Respiration is often described to be a fundamental process to all organisms.
(a) Suggest why.
[2 marks]
(b) Figure 1.1. shows a flow chart that outlines briefly the glycolytic pathway used by humans
in respiration. Figure 1.1
Glucose (6C)
Glucose-6-phosphate
1
Fructose-6-phosphate
ATP —————
* ▼
Triose phosphate (3C) Triose phosphate (3C)
Intermediate Intermediate
stages stages

Complete the flow chart.

1

[3 marks]

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(c) Explain the significance of the reduced NAD produced in this pathway for an individual
respiring aerobically.
[3 marks]
(d) When glucose enters a cell, it is immediately converted into glucose-6-phosphate.
Suggest why.
[2 marks]
(e) Glycolysis occurs in the cytoplasm of a cell while subsequent aerobic reactions do not.
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[Total: 14]

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(a) Draw, in the space below, the structure of an ATP molecule.
[2 marks] (b) ATP is often described as the 'universal currency of energy transfer'.
Suggest why.
[3 marks]
(c) State how many molecules, if any, of ATP are produced in the following stages of respiration.
(i) glycolysis
<u></u>
(ii) the link reaction and the Krebs (citric acid) cycle
(iii) the electron transport chain
ļ
(iv) lactate fermentation
<u></u>
[4 marks]



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(f) In theory, the actual ATP yield during respiration is lower than the theoretical yield.
Explain three reasons why this is the case.
1
2
3
[3 marks]
[Total: 12]
Outline, in detail, the process of oxidative phosphorylation and chemiosmosis in aerobic
respiration.
In your answer, you should use technical terms, spelt correctly.







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It was only in 1961 when Mitchell published his chemiosmosis theory.
(a) Explain what Mitchell meant by the term 'chemiosmosis'.
[3 marks]
(b) Suggest why Mitchell used the term 'chemiosmosis'.
[1 mark]
(c) The theory of chemiosmosis makes reference to a 'proton motive force'.
Explain, in detail, what you understand by the 'proton motive force'.
Explain, in detail, what you understand by the proton motive lorde.
[2 marks]

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(d) The	following statements are facts about mitochondria and respiration.
Α	Mitochondria have both an inner and outer membrane.
В	The pH of the intermembrane space is lower than the matrix.
С	The inner membrane contains many channel proteins.
D	Dissipating the proton motive force prevents ATP synthesis.
Evaluat	e which statements provide evidence for Mitchell's theory.
	[4 marks]
(e) Mito	hell published his theory in 1961.
He was	awarded the Nobel prize in 1978.
Sugges	t why there is often a large gap in time before theories are accredited.
	[2 marks]

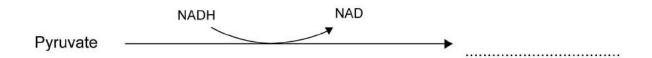




[Total: 12]

- 5 Figure 5.1 shows an outline of anaerobic respiration in mammals and yeast.
 - (a) Fill in the gaps in Figure 5.1.

Figure 5.1



	***************************************	·· NADH	NAD	
Pyruvate	—			

(b) Explain why anaerobic respiration in mammals has a lower yield of ATP than aero	obic
respiration.	

[4 marks]

[6 marks]

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(c) The lactate produced in anaerobic respiration is often said to be 'toxic'.
This is incorrect.
Explain why.
[2 marks]
[2 marks]
(d) Figure 5.2 on the insert is a graph that shows how the length of anaerobic respiration in a
colony of yeast affects the size of the colony.
Describe and explain, in detail, what is shown by Figure 5.2.
[5 marks]
[Total: 17]





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6 Table 6.1 shows the energy values per gram of three respiratory substrates.

Table 6.1

Respiratory substrate	Mean energy value / kJ g ⁻¹
Carbohydrate	15.8
Protein	17.0
Lipid	39.4

(a) Explain what you understand by the term 'respiratory substrate'.	
	marks]
(b) Calculate how much more energy proteins release per unit gram compared to	
carbohydrates.	
Give your answer as a percentage to nearest whole number.	
[2	marks]
(c) Theoretically, 1 mol of glucose should produce 2870 kJ of energy.	
It takes 30.6 kJ to produce 1 mol ATP.	
Given that the true efficiency of glucose turnover is about 32%, show that 1 mol of glucose	ose is
likely to produce 30 mol ATP.	

[2 marks]

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(d) Explain why some substrates have a higher energy value per unit mass than others.
[2 marks]
(e) Although many carbohydrates have similar energy values per gram, glucose is the main
respiratory substrate for humans.
Suggest why glucose is commonly used instead of other carbohydrates.
[2 marks]
[Total: 10]



