

Form 6 Mock Examination February 2020

Biology

Name: _____

Class: _____ () Group: 1X / 2X / 3X

Biology Paper 1B
Question-Answer Book

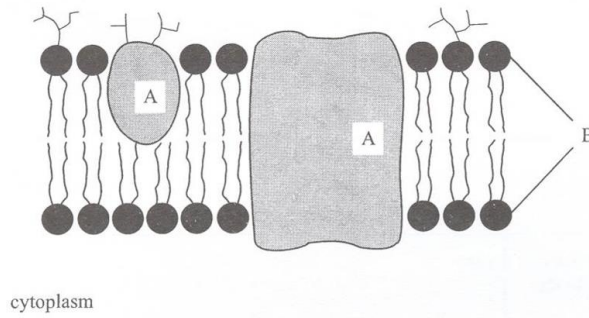
Instructions for Section B

1. Answer **all** questions.
2. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
3. Supplementary answer sheets will be supplied on request. Write your name and class clearly on the supplementary answer sheets and staple them to your Question-Answer Book.
4. Write your answers in paragraphs wherever appropriate.
5. The diagrams in this section are **not** necessarily drawn to scale.
6. No extra time will be given to students for writing down their names after the 'Time is up' announcement.

SECTION B

Answer **ALL** questions. Put your answers in the spaces provided.

1. The diagram below shows a model of cell membrane:

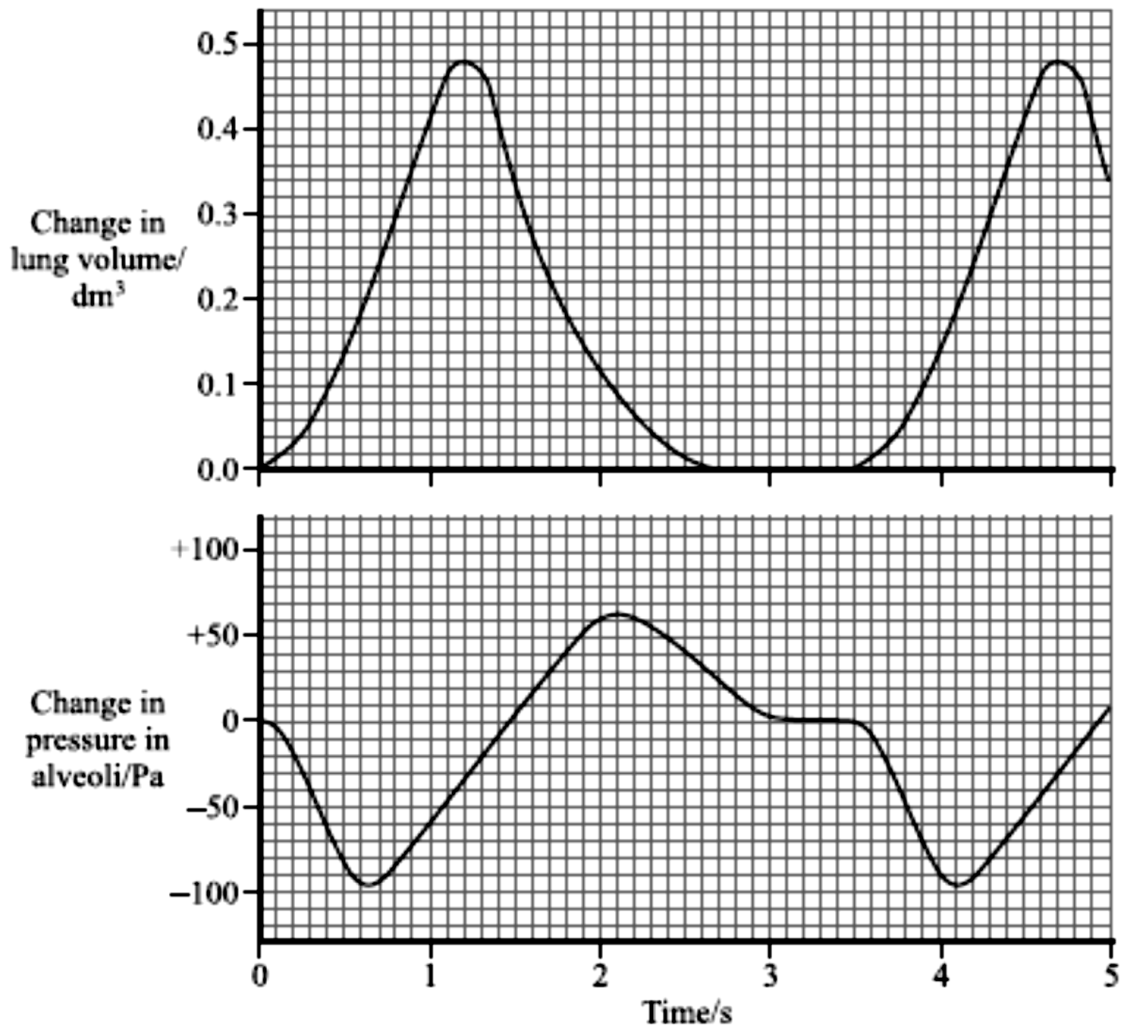


Complete the following paragraph with suitable word(s):

(4 marks)

The membrane is composed of _____ which are labelled as A in the diagram and _____ molecules labelled as B. The layer of molecule B makes the membrane impermeable to _____. Some proteins on the membrane serves to transport molecules across the membrane by _____, which require energy input.

2. The graph below shows some of the changes which take place in a man during breathing.

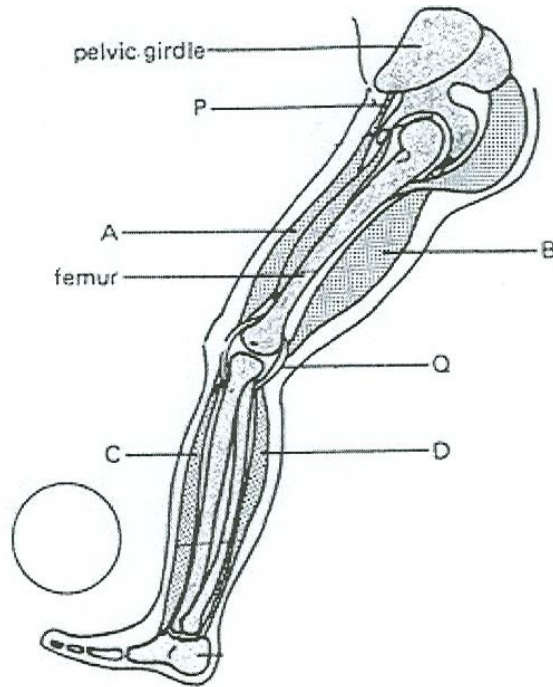


(a) Use the information in the graph to calculate this man's rate of breathing in breaths per minute. (1 mark)

(b) The volume of air in the man's lungs after he had exhaled was 2.4 dm^3 . What is the volume of air in his lungs immediately after he had inhaled? (1 mark)

(c) Explain how the intercostal muscle and diaphragm cause the change in alveolar pressure from 0.5 to 1.0s. (3 marks)

3. The diagram below shows the bones and the muscles of the lower limb of man.

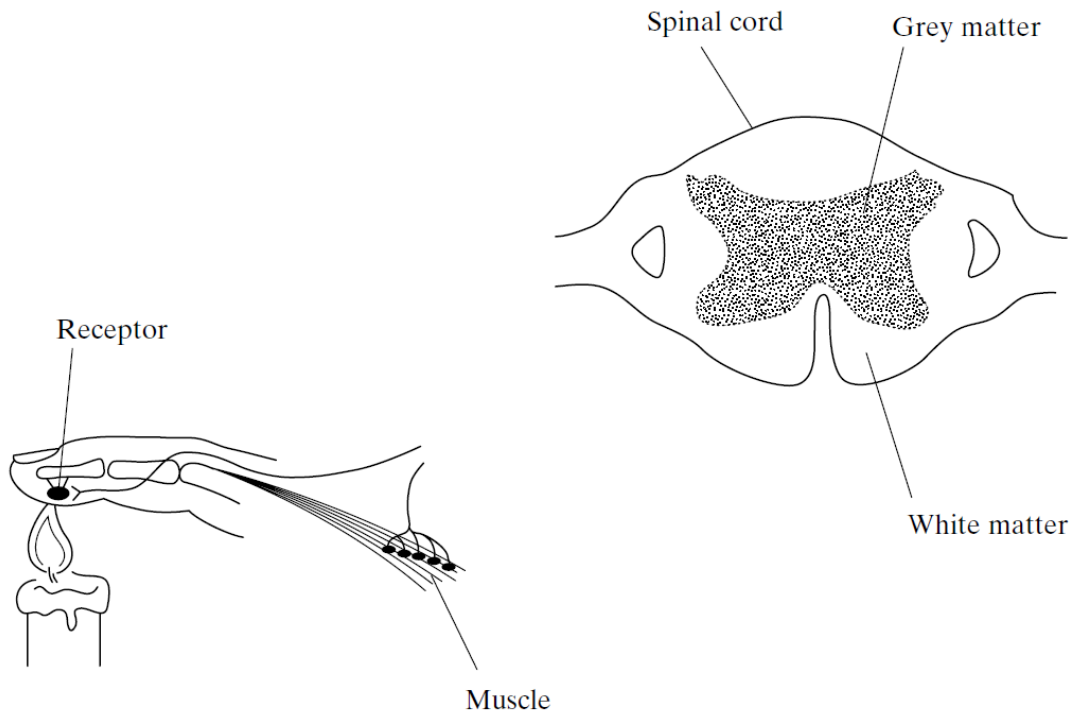


(a) Which of the muscles, A, B, C or D, is/are flexor(s)? (1 mark)

(b) Discuss the role of muscles in support. (2 marks)

(c) Contrast the physical properties of tissues P and Q. Explain the significance of these properties. (3 marks)

4. The diagram below shows the structures relate to withdrawal reflex.



- (a) Complete the diagram by drawing and labelling the structures involved in this reflex arc. (3 marks)
- (b) Describe the role(s) of synapses in this reflex arc. (2 marks)

5. Figure 1 shows the locations where the restriction enzymes *EcoRI* and *HpaII* cut a plasmid.

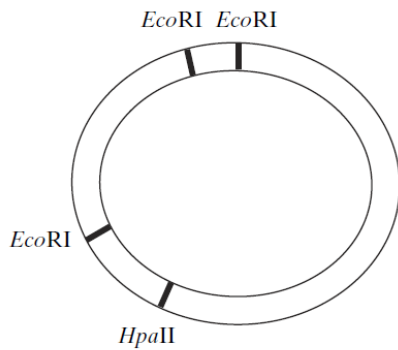


Figure 1

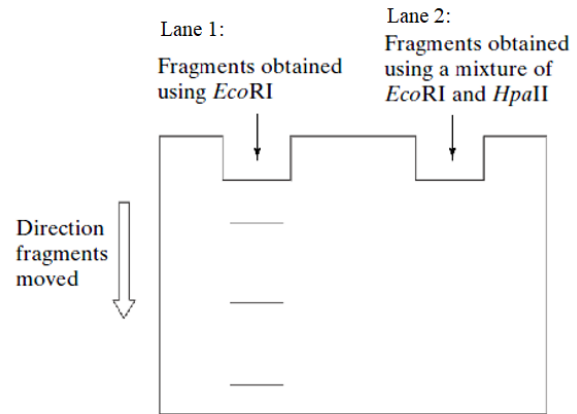


Figure 2

(a) Explain why *EcoRI* and *HpaII* cuts the plasmid at different locations of a plasmid. (1 mark)

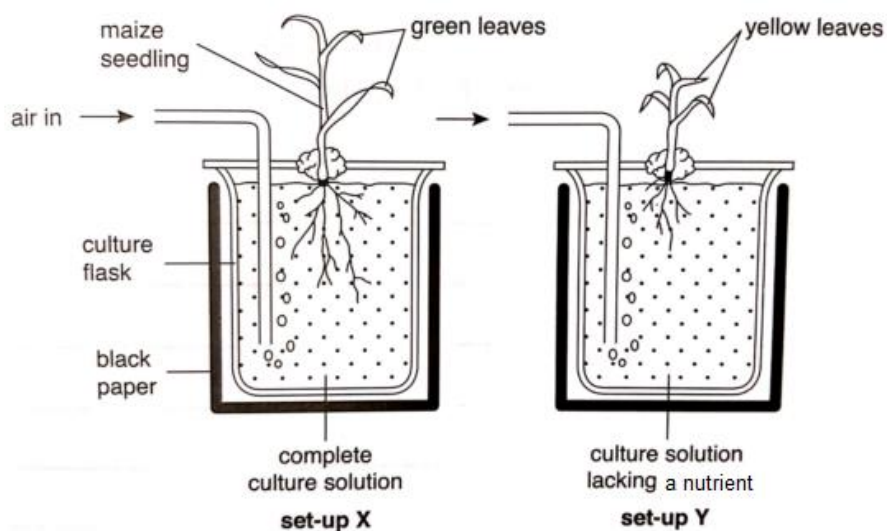
(b) In an experiment, *EcoRI* was used to cut the plasmid shown in Figure 1 and the DNA fragments obtained were separated by gel electrophoresis. Figure 2 shows the results.

- (i) On Figure 2, indicate the positions of the positive and negative electrodes using the symbols “+” and “-” respectively. (1 mark)
- (ii) Explain the DNA profile obtained under lane 1. (2 marks)

(iii) Draw bands under lane 2 on Figure 2 to show the positions of the DNA fragments that would be obtained if a mixture of *EcoRI* and *HpaII* was used to cut the plasmid. (1 mark)

(c) Describe an application of DNA fingerprinting of bacteria. (1 mark)

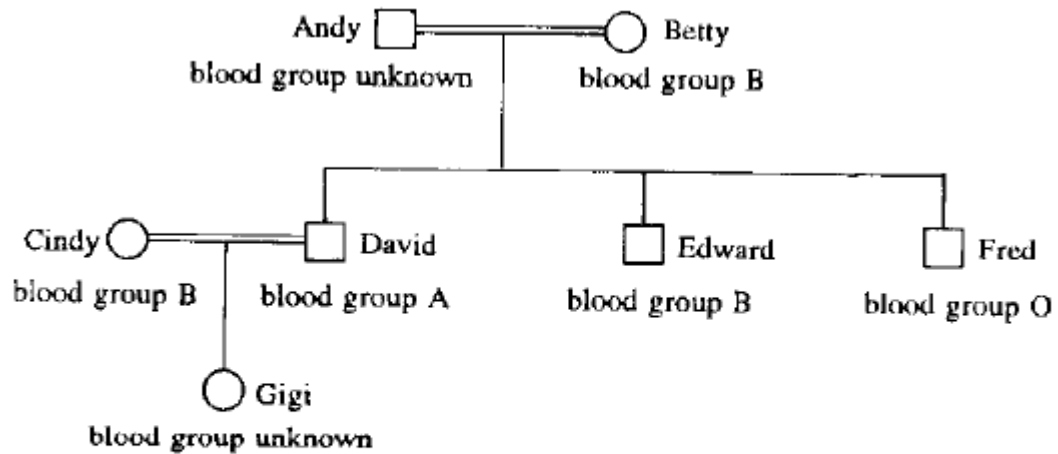
6. The diagram below shows a water culture experiment in which two maize seedlings have been grown in different culture solutions. A complete culture solution is a culture solution containing all minerals required for normal plant growth.



- (a) Which nutrient is lacking in the culture solution in set-up Y? Explain. (3 marks)

- (b) During the experiment, there was an air pump failure in set-up X. Suggest why the growth of the seedling in the set-up slowed down. (3 marks)

7. The inheritance of ABO blood groups is determined by three alleles, I^A , I^B and i . Both I^A and I^B are dominant and i is recessive. The inheritance of blood group in a family is shown in the following pedigree diagram:

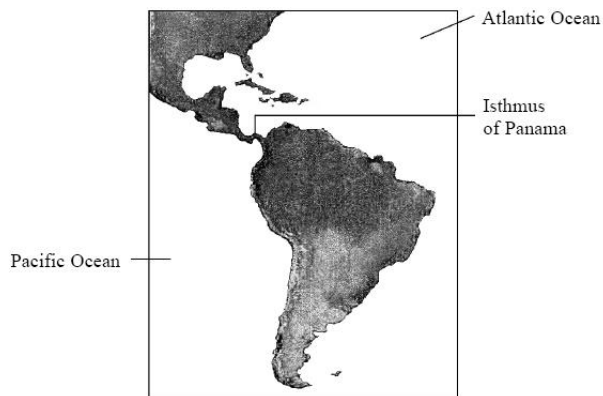


Key : \square male \circ female

- (a) Deduce the genotype of Andy **without using a genetic diagram**. (5 marks)

- (b) Both Cindy and David are heterozygous for their blood groups. What would be the chance of Gigi having blood group O? (1 mark)

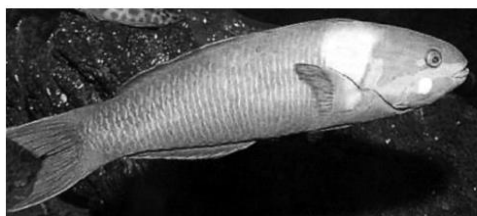
8. The Isthmus of Panama is a strip of land in Central America that separates the Pacific Ocean from the Atlantic Ocean. The map below shows the Isthmus of Panama.



The pictures below show two species of fish known as wrasse.



Blue-headed wrasse (*Thalassoma bifasciatum*)



Rainbow wrasse (*Thalassoma lucasanum*)

The blue-headed wrasse is found in the coral reefs on the Atlantic side of the isthmus and the rainbow wrasse is found in the reefs on the Pacific side of the isthmus.

It has been shown through fossil records that both species are descended from a common ancestral population that was split as the isthmus formed.

- (a) Explain how the common ancestor might have given rise to the two different species (blue-headed wrasse and rainbow wrasse). (4 marks)

- (b) How may the study of fossils provide evidence for evolution? (2 marks)

9. A student investigated an area of moorland where succession was occurring. She used quadrats to measure the percentage cover of plant species, bare ground and surface water every 10 meters along a transect. She also recorded the depth of soil at each quadrat. The results are shown in the table below.

	Percentage cover in each quadrat A to E				
	A	B	C	D	E
Bog moss	55	40	10	–	–
Bell heather	–	–	–	15	10
Sundew	10	5	–	–	–
Ling	–	–	–	15	20
Bilberry	–	–	–	15	25
Heath grass	–	–	30	10	5
Soft rush	–	30	20	5	5
Sheep's fescue	–	–	25	35	30
Bare ground	20	15	10	5	5
Surface water	15	10	5	–	–
Soil depth/cm	3.2	4.7	8.2	11.5	14.8

– Indicates zero percentage cover.

- (a) Explain how these data suggest that succession has occurred from points A to E along the transect. (3 marks)

- (b) The student also collected data of animal species. Account for a greater diversity of animal species in E than A. (3 marks)

(c) Suggest **one** advantage of the above surveying method over

(i) line transect;

(1 mark)

(ii) random sampling with quadrat.

(1 mark)

(d) Suggest **one** limitation of the above surveying method for counting different animal species.

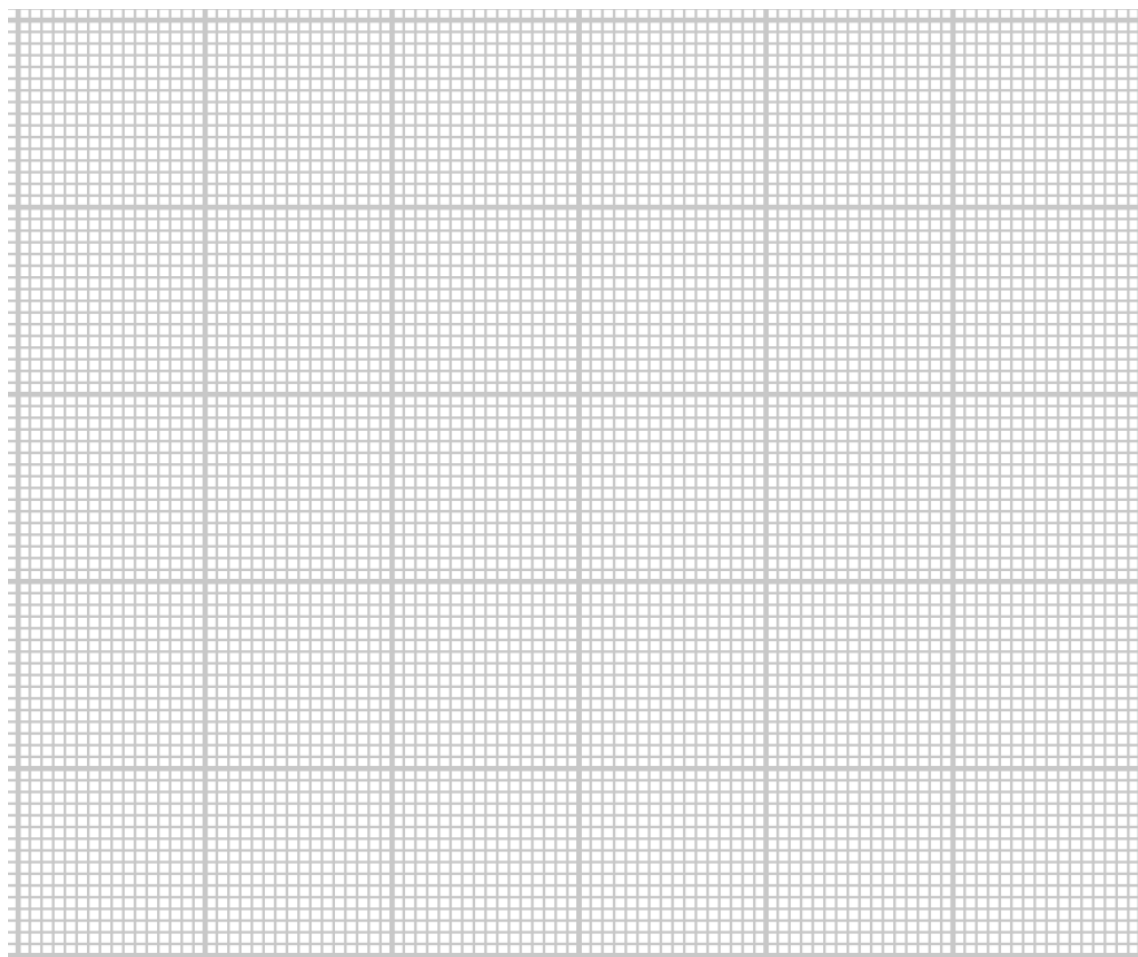
(1 mark)

10. The table below shows the concentrations of glucose in insulin in the blood plasma before and after drinking a glucose solution.

Time after eating meal (min)	Concentration of glucose in blood plasme (mg/100 mL)	Concentration of insulin in blood plasma (arbitrary units)
0	82	19
10	88	19
20	96	28
30	110	44
40	101	52
50	87	41

(a) Plot a graph to present the above results.

(4 marks)



(b) How does the above data show that insulin controls the concentration of blood glucose by negative feedback? (2 marks)

(c) A person who is suspected of suffering from diabetes is given the same glucose solution to drink.

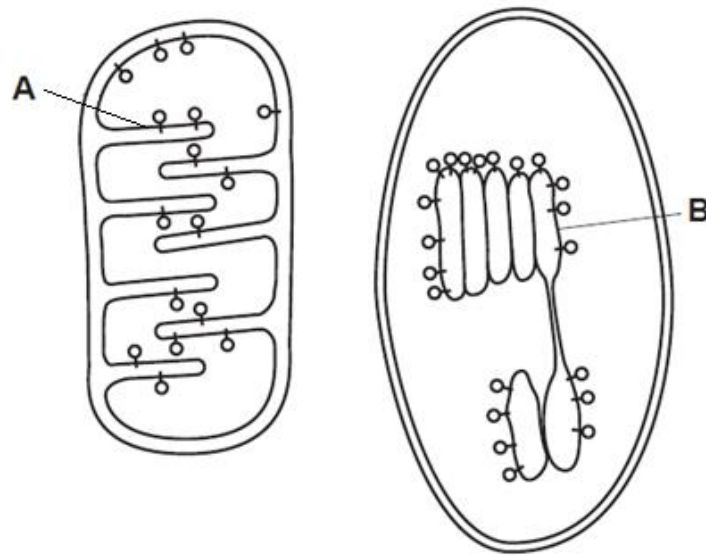
(i) Sketch the change in blood glucose level on the graph in (a). (2 marks)

(ii) Apart from drinking the same volume and same concentration of glucose solution, suggest **two** ways in which the test should be carried out to produce reliable results. (2 mark)

(d) Describe an experiment that can determine the concentration of glucose in blood plasma using Benedict’s solution.

(4 marks)

11. Most ATP is made in cells by membrane systems that create proton gradients by pumping protons from one compartment to another. The diagram below shows two such membrane systems found in two cellular organelles:



(a) Name structures A and B. (2 marks)

A:

B:

(b) Compare and contrast phosphorylation in structure A and structure B. (4 marks)
