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| Candidate Name | Centre Number | Candidate Number |
| | | 2 |



GCE AS/A level

1074/01

New A2

BIOLOGY/HUMAN BIOLOGY - BY4

P.M. MONDAY, 25 January 2010

1³/₄ hours

| For Examiner's use only | | |
|-------------------------|--------------|--------------|
| Question | Maximum Mark | Mark Awarded |
| 1 | 16 | |
| 2 | 12 | |
| 3 | 16 | |
| 4 | 12 | |
| 5 | 14 | |
| 6 | 10 | |
| Total | 80 | |

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.

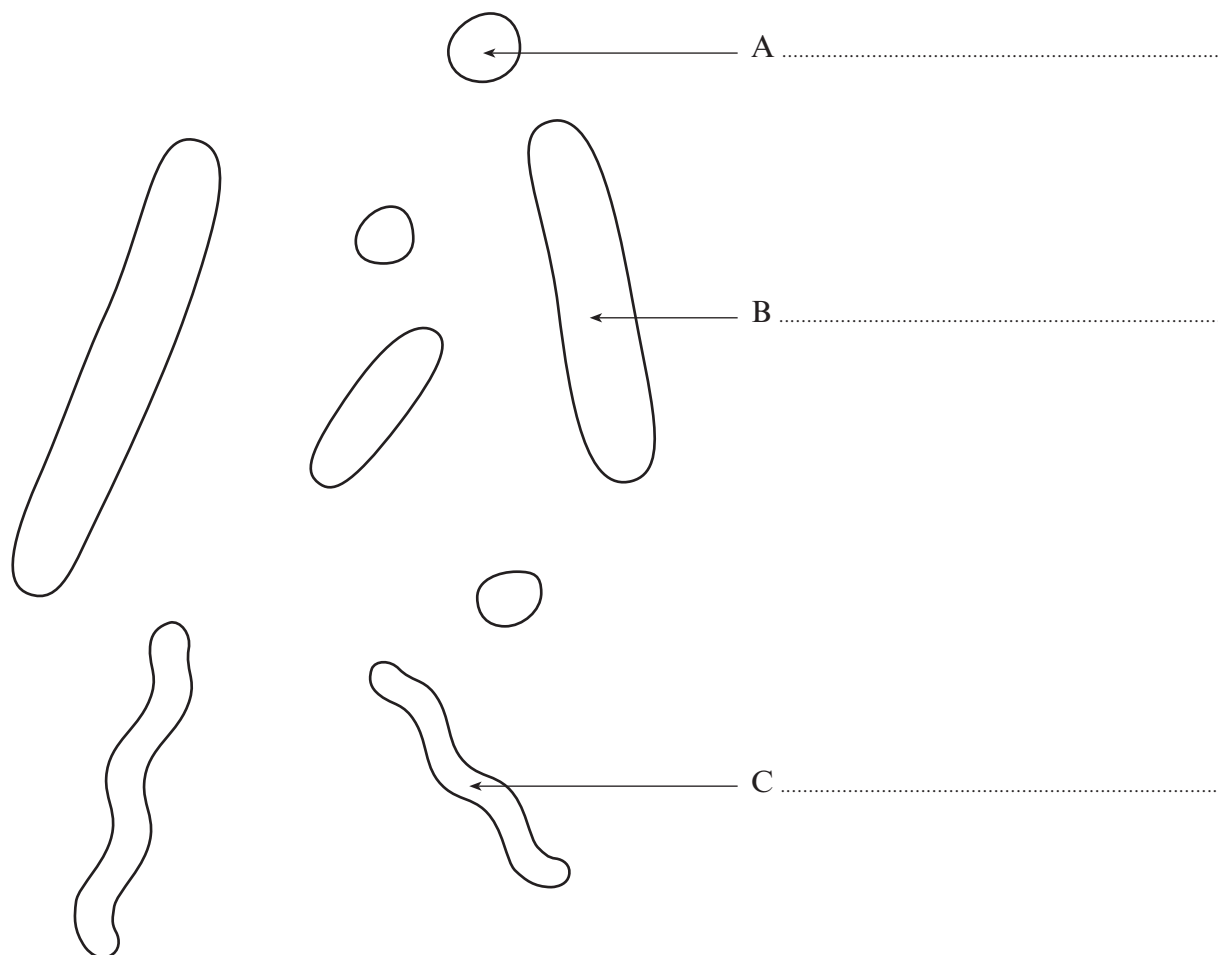
INFORMATION FOR CANDIDATES

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.

1. (a) Bacteria can be classified according to their shape. The diagram below shows some of the types of bacteria found in the mouth.



On the diagram give the **names** of the types of bacteria labelled A - C. [3]

- (b) Before staining all bacteria are colourless. Complete the table to show the final colours expected when using the Gram staining technique on Gram negative and Gram positive bacteria. [2]

| <i>Type of bacterium</i> | <i>Colour after Gram staining</i> |
|--------------------------|-----------------------------------|
| Gram positive | |
| Gram negative | |



- (c) Some bacteria are described as facultative anaerobes and some as obligate anaerobes. State the difference between these two types of bacteria. [2]

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- (d) (i) Correct handling techniques have to be used when culturing bacteria on sterile agar plates to prevent contamination of the plates and the environment. Complete the bullet points below to give **four** *other* methods which you would use to prevent contamination when plates were being inoculated. [4]

- Disinfect the bench.
- Wash hands.
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- (ii) The plates are secured with adhesive tape and incubated at 25°C. Explain why the plates should **not** be:

I sealed completely from the air; [1]

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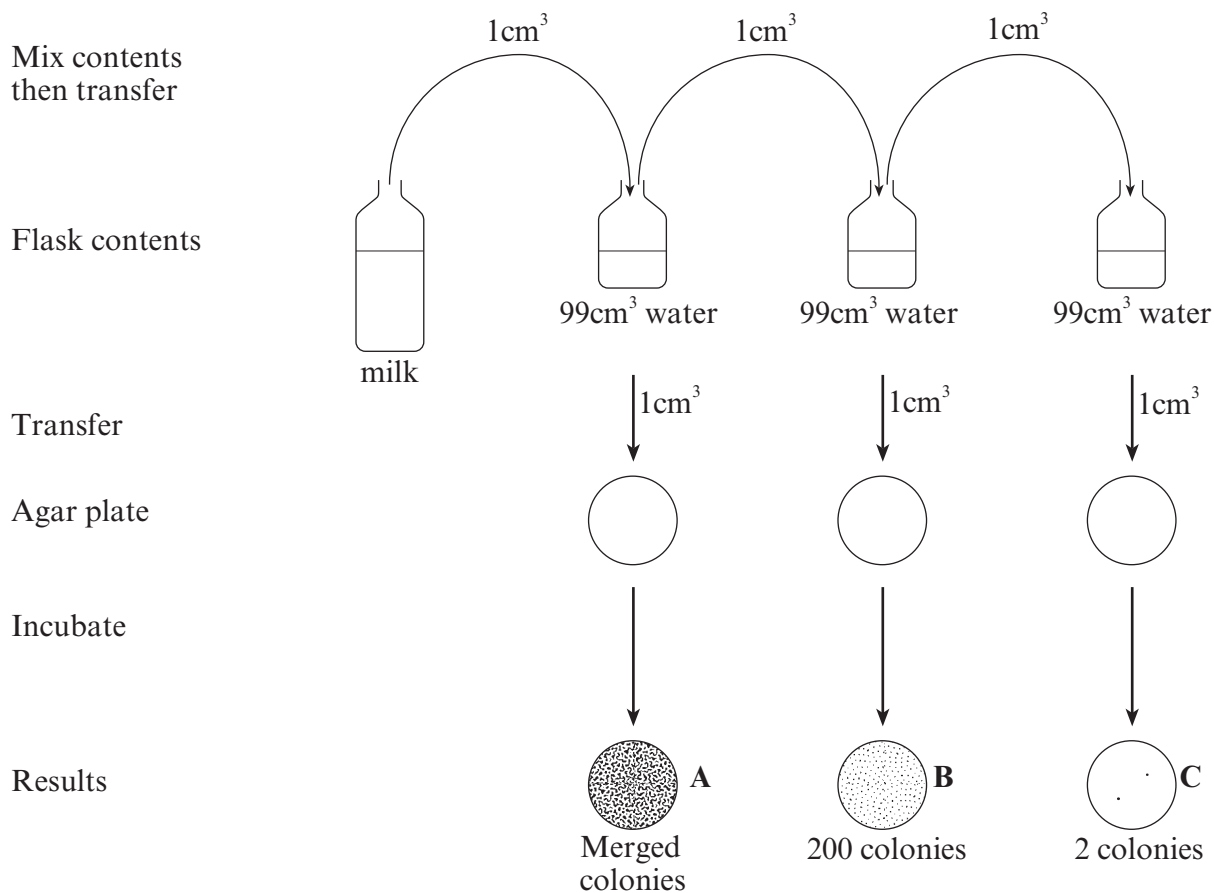
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II incubated at 37°C. [1]

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(e) The following method was used to calculate the number of bacteria in milk.



(i) Explain why plate **B** is used to calculate the number of bacteria per cm^3 of milk. [1]

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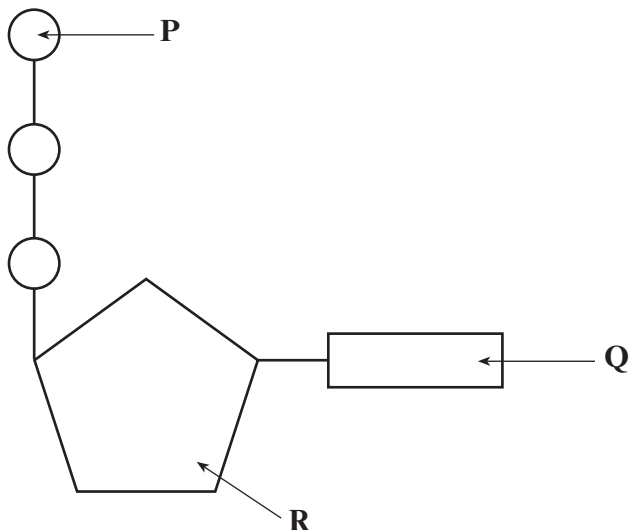
(ii) Using the figures shown in the diagram, calculate the number of bacteria per cm^3 in milk. [2]

Answer

(Total 16 marks)



2. The diagram below represents the structure of ATP.



(a) Name the parts of the molecule P, Q and R.

[3]

P

Q

R

(b) (i) ATP is often described as the ‘universal energy currency’. Explain why it is described in this way.

[2]

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(ii) Give **three** advantages of ATP for its function as a source of energy.

[3]

1

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2

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3

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(c) Describe and explain how a parasite, such as the pork tapeworm, which lives in **anaerobic** conditions in the human gut can produce ATP. [4]

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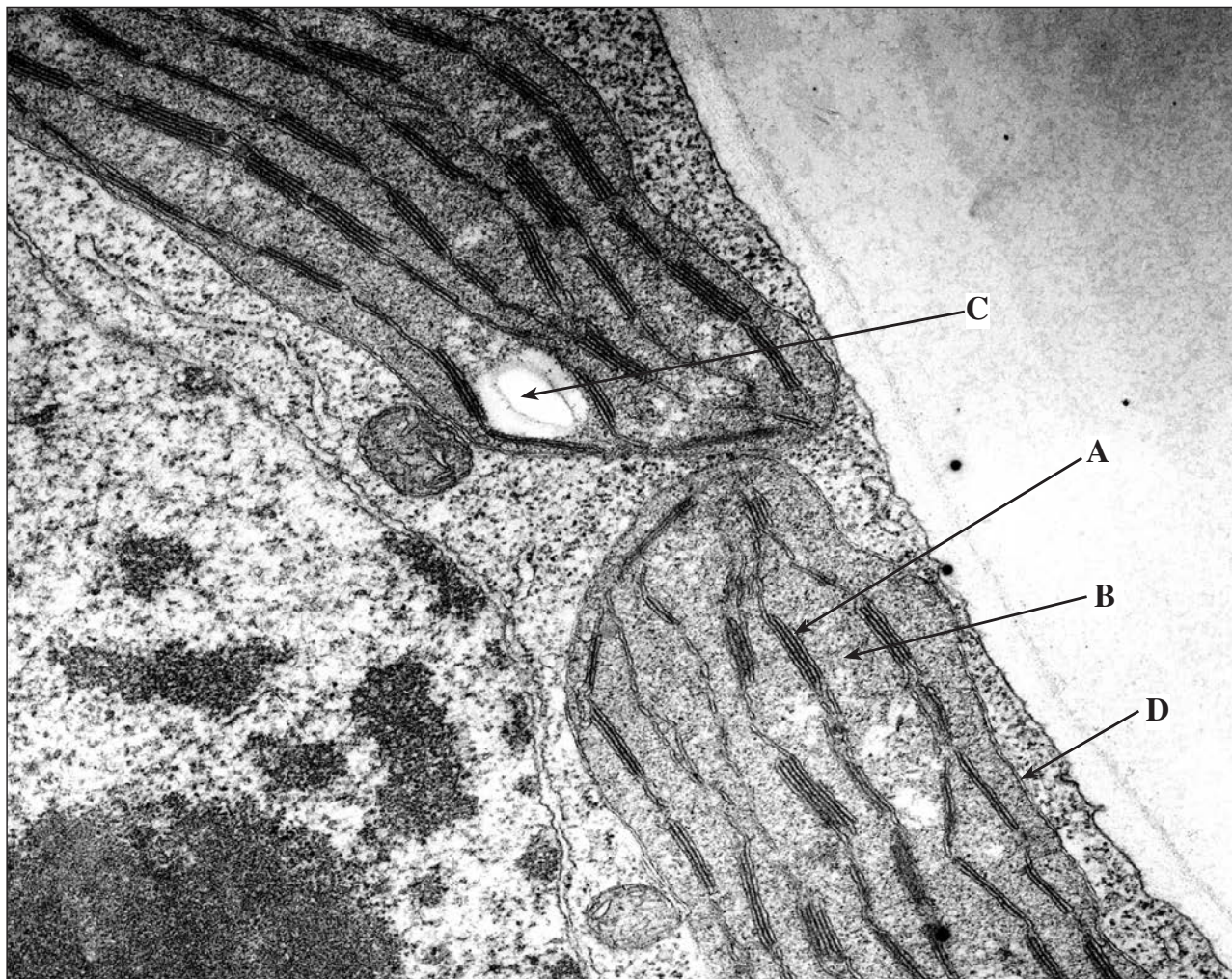
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(Total 12 marks)

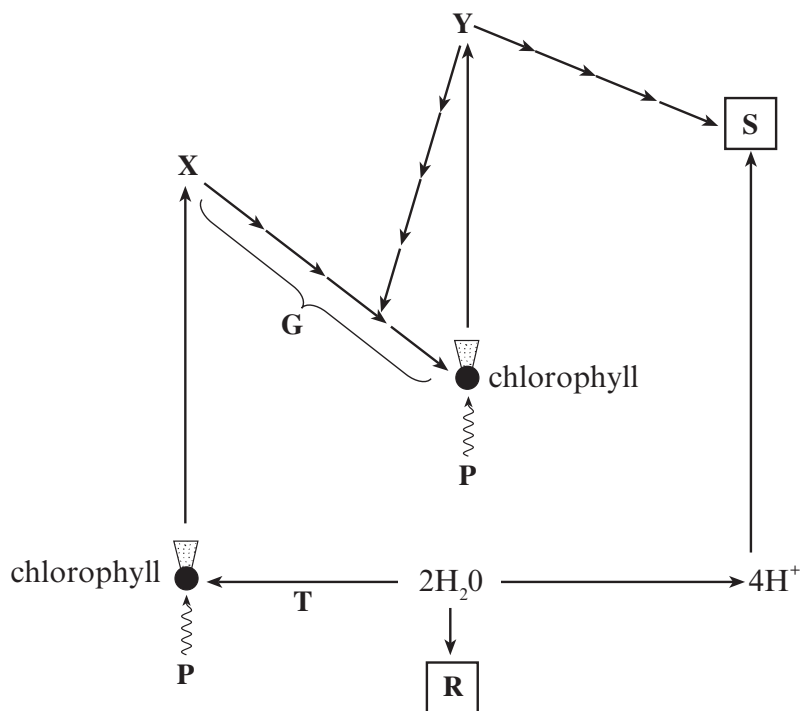
3. (a) The electron micrograph shows a section through two chloroplasts.



Using the letters on the electron micrograph, complete the following table. You may use the same letter once, more than once or not at all. [5]

| <i>Area</i> | <i>Letter</i> |
|--|---------------|
| where chlorophyll is found. | |
| where carbon dioxide is reduced to a hexose sugar. | |
| where oxygen is produced from water. | |
| where there is a high concentration of ribulose 1-5 biphosphate Carboxylase (RuBisCo). | |
| containing the polysaccharides amylose and amylopectin. | |

(b) A representation of the light stage of photosynthesis is shown below.



(i) What is represented by the arrows labelled **P**? [1]

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(ii) What is the general name given to the structures **X** and **Y**? [1]

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(iii) Briefly explain what is happening in the process labelled **G**. [1]

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(iv) What is represented by **R**? [1]

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(v) What is represented by **S**? [1]

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(vi) What process is represented by the arrow labelled **T**? [1]

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(c) Atrazine is a commonly used weedkiller. It prevents non-cyclic photophosphorylation from taking place. Using your knowledge of the light independent stage of photosynthesis, explain why its use leads to the death of a plant. [5]

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(Total 16 marks)

4. (a) Synapses are found in both the nervous system of vertebrates and in the nerve nets of invertebrates.

State **three** functions of a synapse.

[3]

1

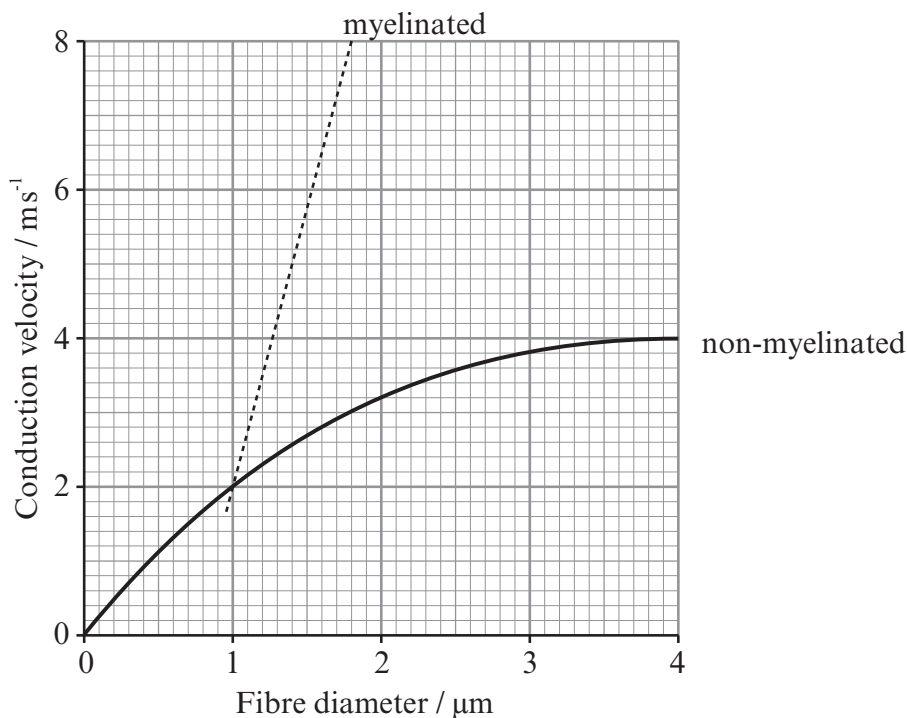
2

3

- (b) Complete the table to show **two** differences between the structure or functioning of the neurones in a vertebrate and in the nerve net found in organisms such as jellyfish (Cnidarians). [2]

| <i>Neurones in a vertebrate</i> | <i>Neurones in the jellyfish nerve net</i> |
|---------------------------------|--|
| | |
| | |

(c) The graph shows the relationship between fibre diameter and the conduction velocity in myelinated and non-myelinated neurones in the cat.



(i) Using the information on the graph, describe the relationship between fibre diameter and speed of conduction in myelinated and non-myelinated neurones.

[3]

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(ii) Suggest why myelinated fibres are never less than 1.0 μm in diameter.

[1]

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(iii) Suggest **three** ways in which organisms have been able to speed up the rate of conduction of the nerve impulse.

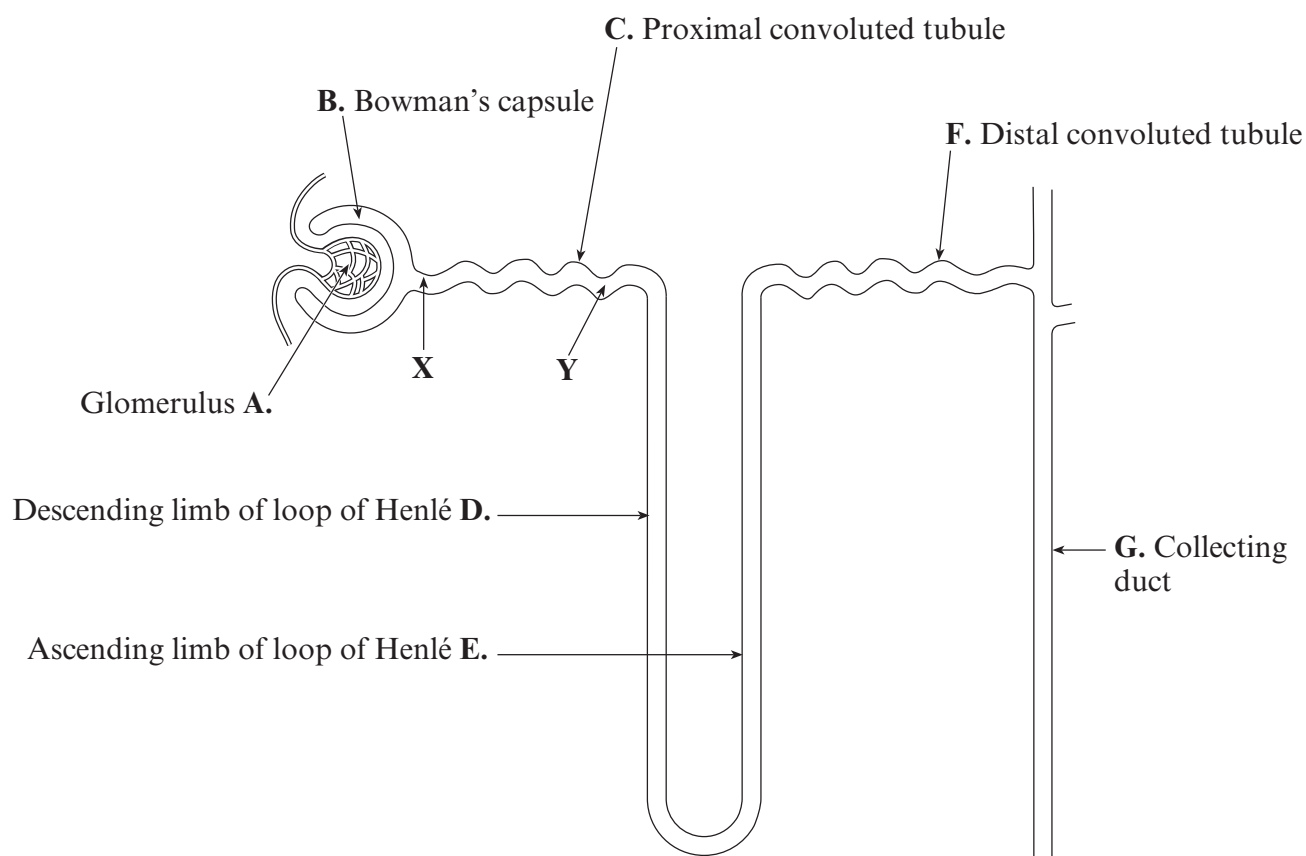
[3]

1

2

3

5. (a) The diagram below is of a kidney nephron.



- (i) In which region of the kidneys is the Bowman's capsule found? [1]

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- (ii) Explain why the urea concentration is higher in the region labelled Y than it is in the region labelled X. [1]

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- (iii) Match any of the letters A-G from the diagram with the statements shown in the following table. [4]

| <i>Statement</i> | <i>Letter(s)</i> |
|--|------------------|
| Main site of selective reabsorption | |
| Areas involved in ultrafiltration | |
| Sodium ions actively pumped from this region | |
| Anti diuretic hormone acts on this region | |

- (iv) The water potential of the blood changes as it passes through the glomerulus and the water potential of the filtrate changes as it passes along the nephron. Using a tick (✓), complete the table below to show if the water potential increases or decreases as it passes along each of the regions labelled in the diagram. [4]

| <i>flowing along region</i> | <i>water potential increasing</i> | <i>water potential decreasing</i> |
|-----------------------------|-----------------------------------|-----------------------------------|
| A | | |
| C | | |
| D | | |
| E | | |

- (b) The Kangaroo rat, *Dipodomys spectabilis*, is found in desert regions of North America. It does not drink water and feeds on dry seeds and other dry plant material. It produces very little urine.

- (i) Explain how the kidney of this mammal is adapted to reduce the volume of urine produced. [2]

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- (ii) Suggest how desert animals are able to obtain water from dry seeds. [2]

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(Total 14 marks)

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