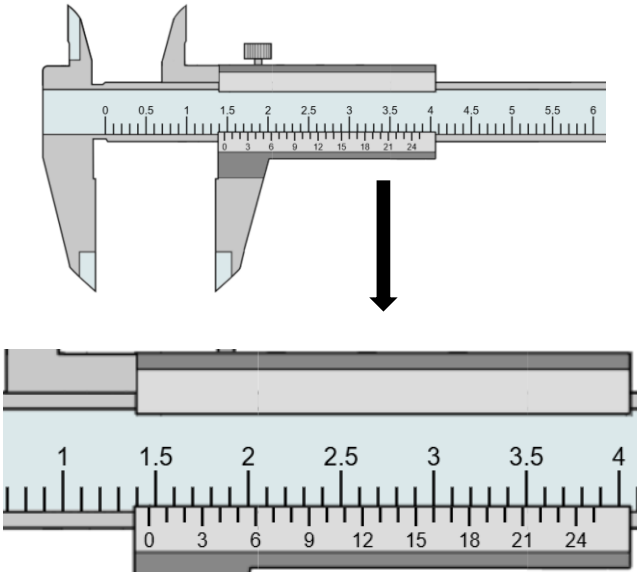
Instructions :

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. Based on the figure of vernier caliper with 25 divisions shown above, which measurement is correct? (1.25 marks)



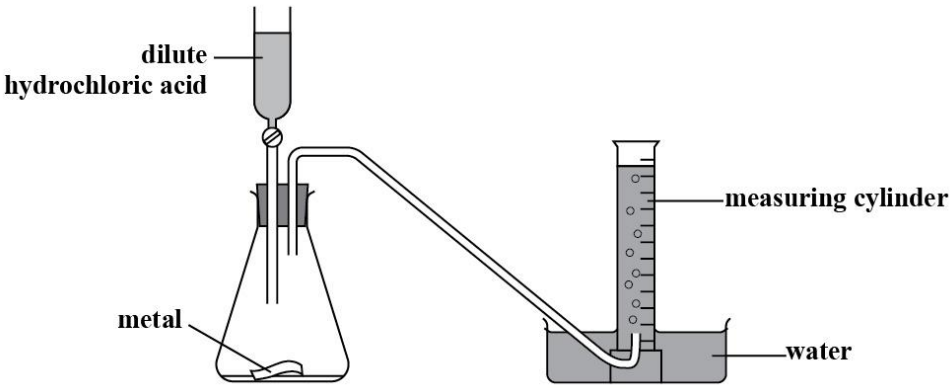
1. 14.64 mm
2. 14.640 mm
3. 14.80 mm
4. 14.800 mm

2. What is the value of 72 milligrams•decimeters^2 per hour^2 or $\left[\frac{mg \cdot dm^2}{h^2}\right]$ in units of kilograms•centimeters^2 per minute^2 or $\left[\frac{kg \cdot cm^2}{min^2}\right]$? (1.25 marks)

1. 1.2×10^{-6}
2. 2×10^{-6}
3. 1.2×10^{-4}
4. 2×10^{-4}

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3. The diagram shows an experiment to measure the rate of a chemical reaction.



Consider the following statements:

A. The goal of this experiment is to study the reaction between an acid and a metal, and to measure the volume of gas produced.

B. Carbon dioxide gas is produced from this reaction.

C. The reaction rate is reduced by adding water to the flask.

D. The cylinder is placed upside down in a water bath to collect the gas that is insoluble in water and has a greater density than water.

E. The control variables are the type and concentration of acid, temperature, and surface area of the metal.

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

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

4. Consider the following statements regarding bacterial, animal and plant cells:

A. Animal and plant cells have a nucleoid.

B. The main constituent of plant cell walls is a polysaccharide called lignin.

C. Animal and plant cells generate ATP within the mitochondria.

D. Bacterial cells have no cell walls.

E. Peptidoglycan is the main component in the bacterial cell wall.

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

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

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5. A slide of an unknown specimen is observed under the microscope.

A. Cell wall
B. Chloroplasts
C. Mitochondria
C. Plasma membrane

Which of the following structures would be helpful in determining whether the specimen is a plant or an animal tissue? (1.25 marks)

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

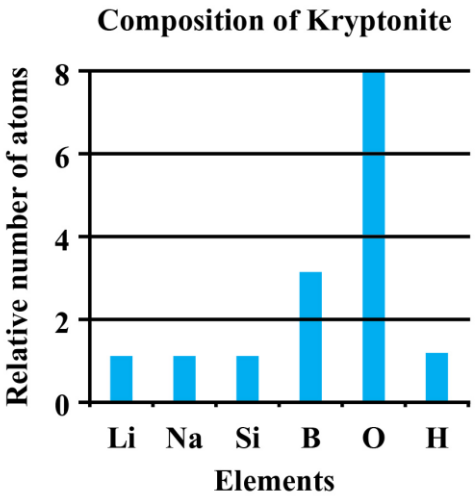
6. Consider the following statement.

A. Has a low melting point
B. Can be easily compressed
C. Is a good electrical conductor
D. Has a fixed volume but no definite shape

Which of these statements are correct about pure water vapour? (1.25 marks)

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

7. Kryptonite is a fictional mineral with a formula similar to that of a certain hypothetical substance, which has the following composition:



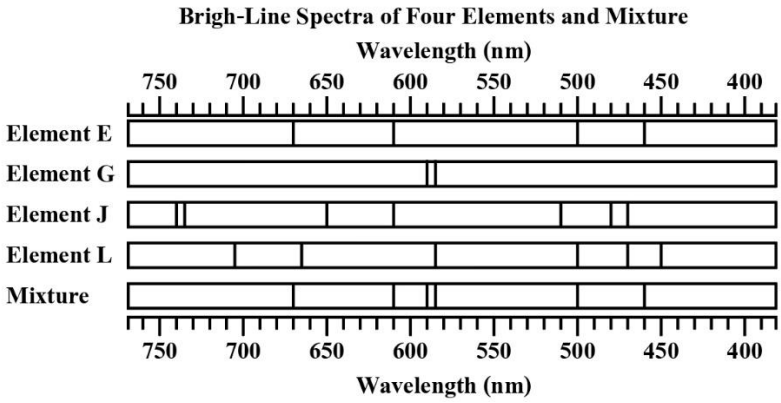
The graph shows the relative number of atoms of each element in Kryptonite.

Which of the following formula is the most accurate for Kryptonite? (1.25 marks)

1. $LiNaSiB_30_7H_2$
2. $Li_2Na_2Si_2B_30_8H_2$
3. $LiNaSiB_30_8H_2$
4. $LiNaSiB_3O_8H$

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8. The bright-line spectra produced by four elements and a mixture of two of these elements are represented in the diagram below



Which elements are present in the mixture? (1.25 marks)

1. L and G
2. L and J
3. E and G
4. E and J

9. Consider the following statements:

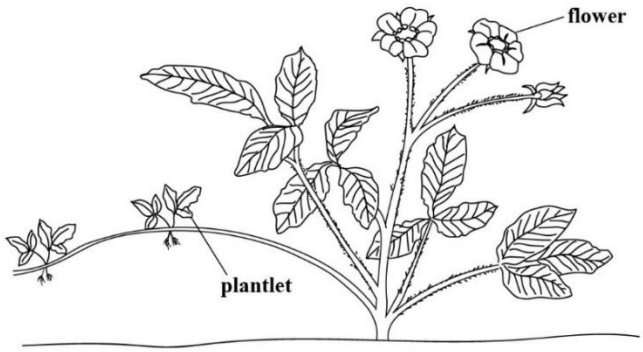
A. All parts of the solution have the same density.
B. All parts of the solution have the same temperature.
C. All parts of the solution have the same chemical properties.
D. All parts of the solution have the same degree of transparency.

Which of the following statements is/are true about a homogeneous solution? (1.25 marks)

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

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10. The diagram shows a plant that is producing small plantlets.



Which statement about the plantlets is correct? (1.25 marks)

1. They are genetically different from the parent plant.
2. They are genetically identical to the parent plant.
3. They are produced as a result of the fusion of nuclei.
4. They are produced by fertilizing the flowers.

11. Which of the following about photosynthesis and respiration in green plants is correct? (1.25 marks)

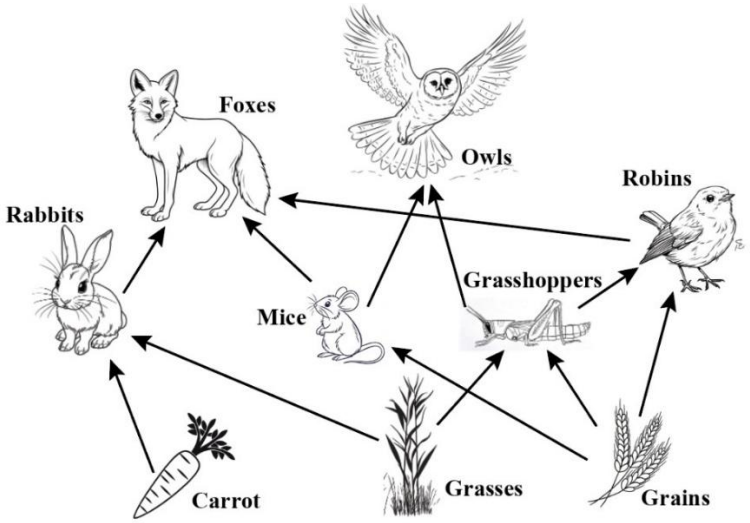
1. Photosynthesis occurs when respiration has stopped.
2. Photosynthesis only occurs only in light and respiration only in darkness.
3. Photosynthesis only occurs in light and respiration occurs all the time
4. Respiration occurs only when photosynthesis has stopped.

12. Which of the following statements is incorrect? (1.25 marks)

1. Xylem primarily transports water and dissolved mineral nutrients from the roots upwards to the rest of the plant, including the stem and leaves.
2. Phloem transports sugars, primarily glucose produced during photosynthesis in the leaves, to other parts of the plant. This movement can be upwards or downwards.
3. The transpiration process occurs when water evaporates from the moist surfaces of mesophyll cells into the air spaces between cells inside the leaf. The water vapor then diffuses out of the leaf into the atmosphere through small openings called stomata.
4. The continuous flow of water through the xylem helps transport dissolved mineral nutrients absorbed by the roots throughout the plant.

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13. The diagram below represents a partial food web.



Consider the following statements:

A. Fewer rabbits means foxes are more likely to eat mice.

B. If the fox population in this area increases, rabbits and mice will decrease, and only grass will increase.

C. A disease outbreak that causes a rapid decline in the number of robins will affect the grains and the foxes.

D. The longest food chain is Grasses ⟶ Grasshoppers ⟶ Robins ⟶ Owls.

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

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

14. Thermometer A measures the freezing and boiling points of water at – 7 degrees and 73 degrees, respectively. Thermometer B measures the freezing and boiling points of water at 83 degrees and 208 degrees, respectively. If Thermometer A reads 13 degrees, what will Thermometer B read? (1.25 marks)

1. 112.00 Degrees
2. 114.25 Degrees
3. 116.50 Degrees
4. 118.75 Degrees

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15. A solar cooker works by concentrating energy from the sun to heat a container in which food can be cooked. A well-designed solar cooker can cook stews, boil water and bake simple cakes. The picture below shows a very simple home-made solar cooker.



A solar cooker works by collecting solar energy to heat the cooking vessel. A well-designed solar cooker can make stews, boil water, and bake simple cakes. The image above shows a simple solar cooker.

Consider the following statements:

A. Heat energy is transferred out of the box by radiation and conduction.

B. Light-colored materials absorb more radiation than they reflect.

C. Insulation slows down the transfer of heat out of the solar oven box.

D. The black color of the solar oven pot attracts infrared radiation.

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

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

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16. The research team observes a eukaryotic cell that exhibits impaired protein synthesis and a significant accumulation of misfolded proteins in the lumen of the endoplasmic reticulum. This leads to a stress response that eventually triggers apoptosis. Given this observation, which cellular component's primary function is most likely to be severely compromised? (2.5 marks)

1. Lysosomes
2. Golgi apparatus
3. Smooth Endoplasmic Reticulum
4. Ribosomes attached to the Rough Endoplasmic Reticulum

17. A red blood cell (RBC) is placed into solution X. It subsequently swells and bursts. Another identical RBC is placed into solution Y, and it immediately shrinks and swells. Which of the following statements correctly describes the relative solute concentrations of solutions X and Y compared to the cytoplasm of the RBC? (2.5 marks)

1. Solution X is hypertonic; Solution Y is hypotonic.
2. Solution X is hypotonic; Solution Y is hypertonic.
3. Both Solution X and Solution Y are isotonic, but their temperatures differ.
4. Solution X is isotonic; Solution Y is hypertonic.

18. A research team is investigating an unknown type of eukaryotic cell. They observe that a specific nutrient, Compound Z, is highly concentrated inside the cell, reaching levels significantly higher than its concentration in the extracellular fluid. Furthermore, the uptake of Compound Z into the cell ceases immediately if the cell is treated with a metabolic poison that inhibits ATP production. Which of the following transport mechanisms is most likely responsible for the uptake of Compound Z? (2.5 marks)

1. Facilitated diffusion
2. Simple diffusion
3. Primary active transport
4. Osmosis

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19. A student is conducting an investigation to explore how different types of sugar affect gas production by bacteria during fermentation. Four 250 mL conical flasks (labeled A to D) are prepared, each containing 100 mL of nutrient broth medium. To each flask, the student adds 5 grams of a specific sugar: glucose in Flask A, sucrose in Flask B, fructose in Flask C, and starch in Flask D. In addition, 5 mL of bacterial culture (with an optical density at 600 nm of 0.6) is added to each flask. All flasks are sealed with stoppers connected to a gas collection apparatus and are incubated at same temperature (as shown in Figure 1).

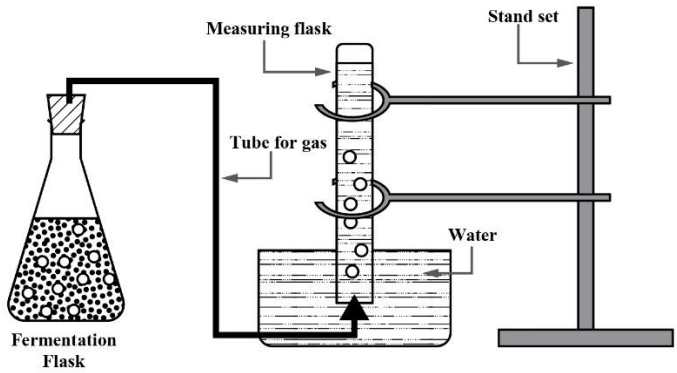


Figure 1. Experimental setup for sugar fermentation by bacteria.

After two days of incubation, the student measures the volume of gas produced in each flask using a water displacement method and records the results in milliliters (mL), as shown in Figure 2 below.

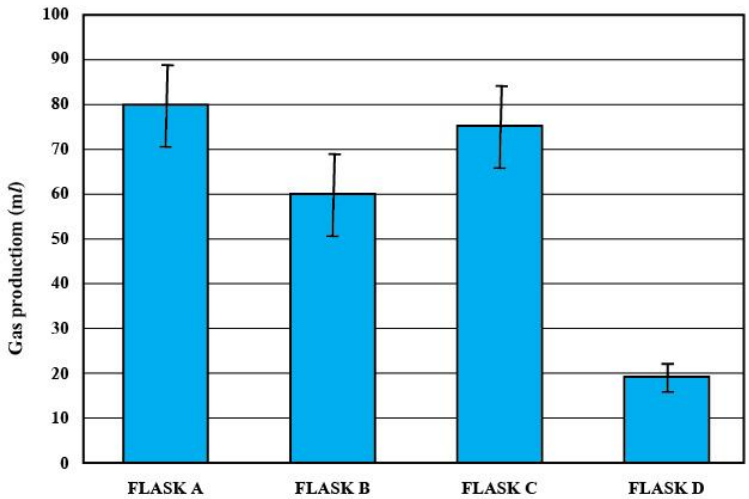


Figure 2. Results of the sugar fermentation experiment

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In this fermentation experiment, the student measures the effect of different types of sugar on gas production by bacteria. Which of the following best identifies the variables involved in this investigation? (2.5 marks)

1. The independent variables are the type of sugar and the optical density of bacteria; the dependent variable is the amount of gas produced; the controlled variable is the amount of sugar added.

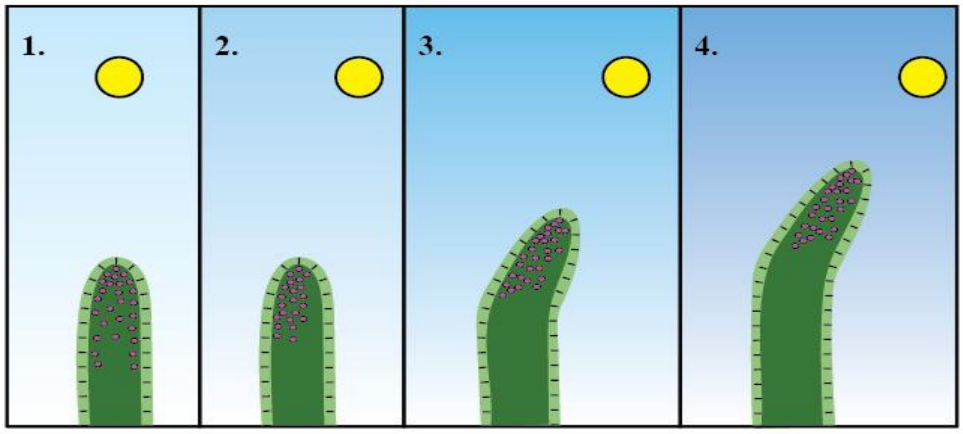
2. The independent variables are the type of sugar and the amount of gas collected; the dependent variables are the gas volume and the type of sugar; the controlled variables include temperature, flask size, and incubation time.

3. The independent variable is the type of sugar added; the dependent variable is the amount of gas produced; the controlled variables include temperature, volume of broth, and bacterial concentration.

4. The independent variable is the type of gas produced; the dependent variable is the concentration of sugar; the controlled variables include the type of sugar and inoculum volume.

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20. A student is investigating how plant shoots respond to light. The experiment uses *Brassica rapa* seedlings (commonly known as fast-growing mustard plants), which are five days old at the start of the investigation. The seedlings are placed in a controlled environment with a constant temperature of 25°C. A single LED lamp is positioned 15 centimeters from one side of the plant to provide directional light. The seedlings are exposed to this light for a total of eight hours. Observations are recorded at four-time intervals: 0 hours, 2 hours, 5 hours, and 8 hours, corresponding to stages 1 to 4 shown in the image.



The diagram illustrates the distribution of auxin shown as dots, a plant hormone responsible for regulating shoot growth. Throughout the experiment, several variables are kept constant, including the light intensity, distance from the light source, type of plant, soil moisture, and container size.

Which statements are not true based on the experiment? (2.5 marks)

1. A controlled variable in this experiment is the species of the plant used to ensure that differences in shoot response are not due to genetic variation.

2. The dependent variable in this experiment is the degree of curvature or bending of the plant shoot toward the light source.

3. The dependent variable in this experiment is the direction from which the light shines onto the plant shoot.

4. The temperature of the environment is a controlled variable because changes in temperature could affect the rate of plant growth and interfere with the results.

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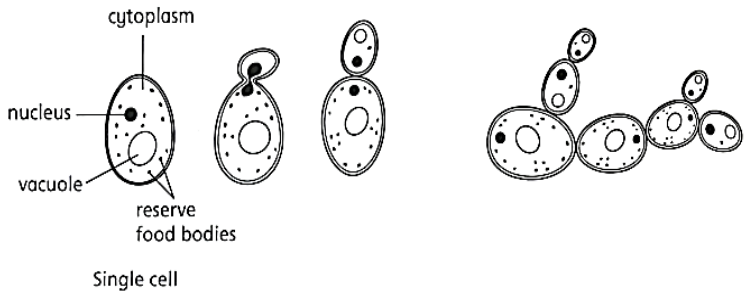
21. Which of the following can be calculated for a solid compound, using only the formula of the compound and the periodic table? (2.5 marks)

1. The density of the compound
2. The heat of fusion of the compound
3. The melting point of each element in the compound
4. The percent composition by mass of each element in the compound

22. A pan made from which of the following metals would use the least amount of heat to reach the desired cooking temperature? (2.5 marks)

1. Aluminum (specific heat 0.22 kcal/kg C°)
2. Copper (specific heat 0.093 kcal/kg C°)
3. Iron (specific heat 0.11 kcal/kg C°)
4. Titanium (specific heat 0.125 kcal/kg °C)

23. The diagram below shows yeast cells.



A : They can reproduce by budding.

B : They do not need food to survive.

C : Each cell is a unicellular organism.

D : These organisms lack the structures necessary for trapping light.

Which of the following statements about the organisms are true? (2.5 marks)

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

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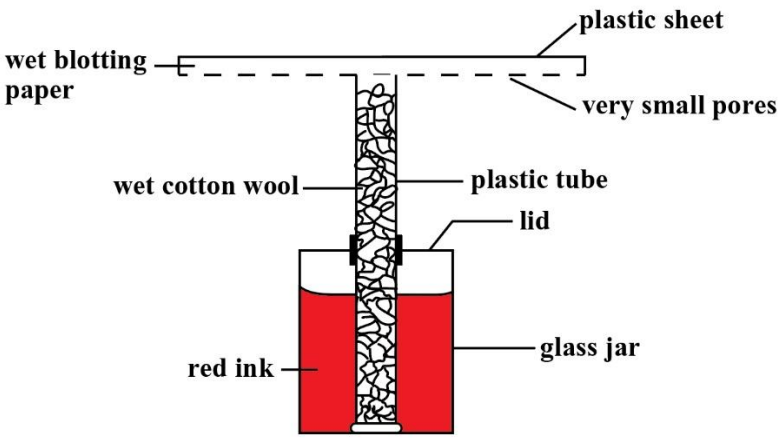
24. The results in the table below were obtained by analysis of the sap vacuole of a freshwater alga and the pond water in which it was growing.

Ion	Sap concentration /mg ions dm^{-3}	Pond water concentration /mg ions dm^{-3}
Ca^{2+}	26.0	2.6
Mg^{2+}	21.6	6.0
Na^{+}	49.9	1.2
K^{+}	49.3	0.51

Which of the following processes accounts for this process? (2.5 marks)

1. Active transport
2. Diffusion
3. Osmosis
4. Plasmolysis

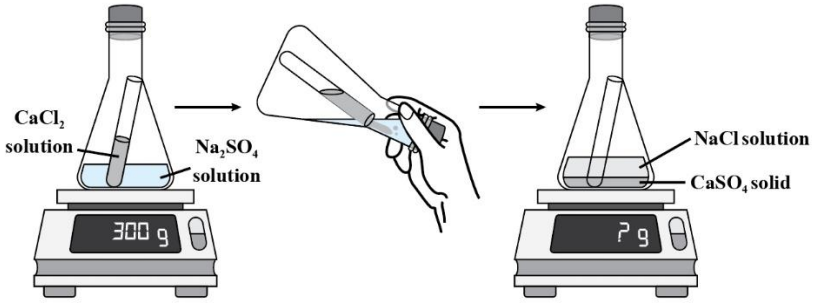
25. Which of the following structures are represented by the plastic sheet and wet cotton wool, respectively? (2.5 marks)



	Plastic sheet	Cotton wool
1.	Cuticle	Xylem
2.	Upper epidermis	Xylem
3.	Cuticle	Phloem
4.	Upper epidermis	Stem

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26. The diagram shows a test tube containing a calcium chloride ($CaCl_2$) solution placed in a sealed flask containing a sodium sulfate (Na_2SO_4) solution. The flask rests on a digital scale, which reads 300 grams. By tilting the flask, the calcium chloride mixes with the sodium sulfate. After returning the flask to the balance, solid white calcium sulfate ($CaSO_4$) is observed at the bottom, while the remaining solution contains sodium chloride (NaCl).



Which of the following is not a chemical change that occurs in the flask? (2.5 marks)

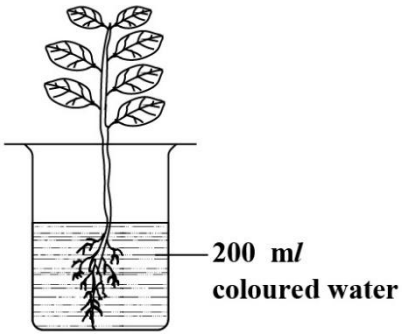
1. Formation of gas bubbles.
2. Formation of a white solid precipitate.
3. Formation of a white, insoluble substance formed.
4. Formation of new chemicals after mixing the original chemicals.

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27. Jenny prepared five experimental setups.

Setup	Amount of coloured water / ml	Temperature of water / °C	Type of plant
P	200	25	X
Q	200	25	Y
R	200	40	X
S	200	40	Y
T	200	25	Z

The diagram below shows one of the setups:



She left the apparatus in a water bath for 24 hours before measuring the amount of water remaining in each setup.

Consider the following statements:

A: To investigate the rate of water uptake by plants X, Y, and Z at 25 °C

B: To investigate if an increase in the temperature of water will affect the uptake of water by plants X and Y.

C: To investigate if the coloured water will affect the amount of water absorbed by plants X, Y, and Z.

What is the purpose of the experiment? (5 marks)

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

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28. Tom wanted to investigate how changes in temperature affect the air pressure inside a sealed container. To do this, he carefully poured warm water into a clean, dry plastic bottle until it was half full. He then tightly sealed the bottle cap to ensure that no air could escape. As the bottle began to cool to room temperature, Tom used a special pressure gauge connected to the cap to measure the air pressure inside at regular time intervals. He recorded how the temperature and pressure changed over time, hoping to better understand the relationship between temperature and the behavior of gas particles in a closed system. Here is Tom's data:

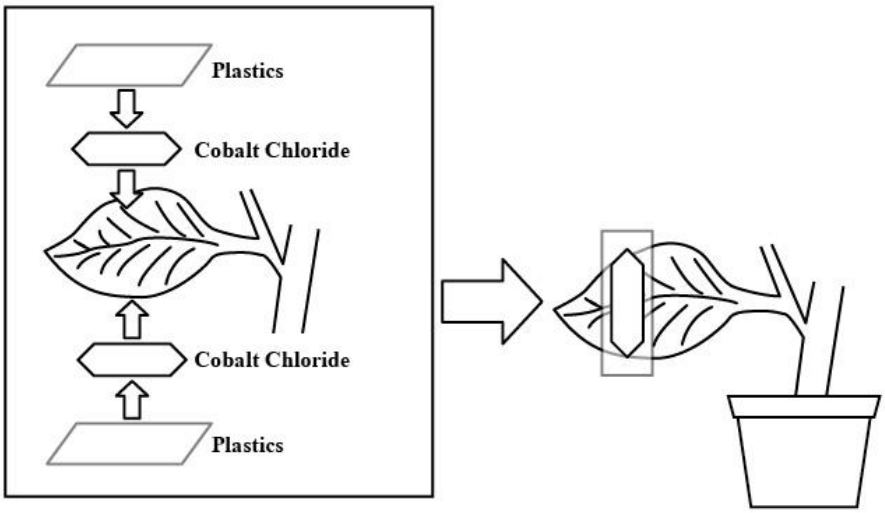
Time (minutes)	Temperature (°C)	Air pressure (kPa)
0	60	120
5	50	112
10	40	104
15	30	96
20	25	92

Why does the pressure inside the sealed bottle decrease as temperature decreases?
(5 marks)

1. Because as the air cools, particles move faster and hit the walls more often, increasing pressure even though temperature is lower.
2. Because as temperature drops, air particles lose energy, move slower, and hit the walls with less force, lowering the pressure inside.
3. Because cooling allows new cold air from outside to enter the sealed bottle and replace the warmer air, changing the pressure.
4. Because as temperature drops, the water level rises and pushes air out, reducing the pressure without changing particle movement.

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29. Students studied the transpiration of a particular plant using cobalt chloride paper, which changes color from blue to pink when exposed to moisture. They arranged 3 sets of experiments (experimental sets 1-3) as shown in the picture. Each set of experiments was placed in a different environment according to the factors being studied. In each set of the experiment, the plants were divided into a control group and an experimental group. The leaves of the plants being tested were all the same size and age. The clear plastic sheets were sealed tight to prevent external moisture from interfering with the experiment. All other factors, apart from the one being studied, were controlled to be identical in each experimental set.



Observe the change in color of the cobalt chloride paper by timing how long it takes to observe the change in color. The results are as follows:

Experimental set	Factors	Timing of the change in color of cobalt chloride paper (minute)	
		Experimental group	Control group
1	Relative humidity	11.5	5.0
2	Temperature	4.0	6.0
3	Distance from light source	1.5	5.0

Based on the experimental results, consider the following statements comparing the environmental conditions used in each setup:

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A. In experimental setup 1, the experimental group had lower relative humidity in the air than the control group.

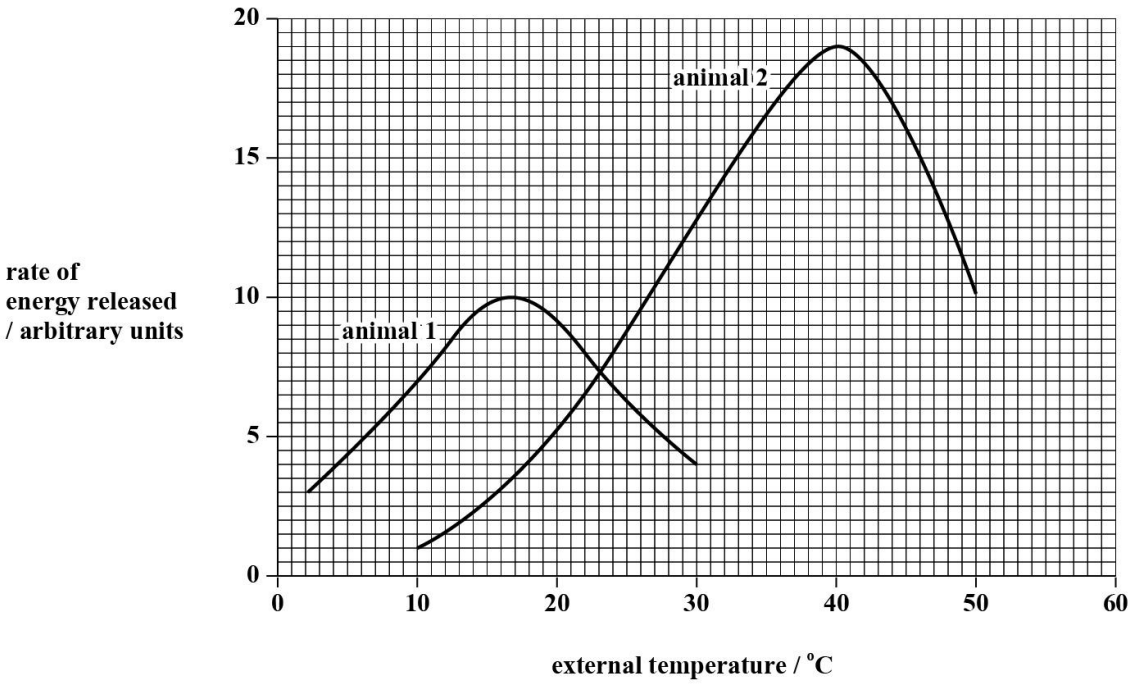
B. In experimental setup 2, the experimental group had a lower temperature than the control group.

C. In experimental setup 3, the experimental group was closer to the light source than the control group.

Which statement is correct? (5 marks)

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

30. The graph shows the energy released by two animals through respiration as external temperature changes.



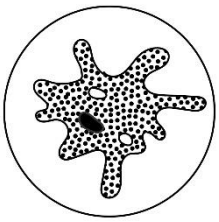
Which conclusion can be drawn from the graph? (5 marks)

1. Animals 1 and 2 release the least energy at 23 °C.
2. Animal 2 always respires faster than animal 1.
3. As the temperature rises, respiration always increases.
4. The rate of respiration is the same for both animals at 23 °C.

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31. Organisms A and B represent microorganisms viewed through a microscope. Although both seem to occupy the same field of view, which organism is actually larger?
(1.25 marks)

Organism A
viewed with 10x objective



Organism B
viewed with 40x objective



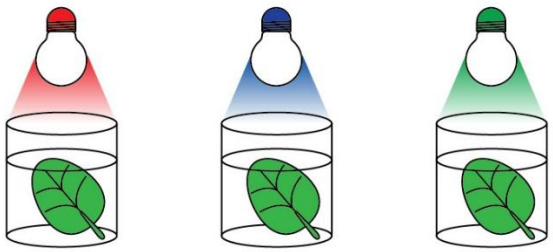
1. A is larger since it fills the field of view at low magnification.
2. B is larger since the magnification is lower.
3. A is larger since the magnification is higher.
4. B is larger since it fills the field of view at high magnification.

32. A specialized gland cell in an animal is responsible for secreting a high concentration of specific digestive enzymes into a duct. These enzymes are large protein molecules synthesized on ribosomes. The cell also actively pumps sodium ions (Na^+) out of the cell, maintaining a low internal Na^+ concentration, and this process requires ATP.
Consider the following statements about the function of this gland cell.
Which of the following statements is INCORRECT? (1.25 marks)

1. The secretion of digestive enzymes from the gland cell likely occurs via exocytosis, a form of bulk transport.
2. The pumping of Na^+ out of the cell against its concentration gradient is an example of active transport.
3. If this cell were placed in a hypotonic solution, it would tend to swell due to water moving out of the cell by osmosis.
4. Small, lipid-soluble molecules could easily enter this gland cell by simple diffusion, provided there is a concentration gradient.

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33. Jessica wants to investigate how different colors of light affect the rate of photosynthesis in spinach leaves. She plans to expose identical leaf samples to red, blue, and green light separately and measure oxygen release as an indicator of photosynthesis rate.



Which of the following is the best hypothesis for her experiment? (2.5 marks)

1. If spinach leaves are exposed to red, blue, or green light, then they will all photosynthesize equally because they receive light energy.
2. If spinach leaves are placed under green light, they will produce the most oxygen because green light reflects the plant's natural color.
3. If different colors of light affect photosynthesis, then exposing spinach leaves to green light will reduce oxygen production compared to red or blue light.
4. If spinach leaves are placed in the dark, they will grow faster because they conserve energy instead of using it for photosynthesis.

34. Colloidal systems can be described in terms of the dispersed phase and dispersion phase as

a. Liquid – gas
b. Liquid – liquid
c. Liquid – solid
d. Solid – liquid

Examples of the systems (a) – (d) above include:

I. Shampoo
II. Gelatin
III. Fog
IV. Paint

Which of the following is the correct match? (2.5 marks)

1. a – I , b – II , c – III , d – IV
2. a – II , b –I , c – IV , d – III
3. a – IV , b –II I, c – II , d – I
4. a – III , b – I , c – II , d – IV

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35. A group of students want to test if aluminum foil reacts with warm copper sulfate. Alfred's job was to set up and put away the Bunsen burner, tripod, and gauze mat. Bruce's job was to light the Bunsen burner. Carmen's job was to collect 150 mL of water in a beaker and then dispose of the hot water afterward. Dianna's job was to prepare a test tube with copper sulfate, put it into the warm water in the beaker and then add the aluminium foil. Once the experiment was over, she was also to dispose of the chemicals in the waste container provided by the teacher.
Which option below most correctly identifies a safety risk or hazard for each student?
(2.5 marks)

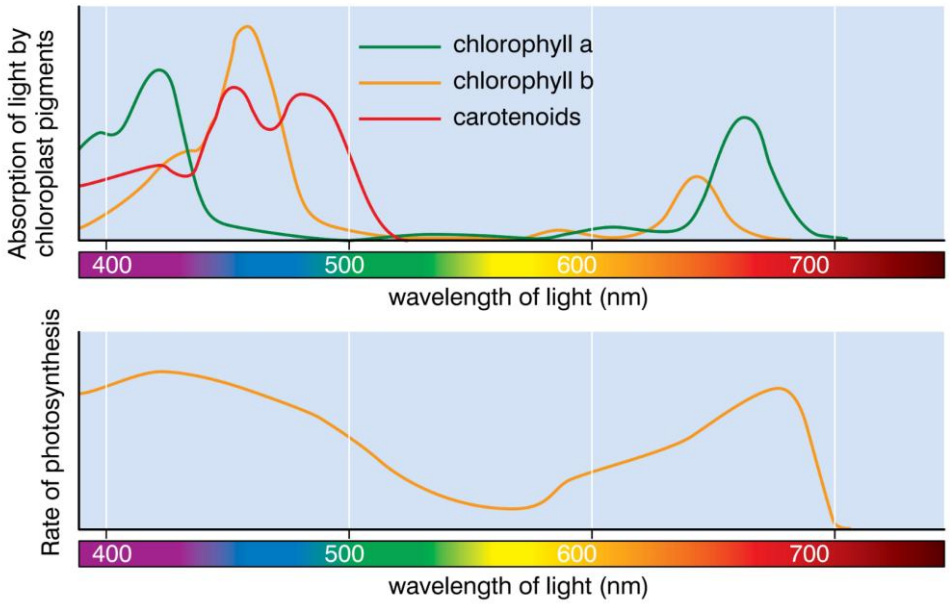
	Alfred	Bruce	Carmen	Dianna
1.	Hot metal can burn skin	Bunsen flames can cause burns	Hot water can burn skin	Copper waste can be toxic in waterways
2.	Placing hot metal under water can cause steam	Leaving the Bunsen on is a waste of money	Broken glass can cause cuts	Copper can irritate the skin
3.	Hot metal can burn skin	The Bunsen flame can blind you if you stare at it	Broken glass can cause cuts	Copper waste can be toxic in waterways
4.	Broken glass can cause cuts	Bunsen flames can cause burns	Hot metal can burn skin	Copper can irritate the skin

36. Which of the following best explains why gases have lower densities than liquids and solids? (2.5 marks)

1. The particle size of gases is generally smaller than those of liquids and solids.
2. The number of particles in gases is less than that of an equal volume of solids and liquids due to the distance between the particles.
3. The attractive force between the gas particles is extremely weak. As a result, the masses of the particles are negligible.
4. Gases do not have fixed shapes. As a result, their densities are the lowest.

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37. At GreenTech Academy, Nina is testing how different light wavelengths affect plant growth and photosynthesis. She uses blue (~450 nm), green (~550 nm), and red (~660 nm) LED lights to grow identical plants under controlled conditions—same temperature (22°C), soil, water, nutrients, and light duration (12 hours/day). She then analyzes a scientific graph showing light absorption by chlorophyll a, chlorophyll b, and carotenoids, alongside a photosynthesis rate curve. She identifies which wavelengths lead to the highest and lowest photosynthesis rates.



Which of the following is the most appropriate hypothesis for Nina's experiment based on the light absorption and photosynthesis graphs? (5 marks)

1. If plants are exposed to red and green LED light, they will show equally high photosynthesis rates because both wavelengths are in the visible spectrum.

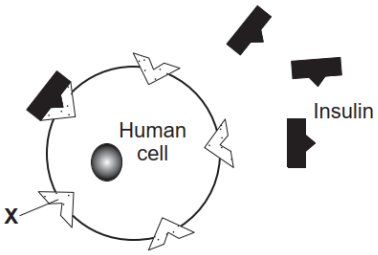
2. If plants are exposed to light with wavelengths poorly absorbed by chlorophyll a and b, such as green LED light (~550 nm), they will have a lower photosynthesis rate and with a reduction in growth.

3. If plants are given equal light duration from any color of LED, they will photosynthesize at similar rates regardless of pigment absorption profiles.

4. If light intensity is high enough, all wavelengths will lead to maximum photosynthesis, even if pigments do not absorb them efficiently.

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38. The diagram below represents the interaction of a human cell and the hormone, insulin, that maintains a healthy blood glucose level in the body.



Some individuals cannot produce insulin. As a result, their cells will (5 marks)

1. produce another molecule to take over the function of insulin
2. synthesize more glucose for energy production
3. not respond appropriately to changes in blood glucose levels
4. divide at a faster rate than when insulin is available

39. Two different human disorders are compared in the table below.

Blood Disorder That Affects Hemoglobin	Skin Disorder With a Sore That Does Not Heal
• caused by a gene mutation • individuals with two copies of the mutated gene have the disorder • this disorder is more common in some populations than in others • individuals are born with this disorder	• caused by a gene mutation • some individuals exposed to UV radiation develop the disorder • there are environmental factors associated with the disorder • abnormal skin cells reproduce rapidly in exposed individual

Which statement describes the patterns of inheritance for these two disorders? (5 marks)

1. The blood disorder is not inherited but the skin disorder is inherited.
2. Both the blood and skin disorders are not inherited but can be passed to offspring.
3. The blood disorder can be inherited, and there are factors associated with the skin disorder that may be inherited.
4. Both the blood and skin disorders can be inherited, with offspring always showing symptoms associated with the disorders.

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40. Nitrogen gas and oxygen gas make up about 99% of the Earth's atmosphere. Other atmospheric gases include argon, carbon dioxide, methane, ozone, hydrogen, etc.
The amount of carbon dioxide in the atmosphere can vary. Data for the concentration of $CO_2(g)$ from 1960 to 2000 are shown in the table below.

Atmospheric Concentration of $CO_2(g)$

Year	Concentration (ppm)
1960	316.9
1980	338.7
2000	369.4

Consider the following statements:

A. In 1980, the mass of carbon dioxide in a 100.0-gram sample of air was 0.0034 grams.

B. Methane can decompose chemically, but argon can not.

C. The gases in the atmosphere are separate elements and are not chemically bound.

Which of the following statements are correct? (5 marks)

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

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

Please check your answers before submitting the answer sheet.

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คำตอบวิชาวิทยาศาสตร์ ชั้นมัธยมศึกษาปีที่ 1

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

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