

Natural Science Discipline
Category 4 - Sample Questions

1. Individuals with HIV sometimes contract a pneumonia infection that is rare in the rest of the people because people with HIV
 - A. Are unable to fight off these pneumonia-causing organisms.
 - B. Are more often exposed to these pneumonia-causing organisms.
 - C. Release pheromones that attract the pneumonia-causing organisms.
 - D. Release substances that increase the strength of the pneumonia-causing organisms.

2. Striking the tendon just below the kneecap causes the lower leg to jerk. Moving an object quickly toward the face can cause the eyes to blink shut. These are examples of
 - A. Learned responses
 - B. Short-term memory
 - C. Reflex reactions
 - D. Sensory overload

3. What is the greatest danger to a patient who has had damage to the skin?
 - A. Loss of oils produced by the skin
 - B. Excessive muscle contractions in the damaged area
 - C. Infections in uncovered tissues
 - D. Damaged tissue entering the blood stream

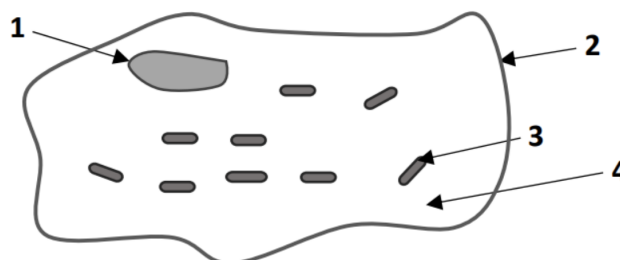
4. Study the table below.

Characteristics of Four Students				
Student	Height (cm)	Scarring	Widow's Peak	Straight Thumb
I	158	Yes	Yes	No
II	185	Yes	No	Yes
III	176	No	Yes	Yes
IV	168	Yes	No	No

Which of the following characteristics is a heritable trait that exhibits continuous variation?

- A. Height
 - B. Scarring
 - C. Widow's Peak
 - D. Straight Thumb
-
5. The fight-or-flight response includes the greater heart output and a rise in blood pressure. This response is due to
 - A. Insulin secreted by the pancreas.
 - B. Thyroxine secreted by the thyroid gland.
 - C. Oxytocin secreted by the pituitary gland.
 - D. Adrenaline secreted by the adrenal glands.

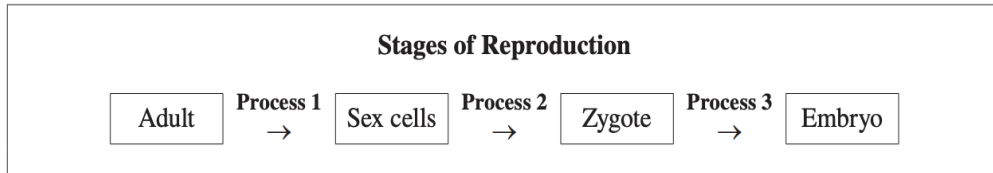
 6. Analyze the given diagram below.



What is the primary function of Part 2?

- A. It directs the cell's activities.
- B. It releases energy to do work.
- C. It produces energy from food.
- D. It protects the cell from its surroundings.

7. Identify the three processes in the stages of reproduction.



8. A base sequence is shown below.

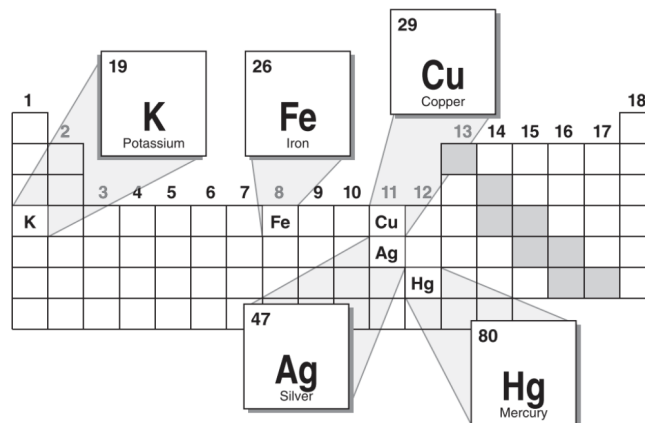
ACAGTGC

How would the base sequence be coded on mRNA?

9. Under the same conditions of pressure and temperature, a liquid differs from a gas because the molecules of the liquid
- A. Have no regular arrangement
 - B. Are in constant motion
 - C. Have stronger forces of attraction between them
 - D. Take the shape of the container they are in

10. Copper has been used to produce metal coins because of the following properties.

- (1) Non-reactive with most acids
- (2) Not readily reactive with oxygen
- (3) Malleable



Which of the elements on the periodic table above would be another appropriate metal for producing metal coins based on its similar properties to copper?

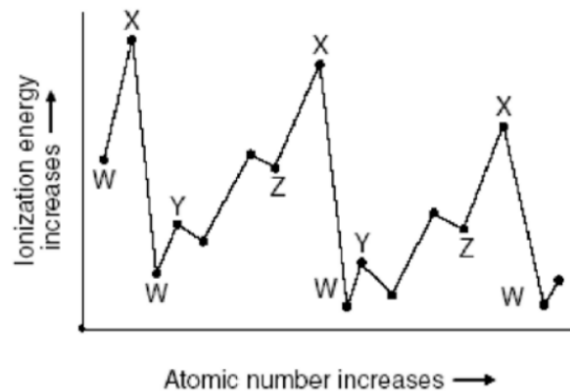
- A. Iron
- B. Silver
- C. Mercury
- D. Potassium

11. A teacher challenged a group of students to identify an unknown white solid. The students recorded the following results in their investigation.

Test	Result
1 - Density	2.13 g/cm ³
2 - Melting point	140 °C
3 - Microscope	Crystalline structure observed
4 - Mixed with HClO ₄ (aq)	Heat generated

Which of the tests listed above provides evidence of a chemical property of the unknown solid?

- A. Test 1
 B. Test 2
 C. Test 3
 D. Test 4
12. The chart below shows the relationship between the first ionization energy and the increase in atomic number.



Which letter on the chart represents the alkali family of elements?

- A. W
 B. X
 C. Y
 D. Z
13. In a science class, students saw a copper precipitate, Cu(s), appear in a solution of copper(II) sulfate, CuSO₄(aq), after a piece of zinc, Zn(s), was added to the solution. Which of the following chemical equations represents the reaction described above?
- A. $\text{CuSO}_4(\text{aq}) + \text{ZnSO}_4(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}(\text{s})$
 B. $\text{Cu}(\text{s}) + \text{ZnSO}_4(\text{aq}) \rightarrow \text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq})$
 C. $\text{Zn}(\text{s}) + \text{ZnSO}_4(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{CuSO}_4(\text{aq})$
 D. $\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{ZnSO}_4(\text{aq})$

14. Analyze the given data below.

Results of Firing Alpha Particles at Gold Foil	
Observation	Proportion
Alpha particles went straight through gold foil	>98%
Alpha particles went through gold foil but were deflected at large angles	=2%
Alpha particles bounced off gold foil	=0.01%

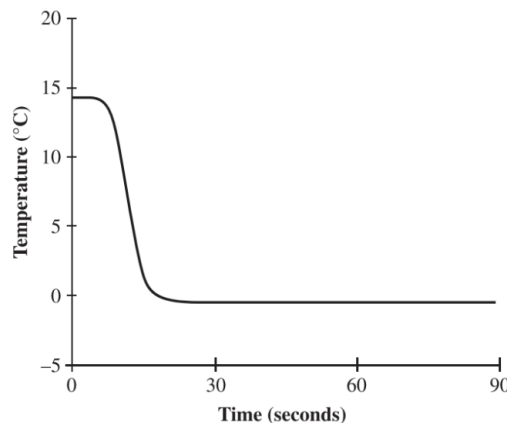
What information do the experimental results above reveal about the nucleus of the gold atom?

- A. The nucleus contains less than half of the mass of the atom.
 B. The nucleus is small and is the densest part of the atom.
 C. The nucleus contains small positive and negative particles.

D. The nucleus is large and occupies most of the atom's space.

15. What type of reaction produces a change like the one shown in the graph below?

Change in Temperature in a Solution During a Chemical Reaction Over Time



16. In an experiment, 12.0 g of solid carbon, $C(s)$, reacted with oxygen gas, $O_2(g)$, to form 44.0 g of carbon dioxide gas, $CO_2(g)$.
If all 12.0 g of carbon reacted, how many grams of oxygen reacted with the carbon?
17. A student holds a book at rest in an outstretched hand. The force exerted on the book by the student is equal to the book's
- Mass
 - Weight
 - Volume
 - Density
18. A ball is dropped from rest from a height 6.0 meters above the ground. The ball falls freely and reaches the ground 1.1 seconds later. What is the average speed of the ball?
- 5.5 m/s
 - 6.1 m/s
 - 6.6 m/s
 - 11 m/s
19. Which of the following statement is not true about a sound wave?
- It travels faster than light.
 - It travels from a definite source.
 - It is caused by vibrations of matter.
 - It can only travel through a medium.
20. A 10-newton force and 15-newton force are acting from a single point in opposite directions. What additional force must be added to produce equilibrium?
- 5 N acting in the same direction as the 10-N force
 - 5 N acting in the same direction as the 15-N force
 - 10 N acting in the same direction as the 10-N force
 - 25 N acting in the same direction as the 15-N force
21. A communication satellite is in a circular orbit around Earth. If the speed of the satellite is constant, the force acting on the satellite
- Is zero
 - Is decreasing

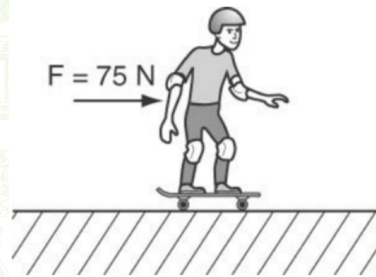
- C. Points toward the center of Earth at all times
- D. Points in the direction that the satellite is moving

22. A student is testing the conductivity of 4 different substances. He uses a 2.5 V battery and records the current in the circuit in each of the 4 substances. The chart below indicates the current measured.

Substance	Current
Q	37 mA
R	0.01 mA
S	2.50 mA
T	2.40 mA

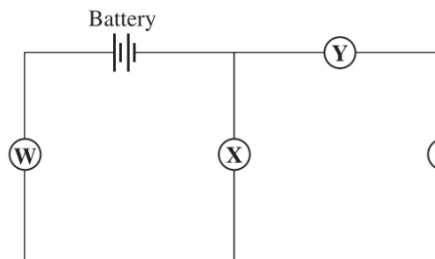
Which substance is most likely an insulator?

- A. Substance Q
 - B. Substance R
 - C. Substance S
 - D. Substance T
23. A 50-kg child on a skateboard experiences a 75-N force as shown.



What is the expected acceleration of the child?

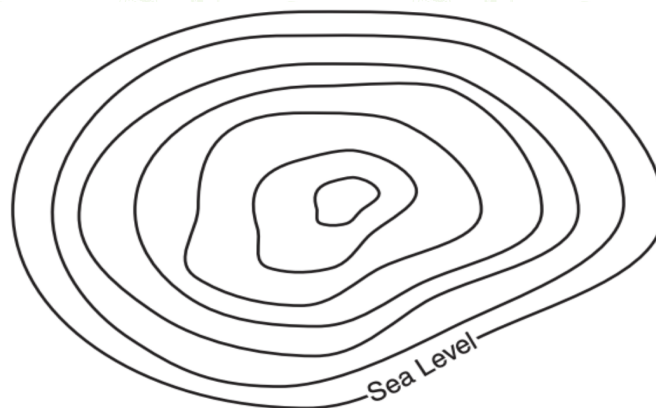
24. When a switch, a variable resistor, a light bulb, and a motor are connected in a circuit such as the one shown below, the circuit will operate as follows.



- (1) The switch will control both the motor and the light bulb.
 - (2) The user will be able to control the brightness of the bulb.
- Identify the electrical components—switch, variable resistor, light bulb, motor—to their corresponding locations in the circuit described above.

25. A rift valley is evidence of which kind of plate boundary?
- A. Convergent
 - B. Divergent
 - C. Transform
 - D. Uniform
26. Which of the following provides evidence for plate tectonics?
- A. Seafloor topography
 - B. Ocean currents
 - C. Coriolis effect
 - D. Atmospheric temperatures

27. Which of the following is the best evidence that Earth's continents were once in vastly different positions than they are today?
- Volcanoes encircle the Pacific Ocean.
 - Major rivers form deltas from continental erosion.
 - Fossils of tropical plants are found in Antarctica.
 - Penguins are found only in the southern hemisphere.
28. In an area where a river has a cut deep into Earth, there are several layers of very different rock exposed. The older rock layer is most likely to be the layer that is
- The thickest layer
 - Below the other layers
 - The richest in fossils
 - Igneous intrusive rock
29. Evidence suggests that Earth is about 4.6 billion years old, even though no rocks have been found that can be dated at more than 4 billion years old. This discrepancy is most likely caused by Earth's original crust being
- Difficult to date so precisely
 - Subject to extensive erosion
 - Destroyed by solar radiation
 - Blasted away during Earth's formation
30. Analyze the given diagram below.

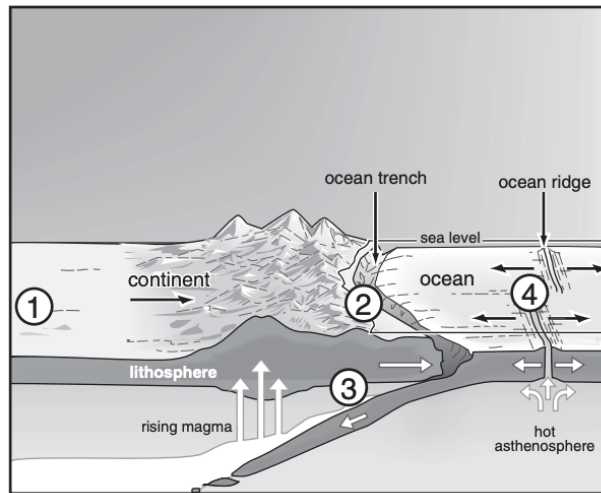


Contour Interval - 5 meters

The highest elevation on this topographic map can be no more than about

- 25 meters
- 34 meters
- 45 meters
- 49 meters

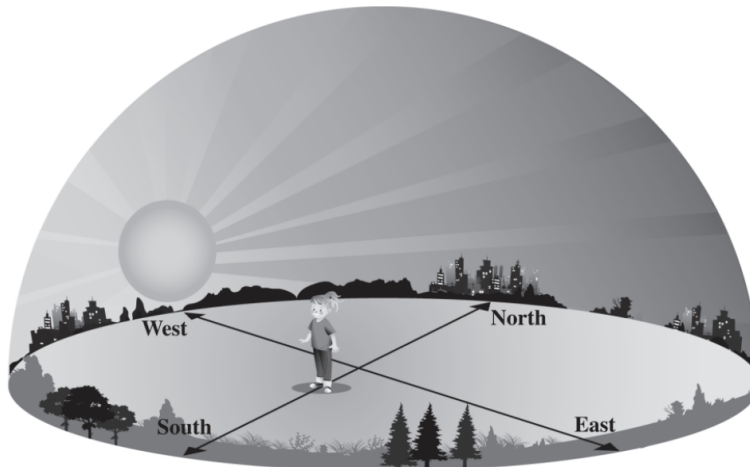
31. Analyze the given diagram below.



At which location would earthquakes be least likely to occur?

32. Draw a diagram that best models the movement of coastal air during the afternoon.
33. Which planet was formed from the light gases of the outer solar nebula?
- Mars
 - Mercury
 - Uranus
 - Venus
34. Which of the following statements best describes how the planets of the solar system formed?
- They are condensed rings of matter thrown off by the young sun.
 - They are remains of an exploded star once paired with the sun.
 - The Sun captured them from smaller, older nearby stars.
 - They formed from a nebular cloud of dust and gas.
35. The surfaces of planet Mercury and our moon contain some very large craters that are most likely the result of
- Giant lava flows
 - Asteroid impacts
 - Nuclear explosions
 - Large collapsed caves
36. Fusion is a form of nuclear reaction resulting in an enormous release of heat energy. The fusion of hydrogen to helium is a reaction that commonly occurs in
- The Sun and other typical stars
 - The ionosphere and thermosphere
 - Earth's outer core of molten iron
 - A comet's tail of ionized gas
37. Although many ancient civilizations designated certain patterns of stars as constellations, they never included planets in their constellations. What feature of planets, as opposed to stars, explains this?
- They look bigger than stars.
 - They are more difficult to see than stars.
 - There are not enough of them to form a constellation.
 - They do not remain in fixed positions relative to other planets or stars.

38. The Moon is very hot on the side facing the Sun and very cold on the dark side. This extreme temperature difference is primarily due to the Moon's
- Mineral composition
 - Thin atmosphere
 - Reflective rocks
 - Lack of volcanic activity
39. Sally is facing south on March 21 and is trying to find the coordinates of the Sun as it sets.



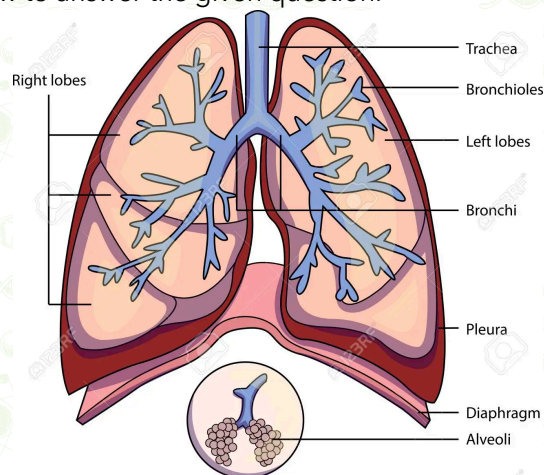
Give the approximate coordinates that will describe the location of the Sun.

40. Which primary property of a star does the spectral analysis determine?

One Spectral Analysis Observation



41. Refer to the diagram below to answer the given question.



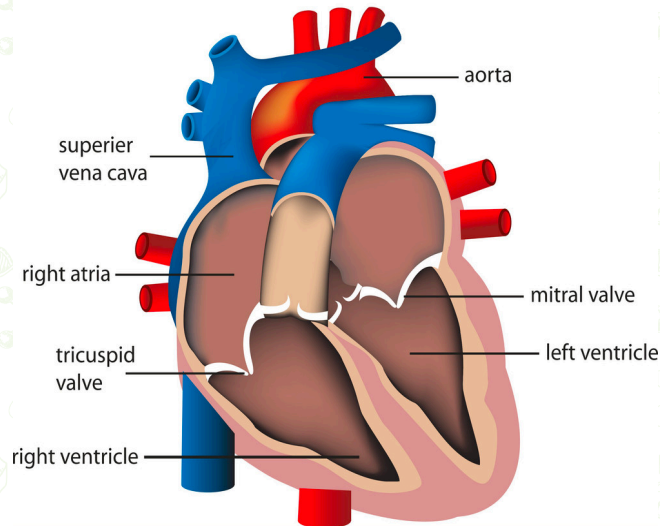
In which part of the lungs do gas exchange take place?

- Alveoli
- Bronchi
- Diaphragm
- Trachea

42. What animal classification are dinosaurs?
- A. Amphibians
 - B. Birds
 - C. Mammals
 - D. Reptiles

43. Analyze the diagram of the human heart below.

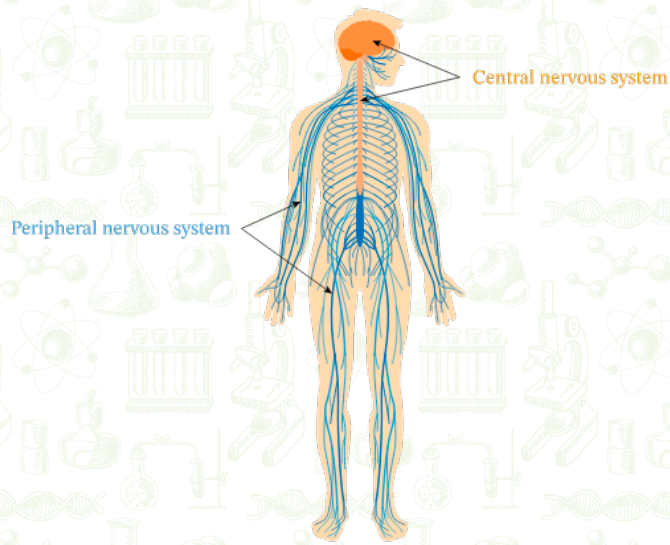
Parts of the Human Heart



Which of the following statements are true about the function of different parts of the heart?

- (1) The superior vena cava returns deoxygenated blood from the upper portion of the body.
 - (2) The aorta is the main artery that carries blood away from your heart to the rest of your body.
 - (3) The right ventricle passes the blood on to the pulmonary artery, which sends it to the lungs to pick up oxygen.
 - (4) The mitral and the tricuspid valves move blood to the lungs and the rest of the body through the ventricles.
- A. 1 and 2 only
 - B. 2 and 3 only
 - C. 1, 2, and 3 only
 - D. 1, 2, 3, and 4
44. What anatomical feature enables dinosaurs to walk upright?
- A. Large, strong femur
 - B. Long, alternating spine
 - C. A hole in the hip socket
 - D. Double-sided hips and thighs

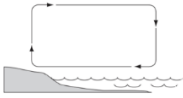
45. Below is an image of the human nervous system which is divided into two main divisions – central and peripheral.



Differentiate central nervous system and peripheral nervous system based on their functions.

46. Differentiate the teeth structure of a plant-eater and a meat-eater dinosaur.

**Natural Science Discipline
Category 4 - Sample Questions
ANSWER KEY**

No	Answer	No	Answer	No	Answer	No	Answer
1	A	13	D	25	B	37	D
2	C	14	B	26	A	38	B
3	C	15	Endothermic reaction	27	C	39	Altitude 5° and Azimuth 270°
4	A	16	32.0 g	28	B	40	Composition
5	D	17	B	29	D	41	A
6	D	18	A	30	B	42	D
7	Process 1 - Meiosis; Process 2 - Fertilization; Process 3 - Mitosis	19	A	31	Location 1	43	C
8	UGUCACG	20	A	32		44	C
9	C	21	C	33	C		
10	B	22	B	34	D		
11	D	23	1.5 m/s ²	35	B		
12	A	24	W - Switch; X - Motor; Y - Variable resistor; Z - Light bulb	36	A		
45	The main difference between central and peripheral nervous system is that the central nervous system receives sensory information, and the processed information is sent into effector organs as the response whereas the peripheral nervous system is involved in sending information to the central nervous system and sending responses from the central nervous system into the effector organs.						
46	Plant-eaters had peglike teeth to rake or slice leaves from trees. Meat-eating dinosaurs had sharp teeth to tear into prey.						