Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	1	3	1	/	0	1	Signature	

Paper Reference(s)

6131/01

Edexcel GCE

Biology (Salters-Nuffield)

Advanced Subsidiary

Unit Test 1

Wednesday 9 January 2008 – Morning

Time: 1 hour 15 minutes

Materials required for examination
Nil

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown above. Check that you have the correct question paper.
Answer ALL questions. Write your answers in the spaces provided in this question paper.
If you need to use additional answer sheets, attach them loosely but securely inside this booklet.
Show all the steps in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
There are 6 questions in this question paper. The total mark for this question paper is 60.
There are 16 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.

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Answer ALL questions

1. (a) The photograph below shows *Daphnia* (a water flea). It is a small animal that lives in freshwater.

Magnification ×25

M. I. Walker/Science Photo Library

Daphnia has a heart which pumps fluid around its body. This fluid has a higher solute concentration than the freshwater that *Daphnia* lives in.

The table below gives four statements concerning transport in *Daphnia*. If a statement is correct, place a tick (✓) in the box to the right of that statement and if a statement is incorrect, place a cross (✗) in the box.

Statements about transport in *Daphnia*	**Tick or cross**
(i) The movement of fluid through the heart is an example of mass transport	
(ii) *Daphnia* uses diffusion to transport oxygen into muscle cells	
(iii) *Daphnia* tends to lose water to the freshwater by osmosis	
(iv) *Daphnia* can use active transport to move ions from the freshwater into its body	

(4)

Leave blank

(b) A student investigated the effect of caffeine on the heart rate of *Daphnia*. Three different *Daphnia* were used, A, B and C. The table below shows her results at the end of the investigation.

Daphnia	**Caffeine concentration/ arbitrary units**	**Duration of observation/ seconds**	**Number of heart beats counted**
A	5	10	50
A	5	10	53
A	5	10	47
B	10	10	73
B	10	10	76
B	10	10	76
C	15	10	101
C	15	10	99
C	15	10	100

(i) Calculate the mean number of heart beats **per 10 seconds** for each *Daphnia*.

Daphnia A ..... heart beats per 10 seconds

Daphnia B ..... heart beats per 10 seconds

Daphnia C ..... heart beats per 10 seconds

(1)

(ii) Use your answers from (i) above to predict the mean number of heart beats in 10 seconds for another *Daphnia* placed in a caffeine concentration of 35 arbitrary units.

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(1)

Leave blank

(iii) Suggest **three** reasons why the prediction you made for (ii) above may not be very reliable.

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2 .....

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3 .....

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(3) **Q1**

(Total 9 marks)

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2. The enzyme pectinase can be used in the commercial process of peeling oranges. In this process, the waxy (lipid) surface of the oranges is first removed. The oranges are then submerged in a solution of pectinase. This enzyme hydrolyses the polysaccharide pectin that holds the cells in the peel together.

After about 12 hours in the solution of pectinase, the orange peel falls off the oranges leaving clean segments.

(a) (i) Suggest why the waxy surface of the oranges is removed before they are submerged in pectinase.

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(2)

(ii) Explain why pectinase does not hydrolyse the cellulose found in the orange peel cell walls.

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(2)

(b) (i) Suggest why chopping up the oranges could speed up hydrolysis.

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(2)

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(ii) The pectinase shows a small increase in concentration over the 12 hours of the hydrolysis. Suggest why the concentration of the pectinase increases slightly.

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(2) **Q2**

(Total 8 marks)

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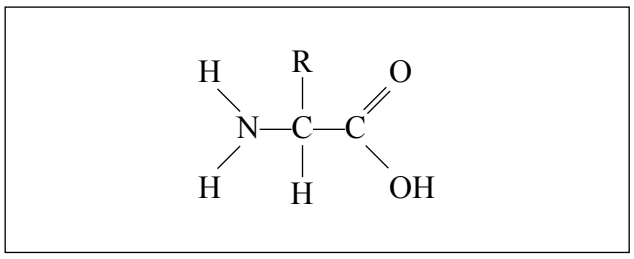
3. The average human baby consumes 800 g of milk per day during the first six months of its life.

Some babies are fed on human breast milk and some are fed on formula milk. Formula milk is made from cows' milk. The table below compares the nutritional quality of human breast milk with formula milk.

	Mass of nutrient/g per 100 g of milk	
Nutrient	**Human breast milk**	**Formula milk**
Protein	1.0	3.3
Carbohydrate	6.9	4.7
Fat	4.4	3.3
Water and minerals	87.7	88.7

(a) (i) The diagrams below show three molecules P, Q and R. Choose a nutrient **from the table above** that would provide the baby with each molecule. Put your answer on the dotted line to the right of each molecule.

Molecule P



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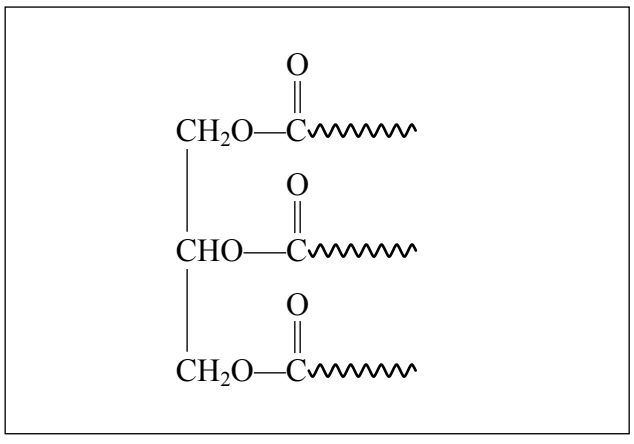
Molecule Q



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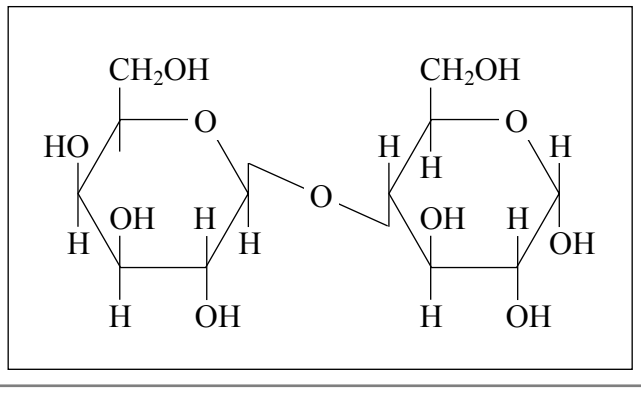
Molecule R



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(3)

Leave blank

(ii) Calculate the difference in the mass of protein consumed **per day** by an average baby fed on formula milk compared with an average baby fed on human milk. Show your working.

Answer ..... g

(2)

(b) Use your own knowledge and data from the table, to suggest and explain a reason why babies fed on formula milk are likely to put on weight more quickly than babies fed on breast milk.

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(2)

(c) There is concern that putting on weight in early life may be one cause of obesity in teenagers.

Body mass index (BMI) can be used to identify people who are obese. Describe how BMI is calculated and used to judge whether somebody is obese or not.

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(2)

Q3

(Total 9 marks)

Leave blank

4. (a) Name a component of DNA that contains nitrogen.

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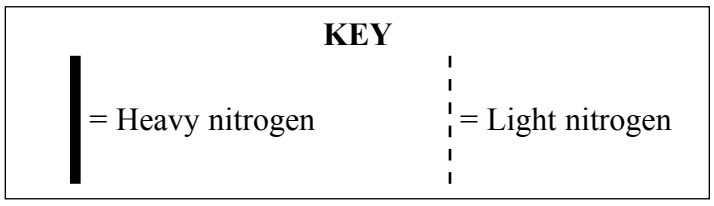
(1)

(b) When bacteria are grown in conditions containing a heavy form of nitrogen, they will incorporate the heavy nitrogen into their DNA each time DNA replication occurs. After many replications in these conditions, all the nitrogen in the bacterial DNA will be of the heavy form.

If the bacteria are then switched to conditions containing a light form of nitrogen, this will become incorporated each time DNA replication occurs.

The diagram below shows the changes in the DNA composition, over two DNA replications, after the bacteria have been transferred from conditions containing heavy nitrogen to conditions containing light nitrogen.

Complete the diagram to show the DNA composition in the third generation.



DNA before replication in light nitrogen conditions

DNA after the first replication in light nitrogen conditions

DNA after the second replication in light nitrogen conditions

DNA after the third replication in light nitrogen conditions

(2)

Leave blank

(c) Name an enzyme involved in DNA replication.

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(1)

(d) The table below shows nine bases from a DNA template strand. Complete the table by giving the corresponding bases on the complementary DNA strand.

DNA template strand	A	G	C	T	T	A	C	C	A
Complementary DNA strand									

(1)

(e) Genetic disorders, such as cystic fibrosis, are caused by mutations in the sequence of bases found in DNA.

Explain how a gene mutation may result in a protein that does not function normally.

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(5)

Q4

(Total 10 marks)

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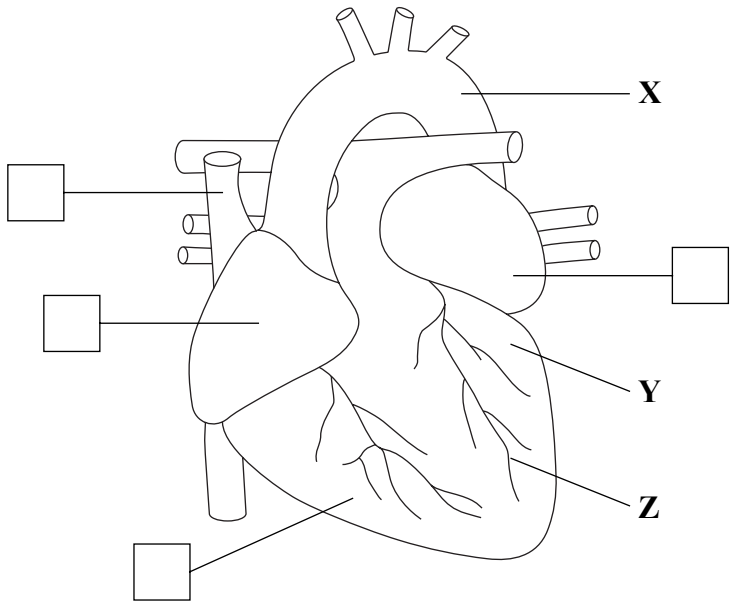
5. (a) The diagram below shows a ventral (front) external view of a mammalian heart.



(i) Name the structures labelled **X**, **Y** and **Z**.

X .....

Y .....

Z .....

Z .....

(3)

(ii) There are four boxes on the heart diagram. Place a tick (✓) in the box that correctly identifies the position where electrical activity of the heart is initiated.

(1)

(iii) Name the structure that initiates electrical activity in the heart.

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(1)

(b) Blood pressure within the heart varies throughout the cardiac cycle.

(i) Explain what is meant by the term **cardiac cycle**.

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(2)

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(ii) The table below shows the range of blood pressures found in the left ventricle and in the right ventricle during one complete cardiac cycle.

Ventricle	Blood pressure / kPa
Right	0.0 to 3.3
Left	0.0 to 15.8

Explain why the maximum blood pressure is higher in the left ventricle than in the right ventricle.

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(2)

(iii) Explain why blood pressure varies in a ventricle during the cardiac cycle.

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(2)

(c) Apart from high blood pressure, state **two** other risk factors for heart disease.

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(1)

Q5

(Total 12 marks)

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6. All cells have a cell surface membrane. It contains many different molecules and its structure has been described as a fluid mosaic.

(a) Explain the term **fluid mosaic**.

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(2)

(b) Glycoproteins and phospholipids are molecules found in cell surface membranes.

(i) Give **one** function of a glycoprotein.

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(1)

(ii) Describe the structure of a phospholipid molecule.

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(3)

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(c) Cholesterol is an important component of many cell surface membranes.

Diagram A is an annotated diagram of a cholesterol molecule. Using your knowledge of the properties of phospholipids, draw **one** cholesterol molecule in an appropriate position in the phospholipid bilayer on diagram B.

Diagram A

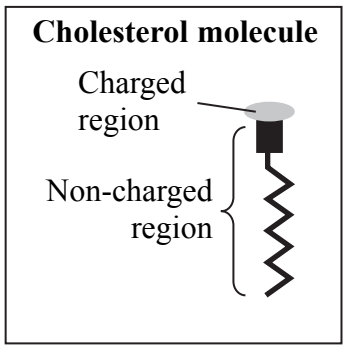
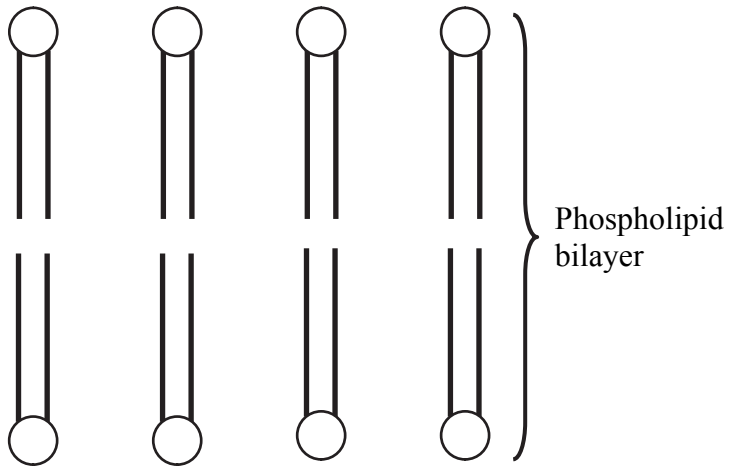


Diagram B



(2)

(d) Cholesterol is also found in the blood. Different types of lipoprotein are involved in transporting cholesterol in blood.

Describe how the different types of **lipoproteins** can affect the health of the body.

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(4)

Q6

(Total 12 marks)

TOTAL FOR PAPER: 60 MARKS

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