Cell level systems – 2021/20 GCSE Gateway Biology A

1. Nov 2021/Paper_J247/01/No.1

Base pairs are found in a molecule of DNA.

Which base pairs with cytosine?

A Adenine (A)

B Cytosine (C)

C Guanine (G)

D Thymine (T)

Your answer ☐ **[1]**

2. Nov 2021/Paper_J247/01/No.4

Plants contain stomata.

Where are stomata found in most plants?

A Mainly on the lower surface of the leaves.

B Mainly on the upper surface of the leaves.

C Mainly on the surface of the stem.

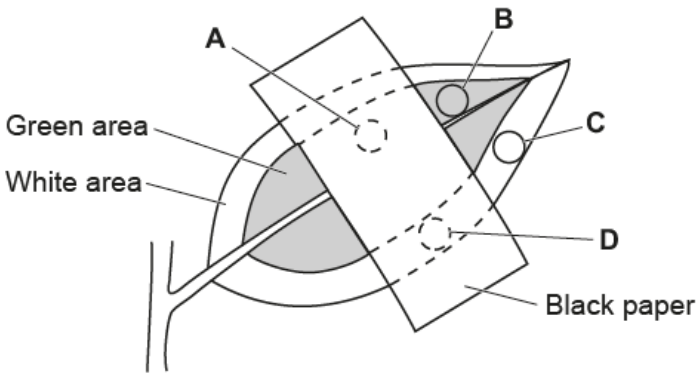
D Mainly on the surface of root hairs.

Your answer ☐ **[1]**

3. Nov 2021/Paper_J247/01/No.9

A piece of black paper was placed over the leaf of a plant.

The plant was kept in the light for 2 days. Four discs were cut from the leaf.



Which disc **A**, **B**, **C** or **D**, would test positive for starch?

Your answer ☐ **[1]**

4. Nov 2021/Paper_J247/01/No.10

Which molecule is joined to fatty acids to make a lipid?

A Amino acid

B Glucose

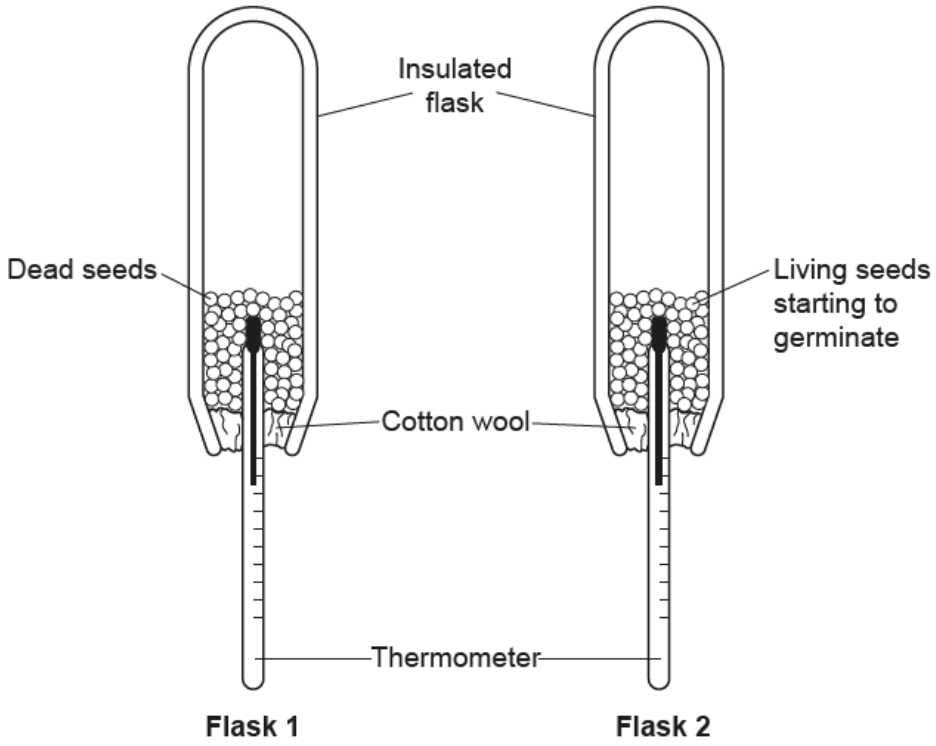
C Glycerol

D Starch

Your answer ☐ **[1]**

5. Nov 2021/Paper_J247/01/No.11

The diagram shows the apparatus used to demonstrate a biological process.



Which biological process could be demonstrated using this apparatus?

A Digestion

B Mitosis

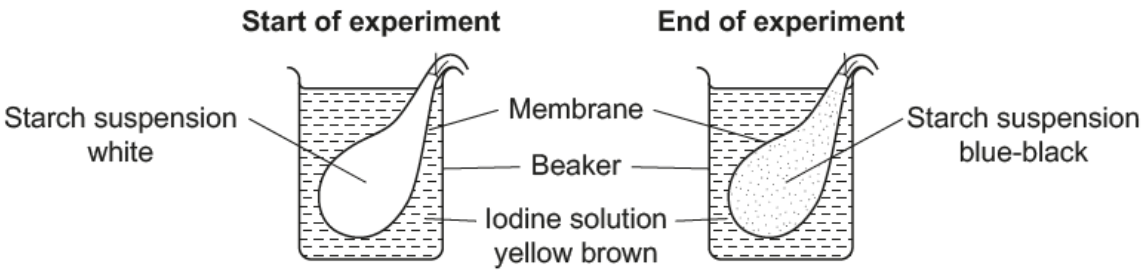
C Photosynthesis

D Respiration

Your answer ☐ **[1]**

6. Nov 2021/Paper_J247/01/No.12

Look at the diagrams modelling transport of molecules into and out of cells.



What do the results show about the size of the molecules?

A Iodine molecules are larger than the pores in the membrane.

B Iodine molecules are similar in size to starch molecules.

C Iodine molecules are smaller than the pores in the membrane.

D Starch molecules are smaller than the pores in the membrane.

Your answer ☐ **[1]**

7. Nov 2021/Paper_J247/01/No.13

Which row in the table is the correct description for the process of **translocation**?

	Structure involved	Liquid transported	Direction of movement
A	phloem	sugar	downwards
B	phloem	sugar and water	upwards and downwards
C	xylem	sugar	upwards
D	xylem	sugar and water	upwards and downwards

Your answer ☐ **[1]**

8. Nov 2021/Paper_J247/01/No.16

(a) Eukaryotic and prokaryotic cells have sub-cellular structures.

Complete the table to show which type of cell contains each sub-cellular structure.
Each row should have **one** tick (✓).

The first row has been done for you.

Sub-cellular structure	Only in eukaryotic cells	Only in prokaryotic cells	In both eukaryotic and prokaryotic cells
Cell membrane			✓
Nucleus			
Mitochondria			
Plasmid			

[3]

(b) (i) A student looks at plant cells using a light microscope, as shown in **Fig. 16.1**.

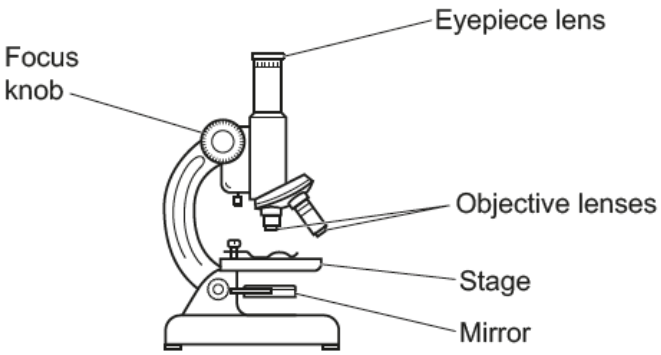


Fig. 16.1

Write **1** to **5** in the boxes to show the correct order of steps in using a light microscope to view the cells.

One has been done for you.

Adjust the focus knob to see the image.	
Place the plant cells onto a microscope slide.	
Place microscope slide on stage.	
Place a coverslip over the plant cells.	
Select low power objective lens.	**3**

[2]

(ii) The microscope shown in **Fig. 16.1** has a ×10 eyepiece and a ×40 objective lens.

Calculate the magnification of the image of the plant cells that the student sees using the microscope.

Magnification = × ..... **[1]**

(iii) A chloroplast in one of the plant cells is 5 μm in diameter.

Use your answer from **(b)(ii)** to calculate the diameter of the chloroplast image seen under the microscope.

Diameter = ... μm **[1]**

(iv) Explain why the plant cells can make food in the form of sugars.

.....

.....

..... **[2]**

(v) The cell wall in the plant cell is made from a carbohydrate called cellulose. Cellulose is a polymer.

Explain why sugars are needed to make the cell wall.

.....

.....

..... **[2]**

9. Nov 2021/Paper_J247/01/No.18

(a) (i) **Fig. 18.1** shows the cell cycle. The letters represent different stages.

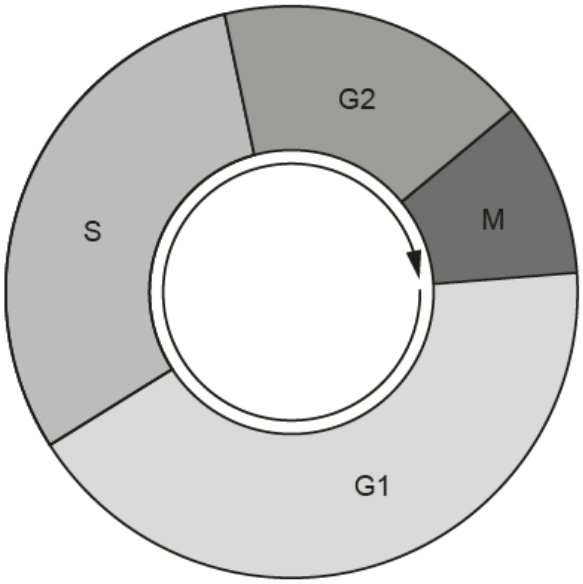


Fig. 18.1

Complete the table to identify the stages from the description of what happens during the cell cycle.
One stage has been done for you.

Stage	Description of what happens
	DNA replication
G2	growth and preparation for mitosis
	movement of chromosomes
	cell growth

[2]

(ii) DNA replication produces a new DNA molecule.

What name describes the shape of a DNA molecule?

..... **[1]**

(b) (i) Cell differentiation occurs during growth in multicellular organisms.

Explain why cell differentiation is important.

.....

.....

..... **[2]**

(ii) Stem cells are found in embryonic and adult tissue in animals.

Where are stem cells found in plants?

Put a (ring) around the correct answer.

meristem **phloem** **stomata** **xylem**

[1]

(c) A gardener digs up a bush and then plants it in a different position in their garden. They try to dig up the bush with as much soil as possible so that the root hairs are not damaged.

Explain why the gardener tries to prevent the root hairs being damaged.

.....

.....

..... **[3]**

(d) Growth in plants is controlled by plant hormones.

Write down **two** other processes in plants that are controlled by plant hormones.

1 .....

2 .....

[2]

10. Nov 2021/Paper_J247/01/No.22

Marimo moss balls are made up of green algae. They are found in lakes and are known to rise and fall during different times of the day. **Fig. 22.1** shows some moss balls in a beaker of water.

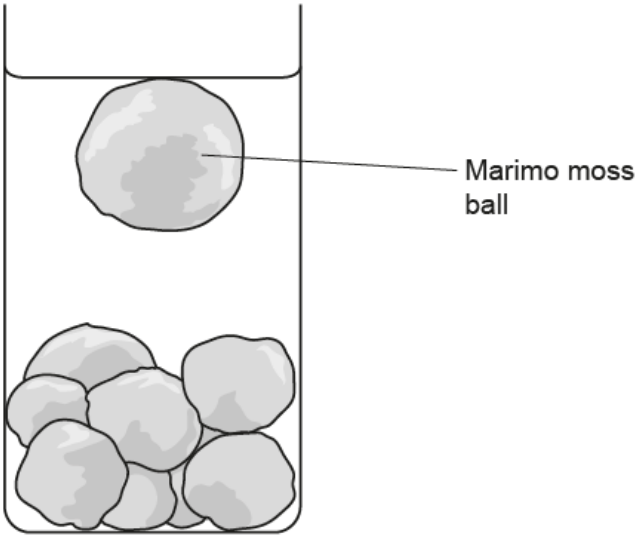


Fig. 22.1

Scientists predict that the moss balls rise because they are covered in tiny bubbles of oxygen.

(a) The scientists test their prediction by using a chemical that stops a biological process in the algae. When the chemical is added they found the moss balls did **not** rise.

(i) Which biological process is affected by the chemical?
Tick (✓) **one** box.

Diffusion	☐
Osmosis	☐
Photosynthesis	☐
Respiration	☐

[1]

(ii) Explain why the moss balls did **not** rise.

.....

..... **[1]**

(b) The scientists then investigate how exposure to light affects a moss ball which had been in the dark.

- In **Experiment 1**, a moss ball is exposed to 12 hours of light then 12 hours of darkness.
- In **Experiment 2**, the moss ball is exposed to continuous light for 24 hours.

They measure the height of the moss ball in a column of water.

Fig. 22.2 shows their results.

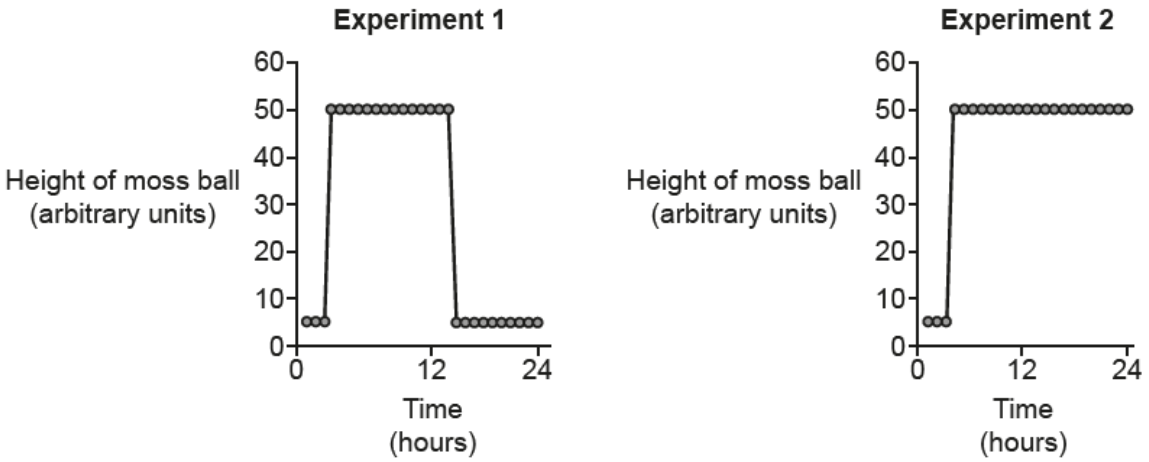


Fig. 22.2

(i) What conclusion can be made from **Experiment 1** about the effect of light on the position of the moss ball?

.....

.....

.....

..... **[2]**

(ii) Suggest an explanation for the differences between the two graphs.

.....

.....

.....

..... **[2]**

(c) Light is one environmental factor that affects plants.

Explain how increasing the temperature from 15 °C to 40 °C can affect plants.

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..... **[3]**

11. Nov 2021/Paper_J247/02/No.2

What are stem cells?

A Any cells in the skin.

B Cells that can form any type of cell.

C Cells that do not have a nucleus.

D Cells with half the normal number of chromosomes.

Your answer ☐ **[1]**

12. Nov 2020/Paper_J247/01/No.1

What is meant by the term cell differentiation?

A Cells become organs

B Cells become organ systems

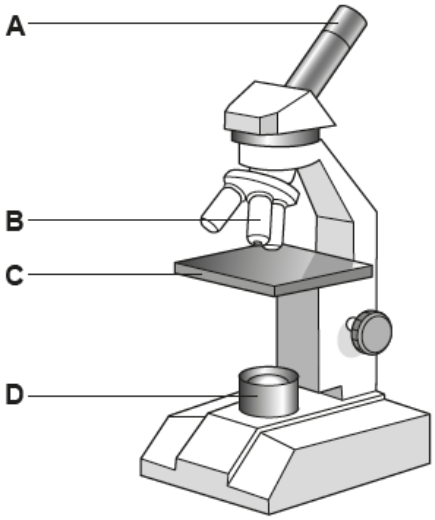
C Cells become specialised

D Cells become tissues

Your answer ☐ **[1]**

13. Nov 2020/Paper_J247/01/No.2

The diagram shows a light microscope.



Which label is pointing to the eyepiece lens?

Your answer ☐ **[1]**

14. Nov 2020/Paper_J247/01/No.4

Which monomer is used to make proteins?

A Amino acid

B Fatty acid

C Glucose

D Glycerol

Your answer ☐ **[1]**

15. Nov 2020/Paper_J247/01/No.12

A light microscope resolution is 0.2 μm. An electron microscope resolution is 0.0001 μm.

How many times closer can two objects be seen as separate objects by using an electron microscope compared to using a light microscope?

A 2x

B 20x

C 200x

D 2000x

Your answer ☐ **[1]**

16. Nov 2020/Paper_J247/01/No.16

(a) Cells contain structures that have different features.

Complete the table using structures from this list.

cell membrane **chloroplast** **mitochondria**

nucleus **ribosomes**

Feature	Structure
Contains chlorophyll for photosynthesis	
Contains enzymes for respiration	
Has receptor molecules for communication	

[3]

(b) A student uses a light microscope to see cheek cells.

One cell is shown in **Fig. 16.1**.

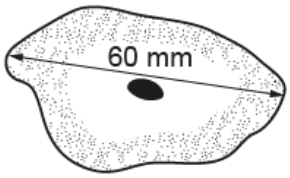


Fig. 16.1

(i) The actual size of the cheek cell is 0.03 mm.

Calculate the magnification of the drawing.

Use the equation: magnification = measured size ÷ actual size

Magnification = × ..... **[2]**

(ii) Which type of substance is used to make structures inside the cell easier to see when using a light microscope?

..... **[1]**

(c) Some students make a model of DNA.

They use four different colours of round sweets to represent the bases and attach them to two candy laces. **Fig. 16.2** shows their model.

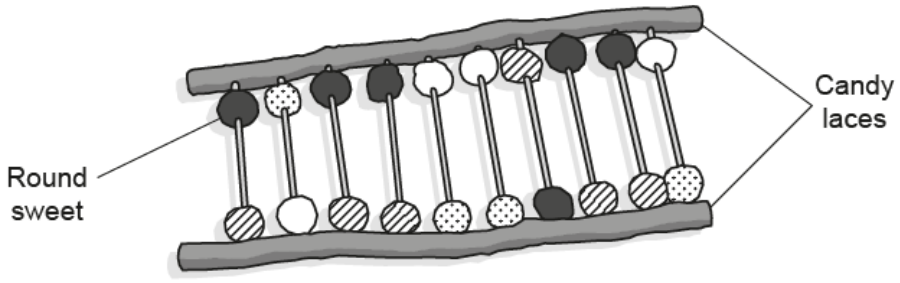


Fig. 16.2

(i) Why did the students use four different colours of round sweets in their model of DNA?

.....

..... **[1]**

(ii) Write down the names of the **two** types of chemical group represented by the candy laces.

1 .....

2 .....

[2]

(d) Respiration is a reaction that happens in all cells.

(i) Why do cells need respiration?

..... **[1]**

(ii) Cells use aerobic respiration when oxygen is available.

What are the **two** products of aerobic respiration?

1 .....

2 .....

[2]

(iii) Aerobic respiration releases heat energy.

What term describes a reaction that releases heat energy?

..... **[1]**

17. Nov 2020/Paper_J247/02/No.20

Gardeners use dead plant material to make compost. They add this compost to soil where they are growing plants.

(a) What do plant roots get from compost in the soil?

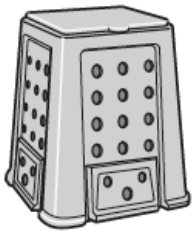
Put a (ring) around the correct answer.

carbon dioxide **minerals** **nitrogen gas** **oxygen gas**

[1]

(b) Compost can be made in a composting bin. In the bin **aerobic** bacteria turn dead plant material into compost.

The drawing shows a composting bin.



Explain why the composting bin needs holes in it.

.....

.....

..... **[2]**

(c) A new way of making compost is called bokashi. In this process the compost is made **anaerobically** in a different type of composter.

Scientists compare the normal methods of making compost with bokashi.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Why did the scientists put the same mass of compost in each composter?

Tick (✓) **one** box.

To allow valid comparisons of the results. ☐

To decrease the temperature. ☐

To make the measurements more accurate. ☐

To make the results repeatable. ☐

[1]

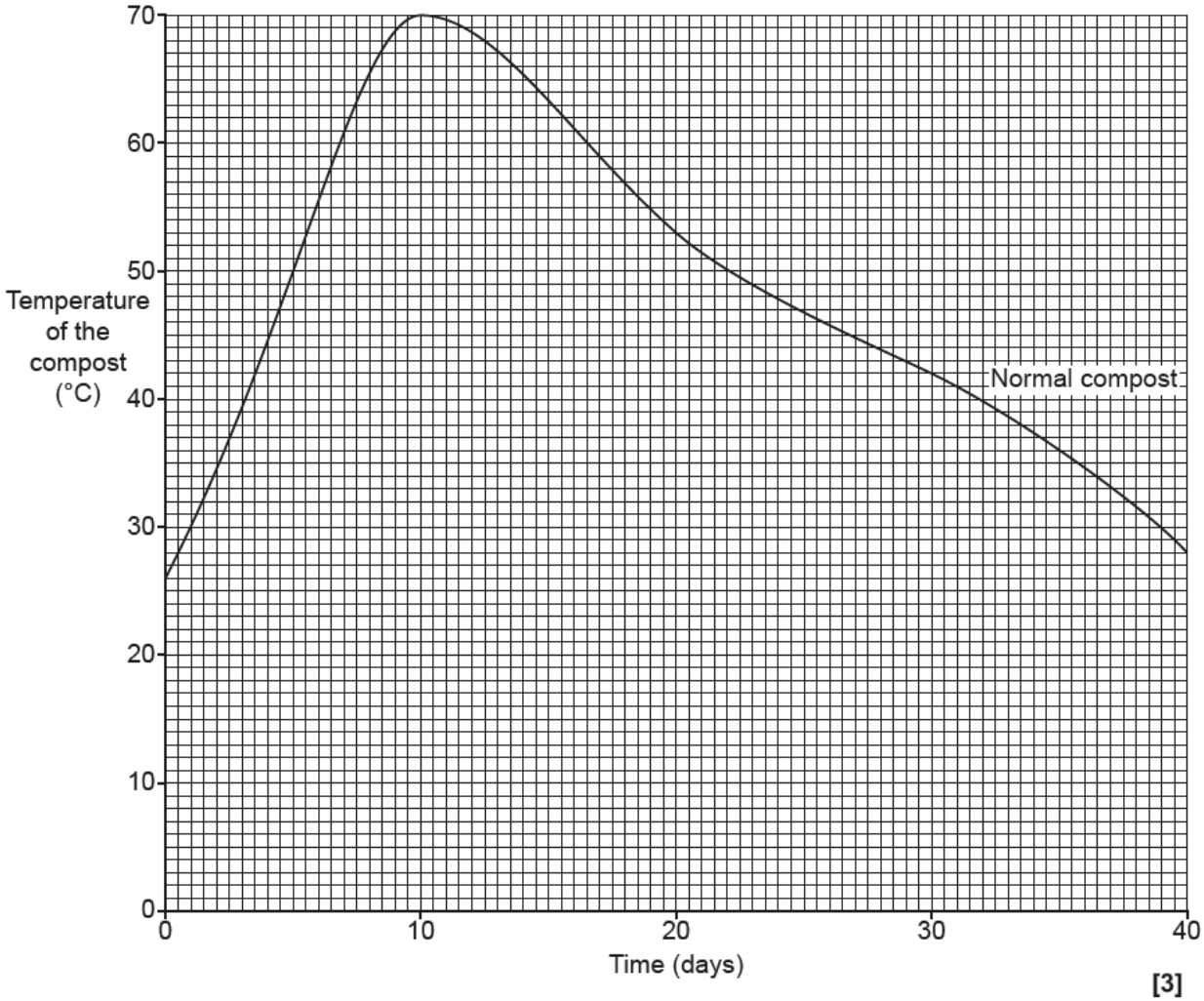
(d) **Table 20.1** shows the scientists' temperature measurements.

	Temperature of the compost (°C)	
Time (days)	**Normal compost**	**Bokashi compost**
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 20.1

(i) The scientists' results for the normal compost are plotted on the grid.

Complete the graph by plotting the results for the **bokashi** compost and draw a curve of best fit.



[3]

(ii) Describe the change in the temperature of the **normal** compost during the investigation.

.....

.....

.....

..... **[2]**

(iii) Use data from **Table 20.1** to calculate the difference between the maximum temperature of the normal compost and the maximum temperature of the bokashi compost.

Difference = ... °C **[2]**

(iv) Which **two** statements explain this difference in temperature between the two types of compost?

Tick (✓) **two** boxes.

Both types of compost are made by aerobic respiration.	☐
Normal compost is made by aerobic respiration.	☐
Normal compost is made by anaerobic respiration.	☐
Aerobic respiration and anaerobic respiration release the same amount of energy.	☐
Aerobic respiration releases more energy than anaerobic respiration.	☐
Aerobic respiration releases less energy than anaerobic respiration.	☐

[2]

(e) **Table 20.2** shows the scientists' results for the mass of the compost.

	Normal compost	Bokashi compost
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	760	1200

Table 20.2

(i) The mass of the normal compost has decreased by 19 kg per day.

Calculate the decrease in mass of the bokashi compost per day.

Give your answer to the nearest **whole** number.

Decrease = ...kg per day **[3]**

(ii) Carbon dioxide is given off in the making of the compost. This causes most of the decrease in mass.

Scientists think that the bokashi method of composting might be better for the environment.

Use your answer from part **(e)(i)** to justify the scientists' conclusion.

.....

.....

..... **[1]**

18. Nov 2021/Paper_J247/03/No.4

Which statement explains why mitochondria are important in respiration?

A They contain mitochondrial DNA.

B They have a larger surface area to volume ratio than other organelles.

C They contain enzymes used in an exothermic reaction.

D They are at a lower temperature than the rest of the cell contents.

Your answer ☐ **[1]**

19. Nov 2021/Paper_J247/03/No.5

Which statement describes why iodine solution is added to onion epidermis cells before viewing under a microscope?

A To colour any protein in the cell.

B To kill the cells.

C To prevent osmosis.

D To stain starch.

20. Nov 2021/Paper_J247/03/No.6

Which feature of electron microscopy has allowed scientists to increase their understanding of sub-cellular structures?

A The ability to increase magnification using an eyepiece and objective lens.

B The ability to magnify ×1500.

C The ability to view living cells.

D The ability to view and identify two structures 1 nm apart.

Your answer ☐ **[1]**

21. Nov 2021/Paper_J247/03/No.7

Which statement describes DNA?

A A monomer of one strand that forms a single helix.

B A monomer of two strands that form a double helix.

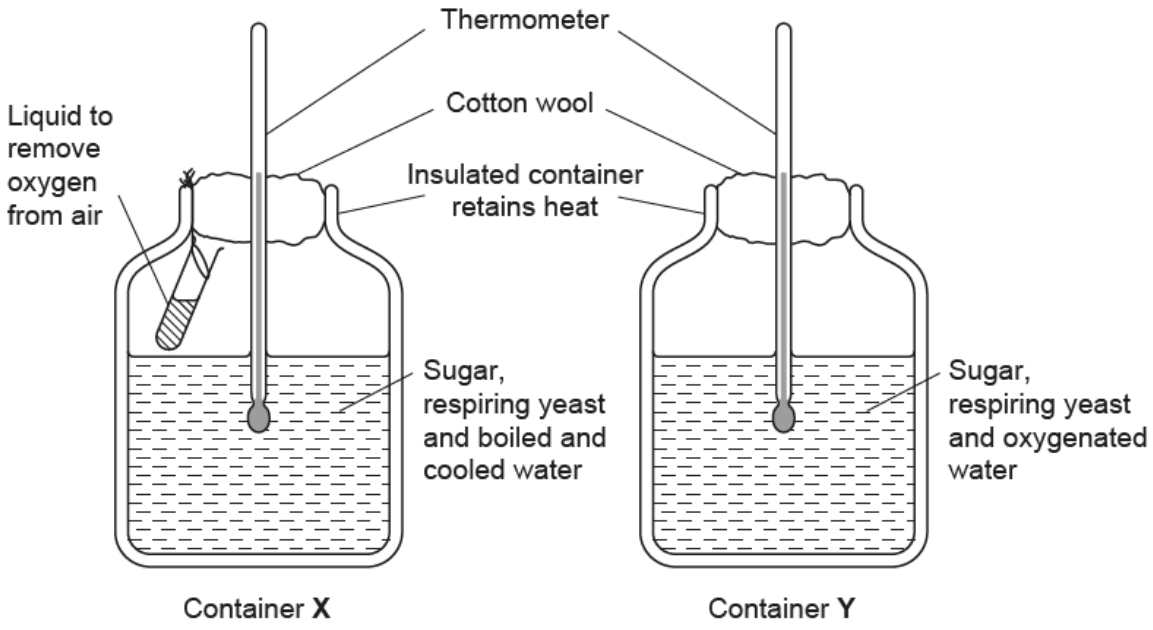
C A polymer of two strands that form a double helix.

D A polymer of two strands that form a single helix.

Your answer ☐ **[1]**

22. Nov 2021/Paper_J247/03/No.8

The apparatus has been set up to compare aerobic and anaerobic respiration.



Which row in the table describes the type of respiration occurring in each container and the temperature rise at the end of the experiment?

	Type of respiration	Temperature rise in container
A	aerobic in **X**, anaerobic in **Y**	**X** is greater than **Y**
B	anaerobic in **X**, aerobic in **Y**	**X** is greater than **Y**
C	anaerobic in **X**, aerobic in **Y**	**Y** is greater than **X**
D	aerobic in **X**, anaerobic in **Y**	**Y** is greater than **X**

Your answer ☐ **[1]**

23. Nov 2021/Paper_J247/03/No.9

Which description identifies the process of photosynthesis?

A It is endothermic because heat energy is absorbed.

B It is endothermic because light energy is absorbed.

C It is exothermic because heat energy is absorbed.

D It is exothermic because light energy is absorbed.

Your answer ☐ **[1]**

24. Nov 2021/Paper_J247/03/No.14

In experiments on photosynthesis, it is often necessary to compare different light intensities.

A plant 20 cm from a light receives a light intensity of 25 arbitrary units of light.

What light intensity does a plant receive 10 cm from the light?

A 10

B 50

C 100

D 1000

Your answer ☐ **[1]**

25. Nov 2021/Paper_J247/03/No.17

Marimo moss balls are made up of green algae. They are found in lakes and are known to rise and fall during different times of the day. **Fig. 17.1** shows some moss balls in a beaker of water.

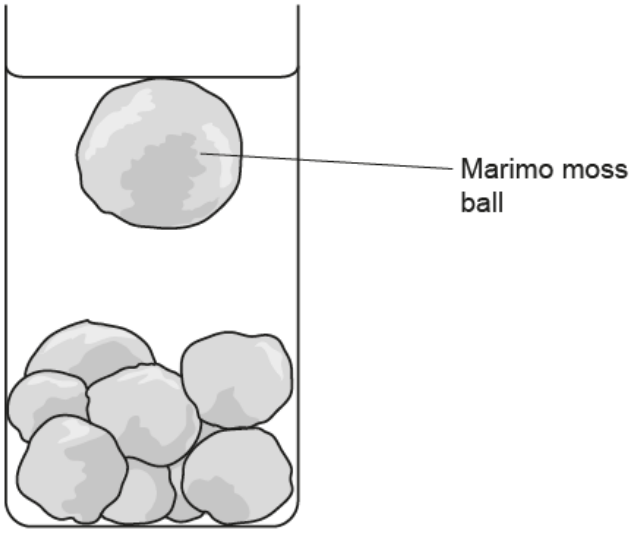


Fig. 17.1

Scientists predict that the moss balls rise because they are covered in tiny bubbles of oxygen.

(a) The scientists test their prediction by using a chemical that stops a biological process in the algae. When the chemical is added they found the moss balls did **not** rise.

(i) Which biological process is affected by the chemical?

Tick (✓) **one** box.

Diffusion	☐
Osmosis	☐
Photosynthesis	☐
Respiration	☐

[1]

(ii) Explain why the moss balls did **not** rise.

.....

..... **[1]**

(b) The scientists then investigate how exposure to light affects a moss ball which had been in the dark.

- In **Experiment 1**, a moss ball is exposed to 12 hours of light then 12 hours of darkness.
- In **Experiment 2**, the moss ball is exposed to continuous light for 24 hours.

They measure the height of the moss ball in a column of water.

Fig. 17.2 shows their results.

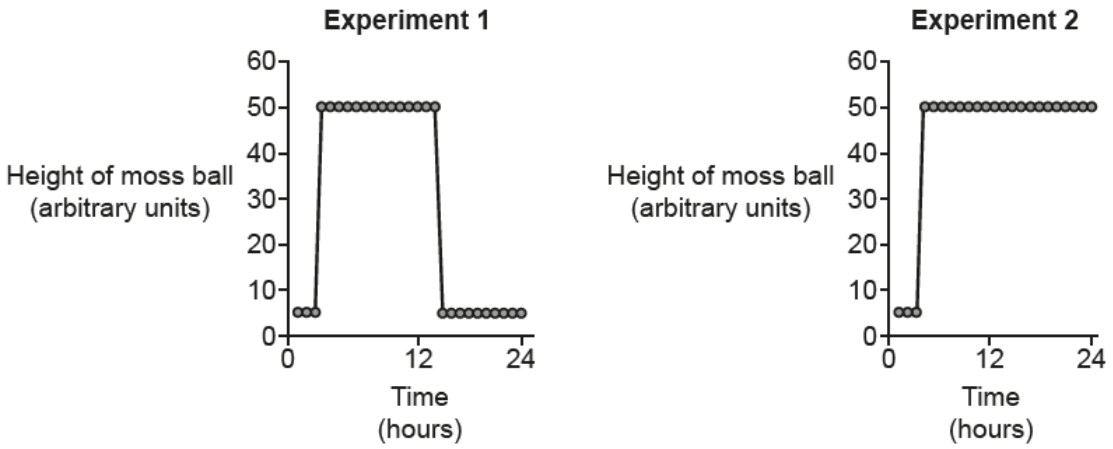


Fig. 17.2

(i) What conclusion can be made from **Experiment 1** about the effect of light on the position of the moss ball?

.....

.....

.....

..... **[2]**

(ii) Suggest an explanation for the differences between the two graphs.

.....

.....

.....

..... **[2]**

(c) Light is one environmental factor that affects plants.

Explain how increasing the temperature from 15 °C to 40 °C can affect plants.

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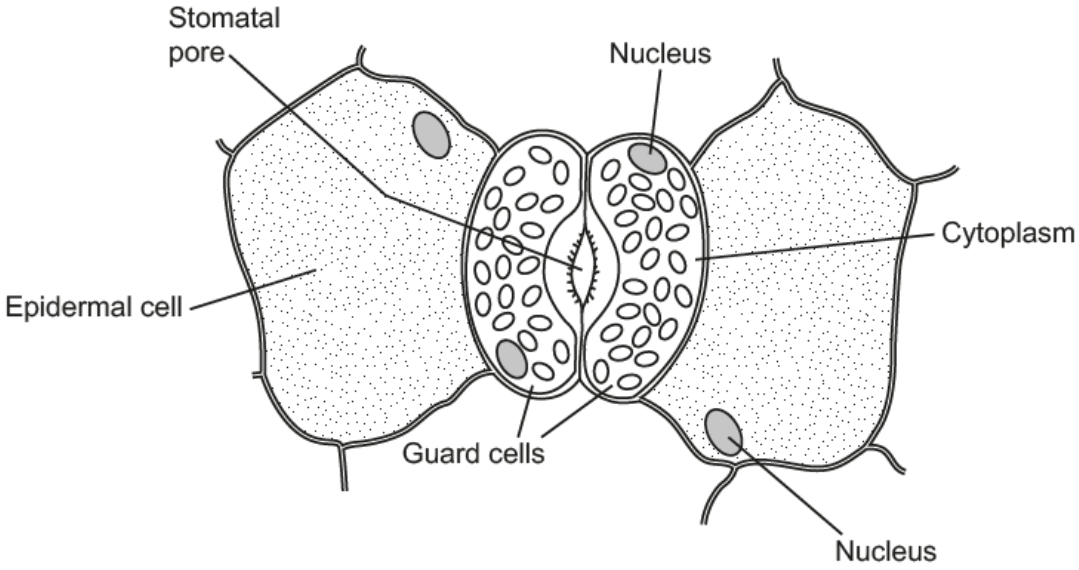
..... **[3]**

26. Nov 2021/Paper_J247/03/No.18

(a) The diagram shows the lower surface of a leaf.



Explain how guard cells change shape to open stomata.

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..... **[4]**

(b) A student looked at the surface of a leaf using a light microscope. **Fig. 18.1** shows a field of view from the leaf surface.

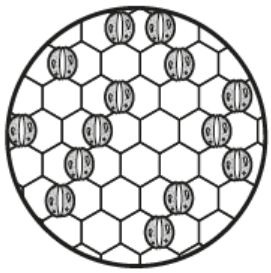


Fig. 18.1

The diameter of the field of view is 0.20 mm.

The student then looked at another two zones of the same leaf using the same magnification.

Table 18.1 shows their results.

Area of field of view (mm^2)	Number of stomata seen in the field of view			Mean number of stomata in field of view
	Zone 1	Zone 2	Zone 3	
.....	14	7	9	.....

Table 18.1

(i) Calculate the area of the field of view.
Use the equation: area = πr^2, where $\pi = 3.14$ and r = radius of the field of view

Write your answer in **Table 18.1**.

[1]

(ii) Calculate the mean number of stomata in one field of view.

Write your answer in **Table 18.1**.

[1]

(iii) Stomatal density is the number of stomata per mm^2.

Use the data in **Table 18.1** to calculate the mean stomatal density.

Give your answer to **3** significant figures.

Mean stomatal density = ... stomata / mm^2 **[2]**

(iv) Random errors can cause results to be above or below the true or accepted value.

How has the student tried to minimise the effect of random error?

..... **[1]**

(c) **Fig. 18.2** shows the relationship between stomatal density and leaf area for leaves from two different plants, **A** and **B**.

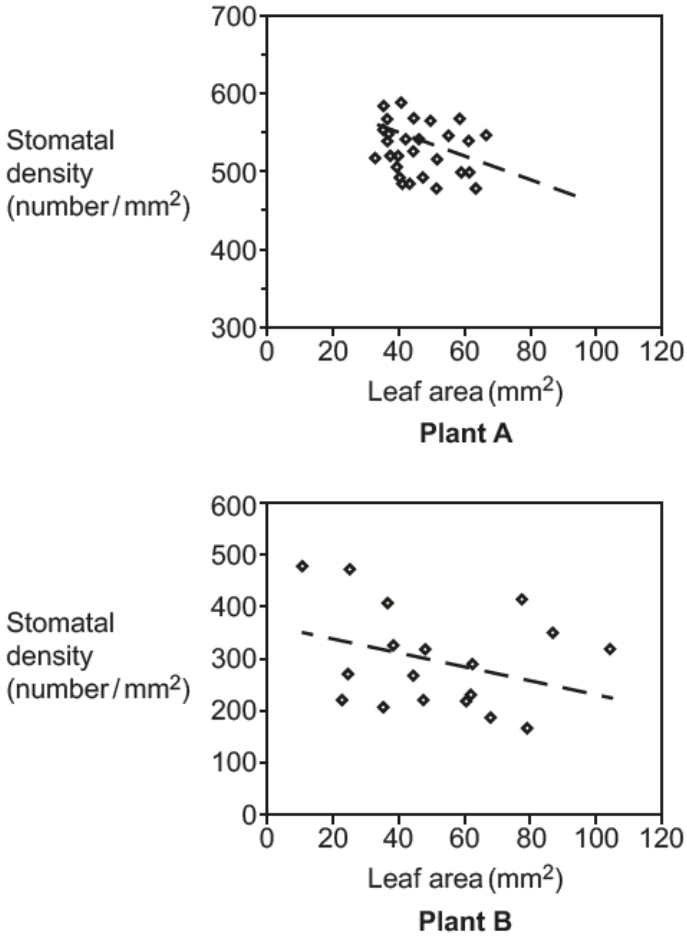


Fig. 18.2

(i) What do the graphs show about the relationship between stomatal density and leaf area?

..... **[1]**

(ii) Give **two** differences in patterns of data shown in the two graphs.

1 .....

.....

2 .....

.....

[2]

(d) **Fig. 18.3** shows the relationship between leaf age, stomatal density and cuticle thickness.

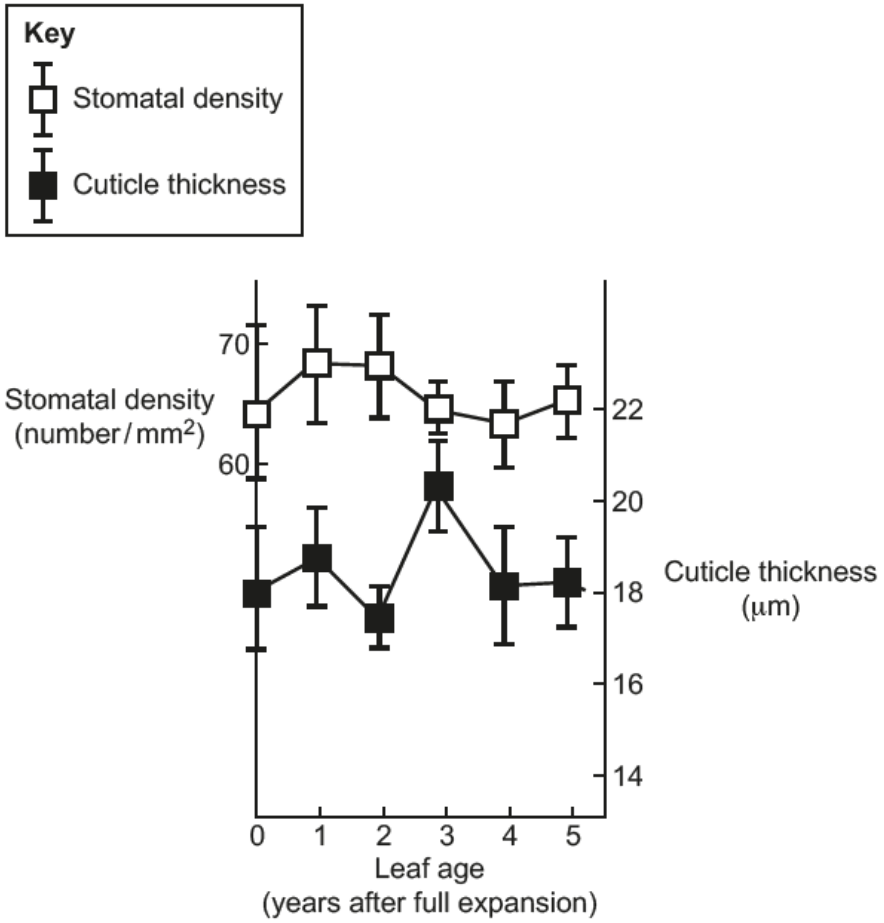


Fig. 18.3

(i) The graph has range bars drawn at each plotted point. These give the highest and lowest values at each point.

Give **one** reason why plotting range bars on the graph improves any interpretations made from the graph.

.....

..... **[1]**

(ii) What does the graph suggest about the relationship between stomatal density and cuticle thickness?

Tick (✓) **one** box.

As stomatal density decreases, cuticle thickness decreases. ☐

As stomatal density decreases, cuticle thickness increases. ☐

As stomatal density increases, cuticle thickness decreases. ☐

As stomatal density increases, cuticle thickness increases. ☐

Stomatal density and cuticle thickness do not have a relationship. ☐

[1]

27. Nov 2021/Paper_J247/03/No.21

(a) The sugar glucose is an important food molecule.

Which type of organisms can make their own glucose?

..... **[1]**

(b) Two students want to use the Benedict's solution test to estimate the glucose concentration of a food.

They notice that the colour change of the Benedict's solution depends on the concentration of glucose in the food. The colour changes are shown in **Table 21.1**.

Benedict's solution colour	Glucose concentration
blue colour	low ↓ intermediate ↓ high
green precipitate	
yellow precipitate	
orange precipitate	
brick red precipitate	

Table 21.1

(i) Identify **three** problems with using the information in **Table 21.1** to estimate the concentration of glucose in a food.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Suggest **two** ways to improve this method so that the colour change of Benedict's solution can give a more accurate estimate of glucose concentration.

1 .....

.....

2 .....

.....

[2]

(c) Instead of measuring colour change, a precipitate can be collected.

The precipitate is dried and its mass is measured.

The concentration of glucose can then be read off a calibration curve as shown in **Fig. 21.1**.

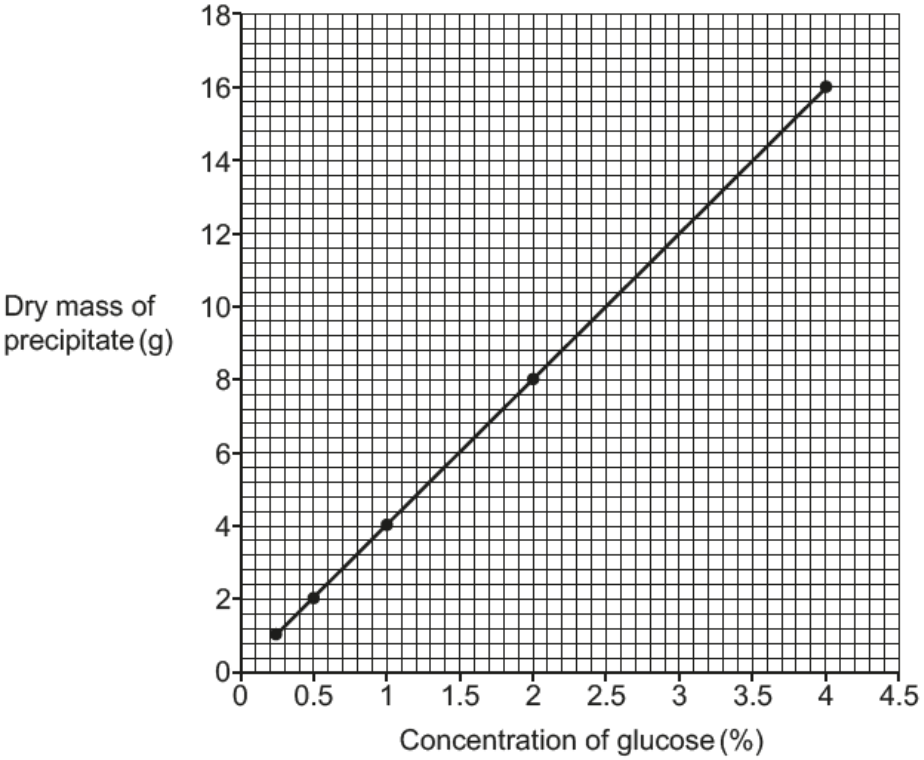


Fig. 21.1

The students collect the precipitate from the Benedict's test of a sample containing glucose.

The wet mass of the precipitate is 15 g, which is 80% water.

Calculate the concentration of glucose in the precipitate.

Use **Fig. 21.1** to support your answer.

Concentration of glucose = ... % **[2]**

28. Nov 2021/Paper_J247/03/No.22

(a) (i) **Fig. 22.1** shows the cell cycle. The letters represent different stages.

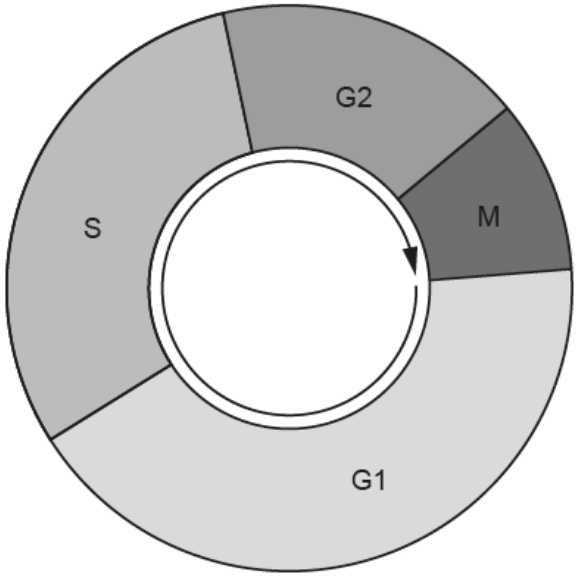


Fig. 22.1

Which processes happen during stage **S** and stage **M**?

Write your answers in the table.

Stage	Process
G1	Growth
S	.....
G2	Growth and preparation for cell division
M	.....

[2]

(ii) Cells can become specialised.

Give **one** reason why this is important for organisms.

.....

..... **[1]**

(b)* Actinomycin D is a drug used in experiments investigating control of growth of malignant tumours. The drug inhibits one stage of protein synthesis.

The drug firmly binds to unzipped DNA. It does not bind to RNA already present in the cell.

Describe how cells make proteins for growth and explain why the drug Actinomycin D inhibits some but not all protein synthesis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

(c) Explain how the structure of DNA determines the type of protein made.

.....

.....

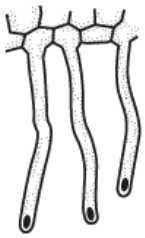
.....

..... **[2]**

29. Nov 2020/Paper_J247/03/No.7

Which diagram shows cells that swell, creating an opening during daylight conditions?

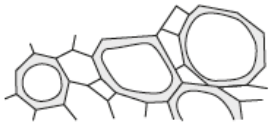
A



B

C

D



Your answer ☐ **[1]**

30. Nov 2020/Paper_J247/03/No.8

In a sample of DNA, 23% of the bases are cytosine.

What percentage of the bases are adenine?

A 23%

B 27%

C 46%

D 54%

Your answer ☐ **[1]**

31. Nov 2020/Paper_J247/03/No.9

Arsenic is a toxin that stops respiration in cells.

What other cell process would be stopped because of arsenic?

A Active transport

B Diffusion

C Osmosis

D Transpiration

Your answer ☐ **[1]**

32. Nov 2020/Paper_J247/03/No.13

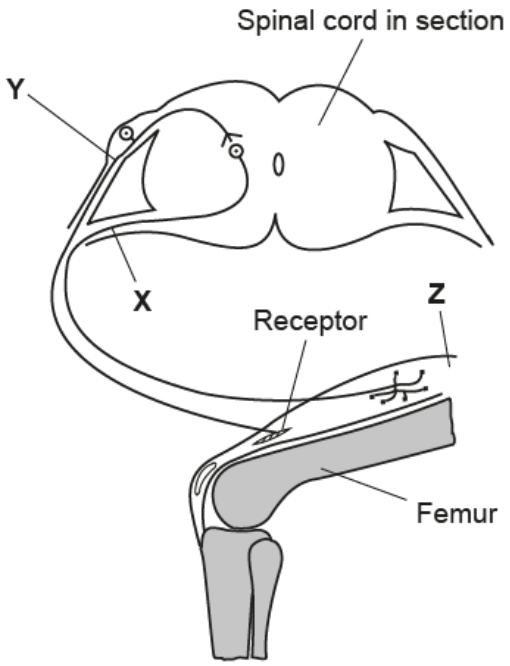
Which row in the table represents the eye when a person is in a dark room?

	Front view of iris and pupil	Circular iris muscles
A		contracted
B		relaxed
C		relaxed
D		contracted

Your answer ☐ **[1]**

33. Nov 2020/Paper_J247/03/No.14

The diagram shows a reflex arc.



A patient needs treatment for a leg injury.

An anaesthetic is injected to block nerve impulses to prevent pain but still allow movement of the leg.

Where was the anaesthetic injected in this patient?

A At **X**

B At **Y**

C At **Z**

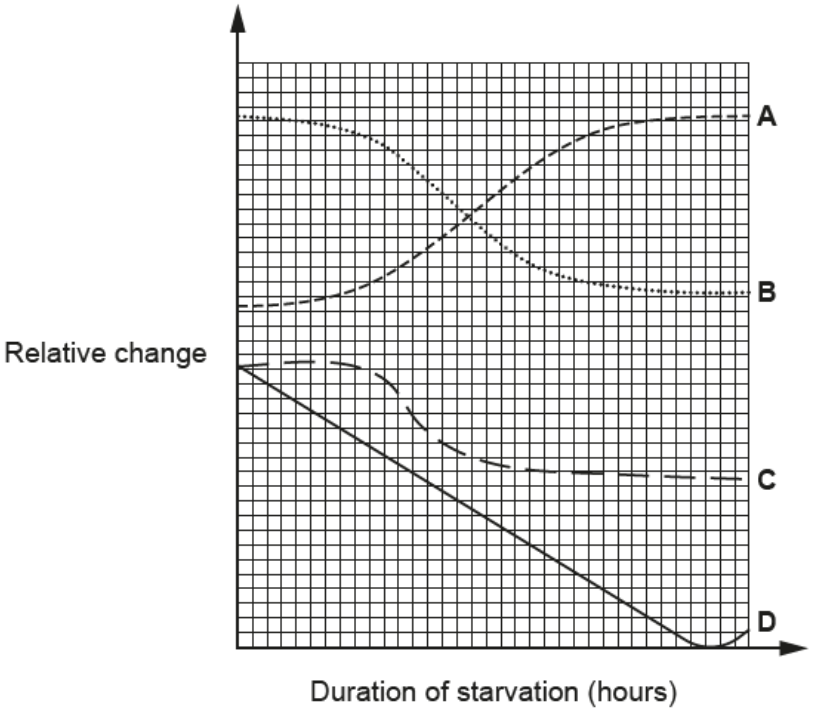
D At **X**, **Y** and **Z**

Your answer ☐ **[1]**

34. Nov 2020/Paper_J247/03/No.15

Short-term starvation affects the levels of blood glucose, liver glycogen and the hormones insulin and glucagon.

Which line on the graph represents the level of glucagon in the blood during short-term starvation?



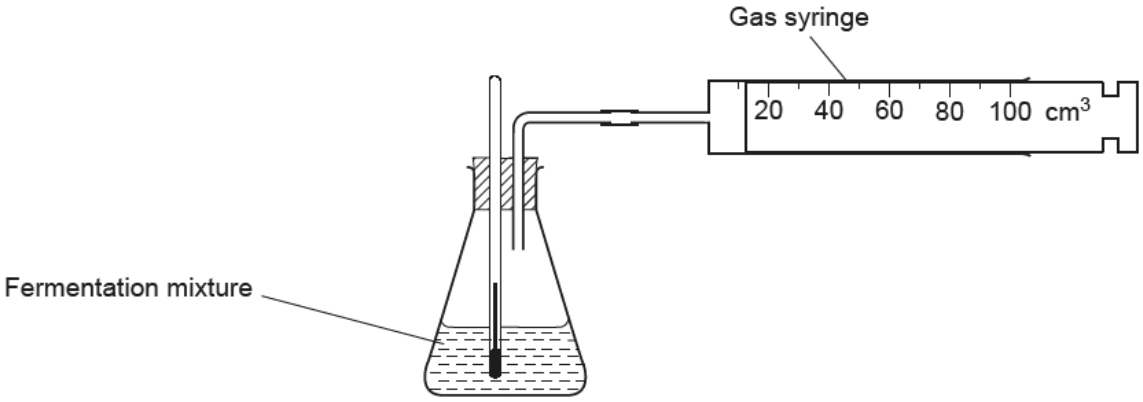
Your answer ☐ **[1]**

35. Nov 2020/Paper_J247/03/No.18

Fermentation involves enzymes that break down sugar releasing carbon dioxide gas.

The volume of carbon dioxide released can be used to measure how fast these enzymes are working.

A student investigates if fermentation works faster at 25 °C or 30 °C.
She measures the volume of carbon dioxide released in 10 minutes.
The diagram shows the apparatus she uses.



(a) The student could have measured the volume of carbon dioxide by collecting the gas over water in a measuring cylinder.

Why is it better to use a gas syringe?

..... **[1]**

(b) The student's results are shown in the table.

Temperature (°C)	Volume of carbon dioxide gas (cm^3) released in 10 minutes		
	Trial 1	Trial 2	Trial 3
25	23	25	22
30	34	27	33

(i) Calculate the **mean** rate of gas produced at **25 °C** in cm^3/minute.

Give your answer to **1** decimal place.

Mean rate of gas produced at 25 °C = ... cm^3/minute **[3]**

(ii) The rate of gas produced at 30 °C is greater than at 25 °C.

Use ideas about enzymes to explain why.

.....

.....

.....

..... **[3]**

(c) Phenols are chemicals that inhibit enzymes during fermentation.

They bind to amino acids on enzyme molecules.

Suggest how phenols inhibit enzymes.

.....

.....

.....

..... **[2]**

36. Nov 2020/Paper_J247/04/No.18

Gardeners often turn dead plant material from their garden into compost. They then add this compost to the soil where they are growing plants.

(a) Why do gardeners add compost to their soil?

Tick (✓) **one** box.

Bacteria in the compost kill disease causing fungi. ☐

The compost is sterile and so is aseptic. ☐

The compost provides carbon dioxide for photosynthesis. ☐

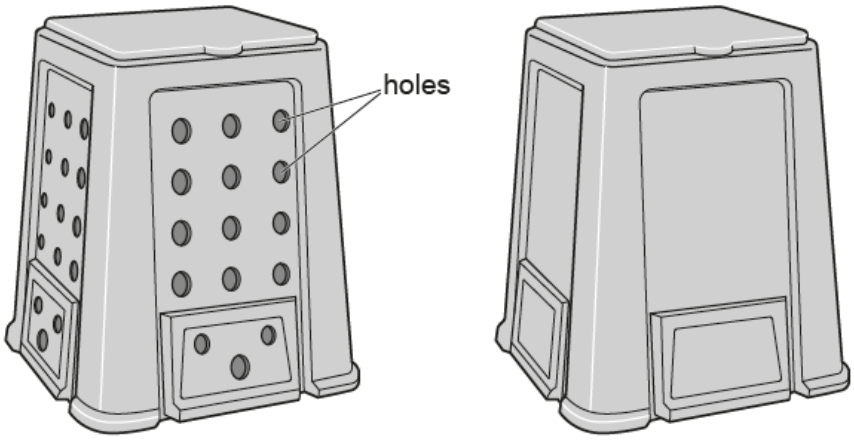
The compost provides minerals for the plants. ☐

[1]

(b) Compost can be made in a composting bin. In the bin **aerobic bacteria** turn dead plant material into compost.

Some people use a different way of making compost, called bokashi. In this process the compost is made **anaerobically**.

The drawings show a normal composting bin and a bokashi bin.



Normal composting bin

Bokashi bin

Explain the difference in the design of the two composting bins.

.....

.....

.....

..... **[2]**

(c) Scientists investigate the two methods of making compost.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Write down **one** way that the scientists make sure that they can draw valid conclusions.

.....

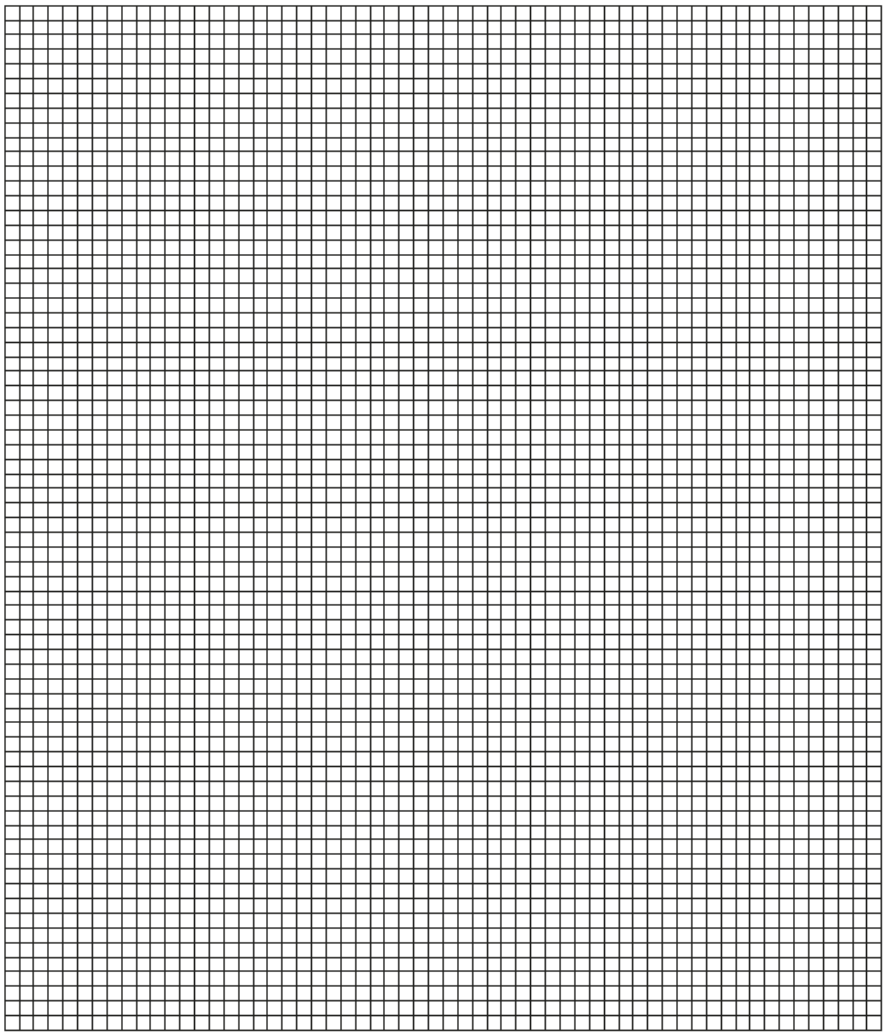
..... **[1]**

(d) **Table 18.1** shows the scientists' temperature readings.

	Temperature of the compost (°C)	
Time (days)	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 18.1

(i) Plot the scientists' results on the grid for normal and bokashi compost, and draw **two** curves of best fit.



[5]

(ii) Explain why the temperature of the compost in the **normal** bin changed as shown in the graph.

.....

.....

.....

..... **[2]**

(iii) Explain the difference in the temperature changes between the aerobic normal compost and the anaerobic bokashi compost.

.....

.....

.....

..... **[2]**

(e) **Table 18.2** shows the scientists' results for the mass of the compost.

	Normal compost	**Bokashi compost**
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	750	1100

Table 18.2

A gas is given off in the formation of the compost. This causes most of the decrease in mass.

(i) The percentage decrease in the mass of the normal compost is 50%.

Calculate the percentage decrease in the mass of the bokashi compost.

Give your answer to **2** significant figures.

Percentage decrease = ... % **[3]**

(ii) The scientists concluded that the bokashi method of composting might be better for the environment.

Use your answer from part **(e)(i)** to justify the scientists' conclusion.

.....

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.....

..... **[2]**