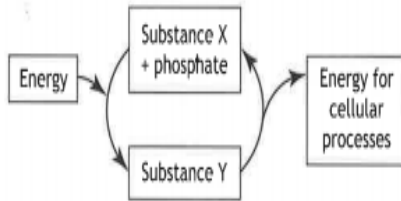


Cells Homework 5 - Respiration

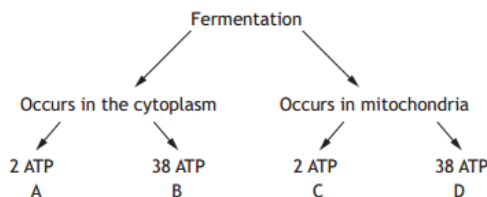
1. The diagram below shows energy transfer in a cell.



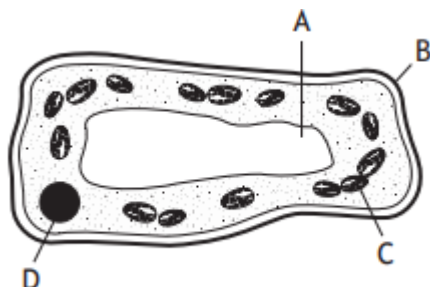
Which line in the table below correctly identifies X and Y.

| | Substance X | Substance Y |
|---|-----------------|-------------|
| A | ADP | glucose |
| B | CO ₂ | ADP |
| C | ADP | ATP |
| D | ATP | glucose |

2. Which of the following shows the correct location and number of ATP molecules released from a molecule of Glucose during fermentation?



3. The diagram below shows parts of a plant cell.



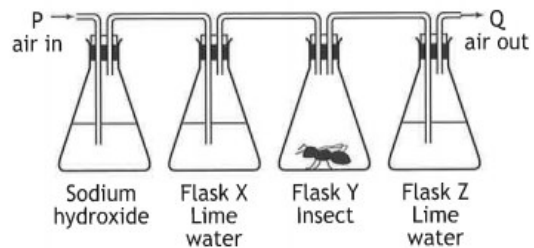
Which part of this cell is composed of cellulose?

4. The experiment below was set up to investigate aerobic respiration in an insect.

Sodium hydroxide solution absorbs carbon dioxide from air.

Lime water turns from clear to cloudy in the presence of carbon dioxide.

Air is drawn through the apparatus from P to Q, passing through each flask in turn.



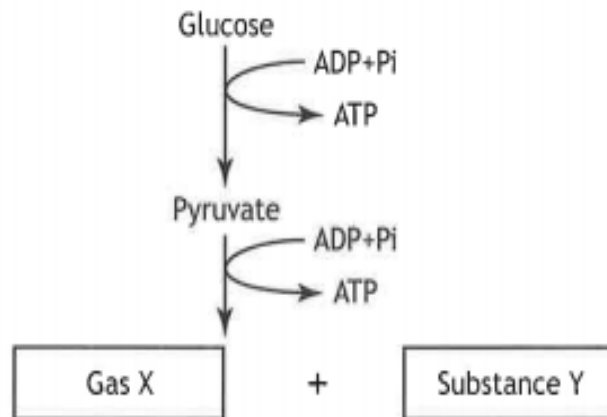
If two insects instead of one were placed in flask Y, the limewater in

- A flask X would turn cloudy more slowly
- B flask X would turn cloudy more quickly
- C flask Z would turn cloudy more slowly
- D flask Z would turn cloudy more quickly

5. What is the difference in the number of ATP molecules produced per glucose molecule by fermentation compared to aerobic respiration?

- A 2
- B 36
- C 38
- D 40

The diagram below shows stages in the breakdown of glucose in the presence of oxygen to form the final products, gas X and substance Y.



(a) Identify gas X and substance Y.

Gas X

1

Substance Y

1

(b) State the number of molecules of ATP which are produced per glucose molecule during each of the following pathways.

1

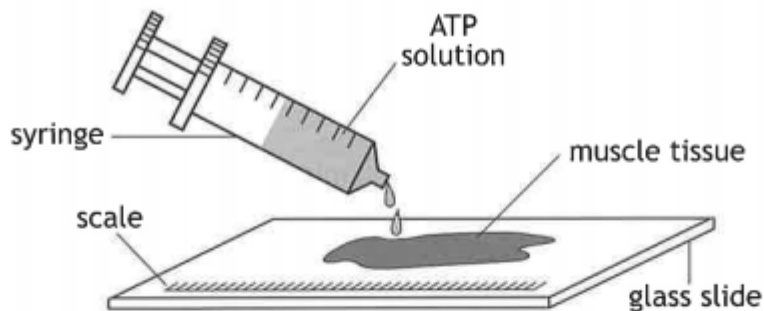
Aerobic respiration

Fermentation

(c) State the location of the fermentation pathway in a cell.

1

- 2 The diagram below shows part of an investigation into the effect of adding two different concentrations of ATP solution to two pieces of muscle tissue.



The results of the investigation are given in the table below.

| Muscle tissue | Concentration of ATP solution added (%) | Length of muscle tissue (mm) | | | |
|---------------|---|------------------------------|-----------------|--------------------|-------------------------|
| | | At start | After 5 minutes | Decrease in length | Percentage decrease (%) |
| 1 | 0.5 | 48 | 45.6 | 2.4 | 5 |
| 2 | 1.0 | 45 | 40.5 | 4.5 | |

- (a) (i) Calculate the percentage decrease in length of muscle tissue 2. 1
Space for calculation.

_____ %

- (ii) Give a conclusion that can be drawn from the results. 1

- (iii) Explain why it is necessary to express the results as a percentage decrease when comparing the results obtained. 1

2

- (b) Explain why different syringes should be used to add the ATP solutions in this investigation.

1

- (c) The list below contains some features of respiration in germinating peas.

| <i>List</i> | |
|-------------|---|
| W | Does not require oxygen |
| X | Releases CO ₂ |
| Y | Produces 38 molecules of ATP per glucose molecule |
| Z | Produces ethanol |

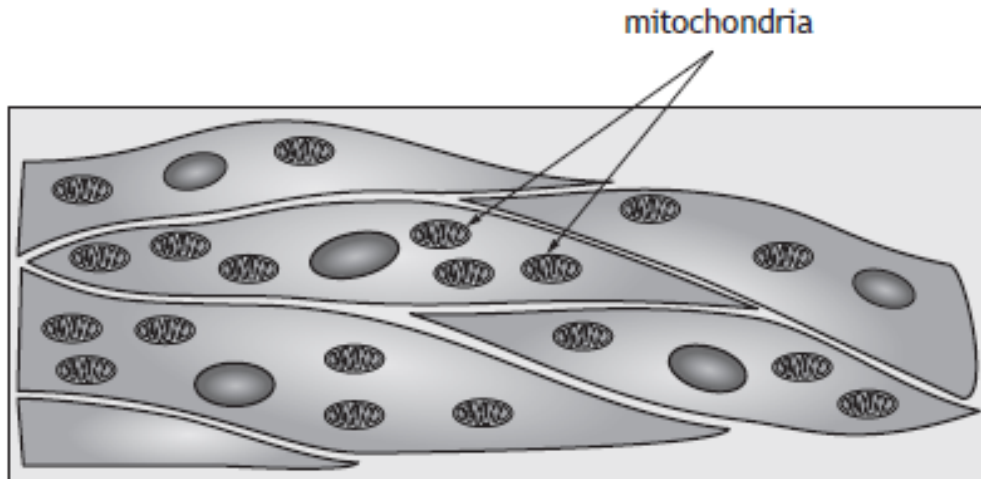
Complete the table below by entering the letters from the list in the correct box to match the features with the type of respiration occurring.

2

Each letter may be used once or more than once.

| <i>Aerobic respiration in germinating peas</i> | <i>Fermentation in germinating peas</i> |
|--|---|
| | |

3 The diagram below shows muscle cells.



(a) (i) Explain why muscle cells require many mitochondria. 1

(ii) Name one substance produced by a cell carrying out aerobic respiration. 1

(b) A muscle cell will carry out fermentation when oxygen is not available. Describe the fermentation pathway in muscle cells. 3

4

Muscle tissue can be dark or light in colour.

Dark tissue cells use oxygen to release energy.

Light tissue cells do not use oxygen to release energy.

(a) Name the process by which energy is released in the dark tissue cells. 1

(b) (i) Name the substance which muscle cells break down to produce pyruvate. 1

(ii) When pyruvate is being formed, enough energy is released to form two molecules of a high energy compound.

Complete the word equation below to show how this compound is generated. 1

_____ + _____ → _____

(c) The table below shows the average percentage of dark and light tissue cells. These cells were found in the muscles of athletes training for different events at the 2014 Commonwealth games in Scotland.

| Type of Athlete | Average percentage of dark tissue cells (%) | Average percentage of light tissue cells (%) |
|-----------------|---|--|
| cyclist | 60 | 40 |
| swimmer | 75 | 25 |
| shot putter | 40 | 60 |
| marathon runner | 82 | 18 |
| sprinter | 38 | 62 |

(i) Using information in the table, identify which type of athlete would be likely to produce the most lactic acid in their muscle cells. Justify your answer. 2

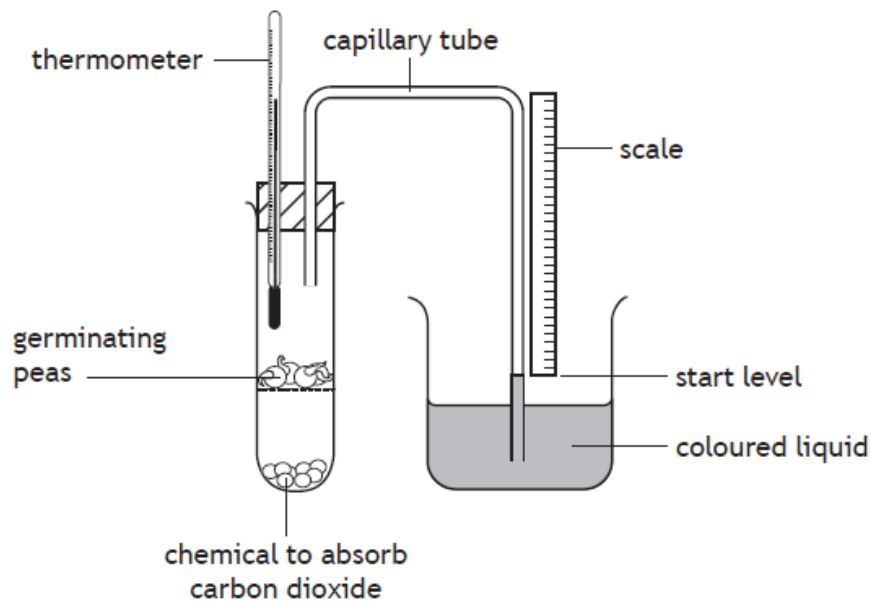
Type of athlete _____

Justification _____

Total Marks- 20 marks

5

A student investigated the effect of temperature on the rate of respiration in germinating (growing) peas. Using the arrangement shown, four respirometers labelled A–D were set up at the temperatures shown in the table below.



The level of the coloured liquid was measured on the scale at the start of the investigation and again after 20 minutes. The rise in liquid level was due to oxygen uptake by the germinating peas. The results are shown in the table.

| <i>Respirometer</i> | <i>Temperature</i> (°C) | <i>Contents</i> | <i>Rise in liquid level</i> (mm) | <i>Rate of oxygen uptake</i> (mm per minute) |
|---------------------|----------------------------|------------------|-------------------------------------|---|
| A | 15 | Germinating peas | 14 | 0.7 |
| B | 15 | Dead peas | 0 | 0 |
| C | 25 | Germinating peas | 26 | |
| D | 25 | Dead peas | 0 | 0 |

- (a) (i) Complete the table above by calculating the rate of oxygen uptake per minute by the peas in respirometer C.

Space for calculation

1

5

- (ii) Using the results from the table complete the following conclusion by underlining one option in the bracket. 1

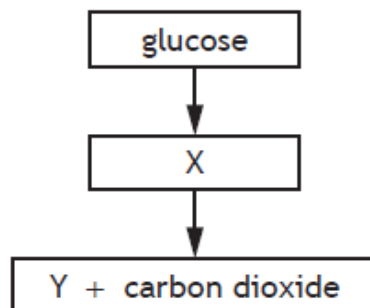
Increasing the $\left\{ \begin{array}{l} \text{temperature} \\ \text{liquid level} \\ \text{oxygen uptake} \end{array} \right\}$ increases the rate of respiration in germinating peas.

- (iii) Another respirometer was set up at 60°C with germinating peas and the coloured liquid did not rise. The student concluded that the peas were not respiring.

Explain why this temperature prevented the peas from carrying out respiration. 2

- (iv) Respirometers B and D were set up as control experiments. Describe the purpose of the controls in this investigation. 1

- (b) The diagram below represents the fermentation pathway in a plant cell.

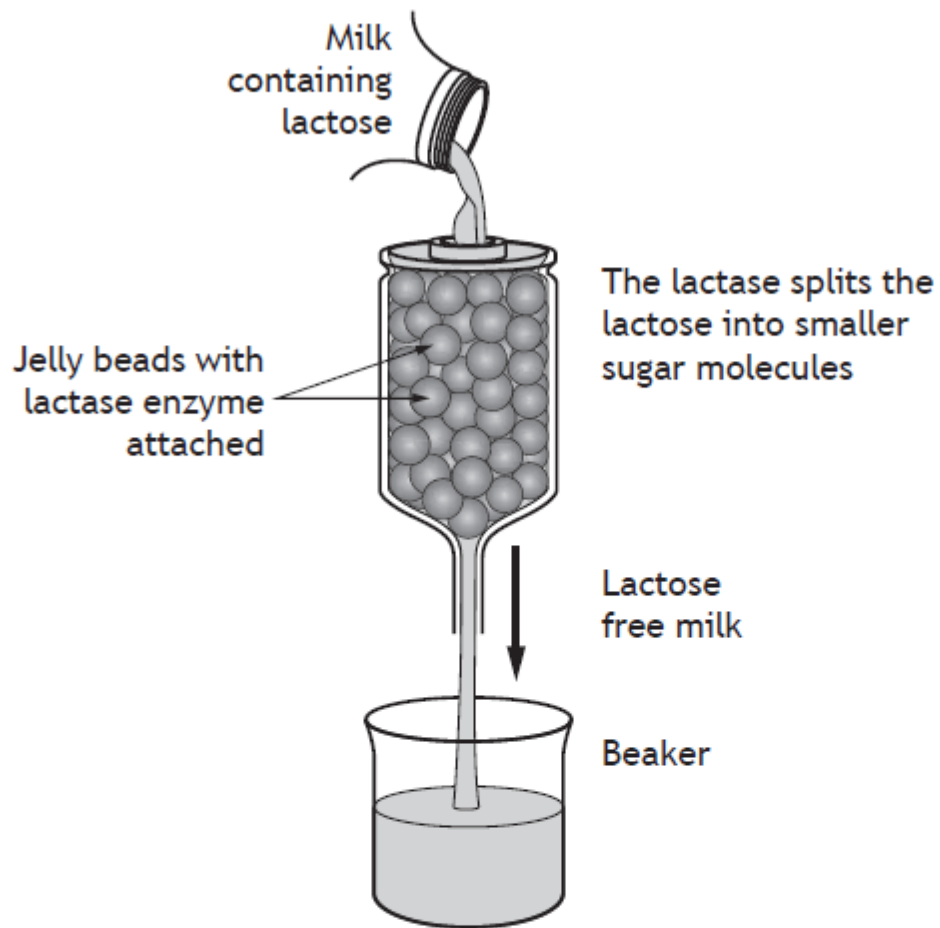


Choose either molecule X or Y and state its name. 1

Molecule _____

Name _____

- 6 The diagram below shows how the enzyme lactase is used in the production of lactose-free milk.



- (a) (i) Underline one option in each of the brackets to make the following sentences correct.

This process is an example of a $\left\{ \begin{array}{l} \text{degradation} \\ \text{synthesis} \end{array} \right\}$ reaction.

In this reaction, lactose is the $\left\{ \begin{array}{l} \text{product} \\ \text{substrate} \end{array} \right\}$ of lactase.

(ii) A fault in the production resulted in boiling water running over the lactase enzyme.

Using your knowledge of enzymes, predict how the milk produced would differ from the expected product.

Explain your answer.

2

Prediction _____

Explanation _____

(b) Enzymes such as lactase are biological catalysts.

Explain the role of enzymes in living cells.

1

(c) Name the substance of which enzymes are made.

1

(d) Name the only synthesising enzyme that produces starch from glucose -1 -phosphate.

1

(e) Give one example of a degrading enzyme and its substrate and product.

Enzyme _____

Substrate _____

Product _____

3

Total Marks- 30 marks