Respiration

MARKS

7. 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**

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

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(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 _____

_____

(ii) A sample of muscle tissue from an athlete was examined and found to contain a total of 360 cells.

90 of these cells were light tissue cells.

Identify which type of athlete the sample was taken from. **1**

Space for calculation

Type of athlete _____

MARK

5. (a) Cellular processes occur in different parts of the cell.

Name the energy producing process which starts in the cytoplasm and is completed in the mitochondria. **1**

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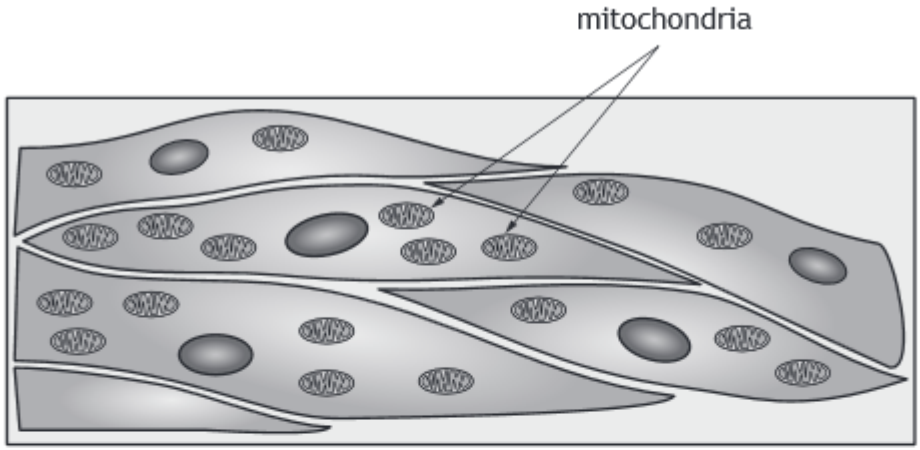
(b) As a result of the complete breakdown of a number of glucose molecules, 114 molecules of ATP were produced.

State the number of glucose molecules which were broken down to achieve this. **1**

Space for calculation

_____ Glucose molecules

4. 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**

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

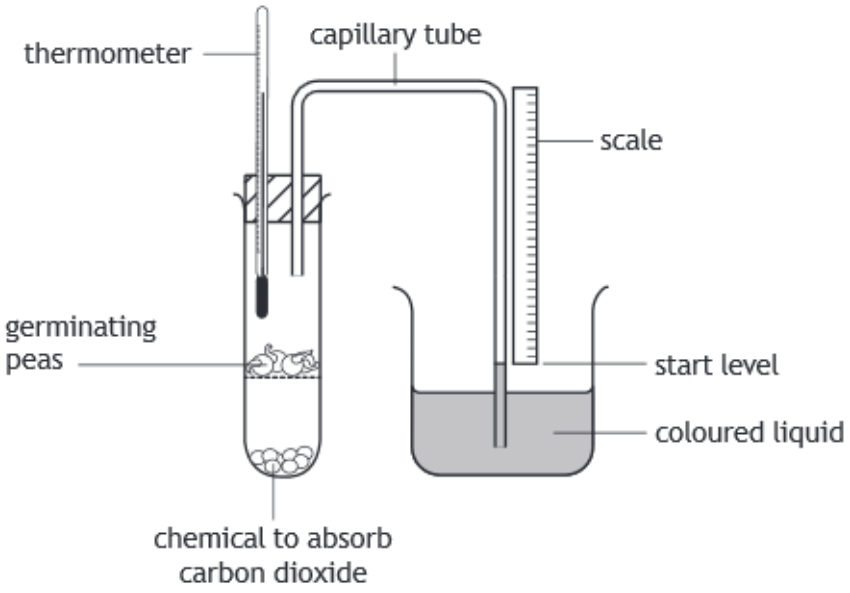
A 2

B 36

C 38

D 40

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.

Respirometer	*Temperature* (°C)	*Contents*	*Rise in liquid level* (mm)	*Rate of oxygen uptake* (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. **1**

Space for calculation

5. (a) (continued)

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

Increasing the { temperature / liquid level / oxygen uptake } 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

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_____

(iv) Respirometers B and D were set up as control experiments.

Describe the purpose of the controls in **this** investigation. 1

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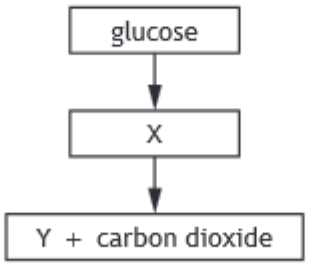
_____

(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 _____

5. (a) The table shows information about two types of respiration in animal cells.

Tick the boxes in the table to indicate whether the statements apply to aerobic respiration, fermentation or both. **2**

	Type of respiration	
Statement	*Aerobic*	*Fermentation*
Oxygen is required		
Pyruvate is formed		
Lactate is formed		
Carbon dioxide is formed		

(b) ATP is an energy-rich molecule formed by respiration.

Name a cellular process which requires energy from ATP. **1**

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