

## 2UPCAT 2014 – Set A2

### SECTION 2: SCIENCE PROFICIENCY

Time -- 50 minutes

60 Questions (86 – 145)

NAME: \_\_\_\_\_

SCHOOL: \_\_\_\_\_

SIMULATED EXAM – SET A

For each question, decide which is the best answer choice, and darken the corresponding oval on the answer sheet.

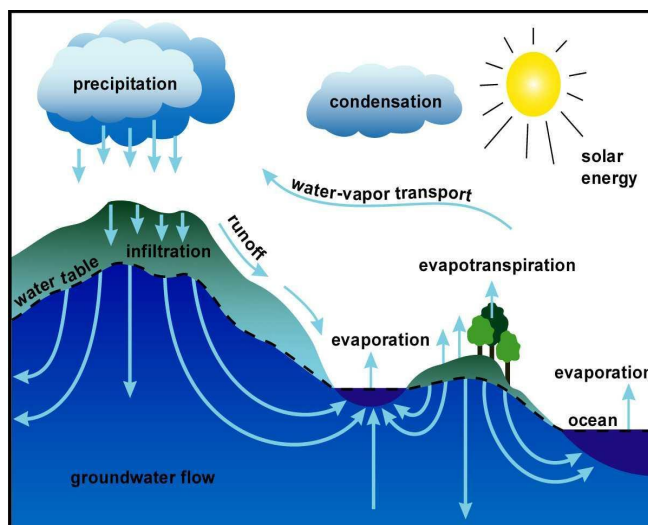
86. A cloud is a visible mass of liquid droplets or frozen crystals, depending on its altitude, made of water or various chemicals suspended in the atmosphere above the surface of a planetary body. What kind of cloud has the highest probability of precipitation?

A. Cirrus  
B. Cumulus  
C. Cumulonimbus  
D. Cirro-cumulus

87. The root system of a plant constantly provides the stems and leaves with water and dissolved minerals. One of the functions of the root system is absorption of water and inorganic nutrients. In order to accomplish this, the roots must grow into new regions of the soil. Plant roots can obtain water from various depths of the soil. Drought occurs when there is none or minimal precipitation that occurs within an area over an extended period of time. This can severely and extensively damage crops and living organism. Water is essential for the survival and growth of plants. During drought, which plant root system can bring about the highest probability of survival for the plant?

A. Tap Roots  
B. Fibrous Roots  
C. They have the same survival rate.  
D. None

88. This is a picture of the hydrologic cycle.



From: extension.usu.edu

This cycle describes the continuous movement of water on, above and below the surface of the Earth. The distribution and location of water is not permanent, they constantly move and change in state in this cycle. This cycle is critical not only to weather, but to life on earth. The water cycle is also essential for the maintenance of most life and ecosystems on the planet. Rain is necessary for the survival of plants and humans. Condensation is necessary for cloud formation. Evaporation is necessary in cooling and keeping a good balance of water vapor in the air. Which of the following least contributes or does not contribute at all to water evaporation?

- A. transpiration of plants  
B. extreme heat during summer  
C. decrease in temperature of the area  
D. perspiration of basketball athlete
89. Which of the following undergoes complete metamorphosis?
- A. butterflies and moths  
B. flies and mosquitoes  
C. cockroaches and fleas  
D. bees and lice
90. Which of the following organisms is capable of asexual reproduction?

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- A. fishes  
B. insects  
C. fungi  
D. toads
91. Iodine-131 has a half life of 8 hours. How much of a 24 g sample would remain after one day?  
A. 4 g  
B. 3 g  
C. 1.5 g  
D. 0
92. Which is a chemical change?  
A. Solid to liquid; liquid to gas  
B. Egg solidify in water  
C. Sugar dissolved in water  
D. Iodine sublimates
93. Displacement is a vector quantity and is defined as the straight-line path connecting the starting and final points.  
  
Mr. John, a physics teacher, walks 10 m north, 17 m south, and  $12\sqrt{2}$  m northwest. What is the magnitude of the displacement of Mr. John?  
A. 5 m  
B. 13 m  
C.  $12\sqrt{2}$  m  
D.  $(27 + 12\sqrt{2})$  m
94. If your weight on Earth is 490 N, what would be your weight on Mars if the acceleration due to gravity there is  $3.8 \text{ m/s}^2$ ?  
A. 50 kg  
B. 160 N  
C. 190 N  
D. 380 N
95. The eruption of Mt. Pinatubo caused widespread destruction and loss of human life. Gases and solids injected into the stratosphere circled the globe for three weeks. Volcanic eruptions of this magnitude can impact global climate, reducing the amount of solar radiation reaching the Earth's surface, lowering temperatures in the troposphere, and changing atmospheric circulation patterns. Which of the following was an effect of the Mt. Pinatubo eruption?  
A. an increase of the Earth's temperature by  $2^\circ \text{C}$   
B. massive global warming  
C. El niño phenomenon  
D. lowered global temperature by  $0.5^\circ$
96. Flooding frequently happens in the Philippines. It may occur due to an accumulation of rainwater on saturated ground. This can threaten several lives, properties and even livestock. If there is a flood, what characteristics of soil would make the situation of flooding worse within the affected area?  
A. high porosity and high permeability  
B. high porosity and low permeability  
C. low porosity and high permeability  
D. low porosity and low permeability
97. Geothermal power stations are similar to other steam turbine thermal power stations wherein heat from a fuel source, such as the Earth's core, is used to heat water or another working fluid. The working fluid is then used to turn a turbine of a generator, thereby producing electricity. The fluid is then cooled and returned to the heat source. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma. Where would be a good area to put a geothermal plant, aside from near an active volcano?  
A. sedimentary basin  
B. under seawater  
C. on top of a mountain  
D. along the shoreline
98. A mid-ocean ridge or mid-oceanic ridge is an underwater mountain range, formed by plate tectonics. It demarcates the boundary between two tectonic plates and consequently is termed a divergent plate boundary. Iceland is located east of Greenland and immediately south of the Arctic Circle, atop the constructive boundary of the northern Mid-Atlantic Ridge. In Iceland there is a mid-ocean ridge, which is a result of this factor?  
A. A number of active volcanoes  
B. Total volume of underground water  
C. Total pressure if the sea water  
D. Earthquakes
99. Cave formation begins when rainwater absorbs carbon dioxide as it falls through the

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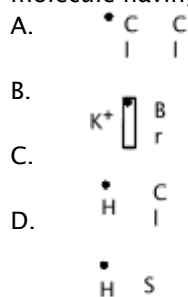
atmosphere. Rain water must have carbon dioxide to become acidic. It must be acidic to chemically react to the limestone bedrock. Rainwater is absorbed by the soil into the ground. As rainwater comes through the soil it absorbs more carbon dioxide that is being produced by plants that are dead. This changes the ground water to a weaker form of carbonic acid. As it travels down through the ground it comes to solid rock. When the rock is limestone or dolomite, caves can form. What can be best inferred on what makes a cave larger and form an underground stream after hundreds of thousands of years or even millions?

- A. Gravity pooled all the water underground and pushed rocks deeper.
  - B. There was initial chemical erosion that allowed water to flow. As it flows it erodes, therefore physical erosion washes away rock and sand
  - C. Dead animals decompose and the chemicals eroded the surrounding rocks
  - D. Earthquakes shake the ground and allow water to enter underground.
100. Which insects have two pairs of wings covered with protective scales and sucking mouthparts? They belong to order *Lepidoptera*.
- A. mosquito and fly
  - B. butterfly and dragonfly
  - C. butterfly and moth
  - D. flea and wasp
101. In snapdragons, red flowers represent the RR genotype while white flowers represent the rr genotype. Upon breeding red and white flowers, the offsprings were neither red nor white, instead they were pink. What mode of inheritance is exhibited by the snapdragons?
- A. Codominance
  - B. Dominance
  - C. Incomplete Dominance
  - D. Sex-influenced
102. Which of the following is the main difference between DNA and RNA?
- A. DNA uses adenine, thymine, cytosine, and guanine as its pyrimidine bases while RNA uses adenine, uracil, cytosine, and guanine.
  - B. RNA contains the sugar ribose, which has one more OH than deoxyribose, the sugar present in RNA.

- C. DNA is a double-stranded molecule while RNA is a single-stranded molecule.
- D. DNA is stable under alkaline conditions while RNA is not stable.

103. Genes come in pairs. One of the genes may be dominant and supersede the other gene, which is said to be recessive. A recessive gene only has an effect if both genes in a pair are recessive. Genes represent certain characteristics in humans. And for each gene, we inherit two copies, one from the mother and the other from the father. For example, brown eye color (B) is dominant over blue eye color (b). What will be the chances of Joanna having blue eyes, if both of her parents do not have blue eyes?
- A. It is not possible for Joanna to have blue eyes, because none of her parents have blue eyes.
  - B. There is 25% chance for Joanna to have blue eyes.
  - C. There is 50% chance for Joanna to have blue eyes, contributing each gene from both of her parents.
  - D. Joanna will definitely have blue eyes because the recessive genes of both of her parents will be passed on to Joanna.

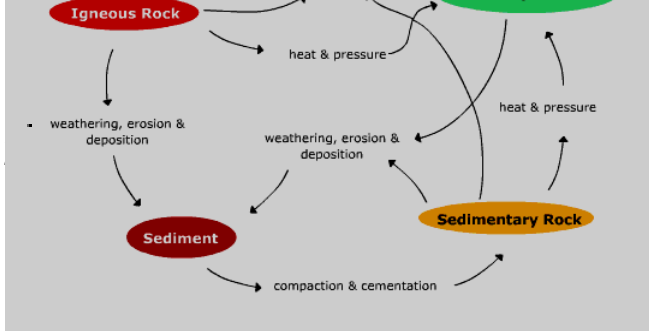
104. Which Lewis electron-dot diagram represents a molecule having a nonpolar covalent bond?



105. What happens to iodine when iodate ions,  $\text{IO}_3^-$ , are converted to iodine molecules,  $\text{I}_2$ ?
- A. It undergoes reduction and its oxidation number changes from -1 to 0.
  - B. It undergoes oxidation and its oxidation number changes from -1 to 0.
  - C. It undergoes reduction and its oxidation number changes from +5 to 0.

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- D. It undergoes oxidation and its oxidation number changes from +5 to 0.
106. Given that the waves below have the same speed, give the correct order of the waves in increasing amplitude.
- (1)
- (2)
- (3)
- A. 1, 2, 3  
B. 2, 1, 3  
C. 3, 2, 1  
D. 3, 1, 2
107. Cloud seeding can be done by dispersing Silver Iodide or dry ice (solid carbon dioxide) into clouds to induce precipitation. Cloud seeding has also been used to dissipate fog, modify hurricanes, and decrease lightning and hail in thunderstorms. The results have been remarkable but never guaranteed increase precipitation on all trials. The Beijing Weather Modification Office has researched on the application of cloud seeding to control weather. During the 2008 Beijing Olympics, the Chinese governments executed cloud seeding to clear the air of pollutants and to keep it from raining over the Bird's Nest stadium while the games were going on. They managed to deliver as they have promised. What could be an obvious negative effect of cloud seeding in China?
- A. Excessive precipitation and unanticipated drought  
B. Significant increase of Silver contamination on crops and water  
C. Unpredictable weather  
D. Increase in thunderstorms and typhoons that may hit the country within the same year of cloud seeding in the area
108. Storm surge is an abnormal rise of water generated by a storm. It creates a change in the water level due to the presence of the storm. The rise may come rapidly, flooding coastal lowlands in the process. PAGASA predicted a storm surge will hit the Philippines even before Typhoon Yolanda entered the country but they did not expect the damages to be that massive. The storm surge that accompanied Yolanda was described as tsunami-like. This is somehow reminiscent of the tsunami that hit Japan in the year 2011. Tsunamis can be created when there is a sudden disturbance on the Earth's crust and deformation on the sea floor. This deformation vertically displaces the overlying water and creates violent underwater disturbance. What is the main characteristic of tsunamis that differentiates it from a storm surge?
- A. Tsunamis are tidal waves.  
B. Tsunamis are created when a body of water is displaced usually by an earthquake.  
C. Tsunamis are always accompanied by typhoons and other forms of weather disturbances.  
D. Tsunamis are single waves that only hit the shorelines by the Pacific Ocean.
109. Stars are self-luminous celestial bodies consisting of a mass of gas held together by its own gravity. On the other hand, planets and moons do not produce their own light. Planets are illuminated by the star around which it revolves. Both Jupiter and Venus are described as the two most luminous planets because they appear as bright stars with the unaided eye on certain times of the year. What would be the best explanation for this occurrence?
- A. Jupiter and Venus have bright moons that illuminate them.  
B. The gases of Jupiter and Venus are in continuous combustion on their surface, therefore giving off a bright appearance.  
C. Jupiter and Venus created an impact from collision with asteroids from space, thus formation of visible fireballs.  
D. They are both illuminated by the Sun.
110. This is a picture of the rock cycle:  
*Image from: [www.e-education.psu.edu](http://www.e-education.psu.edu).*  
The rock cycle is a model that describes the formation of a rock as a result of sedimentary, igneous, and metamorphic processes. The heat comes from the inside of the Earth. There is heat



plants to produce electricity. Based on the picture, what can be inferred?

- A. Igneous rocks are the strongest rocks that resist pressure and high temperature.
  - B. Metamorphic rocks and sedimentary rocks have fossils that can give clues and details regarding the past.
  - C. All rocks can be heated and can be changed from one type to another.
  - D. Cooling of magma directly produces metamorphic rocks.
111. 1.7 g of  $\text{NaNO}_3$  (molar mass = 85 g/mol) is dissolved in water to prepare 0.20 L of solution. What is resulting molarity of the solution?
- A. 0.01 M
  - B. 0.1 M
  - C. 0.2 M
  - D. 1.0 M
112. The Law of Superposition states that in undisturbed strata of sedimentary rock, the oldest rock layer is at the bottom, the youngest at the top. If geologists can determine which way was originally "up" in a stack of layers, they can put those strata in the correct historical order. Rarely, after a sequence of layers has been deposited and compressed to form rock, it may be literally overturned by the thrusting of the Earth's crust as continental plates collide. In rare cases like this, how can the original sequence of the rocks be determined?
- A. Collect samples in near-by undisrupted areas.
  - B. They cannot be determined.
  - C. Carbon-date the fossils that are formed within the sedimentary rock layers
  - D. They are totally in the reverse order of oldest to youngest
113. What is the youngest rock as shown in the diagram below?

Image from: [www.geolsoc.org.uk](http://www.geolsoc.org.uk)

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

114. The following star colors are arranged from highest to lowest temperature:

**Blue >> White >> Yellow >> Orange >> Red**

This is a picture of the different layers of a star:

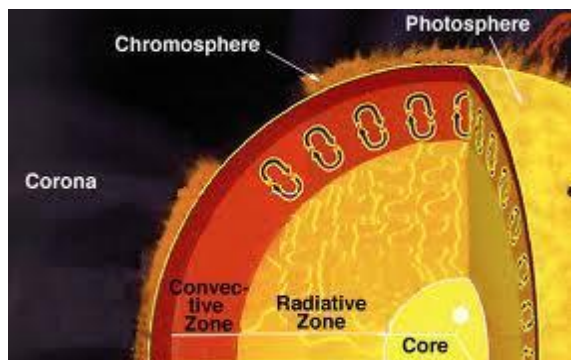
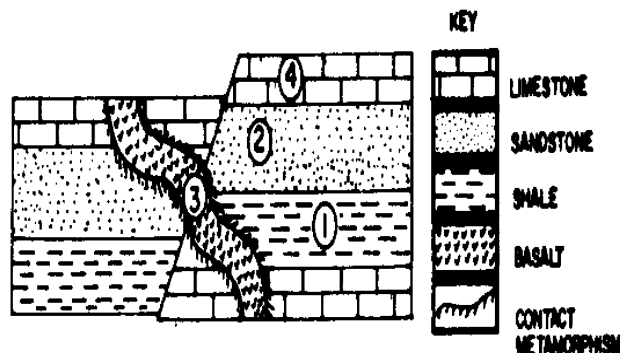


Image from: [buffonescience7.wikispaces.com](http://buffonescience7.wikispaces.com)

The star's core is where the light and energy-producing reactions take place. Stars are fuelled by the nuclear fusion reactions at their core. In most stars, the core is the hottest part unless the star runs out of its current fuel and starts fusing elements in a shell around its core out to the surface or the photosphere. While these shells are burning they are the temporary hotspots of the star, while the core gets hotter and hotter. Given that the following stars have sufficient fuel, which is the hottest?

- A. Core of a young blue star
- B. Core of the Sun
- C. Corona of the Sun
- D. Photosphere of a white dwarf star

115. Xylem and phloem are the two major transport tissues in vascular plants. Which of the following is transported through the xylem?

- A. organic nutrients
- B. water
- C. minerals

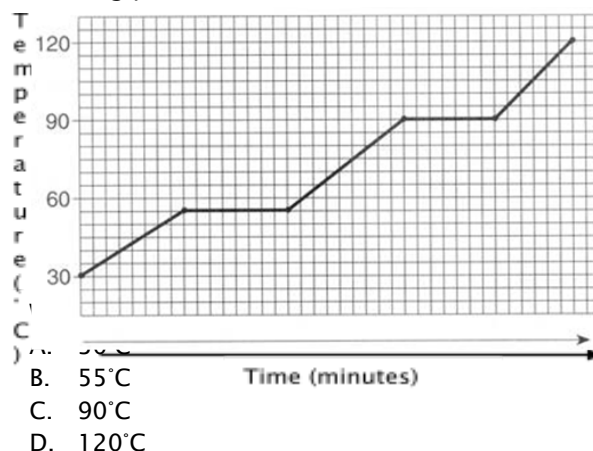
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D. carbon dioxide

116. Almost all of the heavenly bodies give off light or similar radiations. Other types of radiation from space are either blocked completely or greatly altered by gases in the atmosphere. If you want to observe the universe with least interference, what is the best way to do so?
- build a radio telescope that, by nature, cannot be affected by clouds and city lights
  - set-up observatories on the highest peak on Earth with a plane flat surface
  - build observatories on the moon itself because it lacks atmosphere
  - none of the above
117. Divergent plate boundaries are places where adjacent plates are moving apart. Convergent plate boundaries are places where adjacent plates are moving toward each other and colliding. Most rocks resist these forces brought by contact. Some can bend or stretch when forces are applied. There is a possibility that the crust, which is made up of rocks, snaps when too much force from contact occurs and earthquake can materialize. What can be an explanation of the occurrence of earthquakes based on this?
- All rocks have an elastic limit.
  - Human activities increase surface temperature of Earth which loosens the crust and allows movement to occur
  - Rapid decrease of underground water that stiffens the Earth's mantle
  - Deep ground oil drilling induces vibration that loosens the rocks on the crust.
118. What is the function of the numerous folds and microvilli of the small intestine?
- Digestion of carbohydrates
  - Digestion of fats
  - Absorption of biomolecules
  - Absorption of water
119. Storms occur as intense disturbances in the atmosphere. Typhoons are faster and stronger atmospheric disturbances than storms. Tropical storms and typhoons develop over warm tropical waters. Typhoon Yolanda had an expected landfall in Leyte, an island in Visayas which lies adjacent to the Pacific Ocean, on November 9, 2013. What can be inferred from flooded coastal lowlands in Leyte as the typhoon reached the

coastline on November 9 that caused massive damages and loss of lives?

- The typhoon brought very rapid high waves or a large dome of water from the sea, called storm surge.
  - The rainfall from the mountain rushed to the lowlands and cause flash flood.
  - Tsunami swept the entire coastline.
  - The pollution increased the power of the waves.
120. Which of the following chemical reactions has the greatest entropy?
- $PCl_5 \rightarrow PCl_3 + Cl_{2(g)}$
  - $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$
  - $N_2O_{4(g)} \rightarrow 2NO_{2(g)}$
  - $C_2H_5OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(g)}$
121. Why does grounded coffee dissolve faster than granulated coffee?
- The grains of grounded coffee have more surface area in contact with the liquid.
  - The grains of granulate coffee have more surface area in contact with the liquid.
  - Grounded coffee is less dense than granulated coffee.
  - Grounded coffee is denser than granulated coffee.
122. The graph below represents the heating curve of a substance that starts as a solid below its freezing point.



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123. Boyle's Law states that if the temperature is constant, the volume of a given mass of gas is inversely proportional to the pressure. The pressure at the surface of the water is 1 atm and increases by 1 atm every 10 meters of depth, i.e., a pressure of 2 atm at 10 meters underwater. Supposed you had a balloon measuring 1 liter at the surface of the water, what will be its volume at a depth of 20 meters?
- 1/3 liter
  - 1/2 liter
  - 1 liter
  - 2 liters
124. Members of this phylum have segmented bodies, jointed appendages, and bodies covered with exoskeleton.
- Arthropoda
  - Echinoderma
  - Mollusca
  - Porifera
125. The trapping of heat by carbon dioxide and water vapor in the atmosphere is called greenhouse effect. Clouds increase the greenhouse effect by absorbing some of the infrared radiation that would normally be lost into space. Without greenhouse effect, sunlight would warm the ground to only about  $-10^{\circ}\text{C}$ . What is a good result of balanced greenhouse effect?
- severe drought
  - Earth remains warm enough for life to exist
  - changing of seasons
  - significant decrease in rainfall
126. Sex-linked diseases are passed down from generation to generation through one of the X or Y chromosomes. In sex-linked recessive diseases, both genes must be abnormal to cause the pathology. If only one gene in the pair is abnormal, the disease does not occur, or is mild. Someone who has one abnormal gene but no symptoms is called a carrier. A carrier can pass this abnormal gene to his or her children. One example of this is an X-linked recessive disease, usually occur in males. If a woman who is a carrier of X-linked disease married a normal man, what would be the probability of having a son who has that disease?
- None of the sons will have the disease.
  - 25% of the sons will have the disease.
  - 50% of the sons will have the disease.
  - All sons will have the disease.
127. Which of the following consists of the most number of molecules? The atomic masses of O, N, and H are 16 g, 14 g, and 1 g, respectively.
- 32 g  $\text{O}_2$
  - 28 g  $\text{N}_2$
  - 18 g water
  - 4 g  $\text{H}_2$
128. A molecular biologist was examining a cell of unknown identity. It was noted that the cell had the following structures: mitochondria, cell membrane, nucleus, and a cell wall. Which among the following organisms would be a good candidate for the identity of the cell?
- Animal
  - Bacteria
  - Fungi
  - Archaea
129. There are various ways that the Earth's crust gets disrupted. Tectonic earthquake is a particular kind of earthquake that is associated with the Earth's crustal deformation. Volcanic eruptions happen when the Earth's crust breaks and the hot liquid rock of the mantle escapes to the surface. Tsunamis can be created when there is a sudden disturbance on the Earth's crust and deformation on the sea floor as a result it vertically displaces the overlying water and creates violent underwater disturbance. Which of the following cannot cause tsunamis?
- Large areas of the sea floor elevate or subside along the Caribbean
  - Massive volcanic eruption in Indonesia
  - Tectonic earthquakes in Japan
  - Super typhoon damaging China
130. A student performed an experiment and a gas was produced. After the gas was collected and tested with a burning splint, a loud popping noise was heard. Which of the following gases was produced?
- Hydrogen
  - Carbon dioxide
  - Oxygen
  - Methane
131. Nitrates occur in small amounts and are required for proteins to function. Nitrates, in excess concentration in streams and other surface waters can accelerate aquatic plant growth causing rapid oxygen depletion. In addition to

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that, nitrates at high concentrations in surface and groundwater used for human consumption are toxic for the children. Children could have the blue-baby syndrome which affects the ability of the blood to carry oxygen. This syndrome is very fatal and may increased susceptibility to illness and may even result to death. Which among the following could be a possible advantage of nitrates?

- A. Nitrates, in high percentages of concentration, are used by plants to make food.
- B. Nitrates can cure the so-called blue-baby syndrome.
- C. Nitrates maintain sustainability of life.
- D. All of the above

132. Taxonomy is the study of identifying and classifying organisms into groups based on the characteristics an organism shares with others of its same kind. Domain is the most general taxonomic classification of organisms. Cell structure and genetics are two primary criteria used to classify organisms within domains. Which taxonomic domain includes multicellular and photosynthetic organisms?

- A. Archaea
- B. Bacteria
- C. Protista
- D. Eukarya

133. Drought is an extended period when a region notes a deficiency in its water supply whether surface or underground water. This phenomenon usually occurs when a region receives consistently below average precipitation. This can have a great impact on the ecosystem and the agriculture of the affected region. The topsoil will become dry and will have no moisture. What will be the effect of drought to the monocots and dicots?

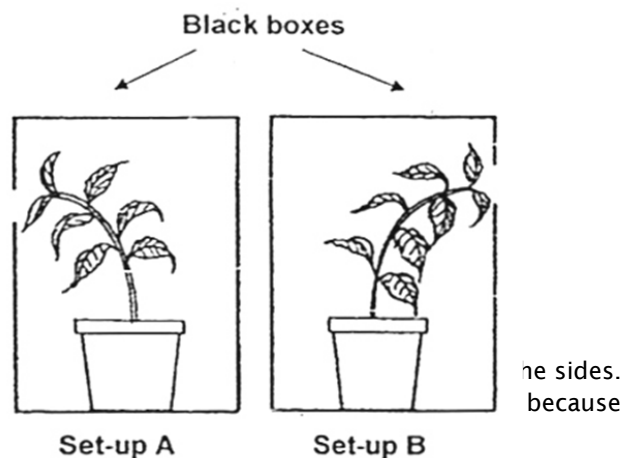
- A. Both of them will not be affected because they have a good storage of water.
- B. Both of them will be equally affected because both they lack water storage.
- C. It will affect the dicots more because monocots have a fibrous root system, and will cover more soil.

D. It will affect the monocots more, because dicots have tap root system and will be to go deeper down the soil.

134. The Law of Conservation of Mass established in 1789 by French chemist Antoine Lavoisier states that mass is neither created nor destroyed during the course of chemical reactions. When iron nail rusts, it gets heavier. Does the iron nail follow the Law of Conservation of Mass?

- A. No, rusting is not a chemical reaction.
- B. Yes, the atoms of the iron nail simply rearrange themselves so that the mass of the iron nail stays the same.
- C. Yes, the mass of the iron and the oxygen in the air that reacts with it to get rusted is equal to the mass of the rusted iron nail.
- D. There is something wrong with the given. The mass of the iron nail is the same as when it gets rusted.

135. A student conducted an experiment with two potted plants. He placed each pot of plant in a sealed black box with an opening on one side of the box. He watered the plants daily. The diagram shows what happened to the plants after a week. What conclusion can be made from the experiment?



the plants grow towards the light to get sunlight.

D. Water is needed for plant growth.

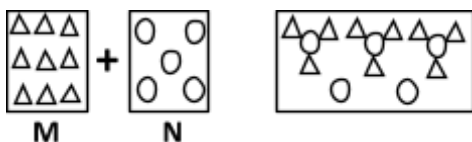
136. Gastric ulcer is the erosion of the protective lining of the stomach called the gastric mucosa. Without this lining, the inner layers of the stomach are damaged by the acids present in the stomach, causing mild to severe pain in the

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abdominal area. Which of the following substances could worsen this condition?

- A. lemon juice  
B. seawater  
C. milk  
D. water

137. A chemical equation shows the amount of each reactant used and the amount of products formed by the reaction. Writing balanced chemical equations, and interpreting them is very essential. A chemical reaction must account for every atom that is used. This is an application of the Law of Conservation of Matter. This law states that in every given chemical reaction, the atoms are neither created nor destroyed. An example of a chemical reaction is illustrated below:



Which among the following chemical equations best describes the diagram?

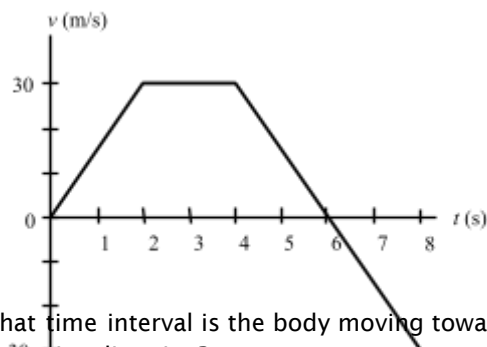
- A.  $9M + 5N = M_6N + 2N_2$   
 B.  $9M + 5N = 3M_3N + N_2$   
 C.  $9M + 5N = 3NM_3 + 2N$   
 D.  $9M + 5N = M_9N + N_2$

138. Based on the following periodic table, which two elements have a half-filled p orbital?

A large grid of 100 squares arranged in a 10x10 pattern. The grid is composed of 10 rows and 10 columns. The top row has 10 squares. The second row has 10 squares. The third row has 10 squares. The fourth row has 10 squares. The fifth row has 10 squares. The sixth row has 10 squares. The seventh row has 10 squares. The eighth row has 10 squares. The ninth row has 10 squares. The tenth row has 10 squares. The grid is a solid 10x10 block of squares.

- D. Sodium and potassium

139. The graph below shows the velocity versus time graph of a body moving in a straight path for a certain period.



At what time interval is the body moving towards the negative direction?

- A.  $0s - 2s$   
B.  $4s - 6s$   
C.  $4s - 8s$   
D.  $6s - 8s$

140. Mark travels to four different moons. He notices that his weight is different for every moon he travels to. The table below shows the acceleration due to gravity to four different moons.

| Moon  | Acceleration due to gravity |
|-------|-----------------------------|
| Alpha | 11 m/s <sup>2</sup>         |
| Beta  | 13 m/s <sup>2</sup>         |
| Gamma | 15 m/s <sup>2</sup>         |
| Omega | 17 m/s <sup>2</sup>         |

In which moon will he be able to jump the highest in one jump? Assuming Mark leaves the ground with the same speed.

- A. Alpha  
B. Beta  
C. Gamma  
D. Omega

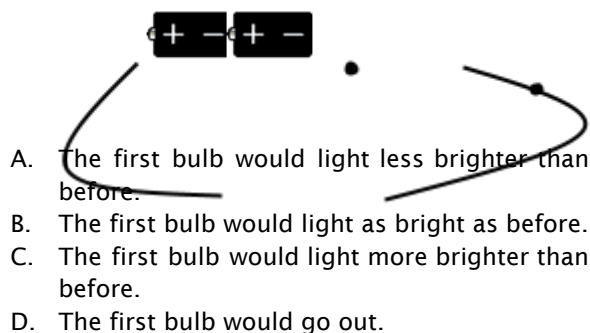
141. You are spear fishing in waist-deep water when you spot a fish. If you are standing behind the fish, where should you aim the spear to catch the fish?
  - A. You should aim it right behind the fish.
  - B. You should aim it right in front of the fish.
  - C. You should aim it exactly where the fish seems to be.
  - D. You should aim it a bit to the side of the fish.
142. The echoes of the sound from a gun fired in the middle of the valley with mountains on both sides were heard 3.0 s after the gun was fired.

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Determine the distance between the mountains.  
The speed of sound in air is 340 m/s.

- A. 340 m
- B. 510 m
- C. 1020 m
- D. 2040 m

143. Two identical light bulbs are connected to a voltage source. A wire was connected across the second bulb as shown in the figure below. What would happen to the first bulb?



144. Acceleration is defined as the rate of change in velocity. The formula for acceleration is:

$$a = \frac{\Delta v}{t} = \frac{v_{\text{final}} - v_{\text{initial}}}{t}$$

Newton's second law states that, "The acceleration of an object is directly proportional to the net force acting on it and inversely

proportional to its mass." This law is also known as the Law of Acceleration. In formula:

$$a = \frac{F}{m}$$

A 25-kg box, initially at rest, is acted upon by a net force of 200 N for 8 s and causes it to accelerate uniformly. What is the final velocity of the box after 8 s?

- A. 50 m/s
- B. 64 m/s
- C. 75 m/s
- D. 80 m/s

145. Resistors may be connected in series, in parallel, or combination of series and parallel. The following formulas are used to get the total resistance ( $R_T$ ) in series and parallel.

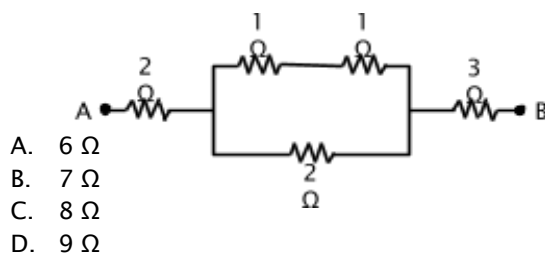
Resistors in series:

$$R_T = R_1 + R_2 + \dots$$

Resistors in Parallel:

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

The figure below shows resistors connected in series and parallel. Find the total resistance from A to B.



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