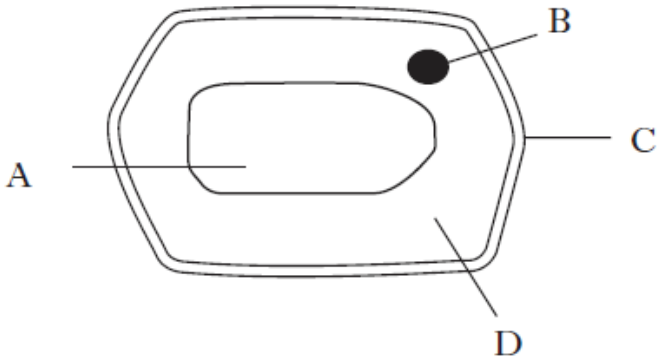
National 4/5 Biology

Cell Biology

Homework Booklet

KEY AREA 1 - Cell Structure

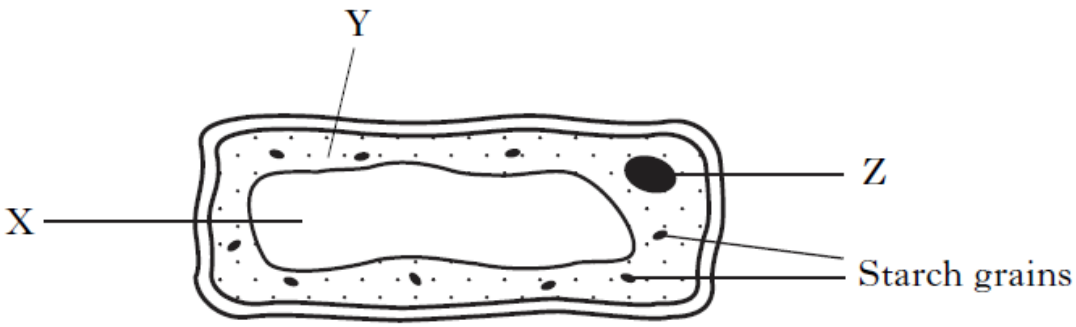
1. Look at the plant cell diagram below.



a) Which of the plant cell components is made from cellulose? (1)

b) Which labelled part controls cell activities? (1)

2. The diagram below represents a potato cell.



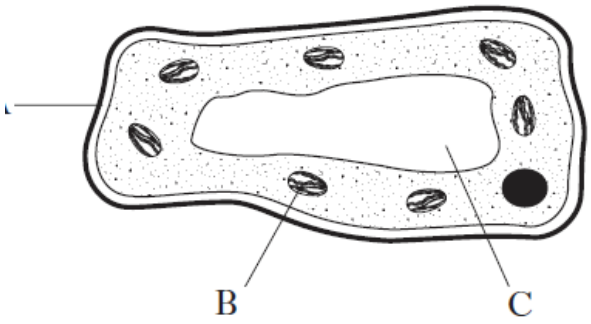
a) Name the parts of the cell labelled X and Y. (1)

b) Give the function of structure Z. (1)

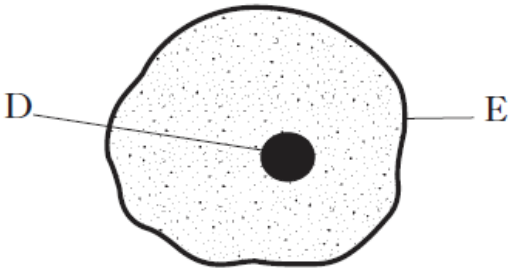
c) Give one difference and one similarity in the structure of plant and animal cells. (2)

3. The diagrams below show two cells.

Plant cell



Animal cell



Copy and complete the table below to show the names and functions of some of these labelled parts. (2)

Part	*Name*	*Function*
B	chloroplast	
C		contains cell sap
E	cell membrane	

4. Yeast cells are used to make important products.

a) List the similarities that fungal cells such as yeast have with plant cells BUT NOT with animal cells. (2)

b) Compared to plant cells, what important structure do yeast cells lack? (1)

c) State one product we get from yeast and name the industry that makes/uses this product. (2)

5. Bacteria are used in the production of yoghurt and cheese.

a) What chemical reaction takes place in milk owing to the presence of these bacteria? (1)

b) What effect does the product of this reaction have on milk? (1)

c) State two differences between the structure of a bacterial cell and an animal cell. (2)

d) Name one other industry that makes use of bacteria. (1)

KEY AREA 2 - Transport

6. The process of diffusion is important to organisms.

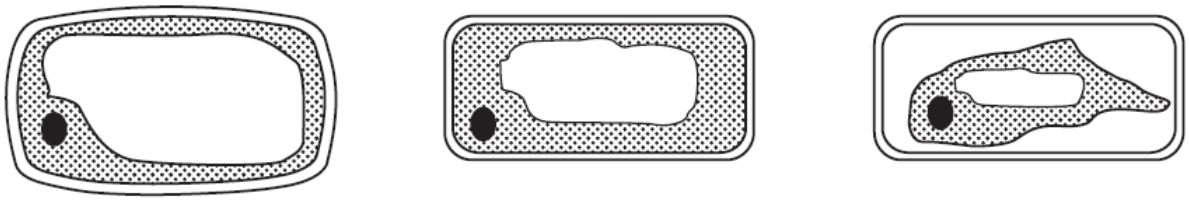
a) From the options below, select a substance which is involved in diffusion and answer the questions which follow.

oxygen	glucose	carbon dioxide

i) Explain why its diffusion is important. (1)

ii) Where does its diffusion take place? (1)

b) Cells from the same plant tissue were placed in three different liquids, left for 20 minutes and then examined using a microscope.
The following diagrams represent cells from each liquid.

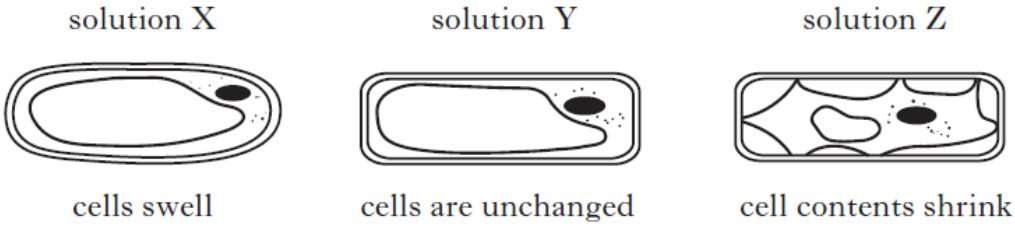


Cell A Cell B Cell C

Which cell is most likely to have been placed in pure water?
Give a reason for your choice. (1)

7. The diagram below shows the appearance of a cell from an onion.

Pieces of onion were placed in three different solutions:
a 10% salt solution; a 2% salt solution and pure water.
The following diagrams show the appearance of the cells after 10 minutes.



a) Use the letters from the diagrams to identify the solutions.
One has been identified already.

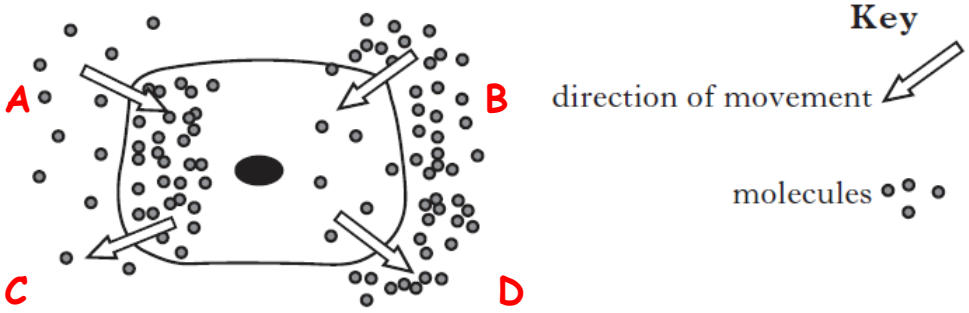
10% salt solution _____

2% salt solution Y

pure water _____ (2)

b) Name the process by which water diffuses through a selectively permeable membrane. (1)

c) The diagram below represents differences in the concentration of molecules inside and outside an animal cell, together with the direction of movement of the molecules.

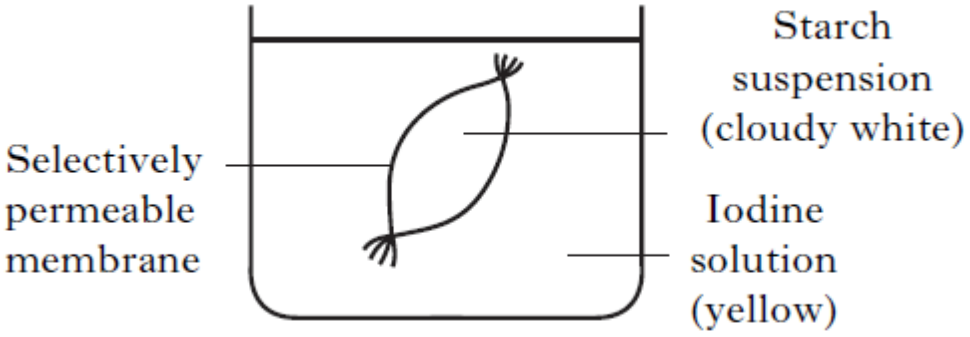


Copy and complete the table on the next page by inserting the missing process and applying the correct letter(s) from the diagram.

Process	Letter(s)
Active Transport	

(2)

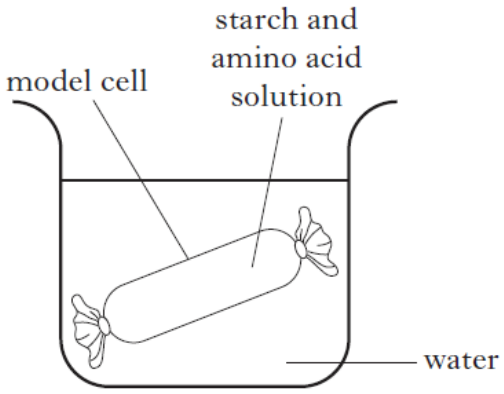
8. The diagram below shows a model cell that was set up to investigate diffusion through a selectively permeable membrane.
Iodine is a small, soluble molecule which changes from yellow to blue/black when it contacts starch.



Predict the colour changes which would be observed after one hour. (1)

	Colour change after one hour	
	Starch suspension	*Iodine solution*
A	remained cloudy white	yellow to blue/black
B	cloudy white to blue/black	remained yellow
C	remained cloudy white	remained yellow
D	cloudy white to blue/black	yellow to blue/black

9. A model cell was made using a visking tubing bag filled with a starch and amino acid solution. It was placed into a beaker of water and left for two hours.



a) Amino acids were detected in the water outside the model cell.
What process is responsible for this movement? (1)

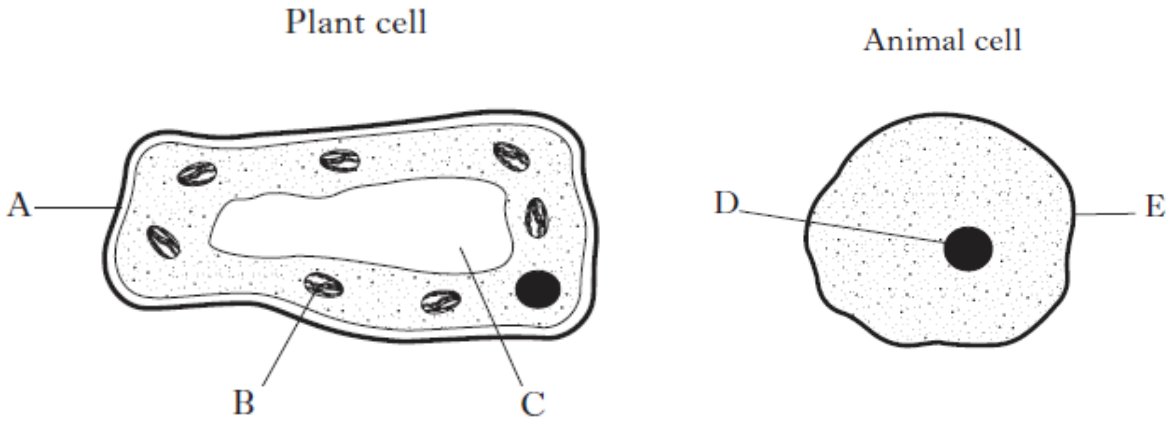
b) Why would no starch be detected in the water outside the model cell? (1)

c) What would happen to the mass of the model cell during the two hours? (1)
Explain your answer. (1)

10. Which line in the table below shows what happens to cells when they are placed in a strong solution of salt? (1)

	Animal Cell	*Plant Cell*
A	swells and bursts	becomes turgid
B	becomes turgid	swells and bursts
C	shrinks	becomes plasmolysed
D	becomes plasmolysed	becomes plasmolysed

11. Look at the cells below.



Describe and explain the appearance of each cell type if they were immersed in pure water for one hour. (2)

KEY AREA 3 – DNA and Proteins

12. The sentence below describes the function of DNA.
Copy it out with a word to make the sentence correct. (2)

The {number / order} of DNA {bases / genes} in a chromosome encodes information for the structure of a {carbohydrate / protein}.

13. The sentence below is about DNA.
Copy it out with a word to make the sentence correct. (2)

Chromosomes are made of DNA. The chain of {acids / bases} in DNA code for {amino acids / fatty acids} in {fats / proteins}.

14. A 'special molecule' is made to carry the code from DNA out of the nucleus.

a) What is the name of this 'special molecule'? (1)

b) What structure in the cell does this 'special molecule' take the DNA code to? (1)

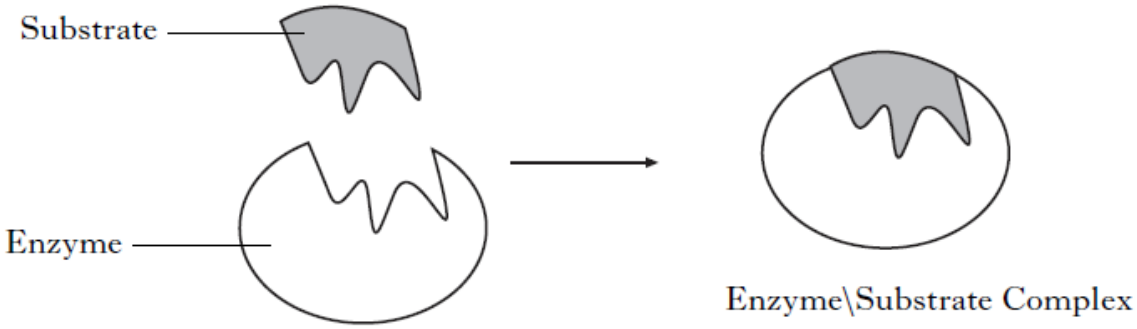
KEY AREA 4 - Proteins and enzymes

15.

a) What term is used to describe the temperature at which an enzyme works best? (1)

b) Name **one** factor, other than temperature, which has an effect on the activity of an enzyme. (1)

16. Enzymes are biological catalysts. The diagram below shows part of an enzyme controlled reaction.



a) Describe the features of an enzyme which allow it to combine with only one substrate. (1)

b) What happens to an enzyme when it is boiled? (1)

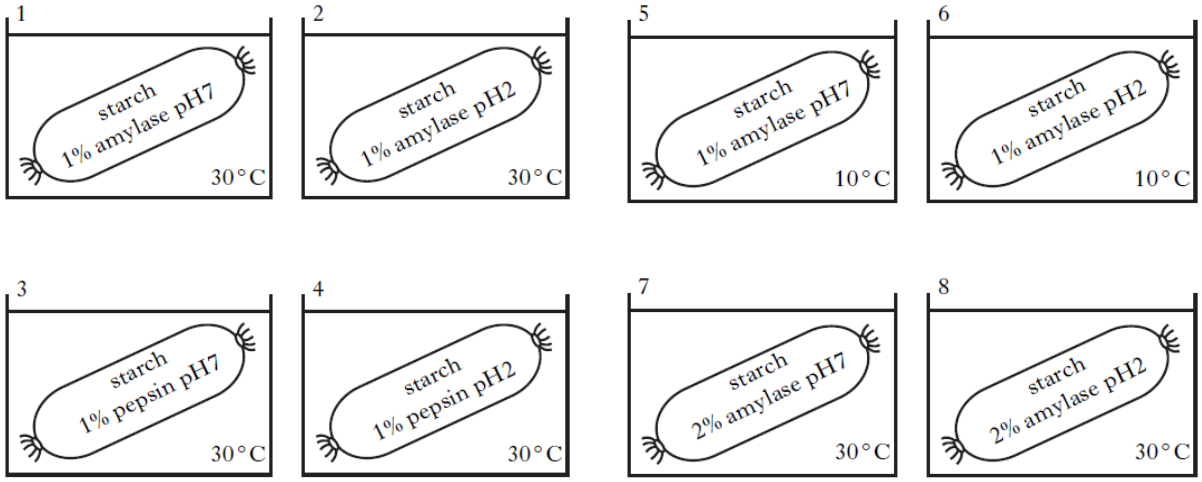
c) What type of reaction is catalysed by a digestive enzyme? (1)

17.

a) Biological washing powders contain enzymes.
Explain how these enzymes work to remove stains. (2)

b) Biological washing powders contain different enzymes.
Explain why this is necessary. (1)

18. Eight visking tubing (model gut) bags, as shown below, were placed into water baths.



Which two bags could be compared to investigate the effect of pH on the digestion of starch?

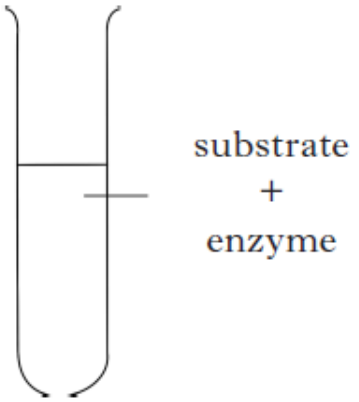
A 1 and 4
B 2 and 5
C 2 and 7
D 7 and 8 (1)

19. Which line in the table below correctly shows the functions of an enzyme?

	Energy input of the chemical reaction	*Rate of the chemical reaction*
A	lowers	speeds up
B	raises	slows down
C	raises	speeds up
D	lowers	slows down

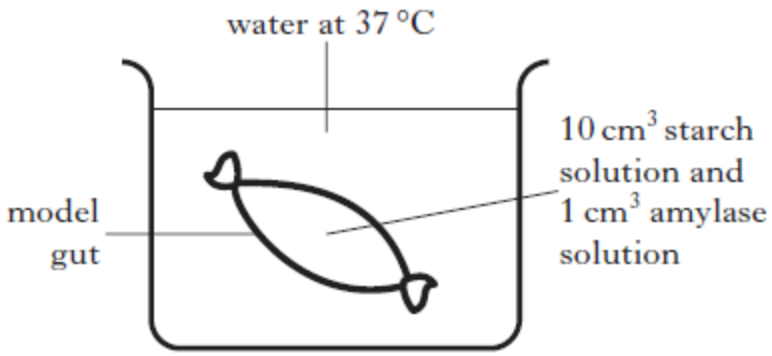
(1)

20. An investigation was carried out to find the effect of pH on the activity of an enzyme. Substrate at different pH values was added to the enzyme in different test tubes.



State two variables that must be kept constant for a valid conclusion to be made from this investigation. (2)

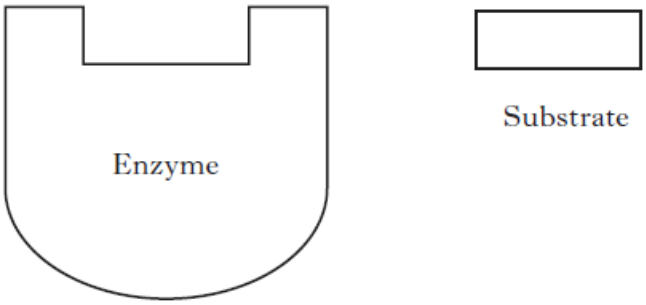
21. The diagram below shows an investigation into the digestion of starch by amylase, using a model gut.



Which line in the table below describes correctly the content of a model gut which should be used as a control? (1)

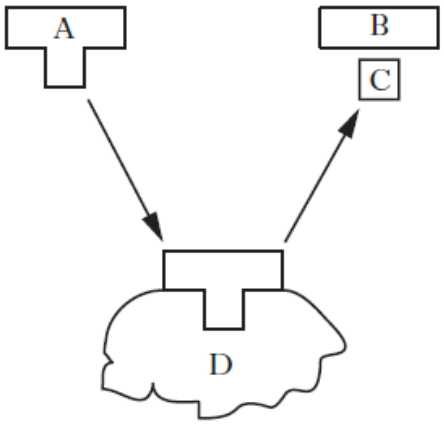
	Starch solution (cm^3)	*Amylase solution* (cm^3)	*Water* (cm^3)
A	10	0	1
B	0	10	1
C	10	1	0
D	1	0	10

22. The diagram below shows an enzyme and its substrate.



Using a named example, describe what happens to this enzyme and its substrate during a degradation reaction. (5)

23. The diagram below represents a degradation reaction involving an enzyme.



Which letter identifies the substrate? (1)

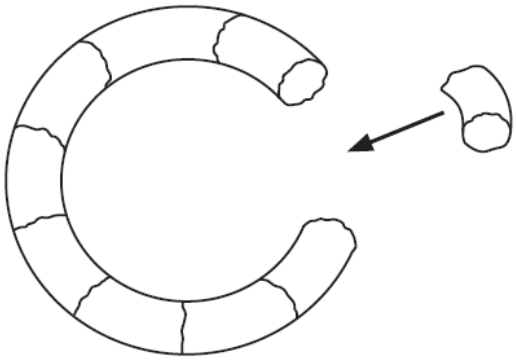
KEY AREA 5 - Genetic Engineering

24. Insulin is used to treat people with diabetes.
It can be manufactured by genetically-engineered bacteria using the steps described below.

A Bacteria are grown in a fermenter and produce insulin.
B The human insulin gene is isolated.
C Plasmids are removed from bacteria.
D Human insulin is purified and used to treat people with diabetes.
E The human insulin gene is inserted into a plasmid.
F Altered plasmids are put into bacteria.

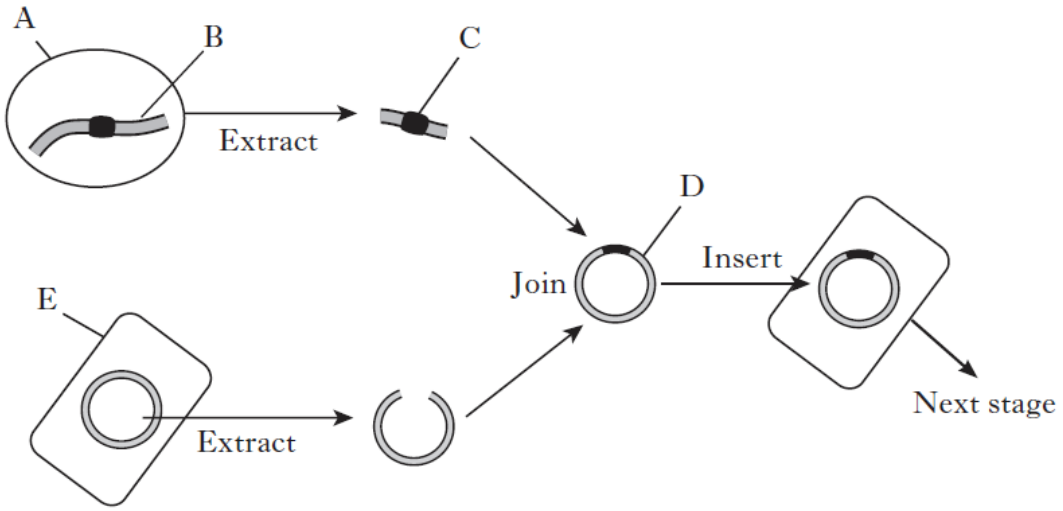
Arrange the steps into the correct order starting with statement B. (1)

25. 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 a bacterium.
C Plasmid is inserted into a human chromosome.
D Bacterial gene is inserted into a human chromosome. (1)

26. 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.

Name of structure	*Letter*
bacterial cell	
insulin gene	
plasmid	

(1)

b) Describe the next stage needed to produce insulin for use as a medicine. (1)

c) Name another human hormone produced by genetic engineering. (1)

d) State one advantage of genetic engineering. (1)

KEY AREA 6 - Respiration

27.
Which substance enters animal cells by diffusion and is used to produce ATP?

A Carbon dioxide

B Starch

C Water

D Glucose (1)

28. Which of the following stages in respiration would result in the production of more than 2 molecules of ATP?

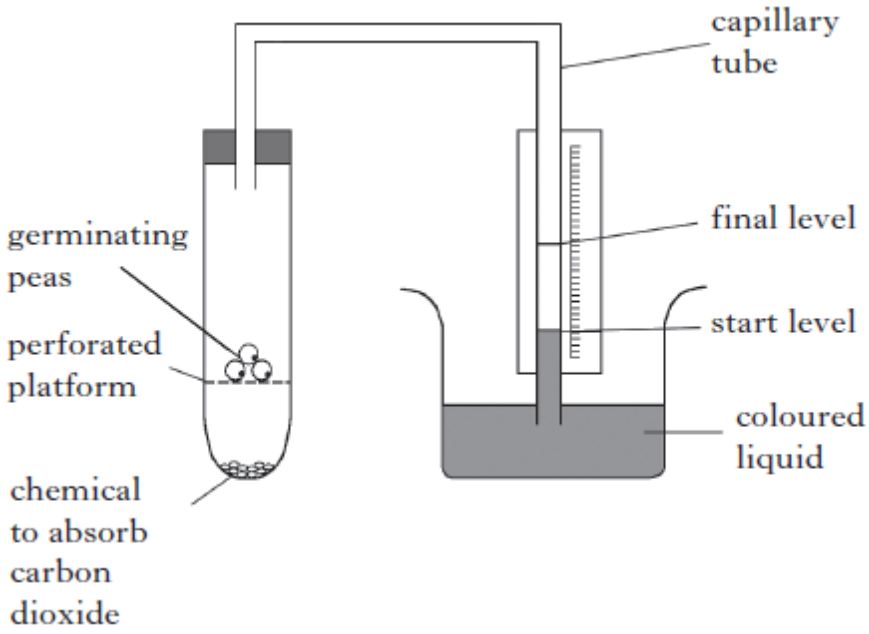
A Glucose to pyruvate

B Pyruvate to lactate

C Pyruvate to carbon dioxide and ethanol

D Glucose to carbon dioxide and water (1)

29. The apparatus below was used to investigate gas exchange in germinating peas.



The movement of the coloured liquid in the capillary tube can be used to measure the volume of

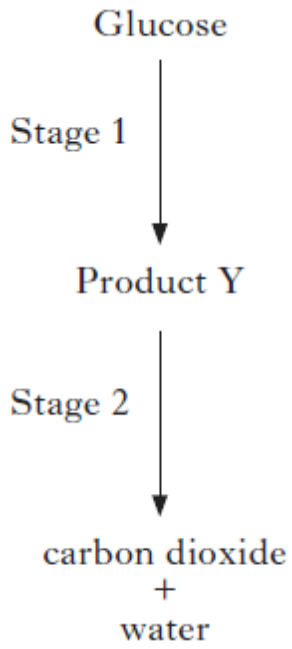
A oxygen produced by respiration

B carbon dioxide used up by respiration

C oxygen used up by respiration

D carbon dioxide produced by respiration. (1)

30. The process of aerobic respiration in a muscle cell is outlined below.



a) Name product Y from Stage 1. (1)

b) How many molecules of ATP are formed from each glucose molecule during stage 1? (1)

c) What molecule must be present to allow stage 2 to proceed? (1)

d) In which cell structure does stage 2 occur? (1)

d) State **two** uses for the energy released when ATP is broken down. (2)

31. The table below shows how altitude affects the percentage oxygen carried in blood.

Altitude (metres)	*Percentage oxygen carried in blood* (%)
(sea level) 0	97
2800	91
3700	85
4700	80

Use the data in the table to explain why a runner who lives at an altitude of 2800 metres would fatigue more quickly if racing in an event at 4700 metres.

(2)

32. Four reactions in the respiration pathway are shown below.

1 Glucose → pyruvate

2 Pyruvate → carbon dioxide + water

3 Pyruvate → lactate

4 Pyruvate → carbon dioxide + ethanol

Which of the reactions can occur in yeast?

A 2 and 3 only

B 2 and 4 only

C 1, 2 and 3 only

D 1, 2 and 4 only (1)