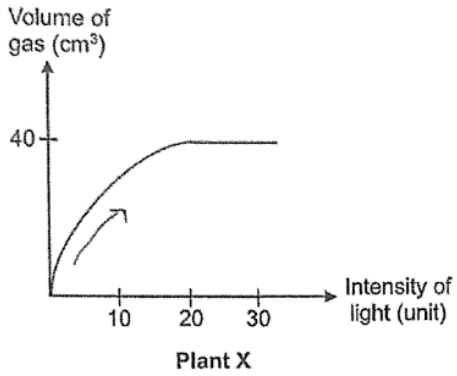
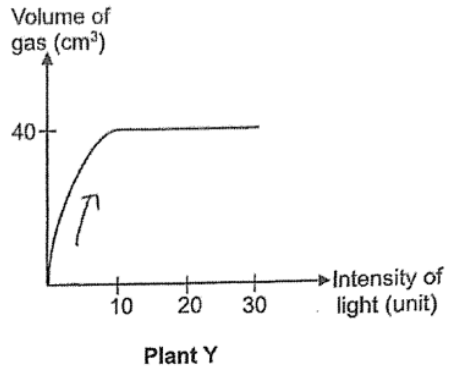
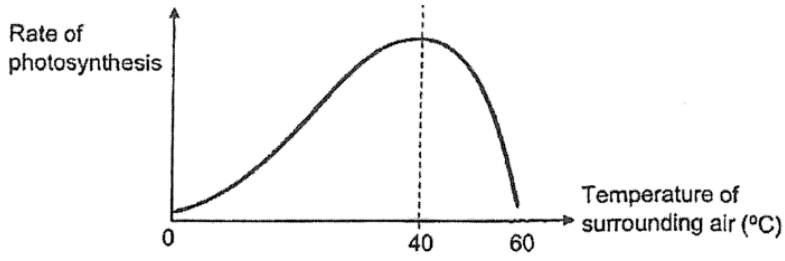
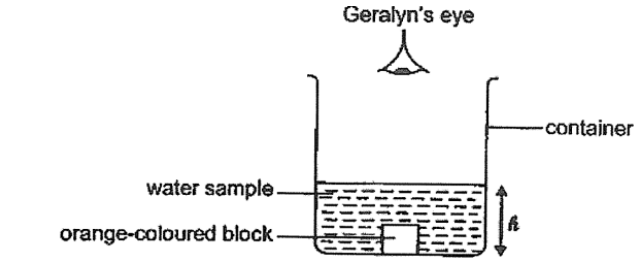
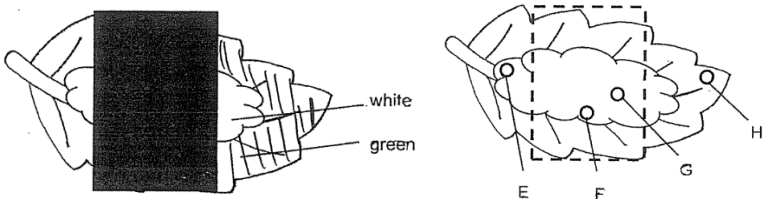
Topic: Energy in Food

Subtopic 1: Photosynthesis and Respiration

Question keywords	Answers
results (Light amount affect height of plants)	The height of the plants increases as the amount of light increases.
Reason (Plants turned yellow after lightbulbs fused)	Without light, the plants were unable to photosynthesize, causing them to turn yellow.
Gas volume change, lamp distance from pondweed	As the distance of the lamp increases, the volume of gas produced decreases.
Explain (Gas volume change, lamp distance from pondweed)	Light intensity decreases as the distance increases, reducing the rate of photosynthesis, which in turn lowers the volume of gas produced.
 	
Water plant X or Y, survive better, shady pond part	Plant Y will survive better because it produces more gas with less light, indicating that it can photosynthesize in low-light conditions.
	
Temperature effect on photosynthesis rate	Photosynthesis increases with temperature up to 40°C, then decreases.
Relationship (Distance from light source, rate of photosynthesis)	As distance increases, the rate of photosynthesis decreases.
Gas in A, importance in process T	Gas: Carbon dioxide; Process T: Photosynthesis, which helps plants make food.

Describe photosynthesis	Plants use sunlight, water, and carbon dioxide to produce glucose and oxygen.
 stopped pouring when couldn't see block **Water sample** | X | Y | Z **Height, h (cm)** | 11 | 2 | 6	
least suitable water sample (X,Y,Z), aquatic plants	Sample Z is least suitable for aquatic plants as it has the least light penetration.
hypothesis (bubbles, water experiment)	The hypothesis is that the number of bubbles produced decreases as the distance of the lamp increases.
lamp distance affect bubbles produced	As the distance of the lamp increases, the light intensity decreases, leading to fewer bubbles.
changes (carbon dioxide, bubbles production)	Add more carbon dioxide to see how its concentration affects the number of bubbles.
	
Starch location in leaf, experiment	In the parts of the leaf exposed to sunlight.
Water sample | A | B | C | D **Amount of dissolved oxygen (units)** | 6 | 10 | 20 | 2	
Water sample with most underwater organisms.	Sample C, as it has the highest amount of dissolved oxygen, supporting the most underwater plants for photosynthesis.
How (6 hours sunlight, sweeter fruits)	More sunlight allows the plant to produce more sugar, resulting in sweeter fruits.
How (piping carbon dioxide, power station to greenhouse, Mr. James' plants)	Carbon dioxide helps the plants photosynthesize more efficiently.
Gas bubble produced, plant X)	Oxygen.

Subtopic 1.1: Photosynthesis and Respiration, Plant Respiratory System

Question keywords	Answers
based on experiment, amount of light, affect stomata size, 8 to 10am	The stomata remained open as the amount of light increased.

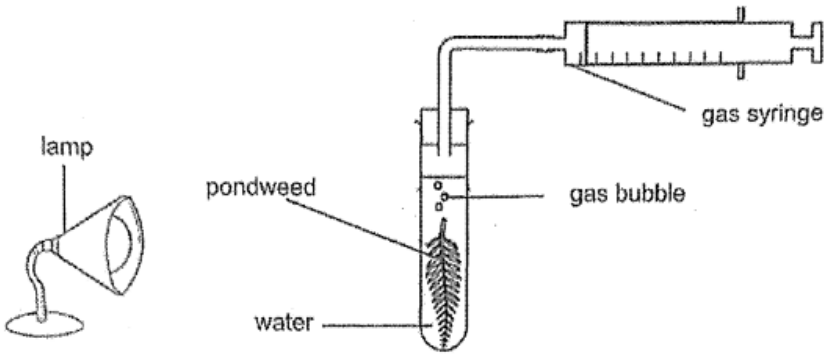
Subtopic 1.2: Photosynthesis and Respiration, The 3 States of Water

Question keywords	Answers
wind speed effect on water absorption in plants	Higher wind speed causes more evaporation, so the plant absorbs water faster to replace the lost water.

Subtopic 1.3: Photosynthesis and Respiration, Living Things and The Environment

Question keywords	Answers
besides food and shelter, how plants help animals	Plants photosynthesize and give out oxygen needed by animals to respire.

Subtopic 1.4: General - Experiment, Photosynthesis and Respiration

<table>
<tr><td>Question</td><td>Answer</td></tr>
<tr><td colspan="2">


<table>
<tr><th>Distance of lamp from pondweed (cm)</th><th>Volume of gas produced (cm^3)</th></tr>
<tr><td>10</td><td>80</td></tr>
<tr><td>35</td><td>65</td></tr>
<tr><td>75</td><td>29</td></tr>
<tr><td>100</td><td>7</td></tr>
<tr><td>150</td><td>0</td></tr>
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<tr><td>Reliable results of experiment</td><td>Pam could repeat the experiment multiple times and calculate the average.</td></tr>
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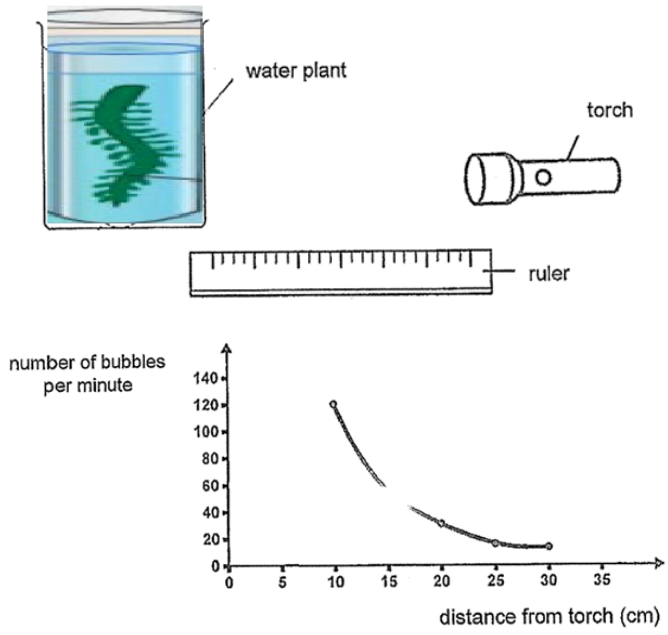
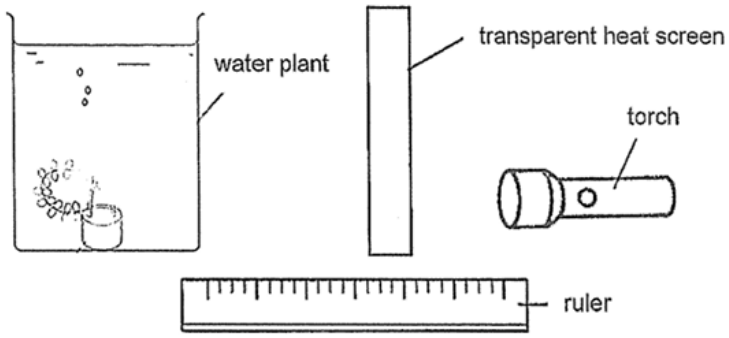
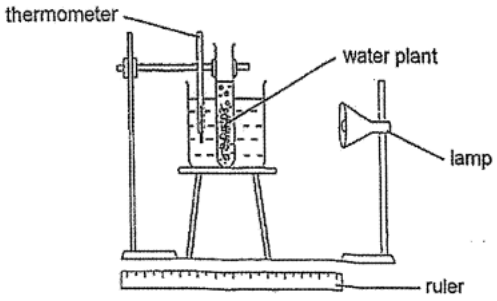


(experiment) Light distance for plant growth	10 cm, as this is where the rate of photosynthesis is highest.

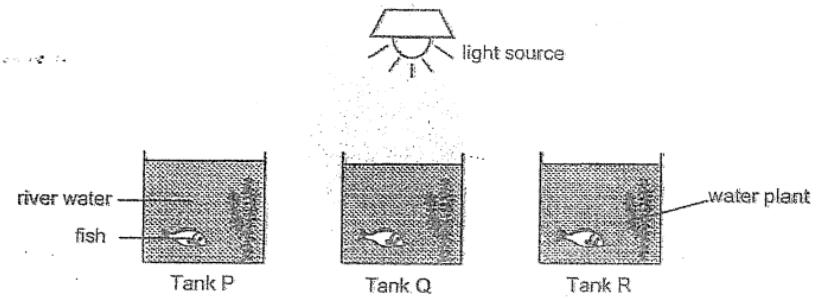


Reason(heat screen in experiment)	To ensure heat from the torch does not affect the rate of photosynthesis.



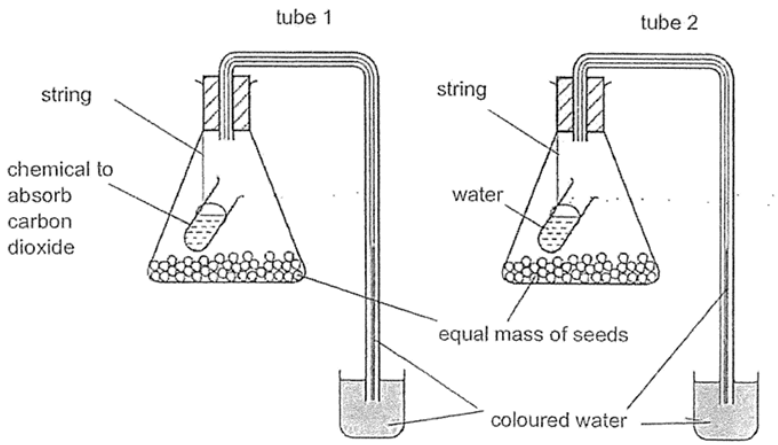
Temperature of water (°C)	Number of bubbles produced per minute
10	4
20	11
30	24

Explain (experiment to test light intensity)	Meixin should vary the distance of the light source from the plant without changing other conditions.



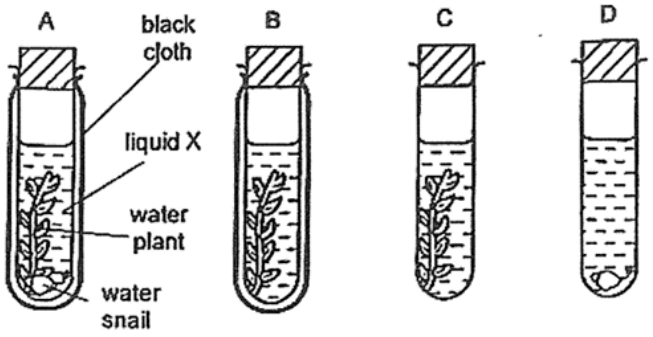
Time	Amount of oxygen (units)		
	Tank P	Tank Q	Tank R
0 hour at start	5	5	5
1 hour later	19	13	21
4 hours later	27	20	36

Why (add fish to each tank)	The fish provide carbon dioxide for the plants to photosynthesize.
why experiment not fair	The tanks are not placed under equal light conditions.
Agree / disagree (Julian's conclusion on tank Q)	No, Tank Q is the cloudiest since the oxygen level was the lowest, indicating the lowest photosynthesis rate.

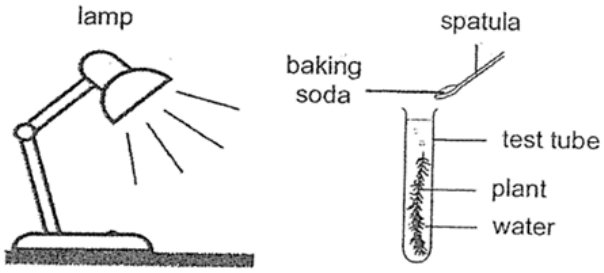


Reason (colored water increase, both tubes)	The oxygen released by the seeds caused the colored water to rise in both tubes.
Reason (higher coloured water level, tube 1 than tube 2)	Carbon dioxide was absorbed by the chemical in tube 1, leaving more space for the colored water to rise.

Sean set up 4 sealed test tubes, A, B, C and D as shown in the diagram below. He filled each set-up with liquid X, which will change from red to yellow when there is an increase in the amount of carbon dioxide. The set-ups were placed near the window.



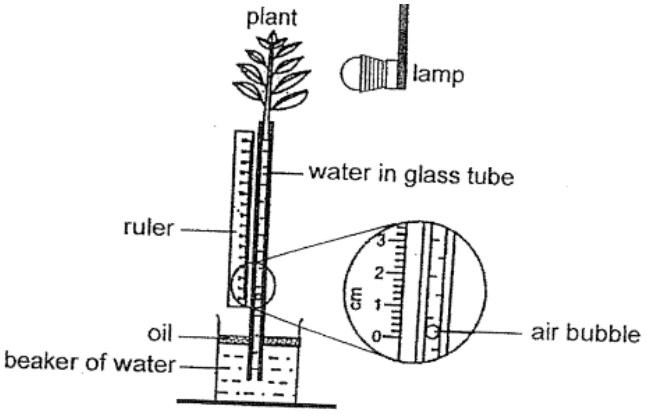
Setup (liquid X changes red to yellow)	Setups B and D. B has plants and sunlight, D has snails producing carbon dioxide.
Prepare (control setup for experiment)	A sealed test tube with only liquid X.



He added a spatula of baking soda into the test tube and counted the number of bubbles produced by the water plant in one minute. In each subsequent minute, he added one spatula of baking soda and counted the number of bubbles produced until four spatulas of baking soda are added.

Baking soda is added to increase the amount of carbon dioxide in the water.

Hypothesis for experiment	If the concentration of carbon dioxide increases, the rate of photosynthesis will increase.
Explain (lamp position for fair test)	The light source remained constant, ensuring a fair test by not introducing extra variables.
Change to increase plant bubbles	Add more plants or move the lamp closer to the water plant.

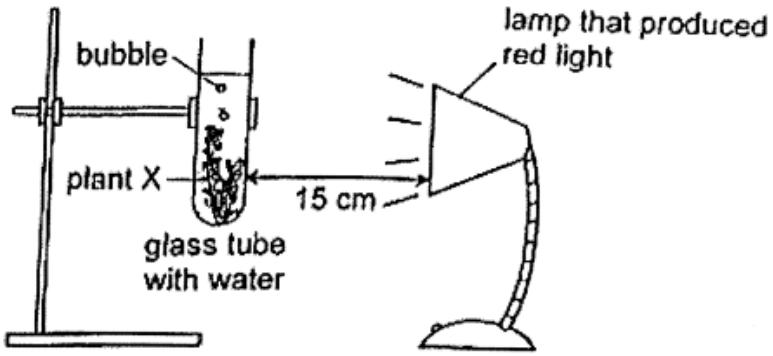


Colour of light	Distance moved by the air bubble (cm)
blue	16
white	5
green	10
orange	11

two variables, kept constant, photosynthesis experiment	Distance of the lamp from the plant, number of leaves on the plant
which Colored light, highest rate of photosynthesis, why	Blue light, as it resulted in the greatest distance moved by the air bubble, indicating more water uptake for photosynthesis.
Why (Air bubble moved 2 cm, no light)	Water was lost through the stomata to the surrounding air as water vapor.

Month	Feb	Mar	Apr	May	Jun	Jul
Average Amount of Daylight hours (h)	8	9	10	10	11	12

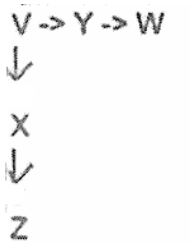
explain (which month, plant Z, sweetest fruits)	July. Plant Z received the most daylight hours, allowing it to undergo the highest rate of photosynthesis.

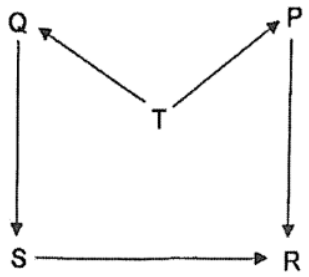


She switched on the lamp that produced red light and counted the number of bubbles produced by plant X in one minute. She repeated her experiment with a lamp that produced blue light. The coloured lights were of the same brightness.

Hypothesis (light color affects bubble production)	Plant X produces more bubbles under red light.
Explain (green light impacts photosynthesis in Tube 2)	The color would change to yellow as no photosynthesis took place, and carbon dioxide accumulated.

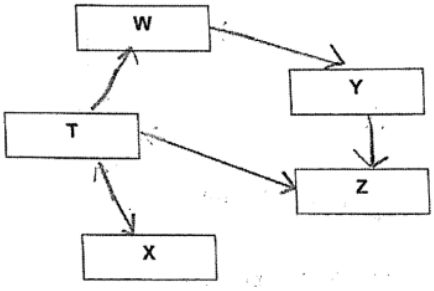
Subtopic 2: Food Chains and Food Web

Question keywords	Answers
Environmental benefit of composting	Composting reduces the amount of waste going to landfills, reducing the production of harmful gases like methane.
Explain (Energy transfer difference from Plant A to Animal C, food chain)	Energy is lost at each level of the food chain, usually as heat.
W feeds on Y. Y and X feed on V. Z feeds on X including its eggs.	
Food web for organisms V, W, X, Y, Z	[Food web answer]



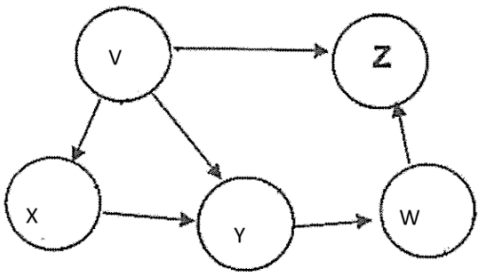
Classify P, Q, R, S, T	Producer: T; Plant-eater: Q, P; Animal-eater: S, R.
organism R's population decreased	A new predator of R appeared, or there was an outbreak of disease that affected R.
Why (animals live on land Y, after plants growing)	There was a presence of plants which provide food for the animals.

Organism W feeds on the leaves of plant T.
Organism X feeds on the fruits of plant T.
Organism Y feeds on W.
Organism Z feeds on Y and the fruits of plant T.



using information (Complete food web with arrows)	W feeds on leaves of T, X feeds on fruits of T, Y feeds on W, Z feeds on Y and fruits of T.
Why (herbivores eating plant T, no food competition)	They feed on different parts of the plant.

- V is the food producer.
- X is the only plant-eater.
- W feeds on animals only.



Complete food web (V, W, X, Y, Z)	The correct food web includes V as the producer, X as the plant-eater, W as the predator.
Organism (is both predator and prey)	Y and Z are both prey and predators.