Use the information below to answer the question:

$\sin 30^\circ = \frac{1}{2}$ $\cos 30^\circ = \frac{\sqrt{3}}{2}$

$\sin 45^\circ = \frac{\sqrt{2}}{2}$ $\cos 45^\circ = \frac{\sqrt{2}}{2}$

$\sin 60^\circ = \frac{\sqrt{3}}{2}$ $\cos 60^\circ = \frac{1}{2}$

$\sin 37^\circ = \frac{3}{5}$ $\cos 37^\circ = \frac{4}{5}$

$\sin 53^\circ = \frac{4}{5}$ $\cos 53^\circ = \frac{3}{5}$

$\pi \approx \frac{22}{7}$ $\sqrt{2} = 1.414$

$\sqrt{3} = 1.732$ $\sqrt{5} = 2.236$

$\sqrt{7} = 2.646$ $\sqrt{10} = 3.162$

Acceleration due to gravity = 10 m/s^2.

Atmospheric pressure = 10^5 Pa.

The speed of sound in the air at 0 ℃ = 331 m/s.

The Coulomb constant (k) in the air or vacuum = 9×10^9 $N \cdot m^2/C^2$.

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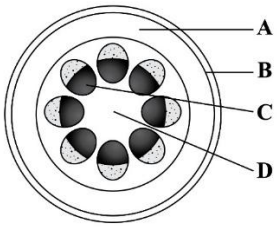
Instructions :

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. If a student removes all of the apical buds from a plant, what is the most likely outcome? (1.25 marks)

1. All of the leaves would die.
2. The plant would not be affected.
3. Branching would occur from the roots.
4. Branching would occur without further primary growth.

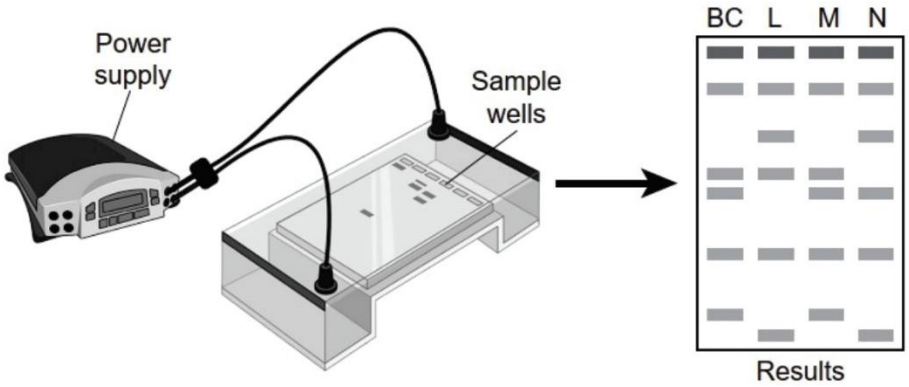
2. The photomicrograph below shows part of a section of a young root. Which type of cells does not respire? (1.25 marks)



1. A
2. B
3. C
4. D

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3. A student was assigned the task of determining which of three species of plant (species L, M, or N) was most closely related to *Botana curus* (BC). The student compared a segment of genetic material from each species using the procedure represented below.



A valid conclusion that can be drawn from these results is that (1.25 marks)

1. genetic material is not useful in determining evolutionary relationships
2. species M is most closely related to BC
3. species L and N are most closely related to BC
4. BC is not related to any of the species

4. What is the meaning of "Biodiversity can help increase the value of land"? (1.25 marks)

1. Greater value can be obtained from more diverse products produced by ecosystems with high biodiversity relative to land that has been cleared for agriculture.

2. Ecosystems with higher biodiversity use more resources than those with low biodiversity, creating greater environmental stress.

3. Ecosystems with low biodiversity use resources at a higher rate than those with high biodiversity.

4. Land cleared for agriculture uses natural resources more slowly and has lower maintenance costs.

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5. Which of the following statements is correct regarding the events in the cell cycle? (1.25 marks)

1. DNA is duplicated during the G1 and G2 phases.
2. DNA replicates during cytokinesis.
3. The M phase is normally the longest phase.
4. Interphase consists of G1, S, and G2.

6. A student is observing a bacterial smear under a compound light microscope. They start with a 10x objective lens and then switch to a 40x objective lens. If the ocular lens has a magnification of 10x, what is the total magnification when using the 40x objective? Additionally, explain how switching from the 10x to the 40x objective affects the field of view and the brightness of the image. (1.25 marks)

1. Total magnification: 400x. Field of view increases, brightness decreases.
2. Total magnification: 400x. Field of view decreases, brightness increases.
3. Total magnification: 400x. Field of view decreases, brightness decreases.
4. Total magnification: 50x. Field of view increases, brightness increases.

7. The plasma membrane is often described as a 'fluid mosaic' model. Explain the key components of this model, their arrangement, and how this structure allows for both fluidity and selectivity in cellular function. (1.25 marks)

1. The plasma membrane is a rigid, impermeable barrier made solely of phospholipids. Its main function is structural support.
2. The membrane is primarily composed of proteins arranged in a static, crystalline lattice. It facilitates active transport only.
3. The fluid mosaic model describes the plasma membrane as a dynamic structure composed of a phospholipid bilayer with embedded and associated proteins, cholesterol, and carbohydrates. The fluidity allows for movement of components and membrane fusion and diverse functions like receptor signaling and cell-cell recognition.
4. It is a solid, impermeable wall with pores for non-selective transport. Its main function is cell adhesion.

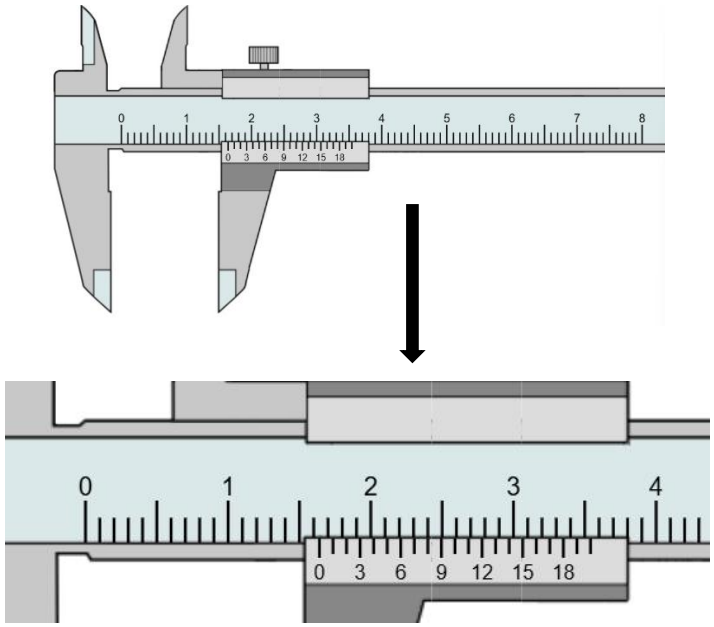
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8. Which of the following are examples of osmosis? (1.25 marks)

A. The absorption of water by root hairs
B. The absorption of mineral salts by root hairs
C. The absorption of water by dry cotton wool
D. The absorption of water by the large intestines
E. The movement of water across the surface of the floor

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

9. Based on the figure below.



which of the following records the measurement correctly? (1.25 marks)

1. 16.4 ± 0.025 mm
2. 16.40 ± 0.03 mm
3. 16.40 ± 0.025 mm
4. More than one answer is correct

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10. In which of the following situations does a car have a negative velocity but a positive acceleration? (1.25 marks)

1. A car is accelerating in the –x direction.
2. A car is accelerating in the +x direction.
3. A car that is decelerating in the –x direction.
4. A car that is decelerating in the +x direction.

11. Suppose an object is accelerated by a force of 100 N. Suddenly, a second force of 100 N is applied in the opposite direction, resulting in the net force on the object becoming zero. How does the object's motion change afterward? (1.25 marks)

1. stops moving immediately.
2. slows down until it stops.
3. continues to move at the final velocity it had before the second force was applied.
4. slows down until it stops, and then accelerates in the direction of the second force.

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12. In March, a chemical leak occurred in a high school laboratory. The incident was caused by a group of students who disposed of sulfuric acid solution down the sink without following instructions of the supervising teacher. This resulted in corrosion of the plumbing system and the release of harmful fumes throughout the laboratory. Some students experienced eye irritation and respiratory discomfort and required basic first aid. Following an investigation, it was found that the students lacked knowledge about proper hazardous waste management in the laboratory and failed to correctly separate chemical waste by type. As a result, the subject teacher organized a training session on chemical labeling and safe waste management for all students.

Based on this incident, what is the most appropriate method for disposing of chemical waste in order to prevent potential hazards in the future? (1.25 marks)

A. Neutralize the pH of the sulfuric acid solution before disposal.
B. Mix all types of chemical waste together before disposal.
C. Separate chemical waste by type and dispose of it following appropriate guidelines.
D. Store chemical waste until the container is full before combining and disposing of it.

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

13. Which of the following correctly arranges the sizes of A , A^+, $B^{2+}$and C^- given their atomic numbers are: A = 56 B = 55 C = 53

(1.25 marks)

1. $C^- > A > A^+ > B^{2+}$
2. $A > A^+ > B^{2+} > C^-$
3. $C^- > A^+ > A > B^{2+}$
4. $B^{2+} > A^+ > A > C^-$

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14. Consider the following substances: CH_4, H_2O, BF_3 and NH_3.

Which of the following correctly arranges the polarity of the given compounds, from least polar to most polar? (1.25 marks)

1. $BF_3 < CH_4 < NH_3 < H_2O$
2. $CH_4 < BF_3 < NH_3 < H_2O$
3. $CH_4 < BF_3 < H_2O < NH_3$
4. $BF_3 < NH_3 < CH_4 < H_2O$

15. Stomata play a critical role in regulating both transpiration (water loss) and carbon dioxide uptake for photosynthesis. Consider the following statements:

A. Stomata open and close are involved in the process of osmosis.

B. Stomata open when guard cells lose water; they close in response to light.

C. Stomata are permanently open in leaves; their size is fixed.

D. Guard cells pump sodium ions to open stomata; closing is passive.

E. Stomatal opening is primarily driven by guard cells actively accumulating potassium ions (K^+) into their cytoplasm.

F. Environmental factors influencing this include light intensity and temperature.

Which of the above statements are correct? (2.5 marks)

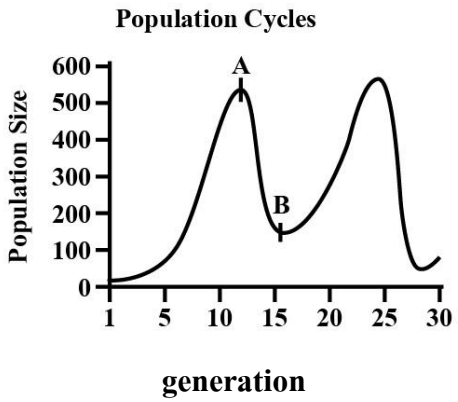
1. A, B and C
2. B, C and F
3. A, E and F
4. D, C, E and F

16. Cholesterol is a lipid molecule that often receives negative attention, but it plays several vital biochemical roles in the human body. Discuss at least three distinct essential functions of cholesterol in human physiology, beyond its role in atherosclerosis. (2.5 marks)

1. Primary structural component of DNA, enzyme catalysis, muscle contraction.
2. Component of cell membranes, precursor for steroid hormones, precursor for bile and precursor for Vitamin D synthesis.
3. Energy storage, main component of cell walls, transport of oxygen.
4. Antibody production, neurotransmitter synthesis, glucose transport.

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17. A biologist recorded the number of rabbits in a population over 30 generations, as shown in the graph below:



Which of the following statements best explains why the rabbit population dramatically decreased between Points A and B shortly after generation 10? (2.5 marks)

1. A new predator that feeds solely on the rabbits' main competitor was introduced into the rabbits' habitat.
2. Farmers in the area set traps for coyotes, the main predators of the rabbits.
3. Environmental changes led to a significant increase in the amount of food available to the rabbits.
4. A fatal disease infected a large proportion of the rabbits in this population.

18. A student's friend has been on a diet and has lost 7 kg in 3 months. After studying cellular respiration, how can the student explain this weight loss? (2.5 marks)

1. It was released as carbon dioxide and water.
2. It was converted into ATP, which weighs much less than fat.
3. It was broken down into amino acids and eliminated from the body.
4. It was converted into urine and eliminated from the body.

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19. In a nuclear laboratory, researchers synthesized a new radioactive element named X-917, which shows great potential for applications in the medical industry. The research team continuously monitored its decay to assess storage safety. The decay test began at 8:00 a.m., and by 2:00 a.m. the following day, only 12.5% of the original amount remained. During the decay process, alpha particles were detected, and an isotope was produced as a decay product.

Another researcher intends to use this data to calculate the optimal timing for utilizing X-917 in medical applications. To do so, it is necessary to determine: What is the half-life of X-917 in hours and which element does X-917 decay into? (2.5 marks)

1. 3 hours, X-913
2. 3 hours, Y-913
3. 6 hours, X-913
4. 6 hours, Y-913

20. A biologist is studying how pollution affects the growth of algal and snail populations in the Chao Phraya River area. At which biological level is he conducting his study? (2.5 marks)

1. Population
2. Community
3. Ecosystem
4. Biosphere

21. The nitrogen cycle is crucial for life, yet atmospheric nitrogen (N_2) is unusable by most organisms. Describe the key processes involved in converting atmospheric nitrogen into forms usable by plants and back into the atmosphere, naming at least three distinct microbial roles in this cycle. (2.5 marks)

1. The nitrogen cycle is purely a chemical process without biological involvement.
2. Nitrogen fixation by animals; denitrification by plants.
3. Nitrogen fixation: Atmospheric N_2 is converted to ammonia (NH_3) to nitrites (NO_2^-) and then to nitrates (NO_3^-) by bacteria.
4. Plants directly absorb atmospheric nitrogen; fungi convert nitrogen into oxygen.

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22. In a biology class, Lisa placed a suspension of the green algae Chlorella in an environmentally controlled chamber and turned on the light. She measured the change in CO_2 levels over 15 minutes. She then repeated the experiment, using an environmentally controlled chamber without light and found that the CO_2 level in the lighted chamber decreased over time, while the CO_2 level in the dark chamber increased over time.
Which of the following is the most likely explanation for Lisa's result in the absence of light? (2.5 marks)

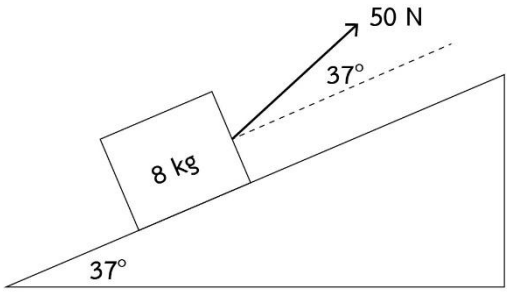
1. The use of CO_2 in photosynthesis is greater than the production of CO_2 in cellular respiration.
2. The use of CO_2 by cellular respiration is greater than the production of CO_2 by photosynthesis.
3. The production of CO_2 by photosynthesis is greater than CO_2 consumption by cellular respiration.
4. The production of CO_2 by cellular respiration is greater than the consumption of CO_2 by photosynthesis.

23. A thermal imaging drone is ascending vertically at a speed of 10 m/s. At a height of 75 m above the ground, an infrared camera was dropped. How long does it take for the infrared camera to reach the ground? (2.5 marks)

1. 2 s
2. 3 s
3. 4 s
4. 5 s

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24. A wooden box is being pulled on a surface with a coefficient of kinetic friction of 0.2 between the box and the surface, by applying a force of 50 N, as shown in the figure.



Which of the following correctly describes the magnitude and direction of the frictional force? (2.5 marks)

1. 6.8 N, directed up the incline
2. 6.8 N, directed down the incline
3. 12.8 N, directed up the incline
4. 12.8 N, directed down the incline

25. A biotechnology company is procuring chemicals for biological experiments, focusing on substances involved in protein synthesis. The chemicals under consideration includes:

Formaldehyde : used for cell fixation

Hydrogen peroxide : used to degrade unwanted proteins

Acetone : used for cleaning equipment

Ethylene oxide : used for sterilizing medical instruments

The company's safety team reviewed the Safety Data Sheets (SDS) for each chemical and found that all four substances have different GHS (Globally Harmonized System) hazard symbols. Therefore, strict protocols for storage, transportation, and disposal must be followed. The operations manager called a meeting to review the team's understanding of GHS symbols, emphasizing that some chemicals - such as acetone, which evaporates quickly and leaves no residues - may appear "safe", but can still be highly flammable if mishandled.

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Based on the information above, which of the following best reflects the appropriate use of GHS symbols for these chemicals and demonstrates proper chemical safety knowledge? (2.5 marks)

1. Formaldehyde should be labeled with the explosive symbol because it is used for cell fixation.
2. Hydrogen peroxide should carry only the corrosive symbol because it can irritate the skin.
3. Ethylene oxide should be labeled with the skull and crossbones symbol, as it is acutely toxic and potentially carcinogenic.
4. Acetone does not require any hazard symbol because it is commonly used and evaporates easily.

26. Consider the following compounds:

XQ : an ionic compound formed from metal ion X^{+} and nonmetal ion Q^{-}

AB_2 : a covalent compound composed of two nonmetal elements A and B

MZ_3 : an ionic compound made up of M^{3+} and Z^{-} ions.

CD_4 : a covalent molecule with a central atom C bonded to four D atoms

Which of the following statements best describe the physical properties of these compounds? (2.5 marks)

1. XQ and MZ_3 are likely to conduct electricity in solid form due to the presence of ions.
2. AB_2 and CD_4 are likely to have lower melting and boiling points compared to ionic compounds.
3. AB_2 can dissolve in water and dissociate into free ions that conduct electricity.
4. XQ and CD_4 are both likely to form crystalline solids with high melting points.

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27. Green algae are placed inside an upturned funnel in a beaker containing pond water with a small amount of $NaHCO_3$ added. The end of the funnel is covered with a measuring cylinder in which air was trapped. A light bulb is used as a light source.
Consider the following statements:

A. After three hours of the experiment, the air inside the cylinder is mostly carbon dioxide.

B. If the light is changed from white to blue light with the same intensity, more bubbles could be observed.

C. If the light is changed from white to green light with the same intensity, more bubbles could be observed.

D. If more $NaHCO_3$ is added to the water, more bubbles could be observed.

Which statements are correct? (5 marks)

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

28. A family took their newborn to see the doctor. The parents were concerned that something might be wrong because the baby seemed to be in constant pain. The doctor found an abnormally high level of lactic acid in the baby's muscle cells and concluded that the baby has a rare condition in which the skeletal muscle cells lack mitochondria. Which of the following statements best explains this finding? (5 marks)

1. The muscle cells undergo fermentation to produce energy.
2. The muscle cells require a small amount of sugar to function.
3. The muscle cells require an extremely high level of oxygen to function.
4. The muscle cells cannot convert glucose into pyruvic acid.

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29. A roof tile falls from rest from the top of a building. A girl inside the building notices that it takes 0.1 s for the tile to pass her window, which has a height of 1.25 m. What is the distance between the top of this window and the roof? (5 marks)

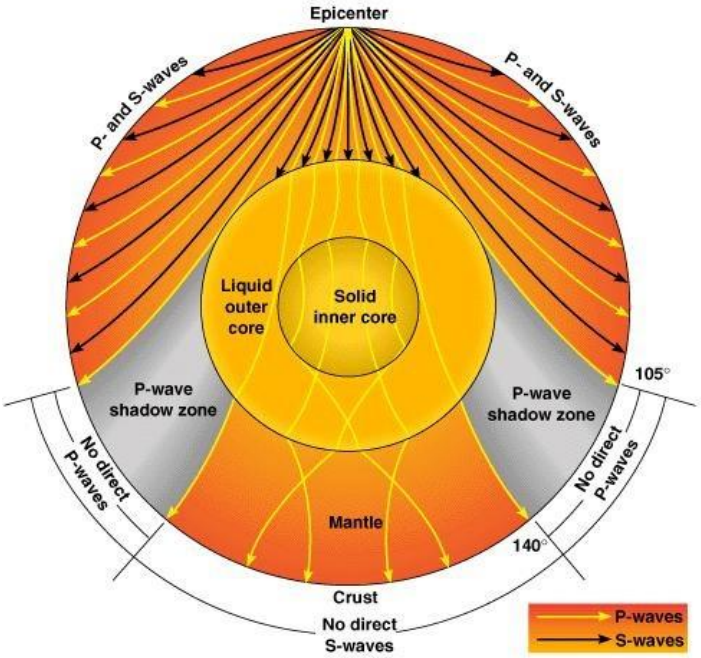
1. 7.2 m
2. 7.6 m
3. 8.0 m
4. 8.4 m

30. An elevator in a tall building is allowed to reach a maximum downward speed of 2.4 m/s. What must the tension be in the cable to stop this elevator over a distance of 3.6 m, if the elevator's mass is 1,200 kg, including occupants? (5 marks)

1. 11,040 N
2. 12,960 N
3. 13,250 N
4. 14,780 N

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31. The Gutenberg discontinuity is crucial for understanding the Earth's internal structure and the composition and behavior of the different layers within the planet. At the Gutenberg Discontinuity, P-waves (primary waves) experience a noticeable decrease in velocity at this depth, while S-waves (secondary waves) are entirely absorbed. The disappearance of S-waves indicates that the region below the discontinuity is liquid, as S-waves cannot travel through liquids as shown in the picture below.



What are the Earth's internal structures at the Gutenberg discontinuity? (1.25 marks)

1. the crust and the mantle
2. the mantle and the outer core
3. the inner core and the outer core
4. the upper mantle and the lower mantle

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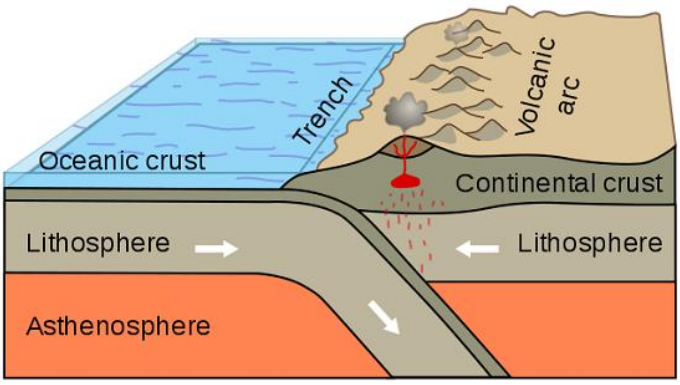
32. Four groups of various oxides are displayed below.

A. Na_2O, BaO, K_2O
B. CO_2, SO_3, N_2O_5
C. Al_2O_3, ZnO, PbO
D. NO, CO, H_2O

Which of the following statements correctly describes the properties of oxides in each group? (1.25 marks)

1. Group A consists of all basic oxides and Group B consists of all acidic oxides.
2. Group C consists of all acidic oxides and Group D consists of all basic oxides.
3. Groups A and B are all acidic oxides.
4. Group C are all basic oxides and Group D are all acidic oxides.

33. At convergent plate boundaries, plates collide with one another. The collision buckles the edge of one or both plates, creating a mountain range or subducting one of the plates under the other, forming a trench. Oceanic crust is destroyed as it subducts, melts, and becomes magma. Convergent plate movement also creates earthquakes and often forms chains of volcanoes as shown in the figure below.



The highest mountain range, the Himalayas, was formed 55 million years ago when the Eurasian and Indo-Australian continental plates converged. Most volcanoes are found above subduction zones but there are no volcanoes in the Himalayas. How could this be explained? (2.5 marks)

1. All volcanoes in the Himalayas are dormant.
2. The continental crust is very thick and magma cannot rise.
3. The continental lithospheric plate does not subduct into the other plate.
4. The continental lithospheric plate has more density than the asthenosphere.

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34. A novel anticancer drug is being developed that specifically targets tubulin polymerization, a critical process for spindle fiber formation during cell division.
If this drug were to be administered to a rapidly dividing cancerous cell line, which specific stage of mitosis would be most directly and significantly impacted, and what observable cellular event would be inhibited as a direct consequence of this drug's action?
(2.5 marks)

1. Telophase; Nuclear envelope reformation would be inhibited.
2. Anaphase; Sister chromatids would fail to separate.
3. Prophase; Chromosome condensation would be prevented.
4. Metaphase; Chromosomes would fail to align at the metaphase plate.

35. A research team is investigating a novel eukaryotic cell line exhibiting unusual resistance to various toxins and xenobiotics. Further analysis reveals an exceptionally high density of a particular organelle, characterized by a vast network of interconnected tubules and sacs, lacking ribosomes on its surface. When exposed to a lipid-soluble toxin, these cells demonstrate a significantly accelerated detoxification rate compared to normal cells. Identify the organelle in question and explain its primary roles in detoxification and lipid metabolism that contribute to this observed resistance. (2.5 marks)

1. Smooth Endoplasmic Reticulum; crucial for lipid synthesis and the detoxification of drugs and poisons through enzymatic modification.
2. Mitochondria; responsible for toxin breakdown through cellular respiration.
3. Rough Endoplasmic Reticulum; primarily involved in detoxification via protein synthesis and folding.
4. Golgi Apparatus; involved in packaging and secreting toxins from the cell.

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36. A botanist observes a specific plant species that exhibits unusually high rates of transpiration even under conditions of moderate humidity and temperature. This plant also shows a remarkable ability to transport sugars from its leaves to its roots over long distances. Which of the following statements most accurately explains how these two observations are fundamentally linked in supporting efficient long-distance transport within the plant? (2.5 marks)

1. High transpiration rates directly increase the turgor pressure within phloem sieve tubes, enhancing sugar transport.
2. The transpirational pull in the xylem creates a negative pressure potential that passively draws sugars through the phloem.
3. Water potential gradients established by transpiration in the xylem are essential for generating the pressure flow in the phloem, thereby facilitating sugar transport.
4. The active loading of sugars into the phloem creates osmotic potential, which in turn drives water uptake into the xylem for transpiration.

37. Earthquake intensity describes the severity of ground shaking at a specific location, which can vary widely even within the same earthquake. It is measured using scales such as the Modified Mercalli Intensity Scale (MMI). On Friday 28th March, a massive level 7.7 Earthquake struck in central Myanmar, causing widespread tremors and severe shaking across Thailand. The quake was followed 12 minutes later by a 6.4 magnitude aftershock.
The strong vibrations were felt in the northern, north-eastern, eastern and central regions of Thailand, including Bangkok, with reports on the collapse of a 30-storey building under construction.
Which factors affect the intensity of an earthquake? (5 marks)

1. Local soil and geology
2. Distance from the epicenter
3. Depth of the earthquake focus
4. All of the above

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38. A boy falls from platform 5.0 m above the water's surface into a deep pool. His downward motion stops 2.0 m below the surface of the water. Estimate the magnitude of average acceleration while he is underwater. (5 marks)

1. 21 m/s^2
2. 23 m/s^2
3. 25 m/s^2
4. 27 m/s^2

39. A team of microbiology students is investigating the antibacterial properties of a newly synthesized chemical compound, tentatively named **'Compound Z,'** against a common bacterium, *Staphylococcus aureus*. They observed that *Staphylococcus aureus* is a frequent cause of skin infections and is showing increasing resistance to conventional treatments. The students hypothesize that **'Compound Z** will effectively inhibit the growth of *Staphylococcus aureus* at low concentrations.' To test this hypothesis, they designed the following experiment:

Experimental Design:

They prepared five sterile petri dishes, each containing 20 mL of nutrient agar inoculated with a standardized amount of *Staphylococcus aureus* suspension.

Dish 1 (Control A): Received 100 µL of sterile distilled water.

Dish 2 (Control B): Received 100 µL of a common, well-known antibiotic solution (e.g., Penicillin) at a standard effective concentration.

Dish 3 (Treatment 1): Received 100 µL of Compound Z solution at a concentration of 0.1 mg/mL.

Dish 4 (Treatment 2): Received 100 µL of Compound Z solution at a concentration of 0.5 mg/mL.

Dish 5 (Treatment 3): Received 100 µL of Compound Z solution at a concentration of 1.0 mg/mL.

All petri dishes were incubated simultaneously in a bacterial incubator set at 37°C for 24 hours.

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After 24 hours, the students measured the diameter of the 'zone of inhibition' (the clear area where bacteria did not grow) around the point of compound application for each dish. A larger zone indicates greater antibacterial activity.

Observed Results (Hypothetical):

Dish 1 (Control A - Water): No zone of inhibition was observed (bacteria grew uniformly).

Dish 2 (Control B - Penicillin): A clear zone of inhibition with a diameter of 25 mm was observed.

Dish 3 (Treatment 1 - Compound Z, 0.1 mg/mL): A small zone of inhibition (5 mm diameter) was observed.

Dish 4 (Treatment 2 - Compound Z, 0.5 mg/mL): A moderate zone of inhibition (12 mm diameter) was observed.

Dish 5 (Treatment 3 - Compound Z, 1.0 mg/mL): A large zone of inhibition (20 mm diameter) was observed.

Based on these results, the students concluded that "Compound Z exhibits antibacterial properties against *Staphylococcus aureus*, and its effectiveness increases with concentration."

Considering the principles of the scientific method and experimental design, which of the following represents the most significant limitation or potential flaw in this experiment, or a critical next step required to strengthen the conclusion? (5 marks)

1. The experiment did not include enough replicates for each treatment group, which could lead to unreliable average measurements.
2. The use of a standard nutrient agar might not be optimal for the specific growth requirements of *Staphylococcus aureus*, potentially affecting bacterial vitality.
3. The conclusion only states that Compound Z 'inhibits' growth, but does not determine if it actually 'kills' the bacteria (bactericidal effect) or merely stops their reproduction (bacteriostatic effect).
4. The students did not perform a toxicity test of Compound Z on mammalian cells, which is crucial before considering it for medical applications.

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40. Fermentation by lactic acid bacteria (LAB) is widely used in producing soy-based fermented foods like tempeh and sweet soy sauce. This process generates bioactive peptides with antioxidant properties.

These antioxidant peptides often include hydrophobic amino acids and aromatic amino acids. Lysine and methionine also contribute to antioxidant activity. Hydrophobic amino acids improve lipid solubility, enhancing reactions with lipid-soluble radicals. Aromatic amino acids donate electrons to neutralize radicals, while histidine aids by donating hydrogen and chelating metal ions to reduce oxidation.

The researchers were therefore interested in investigating the antioxidant activity and identifying antioxidant peptides derived from the fermentation of germinated soybean milk using LAB with different acid solution (acid solution A and acid solution B). This fermentation process has the potential to enhance health benefits, as fermented soy-based products are known to be rich sources of bioactive peptides with various beneficial effects.

The experimental results of antioxidant peptide concentrations and IC_{50} values of different fractions of fermented soymilk obtained from germinated soybeans are shown in the table below.

LAB in acid solution	Size	Peptide Con[c]	IC_{50}^{*}
Solution A	<2	2.26±0.01	471.16
	<5	2.24±0.02	590.84
	<20	2.13±0.02	786.96
Solution B	<2	2.28±0.03	556.93
	<5	2.21±0.03	706.58
	<20	1.97±0.01	663.90
Ascorbic acid			19.71

IC_{50}^{*} : half-maximal inhibitory concentration

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Based on the experimental data above, which present the analysis of peptides in fermented soybean milk using *LAB with different acid solution*, if researchers aim to improve the fermentation process to minimize the IC_{50} value and maximize the antioxidant activity of the peptides, which of the following approaches would be the most appropriate to implement? (5 marks)

1. Use the bacteria in solution B and select the fraction size <20 kDa to obtain the highest peptide concentration.
2. Use the bacteria in solution A and select the fraction size <2 kDa because it gives the lowest IC_{50} value among all experimental groups.
3. Use the bacteria in solution A and select the fraction size <20 kDa because it yields the highest concentration of peptides.
4. Use the bacteria in solution B and select the fraction size <2 kDa because it provides both high peptide concentration and low IC_{50} compared to the other bacteria.

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

Please check your answers before submitting the answer sheet.

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คำตอบวิชาวิทยาศาสตร์ ชั้นมัธยมศึกษาปีที่ 4

ข้อ	คำตอบ	ข้อ	คำตอบ
1	4	21	3
2	3	22	4
3	2	23	4
4	1	24	1
5	4	25	3
6	3	26	2
7	3	27	4
8	3	28	1
9	2	29	1
10	3	30	2
11	3	31	2
12	3	32	1
13	1	33	3
14	2	34	4
15	3	35	1
16	2	36	3
17	4	37	4
18	1	38	3
19	4	39	3
20	3	40	2

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