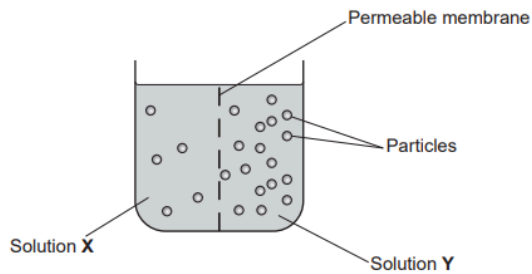


Q1. (2018)

- 2 Look at the diagram. It shows the particles dissolved in two solutions.



The particles can diffuse through the permeable membrane.

Which statement about the particles is true in this diagram?

- A Particles move in both directions across the permeable membrane.
- B Particles only move from X to Y.
- C Particles only move from Y to X.
- D Particles stop moving when the concentrations become equal.

Your answer

☐

[1]

Q2. (2018)

- 3 DNA is a polymer.

What is the name of the monomer in DNA?

- A Base
- B Deoxyribose sugar
- C Nucleotide
- D Phosphate

Your answer

☐

[1]

Q3. (2018)

- 4 A student uses a microscope to look at plant cells on a slide.

Which of these methods should they use first?

- A Highest power objective lens and focus moving the lens away from the slide
- B Highest power objective lens and focus moving the lens towards the slide
- C Lowest power objective lens and focus moving the lens away from the slide
- D Lowest power objective lens and focus moving the lens towards the slide

Your answer

☐

[1]

Q4. (2018)

- 5 The microscope used by the student has an eyepiece lens with a magnification of $10\times$.

Which objective lens would give an image magnification of $200\times$?

- A $10\times$
- B $20\times$
- C $30\times$
- D $200\times$

Your answer

[1]

Q5. (2018)

- 8 DNA is made of two complementary strands.

The diagram shows part of one strand of DNA.



Which base sequence would be found on the complementary strand of this DNA?

- A A
C
T
- B C
A
G
- C G
A
C
- D T
G
A

Your answer

[1]

Q6. (2018)

10 A student wants to test for **protein**.

What would they use to test for protein?

- A Benedict's reagent
- B Biuret reagent
- C Iodine solution
- D Ethanol

Your answer

☐

[1]

Q7. (2018)

13 Which one of these stages comes **first** during mitosis?

- A The nuclear membrane forms.
- B The nuclear membrane breaks down.
- C Chromosomes separate.
- D Chromosomes line up on the equator.

Your answer

☐

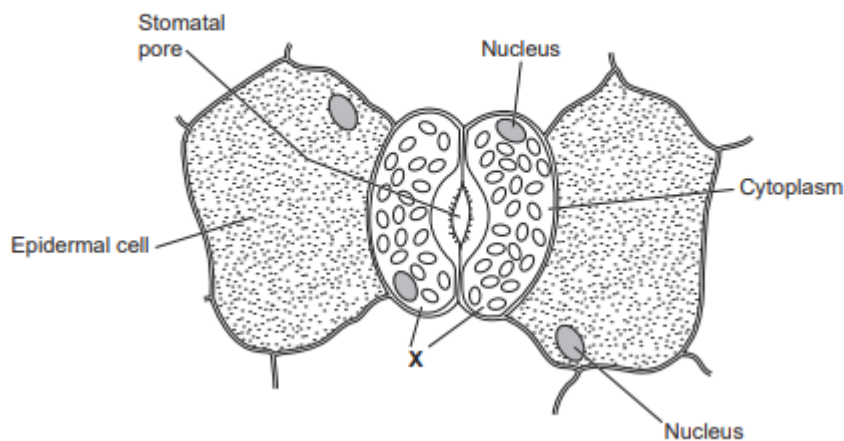
[1]

Q8. (2018)

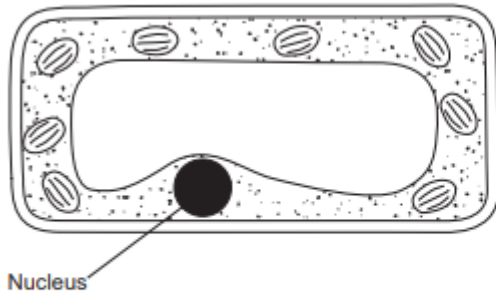
A)

17 Stomata are found on the surface of leaves.

The diagram shows some of the surface cells of a leaf.



(b) Look at the diagram showing a plant cell.

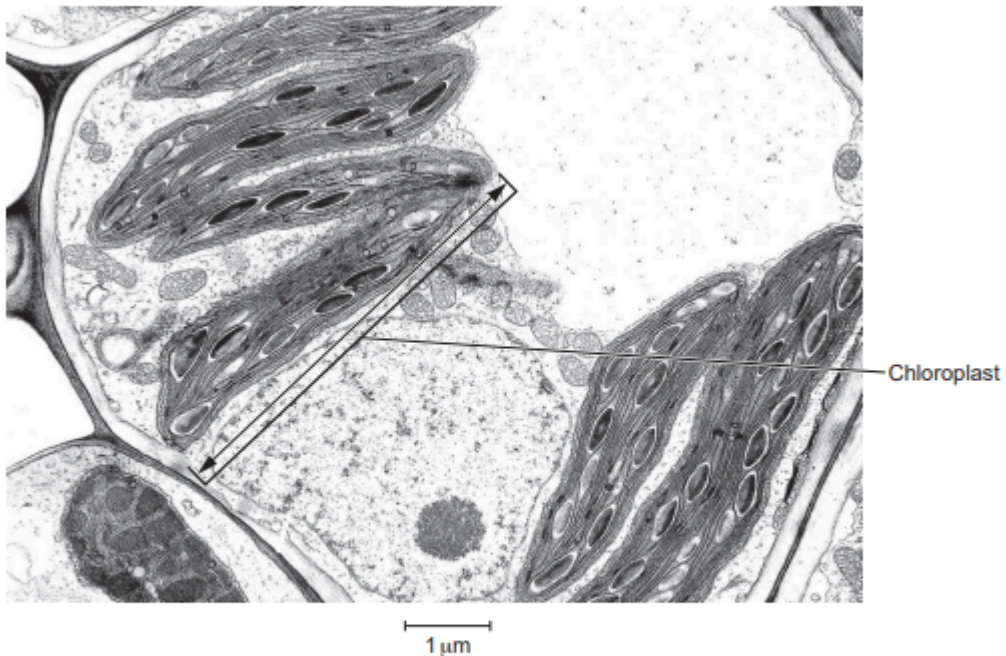


(i) The diameter of the nucleus in the diagram is 10 millimetres. The actual size of the nucleus is 10 **micrometres**.

Calculate the magnification of the diagram.

B)

(ii) Look at the picture of part of a plant cell.



Use the arrow on the picture and the scale to estimate the length of the chloroplast.

Answer = μm [1]

Q9. (2018)

A)

21 Students investigate how to extract DNA from peas.**Stage 1:**

- Chill 10 cm^3 of ethanol. Keep it on ice throughout the method for use in stage 2.
- Make a thick 'soup' by blending 100 cm^3 of peas with salt and cold water. Blend for 15 seconds in an electric blender.
- Strain the 'soup' through a mesh strainer and collect the liquid part in a beaker.
- Add 30 cm^3 of washing-up liquid and swirl to mix.
- Let the mixture settle for 5–10 minutes in a water bath at 60°C .

(a) One group of students made a water bath using a beaker of water, thermometer and Bunsen burner. Another group used an electric water bath.

Write down **two** advantages of using an electric water bath.

- 1
- 2
- [2]

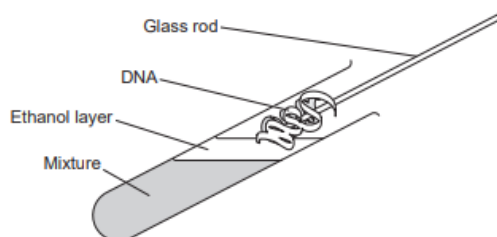
B)

(b) Low temperatures protect DNA by slowing down the activity of enzymes that destroy DNA. High temperatures break down membranes in the cell.

To extract DNA, some methods use a water bath at 60°C but other methods do not use an increased temperature.

Suggest **two** reasons for the different methods.

-
-
- [2]

Stage 2 isolates the DNA.

- Pour the mixture collected from stage 1 into a test tube until a third full. Add protease enzymes to the test tube.
- Slowly pour cold ethanol at an angle of 45° into the tube. Ethanol will float on top.
- DNA is soluble in water, but salted DNA does not dissolve in ethanol and will form white clumps where the water and ethanol layers meet.
- Twirl a glass rod and the DNA will collect on the rod.
- Dry the sample on a pre-weighed filter paper and measure the mass of product.

C)

- (c) Suggest
- two**
- safety precautions which should be taken at stage 2.

Explain why each safety precaution is needed.

1 Safety precaution:

Explanation:

2 Safety precaution:

Explanation: **[2]**

D)

- (d) Look at the table. It shows the results from the two groups of students in the investigation.

Type of water bath used	Mass of DNA collected (mg)			
	Test 1	Test 2	Test 3	Mean
Beaker of water and Bunsen burner				22.9
Electric	33.6	32.3	33.3	

- (i) Calculate the mean mass collected in the investigation using the electric water bath.

Give your answer to **1** decimal place.Answer = mg **[2]**

E)

- (ii) The range of the three test readings for the beaker of water and Bunsen burner was 3.4.

Does the evidence support using an electric water bath instead of a beaker of water and Bunsen burner?

Explain your answer.

.....

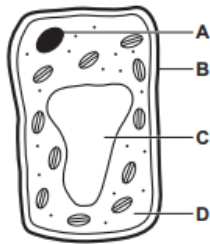
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..... **[2]**

Q10. (2019)

- 1 The diagram shows a plant cell observed using a light microscope.

Which label is pointing to a structure that contains genetic material?



Your answer

[1]

Q11.(2019)

- 2 How many different bases are in DNA?

- A 2
B 4
C 23
D 46

Your answer

[1]

Q12.(2019)

- 12 When the enzyme lipase is mixed with a lipid which of the following will increase in concentration?

- A Amino acids
B Fatty acids and glycerol
C Glucose and fructose
D Starch

Your answer

[1]

Q13. (2019) – 16d

- (d) Light microscopes let us see objects as small as 0.2 micrometres.

The diameter of cells similar to cell X, can vary between 0.008mm and 0.5mm.
(1 mm = 1000 micrometres)

Is it possible to see all these types of cells using a light microscope?

Explain your answer.

.....
.....
.....

[2]

Q14. (2020) –16d

A)

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

(i) Why do cells need respiration?

..... [1]

B)

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

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

1

2

[2]

C)

(iii) Aerobic respiration releases heat energy.

What term describes a reaction that releases heat energy?

..... [1]

Q15. (2020) – 20b

(b) The skin on some areas of the body contains hairs. Modern hair shampoos contain cleaning agents. One cleaning agent is made from fatty acids.

Explain how a **polymer** found in plants and animals can be treated to obtain these fatty acids.

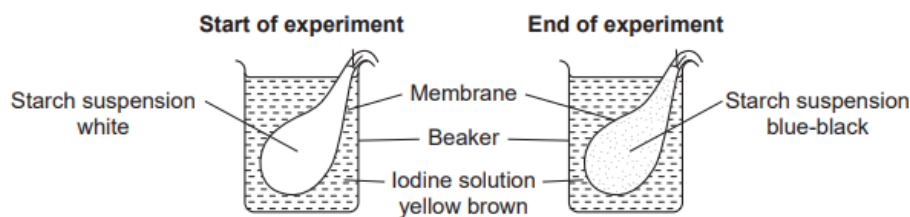
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..... [2]

Q16. (2021)

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]

Q17. (2021)

15 Q_{10} is a measure of the rate of change of a reaction when temperature is increased by 10°C .

Q_{10} is calculated using this formula:

$Q_{10} = \text{rate at higher temperature} \div \text{rate at lower temperature}$

An enzyme reaction has a rate of 36 units/min at 30°C and 16 units/min at 20°C .

What is the Q_{10} for this enzyme?

A 0.44

B 2.25

C 20

D 576

Your answer

[1]

Q18. (2021) – 16b

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

.....

.....

..... [2]

Q19. (2021)

- 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.

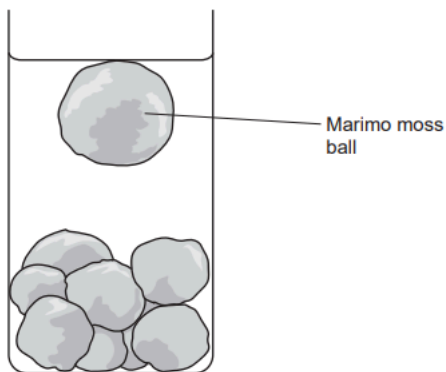


Fig. 22.1

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]

Q20. (2022)

- 2 Which molecule is produced in **both** aerobic and anaerobic respiration in animals?

- A ATP
- B Glucose
- C Lactic acid
- D Oxygen

Your answer ☐

[1]

Q21. (2022) – 23b

(b) Phenolphthalein is an indicator that turns pink in an alkaline solution of pH 10.

When lipase breaks down lipids, the indicator goes colourless.

A group of students investigate how temperature affects the enzymes that break down lipids found in milk.

Describe an experiment that the students could use to investigate the effect of temperature on the breakdown of the lipids found in milk.

In your description include:

- how the independent variable could be changed
- the observations that should be made
- **two** variables that need to be controlled.

To change the independent variable, I will

.....

.....

.....

The observations I make will be to

.....

.....

.....

I will need to control

.....

.....

.....

[5]

- 13 What is the percentage change in mass of the potato chip during an experiment?

Mass of potato chip before (g)	Mass of potato chip after (g)
5.7	5.2

- A -0.5 %
B -8.8 %
C -9.6 %
D -91.2 %

Your answer

[1]

Q23. (2023)

A)

- 19 A student investigates the effect of pH on an enzyme called catalase. Catalase breaks down hydrogen peroxide into water and oxygen.

The student collects the oxygen produced by the reaction.
The table shows their results.

pH	Volume of oxygen collected (cm ³)
2	1
4	12
6	24
8	26
10	8

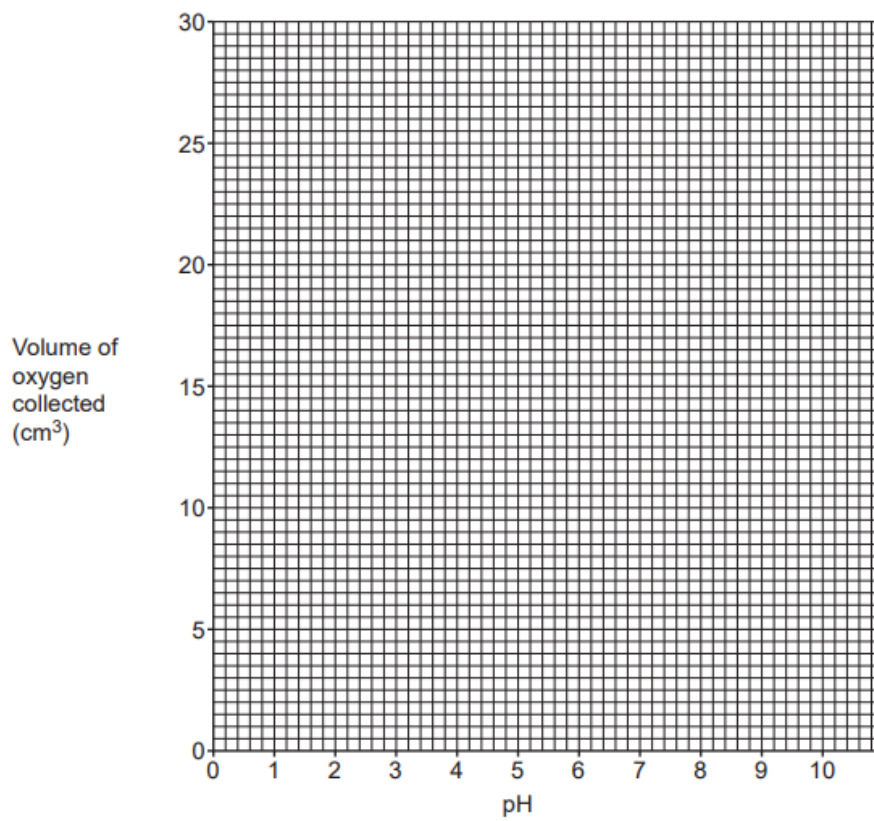
- (a) (i) Plot a graph of the results.

[2]

B)

(ii) Draw a line of best fit.

[1]



C)

(b) Write down a conclusion for the student's results.
Include data in your answer.

.....

.....

.....

..... [2]

D)

- (c) When collecting data, it is important that it is accurate, valid and repeatable.

Draw lines to link each **improvement** the student could make to the **effect** this improvement has on the data.

Improvement	Effect
The experiment is completed three times for each pH.	makes the data more accurate
Use a measuring cylinder, not a beaker, to measure the volume of enzyme.	allows the identification of any anomalous results
Place the mixture of catalase and hydrogen peroxide in a waterbath. This will keep the temperature the same for each pH.	makes the data more valid

[2]

E)

- (d) The student wants to increase their confidence in finding the correct optimum pH for catalase.

What should the student do?

Tick (✓) **one** box.

Repeat the experiment at a higher temperature.

Repeat the experiment using less enzyme.

Repeat the experiment using pH 1, 3, 5, 7, 9 and 11.

Repeat the experiment using pH 6.5, 7, 7.5, 8 and 8.5.

☐
☐
☐
☐

[1]

Q24. (2023)

- 21 (a)** To try to lose weight some people go on a type of diet called a ketogenic diet.

In a ketogenic diet, a person eats food that is high in fat and protein but low in carbohydrates.

Complete each sentence about this diet.

Use the words from the list.

amino acids	enzymes	fatty acids	glycerol
glycogen	homeostasis	respiration	sugar

Proteins in the food are broken down to smaller molecules called

.....

These smaller molecules are used to make more proteins in the body, such as

.....

Fats in the food are broken down into and

These are then used by the body to make lipids.

As the diet is low in carbohydrates such as starch, the person will have less

..... dissolved in their blood.

This means that the body will need to use some of its fat reserves to produce ATP by

.....

The diet is only recommended to be used for a short period of time to lose excess fat.

[5]

Q25. (2024)

- 17** An athlete is running a 10km race. They need to produce ATP in their cells during the race.

- (a)** Describe how cells make ATP.

In your answer include:

- the name of the process
- the substances that are used and made.

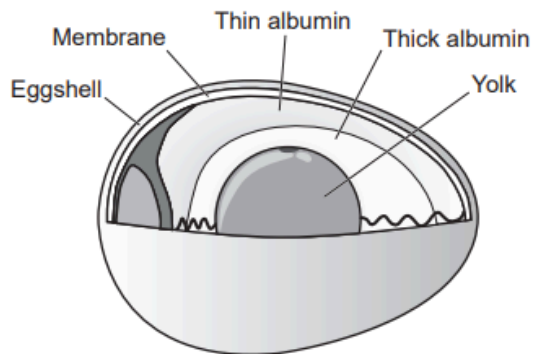
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.....
.....

[4]

Q26. (2024)

18 The diagram shows a hen's egg.

A chick can develop inside the egg.



(a) The developing chick gets most of its nutrition from the egg yolk.

A student tests the yolk for **protein**.

The tables show:

- reagents that could be used to test the yolk
- possible colours of reagents if there is a positive test.

Identify the reagent the student should use and the colour that this reagent will go if protein is present.

Tick (✓) **two** boxes.

Reagent	
Benedict's	
Biuret	
Iodine solution	

Colour	
Blue-black	
Purple	
Red	

[2]

Q27. (2024)

A)

- 22 A student investigates the effect of different concentrations of sugar solution on cubes of beetroot.

This is the method that they use:

Step 1 Cut four cubes of beetroot tissue.

Step 2 Place each beetroot cube in a test tube containing a different concentration of sugar solution.

Step 3 Leave the beetroot cubes in the sugar solutions for 3 hours.

Step 4 Remove the beetroot cubes from the sugar solutions.

- (a) The student wants to calculate the percentage change in mass for each beetroot cube.

They want to use the method above to collect the data they need, but have missed some steps from the method.

Describe the **additional** steps needed in the method to find the data.

.....

.....

.....

.....

.....

..... [3]

B)

- (b) State **two** variables that the student should control in this investigation.

1

2 [2]

C)

- (c) Describe how the student could find out if their data is both repeatable and reproducible.

Repeatable

.....

.....

Reproducible

.....

..... [3]

D)

(d) Two of the beetroot cubes increased in mass.

Explain why some of the beetroot cubes will increase in mass.

.....

.....

.....

..... [2]