OCR
Oxford Cambridge and RSA

Monday 8 June 2015 – Afternoon

A2 GCE BIOLOGY

F214/01 Communication, Homeostasis and Energy

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

* 4 8 3 7 0 1 0 3 4 6 *

* F 2 1 4 0 1 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 **(a)** Fig. 1.1 is a diagram representing a three-dimensional view of a chloroplast.

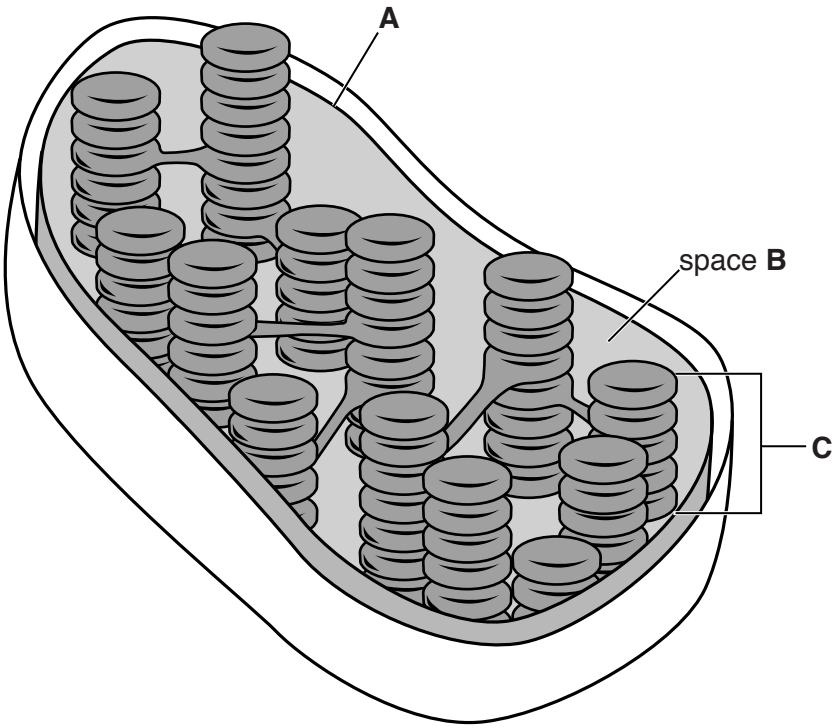

Fig. 1.1

(i) Name parts **A** to **C** in Fig. 1.1.

A .....

B .....

C ..... **[3]**

(ii) Describe **two** ways in which the structure of part **C** is adapted to its function.

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..... **[2]**

(iii) A key aspect of photosynthesis is the metabolic pathway involving carbon dioxide.

Place a tick (✓) in the appropriate box to indicate the part of the chloroplast (**A**, **B** or **C**) in which the metabolic pathway involving carbon dioxide is located.

A	
B	
C	

[1]

(b) Fig. 1.2 shows the theoretical and actual relationship between light intensity and the rate of photosynthesis.

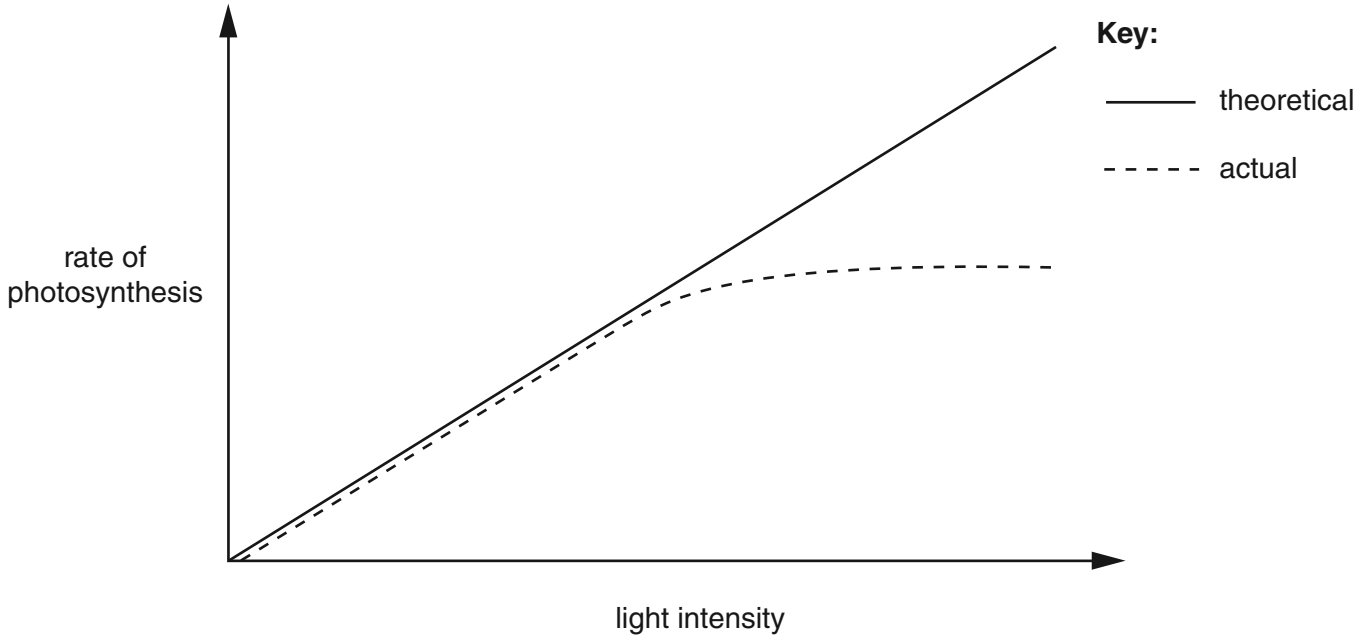

Fig. 1.2

With reference to the biochemistry of photosynthesis, explain why the theoretical rate of photosynthesis is **not** achieved at higher light intensities.

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..... **[2]**

(c) Plants are usually adapted to living in conditions of different light intensities.

The rate of photosynthesis at different light intensities for two different species of plant was investigated. The results are shown in Fig. 1.3.

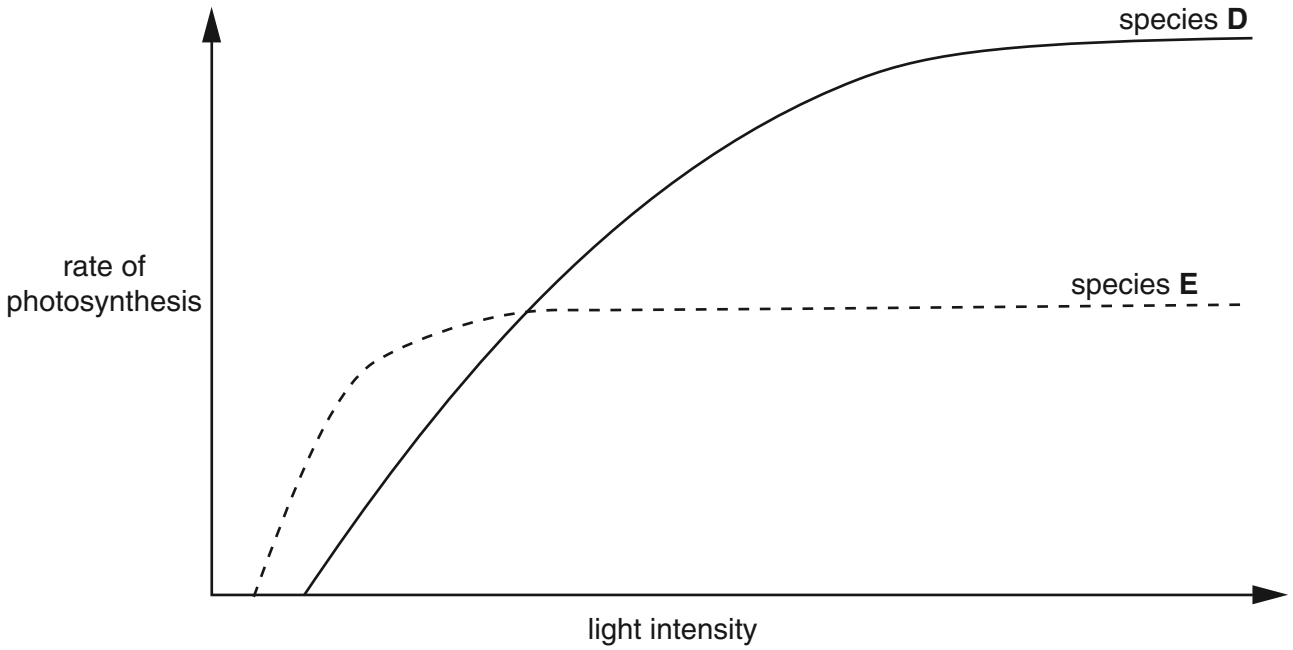

Fig. 1.3

(i) Using the information in Fig. 1.3, explain which of the two species, **D** or **E**, is better adapted to living in **shady** conditions.

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..... **[2]**

(ii) The leaf of a plant that is adapted to living in shade will differ from the leaf of a plant that is adapted to living in sunlight.

Suggest **one** way in which the **structure** of these leaves will differ.

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..... **[1]**

(d) Plants are autotrophs. Most other organisms are heterotrophs.

Outline the ways in which heterotrophic organisms are dependent on plants.

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..... **[3]**

[Total : 14]

2 Within the mammalian body, different systems of communication are used to coordinate and control activities.

(a) Complete the following passage by using the **most suitable** term in each case.

The pancreas and the adrenal glands are both examples of ..... glands. Adrenaline is a ..... that is secreted by the adrenal glands. These glands also secrete steroids such as corticosteroids from cells in the ..... region. The chemicals secreted by these glands are transported by the blood to their ..... cells and tissues. **[4]**

(b) Insulin is secreted from the beta cells of the pancreas in response to increased blood glucose concentration.

Fig. 2.1 is a diagram representing the sequence of events leading to the secretion of insulin from the beta cell.

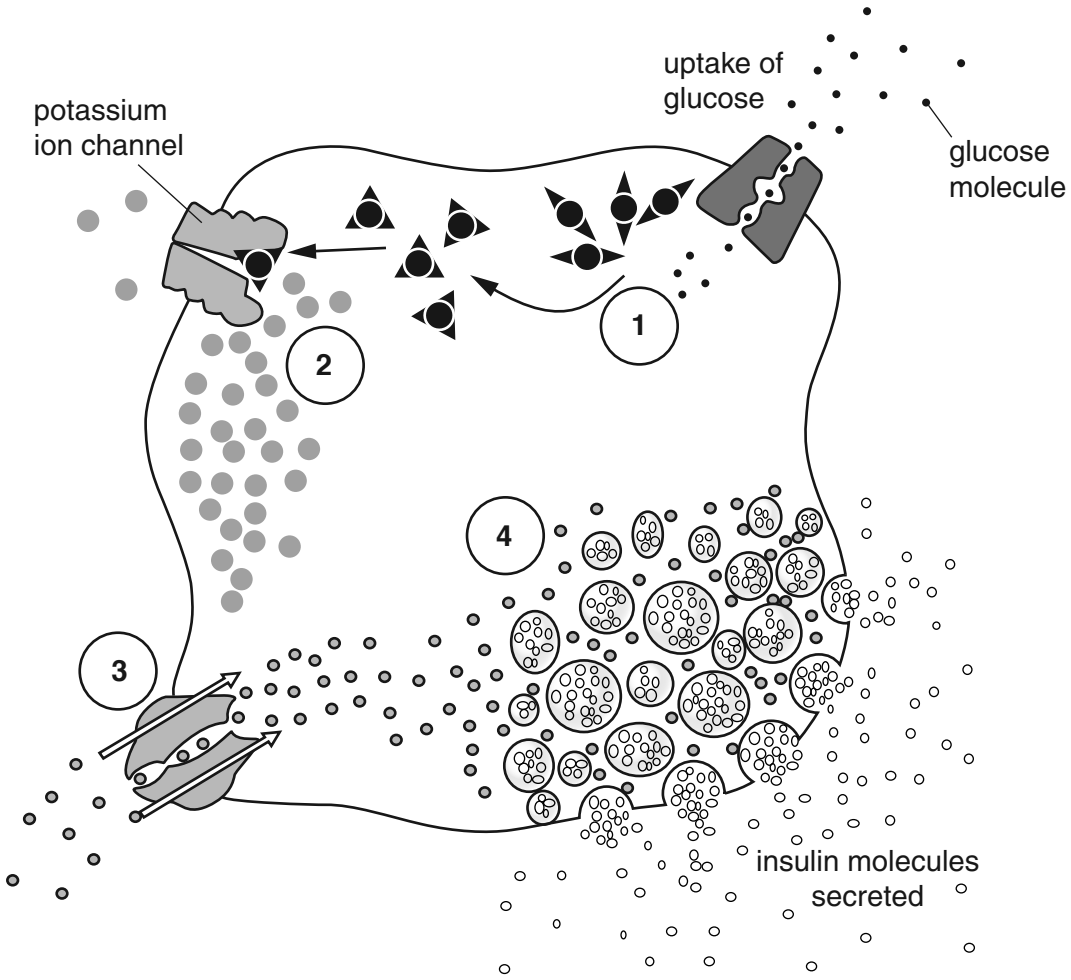

Fig. 2.1

(i) With reference to Fig. 2.1, describe the events occurring at the stages labelled **1** to **4**.

1 .....

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2 .....

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3 .....

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4 .....

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..... **[4]**

(ii) After the initial release of insulin from the beta cell, insulin secretion continues even when there is no further glucose intake.

Suggest and explain why the cell continues to secrete insulin.

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..... **[2]**

[Total : 10]

3 **(a)** Fig. 3.1 is a diagram representing a mitochondrion located in the cytoplasm of an animal cell.

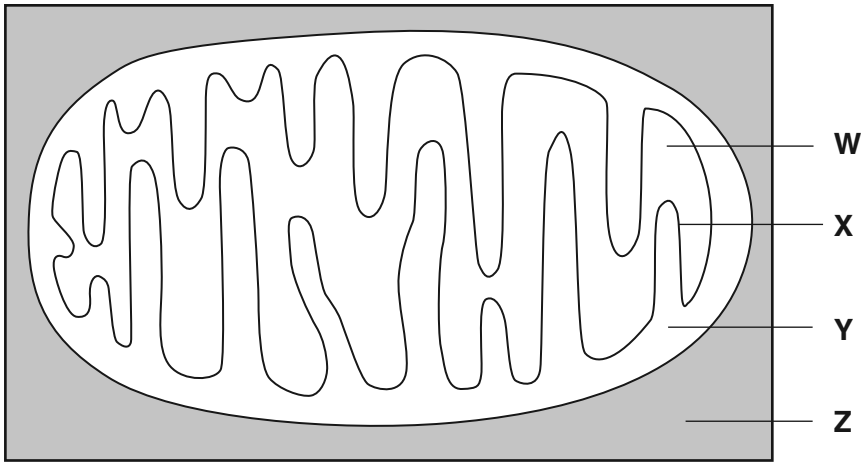

Fig. 3.1

(i) Use the letters **W** to **Z** to identify the region in Fig. 3.1 where each of the following occurs.

You may use each letter once, more than once or not at all.

link reaction .....

glycolysis .....

electron transport chain .....

Krebs cycle ..... **[4]**

(ii) Why does aerobic respiration yield fewer molecules of ATP than the theoretical maximum?

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..... **[2]**

(b) Explain why the incomplete breakdown of glucose in **anaerobic** respiration produces less ATP than aerobic respiration.

In your answer, you should use appropriate technical terms, spelled correctly.

[5]

[Total : 11]

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4 Kidney failure is a serious condition. Many kidney patients receive some form of renal replacement therapy (RRT) such as dialysis.

The UK Renal Registry collects national data about the causes and treatment of kidney failure.

(a) Table 4.1 shows the number of adult patients who started RRT in the UK in 2011. The table also shows the estimated population of each country in the UK and the incidence rate of RRT in each country.

The incidence rate is the number of adult patients starting RRT in 2011 per million people.

Country	**Number of adults starting RRT in 2011**	**Estimated population in 2011 (millions)**	**Incidence rate (per million people)**
England	5774	53.0	109
Northern Ireland	203	1.8	113
Scotland	495	5.3	
Wales	363	3.1	117
UK	6835	63.2	108

Table 4.1

Using the data in Table 4.1, calculate the missing value for the incidence rate of adult patients starting RRT in **Scotland** in 2011.

incidence rate = ... **[2]**

(b) Fig. 4.1 shows the mean percentage of adult patients in the UK starting renal replacement therapy (RRT) in 2011 who were male and the age groups to which they belonged.

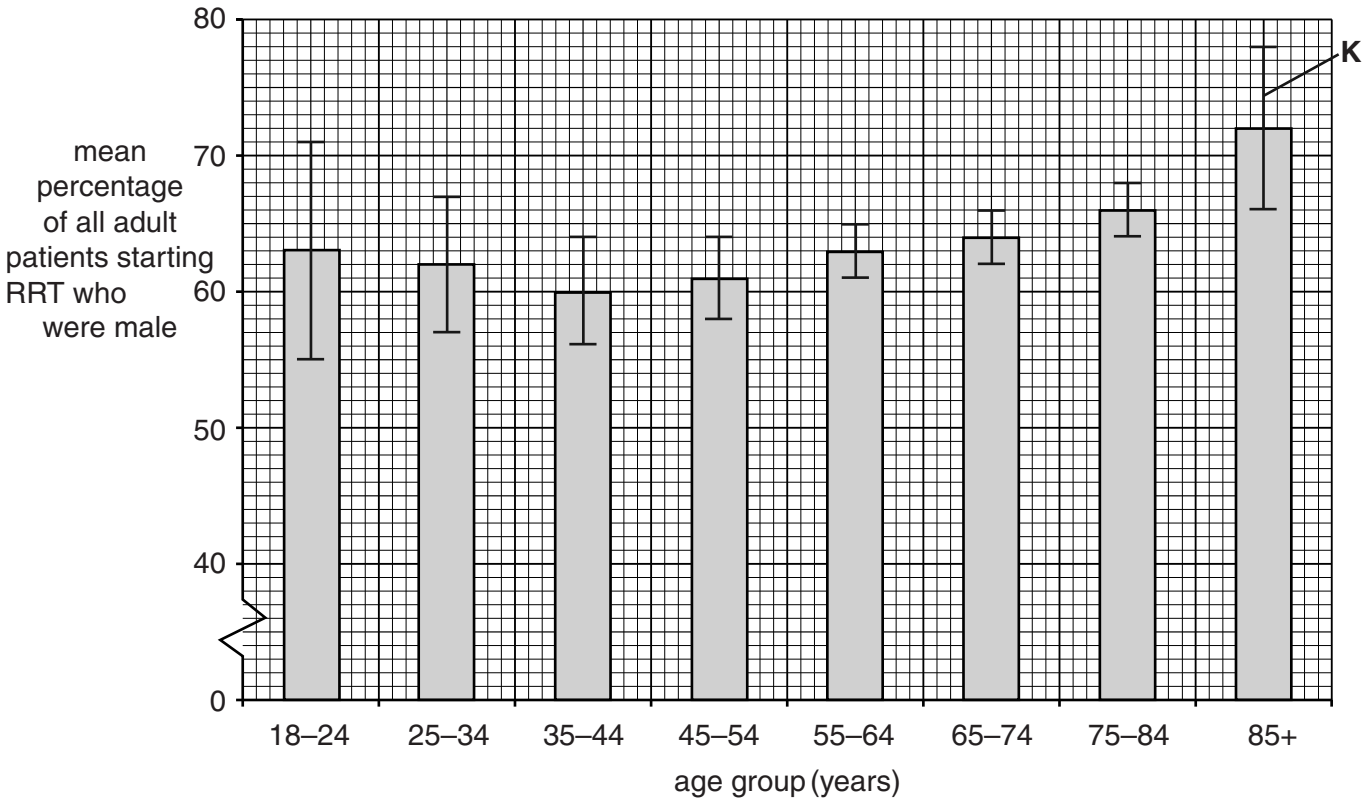

Fig. 4.1

(i) State the name given to the feature indicated by the letter **K** on Fig. 4.1.

..... **[1]**

(ii) What information can be deduced from the data in Fig. 4.1 about the gender of adult patients starting RRT in 2011?

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..... **[2]**

(c) Many causes of kidney failure can be diagnosed.

Table 4.2 shows the percentage of patients starting RRT in 2011 who were diagnosed with different causes of kidney failure. The percentages are given for patients belonging to two different age groups, and for patients of all age groups.

Cause of kidney failure	Patients with kidney failure (%)		
	Aged below 65 years	Aged 65 + years	All age groups
Diabetes	27.2	22.4	24.80
Glomerulonephritis	17.4	9.2	13.30
Pyelonephritis	7.8	6.5	7.15
Hypertension	6.7	7.4	7.05
Polycystic kidney	10.6	3.8	7.20
Renal vascular disease	2.3	11.5	6.90
Other causes	16.0	16.6	16.30
Uncertain diagnosis	12.0	22.6	17.30

Table 4.2

(i) Suggest why 'uncertain diagnosis' occurs more often in the group of patients aged 65+ years compared with the group below 65 years of age.

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..... **[1]**

(ii) Identify the cause of kidney failure with the **most significant** increase in the group of patients aged 65+ years compared with the group below 65 years of age.

Justify your answer.

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..... **[1]**

(d) The main forms of RRT use dialysis. Most patients receiving dialysis have haemodialysis using a dialysis machine. However, the number of people receiving another form of dialysis, peritoneal dialysis, is increasing.

Fig. 4.2 represents the procedure of peritoneal dialysis. Some of the key points of this procedure are listed below.

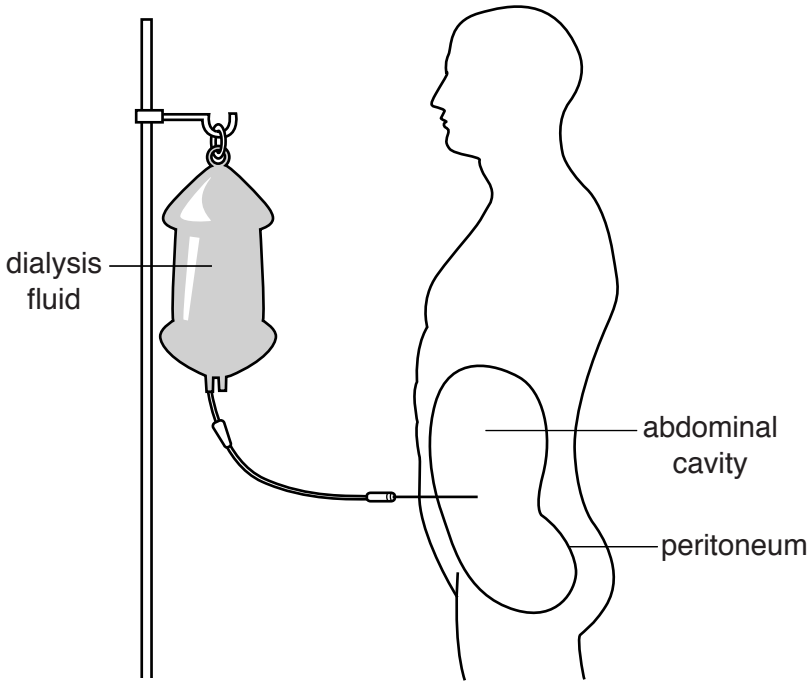

Fig. 4.2

- The peritoneum is a membrane that lines the abdominal cavity and is well supplied with blood capillaries.
- The peritoneum acts as a surface across which waste can be removed.
- The dialysis fluid, containing the sugar dextrose, fills the abdominal cavity.
- The fluid remains in the abdominal cavity for 4 to 6 hours.
- The fluid is then drained from the abdominal cavity and thrown away.
- The procedure usually needs to be done four times each day.

(i) How might the peritoneum differ in its **function** from the artificial membrane in a dialysis machine used in haemodialysis?

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..... **[1]**

(ii) Why does the dialysis fluid used in peritoneal dialysis contain dextrose solution rather than water alone?

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..... **[2]**

(iii) Suggest why patients receiving peritoneal dialysis usually need to have the peritoneal dialysis fluid replaced four times a day, but those receiving haemodialysis only need treatment three times a week.

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..... **[2]**

(e) One function of healthy kidneys is to make the hormone erythropoietin (EPO), which stimulates the production of red blood cells. Patients with kidney failure may need to be given supplements of EPO.

State the type of cell from which red blood cells are formed **and** where this type of cell is located.

type of cell .....

location ..... **[1]**

[Total : 13]

5 **(a)** Outline the ways in which the **structures** of a sensory neurone and a motor neurone are **similar**.

In your answer, you should use appropriate technical terms, spelled correctly.

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..... **[4]**

(b) The table below lists a number of statements about the functions of neurones. Indicate whether each statement refers to:

- sensory neurones only (**S**)
- motor neurones only (**M**)
- sensory **and** motor neurones (**B**).

Statement	**S** or **M** or **B**
Have a resting potential of approximately –70 mV	**B**
Transmit nerve impulses from the CNS	
Connect to other neurones via synapses	
Connect to effectors	

[3]

(c) The presence of a pathogen in the body can cause a fever. During a fever, the body's thermoregulatory set-point (normal body temperature) rises.

(i) Fever is accompanied by sweating.

Explain the effect that this sweating will have on the body.

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..... **[2]**

(ii) Another feature of fever may be uncontrollable shivering.

Suggest why shivering occurs during fever.

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..... **[1]**

(d) Hypothermia is a condition in which the body's core temperature is lowered. Hypothermia can affect people who take part in outdoor activities in winter without wearing suitable clothing.

Some people think that alcohol should be given to those who have hypothermia, as it makes them feel warmer. Alcohol causes vasodilation.

Explain why it is **not** a good idea to give alcohol to someone with hypothermia.

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..... **[2]**

[Total : 12]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.