OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



EXAM QUESTION PACK

B2.1 SUPPLYING THE CELL

SCORE	PERCENTAGE
/113	%

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Gateway Biology A (9-1)

Supplying the cell

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **113**.
- The total number of marks may take into account some 'either/or' question choices.

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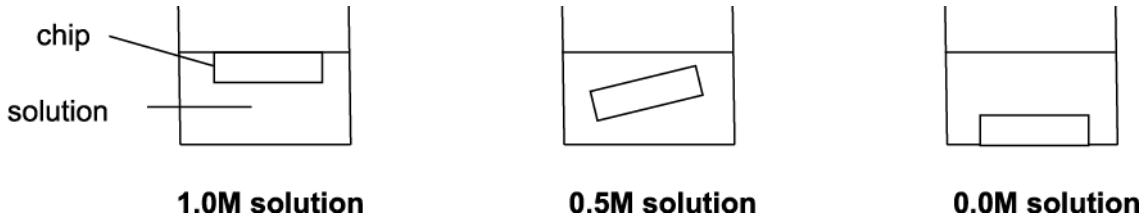
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1(a) An investigation is done to investigate changes in potatoes placed in different sucrose solutions.

Three chips are cut from a potato.

Each chip is 5.0 cm long.

Each chip is left in a different concentration of sucrose solution for two hours.



These are the results after two hours:

chip in **1.0M solution**	4.5 cm
chip in **0.5M solution**	5.0 cm
chip in **0.0M solution**	5.5 cm

In this experiment what process causes some of the chips to change length?

---

[1]

(b) Explain why the chip in the **0.0M solution** increased in length.

---

[2]

(c) Explain why the chip in the **0.5M solution** stayed the same length.

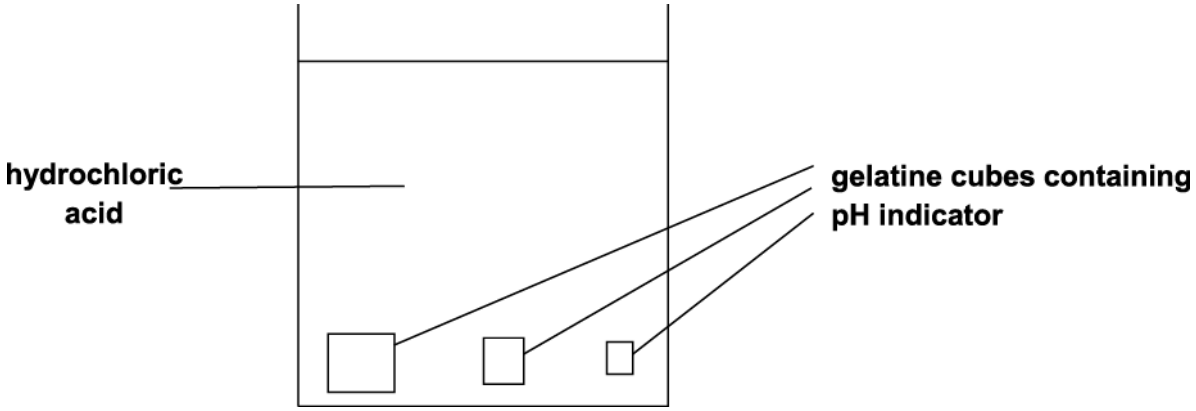
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[2]

2 Some students investigate the effect of the ratio of surface area:volume on the rate of diffusion in animal cells.

They use hydrochloric acid and gelatine cubes stained blue with pH indicator.

They put different sized cubes into a beaker of hydrochloric acid and time how long it takes for the cubes to completely change colour.



The table shows their results.

length of 1 side of cube (cm)	surface area:volume ratio (cm^{-1})	time to completely change colour in seconds
1	_____	132
2	3	328
3	2	673

(i) Calculate the surface area:volume ratio for the cube with sides of 1 cm.

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answer = _____ cm^{-1} [1]

(ii) Calculate the rate of colour change for each of the three cubes.

Write your answers in the table below.

Show your answers in standard form.

length of 1 side of cube (cm)	rate of colour change (s^{-1})
1	_____
2	_____
3	_____

[2]

(iii) Use the results and your calculations in parts **(i)** and **(ii)**

Explain why most single celled organisms do **not** need a transport system (e.g. the circulatory system of multi cellular organisms).

_____

_____

_____

_____ [2]

3 In many countries people rely on bananas for food.

Black sigatoka is a disease of banana plants.

It is caused by a fungus.

Banana plants grown by farmers are usually produced asexually.

This process uses mitosis.

This means that if one banana plant can die of black sigatoka then they all can.

Write down why.

---

[1]

4 Look at the table. Which row describes active transport?

	only occurs across a membrane	can move substances from a low to high concentration	uses ATP	only moves substances from high to low concentration
A			✓	✓
B	✓	✓	✓	
C	✓	✓		
D	✓		✓	✓

Your answer ☐

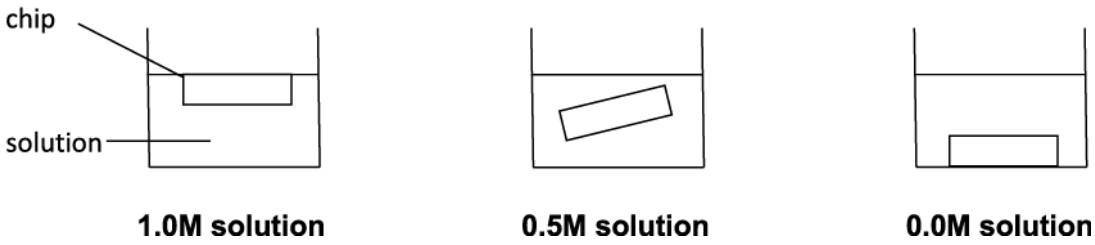
[1]

5(a) An investigation is done to investigate osmosis in potatoes.

Three chips are cut from a potato.

Each chip is 5.0 cm long.

Each chip is left in a different concentration of sucrose solution for two hours.



1.0M solution **0.5M solution** **0.0M solution**

These are the results after two hours:

chip in **1.0M solution** 4.5 cm

chip in **0.5M solution** 5.0 cm

chip in **0.0M solution** 5.5 cm

Explain why the chip in the **0.0M solution** increased in length.

--- [2]

(b) Explain why the chip in the **0.5M solution** stayed the same length.

---[2]

(c)

(i) Calculate the percentage change in length of the chip in the **1.0M solution**.

answer = _____ % [2]

(ii) In experiments like this, what is the advantage of calculating percentage change, not just the actual change?

---[1]

(d)

(i) Measuring the length of the chips is a quick and easy way to get results but it does **not** measure the total change to the chips.

Explain why.

---

[1]

(ii) What could the students measure to see the total change to the chips?

---

[1]

6 Erythromycin is an antibiotic drug.

It is important to get the dose of erythromycin right.

Too much erythromycin can be harmful.

However, recently some strains of bacteria have developed resistance to low concentrations of erythromycin.

To see how effective erythromycin is, it is tested using bacteria grown on agar plates.

This method is used:

- A petri dish is used that has the bacteria growing evenly over the surface.
- A disc of filter paper is soaked in erythromycin.
- The disc is placed on the agar in the centre of the petri dish using sterile forceps.
- The dish is incubated at 37°C.

(i) Why did the scientists incubate the dish at 37°C rather than at higher or lower temperature?

---

[2]

(ii) Why is the filter paper disc moved using sterile forceps?

---

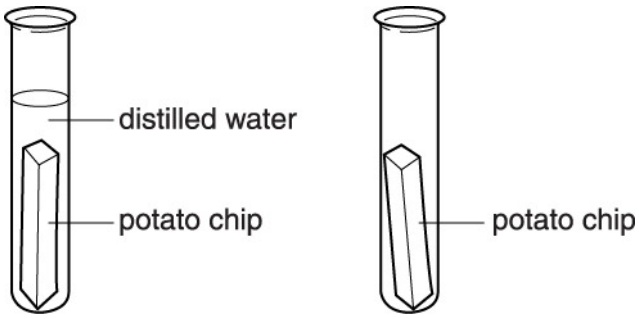
[1]

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7 Katie cuts two chips from a potato.

She puts one of the chips into a test tube of distilled water.

Katie puts the other chip into an empty test tube.



Water enters the cells of the potato chip that has been left in distilled water by osmosis.

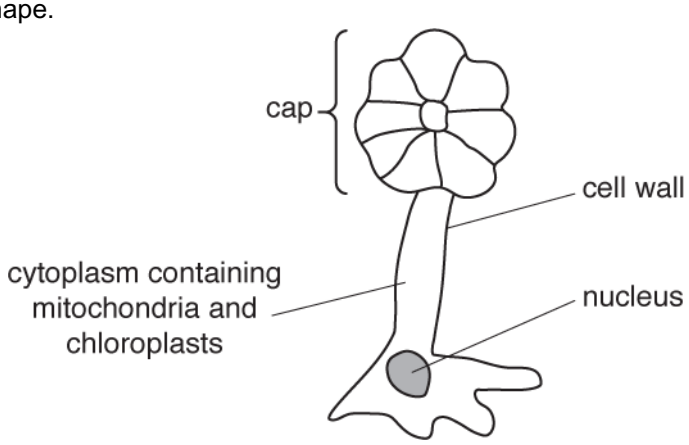
Explain why.

---

[2]

8 *Acetabularia* is a unicellular organism that lives in the sea.

It has rather an unusual shape.



(i) Write down **two** features shown in the diagram of *Acetabularia* that tell you that it is **not** a bacterium.

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1

2 ---------- [2]

(ii) *Acetabularia* is one of the largest unicellular organisms.

To be larger, organisms need to be multicellular.

What is an advantage of being larger and multicellular?

Put a tick (✓) next to the **correct** answer.

Some genes can be lost from some cells.	☐
Both aerobic and anaerobic respiration can occur.	☐
Cells are able to differentiate and specialise.	☐
Organisms are able to clone themselves.	☐

[1]

(iii) To become multicellular, specialised organ systems may be needed.

Write down **one** of these systems and explain why it is needed.

---------- [1]

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9 Mia investigates the effect of two liquids on animal cells.

She puts 5 cm^3 of distilled water into test tube **A**.

She puts 5 cm^3 of concentrated salt solution into test tube **B**.

Mia then adds 3 drops of blood to each of the test tubes.

She records the appearance of the test tubes as soon as the blood is added and then again after 2 minutes.

Here is her results table.

Test tube	Contents	Appearance at start	Appearance after two minutes
A	distilled water and blood	cloudy	clear red liquid
B	concentrated salt solution and blood	cloudy	cloudy

The diagrams show what has happened to the cells in the different liquids.

in test tube **A**



in test tube **B**



Use ideas about **osmosis** to explain the results.

The quality of written communication will be assessed in your answer to this question.

[6]

10 Mia investigates the effect of salt concentration on animal cells.

She puts 5 cm^3 of distilled water into a test tube.

Mia then adds 3 drops of blood to this test tube.

The liquid in the test tube is cloudy.

If the blood cells burst and release their contents then the solution becomes clear.

Mia times how long it takes for the liquid to go clear.

She then repeats the method with different concentrations of salt solution.

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Here is her results table.

Concentration of salt in %	Time to go clear in seconds
0.00	20
0.25	300
0.50	600
1.00	remained cloudy after 15 minutes
2.00	remained cloudy after 15 minutes

Explain the results including the correct scientific terms to describe the appearance of the cells in the solution at the end of the investigation.

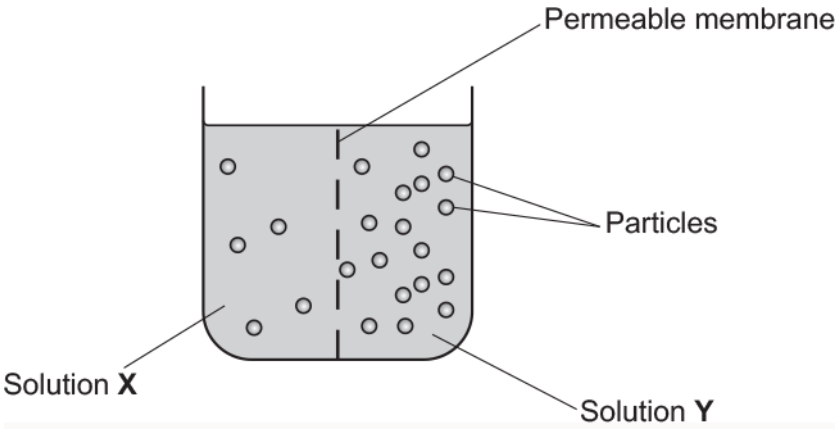


The quality of written communication will be assessed in your answer to this question.

[6]

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11 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]**

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12 Why do plant root hair cells use active transport to take in minerals?

A Minerals are dissolved in water in the soil.

B Minerals are needed by the plant in very low concentrations.

C Minerals are present at very high concentrations in the soil.

D Minerals are present at very low concentrations in the soil.

Your answer [ ] [1]

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]

14 Which process produces gametes?

A Diffusion
B Fertilisation
C Meiosis
D Mitosis

Your answer [ ] [1]

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15 Retinitis pigmentosa is a genetic condition.

It is caused by a mutation to a gene. This mutation produces a recessive allele.

If people have retinitis pigmentosa then the cells in their retina are damaged.

(i) Scientists want to use stem cells as a treatment for this condition.

Why might stem cells be able to repair the retina?

---

[2]

(ii) Write down **two** reasons why medical treatments are tested on animals first.

---

[2]

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16 Look at some of the stages in mitosis.

1 The nuclear membrane forms.

2 The nuclear membrane breaks down

3 Chromosomes separate.

4 Chromosomes line up on the equator

What is the correct order of these stages during mitosis?

A 1 → 3 → 2 → 4

B 1 → 4 → 3 → 2

C 2 → 4 → 3 → 1

D 3 → 2 → 4 → 1

Your answer [1]

17 A plant cell is placed in a solution with a higher solute concentration than the cell contents.

What will happen to the plant cell?

A Absorb water until it bursts.

B Absorb water until it is turgid.

C Lose cytoplasm and shrink.

D Lose water and become flaccid.

Your answer [1]

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18 Which is a function of carrier proteins in a cell membrane?

A Transfer impulses across a synapse

B Transfer molecules by active transport

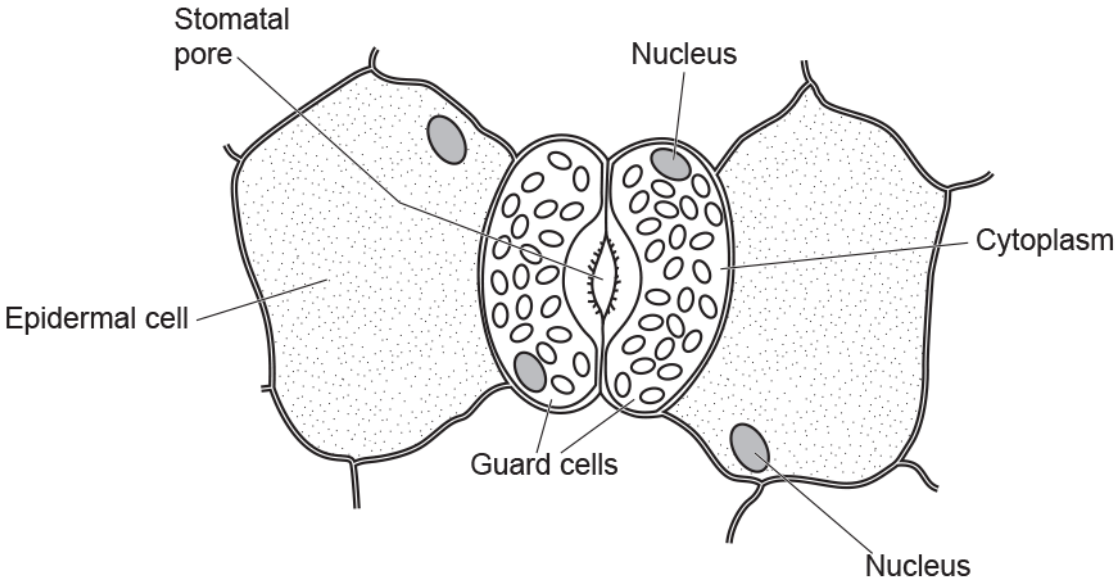
C Transport amino acids in protein synthesis

D Transport molecules around the blood

Your answer ☐ [1]

19

The diagram shows structures on the surface of a leaf.



(i) Photosynthesis occurs in the guard cells but not the epidermal cells.

Explain why this is important in the control of the rate of transpiration in the plant.

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[4]

(ii) Explain why guard cells are an example of specialised cells.

[2]

20

(i) Motor neurone disease (MND) is a condition that affects reaction times. MND affects the speed of nerve impulse in motor neurones.

Stem cells taken from the skin of people with MND are used in research. The stem cells can be grown in the lab and used to measure the speed of the nerve impulse.

Which special feature of stem cells makes this possible?

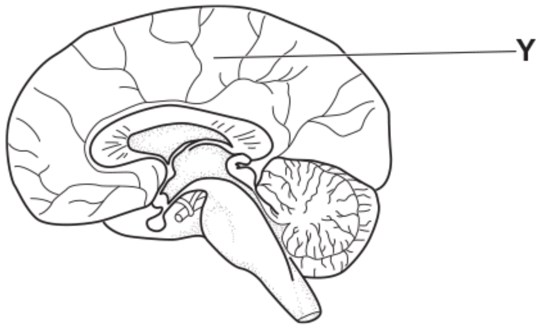
[1]

(ii) The diagram shows the brain.

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Name part **Y** and explain why it is an important area of the brain in the research of MND.

Part **Y**: ____

Explanation: ____ **[2]**

(iii) Measuring the speed of the nerve impulse in the brain is more difficult than using stem cells.

Suggest **two** reasons why.

____

____

____ **[2]**

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21 Retinitis pigmentosa is a genetic condition that affects the eyes.

It is caused by a mutation to a gene. This mutation produces a recessive allele.

The condition causes rod cells in the retina to break down.

(i) Explain why stem cells could be used as a treatment for this condition.

---

[2]

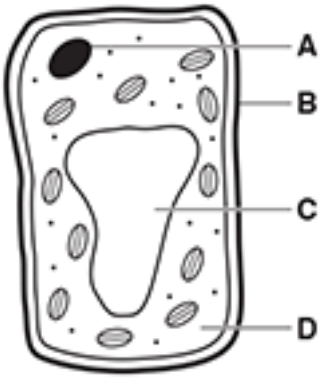
(ii) Why is it an advantage to use stem cells from the patient rather than from another person?

---

[1]

22 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]

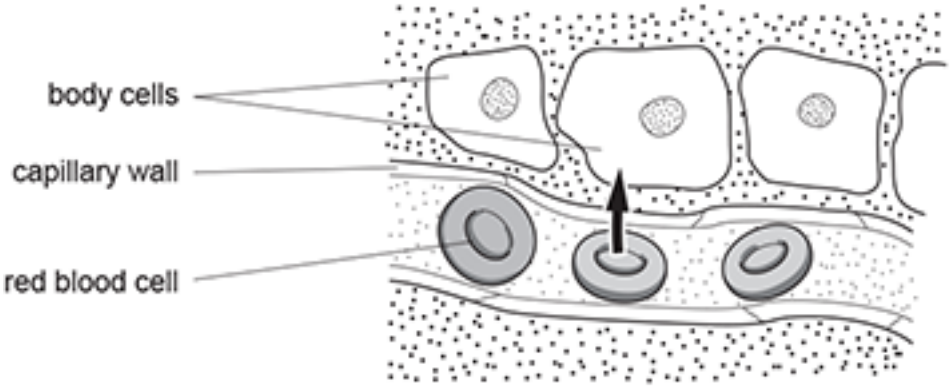
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23 The diagram shows the direction of **oxygen** transfer from red blood cells to body cells.

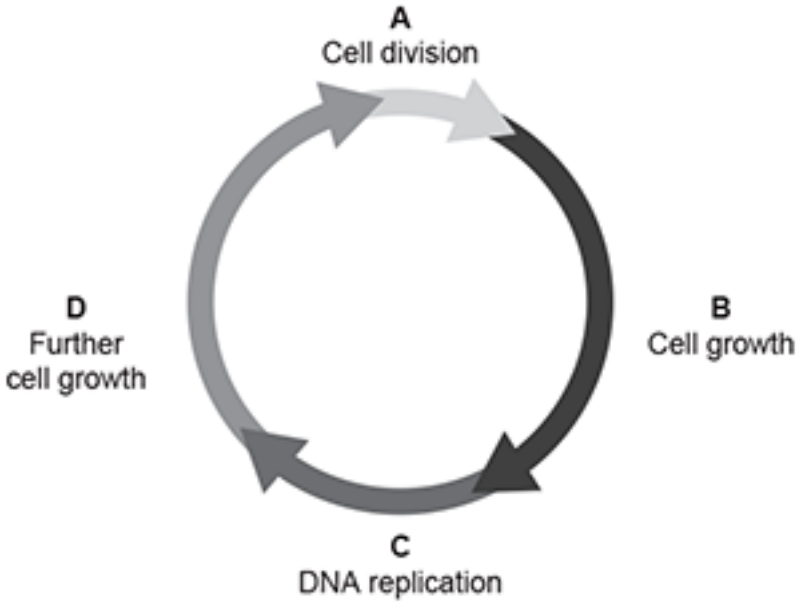
What process does the arrow show?



A Active transport
B Diffusion
C Osmosis
D Transpiration

Your answer ☐ [1]

24 During which phase of the cell cycle does mitosis happen?



Your answer ☐ [1]

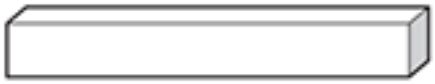
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25 An experiment is carried out to find the concentration of potato tissue.

Four chips are cut from a potato.



At the start, each chip is 50 mm long, 10 mm wide and 10 mm high.

Each chip is put in a different sucrose solution **A**, **B**, **C** and **D**.

The volumes of the chips are calculated after 1 hour.

Sucrose solution	Volume of chip (mm^3)
A	50
B	500
C	5000
D	50 000

Which sucrose solution has the same concentration as the potato tissue?

Your answer ☐ [1]

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26(a) A scientist clones a cauliflower plant.



He uses small pieces of the cauliflower plant called explants.

This is the method the scientist uses to get the explants:

- Place the equipment in a beaker of bleach and swab the bench with 70% alcohol.
- Collect a small piece of cauliflower and place on a white tile.
- Use a scalpel to cut the piece of cauliflower lengthways into small 3–5 mm pieces called explants.
- Measure the mass of the explants.

(i) Suggest why the scientist uses a scalpel rather than a kitchen knife.

---

[1]

(ii) Write down **one** safety precaution that the scientist should take when using a scalpel.

---

[1]

(iii) The explants are then prepared for cloning by placing on an agar jelly plate.

Agar jelly contains water, sugars and minerals.



Agar jelly plate

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When the explants are placed on the agar jelly plate they have no roots or leaves.

Explain why the explants must be placed on the agar jelly plate.

[2]

(b) To grow the explants, the scientist places the agar jelly plate in a warm room near to a window.

(i) Explain why this will help the explants grow and develop into clones.

---

[2]

(ii) Using a heated cabinet with light bulbs inside the cabinet would improve this method.

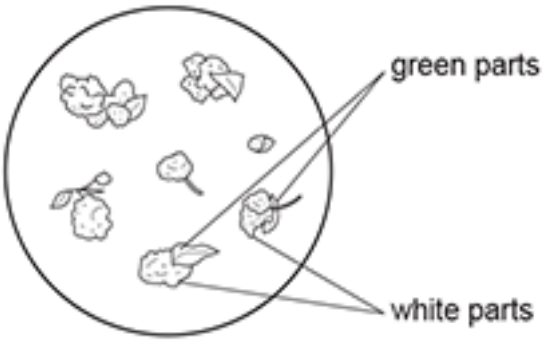
Explain why.

---

[2]

(iii) The scientist examines the agar jelly plate regularly.

Growth of the explants is visible in the plate within 10 days and parts of the explants are turning green.



What conclusion can be made about why the explants have parts that are turning green?

---

[1]

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(c) The mass of the explants at the start was 15 g.

After 10 days the mass of the explants was 28 g.

Calculate the percentage increase in mass of the explants.

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

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

(d) The cells in cauliflower explants behave the same way as embryonic stem cells do in animals.

Explain why it is more difficult to clone adult animals than to clone cauliflowers.

---

[2]

27 The lining of the uterus is shed during menstruation.

New cells are needed to replace the lining of the uterus.

Describe the processes that occur to make these new cells.

[3]

28 Why are stem cells useful for repairing damaged tissues?

A They are easily obtained from any organ.
B They are not attacked by pathogens such as bacteria.
C They are haploid.
D They can divide to form different types of cell.

Your answer [1]

29 A salt marsh is a large, muddy area of land where a river joins the sea.

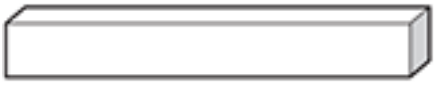
When the tide comes in, the salt marsh gets covered with seawater.

Suggest **one** reason why salt marshes are difficult places for plants to grow

[1]

30 An experiment is carried out to find the concentration of potato tissue.

Four chips are cut from a potato.



At the start, each chip is 50 mm long, 10 mm wide and 10 mm high.

Each chip is put in a different sucrose solution **A**, **B**, **C** and **D**.

The volumes of the chips are calculated after 1 hour.

Sucrose solution	Volume of chip (mm^3)
A	50
B	500
C	5000
D	50 000

Which sucrose solution has the same concentration as the potato tissue?

Your answer ☐ **[1]**

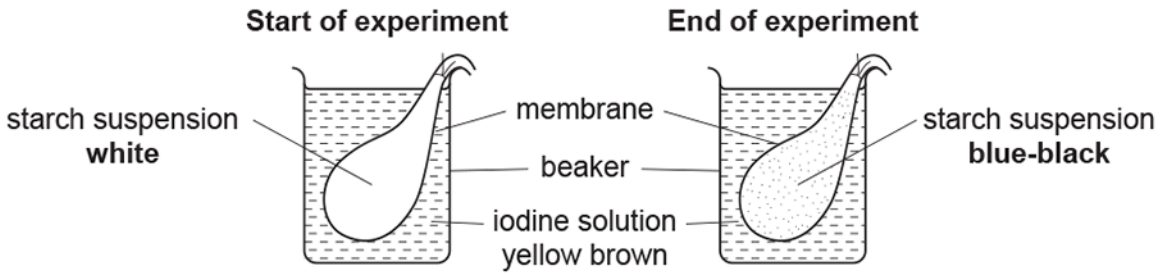
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31(a) An experiment is set up to investigate how substances move into and out of cells.

Look at the results.



Explain the results of this experiment.
Use ideas about molecules in your answer.

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[3]

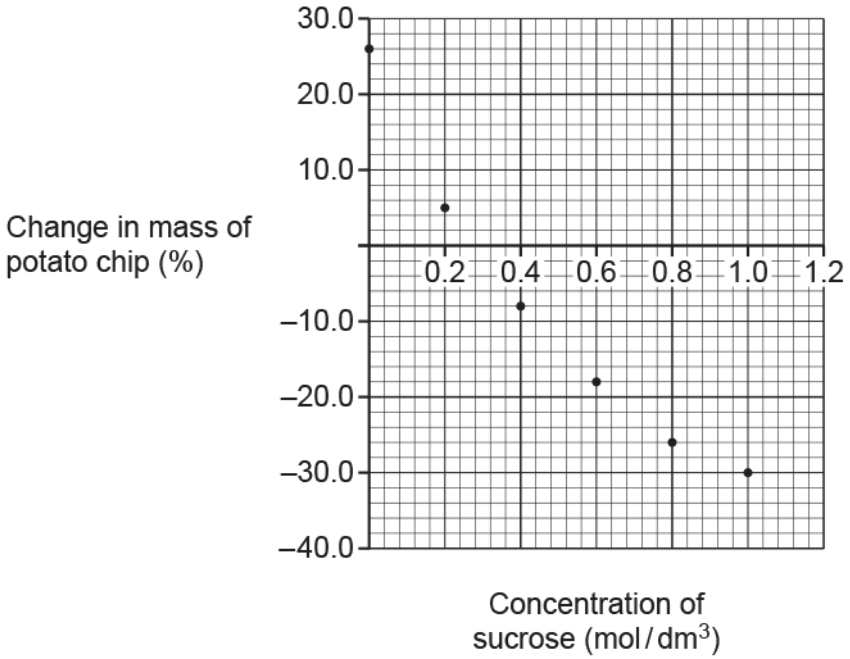
(b) Plant cells are affected by osmotic conditions.

Look at the graph. It shows the percentage change in mass of potato chips in different concentrations of sucrose.

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(i) Draw a curve of best-fit on the graph.

[1]

(ii) Use the graph to estimate the concentration of sucrose that has the same water potential as the potato cells.

Concentration = ... mol / dm^3 **[1]**

(iii) In a different experiment a sucrose concentration of 0.0 mol / dm^3 increases the mass of a carrot chip by 30%.

The carrot chip shows a 10% decrease in mass compared with its original mass for every 0.2 mol / dm^3 increase in sucrose concentration.

Calculate the x-axis intercept for the carrot chip.

x-axis intercept = ... mol / dm^3 of sucrose **[1]**

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(c) Osmotic conditions can increase the size of plant tissue but stem cells are responsible for growth of new cells.

What name is given to plant tissue that contains stem cells?

---

[1]

32 Scientists are using human embryonic stem cells to grow cells to treat type 1 diabetes.

Explain why scientists use embryonic rather than adult stem cells.

---

[2]

33(a) A scientist clones a cauliflower plant.



He uses small pieces of the cauliflower plant called explants.

This is the method the scientist uses to get the explants:

- Place the equipment in a beaker of bleach and swab the bench with 70% alcohol.
- Collect a small piece of cauliflower and place on a white tile.
- Using a scalpel cut the piece of cauliflower lengthways into small 3–5 mm pieces called explants.
- Measure the mass of the explants.

What equipment should be used to measure the mass of the explants to 1 hundredth of a gram?

[1]

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(b) The scientist prepares the explants for cloning on an agar jelly plate.

He does this by placing the explants on the agar.

To grow the explants into cauliflower plants, the scientist places the agar jelly plate in a warm room near to a window.

(i) Before they form new plant structures, the explants must take in sugars from the agar jelly.

Explain why explants cannot make their own sugars.

---

[2]

(ii) The experiment could be improved by placing the agar jelly plate with explants into a heated cabinet containing light bulbs.

Describe how this cabinet could be further improved to maximise the growth and development of the explants.

---

[2]

34 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]

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35 Which type of cell can divide to produce a range of different cell types?

A Heart cell
B Neurone cell
C Sperm cell
D Stem cell

Your answer ☐ [1]

36 A student models the process of mitosis using cookies and sprinkles.



Mitosis is part of the cell cycle.

Which part of the cell cycle has the student modelled?

A Cell division
B Chromosome movement
C DNA replication
D Growth of cell

Your answer ☐ [1]

37 Treatment for cancer often involves powerful medicines that stop cells dividing all over the body.

Write down the name of the type of cell division that occurs when body cells divide.

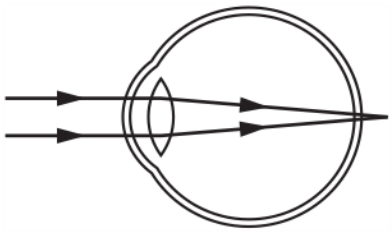
[1]

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38 Look at the diagram showing an eye defect.



What is the defect and which lens could be used to correct it?

A Long-sightedness, corrected with a concave lens
B Long-sightedness, corrected with a convex lens
C Short-sightedness, corrected with a concave lens
D Short-sightedness, corrected with a convex lens

Your answer ☐ [1]

39 A student models the process of mitosis using cookies and sprinkles.



Mitosis is part of the cell cycle.

Which process in the cell cycle has the student modelled?

A Cell division
B Chromosome movement
C DNA replication
D Growth of cell

Your answer ☐ [1]

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40 In people with multiple sclerosis their immune cells stop working as they should. HSCT is a treatment for multiple sclerosis which destroys all the immune cells.

Once the immune cells are destroyed, cells from a patient's bone marrow can replace the immune cells.

What type of cell is used to replace the destroyed immune cells?

A Neurone cell
B Red blood cell
C Stem cell
D White blood cell

Your answer ☐ [1]

41 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]

END OF QUESTION PAPER

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