ASMOPSS THAILAND 2026

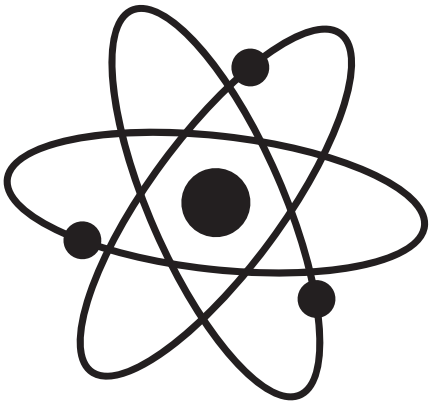
Asian Science & Mathematics Olympiad for Primary and Secondary Schools (Thailand)

Science Primary G.6

Sunday, August 9, 2026

10:30 a.m. – 12:00 p.m. (90 minutes)

B



Instructions

1. This exam includes 40 questions, with 4 choices given (100 marks).
2. Use a 2B black pencil or darker one to fill in the circle.
3. Fill out your name, grade, school, test center, room, seat number, and identification number either in pen or in pencil.
4. If you want to change an answer that you have already marked, use a clean eraser to erase the incorrect answer and mark the new one.
5. It should be noted that figures in the exam are not drawn to scale.
6. Dictionaries, calculators, and electronic devices are not permitted in the test room.
7. Note taking can be done on the test paper only, with no extra sheet provided.
8. Do not write anything or make any symbols in the black barcode area along the edge of the paper except the answers on the answer sheet. Make sure the answersheet is not crumpled.
9. Submit the answer sheet to the proctor when the time is up.
10. Cheating in the exam may cause serious consequences including disqualification from receiving any award or joining the second round of the test held by ASMOPSS THAILAND.

Should any disagreement arise, the judgment of the panel is deemed final.

Announcement of the results via https://asmopssthailand.com on September 16, 2026

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Contact US

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Instructions :

1. Each question carries a different score, as indicated at the end of the question.
2. Students must select only the one best answer for each question.

1. A STEM team builds four small roof prototypes to determine which design collects the greatest volume of rainwater.

Each prototype is tested with the same volume of artificial rain. The team expects each roof to collect between 80 and 140 milliliters of water.

The following equipment is available:

- ▶ a 250-milliliter graduated cylinder marked every 2 milliliters,
- ▶ a 1-liter beaker marked every 100 milliliters,
- ▶ a ruler marked in millimeters, and
- ▶ a digital balance that measures mass in grams.

Which procedure would provide the most reliable comparison of the water collected by the roof prototypes? (1.25 marks)

1. Measure the height of the water with the ruler while it remains in containers of different shapes, then compare the measured heights directly.
2. Place each empty roof on the balance, record its mass before the rain test, and use the roof's original mass as the collected-water volume.
3. Pour the water into the graduated cylinder, place it on a level surface, read the bottom of the meniscus at eye level, and repeat each roof test several times.
4. Pour the water into the large beaker, hold it above eye level, estimate the volume between the markings, and test each roof only once.

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2. The table shows the numbers of bacteria in Samples A and B during a five-hour laboratory investigation.

Time (hours)	Number of Bacteria in Sample A	Number of Bacteria in Sample B
0	1	1
0.5	2	1
1.0	4	2
1.5	8	2
2.0	16	4
2.5	32	4
3.0	64	8
3.5	128	8
4.0	256	16
4.5	512	16
5.0	1,024	32

Assume that the laboratory conditions remain unchanged and that both samples continue to follow the patterns shown in the table until 6 hours.

Which statement correctly predicts the bacterial populations at 6 hours and explains the difference between their reproductive patterns? (1.25 marks)

1. Sample B will contain 64 bacteria, Sample A will contain 64 times as many bacteria as Sample B, and A doubles twice as often as B.

2. Sample B will contain 64 bacteria, Sample A will contain 32 times as many bacteria as Sample B, and both samples have the same doubling time.

3. Sample B will contain 128 bacteria, Sample A will contain 32 times as many bacteria as Sample B, and B doubles twice as often as A.

4. Sample B will contain 32 bacteria, Sample A will contain 128 times as many bacteria as Sample B, and B stops reproducing after 5 hours.

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3. A student exploring alternative energy sources looked out at a field covered in large solar panels (photovoltaic cells) baking under direct sunlight. Unlike wind turbines or coal power plants, solar panels do not require any moving mechanical parts or spinning turbines to generate electricity. How do these solar panels directly generate electrical energy?
(1.25 marks)

1. They burn solar radiation to create high-pressure steam that exits through tiny microscopic exhausts.

2. They absorb light energy directly from the sun and convert it into electrical energy using specialized semiconductor materials.

3. They trap wind currents underneath the glass panel to build up physical compression forces.

4. They absorb sound waves from ambient birds and wind to vibrate internal crystals.

4. Meteorologists observe a high-pressure system moving into a region previously dominated by a low pressure. Based on the behavior of air molecules and atmospheric pressure, which prediction best describes the resulting weather and wind direction? (1.25 marks)

1. The high-pressure system will cause air to rise rapidly into the upper atmosphere, creating severe tornadic activity.

2. Air will move from the high-pressure area to the low-pressure area, generating wind, while the sinking air in the high-pressure system brings clear skies.

3. Air molecules will stop moving completely due to the pressure equalization, resulting in a complete absence of wind.

4. Air will rush inward toward the center of the high-pressure system, causing rapid cloud formation and heavy rainfalls.

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5. A packaging company wants to develop a new eco-friendly delivery box capable of transporting hot soups and cold ice creams together in separate compartments. The divider between the two compartments must minimize heat transfer so the ice cream does not melt and the soup stays hot. What type of material structure and property should the divider possess? (1.25 marks)

1. A porous or trapped-air structure made from a polymer with low thermal conductivity.
2. A thin sheet of transparent glass to allow delivery drivers to see through the compartments.
3. A dense metallic alloy with high thermal conductivity to quickly balance the temperatures.
4. A biodegradable natural fiber that absorbs water easily and expands when heated.

6. During a cooking class, five different actions were performed:

A. Melting butter in a hot pan.
B. Baking a cake in the oven.
C. Chopping raw onions.
D. Caramelizing sugar until it turns brown and smelly.
E. Dissolving salt in warm water.

Which option correctly groups these actions into physical and chemical changes?
(1.25 marks)

1. Physical: C, E Chemical: A, B, D
2. Physical: B, D Chemical: A, C, E
3. Physical: A, B, C Chemical: D, E
4. Physical: A, C, E Chemical: B, D

7. Students are testing three different toy cars on a wooden track. Car A has a mass of

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200 grams, Car B is 400 grams, and Car C is 600 grams. If the students push each car with the exact same amount of force, which of the following statements correctly predicts and explains their motion based on Newton's laws? (1.25 marks)

1. All three cars will accelerate at the same rate because the applied force is identical.
2. Car A will accelerate the fastest because it has the least mass, meaning it requires less force to change its motion compared to the heavier cars.
3. Car B will travel the furthest because its medium mass perfectly balances friction and gravity.
4. Car C will accelerate the fastest because its larger mass gives it more momentum to overcome air resistance.

8. During a physical education class, a student kicks a soccer ball across a dry grass field. The ball rolls quickly at first, gradually slows down over a distance of 15 meters, and finally comes to a stop. Which statement provides the most accurate scientific explanation for why the ball slows down and stops? (1.25 marks)

1. An unbalanced external force called friction, caused by the contact between the ball and the grass, acted opposite to the direction of motion.
2. The air molecules surrounding the ball pushed it forward until they became too dense, blocking its path.
3. The initial force from the student’s kick slowly ran out and was entirely used up inside the ball.
4. The downward force of gravity increased continuously as the ball rolled further away, crushing its forward speed.

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9. During a laboratory activity, students measure the distance at which a bar magnet can attract a small steel ball. They notice that the magnet can attract the ball from 5 cm away at the ends, but must be as close as 1 cm to attract it near the middle of the bar. What conclusion can be drawn from this observation? (1.25 marks)

1. The middle of the bar magnet possesses a different type of magnetism that repels steel.
2. The temperature of the magnet varies across its length, affecting its strength.
3. The steel ball becomes temporarily magnetized only when touching the exact center of the magnet.
4. The magnetic force is strongest at the poles and weakest near the center.

10. Two identical flexible plastic bottles are used in an experiment. Bottle A contains air at 50°C, while Bottle B contains air at 4°C. Both bottles are tightly capped at approximately atmospheric pressure and then placed in a room maintained at 25°C. After one hour, which observation is most likely, and why? (1.25 marks)

1. Both bottles will burst because temperature changes alter the chemical composition of the trapped air.
2. Bottle A will expand greatly because its trapped air becomes hotter as it reaches room temperature.
3. Both bottles will remain unchanged because plastic prevents thermal energy from entering or leaving.
4. Bottle A may collapse inward as its air cools and contracts, while Bottle B may expand slightly as its air warms.

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11. Alice lives in Tokyo, Japan, and Bob lives in Bangkok, Thailand. Tokyo is located further east than Bangkok. They decide to video call each other exactly at solar noon (when the Sun is at its highest point in the sky) in Alice's city. What will Bob observe out his window during the call? (1.25 marks)

1. The Sun has already passed its highest point, and it is late afternoon in Bangkok.
2. The Sun is still rising in the east, and it has not yet reached its highest point in Bangkok.
3. The Sun is setting in the west because Bangkok is behind Tokyo.
4. It is completely dark in Bangkok because the Sun cannot shine on two Asian countries at once.

12. Animals living in a grassland ecosystem depend on one another for survival.
After many lions in the grassland were killed by hunters, events W, X, Y, and Z occurred.

W. The number of plants in the grassland decreased.
X. The deer population increased rapidly.
Y. The deer population gradually decreased.
Z. There was not enough food available for the deer.

Arrange the events in the correct sequence, beginning with the event that occurred first.
(1.25 marks)

1. W, Z, Y, X
2. X, W, Z, Y
3. X, Z, W, Y
4. Y, Z, W, X

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13. A cart is tested on a track with very little friction. The forces shown in the table are all the horizontal forces acting on the cart during each trial.

Trial	Motion before the forces act	Force to the right (N)	Force to the left (N)	Observed motion
1	Stationary	4	4	Remains stationary
2	Moving to the right at a steady speed	3	3	Continues at the same speed
3	Moving to the right	6	2	Speeds up to the right
4	Moving to the right	2	6	Slows down while moving right

Which statement best explains all four results? (1.25 marks)

1. Balanced forces do not change an object's motion, while unbalanced forces can change its speed.

2. Balanced forces always stop a moving object, while unbalanced forces keep its speed constant.

3. A force to the right always increases speed, even when a larger force acts toward the left.

4. An object can move only while a force in its direction of motion is greater than every other force.

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14. Students compare four soil mixtures. They pour the same volume of water into the same mass of each mixture and record the results.

Soil sample	Drainage time (seconds)	Water retained after drainage (milliliters)	Organic matter (grams)
A	25	8	3
B	70	18	5
C	150	31	5
D	95	25	12

A type of seedling requires soil that

▶ retains at least 20 milliliters of water

▶ drains in less than 120 seconds

▶ contains the greatest possible amount of organic matter among the suitable samples.

Which soil sample should the students select? (1.25 marks)

1. Sample A, because it drains fastest and contains the smallest amount of retained water.

2. Sample B, because its drainage time is moderate even though it retains less than 20 milliliters.

3. Sample C, because it retains the most water even though its drainage time exceeds the limit.

4. Sample D, because it satisfies both limits and contains the most organic matter among suitable samples.

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15. Tommy wants to test whether adding a liquid organic fertilizer to the soil makes tomato plants produce heavier fruits. He buys 10 identical potted tomato plants of the same age and height, placing them all in his backyard where they receive equal sunlight and water. Every week, he adds 50 ml of the liquid organic fertilizer to 5 of the plants (Group X).
To make this experiment scientifically valid, how should Tommy treat the remaining 5 plants (Group Y), and what is the scientific term for Group Y? (2.5 marks)

1. He should keep Group Y inside a dark closet without any water; Group Y is the dependent Group.
2. He should give Group Y 50 ml of pure water instead of the fertilizer every week; Group Y is the control group.
3. He should double the amount of water given to Group Y to compensate; Group Y is the hypothesis group.
4. He should replace Group Y with chili plants to compare different species; Group Y is the constant group.

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16. Mario and Luigi want to compare four brands of dishwashing liquid for their ability to remove oil from plastic plates. Their teacher requires them to use identical plates, equal initial amounts of oil, equal volumes of detergent, the same water temperature, and the same number of scrubbing strokes.

Before conducting the experiment, the students must establish an operational definition of "grease-removal effectiveness" so that the results can be measured and compared reliably.

Which statement provides the most appropriate operational definition? (2.5 marks)

1. The average cleanliness score assigned after students touch and visually examine each washed plate
2. The length of time the detergent foam remains after each plate is scrubbed under identical conditions
3. The percentage of the initial oil mass removed by equal detergent volumes under identical washing conditions
4. The amount of surfactant detected in each detergent brand through a chemical composition analysis

17. A group of young scientists is designing a special capsule to protect a fragile electronic device during a deep-sea exploration. The capsule will experience extreme water pressure and very low temperatures, and it must not sink too quickly so that researchers can monitor its descent. Additionally, it requires a transparent window for an internal camera to record the outside environment. Based on these requirements, which combination of material properties is most critical for designing the main body and the window? (2.5 marks)

1. Main body: High compressive strength and low density
   Window: High transparency and high hardness.
2. Main body: High hardness and low electrical conductivity
   Window: High transparency and high magnetism.
3. Main body: High density and high thermal conductivity
   Window: High transparency and high solubility.
4. Main body: High electrical conductivity and high malleability
   Window: High transparency and high flexibility.

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18. A science teacher set up a model racetrack to simulate an amusement park ride. She used three identical plastic toy carts (Cart A, Cart B, and Cart C) and placed different numbers of heavy iron blocks inside them to vary their total mass.

A spring-loaded launcher applied the exact same pushing force to each cart. The students then used a stopwatch and a meter ruler to measure how easy it was to get the carts moving and how long it took for them to stop.

Table: Mass of Carts and Movement Observations

Toy Cart	Total Mass (grams)	Pushing Force Applied	Observations of the Cart's Motion
Cart A	100	Same	Starts moving very quickly; changes speed instantly with a light push.
Cart B	300	Same	Starts moving normally; requires slightly more effort to change speed.
Cart C	600	Same	Starts moving very slowly; strongly resists any change to its speed.

What is the correct conclusion regarding how mass affects an object's change in motion? (2.5 marks)

1. An object with more mass is much easier to start moving and changes speed much faster when the same force is applied.
2. The mass of an object has no effect on its motion, all carts will travel at the same speed because the pushing force was equal.
3. An object with less mass resists changes in motion more strongly, which is why Cart A accelerated the fastest.
4. An object with more mass has a greater resistance to changing its motion, meaning it is harder to start moving and harder to speed up.

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19. The properties of three substances in a mixture are shown below:

Substance X : Density 2.5 g/cm^3, insoluble in water, and non-magnetic.

Substance Y : Density 1.2 g/cm^3, soluble in water, and non-magnetic.

Substance Z : Density 7.8 g/cm^3, insoluble in water, and magnetic.

Which sequence would separate Substance Y from the mixture with the highest purity? (2.5 marks)

1. Sieve the mixture to separate X and Z according to their different densities.
2. Filter the dry mixture, remove magnetic particles, and then evaporate the residue.
3. Add water to dissolve Y, filter out X and Z, and then evaporate the filtrate.
4. Use a magnet to remove Y, filter the remaining solids, and then collect the residue.

20. A student has two identical-looking metal bars: Bar X is made of hardened carbon steel, and Bar Y is made of soft pure iron. Initially, neither bar shows any magnetic properties.
The student places both bars inside a strong magnetic field for 10 minutes. When removed, both bars attract small steel paperclips.
Next, the student performs two tests to see how well the bars retain their magnetism:

Test 1: The student drops both bars onto a concrete floor 20 times.

Test 2: The student heats both bars over a flame for 2 minutes.

Based on how magnetic domains behave in permanent and temporary magnets, which statement correctly predicts the outcome? (2.5 marks)

1. Bar Y will retain its magnetism better than Bar X because soft pure iron has domains that lock into place permanently when exposed to an external field.
2. Bar X will remain magnetic while Bar Y loses most of its strength, because Bar X becomes a permanent magnet while Bar Y behaves as a temporary magnet.
3. Both bars will lose their magnetism at the exact same rate because dropping and heating have no effect on internal domain alignment.
4. Bar Y will become even stronger after being heated because heat provides kinetic energy that helps temporary magnetic domains line up more perfectly.

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21. A group of students built a homemade guitar to study how sound travels and changes. They stretched four different rubber bands over an empty wooden tissue box, then performed two separate tests:

Action 1 (Changing tension): They pulled some rubber bands very tight and left others loose, plucking each with the same finger force.

Action 2 (Changing plucking force): They took one single rubber band, plucked it gently first, and then plucked it much harder.

Table : Physical Properties of Rubber Bands and Sound Observations

Rubber Band	Band Properties	How Hard It Was Plucked	Sound Properties Heard by Students
Band W	Short and pulled very tight	Gently	High pitch (Squeaky/Sharp) and quiet
Band X	Short and pulled very tight	Hard	High pitch (Squeaky/Sharp) and loud
Band Y	Long and left very loose	Gently	Low pitch (deep and heavy) and quiet
Band Z	Long and left very loose	Hard	low pitch (deep and heavy) and loud

Which choice correctly explains how frequency (pitch) and loudness are controlled in this experiment? (2.5 marks)

1. Plucking a rubber band harder makes it vibrate faster, changing the sound from a low pitch to a high pitch.
2. The tension of the rubber band controls its loudness, meaning tight rubber bands always make louder sounds than loose ones.
3. The pitch depends on how tight the rubber band is, while the loudness depends on how hard it is plucked.
4. Band Y produces the highest frequency because loose objects always vibrate much faster than tight objects.

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22. A group of student scientists inside a space research laboratory wanted to test how different gravitational fields affect the mass and weight of an object. They packed a single, sealed titanium cylinder (labeled Object K) and transported it to three different research stations: Earth, Planet X, and Planet Y. At each station, they used two instruments:

An electronic beam balance: To measure the total amount of matter inside Object K.

A calibrated spring newton-meter: To measure the downward gravitational pull acting on Object K.

Table: Measurement Data of Object K Across Different Planets

Research Station	Gravitational Strength compared to Earth	Measured Mass (kg)	Measured Weight (N)
Station 1: Earth	1.0 × Earth's gravity	12	120
Station 2: Planet X	Unknown	12	40
Station 3: Planet Y	Unknown	12	240

Which statement provides the most accurate scientific conclusion regarding Object K and the gravitational environments of the planets? (2.5 marks)

1. The mass of Object K remained at 12 kg everywhere because mass is the amount of matter in an object and does not change with location; furthermore, the gravity on Planet X is 3 times weaker than Earth's gravity.

2. The weight of Object K changed because the amount of physical matter inside the titanium cylinder shrunk on Planet X and expanded on Planet Y.

3. The gravity on Planet Y is 20 times stronger than Earth's gravity because the recorded weight increased from 120 N to 240 N.

4. If Object K is taken to deep space with absolute zero gravity, its recorded mass will drop to 0 kg while its weight stays at 120 N.

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23. A science teacher designed a game called "The Secret Message Box." She placed a bright glowing card with a hidden word inside a wooden box. To read the word, students must look through a viewing slot on top of the box. The teacher prepares four different square plates (Plate 1, Plate 2, Plate 3, and Plate 4) of identical size and thickness to cover the viewing slot. Students use a digital light sensor to measure the light intensity emerging from the slot both before and after placing each plate over it. The baseline light intensity without any plate was exactly 4,000 lux.

Table: Light Sensor Measurements and Visual Details

Tested Plate	Light Intensity After Passing the Plate (lux)	What the Students See Through the Slot
Plate 1	3,850	Can read the hidden word perfectly and clearly.
Plate 2	1,900	Can see the bright glowing card, but the letters are too blurry to read.
Plate 3	0	Complete darkness; cannot see the card or the word at all.
Plate 4	2,150	Can see a fuzzy shape of the card, but the word cannot be identified.

After finishing the experiment, the students wrote four analytical statements based on the data in Table:

Statement I: Plate 1 is a transparent medium because it allows almost all light to travel straight through to our eyes, making the image behind it completely clear.

Statement II: Plate 2 and Plate 4 are translucent media because they absorb or scatter some of the light rays, creating a dim, blurry view of the object.

Statement III: Plate 3 is an opaque medium because the light intensity drops to 0 lux, proving that it blocks all light from passing through.

Statement IV: If the teacher wants the students to see a bright light but keep the secret word completely hidden, Plate 1 is the best plate to choose.

How many of the given statements (I to IV) are scientifically CORRECT? (2.5 marks)

1. Only 1 statement is correct.
2. Only 2 statements are correct.
3. Only 3 statements are correct.
4. All 4 statements are correct.

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24. A meteorological research team launches a specialized weather balloon equipped with digital sensors from sea level (0 km) up into the stratosphere, reaching an altitude of 25 km. The balloon measures variations in atmospheric pressure and ambient air temperature at different heights. The compressed datasets are recorded in the table below.

Table : Data Profiles of Atmospheric Variables Against Altitude

Altitude Marker	Atmospheric Pressure (mmHg)	Approximate Air Density (kg/m^3)	Air Temperature (°C)
0 km (Sea Level)	760	1.20	+15
5 km (High Mountain)	400	0.70	-18
11 km (Troposphere Border)	170	0.36	-56
20 km (Stratosphere Mid-Layer)	40	0.09	-45
25 km (Upper Stratosphere)	18	0.03	-30

Based on the patterns shown in Table, which statements correctly explains the physical properties of air at different altitudes? (2.5 marks)

1. Air temperature decreases uniformly and continuously at all levels of Earth's atmosphere without ever rising.

2. As altitude increases, atmospheric pressure drops because gravity pulls the majority of air molecules closer to Earth's surface, creating a denser molecular layer at sea level.

3. Air density increases as the balloon flies higher because cold temperatures cause gaseous nitrogen to condense into heavy liquid drops.

4. At 25 km, air pressure is at its highest point because the balloon is closer to space where solar radiation compresses gas molecules.

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25. A heavy rainstorm hits the school during lunch break, causing a large puddle of rainwater to leak onto the classroom floor right next to the library bookshelf. A group of primary 6 science club students needs to act quickly to solve two problems:

Problem 1 (The Wiper): They need to find a highly absorbent material from the recycling bin to soak up the liquid puddle immediately before the water ruins the wooden bookshelf.

Problem 2 (The Barrier): They need a waterproof material to place underneath the leaking ceiling to catch falling water drops without letting them leak onto the floor.

They check the classroom recycling bin and find four clean waste items:

Item W : A large bundle of dry, crumpled newspaper sheets.

Item X : An old cotton T-shirt cut into squares.

Item Y : A thick, flexible plastic shopping bag.

Item Z : A glossy, waxy cardboard milk carton (opened flat).

Based on the physical properties of these materials in the recycling bin, which of the following choices provides the most scientific and eco-friendly plan to solve both problems successfully? (2.5 marks)

1. Use Item Y as the Wiper because plastic absorbs liters of liquid instantly, and use Item W as the Barrier because wet paper never tears.

2. Use Item X as the Wiper because cotton fibers have a high water-absorbing capacity to soak up the puddle, and use Item Y as the Barrier because plastic is waterproof and prevents leaks.

3. Use Item W as both the Wiper and the Barrier because paper is completely waterproof and can be washed and reused for twenty years.

4. Use Item Z as the Wiper because wax absorbs water like a sponge, and use Item X as the Barrier because fabrics allow water to pass through onto the floor.

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26. A science teacher brought three different types of rocks to class and placed them into three boxes labeled Box 1, Box 2, and Box 3. She asked her students to determine how each rock was formed. The students examined the rocks using a magnifying glass and performed a simple scratch test to check their physical properties. They recorded their observations in the table below.

Table: Student Observations of Three Rock Samples

Rock Sample Location	Main Physical Features and Textures	How the Rock Formed in Nature
Box 1	Shows clear, flat layers pressed tightly together; contains tiny pieces of river sand and small plant fossils.	Layers of sediment, mud, and organic matter accumulated over time and were compacted together.
Box 2	Very hard with shiny, interlocked mineral crystals; contains no layers or fossils.	Molten magma cooled slowly deep underground, allowing large crystals to grow.
Box 3	features ribbon-like, wavy bands of different colors; shows signs of being deformed and squeezed by intense pressure.	An older rock was pushed deep underground and altered by intense heat and pressure without melting.

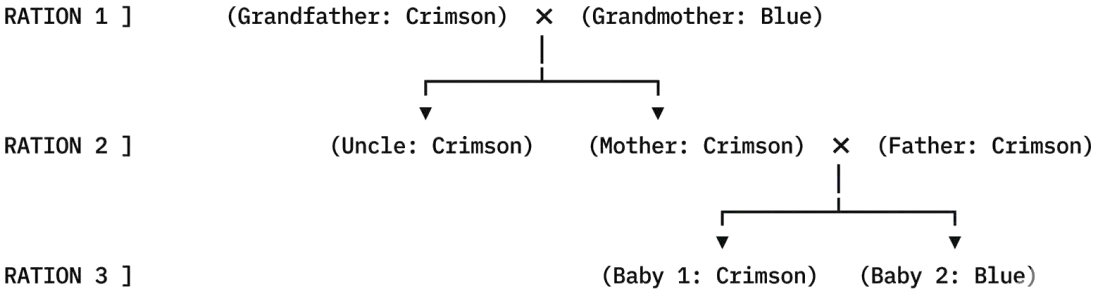
Which option correctly rock classification for each box? (2.5 marks)

1. Box 1: Sedimentary rock Box 2: Igneous rock Box 3: Metamorphic rock
2. Box 1: Igneous rock Box 2: Sedimentary rock Box 3: Metamorphic rock
3. Box 1: Metamorphic rock Box 2: Igneous rock Box 3: Sedimentary rock
4. Box 1: Sedimentary rock Box 2: Metamorphic rock Box 3: Igneous rock

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27. In a mythical rainforest sanctuary, a team of geneticists is studying the family tree of a rare reptile species known as the "Emerald Dragon." These dragons can have two distinct physical traits for their scales:

Fiery Crimson Scales: A powerful dominant trait controlled by the allele (R).
Ocean Blue Scales: A recessive trait controlled by the allele (r).
A dragon will display *Fiery Crimson Scales* if its genotype is either homozygous dominant (RR) or heterozygous (Rr). Conversely, a dragon can only exhibit *Ocean Blue Scales* if it inherits two copies of the recessive gene, making it homozygous recessive (rr).
The scientists tracked three generations of a specific dragon family and recorded their scale colors in the pedigree chart below.



Based on the provided genetic rules and the family tree, which of the following statements correctly analyzes the genotypes of the family members and predicts the true biological outcome? (5 marks)

1. Grandmother and Baby 2 must have a heterozygous genotype (Rr) because blue scales are a dominant trait that completely masks the recessive allele.

2. If Mother and Father have a third dragon baby, there is a 100 % guarantee it will have crimson scales, as the recessive blue alleles were already used up by Baby 2.

3. Both Mother and Father in Generation 2 must be heterozygous (Rr) because they express the crimson scale phenotype but passed down the recessive alleles (r) required for Baby 2 to have blue scales.

4. Incubating a blue scale from Baby 2 under a laboratory heat lamp will instantly mutate its DNA, permanently changing its genetic structure from rr to RR.

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28. A team of food scientists is developing a new recipe for an emergency survival protein bar. During the development process, they performed four consecutive procedures on different ingredients and recorded the visual behaviors, temperature adjustments, and internal structures of the ingredients before and after each procedure:

[**Procedure 1**] → Solid coconut oil is heated inside an incubator, turning it into a clear liquid. When returned to the refrigerator, it reverts to the exact same solid.

[**Procedure 2**] → White sugar crystals are stirred into warm water until they completely disappear, creating a clear, sweet energy syrup.

[**Procedure 3**] → Baking soda is mixed with liquid citric acid inside a closed flask. The mixture instantly fizzes, bubbles vigorously, and releases carbon dioxide gas (CO_2) while the flask becomes noticeably colder.

[**Procedure 4**] → Raw liquid egg whites are poured onto a hot steel plate. The liquid rapidly hardens into an opaque, rubbery white solid that cannot be turned back into liquid.

Which of the following choices correctly classifies these changes and provides the most accurate scientific justification? (5 marks)

1. Procedure 1 and Procedure 2 are both chemical changes because heating oil and dissolving sugar rearrange the atomic nuclei to create entirely new molecular substances.
2. Procedure 4 represents a chemical change because heat from the plate denatures and rearranges the protein bonds inside the egg white, creating a new solid with distinct, irreversible properties.
3. Procedure 2 is a chemical change and Procedure 3 is a physical change because dissolving solids in water is a permanent reaction that can never be undone.
4. All four procedures are strictly physical changes because the final products retain the basic taste profile, which include sweet, fatty, or salty, of the original food ingredients.

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29. A group of Grade 6 student researchers wants to find the most efficient and sustainable material to clean up liquid spills in the school cafeteria. They collect four different material sheets (labeled Material W, Material X, Material Y, and Material Z) of identical size (10 x 10 cm) and thickness.

To test water-absorbing capacity, the students perform a controlled experiment:

1. They measure the initial dry mass of each material sheet in grams.
2. They submerge each sheet completely in a beaker filled with 200 mL of water for exactly 1 minute.
3. They lift the sheets, let the excess water to drip off for 5 seconds, and immediately measure the wet mass.

To make it more eco-friendly, the students also record whether each material can be broken down, remolded, or recycled into new cardboards.

Table: Mass Changes and Environmental Properties of Materials

Tested Material Sheet	Initial Dry Mass (g)	Final Wet Mass (g)	Water Absorbed (g)	Recyclable into New Paper/Cardboard Products?
Material W	5.0	5.2	0.2	No (Can only be melted into hard plastic toys)
Material X	8.0	48.0	40.0	No (Fabrics require textile shredding, not paper milling)
Material Y	4.0	20.0	16.0	Yes (Can be soaked, pulped, and rolled again)
Material Z	6.0	6.3	0.3	Yes (Requires plastic-wax lining separation first)

Which of the following choices provides the most accurate analysis regarding material utility and sustainability for the school cafeteria? (5 marks)

1. Material W is the absolute best choice for absorbing heavy liquid spills because its low water absorption proves it can store water molecules without expanding.
2. Material X has the highest water-absorbing capacity, absorbing 5 times its own dry mass, and it is the easiest material to immediately dissolve into recycled notebook paper.

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3. Material Y shows balanced absorption (absorbing 4 times its own dry mass) and is highly sustainable because its fibers can be easily soaked, mashed into pulp, and flattened to create brand-new, eco-friendly paper products.

4. Material Z is completely waterproof because its final wet mass dropped to zero, proving the protective wax coating entirely prevents water.

30. An elementary school science club conducts an experiment to study chemical digestion in the human digestive system. They prepare four test tubes containing different combinations of substances and keep them in a water bath maintained at exactly 37°C for 30 minutes:

Tube A: Starch solution + Saliva

Tube B: Starch solution + boiled saliva (Saliva was boiled before mixing)

Tube C: Egg white (Protein) + Gastric juice

Tube D: Egg white (Protein) + Saliva

After 30 minutes, they test the contents of each tube. Which of the following choices correctly predicts the experimental results? (5 marks)

1. Tube B remains brown with iodine solution, proving that boiling enhances the chemical reaction of saliva.

2. Tube C remains blue with Biuret reagent, indicating that the protein in the egg white has been chemically digested by the gastric juice.

3. Tube D turns purple with Biuret reagent, proving that saliva is the primary fluid responsible for protein digestion in the human body.

4. Both Tube A and Tube B will yield identical results because temperature does not affect enzyme function.

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31. A local farmer manages a large organic cornfield that functions as a small, balanced ecosystem. In this environment, four main organisms interact through a simple food chain:

Corn plants capture energy from sunlight and use it to grow.

Grasshoppers feed on the fresh green leaves of the corn plants.

Frogs hide under the plants and hunt grasshoppers for food.

Hawks fly above the field and use their sharp eyesight to catch and eat frogs.

Ecological disruption event: One summer, a neighboring farm accidentally releases a large amount of chemical pesticide. The pesticide specifically targets frogs, eliminating 95% of the frog population in the cornfield within one week. It does not directly harm the corn plants, grasshoppers, or hawks.

Based on the food-chain relationships and the ecological disruption described above, which choice correctly predicts and explains the likely long-term biological outcome in this ecosystem? (1.25 marks)

1. The hawk population will rapidly increase because fewer frogs leave more open ground space for hawks to build nests.
2. The corn plants will face a serious decline because fewer frogs allow grasshopper numbers to increase and consume more corn leaves.
3. The grasshopper population will immediately fall to zero because grasshoppers cannot survive without hearing frogs croak.
4. Corn plants will stop making sugar from sunlight because hawks will begin eating corn plants instead of hunting animals.

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32. A group of young geologists went on a field trip to a mysterious volcanic island to collect three different rock samples: Rock X, Rock Y, and Rock Z. They brought the samples back to the school laboratory and examined their textures, layers, and internal structures under a magnifying glass. The students recorded their observations in their field notebooks as follows:

Rock X : Found near an old, dried lava flow. It is dark black, smooth, and very shiny like glass. It formed when hot liquid lava cooled extremely quickly on Earth's surface after a volcanic eruption.

Rock Y : Found at the bottom of a riverbed near the coast. It contains visible layers of compressed sand and small pebbles, and it also has a small imprint of an ancient seashell fossil.

Rock Z : Found deep inside a mountain, where rocks were exposed to strong underground forces. It has wavy, parallel mineral bands formed when pre-existing rocks were squeezed by intense tectonic pressure and heated strongly without melting.

Based on these observations and the principles of the rock cycle, which of the following choices correctly classifies Rock X, Rock Y, and Rock Z into their true geological families? (1.25 marks)

1. Rock X: Metamorphic Rock , Rock Y: Igneous Rock , Rock Z: Sedimentary Rock
2. Rock X: Igneous Rock , Rock Y: Sedimentary Rock , Rock Z: Metamorphic Rock
3. Rock X: Sedimentary Rock , Rock Y: Metamorphic Rock , Rock Z: Igneous Rock
4. Rock X: Igneous Rock , Rock Y: Metamorphic Rock , Rock Z: Sedimentary Rock

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33. A student scientist wanted to determine how different environmental factors—sunlight, water, and carbon dioxide (CO_2) gas—affect the growth and photosynthesis of tomato plants. She prepared four identical young tomato plants of the same initial height and planted them in the same type of nutrient-rich soil. Each plant was placed inside a transparent, sealed glass chamber where environmental conditions could be strictly controlled for 2 weeks. The experimental setup and observations were recorded in the logbook below:

Table Environmental Variables and 2-Week Plant Growth Results

Chamber Number	Sunlight Provided	Water Status	Carbon Dioxide (CO_2) in Air	Final Appearance of the Plant
Chamber 1	Yes	Wet	Yes	Excellent growth; healthy dark green leaves
Chamber 2	No	Wet	Yes	Stem grows long but very weak; leaves turn pale yellow
Chamber 3	Yes	Dry	Yes	Severe wilting; leaves dry out and become brittle
Chamber 4	Yes	Wet	No	Plant survives but growth stops completely; cannot produce starch

If the student scientist wants to scientifically prove that "plants require carbon dioxide (CO_2) gas as a raw material to perform photosynthesis and produce their food," which two chambers must she compare, and what is the scientific reasoning? (2.5 marks)

1. Compare Chamber 2 and Chamber 3 because comparing a dark box with dry soil proves that plants can make starch within a completely frozen environment.

2. Compare Chamber 1 and Chamber 4 because sunlight and water are kept exactly the same (controlled variable), meaning the lack of growth and starch in Chamber 4 is solely caused by the absence of carbon dioxide.

3. Compare Chamber 1 and Chamber 2 because keeping the plants hydrated proves that chlorophyll can only absorb yellow light from pale leaves.

4. Compare Chamber 3 and Chamber 4 because dry soil automatically prevents carbon dioxide gas from entering the glass chamber through the roots.

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34. A group of student scientists wants to study how different organs in the digestive system break down food using chemical enzymes. They set up four separate test tubes (Tube A, Tube B, Tube C, and Tube D) inside a water bath maintained at 37°C to simulate normal human body temperature.

They placed different types of food inside the tubes and added natural digestive juices collected from different organs. After leaving the tubes inside the water bath for 1 hour, they used chemical indicators to determine which foods were completely broken down into tiny, absorbable nutrient molecules.

Table: Food Types, Added Digestive Juices, and Final Laboratory Results

Test Tube	Type of Food Added	Digestive Juice Added to the Tube	Organ Where This Juice is Made	Final Result After 1 Hour in the Water Bath
Tube A	Cooked White Rice	Saliva	Mouth	Fully digested into sweet, simple sugars.
Tube B	Steamed Fish Fillet	Gastric Juice	Stomach	Fully digested into small amino acid chains.
Tube C	Steamed Fish Fillet	Saliva	Mouth	No change
Tube D	Vegetable Oil	Gastric Juice	Stomach	No change

Which of the following choices provides the most accurate scientific conclusion regarding how the human digestive system works? (2.5 marks)

1. Tube C and Tube D show no change because chemical digestion can only happen inside the lungs and heart, rather than the mouth or stomach.

2. The stomach is the only organ in the human body that can absorb nutrients into the bloodstream, which is why the fish fillet in Tube B turned directly into solid energy.

3. Pouring vegetable oil into the stomach will instantly stop the heart from beating because gastric juice turns all fat molecules into poisonous carbon dioxide gas.

4. Digestive enzymes are highly specific; the mouth contains enzymes that chemically digest starch but cannot digest protein, while the stomach contains juices that digest protein but cannot digest fat.

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35. A group of students built a sealed plastic terrarium box to study how water moves through the environment. They placed a layer of damp soil and three small green plants at the bottom, poured 50 mL of water into a tiny plastic cup to represent the ocean, and tightly sealed the clear box.

They placed the sealed box directly under a bright desk lamp to simulate the Sun. Over a 3-hour period, the students monitored the box closely and recorded three specific events (labeled Event 1, Event 2, and Event 3) inside their laboratory notebook.

[**Event 1**] →The liquid water level in the ocean cup slowly decreases as the water turns into an invisible gas floating in the air.

[**Event 2**] → The invisible gas rises to the top, cools down, and forms millions of tiny, visible water droplets flat against the cold ceiling of the box.

[**Event 3**] →The water droplets on the ceiling grow too heavy and fall straight back down into the soil and the plants like a tiny shower.

Based on these observations and the scientific principles of the water cycle, which of the following choices correctly matches the experimental events with their corresponding natural processes? (2.5 marks)

1. Condensation, Precipitation, Evaporation
2. Precipitation, Evaporation, Condensation
3. Evaporation, Condensation, Precipitation
4. Transpiration, Boiling, Sublimation

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36. A group of young ecologists spent two weeks studying a local mangrove forest ecosystem. They focused on how different organisms interact with each other and how they adapt to the harsh environment, which is characterized by high water salinity (saltiness) and muddy, low-oxygen soil.

The students gathered field data and summarized four specific ecological observations in the table below.

Table Field Observations in the Mangrove Ecosystem

Observation	Organism A	Organism B	Nature of Interaction / Adaptation
1	Mangrove trees	Fiddler crabs	The crabs dig burrows in the mud, which brings oxygen down to the tree roots. In return, the trees provide shade and organic leaves for the crabs to eat. Both organisms thrive when living together.
2	Barnacles	Mangrove roots	Barnacles attach themselves firmly to the hard mangrove roots to get a stable habitat and catch floating food. The mangrove trees remain completely unharmed and receive no benefits from the barnacles.
3	Aphids (tiny insects)	Mangrove leaves	Aphids pierce the mangrove leaves to suck out nutrient-rich sap. Over time, the leaves become yellow, wrinkled, and weakened, reducing the tree's growth rate.
4	Mangrove trees	Physical environment	The trees develop special "pneumatophores" (breathing roots) that grow vertically upward out of the muddy water into the open air.

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After completing their field guide, the students proposed four analytical statements to describe these ecological dynamics:

Statement I: Observation 1 describes a mutualistic (+,+) relationship because both the mangrove trees and the fiddler crabs gain clear survival benefits from each other's presence.

Statement II: Observation 2 can be classified as a commensal (+,0) relationship because the barnacles gain a habitat helper while the mangrove tree remains completely unaffected.

Statement III: Observation 3 represents a parasitic (+,-) relationship where the aphid acts as a parasite that harms the host plant without instantly killing it.

Statement IV: Observation 4 shows a behavioral adaptation of the tree to protect itself from being eaten by herbivorous fish during high tide.

How many of the given statements (I to IV) are scientifically CORRECT based on the data provided? (2.5 marks)

1. Only 3 statements are correct.
2. Only 2 statements are correct.
3. Only 1 statement is correct.
4. All 4 statements are correct.

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37. A young botanist at a school greenhouse wants to study how pea pod color is passed from parent plants to offspring. She selects two true-breeding groups of pea plants with distinct pod colors:

True-breeding green-pod plants: plants that have produced only green pods for many generations.

True-breeding yellow-pod plants: plants that have produced only yellow pods for many generations.

She conducts a controlled two-phase breeding experiment to observe how these traits are inherited across generations.

Phase 1: She cross-pollinates a true-breeding green-pod plant with a true-breeding yellow-pod plant.

Result, F1 generation: 100% of the offspring produce green pods only. The yellow pod color does not appear.

Phase 2: She allows two green-pod plants from the F1 generation to self-pollinate. She then collects the seeds and grows them to maturity.

Result, F2 generation: Among 400 offspring plants, 302 produce green pods and 98 produce yellow pods.

Based on the experimental data from Phase 1 and Phase 2, which choice gives the most accurate scientific analysis of these genetic traits? (5 marks)

1. Yellow pod color is dominant because it reappears in the F2 generation after disappearing in the F1 generation.
2. Green pod color is dominant, while yellow pod color is recessive and was masked within the heterozygous F1 plants.
3. The F2 generation shows a 1:1 ratio of green-pod plants to yellow-pod plants, proving that both traits share equal genetic dominance.
4. Yellow pod color reappears in the F2 generation because a depletion of soil nutrients permanently mutated green genes into yellow genes.

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38. A student sets up an experiment with three identical iron bars: Bar A, Bar B, and Bar C.

Bar A is a strong permanent magnet.

Bar B is a normal, unmagnetized iron bar.

Bar C is another unmagnetized iron bar, but it is completely encased in a thick layer of copper sheet.

The student brings Bar A close to Bar B, and they strongly attract each other. Then, the student tries different setups to see how their properties change based on magnetic domains (the microscopic magnetic regions inside materials) and shielding.

Which of the following statements correctly predicts and explains the outcome of these setups? (5 marks)

1. If the student heats Bar A to an extremely high temperature, its magnetic strength will increase because the thermal energy causes the magnetic domains to align more perfectly.

2. When Bar A is brought close to Bar C, no magnetic attraction will occur because the copper sheet acts as a magnetic shield that completely blocks the magnetic field.

3. When Bar A attracts Bar B, the magnetic domains inside Bar B temporarily realign to face the opposite direction of Bar A's magnetic field, causing initial repulsion.

4. When Bar A is brought close to Bar C, Bar A will still attract the iron core of Bar C because copper is non-magnetic and allows the magnetic field to pass through it.

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39. A culinary laboratory is testing a premium batch of imported honey suspected of being adulterated (mixed) with cheap starch syrup and diluted with water. The technicians set up four separate test tubes using samples from the honey batch and mixed them with different biochemical reagents.

Table Experimental Records of the Honey Testing

Test Tube	Chemical Reagent Added	Experimental Conditions	Observation After Treatment
Tube 1	Iodine solution	Kept at room temperature (25°C)	Changed from brown to intense blue-black
Tube 2	Benedict's solution	Heated in a boiling water bath for 5 minutes	Changed from blue to dense brick-red precipitate
Tube 3	Biuret reagent	Kept at room temperature (25°C)	Remained light clear blue
Tube 4	Ethanol emulsion test	Shaken with pure ethanol, then added to water	Remained completely clear and transparent

Based on the empirical evidence gathered in Table , which of the following statements provides the most accurate chemical profile of this honey sample? (5 marks)

1. The honey has been mixed with starch syrup and contains reducing sugars, but it contains zero proteins and zero lipids.

2. The sample is pure natural honey because the dark blue-black color confirms the high natural fruit protein content.

3. The sample contains a massive amount of lipids and structural fibers, but completely lacks any form of carbohydrates.

4. The honey is adulterated with high-fat vegetable oils, which caused the formation of the brick-red precipitate in Tube 2.

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40. A science class wants to simulate how water cycles through the atmosphere and forms different weather phenomena. The students fill the bottom of a large glass jar with 100 ml of warm water at the bottom to represent the ocean. They place a small, elevated plastic platform inside the center of the jar holding a tiny, dry leaf.

To monitor the system, they seal the top of the jar with a clear plastic sheet and place a heavy metal bowl filled with ice cubes directly on top of the sheet. They perform this experiment under two different classroom conditions:

[**CONDITION 1: Room Temperature**] → The warm water evaporates into invisible vapor. As it rises and hits the cold plastic sheet beneath the ice bowl, it cools down and forms a thick, misty floating cloud inside the top section of the jar. Tiny water droplets also begin to form on the surface of the dry leaf.

[**CONDITION 2: Deep Freezer**] → The entire glass jar setup is placed inside a deep freezer where the air temperature drops instantly to -5°C (below the freezing point of water). The invisible water vapor near the plastic platform directly transforms into shiny, needle-like ice crystals that coat the dry leaf.

Based on the scientific principles demonstrated in this experiment, which of the following choices correctly pairs the classroom observation with its real-world natural phenomenon and explains the accurate physical change involved? (5 marks)

1. The misty floating cloud inside the upper section of the jar in Condition 1 represents rain, which forms when water vapor directly melts into a solid gas.
2. The tiny water droplets forming on the dry leaf in Condition 1 represent Dew, which forms when invisible water vapor in the air cools down and condenses into liquid droplets upon touching a cold surface.
3. The shiny, needle-like ice crystals coating the leaf in Condition 2 represent clouds, proving that clouds can only grow on solid leaves when the temperature rises above 100°C.
4. The ice crystals coating the leaf in Condition 2 represent fog, which is formed when liquid water boils into a frozen state through the process of evaporation.

---------- End of Questions ----------

Please check your answers before submitting the answer sheet.

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Answers Keys : Science Primary - Grade 6

No.	Answers	No.	Answers
1.	3	21.	3
2.	1	22.	1
3.	2	23.	3
4.	2	24.	2
5.	1	25.	2
6.	4	26.	1
7.	2	27.	3
8.	1	28.	2
9.	4	29.	3
10.	4	30.	2
11.	2	31.	2
12.	2	32.	2
13.	1	33.	2
14.	4	34.	4
15.	2	35.	3
16.	3	36.	1
17.	1	37.	2
18.	4	38.	4
19.	3	39.	1
20.	2	40.	2

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