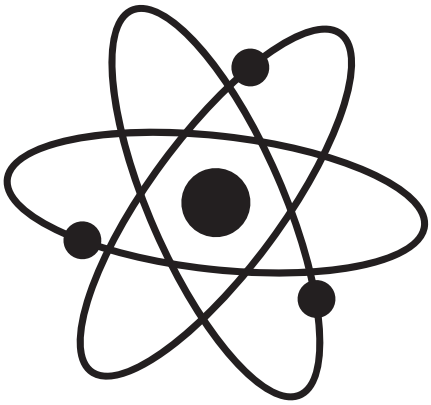
ASMOPSS THAILAND 2026

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

Science Secondary G.8



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 18, 2026

: ASMOPSS Thailand / Miraah Education

Contact US

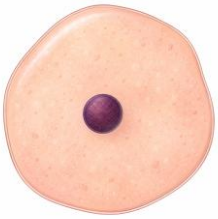
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Instructions :

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. The diagram shows a liver cell.



Which cellular features can be found in both this cell and in most plant cells? (1.25 marks)

1. Cell membrane and cytoplasm
2. Cell membrane and sap vacuole
3. Cell wall and cytoplasm
4. Cell wall and sap vacuole

2. Use the following reference table and the statements below to answer the question:

Indicator	pH Range	Color Change
Methyl Orange	3.1 — 4.4	Red → Yellow
Litmus	5.0 — 8.0	Red → Blue
Bromothymol Blue	6.0 — 7.6	Yellow → Blue
Phenolphthalein	8.3 — 10.0	Colorless → Pink

A. Solution X has a pH range of 4.4 - 6.0. It will change the color of methyl orange to yellow and change the color of bromothymol blue to yellow.

B. Bromothymol blue is the most effective indicator for distinguishing between a solution with a pH of 4.0 and a solution with a pH of 7.0.

C. A water sample from a fish pond changes the color of bromothymol blue to blue, indicating that the water in this pond has a pH greater than 7.6.

Which of the following statements are correct? (1.25 marks)

1. A only
2. B and C
3. A and C
4. A, B, and C

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3. A doctor is testing if a low-carb diet reduces "bad" cholesterol (LDL) in the blood. They split patients into two groups:

Group 1 : Follow a low-carb diet for 30 days.

Group 2 : Follow a normal diet for 30 days.

At the end of a 30-day period, the LDL cholesterol levels of all patients were measured. **The results are shown in the table below:**

Low-carbohydrate diet	Normal diet
112	107
129	162
157	191
103	93
88	132

Based only on the results of the experiment, should a doctor recommend a low-carb diet to patients who need to lower their cholesterol? (1.25 marks)

1. Yes. Low-carb diets are generally healthier than other types of food.
2. Yes. The average LDL level for the low-carb group is lower than the normal diet group, proving that it works.
3. No. Since the LDL levels were not measured at the start of the experiment, we cannot prove that the levels actually decreased.
4. No. The researchers should have checked if the men lost weight instead of measuring cholesterol.

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4. In an experiment on friction, students place a 2.0-kilogram wooden block on three different surfaces. A spring balance is used to measure:

Stage 1 : the maximum force required to just start the block moving;

Stage 2 : the force required to keep the block moving at constant velocity.

The results are shown below. Take g= 10 m/s^2

Surface	Maximum force before motion (N)	Force at constant velocity (N)
Smooth glass	2.0	1.6
Polished wood	4.0	3.0
Rubber	8.0	6.0

Which statement is scientifically correct? (1.25 marks)

1. When a 5.0 newton force pulls the stationary block on rubber, static friction equals 8.0 newtons.

2. For polished wood, the static coefficient is 0.25, while the kinetic coefficient is 0.15.

3. The maximum static friction exceeds kinetic friction on all surfaces, and rubber has μ_s= 0.40

4. The block on polished wood accelerates only when the pulling force lies between 3.0 and 4.0 newtons.

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5. An unmanned Remotely Operated Vehicle (ROV) is diving into the deep sea to collect sediment samples around an underwater hydrothermal vent. To monitor the intense environment, engineers installed an absolute pressure sensor on the ROV's outer hull. The computer has plotted the relationship between depth and the measured pressure as shown in the table below:

Depth from sea level (meters)	**Gauge pressure from seawater** (x 10^5 Pascal)	**Absolute pressure** (x 10^5 Pascal)
0 (Surface)	0.0	1.0
10	1.0	2.0
20	2.0	3.0
30	3.0	4.0

(Given atmospheric pressure = 1.0 x 10^5 Pa and seawater density is constant)

If the ROV dives to a depth of 120 meters below sea level, which of the following accurately predicts the absolute pressure and correctly describes the direction of the fluid pressure exerted on the vehicle? (1.25 marks)

1. The absolute pressure is 12.0 x 10^5 Pa, and the pressure acts vertically downwards toward the seafloor due to gravity.

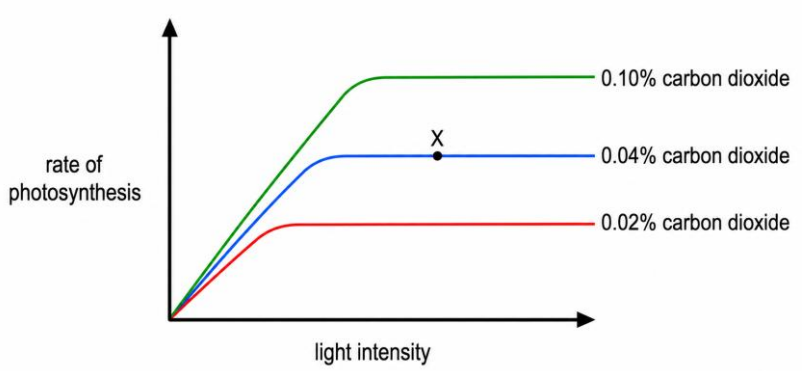
2. The absolute pressure is 13.0 x 10^5 Pa, and the pressure acts in all directions, always perpendicular to the external surfaces of the vehicle.

3. The absolute pressure is 13.0 x 10^5 Pa, and the pressure acts only vertically upwards to provide buoyancy to the vehicle.

4. The absolute pressure is 12.0 x 10^5 Pa, and the pressure varies directly with the shape and total cross-sectional area of the vehicle.

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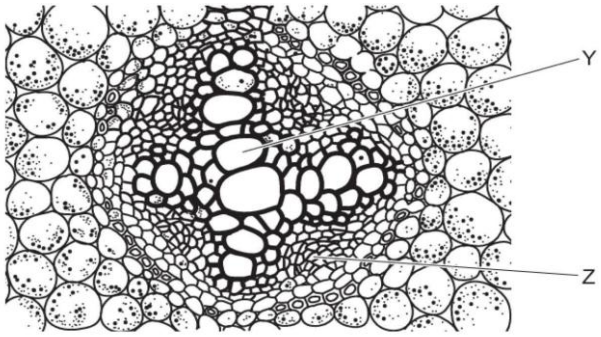
6. The graph below shows the relationship between light intensity and the rate of photosynthesis, conducted at three different levels of carbon dioxide concentration, with the temperature being controlled at 15°C throughout.



At point X on the graph, what is the limiting factor that prevents the rate of photosynthesis from increasing any further? (1.25 marks)

1. Carbon dioxide concentration
2. Light intensity
3. Surface area of the plant
4. Temperature

7. The diagram shows a cross-section of the vascular bundle in a dicot root.



Based on the diagram, which row correctly identifies the name and function of Tissue Y and Tissue Z? (1.25 marks)

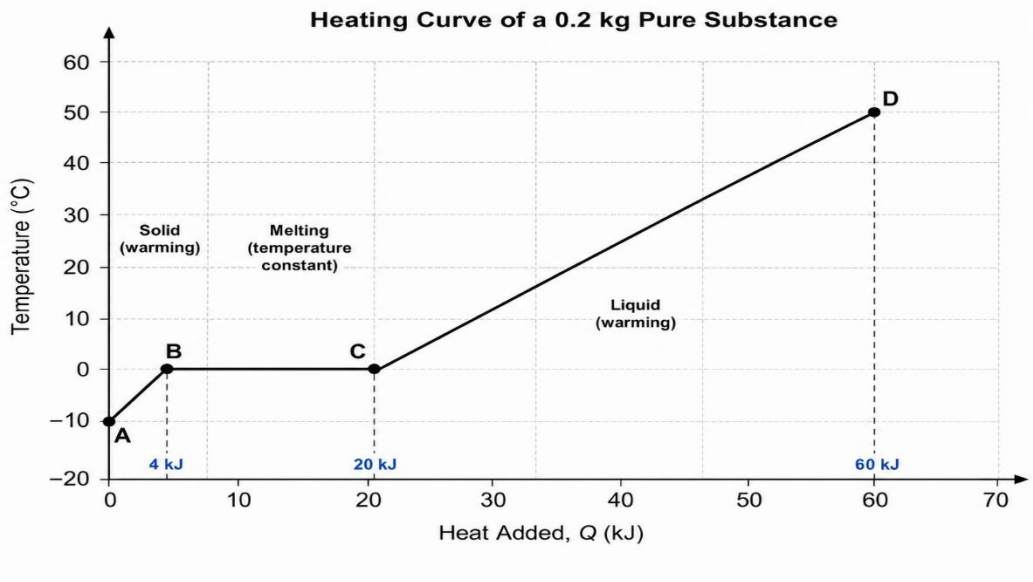
Choice	Tissue Y		Tissue Z	
	Name	Transport	Name	Transport
1.	Phloem	Mineral ions & water	Xylem	Sucrose
2.	Phloem	Sucrose	Xylem	Mineral ions & water
3.	Xylem	Mineral ions & water	Phloem	Sucrose
4.	Xylem	Sucrose	Phloem	Mineral ions & water

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8. Analyze the heating curve graph of a 0.2 kg pure substance sample, starting in a solid state at Point A, and use the data from the table to evaluate the subsequent statements:

Data Table: Heat Added (Q) vs. Temperature (T)

Point	Heat Added (Q) in kJ	Temperature (T) in °C	State/Phase
A	0	-10	Solid
B	4	0	Solid (Starts Melting)
C	20	0	Liquid (Finished Melting)
D	60	50	Liquid



Consider the following statements: (1.25 marks)

I. The specific heat capacity of the substance in the solid state (c_{solid}) is equal to 2,000 J/(kg.°C)

II. The specific latent heat of fusion (L_f) of this substance is equal to 100,000 J/kg.

III. The specific heat capacity of the substance in the liquid state (C_{liquid}) is exactly twice that of its specific heat capacity in the solid state.

IV. During the heating interval between 4 kJ and 20 kJ, the average kinetic energy of the substance's molecules remains constant.

Which of the following statements about the substance above are stated correctly?

1. I and II only
2. II and III only
3. I, III, and IV only
4. All of the above

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9. An energy research institute tested four material sheets (A, B, C, and D) of identical thickness and cross-sectional area to evaluate their thermal insulation capabilities for developing energy-efficient building materials. Each sheet was placed between two temperature-controlled rooms: the left room was maintained at a constant temperature of 80°C, and the right room was maintained at a temperature of 20°C. After 20 minutes, engineers measured the rate of heat transfer through each material sheet, as shown in the table below

Material Type	Rate of Heat Transfer (Joules per second)
A	120
B	85
C	40
D	15

To minimize external heat entering a house and maximize heat distribution under an electric stove for fast cooking, which materials are the most according to thermodynamic principles? (1.25 marks)

1. Material A for house walls, and Material D for the electric stove.
2. Material D for house walls, and Material A for the electric stove.
3. Material C for house walls, and Material B for the electric stove.
4. Material D for house walls, and Material C for the electric stove.

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10. Analyze the decomposition of Calcium Carbonate ($CaCO_3 \rightarrow CaO + CO_2$).

Based on this reaction, which of the following must be true? (1.25 marks)

I. Calcium carbonate is a compound because it can be chemically broken down into simpler substances.

II. Calcium oxide (CaO) is an element because it is a product of decomposition.

III. Carbon dioxide (CO_2) is a compound because it contains two different types of atoms.

IV. This process is a physical change because the substances remain in the solid and gas states.

1. I and III only
2. III and IV only
3. I and IV only
4. I, II, and III only

11. A student is given three unknown colorless aqueous solutions, P, Q, and R. The following observations are made:

a. Solution P reacts with a magnesium strip and produces a flammable gas.

b. Solution Q reacts with solid sodium carbonate and produces a gas that turns limewater milky.

c. Solution R turns red litmus paper blue.

Consider the following statements:

I. Solutions P and Q are likely to be acidic.

II. Solution R is basic, so its hydroxide ion concentration is greater than its hydrogen ion concentration.

III. Mixing solutions Q and R can result in an acid–base neutralization reaction.

IV. Solution P must be a strong acid because it reacts with magnesium metal.

Which statements are correct? (1.25 marks)

1. I and IV only
2. II and III only
3. I, II, and III only
4. I, II, III, and IV

** (This question has been revised and adapted from an actual examination question.)

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12. A student was assigned to prepare a blue copper (II) sulfate ($CuSO_4$) solution to be used in a crystal-growing experiment. The requirement is to prepare 500 g of a 12 % by mass (w/w) solution. However, only a standard solution and distilled water are available in the laboratory.

Reference Data Table

Description	Value / Specification
Target Solution Mass	500 g
Target Concentration	12 % (by mass)
Available Stock Solution	30 % (by mass)
Density of Distilled Water	1.0 g/cm^3
Solubility of $CuSO_4$ at 25 °C	32 g per 100 g of water

Based on the situation and the data in the table, consider the following statements:

I. The mass of solute $CuSO_4$ required to prepare the 500 g solution is 60 g.

II. To prepare this solution, the student must measure out 200 g of the 30% standard solution.

III. The student must add 300 cm^3 of distilled water to the standard solution to reach the desired mass.

IV. This prepared 12% solution is a saturated solution at 25°C.

Which of the following statements are correct? (1.25 marks)

1. I and II only
2. II and III only
3. I, II, and III only
4. All of the above

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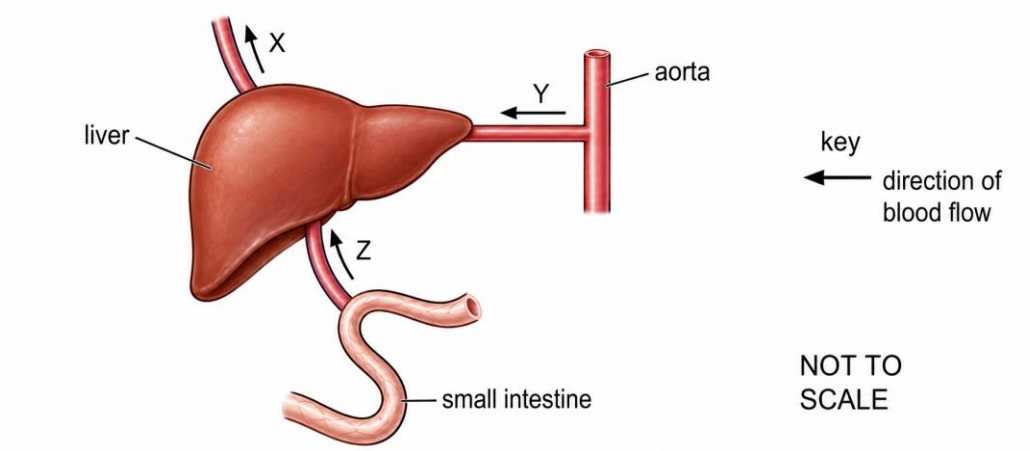
13. The liver is an important organ that processes nutrients from the food we eat.

It has three main blood vessels connected to it

Vessel X : Carries blood out of the liver and back toward the heart.

Vessel Y : Brings oxygen-rich blood from the aorta into the liver.

Vessel Z : A special "short cut" that brings nutrient-rich blood directly from the small intestine to the liver.



According to the diagram, what are the blood vessels X, Y, and Z? (1.25 marks)

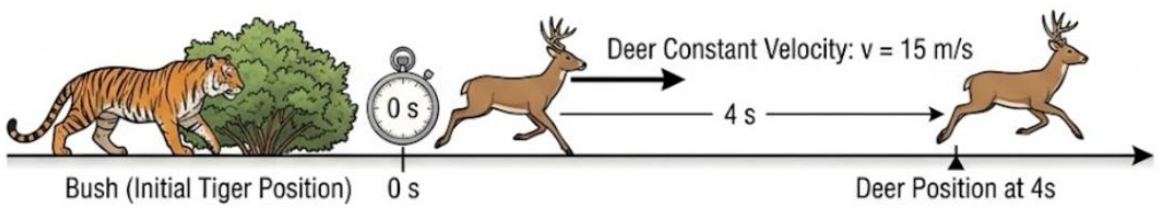
Choice	X	Y	Z
1.	Hepatic artery	Hepatic portal vein	Hepatic vein
2.	Hepatic portal vein	Hepatic artery	Hepatic vein
3.	Hepatic vein	Hepatic artery	Hepatic portal vein
4.	Hepatic vein	Hepatic portal vein	Hepatic artery

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14. A medicine tablet is coated with a starch layer to prevent it from being dissolved by a stomach acid. Once the tablet moves into the small intestine, which enzyme will digest this starch coating, and what will be the product? (1.25 marks)

Choice	Enzyme	Product
1.	Amylase	Fatty acids and glycerol
2.	Amylase	Simple sugars
3.	Lipase	Fatty acids and glycerol
4.	Lipase	Simple sugars

15. A tiger crouching behind a bush spots a deer running past at a constant velocity of 15 m/s in a straight line. Four seconds after the deer passes the bush, the tiger starts chasing the deer from rest, accelerating at a constant rate of 5 m/s² in the same direction, as shown in the diagram.



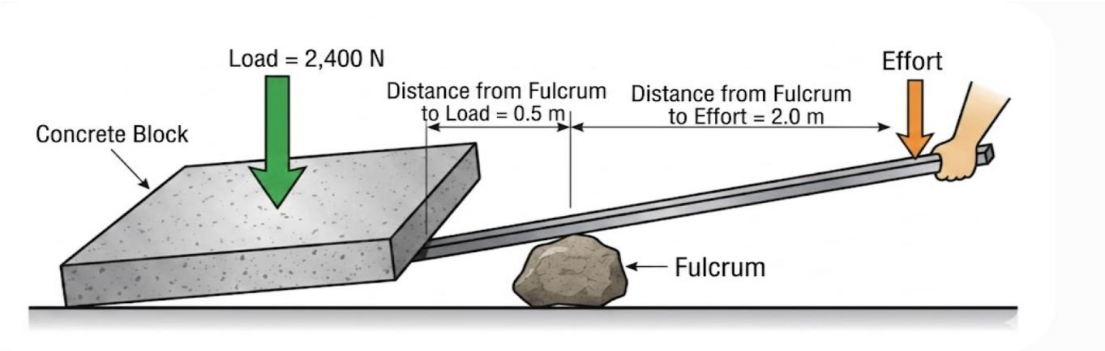
Based on this hunting scenario, find the time the tiger must run from the moment it leaves the bush, and the total distance it covers from its starting position, to exactly catch the deer. (2.5 marks)

1. Time = 6.00 seconds, Distance = 90 meters
2. Time = 6.15 seconds, Distance = 123 meters
3. Time = 7.00 seconds, Distance = 160 meters
4. Time = 8.74 seconds, Distance = 191 meters

** (This question has been revised and adapted from an actual examination question.)

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16. A technician needs to lift a 2,400 N concrete block that has sunk onto a drainage pipe using a uniform 2.5 m steel bar as a lever. The lever is set up by wedging one end of the bar under the block and placing a hard rock as a fulcrum 0.5 m away, as shown in the diagram.

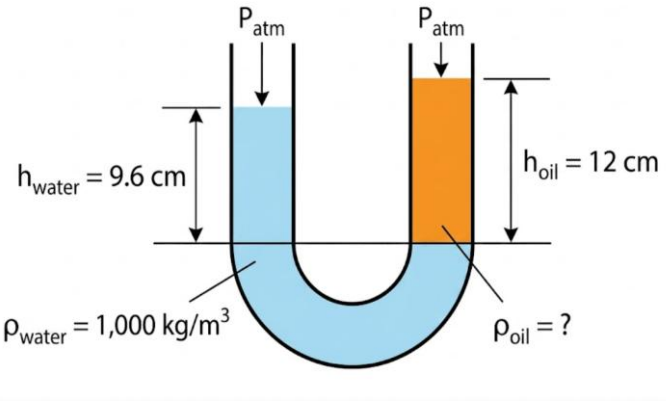


Assuming the steel bar has negligible weight and the technician applies a perpendicular downward force at the other end, which of the following correctly identifies the minimum force required to start lifting the concrete block and the classification of this lever system? (2.5 marks)

1. Apply a force of 600 N, and this system is a First-Class Lever.
2. Apply a force of 480 N, and this system is a First-Class Lever.
3. Apply a force of 600 N, and this system is a Second-Class Lever.
4. Apply a force of 480 N, and this system is a Third-Class Lever.

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17. A fluid mechanics experimental setup consists of a U-tube, open at both ends, filled to a certain level of water with a density of 1,000 kg/m³. Students gradually poured a clear, immersible oil into the right arm of the tube. This created a 12 cm column of oil and caused the water level in the left arm to rise 9.6 cm above the oil-water interface on the right tube, as shown in the diagram.

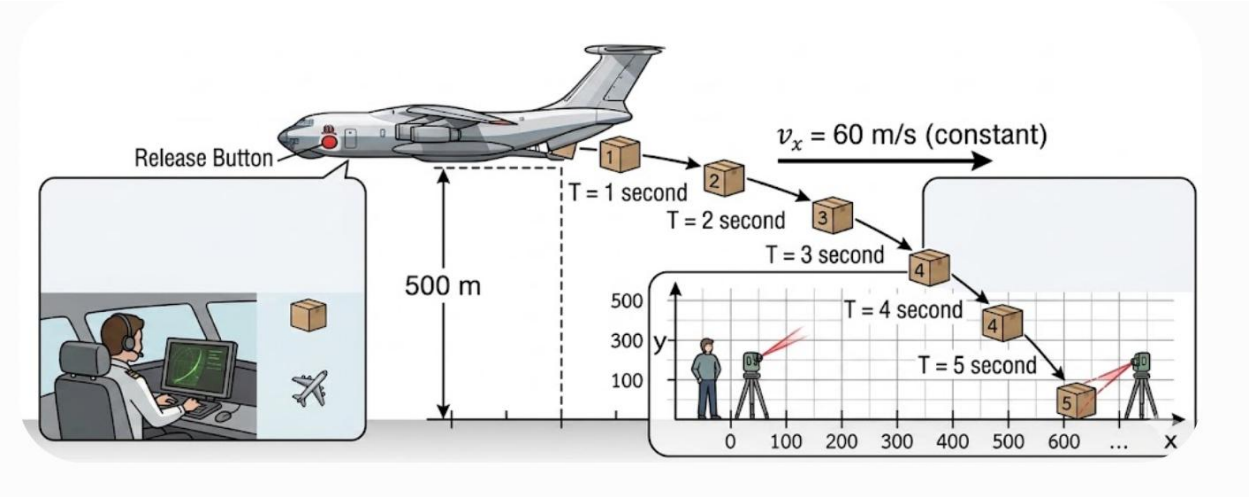


Based on the equilibrium state of the fluids in this experiment, calculate the density of this clear oil. (2.5 marks)

1. 750 kg/m³
2. 800 kg/m³
3. 850 kg/m³
4. 1,250 kg/m³

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18. A transport aircraft flies horizontally at a steady speed of 60 m/s at a height of 500 meters above the ground. Upon reaching the drop point, the pilot releases a medical supply box. Assuming that there is no air resistance, a laser tracking system records the position of the free-falling box at 1s interval, as shown in the diagram.



Considering the trajectory and speed of the supply box from the perspective of two observers—one sitting inside the plane and the other standing stationary on the ground—which statements correctly describes the motion? (2.5 marks)

1. The observer on the plane sees the box falling in a parabolic path because its horizontal velocity is constantly increasing.

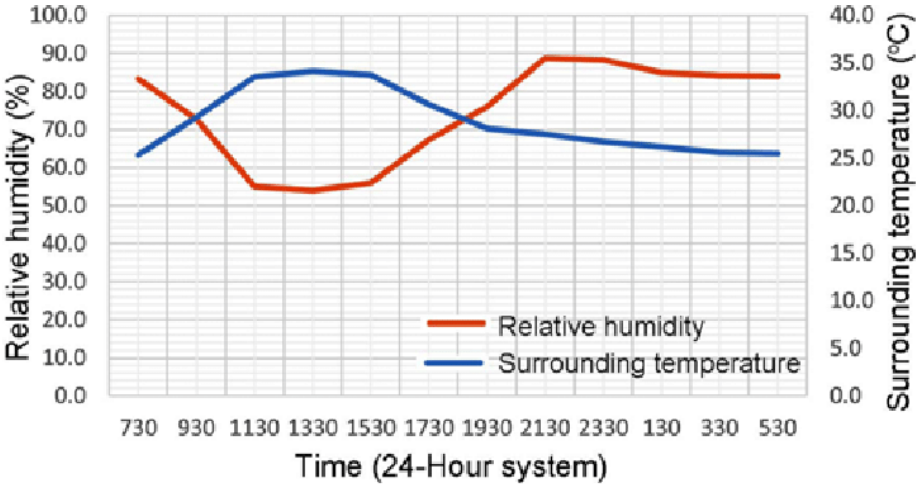
2. The observer on the ground sees the box fall in a parabolic path, maintaining a constant horizontal speed of 60 m/s equal to the aircraft's speed.

3. Both observers see the box fall in a perfectly vertical line directly beneath the aircraft at all times.

4. The resultant speed of the medical supply box upon impact with the ground is equal only to its vertical speed.

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19. Consider the graph showing the changes in temperature and relative humidity over a 24-hour period on a clear day, as shown in the figure:



Which of the following choices best summarizes the relationship between temperature and relative humidity? (2.5 marks)

1. During the period of minimum air temperature, relative humidity is also at its minimum because the air is extremely cold.
2. Relative humidity remains constant throughout the day if the average daily air temperature increases.
3. In the early morning when dew forms on leaves, the relative humidity of the air is below 50 percent.
4. When air temperature rises in the afternoon, relative humidity decreases because the air could hold more water vapor

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20. Meteorological data shows that in the equatorial region (latitudes 0-5 degrees), ocean surface temperatures exceed 27 degrees Celsius almost all year round, resulting in a large amount of water evaporation. However, tropical cyclones rarely form in this region.
What is the reason behind it? (2.5 marks)

1. Warm ocean currents at the equator move too quickly for storms to form.
2. The equatorial region lacks sufficient Coriolis force to cause winds to rotate towards the center.
3. The atmospheric pressure at the equator is too high for air to lift.
4. The air at the equator has a relative humidity that is too high, preventing the release of latent heat.

21. A specific variety of tulip reproduces naturally using underground bulbs, as shown on the diagram below. If a gardener uses these bulbs to propagate his entire field, which of the following would best describe the biological outcome? (2.5 marks)

1. The offspring will display high phenotypic variation, allowing the population to better survive a sudden change in environmental temperature.
2. The offspring are produced by the process of mitosis and will be genetically identical, making the entire crop equally susceptible to the same specific pathogen.
3. The offspring are produced by meiosis and will have a unique combination of alleles, increasing the genetic fitness of the population.
4. The offspring will be genetically different from the parent as a result of the fusion of gametes within the bulb structure.

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22. An experiment is set up to study the gases produced by a plant kept in total darkness. Air is drawn through the apparatus from left to right using a pump.

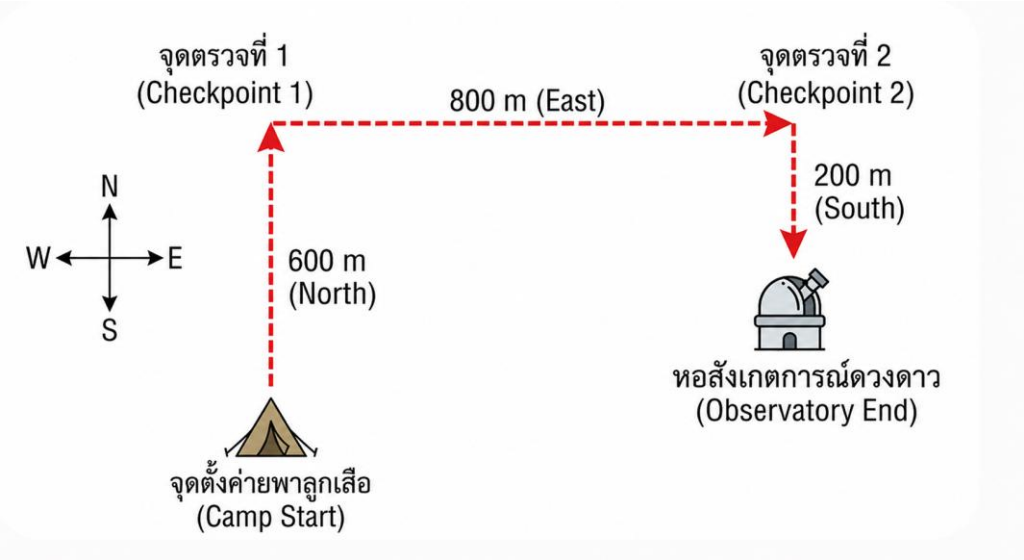


Predict what would happen to the limewater in Flask X and Flask Y after the pump has been running for 30 minutes. (2.5 marks)

Choice	Flask X	Flask Y
1.	Goes cloudy	Goes cloudy
2.	Goes cloudy	Stays clear
3.	Stays clear	Goes cloudy
4.	Stays clear	Stays clear

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23. During a scouting trip, a group of scouts started from their campsite and walked 600 meters due north to Checkpoint 1. From there, they made a right-angled turn and walked 800 meters due east to Checkpoint 2. Finally, they made another right-angled turn and walked 200 meters due south to reach an astronomical observatory, which was their final destination. The map of their path is shown in the diagram.



After completing the journey, the committee needs to record the total distance traveled and the magnitude of the net displacement from the starting campsite to the observatory. Which of the following correctly calculates both values? (2.5 marks)

1. Total distance = 1,600 meters, Magnitude of displacement = 1,000 meters
2. Total distance = 1,600 meters, Magnitude of displacement = 1,400 meters
3. Total distance = 1,600 meters, Magnitude of displacement = 894.4 meters
4. Total distance = 1,200 meters, Magnitude of displacement = 1,000 meters

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24. Use the provided experimental results to analyze the statements and select the most correct answer. A group of students performed paper chromatography to analyze four different food dyes (A, B, C, and D) and an "unknown sample mixture" using water as the mobile phase (solvent). The total distance traveled by the solvent front was 12.0 cm.

The experimental results were recorded as follows:

Dye Sample	Color Observed	Distance Traveled by Dye (cm)	Physical Property Observation
Dye A	Red	3.6	High attraction to paper
Dye B	Blue	9.6	High solubility in water
Dye C	Yellow	6.0	Moderate solubility
Dye D	Green	Spot 1: 9.6 (Blue) Spot 2: 6.0 (Yellow)	Separated into two colors
Unknown	Orange	Spot 1: 3.6 (Red) Spot 2: 6.0 (Yellow)	Separated into two colors

Analyze the following statements:

I. The R_f value of dye B is 0.80, which indicates that it has the lowest absorption capacity on the stationary phase (paper) compared to the other primary dyes.

II. Dye D is a mixture consisting of dye B and dye C, as its separated components share identical R_f values with both dyes.

III. Dye A moved the shortest distance because it has the highest solubility in the mobile phase.

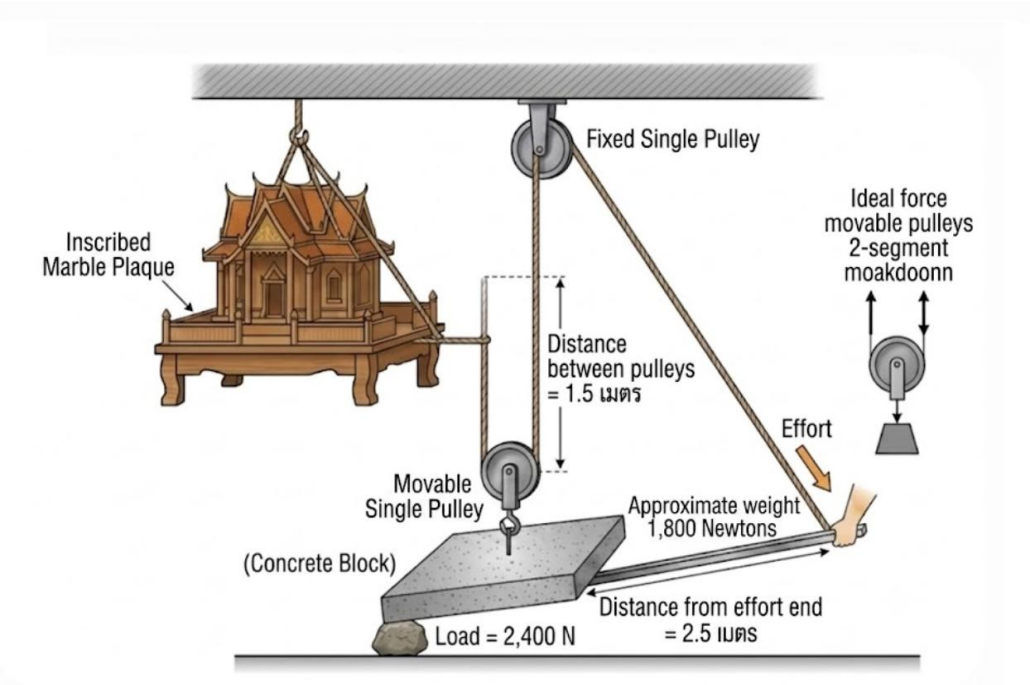
IV. The unknown sample mixture consists of dye A and dye C, and if the distance traveled by the solvent front increases to 24.0 cm, the R_f value of the red spot would remain 0.30.

Which of the following statements are CORRECT? (2.5 marks)

1. I and II only
2. II and IV only
3. I, II, and IV only
4. I, II, III, and IV

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25. A construction team needs to lift a 180 kg (approximately 1,800 N) marble tablet onto an altar using a mechanical advantage system. The setup consists of a fixed pulley attached to the support structure and a movable pulley, all linked by a uniform rope, as shown in the pulley system diagram.



Assuming the pulley system works perfectly without any friction at the axles, and neglecting the weight of the pulleys and the rope, what is the minimum force the construction worker must apply to the end of the rope to keep the marble tablet suspended and stationary? (2.5 marks)

1. 450 N
2. 600 N
3. 900 N
4. 1,080 N

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26. Analyze the provided data and tables carefully. Select the most accurate answer based on your scientific reasoning and understanding of separation principles.

An environmental scientist was tasked with analyzing a complex liquid mixture sampled from an industrial site. The mixture consists of three main compounds (X, Y, and Z), whose physical properties are summarized in the table below:

Component	Boiling Point (°C)	Solubility in Water	Solubility in Ethanol	Affinity for Cellulose (Stationary Phase)
X	78.4	High	High	Low
Y	100.0	High	Low	Medium
Z	165.0	Low	High	High

The scientist is considering the most appropriate separation techniques. Evaluate the following statements regarding the choice of separation method:

I. Fractional Distillation is the most effective method to separate compound X from compound Y because their boiling points differ by approximately 21.6 °C.

II. In paper chromatography separation, compound Z will have the lowest R_f value because it has the best absorption capacity on the stationary phase.

III. Crystallization is the most appropriate first step to isolate component Z from the aqueous mixture because compound Z has low solubility in water.

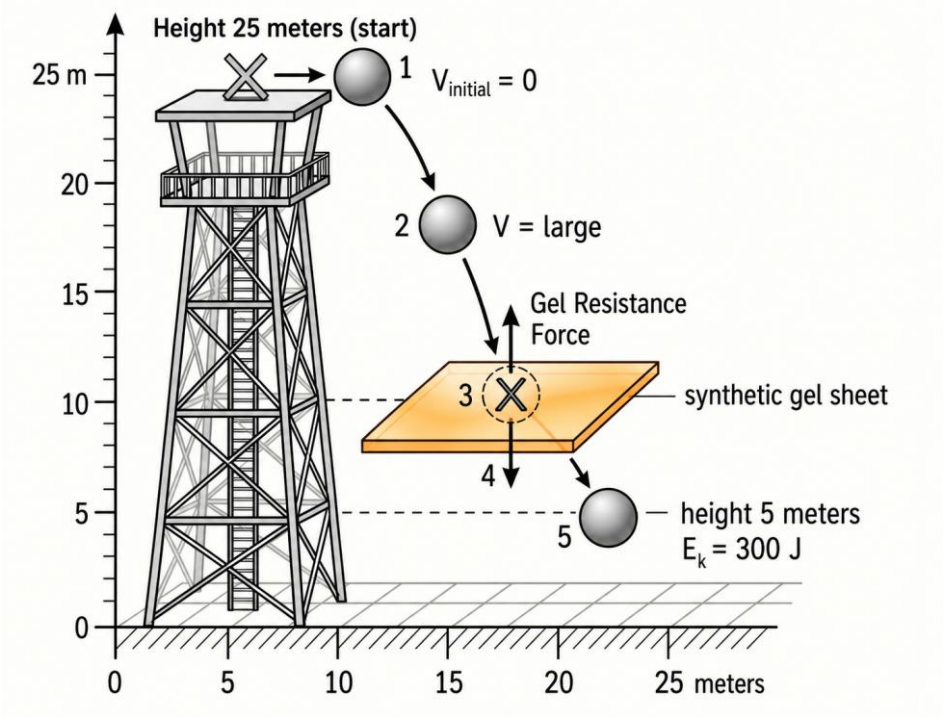
IV. Simple Distillation can be used to completely separate compounds X, Y, and Z from each other with 100% purity in a single cycle.

Which of the following statements are CORRECT? (2.5 marks)

1. I and II only
2. II and III only
3. I, III, and IV only
4. I, II, and III only

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27. In a safety test for a shock-absorbing device, an engineer drops a 4.0 kg test mass from rest at the top of a 25-meter-high tower (ignoring air resistance and given g = 10 m/s^2). As the mass falls, it penetrates a thick synthetic gel sheet positioned above the ground. After passing through the gel, the mass has 300 Joules of kinetic energy remaining at a height of 5 meters above the ground, as shown in the diagram.



Based on the law of conservation of energy, calculate the work done by the resistance force of the synthetic gel sheet on the falling mass. (5 marks)

1. The gel sheet removes 200 Joules of mechanical energy from the system.
2. The gel sheet removes 500 Joules of mechanical energy from the system.
3. The gel sheet removes 700 Joules of mechanical energy from the system.
4. The gel sheet removes 800 Joules of mechanical energy from the system.

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28. A student wants to investigate how yeast affects the decomposition of fruit. They set up three sealed plastic bags, each containing one fresh strawberry of equal size.
The bags were kept in a dark cupboard at 25°C for five days.

Group	Yeast treatment	Results after 5 days
Bag 1	5 g of Baker's yeast	Strawberry partially softened; bag slightly inflated.
Bag 2	15 g of Brewer's yeast	Strawberry significantly liquefied; bag heavily inflated
Bag 3	No yeast added	Strawberry remained mostly firm and intact

The student concludes that Brewer's yeast is more effective at breaking down strawberries than Baker's yeast. Which of the following changes would most improve the validity of this experiment? (5 marks)

1. Use different types of fruit in each bag to see if the yeast reacts differently.
2. Use the same amount of yeast for both Bag 1 and Bag 2.
3. Place Bag 1 in the sunlight and Bag 2 in the dark to compare environments
4. Move all strawberries into a single large bag to ensure they stay at the same temperature.

** (This question has been revised and adapted from an actual examination question.)

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29. An international aid organization is analyzing five local crop pastes (Paste V, W, X, Y, and Z) to find the best survival food for young children in a drought-stricken region.
The children are suffering from Marasmus and Kwashiorkor. The scientists performed standard food tests on equal amounts of each paste and recorded the relative intensity of the positive reactions using plus signs (+). More plus signs indicate a higher concentration of that nutrient.

Table Nutrient Profile Matrix of Five Crop Pastes

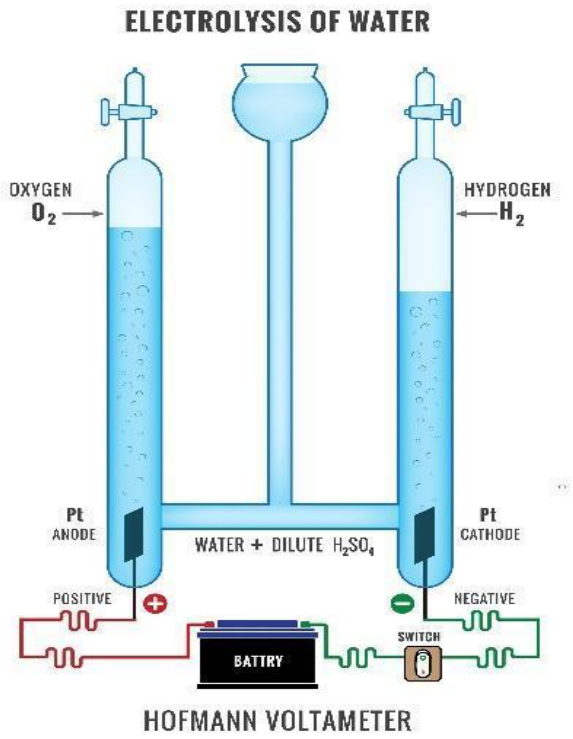
Crop Paste	Iodine Test	Benedict's Test	Biuret Test	Ethanol Test
Paste V	++++	+	-	-
Paste W	-	-	++++	++++
Paste X	++++	++++	++++	-
Paste Y	+	+	-	++++
Paste Z	++	++	++	++

If the organization wants to select a single crop paste that provides the maximum amount of both immediate energy sources and muscle-building blocks to combat both malnutrition diseases simultaneously, which paste should they choose? (5 marks)

1. Paste V, because complex starch is the only nutrient capable of healing swollen bellies and repairing muscles.
2. Paste X, because it provides high amounts of both complex and simple carbohydrates for immediate energy, alongside ample proteins for tissue regeneration.
3. Paste Y, because a child's survival depends exclusively on eating food that contains zero protein molecules.
4. Paste Z, because having equal, lower amounts of all nutrients is always superior to having high amounts of specific targeted nutrients.

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30. In an experiment, a student passed an electric current through a blue liquid inside an experimental apparatus. After 10 minutes, it was observed that two different gases were collected in the test tubes, with the volume of the first gas being twice the volume of the second gas.



Analyze the following observations:

I. The blue liquid is likely a compound because it can be decomposed into different new substances.

II. The ratio of the generated gases indicates that this liquid might be water (H_2O).

III. This process is a physical change because it is merely a state transition from liquid to gas.

IV. The total mass of all generated gases will be equal to the mass of the liquid that disappeared.

Which statements are CORRECT? (5 marks)

1. I, II, and IV only
2. I and II only
3. III and IV only
4. II only

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31. During strenuous exercise, the production of metabolic acids increases, causing the concentration of hydrogen ions in the blood to rise and the blood pH to decrease.
This produces a temporary metabolic acidosis. How does the respiratory system respond to help restore normal acid–base balance? (1.25 marks)

1. Central chemoreceptors directly detect the fall in arterial pH and reduce ventilation, causing carbon dioxide to remain in the blood.
2. Peripheral chemoreceptors detect the fall in arterial pH and increase ventilation, allowing more carbon dioxide to be exhaled.
3. Respiratory centres in the medulla reduce ventilation, causing the bicarbonate concentration in the blood to increase rapidly.
4. Carbonic anhydrase in red blood cells is inhibited, preventing carbon dioxide from reacting with water to form carbonic acid.

32. A medical researcher measures the average blood-flow velocity and the total cross-sectional area of three major types of blood vessels. The results are shown below.

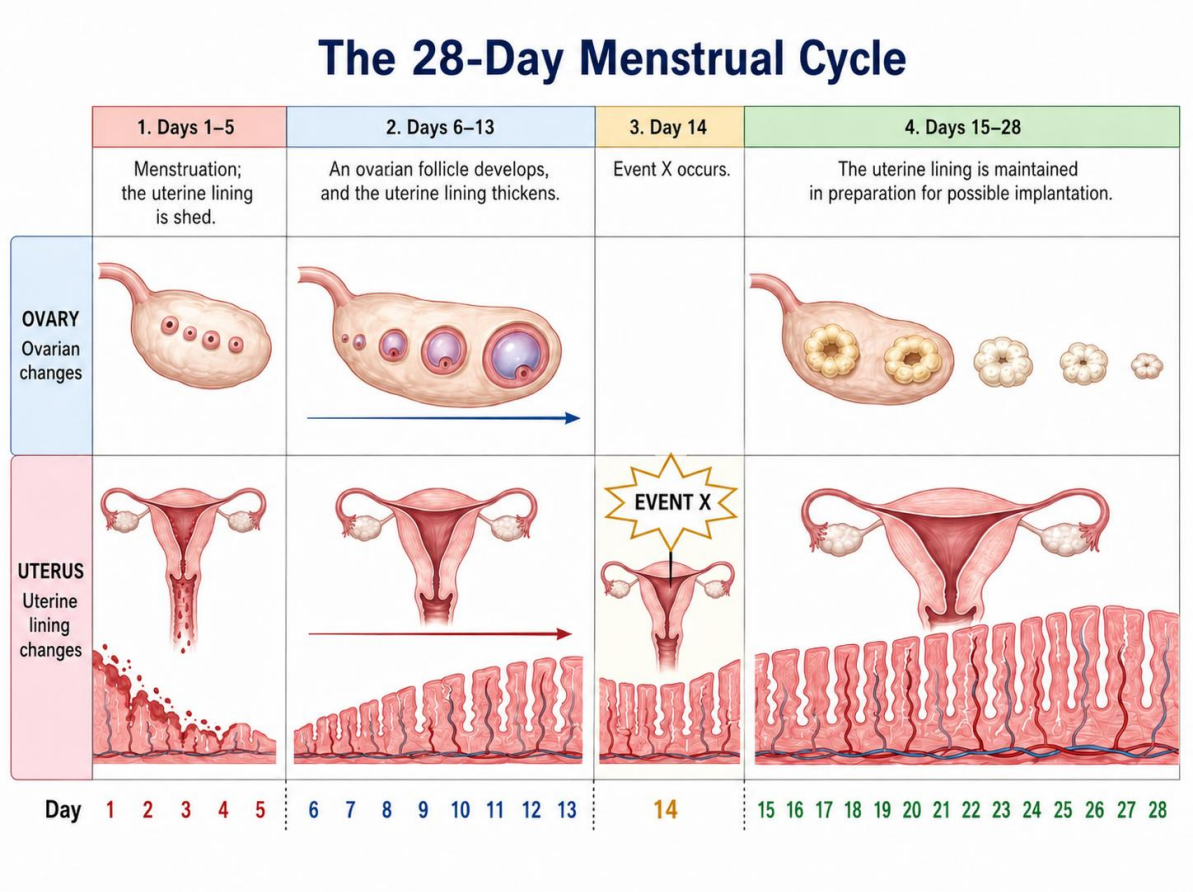
Vessel type	Total cross-sectional area	Blood-flow velocity
Type X	Small	Very high
Type Y	Extremely large	Very low
Type Z	Medium	Moderate

Why is the low blood-flow velocity in Type Y vessels biologically advantageous? (1.25 marks)

1. It reduces the risk that high pressure will damage the thick walls of major arteries.
2. It allows sufficient time for gases, nutrients, and wastes to diffuse between blood and tissues.
3. It accelerates the return of carbon dioxide to the heart before blood begins to clot.
4. It causes red blood cells to lose their nuclei and therefore carry additional oxygen.

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33. The diagram below shows a simplified 28-day human menstrual cycle.



Days 1–5: Menstruation; the uterine lining is shed.

Days 6–13: An ovarian follicle develops, and the uterine lining thickens.

Day 14: Event X occurs.

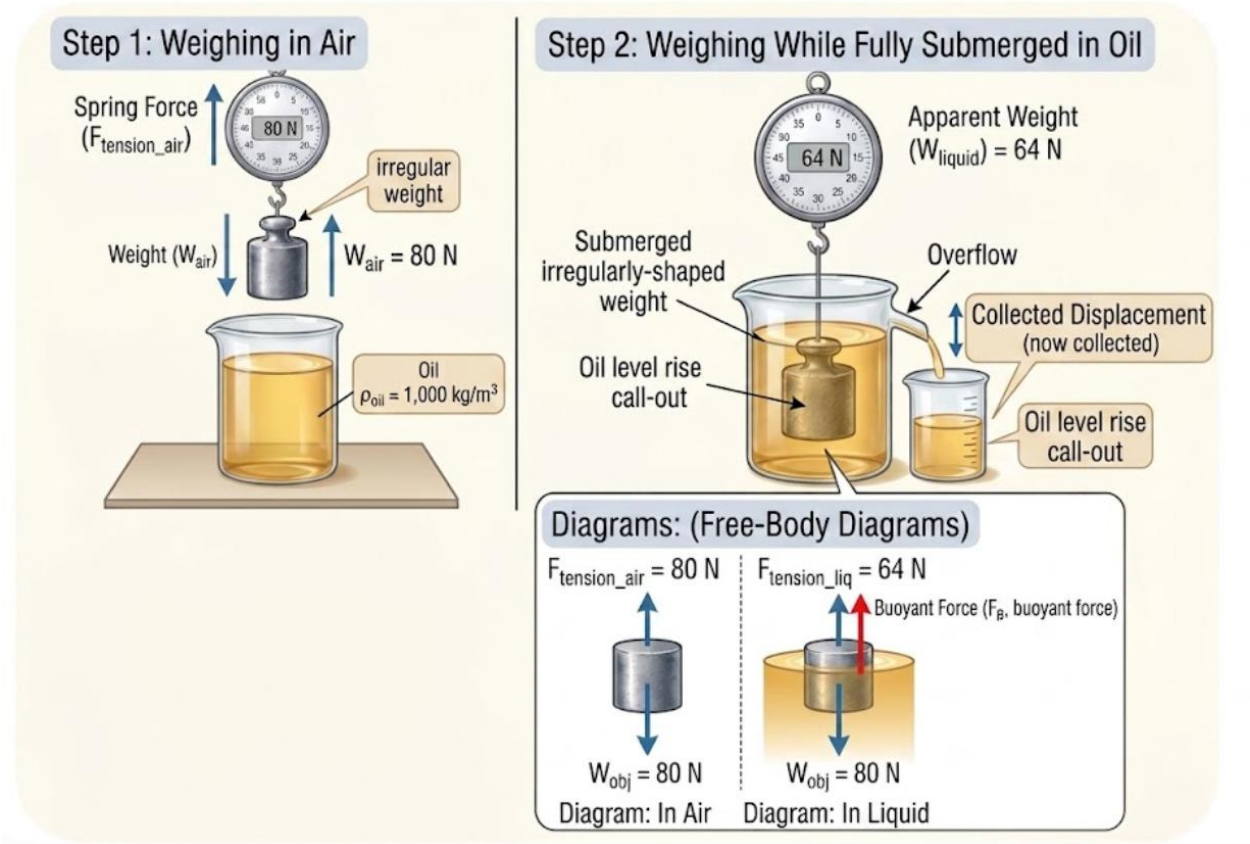
Days 15–28: The uterine lining is maintained in preparation for possible implantation.

What is Event X, and which hormonal surge directly triggers it? (2.5 marks)

1. Fertilization, triggered by a rise in progesterone
2. Ovulation, triggered by a surge in luteinizing hormone
3. Menstruation, triggered by a rise in estrogen
4. Implantation, triggered by a surge in follicle-stimulating hormone

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34. A marine science student conducts an experiment to determine the density of an irregularly shaped ancient artifact. First, the object is weighed in the air using a spring balance, which reads 80 N. Next, it is lowered into a tank of seawater until completely immersed without touching the bottom. The spring balance reading drops to 64 N, as shown in the force diagram.



Given that the density of seawater is 1,000 kg/m³ and the acceleration due to gravity g = 10 m/s^2, analyze and determine the magnitude of the buoyant force acting on the object and the volume of the ancient artifact, respectively. (2.5 marks)

1. Buoyant force = 16 N, Volume = 1.6 x 10^{-3} m^3
2. Buoyant force = 16 N, Volume = 6.4 x 10^{-3} m^3
3. Buoyant force = 64 N, Volume = 1.6 x 10^{-3} m^3
4. Buoyant force = 80 N, Volume = 8.0 x 10^{-3} m^3

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35. Geologists have found that the Earth's mantle accounts for approximately 80% of the Earth's volume and is primarily composed of ultramafic rocks. Its density is approximately 3.4–4.4 g/cm^3. When analyzing the chemical composition of the mantle compared to the Earth's crust, which of the following is a distinct characteristic that clearly distinguishes the mantle from the crust? (2.5 marks)

1. It has the highest proportion of oxygen and silicon among all layers, making the Earth lightweight.

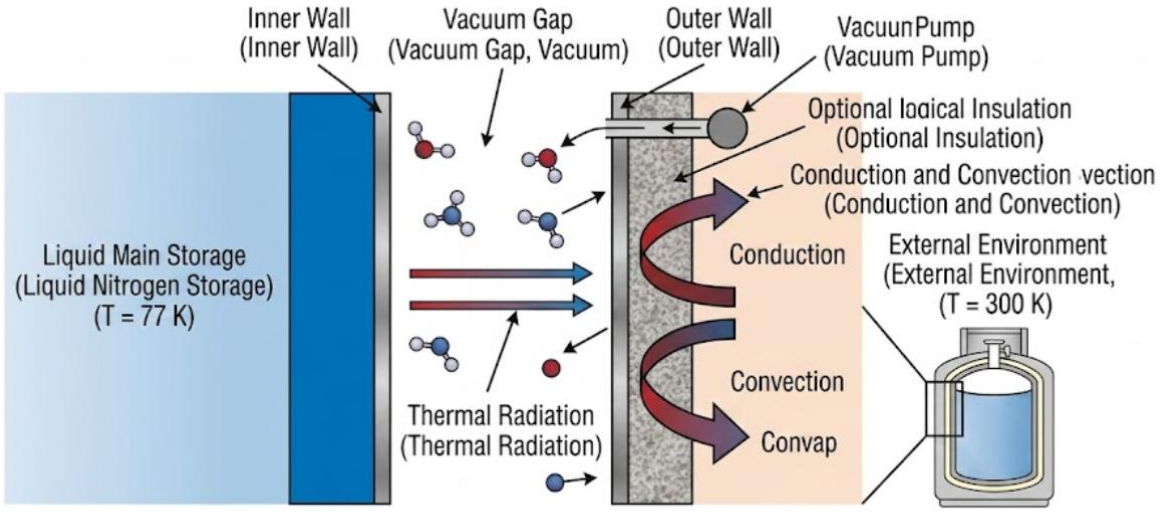
2. The proportion of iron and magnesium increases, while the proportion of aluminum and potassium decreases.

3. It consists of iron and nickel in a solid state to provide the strength to support the Earth's crust.

4. Large amounts of hydrogen and helium are stored due to the influence of the early atmosphere.

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36. At a materials science technology seminar, an engineering team proposed a double-walled structure for cryogenic liquid nitrogen storage containers to minimize evaporation rates. The container wall consists of two layers, with the intervening space connected by a high-capacity vacuum pump to remove all air molecules and create a vacuum gap, as shown in the cross-sectional diagram.



Based on this design, what is the primary purpose of creating a vacuum in the gap, and through which physical mechanism does it best inhibit heat transfer from the external environment into the system? (2.5 marks)

1. It best inhibits thermal radiation because thermal radiation cannot travel through a vacuum.

2. It best inhibits thermal conduction and convection because both processes require medium to transfer energy.

3. It best inhibits thermal conduction and thermal radiation because the vacuum medium reflects all income heat.

4. It inhibits only convection because gases cannot circulate within a vacuum.

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37. An experiment was conducted to study how light intensity affects photosynthesis. A water plant was placed in a test tube, and a light source was positioned at various distances from it. The number of oxygen bubbles produced per minute was recorded as an indicator of the photosynthesis rate.

Distance from light source (cm)	Number of bubbles per minute
10	60
20	25
30	10
40	5

Which of the following is the most accurate conclusion based on the experimental result? (5 marks)

1. As the distance from the light source increases, the number of bubbles produced decreases.
2. As the distance from the light source decreases, the number of bubbles produced decreases.
3. As the distance from the light decreases, the number of bubbles produced stays the same.
4. There is no relationship between the distance of the light source and the number of bubbles produced.

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38. Plant X grows in a desert, while Plant Y grows in a tropical rainforest. A student examined the leaves of both plants under a microscope and records the following information:

	Plant X	Plant Y
Stomata density	18 per mm^2	280 per mm^2
Stomata size	Very small	Large
Leaf surface	Thick, waxy layer	Thin, no coating
Leaf shape	Small and needle-like	Large and broad

The student concluded that the stomata of Plant X are an adaptation that helps it survive in the desert.

Which explanation best describes why having fewer and smaller stomata help Plant X survive, without containing any scientific error? (5 marks)

1. Stomata are tiny pores that allow gases to move into and out of the leaf. When a plant has fewer stomata, less carbon dioxide can enter, causing the plant to produce less food by photosynthesis. Although this may seem like a disadvantage, it is actually beneficial for Plant X because less photosynthesis means less oxygen is produced inside the leaf. If much oxygen builds up within the leaf cells, it can cause cellular damage. Therefore, limiting photosynthesis can help protect the cells of Plant X from being harmed, especially during the hottest part of the day when the desert sun is at its most intense.

2. Stomata are the main openings through which water vapor evaporates from the leaf. The process is referred to as transpiration. When a plant has fewer and smaller stomata, less water vapor can escape at any one time, significantly slowing down water loss. In the desert, it may not rain for weeks, so plants that lose water quickly will experience dehydration before the next rainfall arrives. The reduced number of stomata in Plant X allows it to retain water supply longer, keeping its cells turgid and strong enough to survive through prolonged periods of drought.

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3. Transpiration not only involves the release of water, but also creates a pulling force inside the plant. As water evaporates from the leaf, it pulls more water up from the roots, similar to drinking through a straw. This mechanism is what helps transport water and dissolved minerals from the soil all the way up to the leaves. Because Plant X has very few stomata, there is almost no transpiration occurring, causing the pulling force to almost disappear. To solve this problem, desert plants develop extremely deep roots to push water upward using pressure from below, replacing the transpiration pull that can no longer function.

4. Water moves out of the leaf through the stomata because the air inside the leaf contains more water vapor than the dry air outside, and water naturally moves from an area of higher concentration to an area of lower concentration. In the desert, the outside air is extremely dry, so this difference is very high, causing water to evaporate quickly. Having fewer stomata help reduce the rate of transpiration. To compensate for less carbon dioxide uptake during the day, Plant X keeps its stomata closed when the sun is up and opens them only at night when the air is cooler and less dry, collecting just enough carbon dioxide to use the next morning.

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39. Consider the situation of Tropical Storm "Mangkhut" moving in the South China Sea, east of Vietnam. At the same time, a strong high-pressure area (H) from China is spreading over the Northern and Northeastern regions of Thailand. From this situation, how can we predict the trajectory of this storm? (5 marks)

1. The storm will change direction and move northward directly towards China.
2. The storm will intensify into a super typhoon due to energy from the cold air mass.
3. The storm will remain stationary in the middle of the sea until the cold air mass dissipates.
4. The storm will track lower to the southwest and rapidly weaken upon making landfall.

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40. A group of students wanted to investigate whether three natural plant extracts – garlic, turmeric, and pandan leaves – could delay or prevent mold growth on bread. To prepare the extracts, they boiled a fixed amount of each plant in equal volumes of water, filtered out the residue, and kept only the liquid. They spread each extract onto a separate slice of homemade, preservative-free bread. To ensure a fair test, they baked all the bread themselves using the exact same recipe.

Each experimental group used three slices of bread, and all sample slices were stored in plastic bags left slightly open, under controlled conditions of 28°C and 70% humidity. Every 24 hours, the students photographed each slice and used image analysis software to measure how much of the surface was covered by mold. The results represent the average values calculated from the three slices in each group.

Table: Mold coverage on bread surface (%)

Day	Control group	Garlic	Tumeric	Pandan leaves
1	0	0	0	0
2	6	0	0	4
3	20	0	3	14
4	38	2	9	27
5	55	4	17	41
6	68	7	26	54
7	82	11	38	67

Based on the provided in the table, which of the following conclusions is correct and most strongly supported by the result? (5 marks)

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1. Garlic was the most effective treatment, keeping the bread completely mold-free until Day 4. By day 7, mold coverage was only 11% compared to 82% in the control group. This 71% reduction shows that garlic effectively inhibits long-term mold growth, suggesting that garlic extract is worth investigating further as a natural alternative to chemical preservatives.

2. Pandan leaves showed very little efficacy compared to the control. By Day 7, pandan-treated bread had 67% mold coverage, while the control reached 82%. Because this 15% difference is so small, it could easily be attributed to natural variation between individual slices of bread rather than any genuine antifungal properties of the extract.

3. Mold growth in the garlic group was slower and more consistent than any other group, averaging about 1.5% per day compared to 11.7% per day in the control. Pandan, conversely, had a negligible impact on the growth rate. This trend indicates that the effectiveness of each natural extract is directly tied to the concentration of active compounds present in the plant.

4. The average daily increase in mold coverage was roughly 1.6% for garlic, 5.4% for tumeric, and 9.6% for pandan. Since mold spreads continuously across all groups over 7 days without leveling off, \the only supported conclusion is that while all three extracts slow mold growth to varying degrees, there is insufficient evidence to claim that any of them can halt it completely or reliably replace commercial preservatives in food production.

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

Please check your answers before submitting the answer sheet.

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Answers Keys : Science Secondary - Grade 8

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

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Note:

Question 11: None of the answer choices provided was correct. Therefore, the committee decided to award full credit for this question to all candidates.

(After revision, the correct answer is Choice 3.)

Question 15: None of the answer choices provided was correct. Therefore, the committee decided to award full credit for this question to all candidates.

(After revision, the correct answer is Choice 4.)

Question 25: The question was incomplete and did not provide sufficient information to determine a valid answer. Therefore, the committee decided to award full credit for this question to all candidates.

Question 28: The question was incomplete and did not contain a correct answer choice. Therefore, the committee decided to award full credit for this question to all candidates.

(After revision, the correct answer is Choice 2.)

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