

**Directions:** Read the questions carefully and choose the letter that corresponds to your answer.

1. How come a person with type B blood cannot donate to a person with type A blood?
  - A. The recipient has antibodies against B blood, which has B-antigens, resulting in clotting up the donated blood.
  - B. The recipient has B surface antigens that can be recognized by antibodies of the donor, resulting in rejection of the donated blood.
  - C. Both A and B are true.
  - D. None of the above statements are true.
  - E.
  
2. **Weathering** is the process that changes solid rock into sediments. With weathering, rock is disintegrated. It breaks into pieces. However, rocks on the moon are not being weathered. Which of the following is the reason for this?
  - A. There is no atmosphere on the moon.
  - B. There is no water on the moon.
  - C. There is no volcano on the moon.
  - D. The gravity on the moon is very small.
  
3. Each of two replicated strands of a chromosome is called a(n)
  - A. aster.
  - B. centriole.
  - C. synapse.
  - D. chromatid.
  
4. 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.

5. If two flies heterozygous for wing length and body color are crossed, which of the following are possible results?

- A. chance of L, long wings =  $3/4$
- B. chance of l, short wings =  $1/2$
- C. chance of G, grey body =  $1/4$
- D. all of the above are true

6. 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  $0.5^{\circ}$

7. Which of these would be least likely to diffuse across the phospholipid bilayer of a cell membrane?

- A. water
- B. sodium ions
- C. oxygen
- D. carbon dioxide

8. The bacteria that causes syphilis is

- A. a coccus.
- B. E. coli.
- C. a bacillus.
- D. a spirochete.

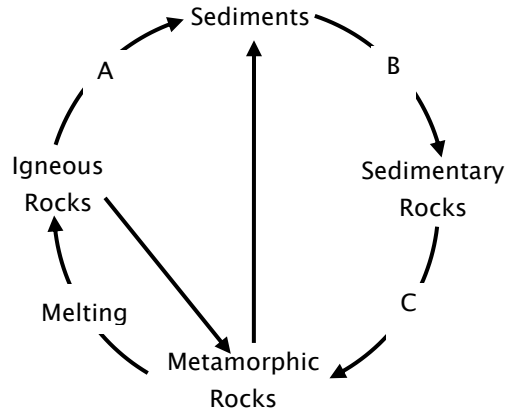
9. Cloud seeding can be done by dispersing Silver Iodide or dry ice (solid carbon dioxide) into clouds to induce precipitation. Cloud seeding has also been used to dissipate fog, modify hurricanes, and decrease lightning and hail in thunderstorms. The results have been remarkable but never guaranteed 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

10. Geothermal systems produce electricity from what energy source?
- A. heat from the Sun
  - B. mechanical energy from wind
  - C. heat from Earth's interior
  - D. mechanical energy from waves
11. The proportion of adenine bases in a sample of DNA was found to be 12%. Which of the following statements is true? The proportion of
- A. uracil bases in the sample is 12%.
  - B. thyroxine bases in the sample is 12%.
  - C. uracil bases in the sample is 88%.
  - D. cytosine bases in the sample is 38%.
12. If a single-celled saltwater organism is placed in freshwater, it will not be able to survive. Which statement explains why this is true?
- A. The organism's cell will absorb too much water through osmosis.
  - B. The organism's cell will absorb too many sodium ions through osmosis.
  - C. The organism's cell will release too many hydrogen ions through diffusion.
  - D. The organism's cell will release too much water through facilitated diffusion.
13. Protozoa are placed in different classes according to their
- A. movement.
  - B. color.
  - C. shape.
  - D. size.

14. Refer to the diagram below.



Which of the following is TRUE?

- I. Path A is uplift, weathering, erosion, deposition
- II. Path B is heating and crystallization.
- III. Heat and pressure are responsible for path C.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

15. Agglutination is the

- A. clumping of students in hallways.
- B. clumping of platelets to help stop bleeding.
- C. clumping of white blood cells around bacteria.
- D. clumping of blood cells due to an antibody-antigen reaction.

16. Differences between eukaryotic and prokaryotic cells include all of the following except \_\_\_\_\_.

- A. eukaryotic cells have mitochondria
- B. eukaryotic cells have cilia and flagella with complex structure
- C. prokaryotic cells have more complex cell walls
- D. prokaryotic cells have no genetic material

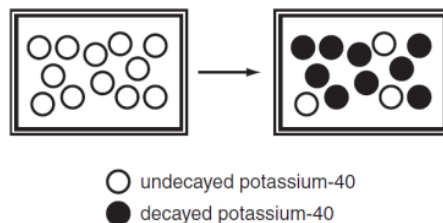
17. I lack respiratory, excretory, and circulatory systems, have bilateral larva, deuterostome development, and move using a water vascular system. What am I?

- A. echinoderm
- B. chordate
- C. jellyfish
- D. mollusc

18. Assuming that complete dominance is followed, which of the following genotypes has the same phenotype as QQRrSsTt?

- A. AABbccDd
- B. QqRRsS TT
- C. QqrrsStt
- D. QQRrSsTt

19. Potassium-40 is used to determine the age of rocks. The diagram below shows a rock sample in which some of the potassium-40 atoms have undergone radioactive decay. According to the diagram, how many half-lives has the rock sample undergone?



- A. 9 half-lives
- B. 3 half-lives
- C. 2 half-lives
- D. 1 half-life

20. Which of the following pairs are analogous structures?

- A. the front leg of a horse and a human arm
- B. the front leg of a frog and a bat wing
- C. the wing of a bird and a bat wing
- D. the front flipper of a porpoise and a human arm

21. What enzyme in saliva breaks down sugars?

- A. Aqua-enzymes
- B. Amylase
- C. Adenine
- D. Glyoxalase

22. A scientist performed an experiment where he knocked out the genes of a mouse cell responsible for producing the Golgi complex. Which of the following could be a consequence of the experiment to mice lacking the gene?

- A. Mice would grow to be fat, and obese, since there would be no regulation of lipid synthesis.
- B. Mice would develop uncontrolled mutations over the course of its life, since production of proteins has been hampered.
- C. Mice won't grow or develop into adults, and will live for only a few days or weeks, since proteins won't be processed properly and they wouldn't know where to go after they're synthesized.
- D. The mice will be lethargic since they won't be able to process absorbed nutrients to transform them into energy in the form of ATP.

23. What enzyme in saliva breaks down sugars?

- A. Aqua-enzymes
- B. Amylase
- C. Adenine
- D. Glyoxalase

24. Vitamins help to control chemical reactions in our bodies. Without vitamins certain reactions cannot take place. We need only tiny amounts of vitamins, but without them we will suffer from deficiency diseases, like the lack of vitamin D will lead to

- A. beriberi
- B. rickets
- C. scurvy
- D. night blindness

25. In which population would you expect the most rapid evolutionary change?

- A. a small population with a high mutation rate in a changing environment
- B. a small population with a low mutation rate in a stable environment
- C. a large population with a high mutation rate in a changing environment
- D. a large population with a low mutation rate in a stable environment

26. In a species of pea plant, white flowers were completely dominant over red flowers. Pure breeding, white flowered pea plants are crossed with pure breeding, red-flowered pea plants. What proportion of white- and red-colored plants will be produced in the F1 generation?

- A. all white-flowered plants.
- B. all red-flowered plants.
- C. a 3 : 1 ratio of white-flowered plants to red-flowered plants.
- D. a 3 : 1 ratio of red-flowered plants to white-flowered plants.



27. Flowers are the reproductive organs of angiosperms. These organs have various parts that fall under three groups: (1) male parts, (2) female parts and (3) accessory parts.

Depending on the present structures, a flower may be categorized as complete, incomplete, perfect or imperfect. Which of the following lists of parts describes a perfect flower but not a complete flower?

- A. Pistil, stamen and accessory parts
- B. Pistil and accessory parts only
- C. Stamen and accessory parts only
- D. Pistil and stamen only

**Read the passage below to answer questions 28 and 29.**

Eutrophication is a phenomenon where excessive amounts of nutrients are added to a marine ecosystem. These nutrients cause plant life like algae to multiply rapidly, leading to very high population densities. In freshwater ecosystems, the algae can become so dense that it can turn ponds, lakes or even smaller rivers green. The algae grows to an unreasonable level at a very fast rate. The algae are known as phytoplankton and are microscopic, single-celled organisms.

A body of water that is experiencing eutrophication and a resulting bloom can be quickly devastated. Eutrophication affects all living organisms in the area including fish, birds and mammals. The top layer of phytoplankton causes such a build-up on the surface that they accumulate sediment. When this occurs the sunlight is blocked and it will choke off the plant life below the surface. The phytoplankton will also cause less surface area for the water to interface with air. As a result, there will be less oxygen available in the water. As oxygen continues to deplete, the depletion can have a negative effect on life as there will be less oxygen to support the organisms below the surface that depend on the oxygen from plants that diffuses into the water.

Scientist 1

The root cause of eutrophication is not known. However, the frequency and increasing incidents of eutrophication point to human farming activity as the potential cause. The growth of the phytoplankton is caused by runoff that contains multiple sources of nitrates that are also found in fertilizer. The nitrates allow for the phytoplankton to grow

rapidly. The solution to the problem is to either move the drainage so the runoff from the human farming activity cannot reach the water source or move the farms.

Scientist 2

Sometimes eutrophication can happen naturally without any real cause. Sometimes when there are periods of heavy rain, the increase in rain water leads to an imbalance in the pH of the water. This in turn creates favorable conditions for the phytoplankton to grow and proliferate. This is a natural cycle that also ensures that too many fish and other animals do not build up in a freshwater source. This type of bloom is nature's way of eliminating overpopulation with an abiotic factor. Although many organisms will die as a result, it will help to thin the numbers of organisms and ensure a healthier freshwater source.

28. According to Scientist 1, which of the following is the cause of the eutrophication?

- A. A change in the pH of the water.
- B. The increasing changes in phytoplankton.
- C. Agricultural run-off from human activity.
- D. The build-up of phosphates in the body of water.

29. What is the main point of disagreement between Scientist 1 and Scientist 2?

- A. The source of the nitrogen.
- B. The root cause of the eutrophication.
- C. The effects of the lack of oxygen.
- D. The effect of the plant life in the aquatic ecosystem.

30. Which of the following is the function of the cotyledon in a seed?

- A. to form the lower portion of the plant.
- B. to form the upper portion of the plant.
- C. to protect the seed from drying out.
- D. to provide nutrients for the germinating plant.

31. What is the probability that a father with a homogenous dominant trait and a mother with the same homogenous dominant trait will produce an offspring with the recessive trait?

- A. 25%
- B. 15%
- C. 0%
- D. 100%

32. Mount Mayon is what type of volcano?

- A. Stratovolcano
- B. Shield
- C. Caldera
- D. Cinder

33. The circulatory system has three main components: (1) the pumping organ – the heart, (2) the circulating medium – the blood and (3) the passageways of blood – the blood vessels. Furthermore, there are three types of blood vessels: capillaries, arteries and veins. Capillaries are the site of gas exchange between the blood and the bodily tissues. Arteries carry blood away from the heart while veins carry blood towards the heart. Apart from these differences in function, these three types of blood vessels all have different morphological features.

Arteries have much thicker walls than veins. What is the significance of the thicker walls for arteries?

- A. Arteries normally carry oxygenated blood – which require flowing through thicker vessels in order to preserve the oxygen content.
- B. Arteries receive greater blood pressure than the veins. The greater blood pressure would threaten destroying thin-walled blood vessels, warranting thicker walls for arteries.
- C. Veins have valves that prevent back-flow of blood. The valves are designed to work in thin walled vessels.
- D. Veins normally carry deoxygenated blood – which does not require flowing through thicker vessels in order to preserve the oxygen content.

34. Global climate change can be attributed to the increase in what two gases produced by human activities?

- A. nitrous oxide and sulfur dioxide
- B. methane and carbon dioxide
- C. ozone and carbon dioxide
- D. ozone and methane

35. What measurement is used to quantify the destruction caused by an earthquake?

- A. the Richter scale
- B. the modified Mercalli scale
- C. the moment magnitude scale
- D. the moment destruction scale

36. Igneous rocks originate when magma or lava cools and crystallizes or when pyroclastic materials are consolidated. The two categories of igneous rocks are plutonic rocks, which form within the earth's crust, and volcanic rocks, which form at the surface. Volcanic rocks can usually be distinguished from plutonic rocks by

- A. its color
- B. its composition
- C. its iron-magnesium content
- D. the size of its mineral crystals

37. The solidification of molten rock from inside or outside the earth causes the formation of igneous rocks. These rocks are characterized by the presence of large or small crystals, depending on the rate of cooling of the rocks. Granite is an intrusive igneous rock that cooled beneath the earth's crust, and has large crystals. What is the most probable reason for this?

- A. Extreme pressures at the bottom create larger crystals.
- B. Gravity causes the heavier crystals to collect at the bottom of intrusive igneous rocks.

- C. Hotter temperatures act as a catalyst to increase the rate of crystal formation in intrusive igneous rocks.
- D. Hotter temperatures beneath the earth's crust decrease the cooling rate, allowing more time to grow larger crystals.

38. 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

39. Suppose two hypothetical organisms with blue eyes have an offspring with red eyes. Assuming that this trait obeys the Mendelian laws of inheritance, which among the following statements is TRUE?

- A. Red eye color is the dominant trait.
- B. The red-eyed offspring has a homozygous dominant genotype.
- C. The parents both have a heterozygous genotype.
- D. The red-eyed offspring has a heterozygous genotype.

40. Mechanical and chemical weathering result in disintegration and decomposition of parent material so that it is more nearly in equilibrium with new physical and chemical conditions. Mechanical weathering involves forces that break rocks into smaller pieces without changing their chemical composition. Which mechanical weathering process involved in the origin of exfoliation domes?

- A. pressure release
- B. expansion and contraction
- C. heating and cooling
- D. oxidation and reduction

41. Rock and dust samples brought back from the Moon by the Apollo missions in the 1980s were more similar to Earth's mantle than to meteorites that struck the Earth. Which of the following statements is true about Earth's rock and moon's rock?

- A. Rocks on Earth are much younger than those on the moon.
- B. Rocks on Earth are much older than those on the moon.
- C. Rocks on Earth are about the same age as rocks on the moon.
- D. Moon rocks do not have age.

42. 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

43. 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

44. Water is essential in the process of photosynthesis. In plants, water is first absorbed in the roots and is conducted all the way to the leaves where photosynthesis primarily occurs. This conduction process occurs through the xylem vessels of plants.

There are two forces that participate in this water conduction: adhesion and cohesion. Adhesion refers to the attractive forces between the water molecules and the walls of the xylem vessels, while cohesion refers to the attractive forces among water molecules. Suppose an air bubble is present in a xylem vessel, the conduction of water will be unable to proceed. What is the reason behind this phenomenon?

- A. The air bubble interrupts the cohesive forces among the water molecules. It cuts the continuous stream of water, making it unable to continually flow.
- B. The air bubble interrupts the adhesive forces between the walls of the xylem vessels and the water molecules.
- C. The air bubble is less dense than water, therefore impeding the continuous flow of water.
- D. The air bubble creates a pocket of space that eventually kills the xylem cells, thus preventing it from resuming water conduction.

45. A new vaccine was discovered as a treatment for a certain viral chicken disease. What should a scientist do in order to test for the effectivity of the vaccine?

- A. Administer the vaccine to 50 chickens and expose all of them to the disease.
- B. Administer the vaccine to 25 of 50 chickens and expose all 50 chickens to the disease.
- C. Expose 25 of 50 chickens to the disease then vaccinate all 50 chickens.
- D. Expose all 50 chickens to the disease then vaccinate 25 of them.

46. Why does semen have alkaline bases as part of its composition?

- A. To maintain a neutral environment for the sperm to “swim” in.
- B. To protect the sperm from the acidic environment in the vagina.
- C. To speed up the transport of the sperm to the fallopian tube.
- D. To destroy any rival sperm cells inside the vagina.



47. A forensic anthropologist would most likely use which bone to determine the height of a corpse?

- A. phalanges
- B. femur
- C. occipital
- D. patella

48. Professor Geller wanted to demonstrate the role of osmosis in plant cells. He placed the cells in a solution that is hypertonic to the cells. The solution contains red microscopic dye particles. Which of the following could be a possible result of Professor Geller's demonstration?

- A. Plant cells decrease in size (flaccid), and the solution will have a lighter color.
- B. Plant cells increase in size (turgid), and the solution will remain the same color.
- C. Plant cells maintain their size, and the solution will become darker.
- D. Plant cells will burst, causing the solution to reduce its color