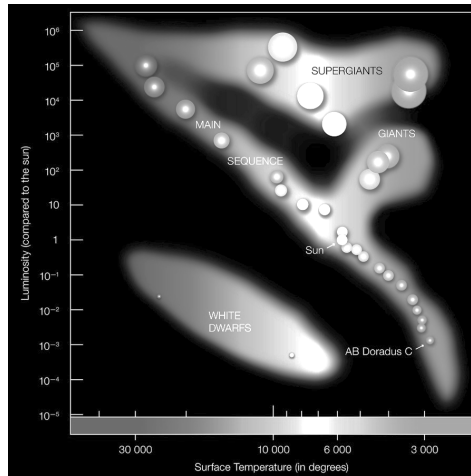
33. Stanley was running on a jogging trail near his house. He generally runs at a pace of 4 m/s. While he was running, he realized he was going to have to pass the person that was running in front of him. To do this, Stanley had to run at a pace of 8 m/s for about 2 seconds. What was the acceleration during this time?

- A. .25 m/s  
B. 2 m/s  
C. 4 m/s  
D. 16 m/s

34. In 1687, Isaac Newton published a book discussing the three laws of motion. The third law of motion is known as the law of action-reaction. Which of the following situations is an example of Newton's third law of motion?

- A. A person pushes on the water with a roar while the roar pushes back on the person's hand.  
B. A skater pushes on the skates while the wheels of the skates push on the ground.  
C. A tennis racket pushes on a ball while the ball pushes back on the racket.  
D. A gymnast pushes down on a balance beam with her feet and the balance beam pushes down on the ground.

35. Since the rotational period and revolutionary period of the moon are identical lengths, which of the following statements best applies?
- A. This is why we only see stars at night
  - B. This is how the moon creates tides
  - C. This is why the moon appears all one color
  - D. This is why we see only one side of the moon from earth



36. A star with a temperature of 15,000 K and a luminosity of .8 is most likely which classification of stars?
- A. Main sequence
  - B. Giant
  - C. White dwarf
  - D. Super giant
37. The theory of plate tectonics does not explain which of the following:
- A. Karst topography
  - B. Volcanic activity
  - C. Earthquakes
  - D. Mountain formation
38. Which of the following crustal features is not formed at convergent boundaries?
- A. Island
  - B. Volcano
  - C. Hill
  - D. Rift Valley
39. On a summer day in July, a person stepped barefoot off a beach towel onto the hot sand and then proceeded to walk to the ocean. Why did the sand seem so much warmer?
- A. The sand has a lower specific heat and heats up rapidly.
  - B. The water has a lower specific heat and heats up slowly.
  - C. The sand has a higher specific heat and heats up slowly.
  - D. The water has a higher specific heat and heats up rapidly.

40. A scientist learns about two currents in an ocean that move in opposite parallel directions to each other. This information would be most likely to help in which of the following scenarios?

- A. Building faster boats
- B. Preventing tropical storms
- C. Predicting storms
- D. Decreasing pollution

41. Which of the following statements most accurately describes the competition that occurs between organisms within an ecosystem?

- A. Competition between organisms is a result of limited resources.
- B. Organisms only compete for the biotic factors in an ecosystem.
- C. Competition between organisms is a result of unlimited resources.
- D. Organisms only compete for the abiotic factors in an ecosystem.

42. A small amount of liquid is applied between a dog's shoulder blades each month. The liquid is supposed to help prevent insects from bothering the dog. Lately, the liquid does not keep fleas off the dog. What is most likely cause of this change?

- A. Giving the dog a bath after applying the liquid makes it where the liquid not able to work correctly.
- B. The fleas that survived exposure to the liquid and have produced offspring that are resistant to the liquid.
- C. The weather conditions have changed.
- D. The liquid has changed the dog's fur over time.

43. Which scientific law are decomposers modeling when they break down organic material and release carbon dioxide into the atmosphere and nitrogen into the soil?

- A. Newton's First Law of Inertia
- B. Newton's Third Law Action and Reaction
- C. Law of Conservation of Mass and Energy
- D. Law of Universal Gravitation



44. Students were traveling south with their class from Dallas to San Antonio. Students were told it would take about 4.5 hours to travel the 270 miles. What would the velocity of the vehicle have to be in order to cover that distance in that amount of time?

- A. 60 mi/hr<sup>2</sup>
- B. 60 mi/hr
- C. 60 mi/hr<sup>2</sup> south
- D. 60 mi/hr south

45. Scientists believe that the universe is expanding because of a phenomenon known as

- A. Gravitation waves
- B. Red shift
- C. Blue shift
- D. Gamma radiation



46. The SDS for a chemical says possible effects included irritation to respiratory tract as well as gastrointestinal tract. An individual handling this chemical so most likely –

- A. Wear latex gloves
- B. Submerge the chemical in distilled water
- C. Wear a face mask
- D. Have a fire blanket readily available

47. Which sound can be heard from the farthest distance based on the decibel level?

|                         |              |
|-------------------------|--------------|
| <b>Normal breathing</b> | <b>10 dB</b> |
| <b>Lawnmower</b>        | <b>85 dB</b> |
| <b>Whisper</b>          | <b>30 dB</b> |
| <b>Washing machine</b>  | <b>70 dB</b> |

- A. Normal breathing
- B. Lawnmower
- C. Whisper
- D. Washing machine

48. Students cut one inch strips of several different paper towels to see the absorbency of each. To create a graph, the students will need to put which variable on the x axis?

- A. Brand of paper towel
- B. Size of paper towel
- C. Temperature of water
- D. Time

49. Students were shown a lava lamp. The wax was heated and it rose up in the liquid, and then drifted back down after a period of time. This model most likely represents which of the following concepts?

- A. Conduction
- B. Convection
- C. Electrical transmission
- D. Radiation

50. For a lab, students see the following:



In the event of an accident, the students should know the location of which of the following?

- A. Fume hood
- B. Emergency shut off
- C. Fire blanket
- D. Safety shower

**UNIVERSITY INTERSCHOLASTIC LEAGUE  
2023-2024 SCIENCE  
FALL/WINTER TEST**

**ANSWER KEY**

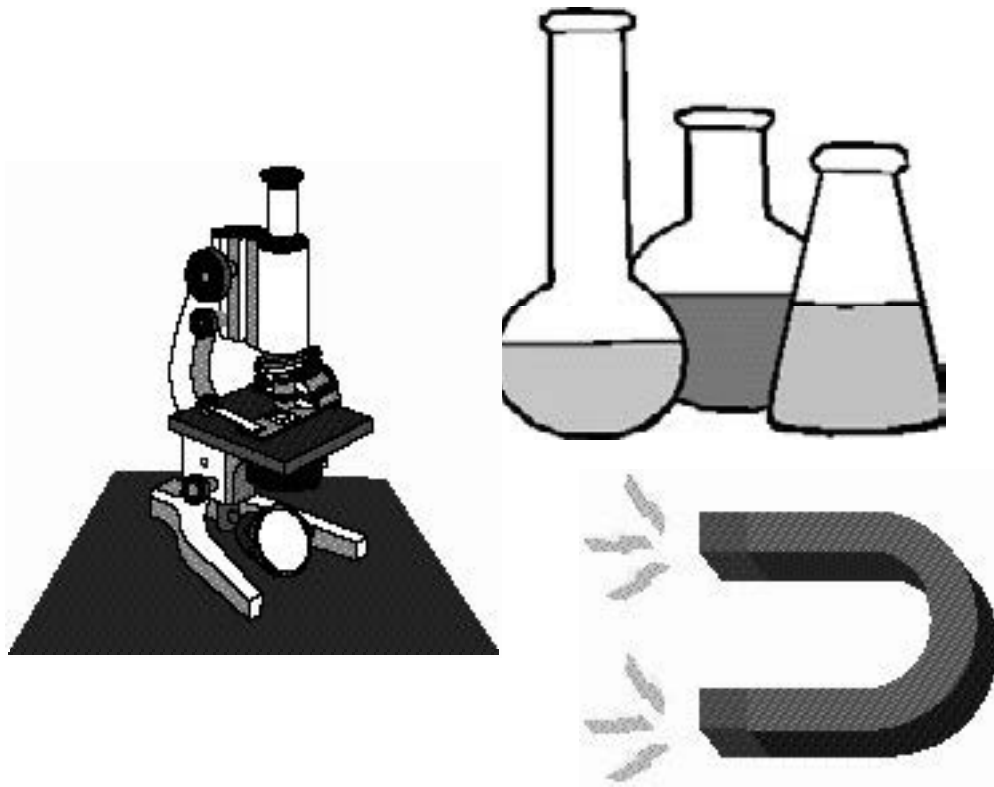
|       |       |       |
|-------|-------|-------|
| 1. C  | 18. C | 35. D |
| 2. D  | 19. A | 36. C |
| 3. D  | 20. B | 37. A |
| 4. C  | 21. B | 38. D |
| 5. A  | 22. C | 39. A |
| 6. C  | 23. A | 40. C |
| 7. B  | 24. C | 41. A |
| 8. A  | 25. B | 42. B |
| 9. D  | 26. A | 43. C |
| 10. C | 27. D | 44. D |
| 11. A | 28. B | 45. B |
| 12. C | 29. C | 46. C |
| 13. B | 30. B | 47. B |
| 14. D | 31. B | 48. A |
| 15. B | 32. D | 49. B |
| 16. C | 33. B | 50. D |
| 17. B | 34. C |       |

**SPRING DISTRICT 2023-2024**

**A+ ACADEMICS**



University Interscholastic League



# Science

**DO NOT OPEN TEST  
UNTIL TOLD TO DO SO**

**UNIVERSITY INTERSCHOLASTIC LEAGUE**  
**2023-2024 SCIENCE**  
**SPRING TEST**

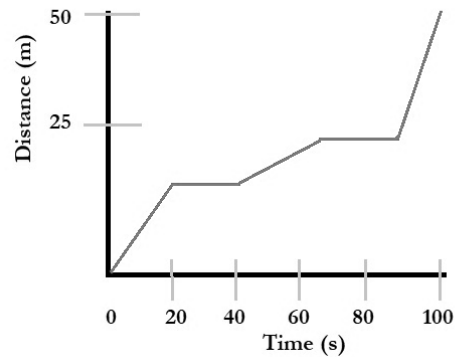
1. Students collect data on the following samples. Which of the following are most likely elements?

| Sample Number | Substance                     | Observations  |
|---------------|-------------------------------|---|
| 1             | Na                            | Has a strong metallic luster. In color, it is very analogous to silver. It is soft at common temperatures that it can be shaped by the pressure of the fingers. |
| 2             | H <sub>2</sub>                | It is a gas with no color and odor and has the lowest density of all gases.   |
| 3             | N <sub>2</sub> O <sub>4</sub> | Red-brown liquid with a sharp, unpleasant chemical odor. It also has a low boiling point.   |
| 4             | Ag                            | It is a white, soft, lustrous, very ductile, and malleable metal. It is a very good conductor of electricity and heat.  |
| 5             | NaCl                          | Crystals or white crystalline powder. Transparent and colorless in crystalline form.  |

- A. Na, H<sub>2</sub>, and Ag  
B. Na, N<sub>2</sub>O<sub>4</sub>, and NaCl  
C. N<sub>2</sub>O<sub>4</sub> and NaCl  
D. N<sub>2</sub>O<sub>4</sub>, Ag, and Na
2. All of the following are examples of an inclined plane except –  
A. Mobility ramp  
B. Inflatable slide  
C. Screw  
D. Seesaw
3. A glass of lemonade is sitting on a picnic table outside. The energy from the sun will heat up the glass through which of the following processes?  
A. Convection  
B. Conduction  
C. Radiation

4. Using the graph, what is the average speed of the object during the period shown?

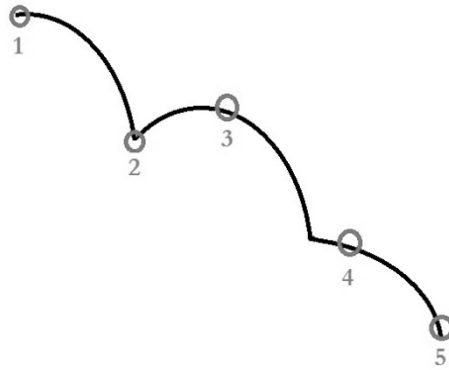
A. .5 m/s  
B. .75 m/s  
C. 2 m/s  
D. 5000 m/s



5. Which best shows that thermal energy will move from a hotter area to a cooler area until an equilibrium is reached?
- A. A person sitting directly under a fan feels cooler than someone sitting away from the fan  
B. A refrigerator without power  
C. A pot of water boiling after 10 minutes on a stove  
D. Salt placed on an ice cube to increase its melting
6. When a car is on a road covered with water it can be difficult to control the motion of the car. Which force is most likely responsible for this type of motion?
- A. Balanced  
B. Equal  
C. Unbalanced  
D. Gravitational
7. The inner core of the earth is a solid metal, while the outer core of the earth is made of molten metal. Which of the following best explains why this occurs?
- A. The temperature of the inner core is higher than the outer core  
B. The temperature of the inner core is lower than the outer core  
C. The pressure of the inner core is lower than the outer core  
D. The pressure of the inner core is higher than the outer core
8. Which celestial body is composed of only rocks and minerals?
- A. Sun  
B. Asteroid  
C. Comet  
D. Black hole
9. Earth's surface is made up of many different types of rocks. Rocks that were primarily formed by melted rock deep within the earth would be an example of which of the following:
- A. Igneous  
B. Metamorphic  
C. Sedimentary
10. Which of the following is the smallest tectonic plate?
- A. Pacific  
B. North American  
C. Antarctic  
D. Indo-Australian

11. At which position in the path of this falling object does it have the greatest potential energy?

- A. 3
- B. 2
- C. 5
- D. 4



12. Which of the following countries were the leaders in the world for space exploration during the 1960s?

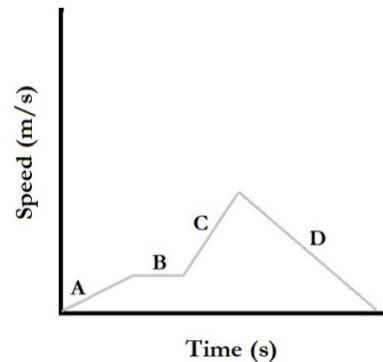
- A. United States and China
- B. Soviet Union and United States
- C. China and Germany
- D. Japan and Soviet Union

13. Which celestial body in our solar system has the greatest gravitational pull?

- A. Sun
- B. Jupiter
- C. Ceres
- D. Earth

14. Identify the locations from the speed time graph where an increase in speed can be observed?

- A. A & B
- B. B & D
- C. A & C
- D. C & D



15. Which of the following represents a biotic change?

- A. Cloudy sky during the day keeps temperatures cooler
- B. Flash flooding causes high humidity in a region
- C. Salinity of local pond changes after a thunderstorm
- D. Increase in coyote population will cause a reduction in the deer population

16. In which of these boxes would be best for a student to place a picture of a deer?

- A. 1
- B. 2
- C. 4
- D. 6

17. An 18-wheeler moves forward with 220 N of force as it is traveling down the highway. friction opposed the motion of the 18-wheeler with a force of 30 N. What is the net force?

- A. 30 N
- B. 190 N
- C. 220 N
- D. 6,600 N

18. What always happens when a chemical reaction occurs?

- A. New substances are formed
- B. Light is given off
- C. There are changes in the size and shape of the object
- D. Mass is destroyed

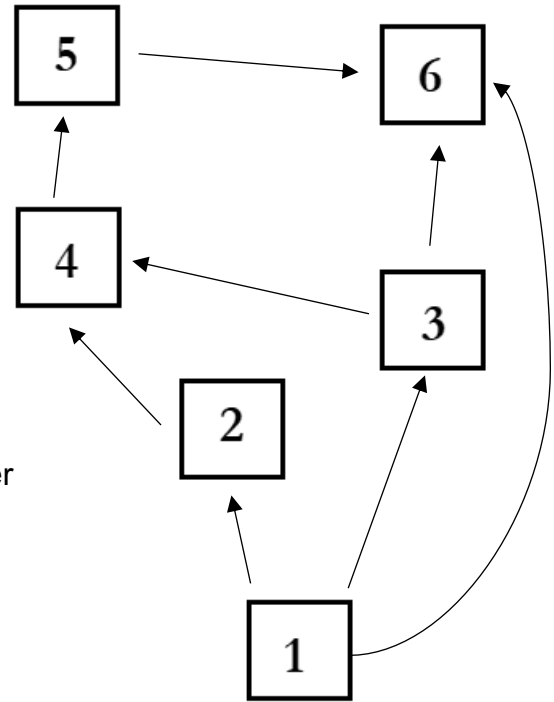
19. Students are completing a lab using a metal slinky. One of the students stretched the slinky too far and accidentally twisted the slinky. This would be an example of which of the following?

- A. Physical change because the change is irreversible
- B. Chemical change because the change is irreversible
- C. Physical change because the change is reversible
- D. Chemical change because the change is reversible

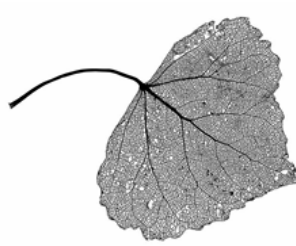
20. Which of the following best relates to both of the statements provided?

- *This can stimulate the growth of bones*
- *It can also be counteracted in the circulatory system by structures in the veins*

- A. Friction
- B. Homeostasis
- C. Calcium
- D. Gravity



21. Use the dichotomous key to identify the type of leaf pictured.



|  |               |
|--|---------------|
| 1. Leaves are needlelike or very small and scalelike | Go to 2.      |
| 1. Leaves are broad                                  | Go to 5.      |
| 2. Leaves are long and needlelike.                   | Go to 3.      |
| 2. Leaves are small and scalelike.                   | CEDAR         |
| 3. Two needles to a bundle                           | SHORTLEAF     |
| 3. Three needles to a bundle                         | Go to 4.      |
| 4. Adult needles are 4-6 inches.                     | LOBLOLLY      |
| 4. Adult needles are 6-12.                           | LONGLEAF PINE |
| 5. Leaves are broad and heart-shaped.                | Go to 6.      |
| 5. Leaves are not heart-shaped.                      | Go to 7.      |
| 6. Leaf edge is saw-toothed.                         | COTTONWOOD    |
| 6. Leaf edge is smooth.                              | REDBUD.       |
| 7. Leaves grow oppositely of the branch.             | Go to 8.      |
| 7. Leaves grow alternately.                          | Go to 11      |
| 8. Leaves are simple and lobed.                      | Go to 9.      |
| 8. Leaves are simple and not lobed.                  | Go to 10.     |
| 9. Leaves are moderately lobed.                      | RED MAPLE     |
| 9. Leaves are deeply lobed (almost to the mid-rib)   | SILVER MAPLE  |

- A. Cedar
- B. Loblolly

- C. Cottonwood
- D. Silver Maple

22. Sand for beaches comes from rocks in the area that are weathered down, and the sediment is deposited in the beaches. A beach erodes because the supply of sand to the beach cannot keep up with the loss of sand to the water. If rocks were to stop weathering, how would the beach change?
- A. The beach would gain sediment because sand would still be deposited and not weathered away.
  - B. The beach would lose sediment because sand would still erode, and there is no new sediment being deposited.
  - C. The beach would stay the same because the beach could not change if it could not be weathered.
  - D. The beach would lose sediment because the sand would still weather, moving sediment onto the land.



23. Who was the first woman to orbit Earth?

- A. Sally Ride
- B. Svetlana Savitskaya
- C. Valentina Tereshkova
- D. Kayla Barron

24. This picture was taken during the middle of summer during a drought. Based on this, which of the following statements most likely identifies why the organisms are at the top of the fence posts?

- A. The snails are going to higher ground to reach cooler air.
- B. The snails are going to higher ground to mate.
- C. The snails are going to higher ground to avoid a flash flood.
- D. The snails are going to higher ground to avoid predators.



25. A local gardener wants to increase the sustainability of their garden in their backyard. Which of the following will most likely result in greater sustainability?

- A. Decrease the unique types of plants in the garden.
- B. Add worms to the garden soil.
- C. Have more mature versions of species that are already in the garden.
- D. Grow only one type of plant in the garden.

26. Bears in most areas have either a black or brown coat. A polar bear has a white coat in winter. How does the polar bear's white color help it survive in the arctic?

- A. It makes the animal warmer during the summer
- B. It helps the animal blend into its background
- C. It makes the animal appear larger to prey
- D. It helps the animal stay cooler during the winter

27. Which cell organelle has the function of taking in nutrients, breaking them down, and creating energy for the cell?

- A. Mitochondria
- B. Ribosome
- C. Endoplasmic reticulum
- D. Golgi apparatus

28. A person with an infection may begin to feel hot and run a fever. This response most likely helps the body fight infection by doing which of the following —

- A. Forcing the bacteria to exit the body
- B. Trapping harmful bacteria within the body
- C. Keeping additional bacteria from entering the body
- D. Making it difficult for additional bacteria to grow in the body

29. During asexual reproduction, a single cell becomes two new cells. The genetic material in each of the daughter cells is usually —

- A. Half the number of genes
- B. Completely different from the parent cell
- C. Exact same number of genes
- D. Twice the number of genes

30. Can a tattoo be inherited through sexual reproduction? Why?

- A. Yes, it is an inheritable trait
- B. Yes, it is an acquired trait
- C. No, it is an inheritable trait
- D. No, it is an acquired trait

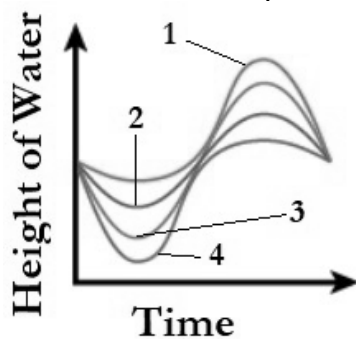
31. Which element will have similar chemical reactivity to Tellurium (Te), located in group 16 on the periodic table?

- A. Fluorine
- B. Sulfur
- C. Bromine
- D. Neon

32. Which of the following are examples of unbalanced forces?

- A. A girl sitting on a swing
- B. A bucket full of sand
- C. A child jumping rope
- D. A boy floating on the water

33. Which lines best represents a spring tide?



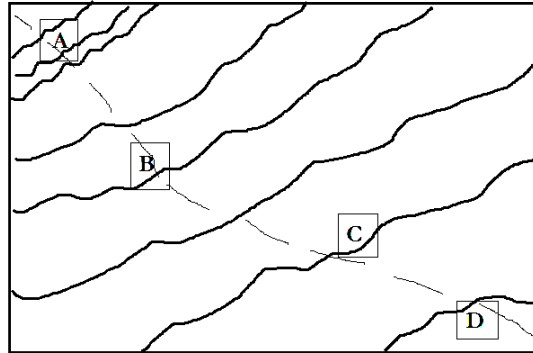
- A. Line 1
- B. Line 2
- C. Line 3
- D. Line 4

34. Looking up at the night sky we see numerous stars that started their life journey many years ago. A star's life cycle is determined by its characteristics. Which statements correctly describe the stars throughout their life cycle?

- A. A star's life cycle begins with a nebula
- B. As a supergiant continues throughout its life cycle, it will become a planetary nebula
- C. A white dwarf is a small-sized star that does not go through a change in its life cycle
- D. Every star's life cycle will end with a black hole or neutron star

35. This is a topographic map of a canyon. Which point is the steepest?

- A. A
- B. B
- C. C
- D. D



36. On a normal summer day at the beach, the temperature over the land is warmer than the temperature over the

water. The warmer air will rise and the cooler air moves over the land, producing sea breezes. This most likely shows that —

- A. Soil warms up more slowly than water
- B. Water has a higher specific heat than land
- C. The air above the land becomes cool and rises
- D. The land has a higher specific heat than water

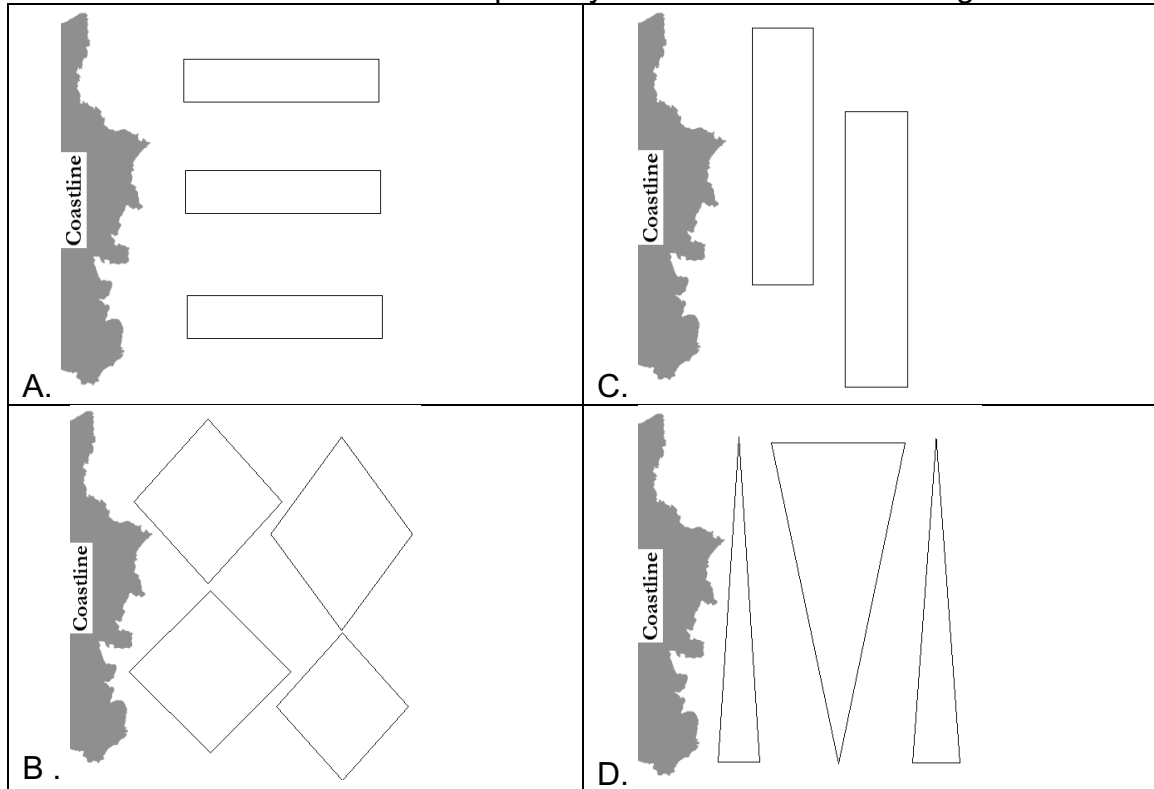
37. Similar to a water lily, a watershield has a unique set of traits to live in an aquatic environment. To survive on land, the watershield would need to develop an adaptation to perform which of the following functions?

- A. Structures to obtain radiant energy
- B. Structures to obtain nutrients
- C. Produce flowers
- D. Structures to provide support

38. A scientist mixes two solutions, planning to produce methane. Which of the following is the BEST evidence that a chemical reaction is producing methane?

- A. Change in color
- B. Formation of a precipitate
- C. Change in temperature
- D. Formation of bubbles

39. If an artificial reef is built, what shape and direction would need to be designed to allow the most amount of water to pass by the reef as the tide changes?



40. A runner is four miles east of another runner, who is four miles east of a school. Where is the first runner with respect to the school?

- A. 4 miles east of the school
- B. At the school
- C. 8 miles east of the school
- D. 4 miles west of the school

41. Daily weather of an area is largely impacted by the type of air that is moving in. If the air is moving in off the ocean, the air will normally carry a larger amount of moisture. As compared to an air mass that is moving over a continent, would be more likely to be dry.

Which type of air mass would most likely generate a warm, wet environment?

- A. Continental Polar Air Pressure
- B. Maritime Polar Air Pressure
- C. Continental Tropical Air Pressure
- D. Maritime Tropical Air Pressure

42. Which is most likely to cause a decrease in a predator population?
- A. Decrease in prey population
  - B. Reduction in competition
  - C. More autotrophs
  - D. Population size remaining constant
43. Many galaxies have no disks, no spiral arms, and almost no dust or gas. These galaxies can range from small dwarfs to huge giants. Which classification best describes this?
- A. Spiral
  - B. Elliptical
  - C. Barred
  - D. Irregular
44. Based on the periodic table, which of the following element most readily accepts electrons?
- A. Fluorine
  - B. Nitrogen
  - C. Aluminum
  - D. Helium
45. Which best describes the scenario?

*A rocket launching off headed northwest at 10,000 km/hr.*

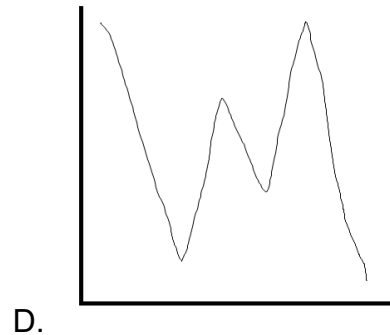
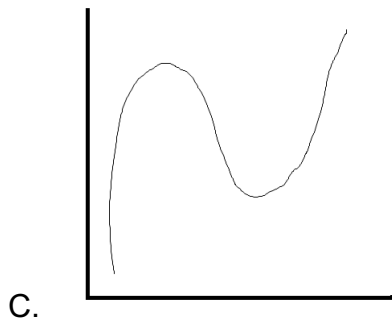
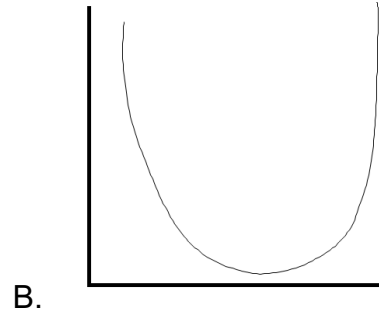
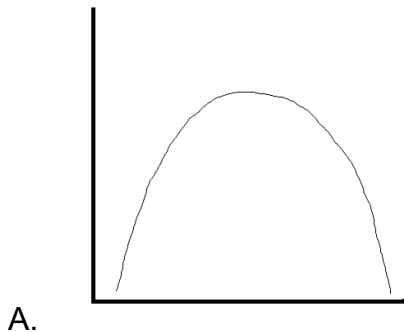
- A. Example of speed
  - B. Example of acceleration
  - C. Example of speed and acceleration
  - D. Example of velocity and acceleration
46. A quadrat, is used by scientists to observe and collect data, as shown. The length of one of the smaller cells would most likely be –
- A. 20 cm
  - B. 25 cm
  - C. 20 mm
  - D. 25 mm



47. A student experiments to measure the acceleration of a falling marble, which should be  $9.8 \text{ m/s}^2$ . The student collects an experimental value of  $11.6 \text{ m/s}^2$ . The most likely reason for this variation is due to:

- A. Air resistance
- B. Human error
- C. Fluctuations in gravity
- D. Mass of the object

48. A student took a glass of lemonade filled with ice outside on a hot summer day. Shortly after the student went back inside for more ice to refill the glass since it had already melted. Which sketch best represents the change of temperature occurring?



49. Which of the following is not equal to 1000 mL?

- A. 1 L
- B. 100 cL
- C.  $1 \text{ dm}^3$
- D.  $1 \text{ cm}^3$

50. Suppose you are on a scale as you are riding up to the top of a building in an elevator. What will be true about the reading on the scale as you travel upward?

- A. The scale's reading will remain constant
- B. The scale's reading will increase
- C. The scale's reading will decrease
- D. The mass reading will increase

**UNIVERSITY INTERSCHOLASTIC LEAGUE  
2023-2024 SCIENCE  
SPRING TEST**

**ANSWER KEY**

|      |      |      |
|------|------|------|
| 1. A | 18.A | 35.A |
| 2. D | 19.C | 36.B |
| 3. C | 20.D | 37.D |
| 4. A | 21.C | 38.D |
| 5. C | 22.B | 39.A |
| 6. C | 23.C | 40.C |
| 7. D | 24.D | 41.D |
| 8. B | 25.B | 42.A |
| 9. A | 26.B | 43.B |
| 10.D | 27.A | 44.A |
| 11.A | 28.D | 45.D |
| 12.B | 29.C | 46.A |
| 13.A | 30.D | 47.B |
| 14.C | 31.B | 48.C |
| 15.D | 32.C | 49.D |
| 16.B | 33.C | 50.B |
| 17.B | 34.A |      |