



Combined Science Biology Paper 2 Foundation Tier: Extended Open Response question 6c (2024)

*(c) The arrows in Figure 11 show the direction of water movement through a tree.

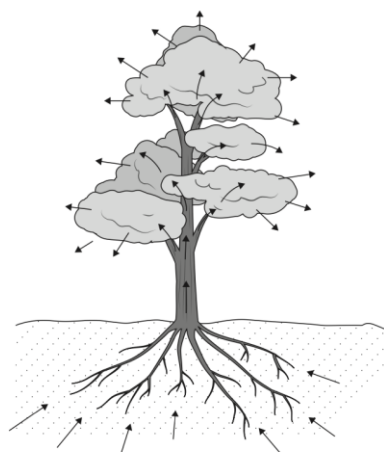


Figure 11

Explain how water is moved from the soil, through the plant and into the air.

(6)

Question number	Indicative content	Mark
6 *(c)	<p>AO1 6 marks</p> <p>Roots</p> <ul style="list-style-type: none"> • water enters the roots • into root hair cells • which have a projection / large surface area • by osmosis • from a dilute solution in the soil to a more concentrated solution in the root cells. <p>Stem/trunk</p> <ul style="list-style-type: none"> • through xylem • which are long / thin / hollow / lignified / dead cells • because water is being pulled up • because of transpiration <p>Leaves</p> <ul style="list-style-type: none"> • water moves into the leaves • by osmosis • because the leaf cell contents are more concentrated than in the xylem • water evaporates / water moves out of the leaves • through the stomata • (into the air) by diffusion • reference to transpiration 	(6)



Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> • no rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	<ul style="list-style-type: none"> • demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	<ul style="list-style-type: none"> • demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • presents an explanation that has a well-developed structure which is clear, coherent and logical.

Level	Mark	Additional guidance	General additional guidance
	0	No rewardable material.	The level is driven by the areas covered in the response. The mark within the level is determined by the detail.
Level 1	1-2	<p>The answer refers to part of the route taken by water through the plant / tree</p> <p>The response includes a basic explanation of how water moves through the plant</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water leaves the plant through the leaves • water leaves the plant via evaporation from the leaves
Level 2	3-4	<p>The answer refers to more than one part of the route taken by water through the plant / tree</p> <p>The response includes an explanation of how water is moved into the roots, through the plant or through the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water moves into the root and up the stem • water moves into the root via osmosis and up the stem
Level 3	5-6	<p>The answer is detailed and refers to water moving into the roots, through the stem / branches and out of the leaves</p> <p>The response includes a detailed explanation of how water is moved into the roots, through the plant or out of the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water moves into the root. Water then moves up the stem in the xylem out of the leaves. • water moves into the root. Water then moves up the stem in the xylem to the leaves where it is lost to the air via transpiration



Exemplar 1: (awarded 6/6)

Explain how water is moved from the soil, through the plant and into the air.

(6)

Root hair cells in the plant have hair-like structures that stick into the soil and absorb mineral ions and water which is transferred through phloem and xylem tubes to the rest of the plant including leaves and stomata. ^{Root hair cells also have a large surface area to absorb as much nutrients as they can.} Phloem tubes are tubes of elongated living cells that carry food substances, like sucrose, through the plant. Xylem tubes ~~are~~ ~~be~~ have dead cells that carry water and mineral ions through the plant. Guard cells control what goes in and out of the plant by swelling up with water. Then, transpiration occurs which is ~~when~~ the loss of water vapour off the plants leaves, and it is evaporated into the air. Meristems is where stem cells are made, which can differentiate into other cells to carry out different ^{functions}.



Exemplar 2: (awarded 3/6)

*(c) The arrows in Figure 11 show the direction of water movement through a tree.

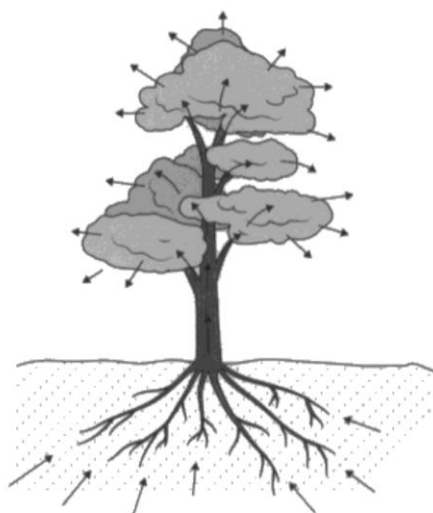


Figure 11

Explain how water is moved from the soil, through the plant and into the air.

(6)

It goes through the roots
into the trunk ~~and~~ then
goes up into the air



Combined Science Biology Paper 2 Higher Tier: Extended Open Response question 6b (2024)

*(b) Hormones can be used as part of assisted reproductive technology.

Explain how assisted reproductive technology (ART) can be used to increase the chances of a woman becoming pregnant.

(6)

Give women drug hormone drug so
the produce FSH and release
egg. Then take out the egg from
the ovary. Put the egg and
sperm cell in a dish to fertilise
the egg. It will become tiny ball
cells & embryo. Put one or two
balls & embryo cell into the
uterus. This might lead to ~~born~~
~~1~~ ~~more~~ babies born more than
1 which is harmful for mother
the mother.



Question number	Indicative content	Mark
6*(b)	<p style="text-align: center;">A01 6 marks</p> <p>Clomifene therapy</p> <ul style="list-style-type: none"> • Clomifene is a fertility drug • that causes the pituitary gland • to release more FSH and LH • so more eggs are matured in the follicle • more chance of the egg being released <p>IVF (<i>in vitro</i> fertilisation)</p> <ul style="list-style-type: none"> • eggs are removed from the mother's ovary • sperm are taken from the father • the sperm and the eggs are mixed / the sperm is injected into the egg • in a <i>Petri</i> dish • the fertilised egg is allowed to divide • the {fertilised egg / ball of cells / zygote / embryo} is placed into the uterus 	(6)

Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> • no rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	<ul style="list-style-type: none"> • demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.



Additional Guidance

Level 1	1-2	<ul style="list-style-type: none">• A brief explanation of either IVF OR Clomifene therapy OR other ART techniques• The response links the method to a hormone, named process or the idea of external fertilisation
Level 2	3-4	<ul style="list-style-type: none">• A brief explanation of how IVF AND Clomifene therapy work OR a detailed explanation of one method• The response links one method to the type of ART either Clomifene OR IVF
Level 3	5-6	<ul style="list-style-type: none">• A detailed explanation of BOTH IVF and Clomifene therapy• The response links both methods to the type of ART, Clomifene AND IVF



Combined Science Chemistry Paper 1 Foundation Tier: Extended Open Response question 6c (2024)

*(c) A student has three solids, A, B and C.

The solids are sodium carbonate, powdered zinc and copper oxide, but the student does not know which solid is which.

The student reacted each solid with dilute sulfuric acid.

Figure 9 shows the student's observations and the results of tests on any gases produced.

observations and results				
		reaction with dilute sulfuric acid	gas bubbled through limewater	gas tested with a lit splint
powdered zinc →	solid A	bubbles seen colourless solution formed	no change	squeaky pop
Copper oxide →	solid B	blue solution formed some black solid remains at bottom of test tube	no gas produced	no gas produced
Sodium carbonate →	solid C	bubbles seen colourless solution formed	limewater turned cloudy	puts out lit splint

CO₂ ← Figure 9

Use the observations and results in Figure 9 to identify which solid is which.

Your answer should include

- how each test result helps you to identify the solid
- word equations to support your answer.

(6)

Solid A
• Colourless
• Has Hydrogen
• No change through lime water
→ These leads it to be Powdered Zinc

Solid B → Must be copper sulphate
• Blue solution formed → Cu Copper sulphate
• Black Soluble → copper oxide sludge
• No gas produced → Must be Copper sulphate

Solid C
• High CO₂ amount since it puts out lit splint
• Also cloudy limewater means CO₂ is present
→ Must be Sodium carbonate since carbonate has CO₂ contents



Question number	Indicative content	Mark
6(c)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>A01 (3 marks) A03 (3 marks)</p> <ul style="list-style-type: none"> solid A is powdered zinc metal + acid → metal salt + hydrogen zinc + sulfuric acid → zinc sulfate + hydrogen bubbles seen so gas is produced does not turn limewater cloudy so gas is not carbon dioxide test for hydrogen is lit splint lit splint makes squeaky pop so gas produced is hydrogen solid B is copper oxide metal oxide + acid → metal salt + water copper oxide + sulfuric acid → copper sulfate + water no gas is produced copper oxide is black some left in excess at bottom of test tube copper sulfate solution is blue solid C is sodium carbonate metal carbonate + sulfuric acid → metal sulfate + carbon dioxide + water sodium carbonate + sulfuric acid → metal sulfate + carbon dioxide + water bubbles seen so gas is produced test for carbon dioxide is limewater limewater turned cloudy so gas produced is carbon dioxide no reaction with lit splint so no hydrogen gas produced 	(6) A01; A03

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> The plan attempts to link knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (A01) Analyses the scientific information but understanding and connections are flawed. An incomplete plan that provides limited synthesis of understanding. (A03)
Level 2	3–4	<ul style="list-style-type: none"> The plan is mostly supported through linkage knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (A01) Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. A partially completed plan that synthesises (A03)
Level 3	5–6	<ul style="list-style-type: none"> The plan is supported throughout by linkage knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (A01) Analyses the scientific information and provide logical connections between scientific concepts throughout. A well-developed plan that synthesises relevant understanding coherently. (A03)



Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material and any references to other metals / discard any contradictory material then:
Level 1	1–2	<p><u>Additional Guidance</u></p> <p>Correctly identifies at least 1 solid or product</p> <p>Identifies product with correct test</p> <p>Gives at least 1 general observation</p> <p>Gives at least 1 general word equation</p> <p>Identifies all 3 substances</p>	<p><u>Possible candidate response</u> (all examples, not a definitive list)</p> <p>solid A – zinc (1)</p> <p>reaction with solid A gives off hydrogen (1)</p> <p>limewater cloudy so is carbon dioxide (1)</p> <p>gas is released so must be bubbles (1)</p> <p>metal + acid → salt + hydrogen (2)</p> <p>solid A is zinc and the gas given off is hydrogen (2)</p> <p>A – zinc, B – copper oxide, C – sodium carbonate (2)</p>
Level 2	3–4	<p><u>Additional Guidance</u></p> <p>Correctly identifies at least 2 solids with at least one linked explanation</p> <p>Correctly identifies at least 1 solid and 1 product with at least one linked explanation</p> <p>Gives at least one correct word equation</p> <p>Identifies one solid with correct word equation</p> <p>Correctly identifies all 3 solids with linked explanations for just 1 solid</p>	<p><u>Possible candidate response</u></p> <p>solid A is zinc and solid B is copper oxide. Copper oxide is black (3)</p> <p>solid C is sodium carbonate as carbon dioxide turned limewater cloudy (3)</p> <p>solid B is copper oxide, which is black. It produces copper sulfate, which is blue (4)</p> <p>zinc + sulfuric acid → zinc sulfate and hydrogen (3)</p> <p>Solid B: copper oxide + sulfuric acid → copper sulfate + water (4)</p> <p>A – zinc, B – copper oxide, C – sodium carbonate; and hydrogen is produced when zinc reacts with an acid as zinc is a metal (4)</p>
Level 3	5–6	<p><u>Additional Guidance</u></p> <p>Correctly identifies 2/3 solids with linked explanations for at least two</p> <p>Fully identifies one solid with all products and a linked explanation</p> <p>Identifies all 3 solids backed by relevant information</p>	<p><u>Possible candidate response</u></p> <p>solid A is zinc as hydrogen is produced. Solid B is copper oxide as it is black. (5)</p> <p>Solid B: copper oxide + sulfuric acid → copper sulfate (blue solution) + water (5)</p> <p>solid A is zinc because hydrogen is produced. Solid B is copper oxide, which forms blue copper sulfate solution. Solid C is sodium carbonate as it is the only solid that could produce carbon dioxide (6)</p>



Combined Science Physics Paper 1 Higher Tier: Extended Open Response question 6c (2023)

*(c) Newton's second law can be stated as

$$\text{force} = \text{mass} \times \text{acceleration}$$

A student is provided with a trolley and a runway on a bench, as shown in Figure 12, and access to other equipment.

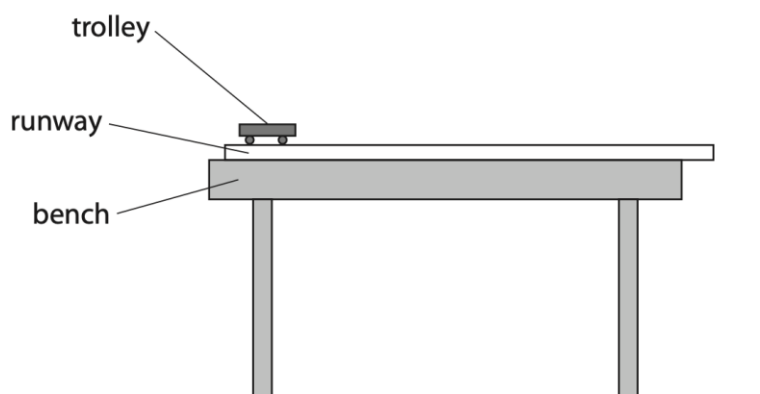


Figure 12

Describe a procedure the student could use to investigate how the acceleration of the trolley depends on the force applied to the trolley.

You may add to the diagram in Figure 12 to help your answer.

(6)

The student could undertake an experiment in which an increasing number of weights are added to the trolley, some on the trolley itself, some at the end of a string. The weights at the end of the string, hanging off the table will use their GPE to apply force to the trolley, pulling it through the light gates. The light gates, which, will be placed in the same location in each subsequent experiment can measure the speed, and thus, acceleration, helping the student investigate how force, mass and acceleration are linked.



Question number	Indicative content	Mark
6c	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;">AO1</p> <p>isolated statements</p> <ul style="list-style-type: none"> • weights on hanger • weights added to trolley • light gate(s) / ticker(tape) timer / ultrasonic transducer • datalogger • (interrupter) card on trolley • sloping runway • weigh trolley • use newtonmeter • use $a = (v-u)/t$ • measure distance and time • use stopclock and ruler • use (average) speed = distance / time • use $a = (v^2-u^2)/2s$ • plot graph of F against a <p>detail of procedure</p> <ul style="list-style-type: none"> • suspend weights from weight hanger to produce force • changing weights on hanger • keeping mass constant by moving weights between hanger and trolley • light gates/ticker(tape) timer/ultrasonic transducer used to measure acceleration/velocity/time • runway on slope so no (effect of) friction /so trolley rolls at constant speed (with no weights/force) • increase angle of slope to increase force • interrupter card for time through gate • final speed = 2 x average speed 	(6) AO1



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) Presents a description which is not logically ordered and with significant gaps. (AO1)
Level 2	3–4	Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)
Level 3	5–6	Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1) Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> isolated facts mention at least 2 isolated statements evidence may be seen in the diagram	<u>Possible candidate responses</u> add weights and use light gates
Level 2	3–4	<u>Additional guidance</u> limited procedure 1 detail of procedure and mention 1 other isolated statement evidence may be seen in the diagram	<u>Possible candidate responses</u> use light gates to measure acceleration/velocity/time and add weights
Level 3	5–6	<u>Additional guidance</u> detailed procedure 2 details of procedure and mention 1 other isolated statement evidence may be seen in the diagram	<u>Possible candidate responses</u> use light gates to measure acceleration/velocity/time and suspend weights from weight hanger to produce force and sloping runway