



UNICUS
OLYMPIADS

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Sample Paper



Class 4

Unicus Global Science Olympiad (UGSO)

Time: 60 minutes

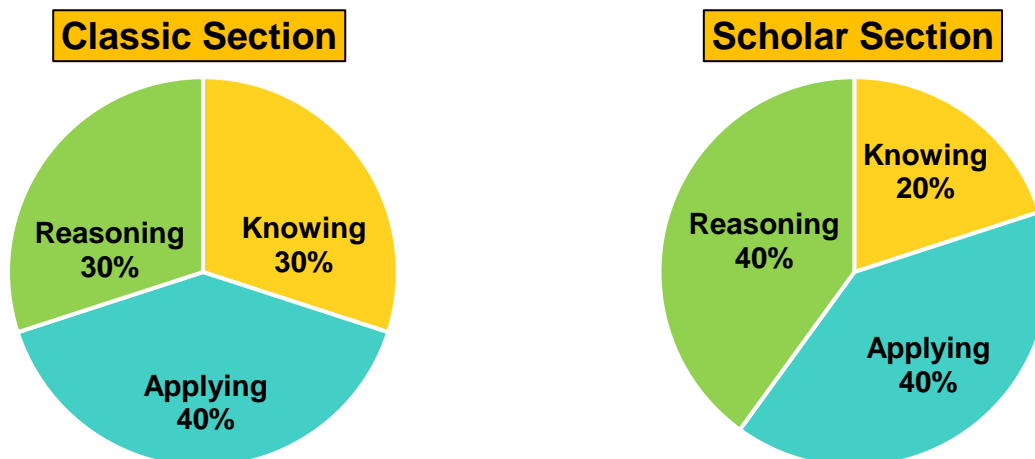
Pattern and Marking Scheme			
Section	Total Questions	Marks per Question	Total Marks
Classic Section	30	1	30
Scholar Section	15	2	30
Grand Total	45		60

Unicus Global Science Olympiad (UGSO)

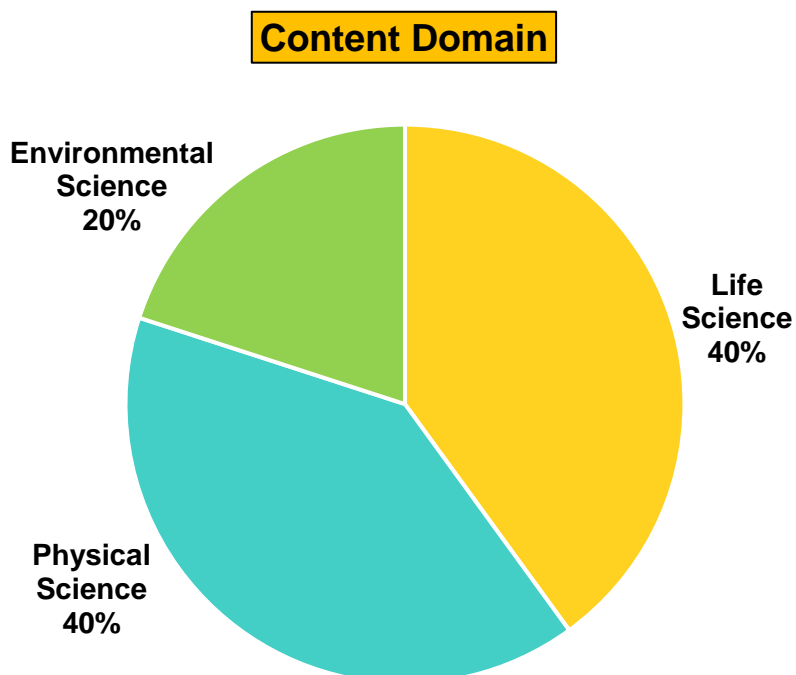
The **Unicus Global Olympiad** is organised around two dimensions:

1. Content dimension, specifying the subject matter domains to be assessed
2. Cognitive dimension, specifying the thinking processes to be assessed

Target percentages of the question paper devoted to cognitive domains



Target percentages of the question paper devoted to content domains



For more details, visit <https://www.unicusolympiads.com/>.

Classic Section (Each Question is 1 Mark)

Cognitive Domain: Applying

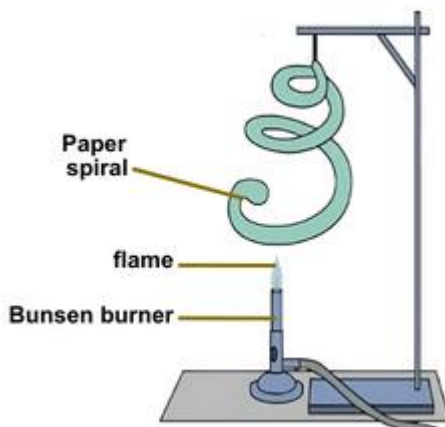
Content Domain: Physical Science

1. Consider a scenario where you dissolve salt in water until no more salt can dissolve. What would initially happen if you heat the solution?
 - a. The salt would evaporate leaving only water behind
 - b. The water would evaporate leaving only salt behind
 - c. More salt would dissolve in the water
 - d. The salt would precipitate out of the solution

Cognitive Domain: Reasoning

Content Domain: Physical Science

2. A Bunsen burner was placed under a piece of paper spiral as shown in the figure below. After some time, the paper spiral started to spin. Which one of the following correctly shows the energy conversion as the Bunsen burner is switched on?



- a. Chemical energy → Heat energy → Kinetic energy → Kinetic energy
- b. Chemical energy → Solar energy → Heat energy → Kinetic energy
- c. Chemical energy → Light energy → Heat energy → Gravitational energy
- d. Chemical energy → Kinetic energy → Kinetic energy → Gravitational energy

Cognitive Domain: Knowing

Content Domain: Physical Science

3. Sara is curious if a mixture of flour and water would be the same throughout. She mixes them and lets it sit for an hour. What is likely to happen to the flour in the mixture?
 - a. The flour will dissolve completely like sugar.
 - b. The flour will settle at the bottom after some time.
 - c. The flour will react and disappear.
 - d. The flour will rise to the top and float.

Cognitive Domain: Knowing	Content Domain: Physical Science
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4. A toy car is pushed across a rough carpet and then across a smooth tile floor. On which surface will the car travel a shorter distance and why?
- | | |
|--|--|
| <p>a. On the carpet, due to greater friction.</p> <p>c. On the carpet, due to less friction.</p> | <p>b. On the tile, due to less friction.</p> <p>d. On the tile, due to greater friction.</p> |
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Cognitive Domain: Applying	Content Domain: Physical Science
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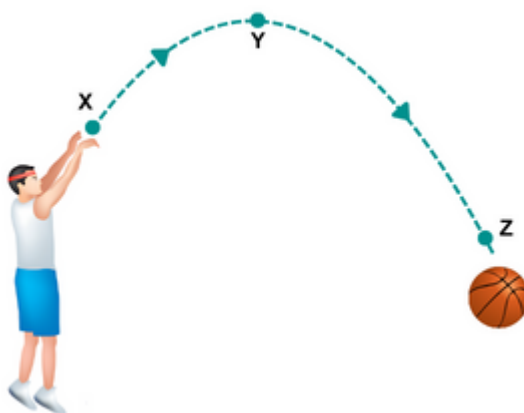
5. The picture shows a man trying to slide a heavy box along the floor. Which of the following forces would help the man to move the heavy box along the floor?
- A. The mass of the heavy box.
 B. The push the man exerted against the box.
 C. The friction between the box and the floor.
 D. The friction between the man's feet and the floor.



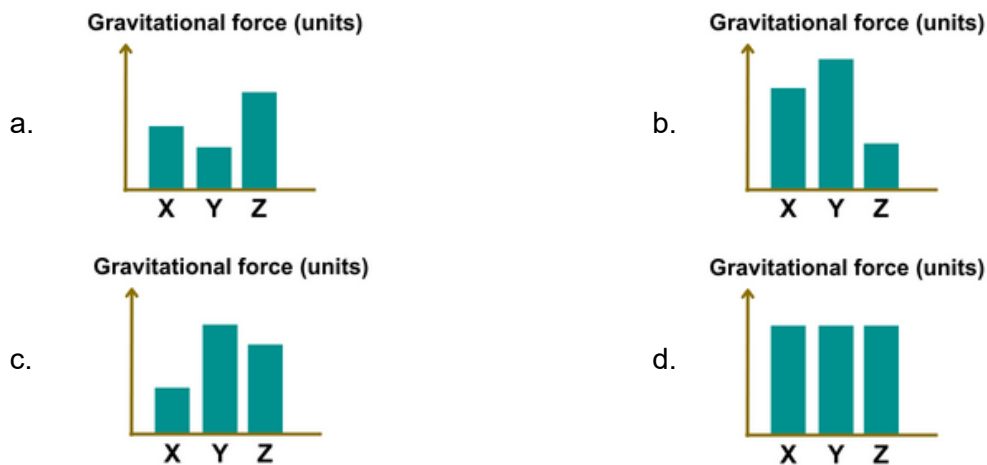
- | | |
|---|---|
| <p>a. B only</p> <p>c. A and D only</p> | <p>b. C only</p> <p>d. B and D only</p> |
|---|---|

Cognitive Domain: Reasoning	Content Domain: Physical Science
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6. Steven threw a basketball into the air. The diagram below shows the path of the basketball after he has thrown it. Points X, Y and Z are different positions along the path of the moving basketball. Which of the following graphs shows the correct amount of gravitational force acting on the basketball at points X, Y and Z?



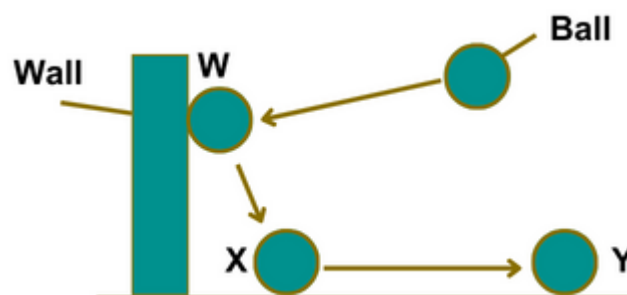
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Cognitive Domain: Reasoning

Content Domain: Physical Science

7. Richard picked up a ball from the floor and threw it against a wall as shown in the diagram below. The ball hit the wall at point W, landed at point X and rolled on the floor before finally stopping at point Y. What are some effects of forces which can be observed from the above?
- A. A force can stop a moving object.
 - B. A force can move a stationary object.
 - C. A force can change the speed of a moving object.
 - D. A force can change the direction of motion of a moving object



- a. B only
- b. D only
- c. A, C and D only
- d. A, B, C and D

Cognitive Domain: Knowing

Content Domain: Physical Science

8. Students are comparing the capacity of containers by filling them with sand instead of water. What property of sand might affect the accuracy of their capacity measurements?
- a. The colour of the sand
 - b. The grain size of the sand
 - c. The weight of the sand
 - d. The temperature of the sand

Cognitive Domain: Applying

Content Domain: Physical Science

9. A science teacher challenges the class to measure the length of a curved tube. The tools available are a string and a ruler. What is the best approach?
- Lay the string along the curve of the tube, keeping it taut, and mark where it meets the end of the curve. Then, measure the length of the marked string with the ruler.
 - Cut the string into smaller segments and lay them end to end along the curve of the tube, then measure the total length with the ruler.
 - Wrap the string around the tube, marking where it overlaps, then straighten it out and measure its length with the ruler.
 - Use the ruler to estimate the length of the curved tube by measuring its straight sections and adding them together.
-

Cognitive Domain: Reasoning

Content Domain: Physical Science

10. During a science fair, students compare how quickly different materials affect temperature readings. They place identical thermometers inside a metal cup and a plastic cup, both filled with the same amount of ice water. After 5 minutes, they record the temperature. What might they conclude about the thermal properties of metal and plastic?
- The thermometer in the metal cup shows a lower temperature because metal conducts heat away from the water faster, cooling the thermometer quicker.
 - The thermometer in the plastic cup shows a lower temperature because plastic insulates the cold within the cup, maintaining a lower temperature longer.
 - Both cups show the same temperature because the water was initially the same temperature in both cups.
 - The thermometer in the metal cup shows a higher temperature initially, as metal absorbs ambient heat faster than plastic.
-

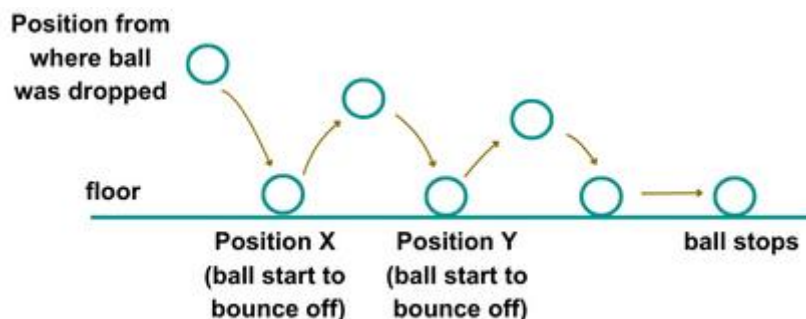
Cognitive Domain: Knowing

Content Domain: Physical Science

11. Lucas turns on a fan in his room on a hot day. The fan starts to spin and creates a breeze. What type of energy transformation is primarily occurring in the fan?
- Chemical energy to mechanical energy
 - Mechanical energy to wind energy
 - Electrical energy to mechanical energy
 - Solar energy to electrical energy
-

Cognitive Domain: Applying	Content Domain: Physical Science
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12. A rubber ball was dropped onto the floor as shown in the diagram below. The ball bounced several times making a sound each time it hit the floor. Which one of the following statements is true about the energy in the ball as it moved from position X to position Y?



- The ball has no kinetic energy at both positions X and Y.
- The ball has more kinetic energy at position X than at position Y.
- The ball has the less kinetic energy at position X than at position Y.
- At position X, all the potential energy is converted to only kinetic energy.

Cognitive Domain: Applying	Content Domain: Physical Science
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13. Choose the correct combination of simple machines that would most efficiently accomplish each task.

	Task	Simple Machines Options
1.	Lifting a heavy box into a truck	A) Lever and Wheel and Axle B) Pulley and Inclined Plane C) Screw and Wedge
2.	Cutting a piece of wood	A) Lever and Pulley B) Wedge and Inclined Plane C) Wedge and Lever
3.	Drawing water from a well	A) Pulley and Wheel and Axle B) Lever and Screw C) Inclined Plane and Wedge
4.	Splitting a log	A) Wedge and Inclined Plane B) Lever and Wheel and Axle C) Wedge and Lever

- | | |
|-------------------------------|-------------------------------|
| a. 1 - B, 2 - C, 3 - A, 4 - C | b. 1 - A, 2 - C, 3 - A, 4 - A |
| c. 1 - C, 2 - C, 3 - B, 4 - C | d. 1 - A, 2 - C, 3 - B, 4 - C |

Cognitive Domain: Knowing

Content Domain: Life Science

14. While exploring a marsh, Noah sees some plants with spongy, air-filled stems. The marsh is often flooded with water. How might these air-filled stems help the plant survive?
- They help the plant float in the water and access sunlight
 - They allow the plant to climb up other plants for support
 - They attract insects with a sweet scent
 - They store extra water for dry periods

Cognitive Domain: Applying

Content Domain: Life Science

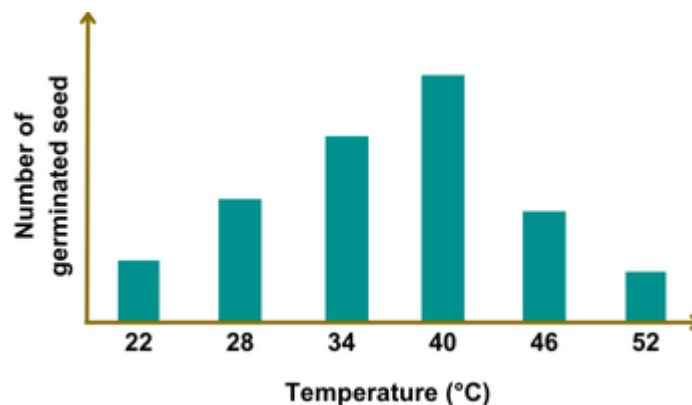
15. Plants grown outdoors often have a vibrant green colour compared to plants grown in greenhouses. What factors might contribute to the paler appearance of some greenhouse plants compared to outdoor plants?
- The greenhouse might not have enough water for the plants.
 - The artificial lights might not be bright enough.
 - The greenhouse might not have enough fresh air for the plants.
 - The artificial lights might be too hot for the plants.

Cognitive Domain: Reasoning

Content Domain: Life Science

16. Seed germination is influenced by various factors, including temperature. A student conducted an experiment to investigate the same. She soaked twenty seeds in water at different temperatures and observed how many germinated. The results are shown in the graph below. Based on the data from the experiment, choose the correct option.

- All the seeds germinated at 42°C.
- The number of seeds germinated increased with the increase in temperature.
- There is an ideal temperature for seed germination.



- A only
- A and B only
- B and C only
- C only

Cognitive Domain: Reasoning

Content Domain: Life Science

17. Henry investigated how leaf surface area affects plant growth. He got the same type of plant, one with broad leaves and another one with small and narrow leaves. Both plants received the same water and sunlight. The results are given in the table below. Based on the experiment, what can we potentially conclude?

- A. The exchange of gases in Pot B plant is better.
- B. Leaf size can affect the process of photosynthesis in plants.
- C. The amount of water and sunlight do not affect the plant growth.

Feature	Pot A	Pot B
Starting Height	10 cm	10 cm
Average Surface Area of leaves	25 cm ²	75 cm ²
Ending Height	18 cm	24 cm

- a. B only
- b. A and B only
- c. B and C only
- d. A, B and C

Cognitive Domain: Knowing

Content Domain: Life Science

18. During a lesson on ecosystems, Liam learns that some fish species can only survive in specific water conditions. What term describes the natural environment in which a species lives, which includes factors like temperature and water quality?

- a. Habitat
- b. Biosphere
- c. Atmosphere
- d. Ecosystem

Cognitive Domain: Applying

Content Domain: Life Science

19. While hiking in the mountains, Mia notices birds nesting at different heights. She observes that certain birds prefer only the higher altitudes. What could be a reason that some bird species only nest at higher altitudes?

- a. To avoid competition for food
- b. To be closer to water sources
- c. To catch more sunlight for warmth
- d. To escape land-based predators

Cognitive Domain: Applying

Content Domain: Life Science

20. Maddie and Ken are on a school field trip and see a creature with a pincer and a long tail as shown in the image below. Maddie says it's not a bug, but Ken says it's an insect. Who do you think is most likely right, and why?



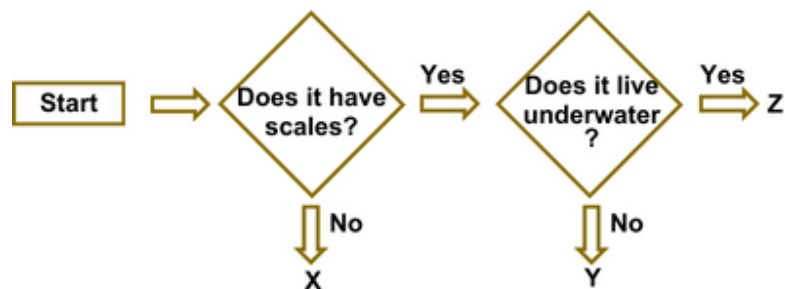
Unicus Global Science Olympiad (UGSO)

- a. Maddie is right because scorpions do not have wings like insects.
- b. Ken is right because scorpions, like all insects, have eight legs.
- c. Maddie is right because scorpions have a tail, and insects don't.
- d. Ken is right because scorpions have pincers like most insects.

Cognitive Domain: Reasoning

Content Domain: Life Science

21. Consider the diagram given below. Based on the following descriptions, identify the MOST LIKELY animal for each category (X, Y, and Z).



	Animal X	Animal Y	Animal Z
A	Buffalo	Lizard	Fish
B	Snake	Beetle	Fish
C	Fox	Porcupine	Jellyfish
D	Sparrow	Snake	Frog

- a. A
- b. B
- c. C
- d. D

Cognitive Domain: Knowing

Content Domain: Life Science

22. In a science lesson, Mia learns that the respiratory system includes several parts, each with a specific function. If she were to explain the role of the trachea, what would be the most accurate description?

- a. It is where the exchange of gases occurs.
- b. It carries air to and from the lungs.
- c. It warms and moistens the air we breathe.
- d. It controls the movement of oxygen in and out of the lungs.

Cognitive Domain: Applying

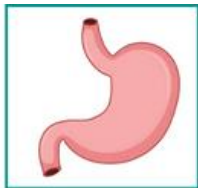
Content Domain: Life Science

23. Aura observes that her baby cousin has fewer teeth than she does and wonders why. She learns that adults and babies have different numbers of teeth. If Aura counts 20 teeth in her cousin's mouth, what kind of teeth are most likely present?

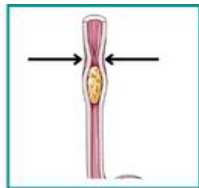
- a. Premolars and molars
- b. Incisors and molars
- c. Canines and incisors
- d. All types including wisdom teeth

Cognitive Domain: Reasoning	Content Domain: Life Science
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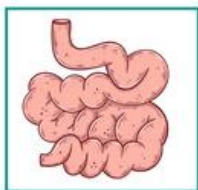
24. Our digestive system breaks down food into nutrients our body can absorb. Food travels through a series of organs in the digestive tract shown in the diagram below. Based on your understanding of digestion, choose the MOST LIKELY order in which food would travel through these organs during digestion.



1. Stomach



2. Oesophagus



3. Small intestine



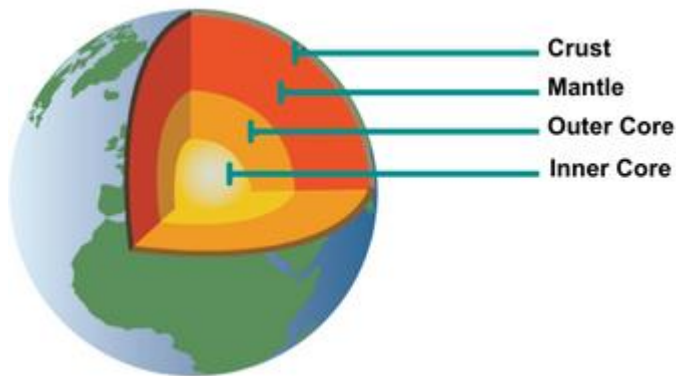
4. Colon

- a. 2134
- c. 1234

- b. 2143
- d. 1243

Cognitive Domain: Knowing	Content Domain: Environmental Science
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25. Jamie is studying the Earth's layers for a school project. She learns that one layer contains most of the Earth's mass. Which layer is Jamie learning about?



- a. Crust
- c. Outer core

- b. Mantle
- d. Inner core

Cognitive Domain: Applying

Content Domain: Environmental Science

26. Lucy creates a science project about the effects of volcanic eruptions on Earth's surface. She focuses on the role of magma. What is the primary way in which the magma from beneath the Earth's crust affects the surface during a volcanic eruption?
- a. It cools down to form new sedimentary rock layers.
 - b. It heats up the surface water, causing steam explosions.
 - c. It emerges as lava, which solidifies to form new landforms.
 - d. It causes the Earth's rotation to slow down slightly.

Cognitive Domain: Applying

Content Domain: Environmental Science

27. While studying the reasons for seasons on Earth, a group of students conducted a model experiment showing the tilt of the Earth's axis. They observed that when the northern hemisphere is tilted towards the Sun, it experiences:
- a. Winter because it is farther from the Sun.
 - b. Summer because it is closer to the Sun.
 - c. Summer because it receives more direct sunlight.
 - d. Winter because it receives less sunlight.

Cognitive Domain: Knowing

Content Domain: Environmental Science

28. You're a gardener and want to know what makes soil feel gritty or smooth. Which of the following factors MOST influence the texture of soil?
- a. Amount of organic matter
 - b. Depth of soil layers
 - c. Amount of water in the soil
 - d. Type and percentage of soil particles

Cognitive Domain: Applying

Content Domain: Environmental Science

29. A student inflates two identical balloons, one with air and one with helium. They tie the balloons together and let them go. The helium balloon floats higher. What property of air best explains why the helium balloon will float higher?
- a. Air is a mixture of gases.
 - b. Air has weight.
 - c. Air takes up space.
 - d. Air can be compressed.

30. Jamie is curious about plants and their role in the air we breathe. She conducts an experiment:

Experiment 1: She places a burning candle in a sealed container and observes the flame go out after 2 minutes.

Experiment 2: She repeats the experiment, but this time with a small plant inside the container along with the candle. The candle burns for 5 minutes before going out.

Based on Jamie's observations, what can she conclude?



- The plant creates more air inside the container.
- The plant uses up all the air in the container.
- The burning candle uses up oxygen in the container, and the plant helps replace it.
- The burning candle uses up carbon dioxide in the container, and the plant helps replace it.

Scholar Section (Each Question is 2 Marks)

31. Leo set up an experiment to investigate the flexibility of 3 different materials, A, B and C as shown below.



He poured different amounts of water into the beaker placed on top of each material until the distance between the highest and lowest points of the material reached 2 cm. He recorded his observations and concluded that material B was the most flexible and material A was the least flexible.

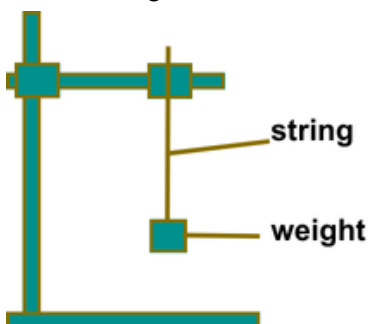
	Amount of water in the beaker (cm ³)		
	Material A	Material B	Material C
1.	150	50	100
2.	100	50	150
3.	150	100	150
4.	50	150	100

Which of the following did he record in order to draw the conclusion above?

- a. 1
- b. 2
- c. 3
- d. 4

Cognitive Domain: Applying **Content Domain: Physical Science**

32. An experiment was conducted to test the strength of four different materials M, N, O and P. Weights of the same mass were hung on the different materials until they snapped.



The results of the experiment are recorded in the table below. Which one of the following shows the correct order of strength for materials M, N, O and P from the weakest to the strongest?

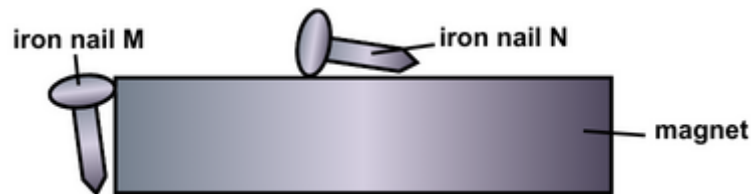
Material	M	N	O	P
Number of weights before the material snapped	15	23	10	8

- a. P, O, M, N
- b. P, M, O, N
- c. N, O, M, P
- d. N, M, O, P

Cognitive Domain: Applying **Content Domain: Physical Science**

33. Katy placed two similar iron nails M and N next to a magnet as shown in the diagram below. When Katy picked up the magnet, only iron nail M remained attached to the magnet. Which of the following statement(s) best explain(s) Katy's observations?

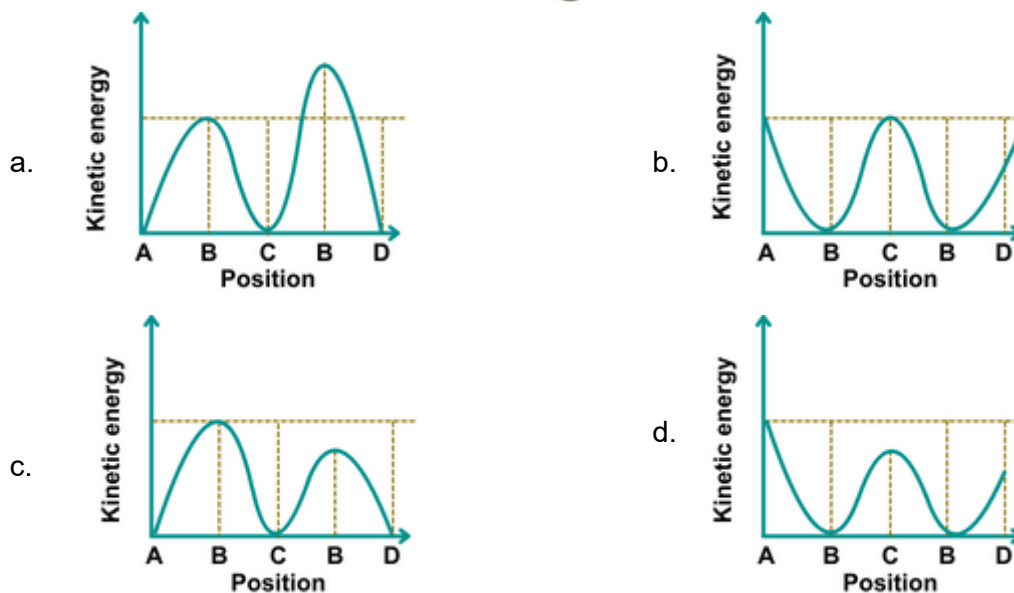
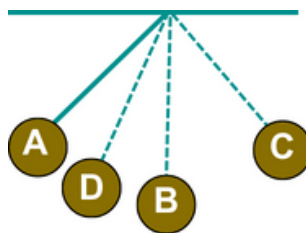
- A. Iron nail N repelled the magnet.
- B. The magnet lost its magnetism at point X.
- C. Iron nail M was attracted to the magnet as the magnetic attraction of the magnet was strongest at its poles.



- a. A only
- b. C only
- c. A and B only
- d. A and C only

Cognitive Domain: Reasoning	Content Domain: Physical Science
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34. Kevin carried out an experiment with a pendulum as shown in the diagram below. He released the metal ball at position A and let it swing to position C and then back to position D. Which one of the following graphs shows the change in kinetic energy of the metal ball as it swung from A to C and then back to D passing through position B at both times?



Cognitive Domain: Knowing	Content Domain: Physical Science
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35. If you are using a screwdriver to twist out a screw, you are actually utilising two fundamental simple machines. What are they?

- a. Lever and wedge
- b. Inclined plane and wheel and axle
- c. Pulley and wedge
- d. Inclined plane and wedge

Cognitive Domain: Reasoning

Content Domain: Life Science

36. Plants go through different stages of development and each stage has specific characteristics. Look at the diagram given below and accurately identify the functions that the stages 1, 2, 3 and 4 can perform.



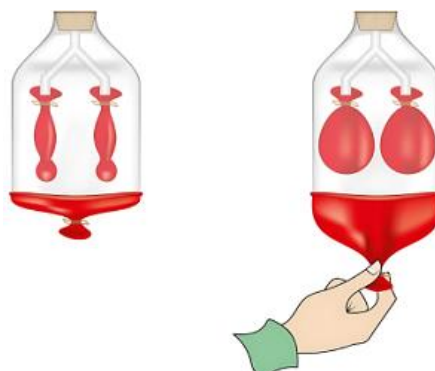
	Can absorb water	Can make food	Can reproduce
A	1, 2, 3, 4	2, 3, 4	4
B	2, 3, 4	3,4	4
C	1, 2, 3, 4	3,4	4
D	3,4	2, 3, 4	1,4

- a. A
- b. B
- c. C
- d. D

Cognitive Domain: Applying

Content Domain: Life Science

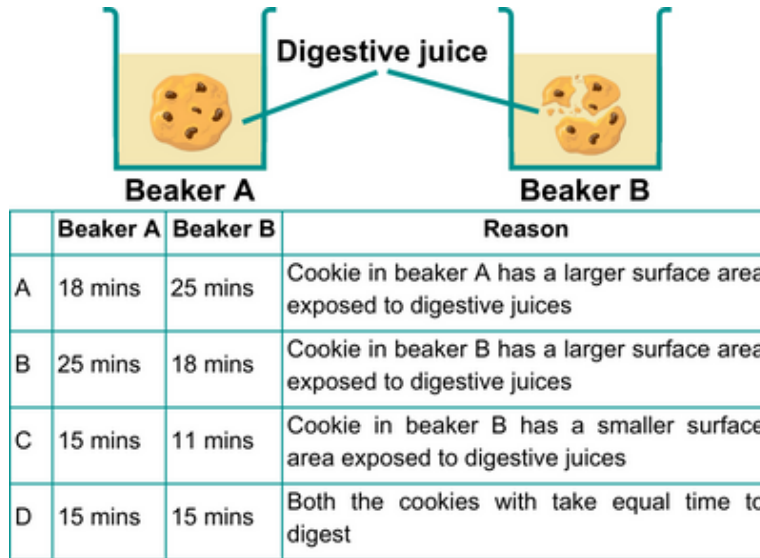
37. During a class activity, Emily uses a balloon to demonstrate how lungs work. She explains that when the balloon expands, it represents a specific part of breathing. What is Emily demonstrating with the expanding balloon?



- a. The release of carbon dioxide from the lungs.
- b. The movement of oxygen into the blood.
- c. Exhaling, where the lungs expel air.
- d. Inhaling, where the lungs fill with air.

Cognitive Domain: Reasoning	Content Domain: Life Science
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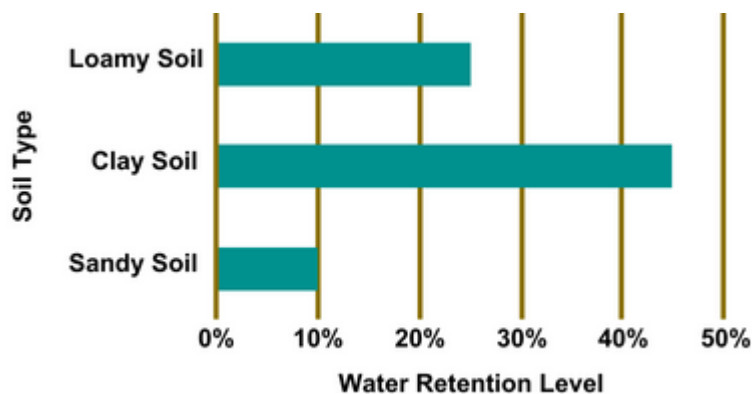
38. A student investigated how food size affects digestion speed. They placed cookies in two beakers with digestive juices and measured the time it took for the cookies to break down (refer to the diagram below). Which of the following best predicts the time it would take to break down the cookie in Beaker A and Beaker B, and why?



- a. A
- b. B
- c. C
- d. D

Cognitive Domain: Applying	Content Domain: Environmental Science
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39. You're helping your friend plant a garden. Your town doesn't get much rain even in monsoon. They want to choose the best soil type to retain moisture for their plants and ensure that their plants get proper nutrients. The chart given below shows how much water different soil types can hold. Considering the data, which soil type would be MOST suitable for growing plants in a region with scarce rainfall?



- a. Clay soil
- b. Sandy soil
- c. Loamy soil
- d. A mixture of loamy soil and clay soil

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Direction (for questions 40 to 42): Carefully read the given passage taken from an advertisement by a supermarket and answer the following questions.

A Glimpse into Food Preservation at GreenGrocer Mart

GreenGrocer Mart employs a variety of scientific methods to ensure the freshness and safety of our products. Our techniques include cooling, where fruits and vegetables are stored at 4°C to slow bacterial growth, and freezing, which completely halts bacterial activity at -18°C, preserving the food's quality for up to a year.

We also utilise drying to remove moisture, extending the shelf life of products like dried fruits and nuts. Canning involves heating food to eliminate bacteria, then sealing it in airtight containers, allowing for a storage period of up to two years. Additionally, certain foods contain safe chemical preservatives to prevent bacterial growth.

The data given below highlights the shelf life of the products preserved by different techniques. Through these diverse preservation strategies, Green Grocer Mart ensures that all customers have access to fresh, safe, and nutritious food every day.

Method	Example	Shelf Life
Cooling	Apples, Carrots	1-4 weeks
Freezing	Peas, Chicken	Up to 1 year
Drying	Apricots, Almonds	6 months
Canning	Tomatoes, Peaches	2 years
Chemicals	Jams, Cured Meats	Varies

Cognitive Domain: Reasoning

Content Domain: Life Science

40. GreenGrocer Mart uses different preservation methods depending on the food. Why do you think they don't simply freeze everything to keep it fresh the longest?
- A. Freezing can change the taste and texture of some foods.
 B. Not all foods require such a long shelf life.
 C. Microwaves wouldn't be able to heat frozen food properly.
- a. A only
 b. A and B only
 c. B and C only
 d. A, B and C

Cognitive Domain: Applying

Content Domain: Life Science

41. Imagine there's a power cut at Green Grocer Mart. Which section of food would be most at risk of spoiling quickly?
- a. The canned food section
 b. The shelf with jams and cured meats
 c. The frozen food section
 d. The refrigerator section

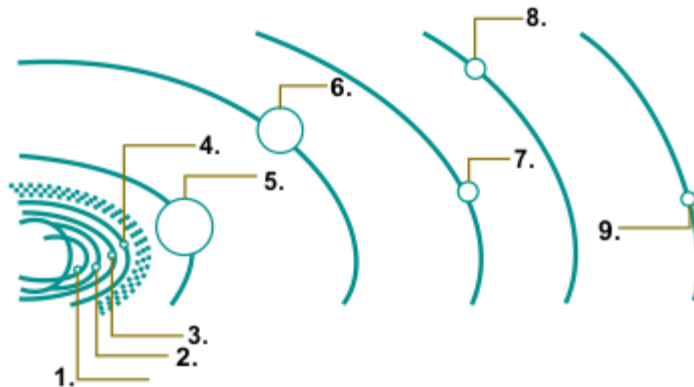
Cognitive Domain: Knowing

Content Domain: Life Science

42. GreenGrocer Mart receives a shipment of fish that needs to be kept safe for consumption for at least six months. Which preservation method should they choose based on the information in the passage?
- a. Freezing
b. Cooling
c. Drying
d. Chemicals

Direction (for questions 43 to 45): Consider the passage given below and answer the following question:

Our solar system is a vast and wondrous place, consisting of the Sun at its centre and a collection of orbiting celestial bodies. Planets, dwarf planets, moons, asteroids, comets, and dust all make up this cosmic neighbourhood. The planets orbit the Sun in elliptical paths, each with its unique characteristics and composition.



Cognitive Domain: Knowing

Content Domain: Environmental Science

43. Imagine you live on another planet in our solar system. Based on the diagram, which planet would you choose to experience the shortest year?
- a. Venus
b. Mars
c. Earth
d. Mercury

Cognitive Domain: Applying

Content Domain: Environmental Science

44. Look at the diagram. If a new planet were to be discovered that fit between planets 5 and 6, what would be the most likely characteristic of this new planet based on its position?
- A. It could be a gas giant.
B. It will take an elliptical path to orbit around the sun.
C. Its temperature would definitely be higher than planet 2.
- a. A and B only
b. B only
c. B and C only
d. A, B and C

45. Study the diagram carefully. Identify the celestial bodies found within the solar system that are likely not depicted in the diagram.

- a. Star, Moon, Comet, Meteoroid
- b. Moon, Comet, Meteoroid
- c. Star, Moon, Comet, Meteoroid, Dwarf planet
- d. Moon, Comet, Meteoroid, Galaxy

Answer Key

1.	c	2.	a	3.	b	4.	a	5.	d	6.	d	7.	d
8.	b	9.	c	10.	a	11.	c	12.	b	13.	a	14.	a
15.	b	16.	d	17.	b	18.	a	19.	d	20.	c	21.	a
22.	b	23.	c	24.	a	25.	b	26.	c	27.	c	28.	d
29.	b	30.	c	31.	a	32.	d	33.	b	34.	c	35.	b
36.	c	37.	d	38.	b	39.	d	40.	d	41.	d	42.	a
43.	d	44.	a	45.	b								