



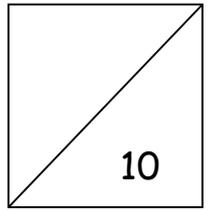
Cathkin High School

National 5 Biology

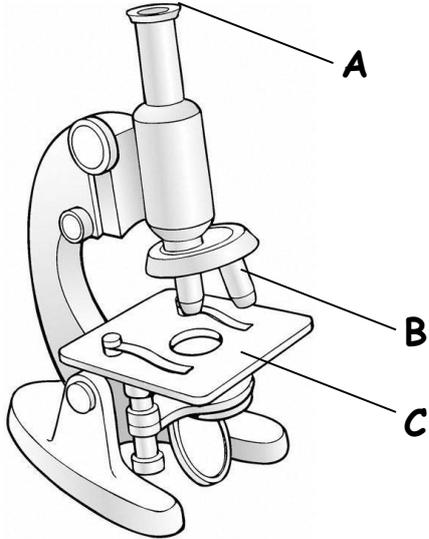
Unit 1: Cell Biology  
Homework Booklet

# Cell Structure

## Homework Exercise 1



1.

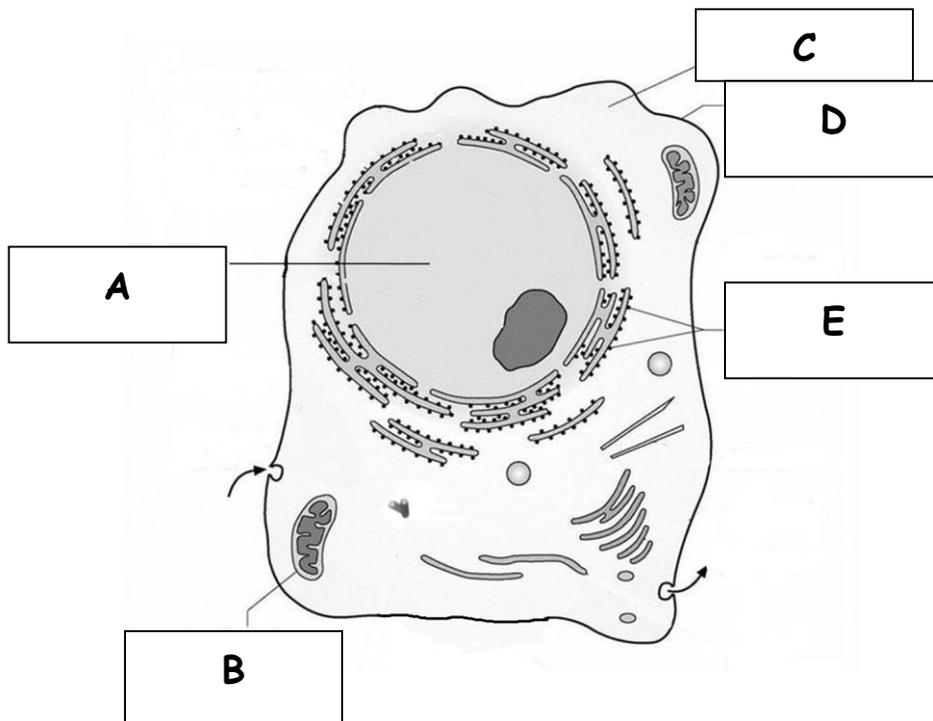


a) Name parts A, B and C. (2)

2. Copy and complete this sentence:

The \_\_\_\_\_ is the basic unit from which all living things are made (1)

3. The diagram below shows a typical cell.



a) Copy and complete this sentence:

The type of cell shown is \_\_\_\_\_ cell. (1)

b) Name the parts labelled A, B and E on the diagram. (2)

4. State the difference between the cell wall of a plant and a bacterial cell (1)

5. Copy and complete the table below by matching the parts of the cell from the list with their correct function.

**List: nucleus; cytoplasm; cell membrane; chloroplast**

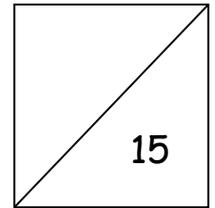
<b>Part of Cell</b>	<b>Function</b>
	Where chemical reactions take place
	Controls all the cell's activities
	Controls what enters and leaves the cell

(2)

6. When making a slide of onion cells iodine solution is added. Explain why. (1)

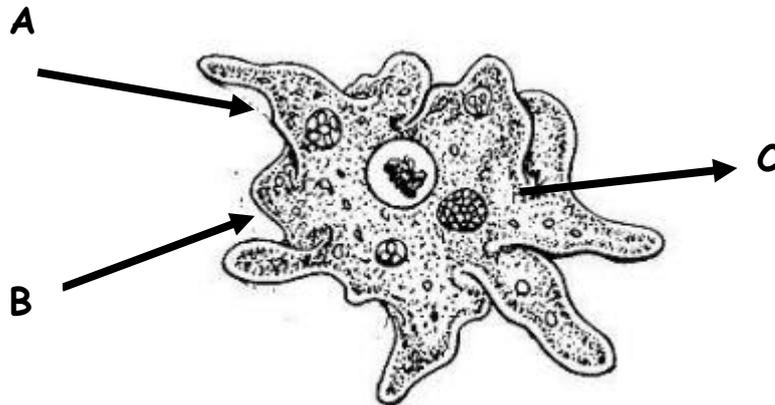
# Transport across Cell Membranes

## Homework Exercise 1



1. The

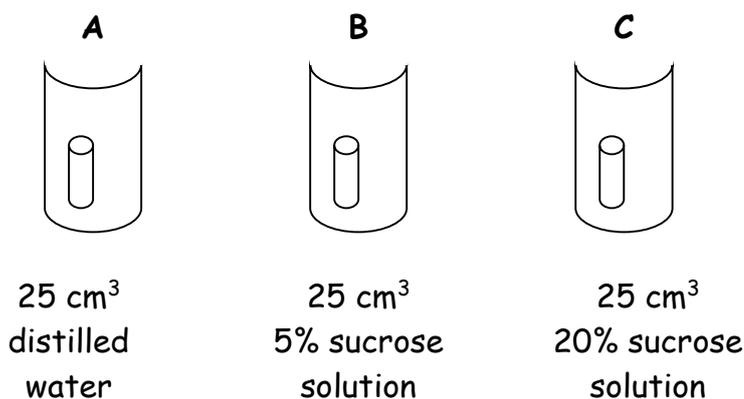
diagram below shows a single-celled organism called an *amoeba*. The arrows indicate the movement of substances in and out of the cell.



- Name the substances represented by the letters A, B and C. (2)
- Which part of the cell controls movement in and out of the cell? (1)
- Name the process by which materials enter or leave the cell. (1)

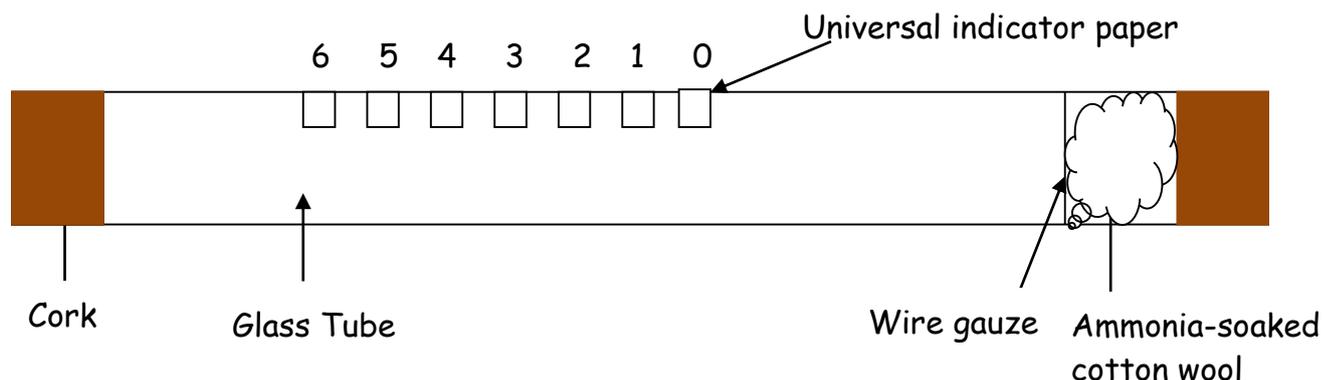
2. Three cylinders of potato were carefully dried on blotting paper and weighed. Each piece weighed 3g.

One piece was then placed in each tube as shown below and the tubes were left for 24hrs and then reweighed.



- Which potato cylinders would be (i) the heaviest and (ii) the lightest? (2)
- The movement of which substance was mainly responsible for the weight changes in the potato cylinders? (1)
- Name the process which was responsible for this movement in the potato cylinders. (1)
- Why were the surfaces of the discs dried before they were reweighed? (1)

3. The apparatus shown in the diagram was set up by groups of students.



The cotton wool was soaked with ammonia solution before being placed against the wire gauze and then the tube was corked at both ends.

Ammonia gas causes universal indicator paper to change colour from yellow to blue. The time taken for this to happen was recorded.

The investigation was repeated with three different ammonia solutions.

The results are given in the table below.

<i>Concentration of ammonia solution</i>	<i>Pieces of universal indicator paper Time taken for colour change to occur (seconds)</i>					
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1 Molar (dilute)	11	51	128	211	441	752
4 Molar	8	36	72	163	305	511
9 Molar (concentrated)	5	12	33	64	146	263

a) The pieces of indicator paper change colour in order. What process is taking place which makes this happen and explain why it happens. (1)

b) Look at the results for the fifth piece of indicator paper in each of the investigations. Suggest a reason for the different times taken for the indicator paper to change colour in each investigation. (1)

c) The indicator paper was moistened with distilled water to make it stick to the inside of the tube. Why was distilled water used and not tap water? (1)

d) Suggest **two** reasons why the tubes were corked (1)

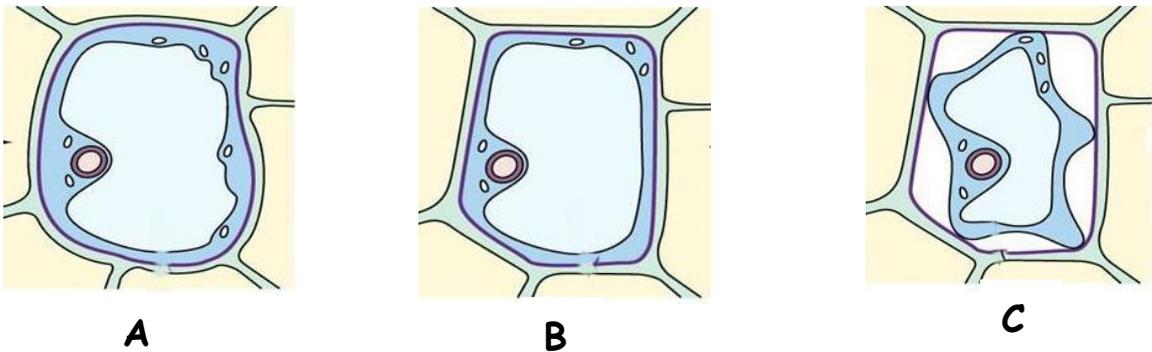
e) The tubes must be kept horizontal and not stood on end for these investigations. Explain why. (1)

f) State two factors which must be kept constant for each investigation. (1)

# Transport across Cell Membranes

## Homework Exercise 2

1. The diagrams below show three similar plant cells from strips of onion epidermis. One cell had been placed in water and the other two in sugar solutions of different concentrations.

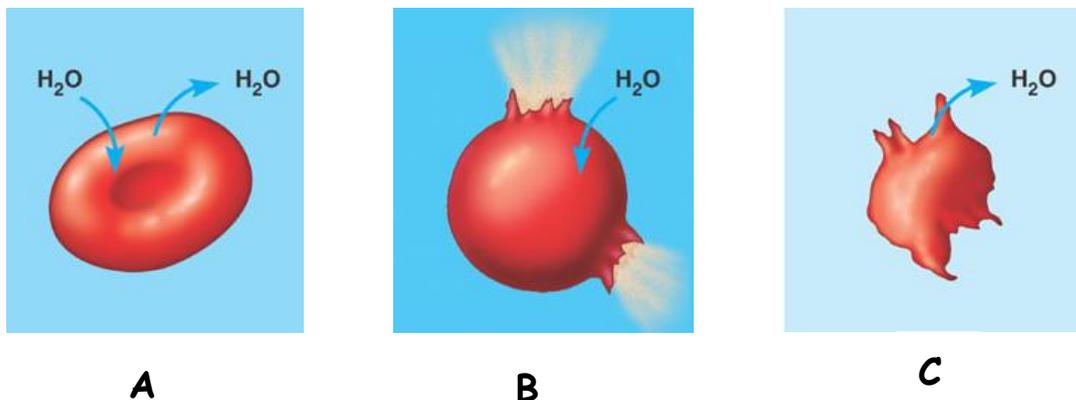


(a) Copy and complete the table below to show which cell was bathed in each fluid.

Bathing Fluid	Letter of Cell
20% sugar solution	
5% sugar solution	
Distilled water	

- (b) What term could be used to describe the appearance of (i) cell A and (ii) cell C? (3)
- (c) Explain the changes that take place to cell A and cell C. (2)

2. The diagrams below show the changes which take place in red blood cells when placed in different solutions.

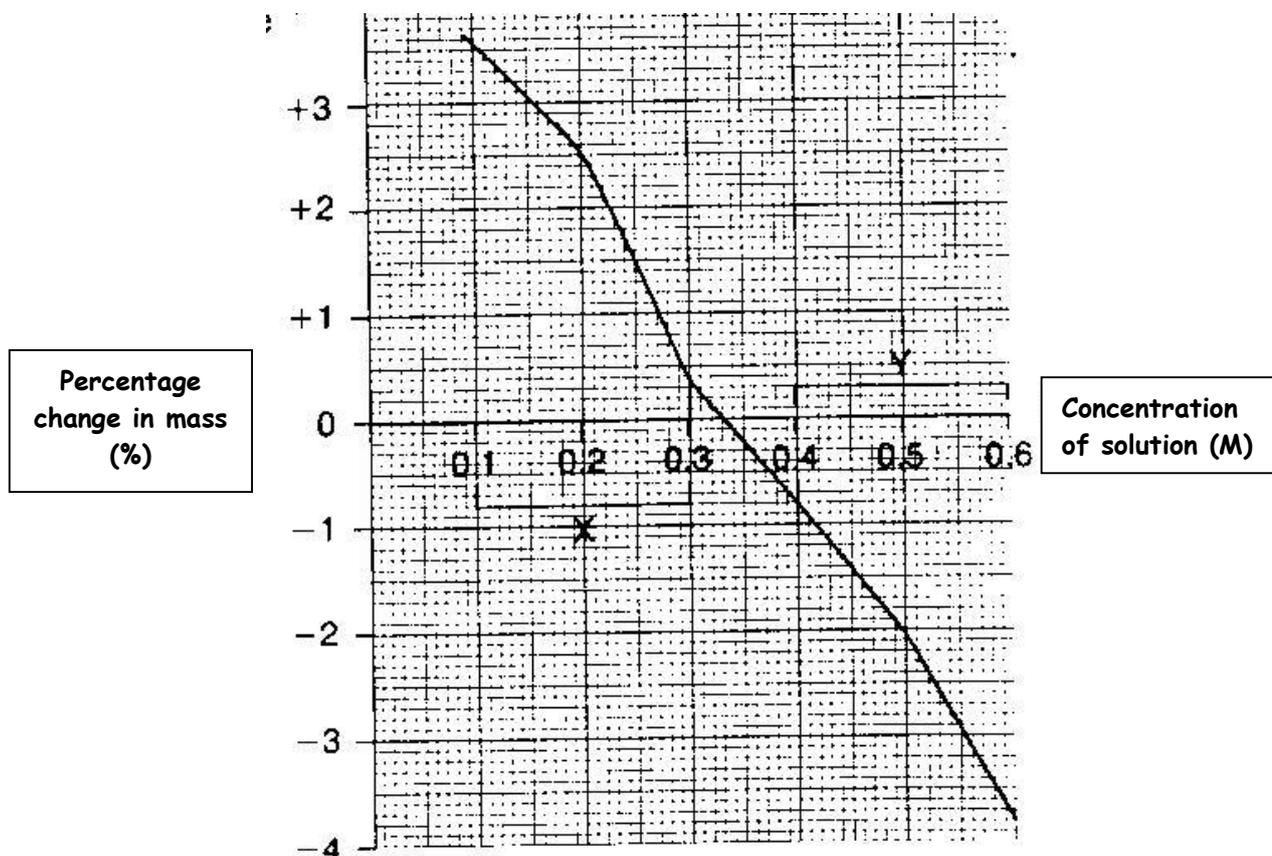


Explain the changes which have taken place in cells B and C. (2)

3. The discs of fresh potato were cut and separated into batches of ten. Each batch was weighed and placed into one of six different concentrations of salt solution. Fifteen minutes later the discs were removed, any surface liquid wiped off and then the discs were reweighed.

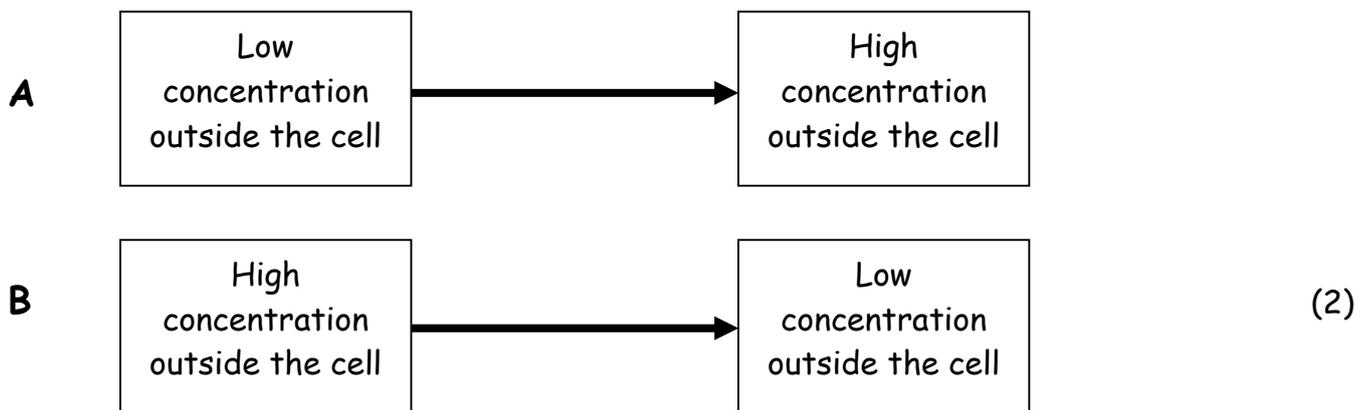
The results are shown in the table and graph below.

<i>Batch of discs</i>	<i>Concentration of solution (M)</i>	<i>Original mass (g)</i>	<i>Final Mass (g)</i>	<i>Change in mass (g)</i>	<i>% change in mass</i>
<i>A</i>	0.1	8.93	9.25	+0.35	+3.6
<i>B</i>	0.2	9.37	9.61	+0.24	+2.4
<i>C</i>	0.3	8.74	8.77	+0.04	+0.4
<i>D</i>	0.4	8.56	8.49	-0.07	-0.8
<i>E</i>	0.5	9.29	9.10	-0.19	-2.0
<i>F</i>	0.6	9.63	9.26	-0.37	-3.8



- a) Why were the discs dried before being reweighed? (1)
- b) Why were batches of ten discs used rather than single discs? (1)
- c) Why does the graph record the percentage change in mass and not the actual change in mass? (1)
- d) What has happened to the mass of discs in regions X and Y on the graph? (1)
- e) Explain why these changes to the discs have taken place. (1)
- f) Which concentration of salt solution would cause no change in the mass of the discs? (1)
- g) Explain why the discs in this solution would not change in mass. (1)

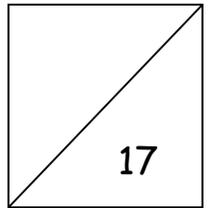
4. Name the mechanisms A and B shown below which are used by cells to take in materials.





# Transport across Cell Membranes

## Homework 3



1. Copy and complete the following sentences:

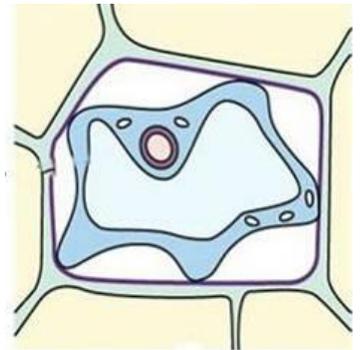
When a substance diffuses, its particles move from a region where its concentration is \_\_\_\_\_ to a region where its concentration is \_\_\_\_\_.

Osmosis is the name given to the diffusion of \_\_\_\_\_ molecules from an area of \_\_\_\_\_ water concentration to an area of \_\_\_\_\_ water concentration through a \_\_\_\_\_ membrane. (3)

2. The diagram opposite shows a plant cell which had been placed in a liquid.

a) Was the liquid distilled water or concentrated sugar solution? (1)

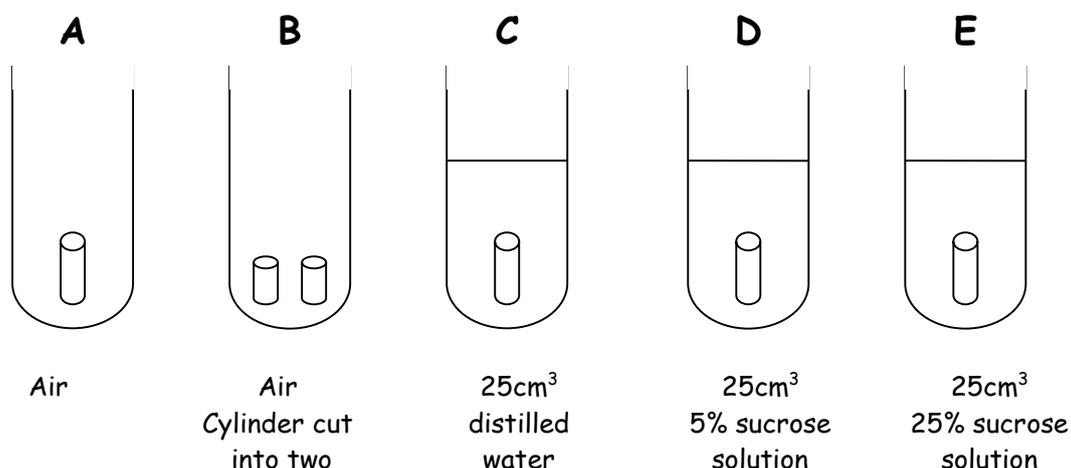
b) State the condition this cell is said to be in. (1)



3. Five cylinders of fresh potato were blotted dry and their mass was recorded. Each one weighed 5g.

One cylinder was placed in each of five test tubes as shown below.

After 24 hours they were again weighed. The cylinder in tube A now weighed 4g and that in tube E weighed 4.5g.



a) What process caused the change in mass in tube E? (1)

- b) Which of the five cylinders is likely to be heaviest after 24hrs? Explain your answer. (1)
- c) Calculate the percentage decrease in mass of the cylinder in A? (1)

4. Plasma and tissue fluid contain about 1% of dissolved salts.

State what would happen if some human liver cells were placed in a 10% salt solution. (1)

5. A piece of potato was cut into six equal sized strips.

The lengths were measured and the strips placed into sugar solutions of different concentrations.

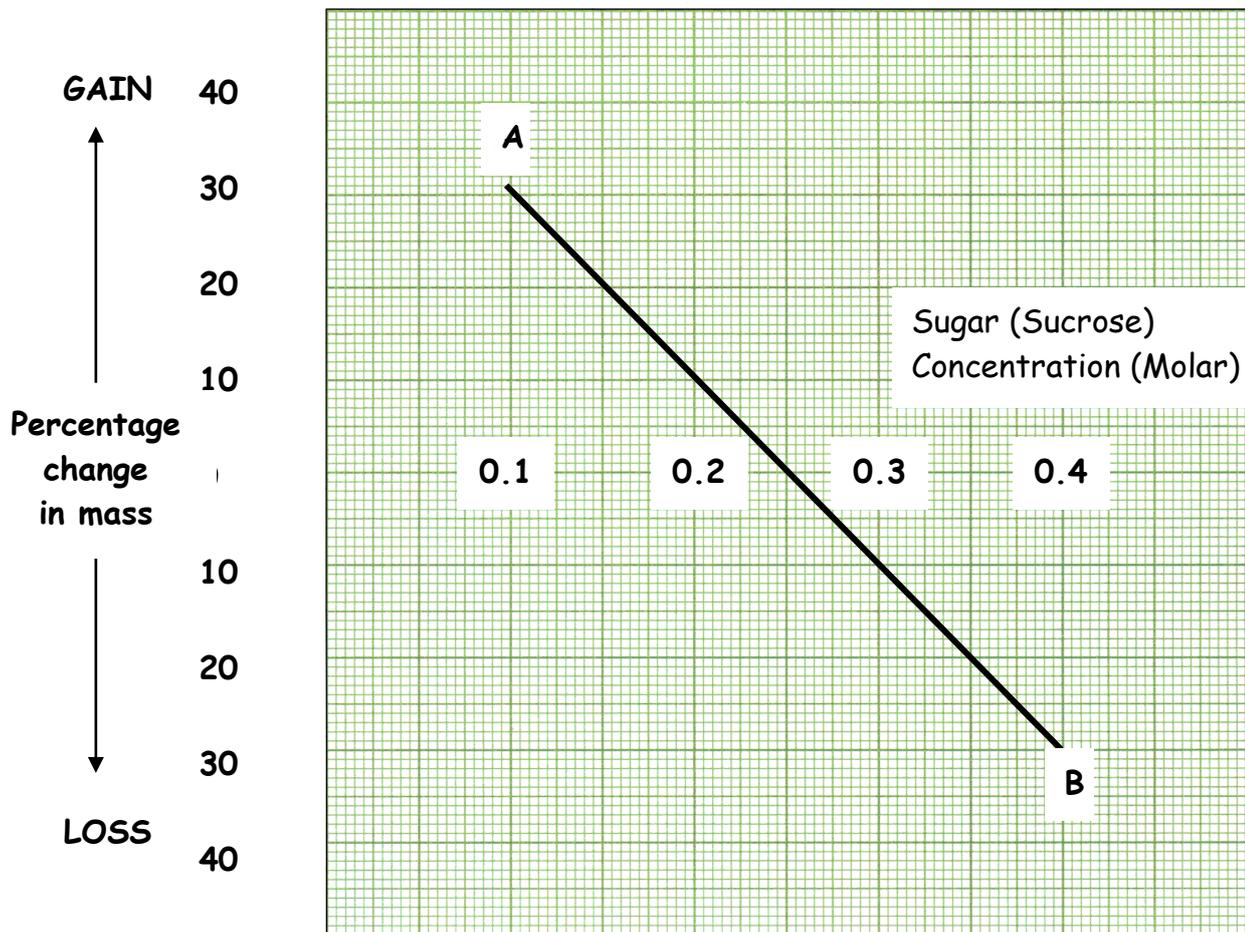
After 2 hours, the lengths were measured again. The results are shown in the table below.

<i>Solution</i>	<i>Initial Length (mm)</i>	<i>Final Length (mm)</i>	<i>Change in length (mm)</i>
<i>A</i>	50	42	-8
<i>B</i>	50	44	
<i>C</i>	50	47	
<i>D</i>	50	51	+1
<i>E</i>	50	52	
<i>F</i>	50	56	

- (a) Copy and complete the table to show the changes in length for each strip. (1)
- (b) Use the results for change in length of the potato strips to construct a bar chart on graph paper. (2)
- (c) Which solution has a water concentration closest to that of the potato cells? (1)

6. Pieces of potato were weighed, placed in sugar (sucrose) solutions of different concentrations for 30 minutes, and then reweighed.

The graph below shows the resulting gain or loss in mass, expressed as a percentage of the original mass, at each sugar concentration.

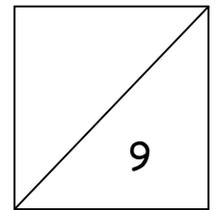


- (a) What terms is used to describe the condition of the potato cells at  
(i) point A and  
(ii) point B on the graph? (2)

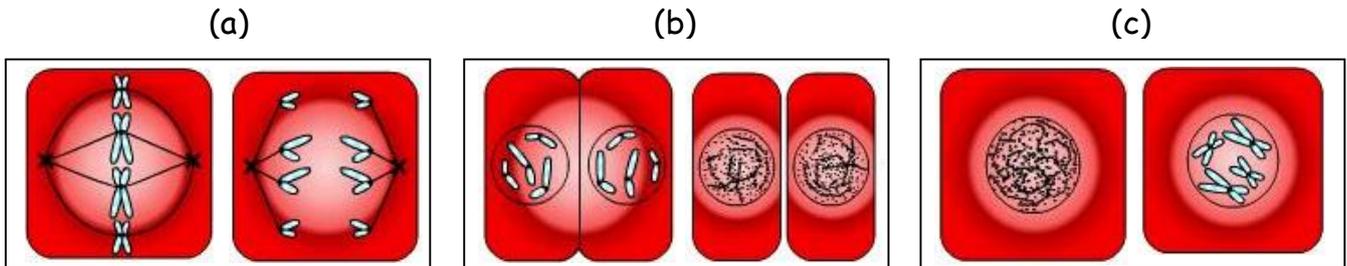
- (b) Give the concentration of the sugar solution which is equal to the concentration of the cell sap in the potato cells.  
Explain your answer. (2)

# Cell Division

## Homework Exercise 1

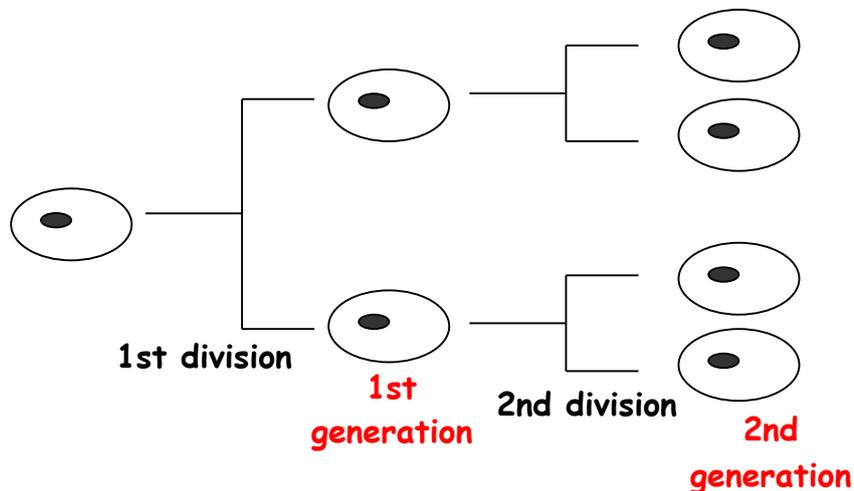


1. The diagrams below show six stages of a cell process.  
The stages are shown in pairs. The diagrams in each pair are in the correct order. The three pairs of diagrams are **NOT** in the correct order.



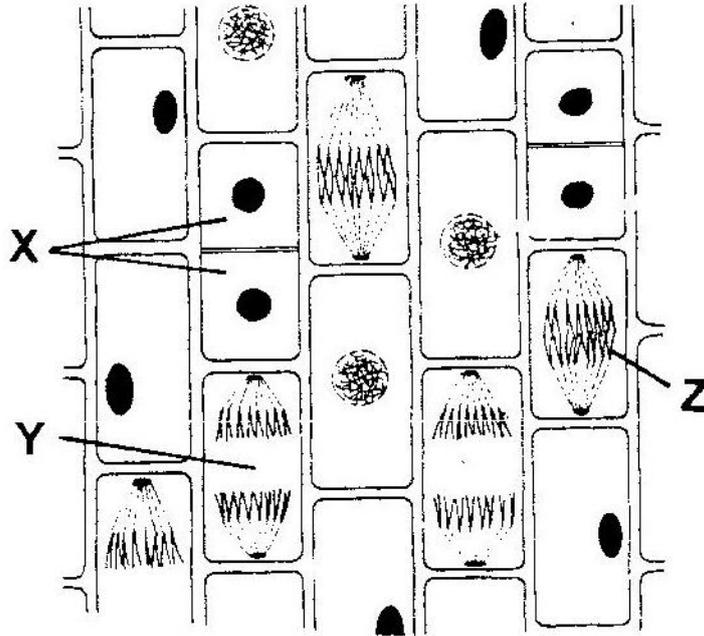
- (a) Name the process shown in the diagrams. (1)
- (b) Write the letters of each pair in the order in which they occur in this process. (1)
- (c) Name the cell structure which controls this process. (1)

2. A cell can divide to produce two daughter cells. Each daughter cell grows and then divides. The beginning of these divisions is shown in the diagram below.



- Calculate the number of cells in the 4th generation. (1)

3. The diagram below shows some of the stages in cell division occurring in the cells of a plant root.



Describe the stages of cells division (mitosis) shown in the cells labelled X, Y, and Z. (3)

4. Describe the meaning of the term 'diploid cell'. (1)

5. Typical timings of the stages of mitosis are shown in the table below.

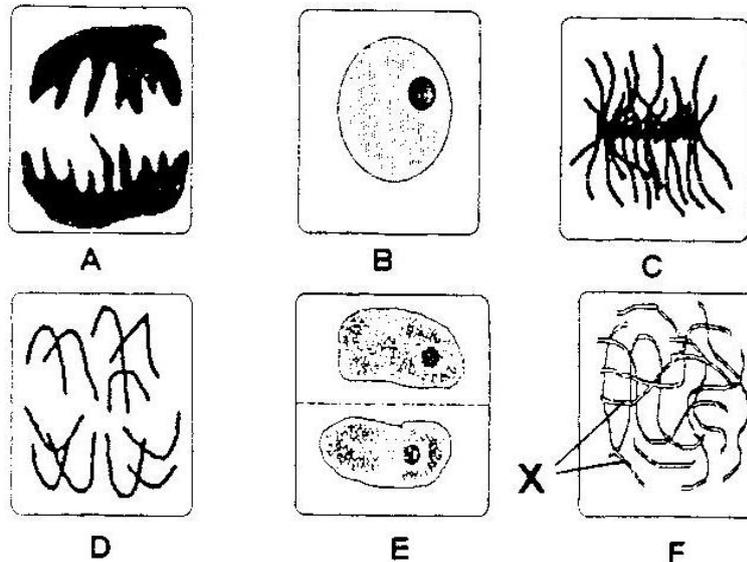
Stage	A	B	C	D
Time (minutes)	88	33	25	54

What percentage of the total time for mitosis is taken by stage C? (1)

# Cell Division

## Homework Exercise 2

1. The diagrams below show stages in mitosis (cell division).



(a) Copy and complete the table below to place the stages in the order in which they occur.

<b>Order</b>	1	2	3	4	5	6
<b>Stage</b>	B					

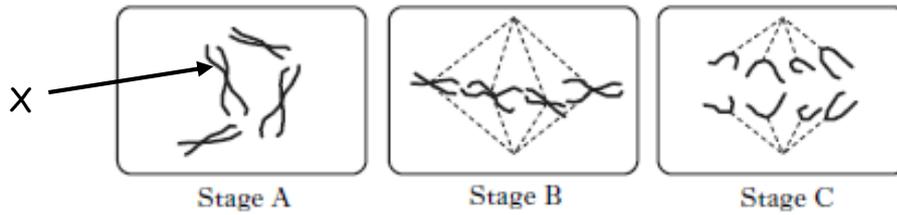
(2)

(b) What name is given to the thread-like structures labelled X? (1)

2. Scientists can grow liver tissue in the laboratory. This is done by making a few liver cells divide by mitosis to form a large mass of cells. Why is it important that the daughter cells contain the same number of chromosomes as the original mother cells? (1)

3. A cell divides every 20 minutes. How many cells would be produced from one original cell at the end of two hours? (1)

4. Stages of mitosis are shown in their correct order in the diagrams below.



- (a) Sketch Stage B and label a spindle fibre on your drawing. (1)
- (b) Stage C would be followed by stage D. Describe what would happen in stage D. (1)
- (c) Name Structure X. (1)
- (d) Where in a cell would structure X normally be found? (1)

5. Below is a list of events which occur during mitosis.

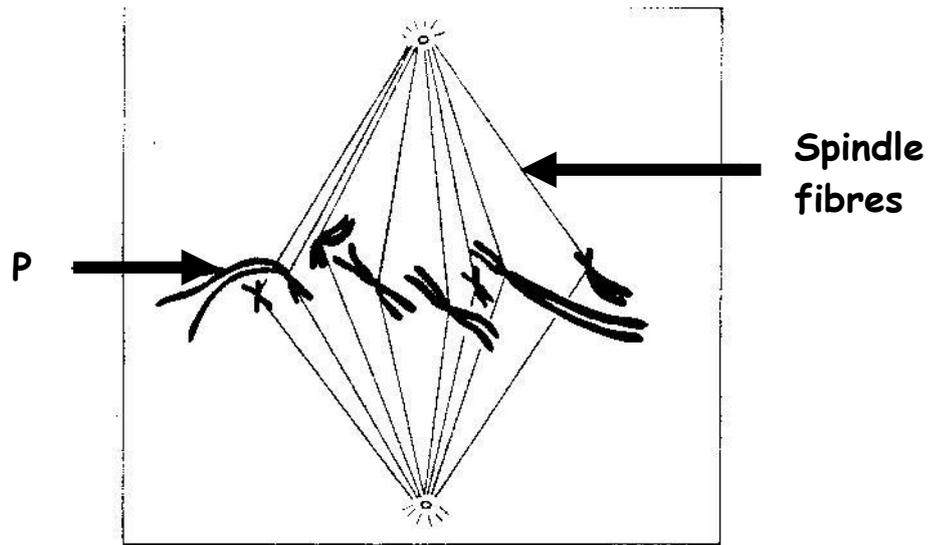
Copy and complete the table below to show the order in which these events take place.

List of events

- A. Chromatids separate
- B. Two nuclei are formed
- C. Chromosomes replicate
- D. Chromatids move to opposite ends of the cell
- E. Chromosomes visible as pairs of chromatids
- F. Cells divides
- G. Chromatids line up along the middle of cell
- H. Two identical cells are formed (3)

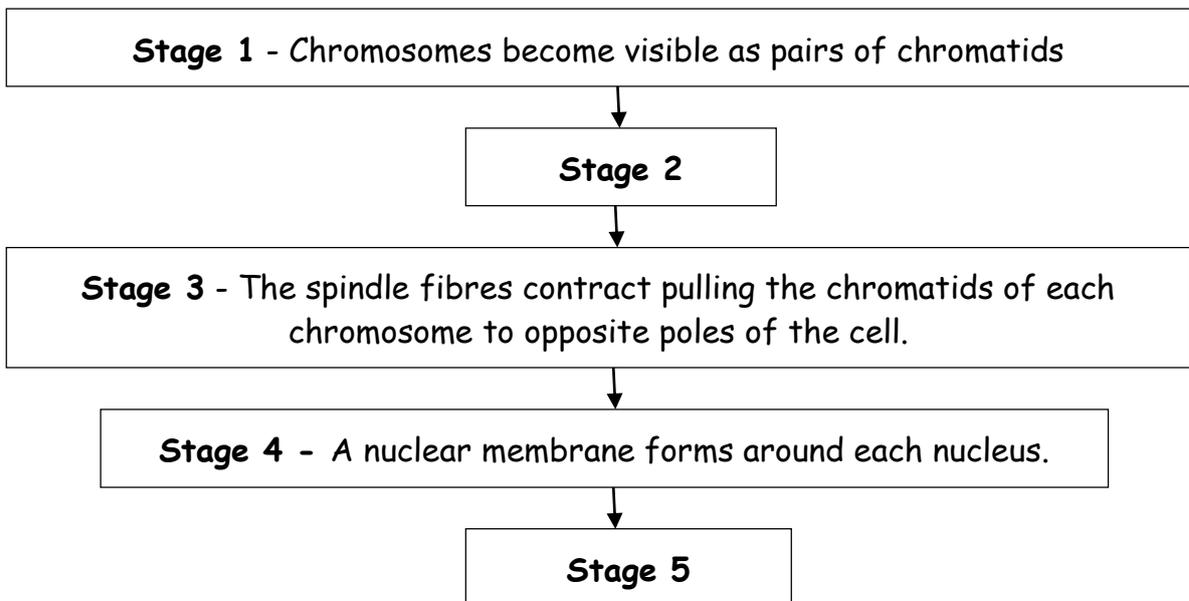
Order	Letter
1	
2	
3	
4	
5	
6	
7	
8	

6. The diagram below represents chromosomes at one stage of cell division.



- (a) Name the structure labelled P. (1)
- (b) Describe what happens to the chromosomes at the next stage of cell division. (1)
- (c) This cell contains 8 chromosomes.
  - (i) How many chromosomes will be present in each daughter cell when cell division is complete? (1)
  - (ii) Why is it important that each daughter cell has this number of chromosomes? (1)

7. Below is a flow diagram which describes some of the stages of cell division.



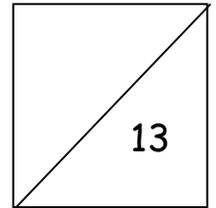
Describe what occurs at stages 2 and 5. (2)



# Cell Division

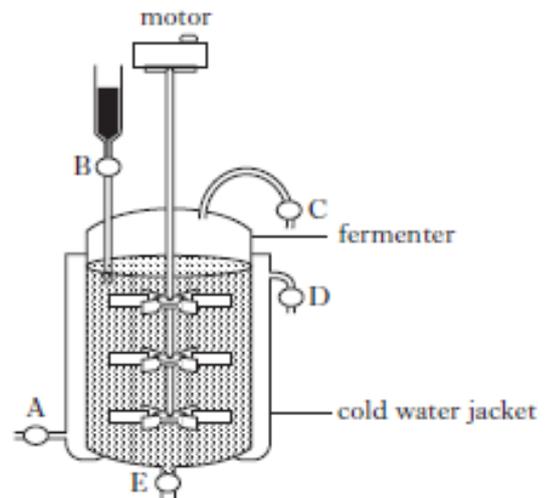
## Aseptic techniques

### Homework Exercise 1



1. Name the substance on which we grow microorganisms. (1)
2. Describe three conditions which microbes require for growth. (3)
3. Describe the meaning of the term 'aseptic technique'. (1)
4. Explain why aseptic techniques are required when growing colonies of microbes. (1)
5. During the brewing of beer, ingredients including yeast and malted barley are added to a fermentation vessel. How does sterilising the fermentation vessel before the raw materials are added help to provide optimum conditions for the yeast? (1)
6. The diagram shows an industrial fermenter. It is fitted with a number of taps which allow substances to be added or removed.

- (a) Which of the taps, A, B, C, D or E, would open to:
- (i) add nutrients to the mixture?
  - (ii) remove waste gases?
  - (iii) drain off the products? (3)



- (b) When the vessel is empty, it is treated to destroy residual spores of fungi and bacteria. How could this be done?

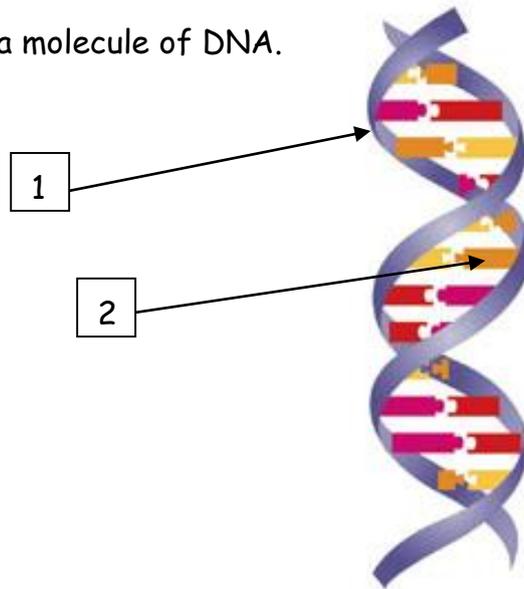
7. Explain why containers are sterilised before being used for making yoghurt. (1)
8. Describe the procedure used in laboratories to grow colonies of microbes. (2)

# DNA and the production of proteins

## Homework Exercise 1

14

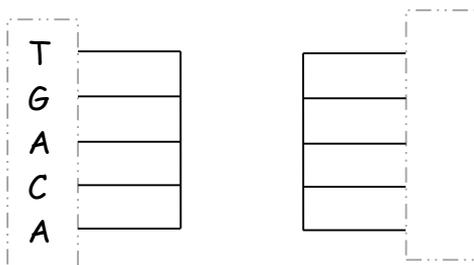
1. How many strands make up a molecule of DNA? (1)
2. Name the 4 different bases found in DNA. (4)
3. The bases found in a molecule of DNA are said to be complementary. What does this mean? (1)
4. The diagram below shows a molecule of DNA.



Label structures 1 and 2.

(2)

5. The diagram below shows a single strand of DNA. Draw the complimentary strand.

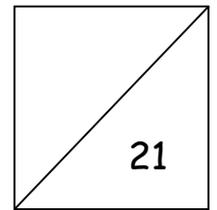


(2)

6. Name the nucleic acid needed to make proteins from DNA. (1)
7. Describe how proteins are made from DNA. (2)
8. What determines the sequence of amino acids in a protein? (1)

# Proteins and Enzymes

## Homework Exercise 1



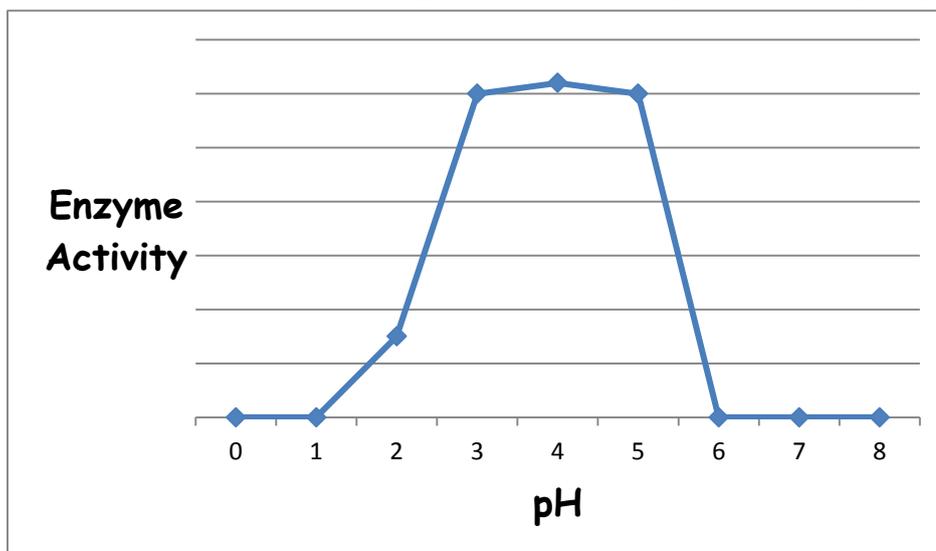
1. What is an enzyme? (1)

2. Explain why protein shapes are different and the importance of this to proteins. (2)

3. Which of the statements below are TRUE about ALL enzymes?

- a. Enzymes are proteins
  - b. Enzymes are only used to break down large molecules into smaller ones
  - c. Enzymes speed up chemical reactions
  - d. Enzymes are changed by a reaction
  - e. Enzymes are specific
- (2)

4. The graph below shows the effect of pH on the activity of the enzyme pectinase.

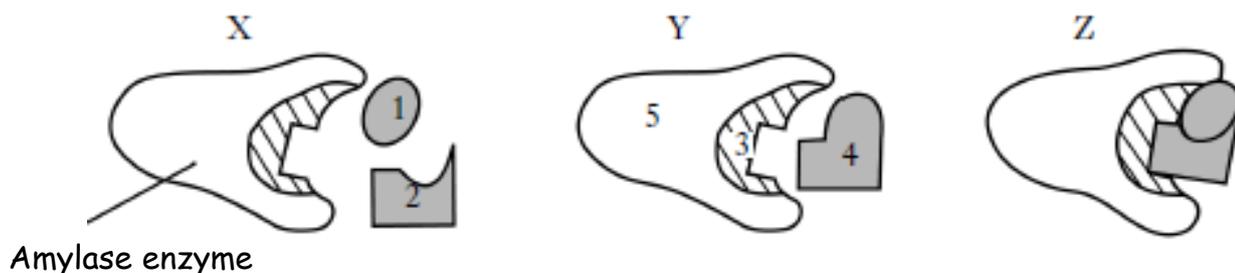


a. Between which two pH values is pectinase active? (1)

b. What term is used to describe the pH at which an enzyme is most active? (1)

5. Describe what happens to an enzyme when it is denatured. (1)

6. The diagram below shows the three stages X, Y and Z of enzyme action.



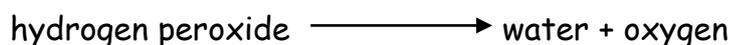
(a) Amylase promotes the breakdown of large complex starch molecules into simpler molecules.

Put the stages into the correct order to show this degradation reaction. (1)

(b) Which number(s) in the diagram shows the:

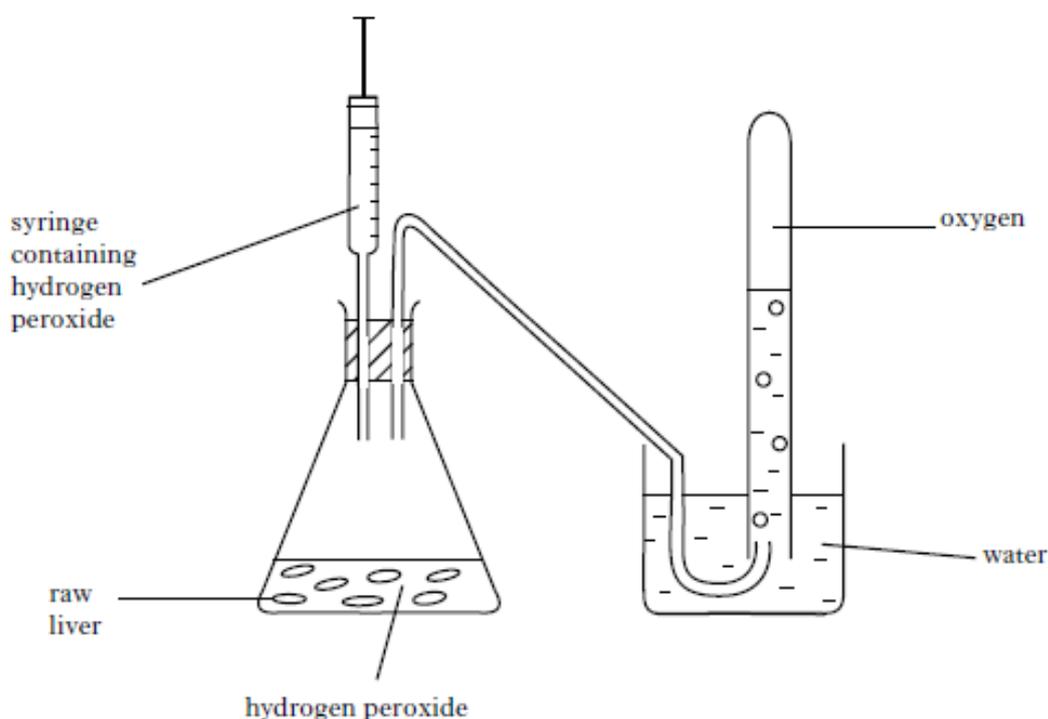
- (i) active site
- (ii) substrate
- (iii) product? (3)

Q.7. Liver contains the enzyme catalase which carries out the following reaction.



The investigation shown below was carried out to demonstrate the effect of pH on catalase activity in liver.

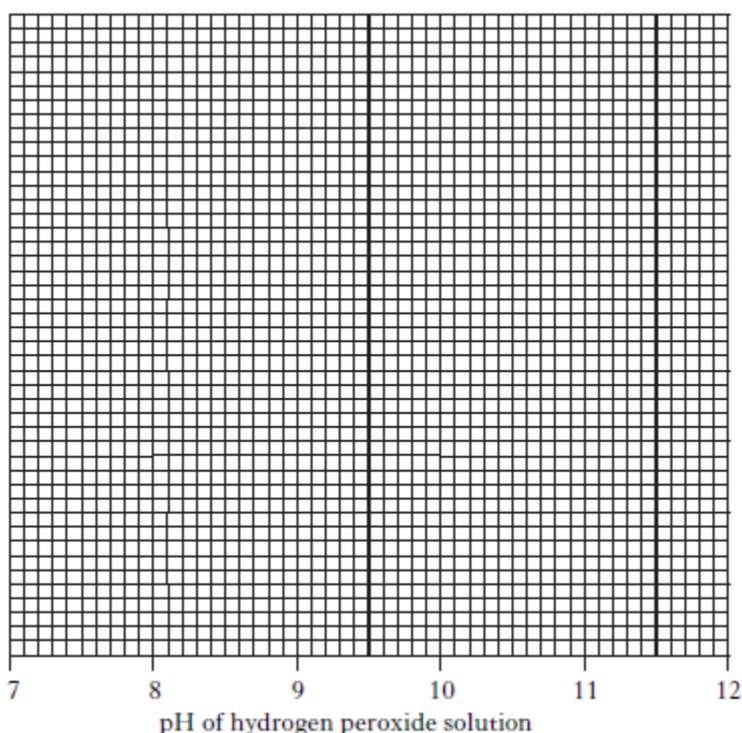
Hydrogen peroxide of different pH values was added to 1g of roughly chopped raw liver.



The time taken to collect  $1\text{cm}^3$  of oxygen was recorded and the results are shown in the table below.

<i>pH of hydrogen peroxide solution</i>	<i>Time to collect <math>1\text{cm}^3</math> of oxygen (seconds)</i>			<i>Average time to collect <math>1\text{cm}^3</math> of oxygen (seconds)</i>
	<i>Trial 1</i>	<i>Trial 2</i>	<i>Trial 3</i>	
7	76	77	81	78
8	56	58	57	57
9	50	45	40	45
10	53	50	53	52
11	59	69	70	

- (a) From the table, state the optimum pH for catalase in liver. (1)
- (b) Calculate the average time taken to collect  $1\text{cm}^3$  of oxygen at pH 11. (1)
- (c) Name the variable altered in the investigation. (1)
- (d) State two variables, **not already mentioned**, which must be kept constant. (2)
- (e) Explain why the experiment was repeated at each pH value and averages calculated. (1)
- (f) On graph paper, copy and complete the grid below and construct a line graph of the **average time taken to collect  $1\text{cm}^3$  of oxygen** against pH of hydrogen peroxide solution. (2)

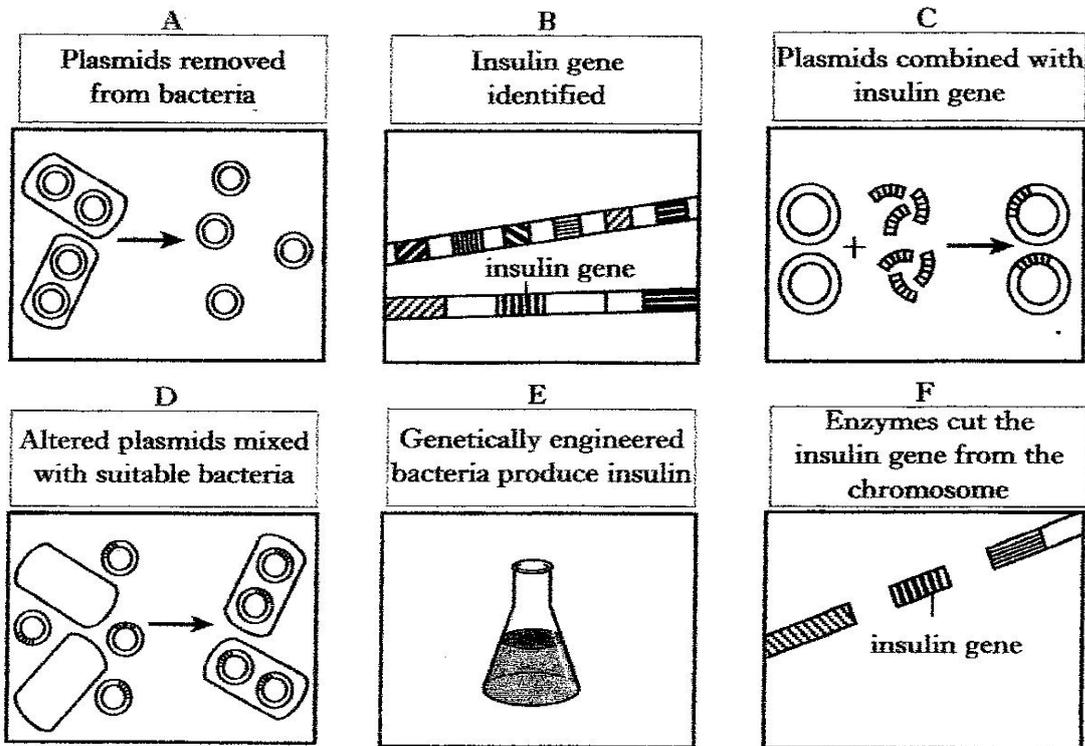


- (g) From your graph, predict the average time taken to collect  $1\text{cm}^3$  of oxygen at pH12. (1)

# Genetic Engineering

## Homework Exercise 1

1. The diagrams show the production of insulin by genetic engineering. They are not in the correct order.



(a) Use the letters to put the diagrams into the correct sequence. The first and last have been completed for you.

B




E

(1)

(b) Name another substance produced using genetic engineering.

(1)

(c) Before genetic engineering was used to produce insulin, it was obtained from the pancreas of animals, such as pigs.

Give one advantage of producing insulin by genetic engineering.

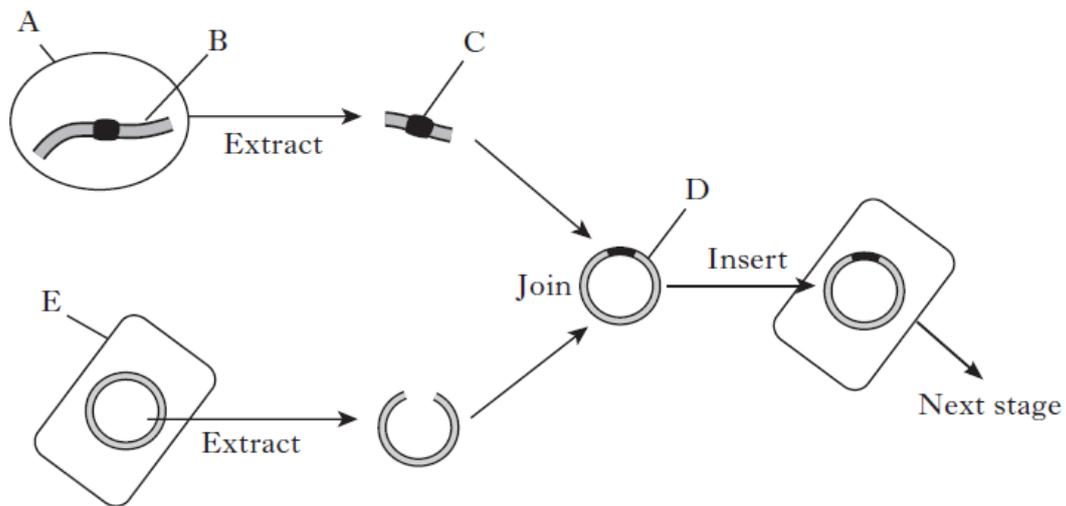
(1)

(d) Complete the following sentences by deleting the incorrect word from each pair to create a correct sentence.

Genetic engineering is the transferring of DNA/RNA to produce a useful organism or product. During this process, a short section of genetic information called a gene/chromosome is inserted into a fungal/bacterial cell.

(3)

2. The diagram below represents some of the stages of genetic engineering which are used to produce medicines, such as insulin, for human use.



(a) Copy and complete the table below to identify the labelled parts of the diagram.

<i>Name of structure</i>	<i>Letter</i>
bacterial cell	
insulin gene	
plasmid	

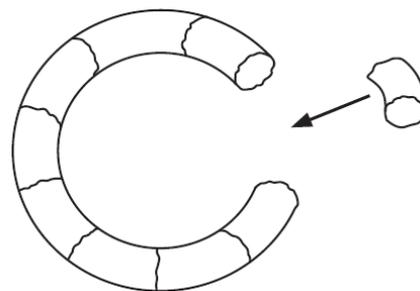
(2)

(b) Describe the next stage needed to produce insulin for use as a medicine.

(1)

3. Which stage in the production of human insulin by genetic engineering is represented in the diagram below?

- A** Human gene is inserted into a plasmid
- B** Human gene is inserted into bacterium
- C** Plasmid is inserted into a human chromosome
- D** Bacterial gene is inserted into a human chromosome



(1)

4. The following stages occur during genetic engineering.

- 1 Insulin gene is extracted from a human cell
- 2 Bacteria divide and produce large quantities of human insulin
- 3 Plasmid is removed from bacterial cell and "cut" open
- 4 Insulin gene is inserted into bacterial plasmid,

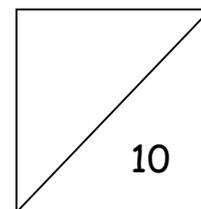
Put the stages into the correct order.

(1)

# S3 Biology - Extension

## Genetic Engineering

### Homework Exercise 2



1. Read the following passage and answer the questions based on it.

*Adapted from **GM Organisms** by John Pickrell, [www.newscientist.com](http://www.newscientist.com)*

*Genetic modification (GM) of crops began with the discovery that the soil bacterium *Agrobacterium* could be used to transfer useful genes from unrelated species into plants. The Bt gene is one of the most commonly inserted. It produces a pesticide toxin that is harmless to humans but is capable of killing insect pests. Many new crop types have been produced. Most of these are modified to be pest, disease or weedkiller resistant, and include wheat, maize, oilseed rape, potatoes, peanuts, tomatoes, peas, sweet peppers, lettuce and onions.*

*Supporters argue that drought resistant or salt resistant varieties can flourish in poor conditions. Insect-repelling crops protect the environment by minimising pesticide use. Golden rice with extra vitamin A or protein-enhanced potatoes can improve nutrition.*

*Critics fear that GM foods could have unforeseen effects. Toxic proteins might be produced or antibiotic-resistance genes may be transferred to human gut bacteria. Modified crops could become weedkiller resistant "superweeds". Modified crops could accidentally breed with wild plants or other crops. This could be serious if, for example, the crops which had been modified to produce medicines bred with food crops.*

*Investigations have shown that accidental gene transfer does occur. One study showed that modified pollen from GM plants was carried by the wind for tens of kilometres. Another study proved that genes have spread from the USA to Mexico.*

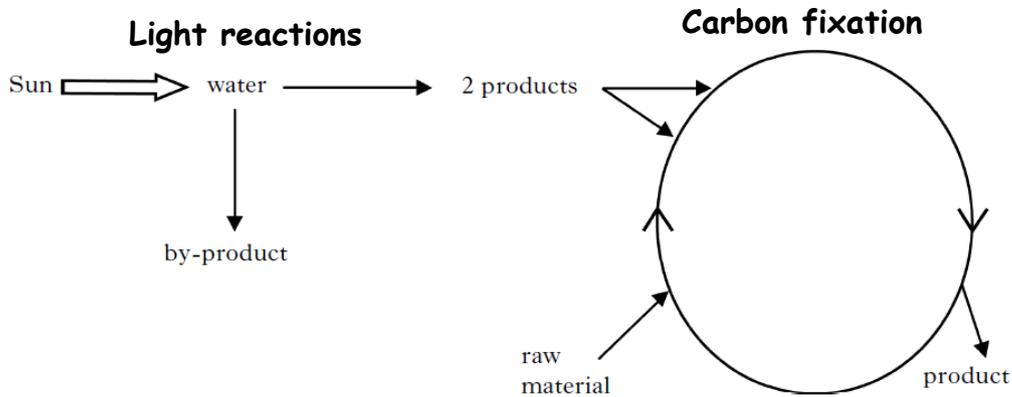
- (a) What role does the bacterium *Agrobacterium* play in the genetic modification of crops? (1)
- (b) Crops can be genetically modified to make them more resistant to pests, diseases and weedkillers. Give another example of genetic modification that has been applied to potatoes. (1)
- (c) Explain why a plant, which is modified to be weedkiller resistant could be:
- (i) useful to farmers (1)
  - (ii) a problem for farmers (1)
- (d) Give one example of a threat to health by the use of GM crops. (1)
2. Genetic engineering uses bacteria to produce human insulin. Describe the stages involved in this process. (5)



# Photosynthesis

## Homework Exercise 1

1. The diagrams below show the two stages of photosynthesis.

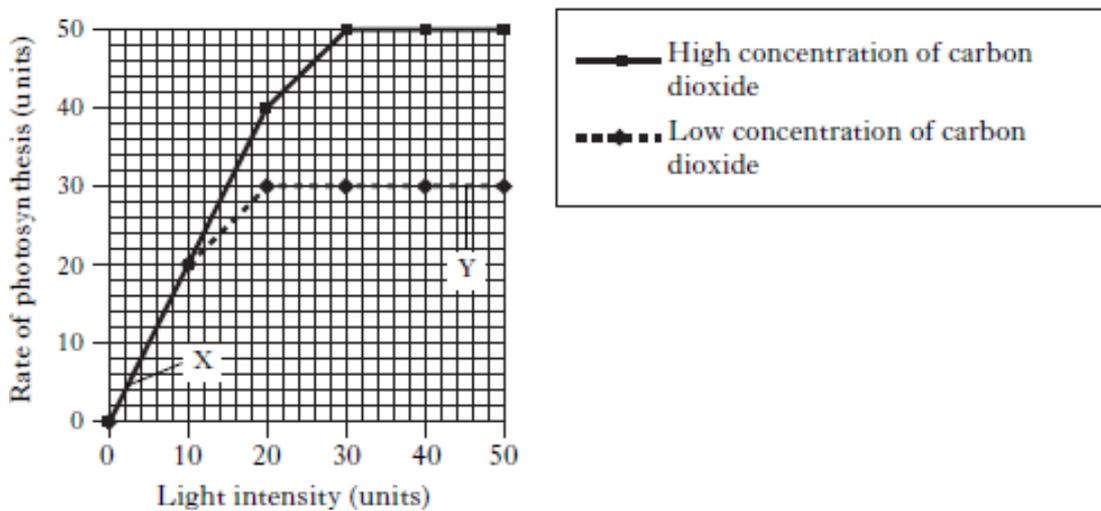


Describe what happens during the two stages:

- (a) light reactions and
- (b) carbon fixation.

(5)

2. The graph below shows the effect of two different environmental factors on the rate of photosynthesis.



(a) What are the limiting factors at X and Y? (2)

(b) Suggest **one** way the rate of photosynthesis can be measured. (1)

(c) During the first stage of photosynthesis, light energy is used.

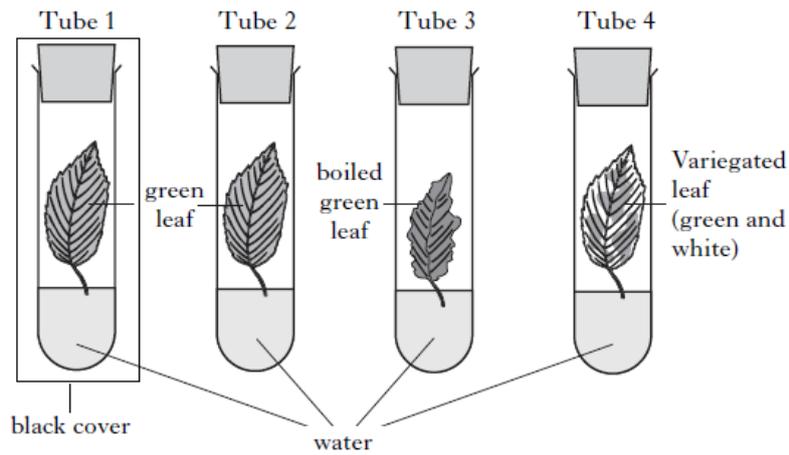
(i) Where is light energy trapped in the cell? (1)

(ii) State **one** use of this light energy. (1)

(d) (i) Name the second stage of photosynthesis. (1)

(ii) Name the carbohydrate produced during the second stage of photosynthesis. (1)

3. Leaves were placed in tubes as shown below. The tubes were left in bright light.



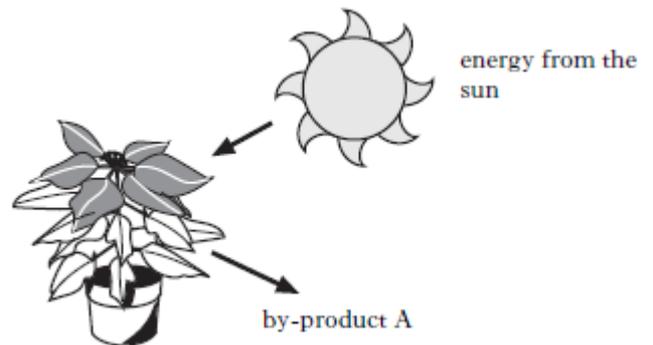
For each of the tubes, copy and complete the table and tick the appropriate box in the table to indicate which processes will take place in the leaves.

<i>Process</i> <i>Tube</i>	<i>Only</i> <i>photosynthesis</i>	<i>Only respiration</i>	<i>Both</i>	<i>Neither</i>
1				
2				
3				
4				

(2)

4. (a) Name the by-product A released during photosynthesis. (1)

- (b) Hydrogen and a high energy molecule are produced during the light reaction.  
 (i) Name the high energy molecule. (1)  
 (ii) Describe the use of hydrogen in carbon fixation. (1)

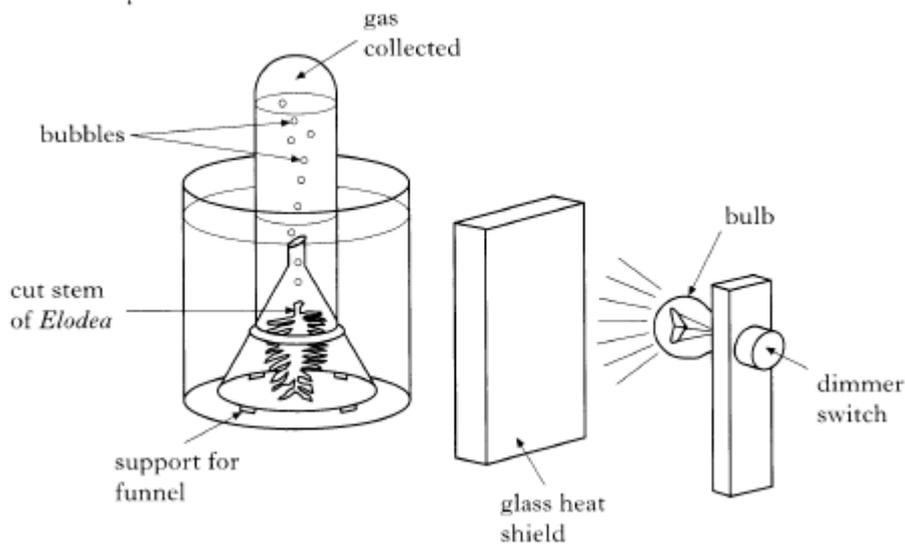


- (c) (i) Explain why an increase in temperature can lead to an increase in the rate of photosynthesis. (1)  
 (ii) Other than temperature, state **two** limiting factors of photosynthesis. (2)

# Photosynthesis

## Homework Exercise 2

1. Describe the **two** stages of photosynthesis **including** the names of the raw materials and products for **each** stage. (5)
  
2. An experiment was set up to measure the effect of light intensity on the rate of photosynthesis in the water plant, *Elodea*.  
The light intensity was varied using a dimmer switch on the bulb. The rate of photosynthesis was measured by counting the number of bubbles released per minute.



- (a) Name the gas collected. (1)
  
- (b) There are **two** reactions in photosynthesis. The first reaction is the light reaction.
  - (i) Name the two substances produced by the light reaction that are required for the second reaction. (2)
  - (ii) Name the second reaction. (1)
  
- (c) Plant cells convert sugar (e.g. glucose) into other carbohydrates.  
Complete the table below by naming two of these carbohydrates.

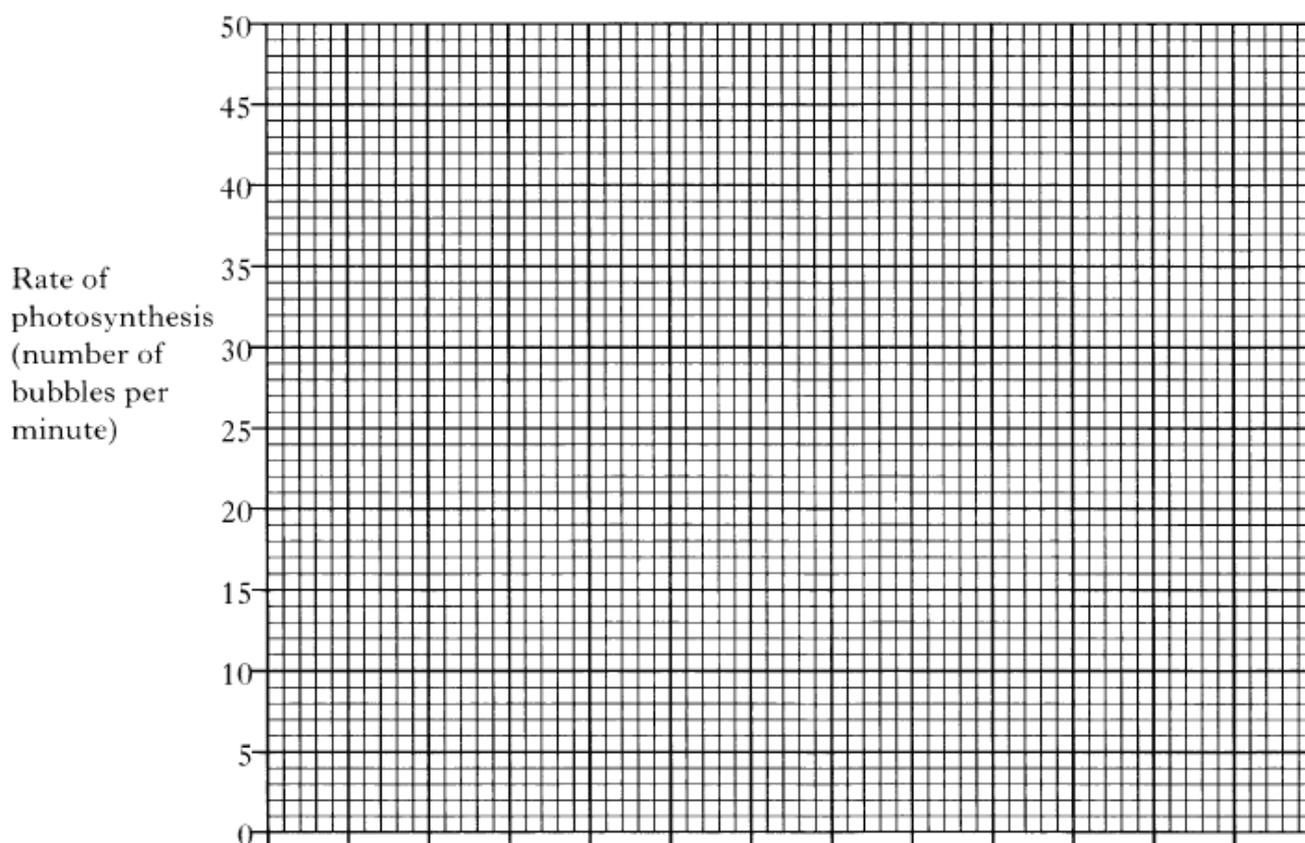
<i>Role of carbohydrate in plant cells</i>	<i>Name of carbohydrate</i>
Storage as an insoluble material	
Forms cell walls	

(2)

(d) The results of the experiment are shown in the table below.

<i>Light intensity (units)</i>	<i>Rate of photosynthesis (number of bubbles per minute)</i>
1	2
3	10
5	23
8	45
10	45
12	45

On graph paper, copy and complete the grid below and plot a line graph to show rate of photosynthesis against light intensity.



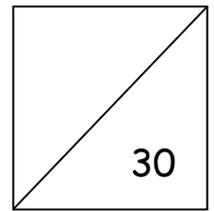
(e) Using the data in the table, explain the results obtained at light intensities greater than 8 units.

(2)

(1)

# Respiration

## Homework Exercise 1



1. Which of the following statements concerning aerobic respiration is correct?

- A. Two molecules of ATP are produced per molecule of glucose respired
- B. Lactic acid builds up in the muscles
- C. Ethanol and carbon dioxide are produced in plants
- D. Carbon dioxide and water are produced

(1)

2. Which of the following equations concerning ATP is correct?

- A.  $\text{ATP} \longrightarrow \text{ADP} + \text{P}_i + \text{Energy}$
- B.  $\text{ATP} + \text{Energy} \longrightarrow \text{ADP} + \text{P}_i$
- C.  $\text{ADP} + \text{P}_i \longrightarrow \text{ATP} + \text{Energy}$
- D.  $\text{ADP} + \text{Energy} \longrightarrow \text{ATP}$

(1)

3. What are the end products of fermentation in animal cells?

- A. ethanol + carbon dioxide + ATP
- B. lactic acid + carbon dioxide + ATP
- C. lactic acid + ATP
- D. ethanol + ATP

(1)

4. Muscle cells require which of the following substances to aerobically respire?

- A. hydrogen and oxygen
- B. pyruvate and oxygen
- C. carbon dioxide and water
- D. glucose and oxygen

(1)

5. During fermentation, a yeast cell needs:

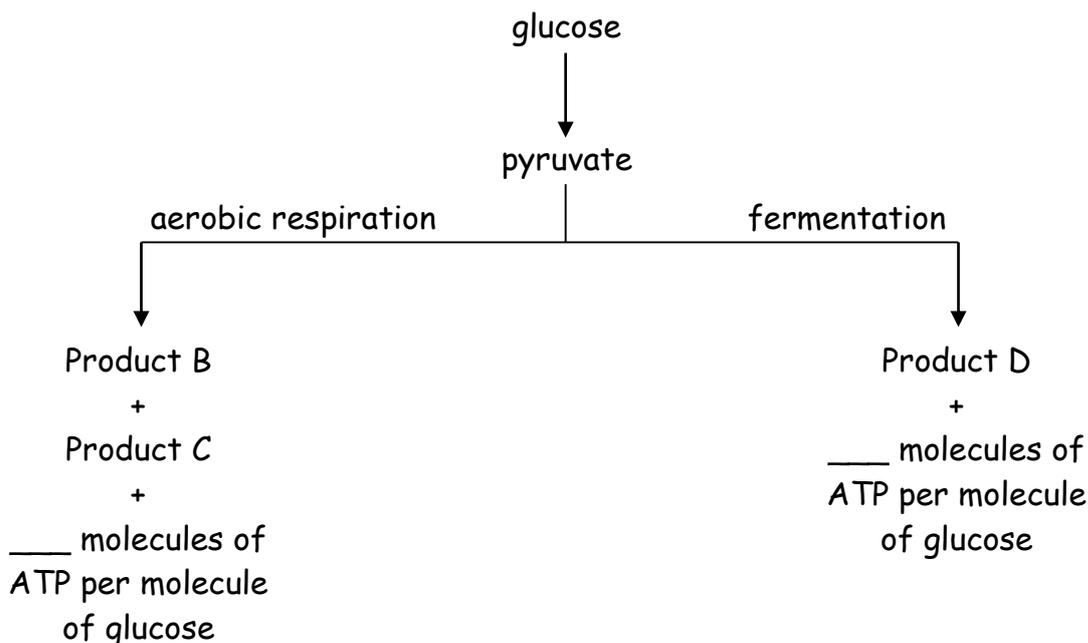
- A. alcohol
- B. glucose
- C. lactic acid
- D. carbon dioxide

(1)

6. Describe the **two** stages of aerobic respiration **including** the names of the raw materials and products for **each** stage.

(5)

7. The diagram below shows some steps in respiration in muscle cells.



- (a) What chemical substance controls these reactions? (1)
- (b) Name the products B, C and D. (1)
- (c) State the number of molecules of ATP produced from each molecule of glucose by:
  - (i) aerobic respiration
  - (ii) fermentation (2)
- (d) Why might a muscle cell switch from aerobic respiration to fermentation? (1)

8. Copy and complete the table below to compare the processes of aerobic respiration and fermentation in yeast.  
Write the letters of the statements from the list into the correct columns.

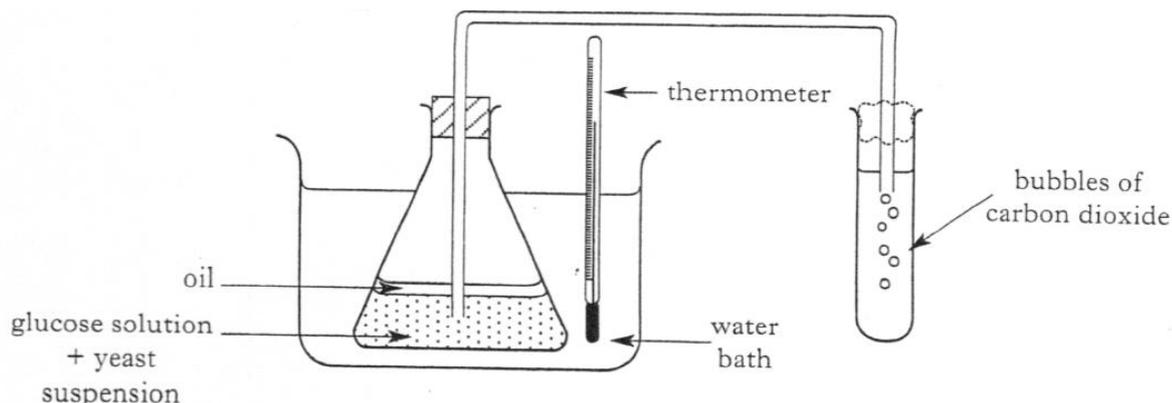
Statements

- A. Water is produced
- B. Carbon dioxide is produced
- C. 1 molecule of glucose produces 2 molecules of ATP
- D. Ethanol is produced
- E. Glucose is broken down by several enzymes
- F. Oxygen is required

Aerobic respiration	Fermentation

(2)

9. An investigation into the effect of temperature on fermentation in yeast was carried out.



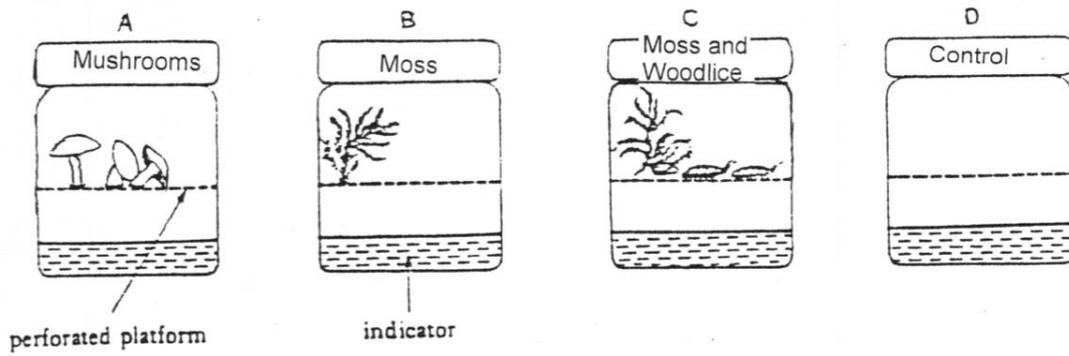
1. A glucose solution was boiled and cooled and poured into a conical flask
2. A yeast suspension was added to the glucose solution
3. Oil was poured over the surface of the liquid
4. The number of bubbles of carbon dioxide produced in one minute was counted
5. The procedure was repeated at a range of temperatures.

- (a) In this investigation, temperature was the only variable altered. State two variables that should be kept constant when setting up this investigation. (2)
- (b) Explain the purpose of the layer of oil. (1)
- (c) The results of the experiment are shown in the table below. Present the results in a suitable format on the graph paper provided. (2)

<i>Temperature (°C)</i>	<i>Bubbles of Carbon dioxide (number/minute)</i>
4	0
20	3
35	6
45	22
50	20
70	0

- (d) From the results, describe the effect of temperature on fermentation in yeast. (2)
- (e) Suggest one way in which the reliability of the results could be improved. (1)
- (f) In addition to carbon dioxide, what will be produced in the flask during the investigation. (1)
- (g) Explain why no carbon dioxide is produced when the temperature is 70°C. (1)

10. Three clear glass containers were set up in light to investigate gas exchange by the organisms shown. Each container was air tight. The experiment was left for 12 hours.



The colour change shown by the indicators in different carbon dioxide levels are shown below:



(a) Copy and complete the table below to show the expected colour change in tubes A and B after 12 hours. (1)

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
<b><i>Initial Colour</i></b>	Orange	Orange	Orange	Orange
<b><i>After 12 hours</i></b>			Orange	Orange

(b) Why does no colour change occur in container C? (1)

(c) Explain why the control tube D was included in the experiment. (1)