Candidate Name	Centre Number	Candidate Number
		2

General Certificate of Education
Advanced Subsidiary/Advanced

311/01

BIOLOGY
MODULE BI1

A.M. WEDNESDAY, 9 January 2008
(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. Explain the meaning of the following.

(a) Active transport [1]

.....

.....

(b) The primary structure of a protein [1]

.....

.....

(c) Enzyme-substrate complex [1]

.....

.....

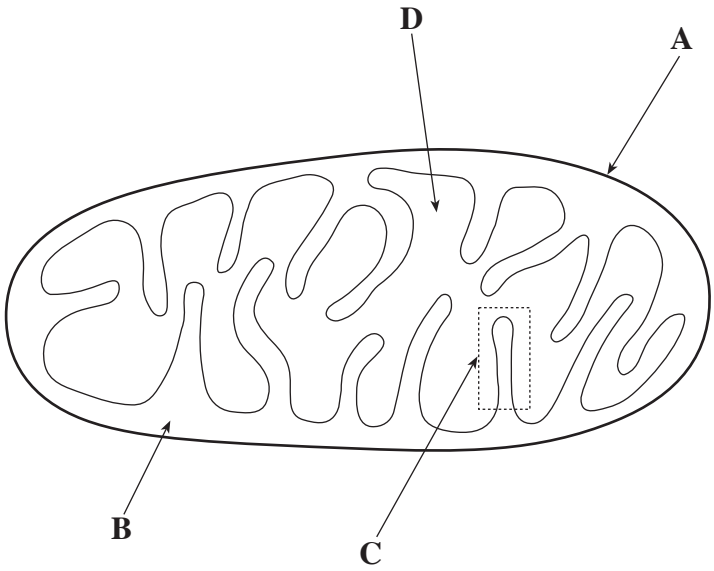
(d) Immobilised enzyme [1]

.....

.....

(Total 4 marks)

2. The diagram shows a mitochondrion.



(a) Name the structures labelled **A**, **B**, **C** and **D** on the diagram. [4]

A .....

B .....

C .....

D .....

(b) Explain why the inner membrane is highly folded. [2]

.....

.....

(c) Name the main molecule that is synthesised in this organelle. [1]

.....

(d) (i) Which of the following cells would contain the greater number of mitochondria? [1]

Skin Cell

Muscle cell

(Circle your choice)

(ii) Give a reason for your choice. [1]

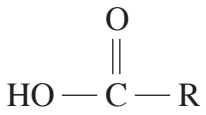
.....

.....

(Total 9 marks)

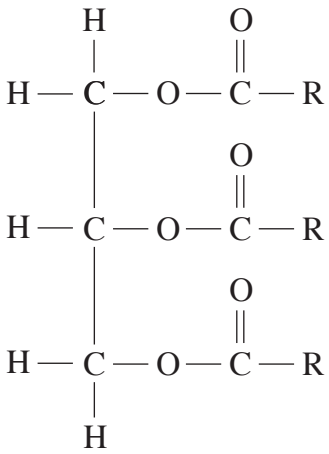
3. The diagram (A) below shows the general formula of a fatty acid.

Diagram A



Lipids are formed when three fatty acids react with another molecule (diagram B).

Diagram B



(a) (i) Name the molecule. [1]

.....

(ii) In what way is the reaction which forms a lipid, similar to the formation of a dipeptide or a disaccharide? [1]

.....

(iii) Describe **one** feature of the R group in fatty acids. [1]

.....

(b) The lipids found in plants are often described as oils, because they are liquids at room temperatures. Animal fats are solids at room temperature.

(i) Describe the structural difference between a solid animal fat and a liquid plant oil. [1]

.....

.....

(ii) Plant oils are often found in seeds. What function do they perform there? [1]

.....

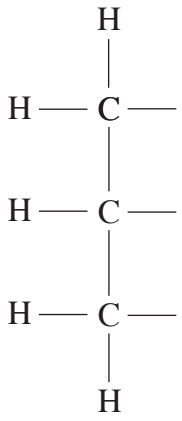
(iii) What makes lipids particularly suitable for this function? [1]

.....

.....

(c) (i) Complete the diagram below to show the structure of a phospholipid (Diagram C). [1]

Diagram C



(ii) How do the properties of diagram C differ from those of diagram B? [2]

.....

.....

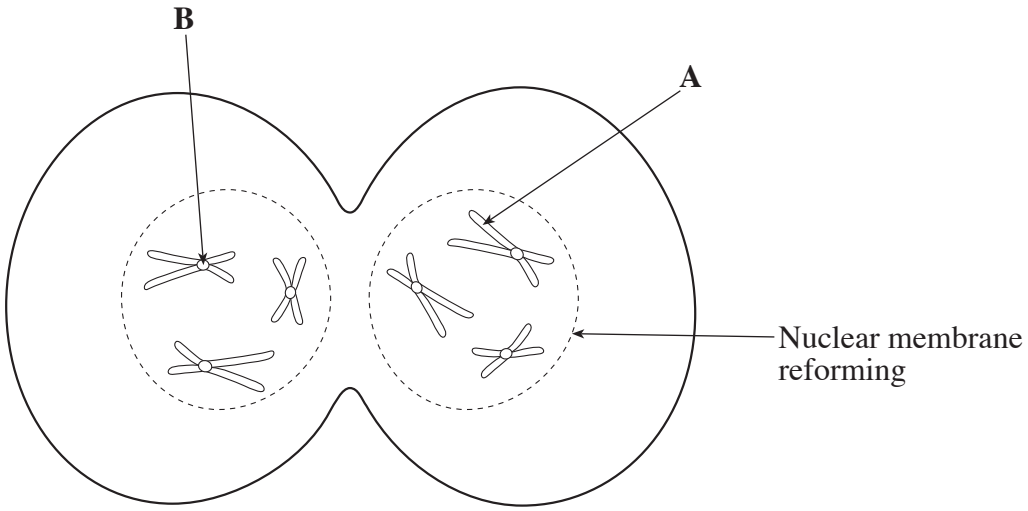
(iii) Explain how this change plays a vital role in cells. [2]

.....

.....

(Total 11 marks)

4. The diagram shows a cell undergoing meiosis.



(a) Name the structures labelled **A** and **B**. [2]

A .....

B .....

(b) (i) Name the stage shown. [1]

.....

(ii) Explain how you arrived at your answer. [2]

.....

.....

(c) List **two** things that would take place in the next stage. [2]

1. .....

2. .....

(d) What is the diploid number of chromosomes in this organism? [1]

.....

(e) (i) What is the advantage of sexual compared with asexual reproduction. [1]

.....

(ii) List **three** ways in which meiosis achieves this advantage. [3]

.....

.....

.....

.....

(Total 12 marks)

5. *(a)* In the table below, give **three** differences between the structures of DNA and RNA. [3]

	DNA	RNA
1.	....	....
2.	....	....
3.	....	....

(b) The bacterium *E.coli* was cultured in a growth medium containing the heavy isotope of nitrogen N^{15}.
All of the nitrogen in the DNA of these cells was of the heavy form.
The cells were transferred to a medium containing normal nitrogen (N^{14}) and allowed to divide once.

(i) Explain why the density of the DNA in the new generation was intermediate between that of normal bacteria and those cultured in the heavy nitrogen medium. [2]

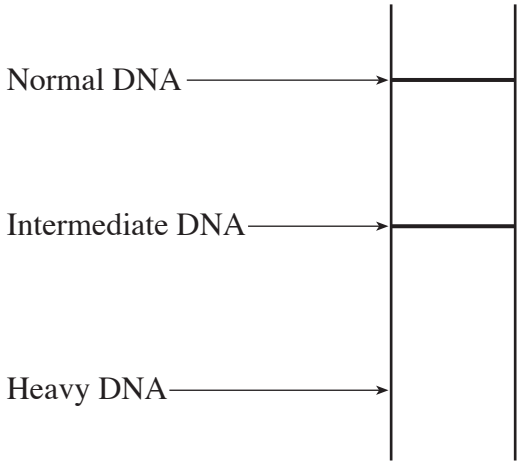
.....

.....

(ii) Which part of the DNA molecule contains the nitrogen? [1]

.....

(c) The cells were allowed to divide once more in the normal (N^{14}) medium. The DNA was extracted from these cells and the diagram shows its distribution after centrifugation.



(i) What would be the proportion of the two types of DNA in the new generation? [1]

.....

(ii) Explain how you arrived at your answer. [1]

.....

.....

(d) (i) Name the enzyme mainly responsible for the synthesis of a new strand of DNA. [1]

.....

(ii) Give an example of the practical application of this enzyme. [1]

.....

.....

(e) (i) Explain how the sequence of nucleotides in the new strand of DNA is determined. [2]

.....

.....

(ii) Explain how a single alteration in this sequence might affect the organism's metabolism. [2]

.....

.....

(Total 14 marks)

6. An enzyme experiment was carried out using tubes which were labelled A to H.

An equal volume of an enzyme was added to each tube along with the same volume of substrate.

The tubes were placed in a water bath at constant temperature.

One tube was removed from the water bath every five minutes and the concentration of substrate remaining was measured.

These results were used to calculate the rate of reaction during the five minute period before the removal of each tube. The reaction rates are shown in the table.

Tube	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
Time period (minutes)	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Reaction rate (mg ml^{-1} min^{-1})	24	24	24		0	0	0	0

(a) (i) Apart from temperature, what **other** factor would need to be kept constant? [1]

.....

(ii) How would this be achieved? [1]

.....

(iii) How could the enzyme molecule be affected if the other factor in (i) was not kept constant? [1]

.....

(b) The concentration of substrate after 15 minutes was 360 mg ml^{-1} and after 20 minutes it was 300 mg ml^{-1}. Calculate the missing value for the reaction rate under D and show your working. [1]

.....

(c) (i) At the start of the experiment was the enzyme concentration

greater

less

the same

when compared to the substrate concentration?

(Circle your choice.) [1]

(ii) Explain your choice. [2]

.....

.....

(d) The substrate concentration was doubled and the experiment was repeated. All other factors were kept constant.
In the open boxes on the table fill in the reaction rates you would expect to see. [3]

(Total 10 marks)

7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Draw a labelled diagram to show the structure of a prokaryote cell. [5]
Explain how a typical eukaryote cell differs from a prokaryote. [5]

Or *(b)* List the uses of genetic engineering.
Discuss the advantages, problems and disadvantages associated with genetic engineering, using examples where appropriate. [10]

Examiner only

(Total 10 marks)