AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.5.3 HORMONAL COORDINATION IN HUMANS (PACK 2)

SCORE	PERCENTAGE
/227	%

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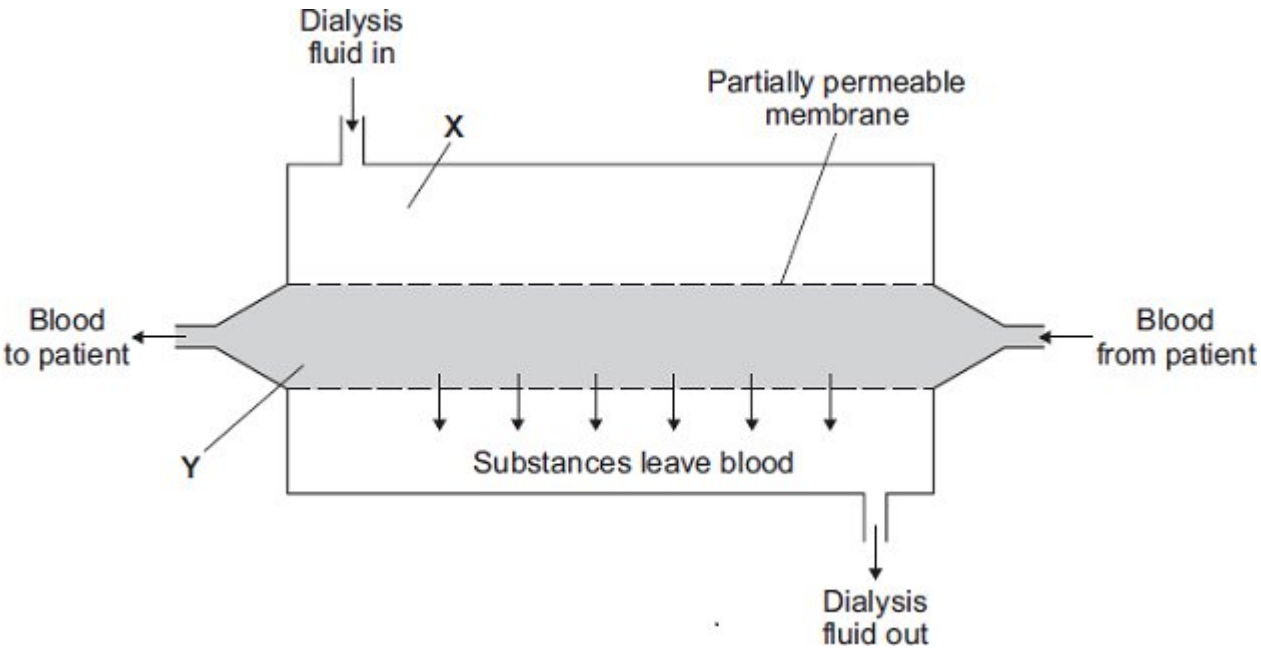
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Q1.

People with kidney disease may be treated by dialysis.

The diagram shows a dialysis machine.



(a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(i) This person lost mass mainly because [salt / urea / water] was removed from the blood.

(1)

(ii) This substance was able to pass through the partially permeable membranes because its molecules are [large. / round. / small.]

(1)

(iii) The concentration of sodium ions at **X** is 3.15 grams per dm^3.

At the end of a dialysis session, the most likely concentration of sodium ions

[0.00]

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at **Y** would be | 3.15 / 6.30 | grams per dm^3.

(1)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment		Cost per year in pounds
Dialysis		30 000
Kidney transplant:		
	operation + first year's medical care	51 000
	medical care in each further year	5 000

(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is the dialysis treatment? _____ pounds

(1)

(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years **3 years** **4 years**

(1)

(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is it necessary to suppress the immune system ?

_____

_____

(1)

(Total 6 marks)

Q2.

Urine consists of water, ions and other substances such as urea.
Urine is formed in the kidney by filtering the blood.
The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

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Substance	Diameter of molecule in nanometres
A	10 to 20
B	1
C	0.6
D	0.5
E	0.2

Use information from the table and your own knowledge to answer the questions.

(a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein? ☐

(1)

(ii) Protein is **not** found in the urine of a healthy person.

Explain why.

_____

_____

_____

_____

_____

_____

(2)

(b) Substance **B** is **not** found in the urine of a healthy person.
Suggest an explanation for this.

_____

_____

_____

_____

_____

_____

(2)

(c) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

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Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.
The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but haemoglobin can be found in the urine of a person with haemolytic anaemia.

Explain why.

(3)

(Total 8 marks)

Q3.

The number of cases of Type 2 diabetes in the UK is increasing rapidly.

(a) Describe how insulin and glucagon help control the blood sugar concentration in a healthy person.

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_____

_____

(6)

(b) What is Type 2 diabetes?

_____

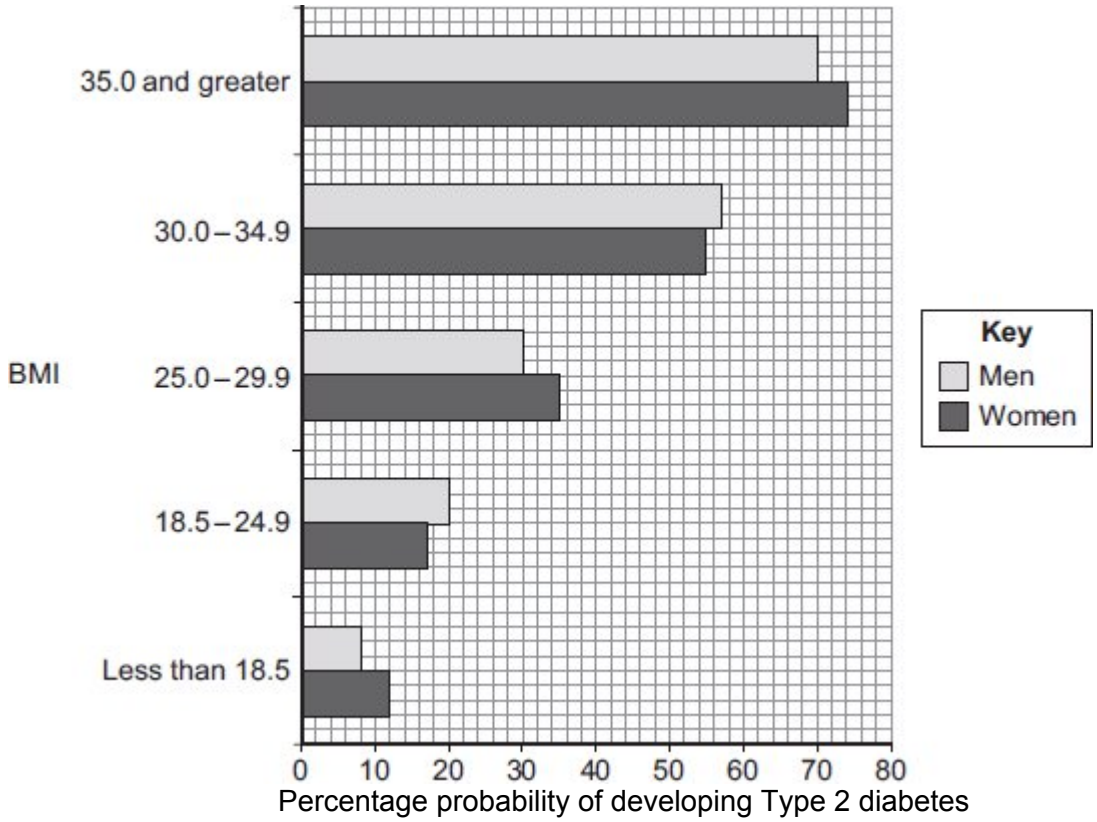
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(1)

(c) Body mass index (BMI) is a person's body weight divided by the square of his or her height.

(i) **Graph 1** shows the relationship between BMI and the percentage probability of developing Type 2 diabetes.

Graph 1



Suggest an explanation for the relationship between BMI and the risk of developing Type 2 diabetes.

_____

_____

_____

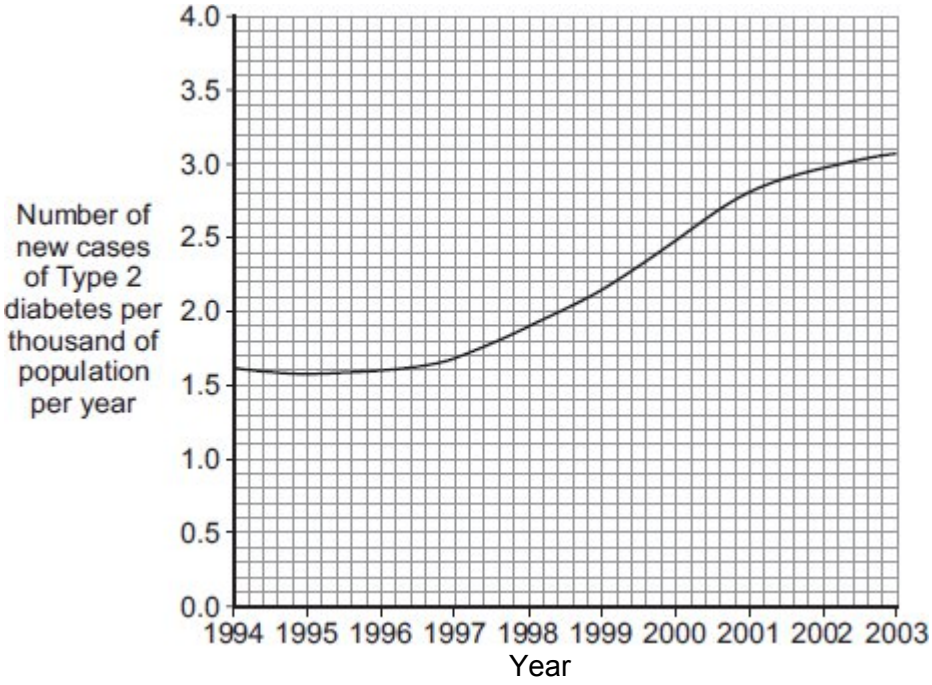
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(2)

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(ii) **Graph 2** shows changes in the number of new cases of Type 2 diabetes in the UK.

Graph 2



Suggest explanations for the trend shown by the data in **Graph 2**.

_____

_____

_____

_____

_____

_____

(3)

(Total 12 marks)

Q4.

One factor that may affect body mass is *metabolic rate*.

(a) (i) What is meant by *metabolic rate* ?

_____

_____

(1)

(ii) Metabolic rate is affected by the amount of activity a person does.

Give **two** other factors that may affect a person's metabolic rate.

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1. _____

_____

2. _____

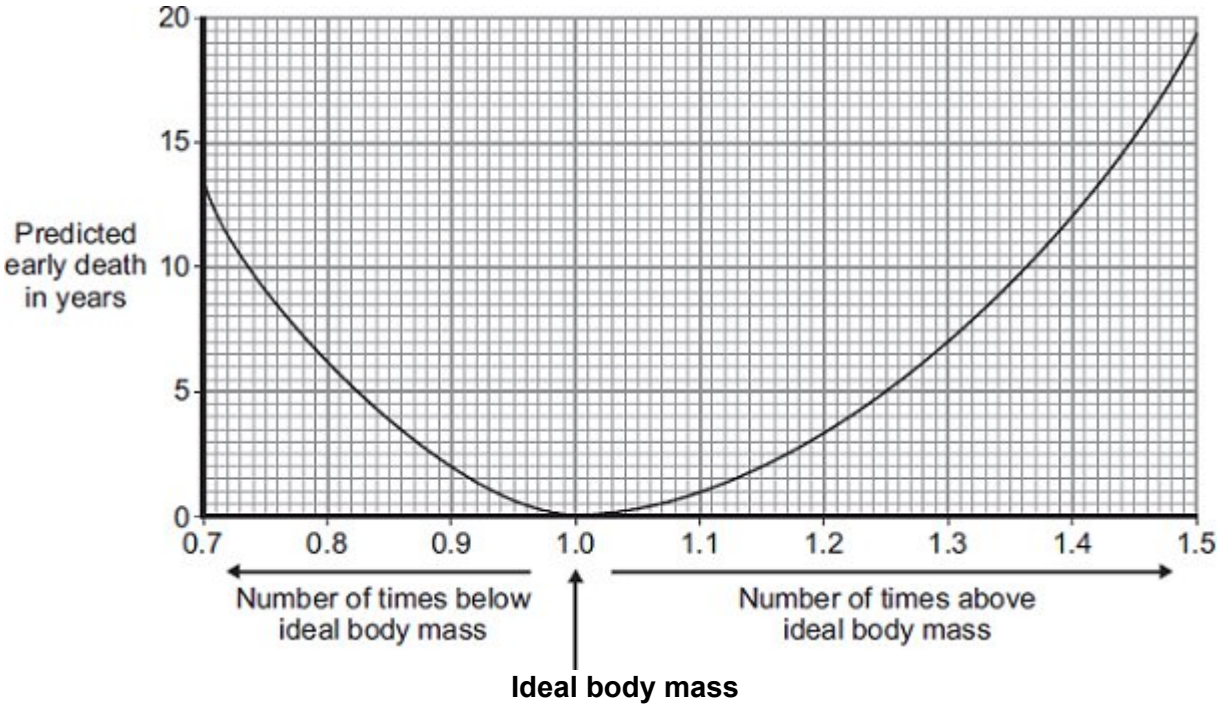
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(2)

(b) Predicted early death is the number of years that a person will die before the mean age of death for the whole population. The predicted early death of a person is affected by their body mass.

Scientists have calculated the effect of body mass on predicted early death.

The graph shows the results of the scientists' calculations.



The number of times above or below ideal body mass is given by the equation:

$$\frac{\text{Actual body mass}}{\text{Ideal body mass}}$$

In the UK the mean age of death for women is 82.

A woman has a body mass of 70 kg. The woman's ideal body mass is 56 kg.

(i) Use the information from the graph to predict the age of this woman when she dies.

_____

_____

_____

Age at death = _____ years

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(2)

(ii) The woman could live longer by changing her lifestyle.

Give **two** changes she should make.

1. _____

_____

2. _____

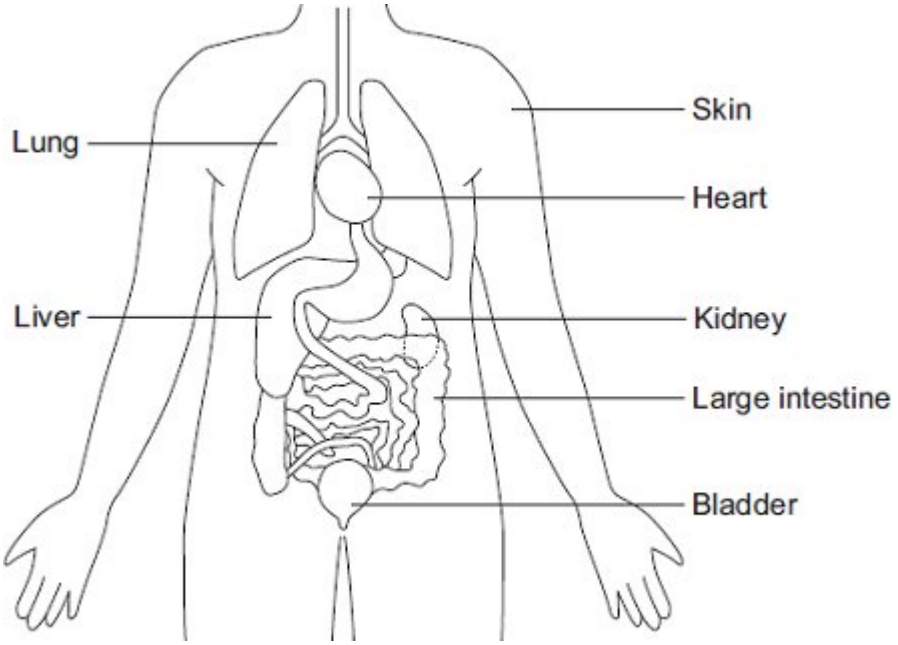
_____

(2)

(Total 7 marks)

Q5.

The diagram shows some of the organs of the human body.



(a) Which organ labelled on the diagram:

(i) produces urine _____

(1)

(ii) stores urine _____

(1)

(iii) produces urea _____

(1)

(iv) gets rid of carbon dioxide _____

(1)

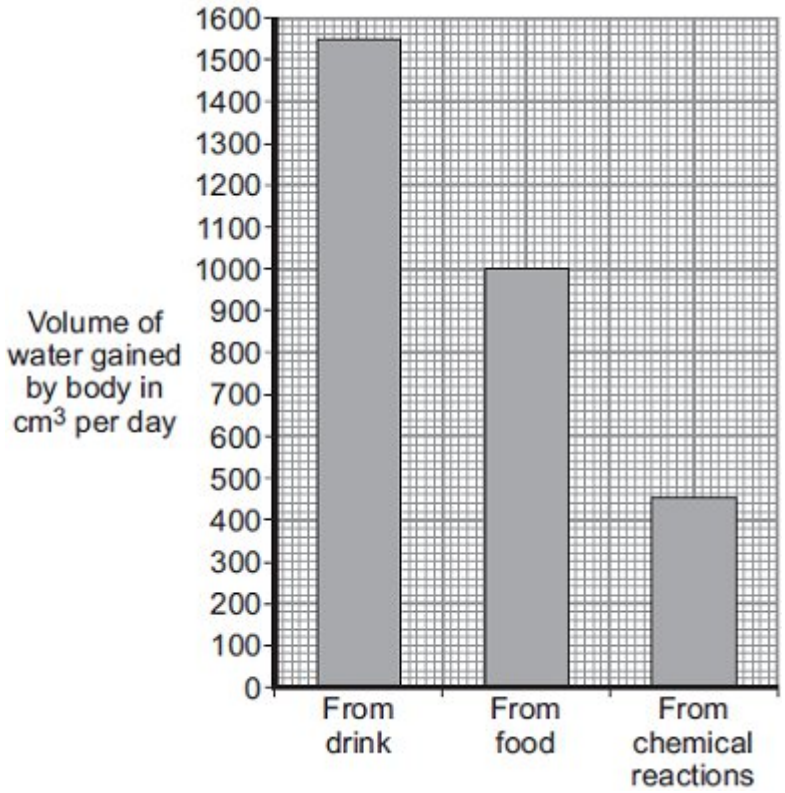
(v) helps to control body temperature? _____

(1)

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(b) **Bar chart 1** shows the volume of water the human body gains each day.

Bar chart 1



(i) Calculate the total volume of water the body gains each day.

_____

_____

_____

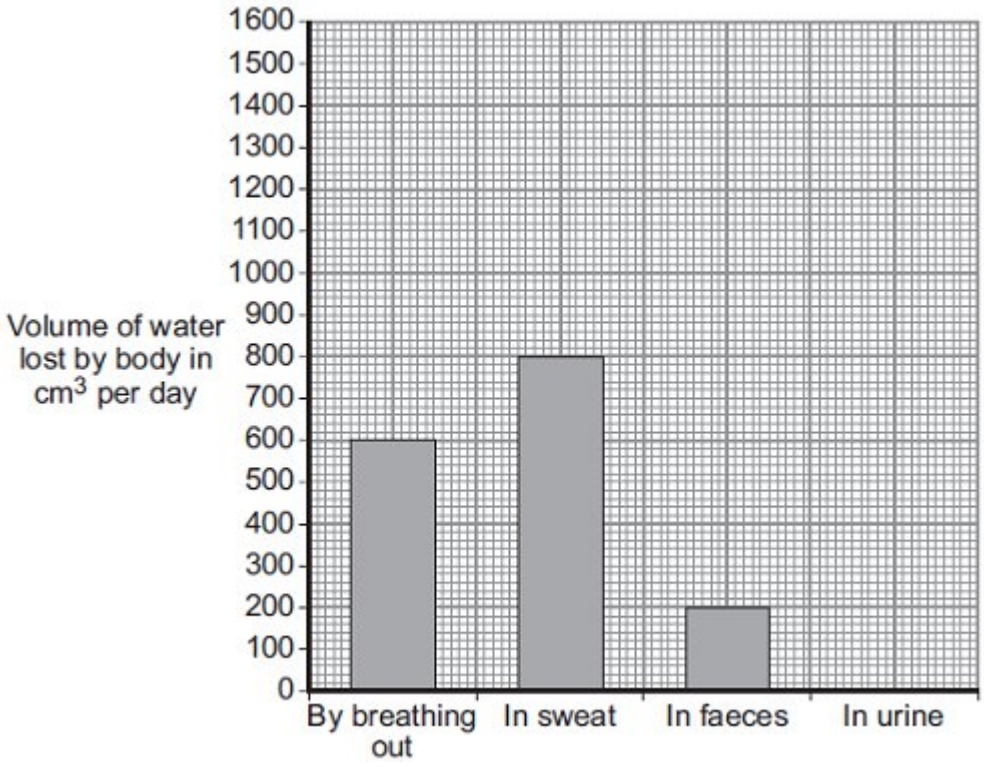
Total volume of water gained = _____ cm^3

(2)

Bar chart 2 shows the volume of water lost each day by breathing out, in sweat and in faeces.

Bar chart 2

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Water lost by body

(ii) Calculate the total volume of water lost each day by breathing out, in sweat and in faeces.

_____

_____

Volume = _____ cm^3

(1)

(iii) The volume of water the body loses must balance the volume of water the body gains.

Use your answers to part (b)(i) and part (b)(ii) to calculate the volume of water lost in urine.

_____

_____

Volume of water lost in urine = _____ cm^3

(1)

(iv) Plot your answer to part (b)(iii) on **Bar chart 2**.

(1)

(v) After taking some types of recreational drugs, the kidneys produce very little urine.

What happens to the body cells if the kidneys produce very little urine?

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_____

_____

(1)

(Total 11 marks)

Q6.

Type 1 diabetes develops when the body does not produce enough insulin.

(a) Which organ produces insulin?

_____

(1)

(b) One treatment for diabetes is to inject insulin.

The table gives the properties of four different types of insulin, **A**, **B**, **C** and **D**.

Type of insulin	Time taken for the insulin to begin to work in minutes	Time taken for insulin to reach maximum concentration in the blood in minutes	Time when insulin is no longer effective in hours
A	15-20	30-90	3-4
B	30-60	80-120	4-6
C	120-240	360-600	14-16
D	240-360	600-960	18-20

(i) Some people with diabetes need to inject insulin just before a meal to stop a big increase in blood sugar concentration.

Which type of insulin, **A**, **B**, **C** or **D**, should these people with diabetes inject just before a meal?

_____

Give the reason for your answer.

_____

_____

(2)

(ii) A person with diabetes is told to inject type **B** insulin immediately after breakfast at 09.00.
The person with diabetes is told to then inject a second type of insulin at lunchtime at 12.00.
The second type of insulin should keep the blood sugar level under control for the rest of the 24 hours.

Which type of insulin, **A**, **C** or **D**, should this person with diabetes inject at lunchtime?

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_____

Give the reason for your answer.

_____

_____

(2)

(iii) Apart from injecting insulin, give **one** other way in which Type 1 diabetes can be controlled.

_____

(1)

(Total 6 marks)

Q7.

The pancreas and the liver are both involved in the control of the concentration of glucose in the blood.

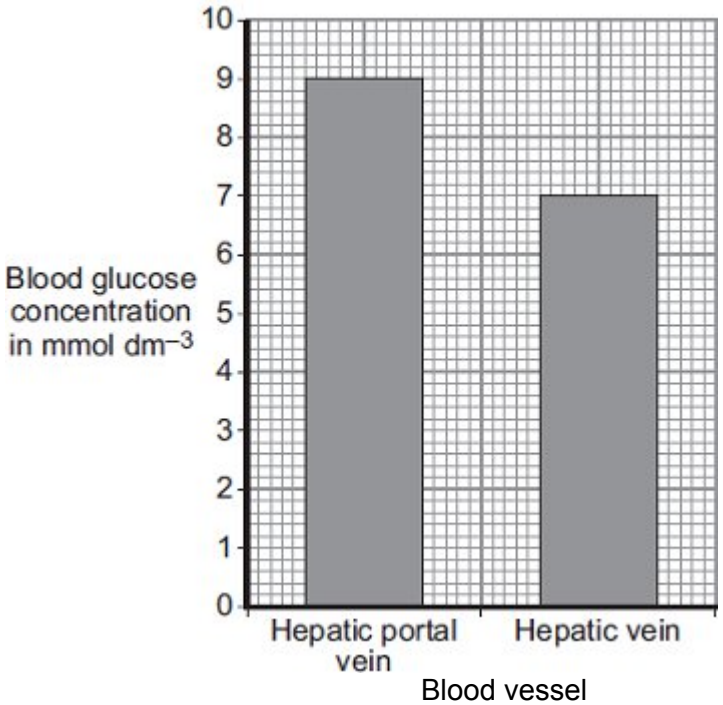
The liver has two veins:

- the hepatic portal vein taking blood from the small intestine to the liver
- the hepatic vein taking blood from the liver back towards the heart.

Scientists measured the concentration of glucose in samples of blood taken from the hepatic portal vein and the hepatic vein. The samples were taken 1 hour and 6 hours after a meal.

Graph 1 shows the concentration of glucose in the two blood vessels 1 hour after the meal.

Graph 1



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(a) The concentration of glucose in the blood of the two vessels is different.
Explain why.

_____

_____

_____

_____

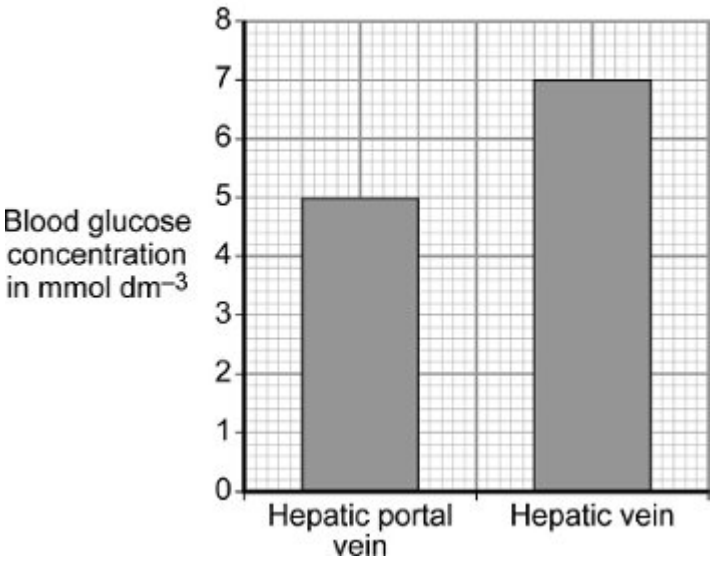
_____

_____

(3)

(b) **Graph 2** shows the concentration of glucose in the two blood vessels 6 hours after the meal.

Graph 2



(i) The concentration of glucose in the blood in the hepatic portal vein 1 hour after the meal is different from the concentration after 6 hours.

Why?

_____

_____

(1)

(ii) The person does **not** eat any more food during the next 6 hours after the meal.

However, 6 hours after the meal, the concentration of glucose in the blood in the hepatic vein is higher than the concentration of glucose in the blood in the hepatic portal vein.

Explain why.

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_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q8.

The human body produces many hormones.

(a) (i) What is a *hormone*?

_____

_____

(1)

(ii) Name an organ that produces a hormone.

_____

(1)

(iii) How are hormones transported to their target organs?

_____

(1)

(b) Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

_____

_____

_____

_____

_____

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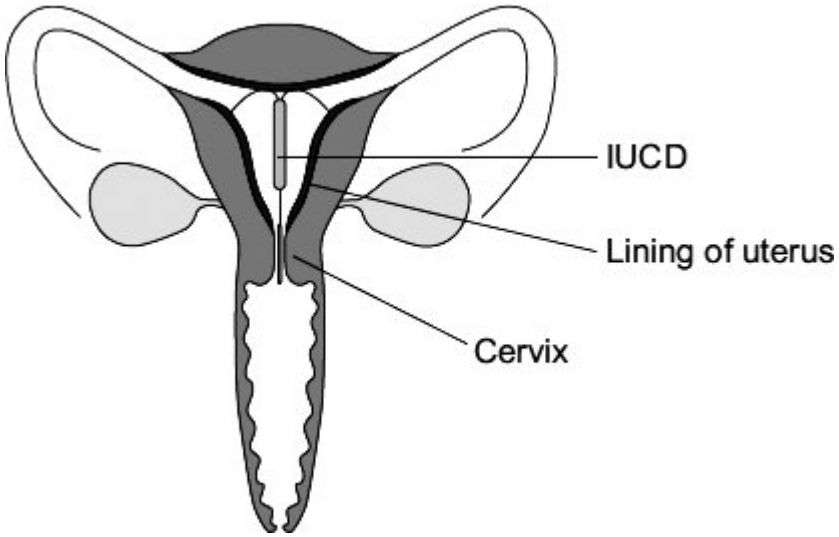
(3)

(Total 6 marks)

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Q9.

The diagram shows an intra-uterine contraceptive device (IUCD).



The IUCD is put inside the uterus (womb). The IUCD contains a hormone. The hormone diffuses directly into the uterus. The supply of hormone in the IUCD lasts for about five years.

The hormone works by:

- causing the cervix to produce a thick plug of mucus
- causing the lining of the uterus to become very thin.

For every 1000 women using the IUCD for one year about 2 women become pregnant. There are about 10 pregnancies for every 1000 women using the contraceptive pill for one year.

Evaluate the use of the IUCD compared with the contraceptive pill.

Use the information in this question and your own knowledge and understanding.

Remember to give a conclusion to your evaluation.

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_____

_____

(Total 4 marks)

Q10.

Diabetes is a disease in which a person's blood glucose concentration may rise.

Doctors give people drugs to treat diabetes.

The table shows some of the side effects on the body of four drugs, **A, B, C** and **insulin,** used to treat diabetes.

Drug	Side effects on the body
A	Weight loss Liver, kidney and heart damage Feeling of sickness
B	Weight gain Damage to some cells in pancreas
C	More water is kept in the body Weight gain Increased chance of bone breakage in women
Insulin	A little more water is kept in the body Weight gain Increased risk of lung damage

(a) Which drug, **A, B, C** or **insulin,** is most likely to result in an increase in blood sugar concentration in some people?

Explain your answer.

Drug _____

Explanation

_____

_____

(2)

(b) (i) Drugs **A, B and C** can be taken as tablets.

The chemicals in the tablets are absorbed into the blood from the digestive system.

Insulin is a protein.

Insulin **cannot** be taken as a tablet.

Why?

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_____

(1)

(ii) Other than using drugs, give **two** methods of treating diabetes.

1. _____

2. _____

(2)

(Total 5 marks)

Q11.

Doctors use dialysis to treat patients with kidney failure.

The table shows the sizes of molecules of some of the substances found in blood plasma.

Substance	Size of molecule in arbitrary units
Water	18
Sodium ion	23
Urea	60
Glucose	180
Albumin (a blood protein)	68 000

(a) Use information from the table to answer the questions.

(i) Albumin is a blood protein. Albumin is **not** removed from the blood during dialysis.

Explain why.

_____

_____

_____

_____

(2)

(ii) During a dialysis session, one patient's body mass decreased by 2 kilograms.

This decrease was mainly due to removal from the blood of one of the substances in the table.

Which substance was this? _____

(1)

(iii) The substance you named in part (a)(ii) was able to pass through the dialysis membrane.

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Draw a ring around the correct answer to complete the sentence.

The substance passed through because the

membrane was

impermeable.
partially permeable.
surrounded by capillaries.

(1)

(b) For most patients, a kidney transplant is better than continued treatment using dialysis.

Kidney transplants have some disadvantages.

Give **two** disadvantages of kidney transplants.

1. _____

_____

2. _____

_____

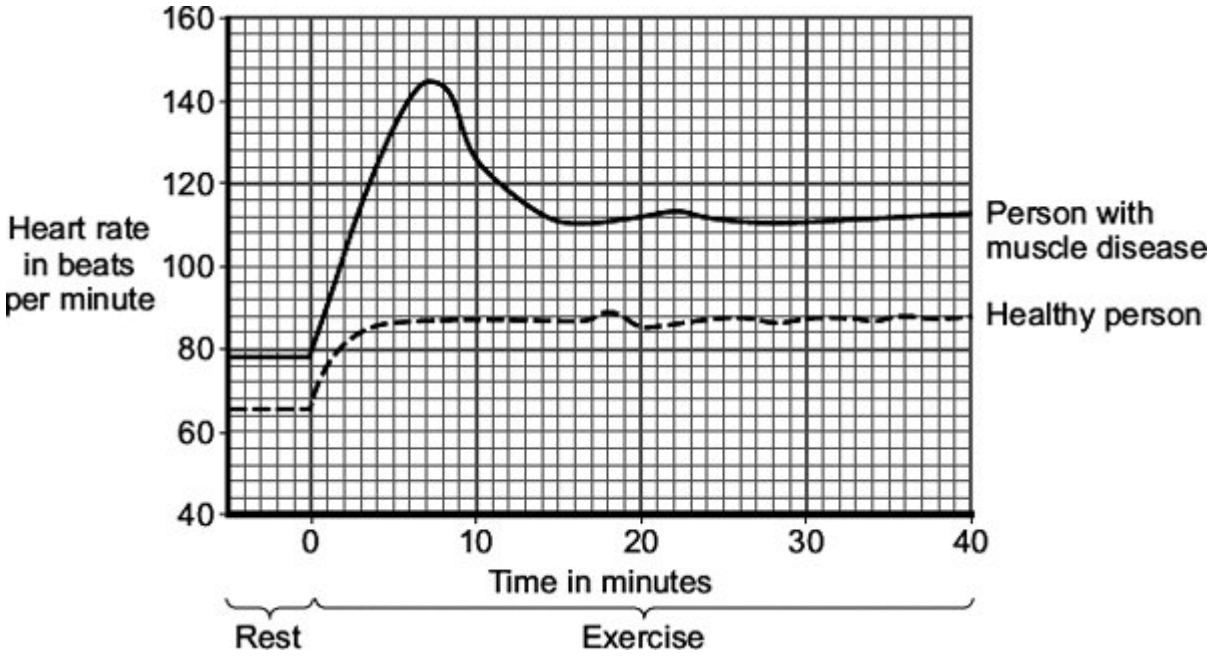
(2)

(Total 6 marks)

Q12.

Two people did the same amount of gentle exercise on an exercise cycle.
One person had a muscle disease and the other had healthy muscles.

The graph shows the effect of the exercise on the heart rates of these two people.



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(a) Describe **three** ways in which the results for the person with the muscle disease are different from the results for the healthy person.

To gain full marks in this question you need to include data from the graph in your answer.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) The blood transports glucose to the muscles at a faster rate during exercise than when a person is at rest.

(i) Name **one** other substance that the blood transports to the muscles at a faster rate during exercise.

_____

(1)

(ii) People with the muscle disease are not able to store glycogen in their muscles.

The results shown in the graph for the person with the muscle disease are different from the results for the healthy person.

Suggest an explanation for the difference in the results.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q13.

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Use your knowledge of how the kidney works to answer the following questions.

(a) Blood plasma contains mineral ions, glucose, urea and proteins.

Explain why urine contains mineral ions and urea, but **no** glucose or protein.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) A man ate and drank the same amounts of the same substances and he did the same amount of exercise on two different days. On one of the two days the weather was hot and on the other day the weather was cold.

The man's urine contained a higher concentration of mineral ions and urea on the hot day than on the cold day.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

Q14.

Thalidomide is a drug that was developed in the 1950s.
In the 1950s some pregnant women took thalidomide to prevent morning sickness during pregnancy.

Today, thalidomide is **not** used to prevent morning sickness.

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(a) (i) Give **one** medical use of thalidomide, today.

_____

_____

(1)

(ii) Today, before a woman is given thalidomide, she is

- checked to see if she is pregnant
- told to use two different methods of contraception at the same time.

Give the reason why:

the woman is checked to see if she is pregnant

_____

_____

the woman is told to use two different methods of contraception at the same time

_____

_____

(2)

(b) The information is about two types of contraceptive pill used by women.

Combined pill

- contains two hormones
- is taken for 21 days, then no pills are taken for 7 days
- > 99 % effective at preventing pregnancy
- increases chance of headaches
- increases chance of breast cancer
- decreases chance of cancer of the ovary

Mini-pill

- contains one hormone
- must be taken at the same time every day
- < 99 % effective at preventing pregnancy
- increases chance of breast cancer

(i) Which **two** hormones does the combined pill contain?

Draw a ring around **two** answers.

LH **oestrogen** **progesterone** **FSH**

(2)

(ii) Give **two** advantages of taking the combined pill and **not** the mini-pill.

_____

_____

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_____

_____

(2)

(iii) Give **one** advantage of taking the mini-pill and **not** the combined pill.

_____

_____

(1)

(Total 8 marks)

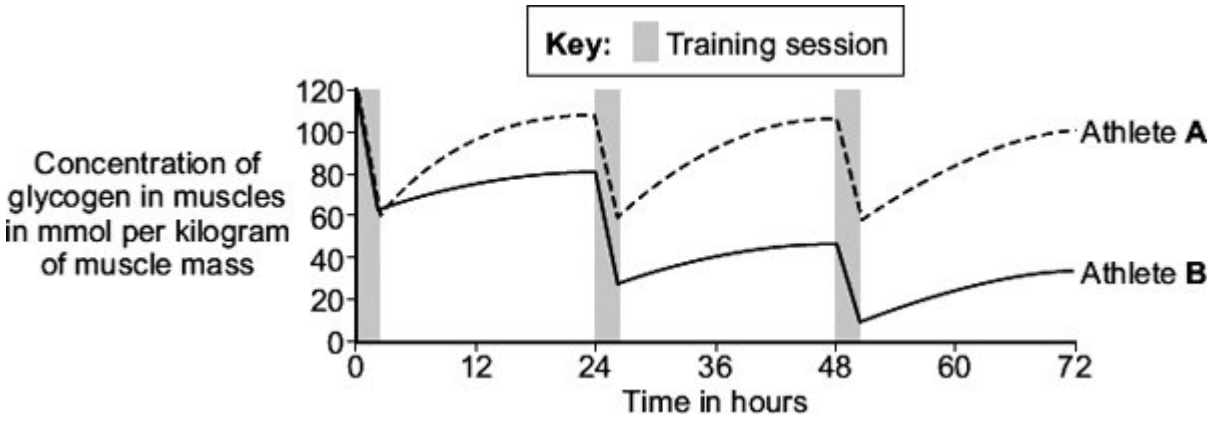
Q15.

Glycogen is stored in the muscles.

Scientists investigated changes in the amount of glycogen stored in the muscles of two 20-year-old male athletes, **A** and **B**.
Athlete **A** ate a high-carbohydrate diet. Athlete **B** ate a low-carbohydrate diet.

Each athlete did one 2-hour training session each day.

The graph shows the results for the first 3 days.



(a) (i) Give **three** variables that the scientists controlled in this investigation.

_____

_____

_____

_____

_____

_____

(3)

(ii) Suggest **two** variables that would be difficult to control in this investigation.

_____

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_____

_____

_____

(2)

(iii) Describe **one** way in which the results of Athlete **B** were different from the results of Athlete **A**.

_____

_____

(1)

(b) Both athletes were training to run a marathon.

Which athlete, **A** or **B**, would be more likely to complete the marathon?

Use information from the graph to explain your answer.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 10 marks)

Q16.

(a) **List A** gives the names of three hormones.

List B gives information about the three hormones.

Draw a line from each substance in **List A** to the correct information in **List B**.

List A Hormone	**List B Information**
	Used in some contraceptive pills to stop eggs maturing
FSH	

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	Used as a fertility drug to make eggs mature
LH	
	Causes the lining of the womb to break down
Oestrogen	
	Stimulates the release of eggs in IVF

(3)

(b) The table gives information about three methods of giving hormones to stop a woman becoming pregnant.

	The 'pill'	**The 'patch'**	**The 'implant'**
How the hormone is given	Swallowed each day for 21 days out of every 28 days.	Stuck onto the skin. Each patch lasts three weeks. There is a one week gap between each patch.	Needs an operation to put it under the skin. Lasts for up to 5 years.

Use the information in the table to answer these questions.

(i) Which of the three methods is likely to be the most reliable?

_____

(1)

(ii) Explain why you chose this method.

_____

_____

(1)

(iii) Give **one** disadvantage of the method you have chosen.

_____

(1)

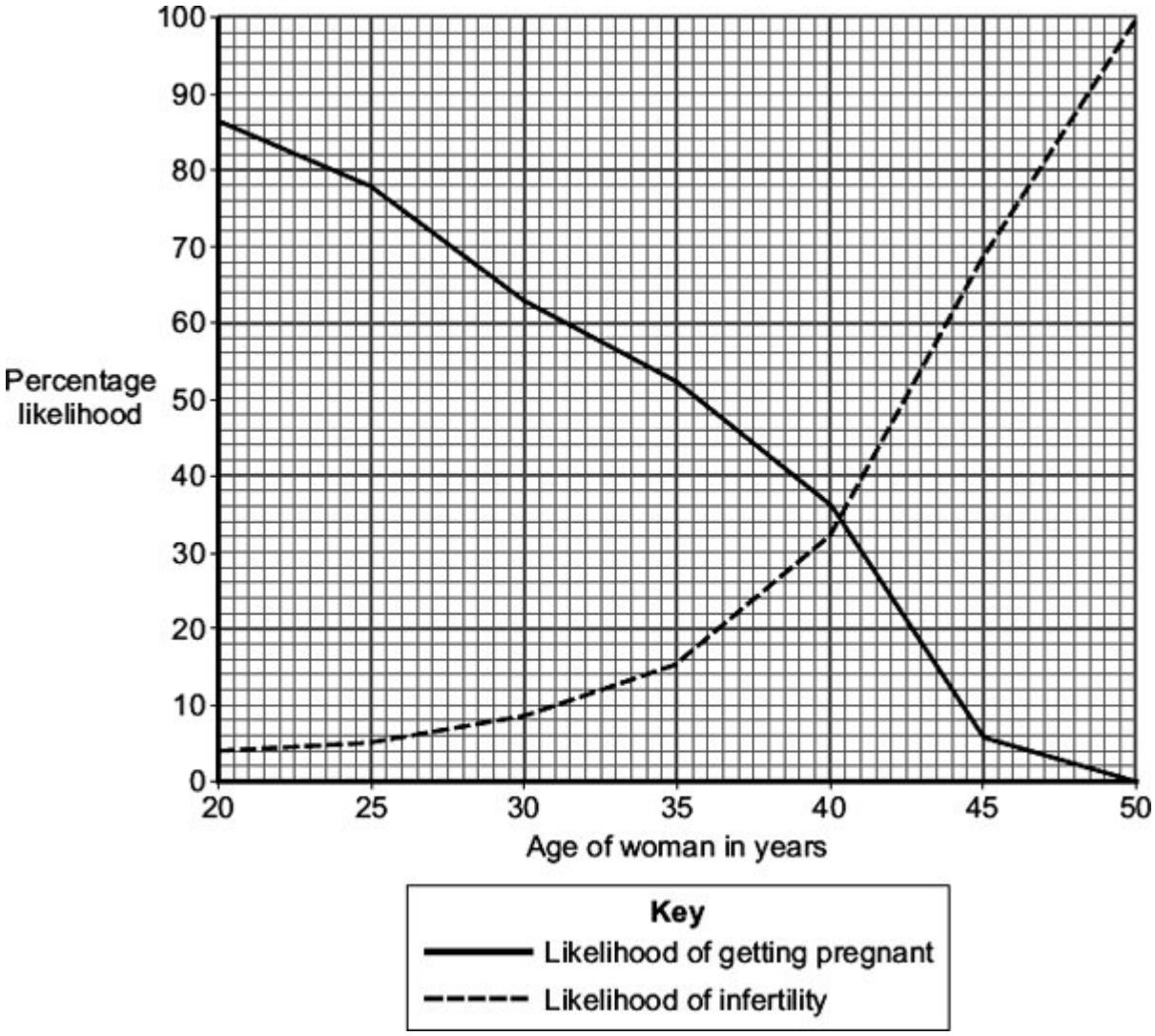
(Total 6 marks)

Q17.

The graph shows how the likelihood of getting pregnant and the likelihood of infertility change with a woman's age.

The data is for healthy women who have unprotected sexual intercourse during one year.

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(a) Use information from the graph to answer this question.

A woman in her mid-twenties is thinking about waiting until her late-thirties before she has children.
A doctor advises the woman not to wait.

Explain why the doctor gives this advice.

_____

_____

_____

_____

_____

(2)

(b) The hormones FSH and LH are used in fertility treatment.

Give the function in fertility treatment of:

(i) FSH

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_____

_____

(1)

(ii) LH.

_____

_____

(1)

(c) In the first stage of in-vitro fertilisation (IVF), eggs from the mother are fertilised with sperm from the father.

Describe the next stages of IVF.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q18.

The volume of water the body needs depends on a number of factors.

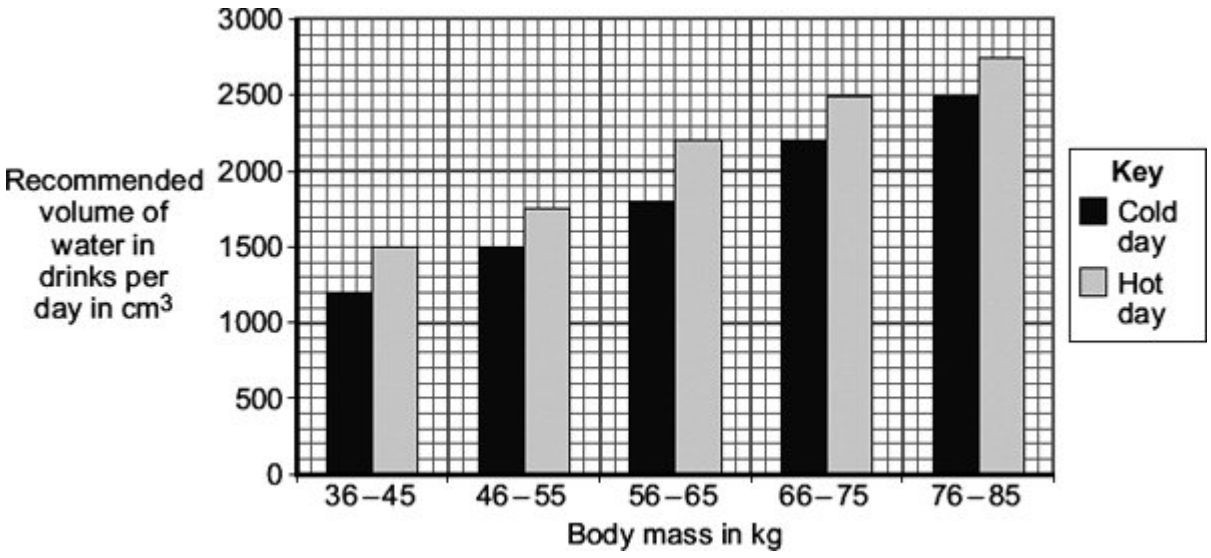
(a) Water enters the body in drinks.

Give **one** other way the body can get water.

_____

(1)

(b) The chart shows the recommended volume of water that women of different body masses should drink, on a cold day and on a hot day.



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(i) Describe the relationship between body mass and the recommended volume of water that a woman should drink.

_____

_____

(1)

(ii) What is the recommended volume of water that a 70 kg woman should drink on a cold day?

_____ cm^3

(1)

(iii) While following a diet, the 70 kg woman loses 10 kg of body mass.

Calculate how much less water she is recommended to drink on a cold day.

Use information from the chart.

Show clearly how you work out your answer.

_____

_____

_____

Answer = _____ cm^3

(2)

(c) It is recommended that women should drink more water on a hot day than on a cold day.

Why?

_____

_____

_____

_____

(2)

(d) Excess water is lost from the body in urine.

Name the organ that produces urine.

_____

(1)

(Total 8 marks)

Q19.

It is important that the concentration of glucose (sugar) in the blood is controlled.

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(a) (i) Which hormone controls the concentration of glucose in the blood?

_____

(1)

(ii) Which organ produces this hormone?

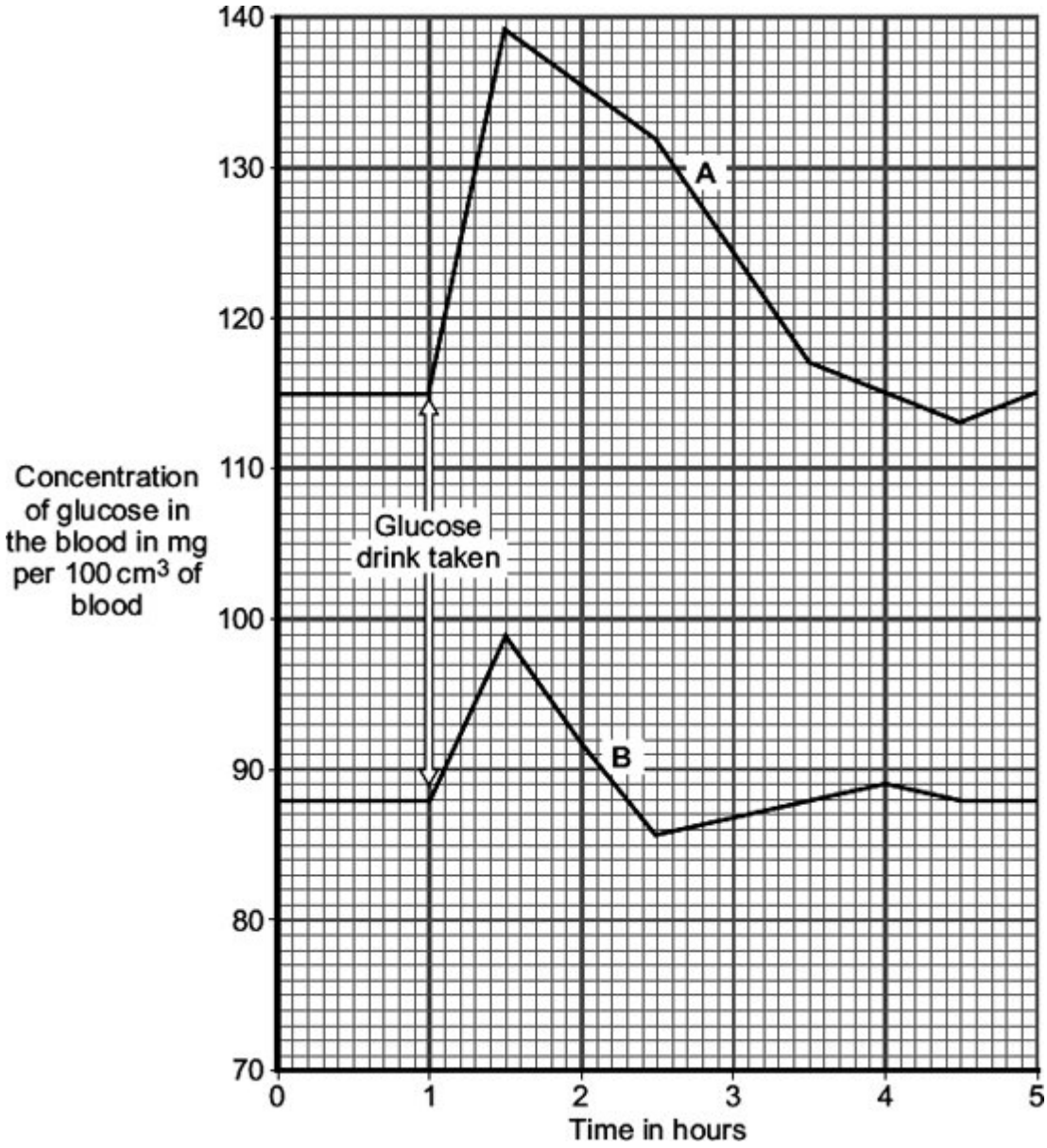
_____

(1)

(b) The concentration of glucose in the blood of two people, **A** and **B**, was measured every half an hour.

One hour after the start, both people drank a solution containing 50 g of glucose.

The graph shows the result.



(i) By how much did the blood glucose concentration in person **B** rise after drinking the glucose drink?

_____ mg per 100 cm^3 of blood

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(1)

(ii) A doctor suggests that person **A** has diabetes.

Give **two** pieces of evidence from the graph to support this suggestion.

1. _____

_____

2. _____

_____

(2)

(iii) Give **one** reason for the fall in blood glucose concentration in person **B**, shown in the graph.

_____

(1)

(Total 6 marks)

Q20.

The kidneys produce urine.

The table shows the composition of a sample of urine from one person.

Substance	Percentage
Ions	2.5
Urea	2.6
Water	

(a) (i) Calculate the percentage of water in this sample of urine.

Show clearly how you work out your answer.

_____

_____

Percentage of water = _____ %

(2)

(ii) The urine of a healthy person does **not** contain protein.

What is the reason for this?

Tick (✓) **one** box.

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Protein molecules in the plasma cannot pass through the filter in the kidney. ☐

Protein molecules in the plasma can pass through the filter in the kidney and are then reabsorbed. ☐

There are no protein molecules in the plasma. ☐

(1)

(b) Dialysis can be used to treat a person with kidney disease.

Draw a ring around the correct answer to complete each sentence.

(i) The dialysis machine contains membranes that are

fully permeable.

impermeable.

partially permeable.

(1)

(ii) At the end of a dialysis session, the concentration of substances in the blood would be

higher than

lower than

the same as

the concentration of substances in the dialysis fluid.

(1)

(c) For most patients, a kidney transplant is better than continued treatment by dialysis.

Kidney transplants have some disadvantages.

Give **one** disadvantage of a kidney transplant.

_____

_____

(1)

(Total 6 marks)

Q21.

Blood plasma is a solution of glucose, and many other substances, in water.

The urine of a healthy person contains water but does not contain glucose.

(a) Name **two** more substances found in the urine of a healthy person.

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1. _____

2. _____

(2)

(b) (i) Describe what happens to the glucose in the blood of a healthy person when the blood enters the kidney.

_____

_____

_____

_____

_____

_____

_____

(3)

(ii) A diabetic person's blood often contains a high concentration of glucose.

The urine of a diabetic person may contain glucose.

Suggest an explanation why.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q22.

In-vitro fertilisation (IVF) is used to help some women get pregnant.

(a) Name the **two** hormones used in IVF treatment.

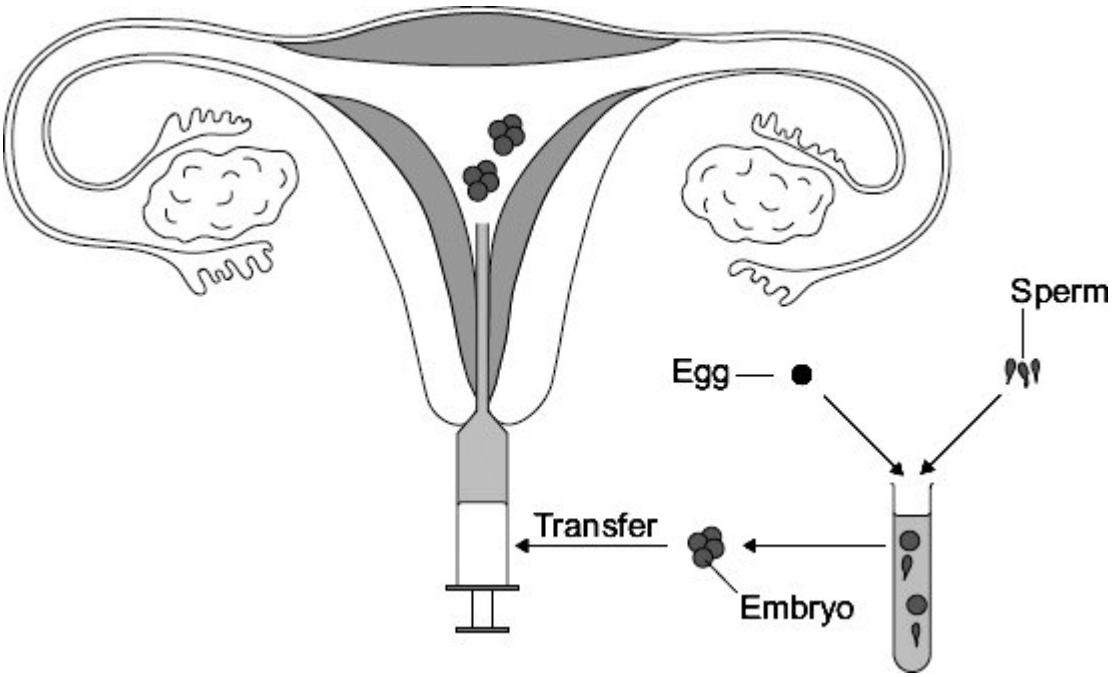
1. _____

2. _____

(2)

(b) The diagram shows the process of IVF.

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Describe the process of IVF. Use information from the diagram to help you.

_____

_____

_____

_____

_____

_____

_____

_____

_____

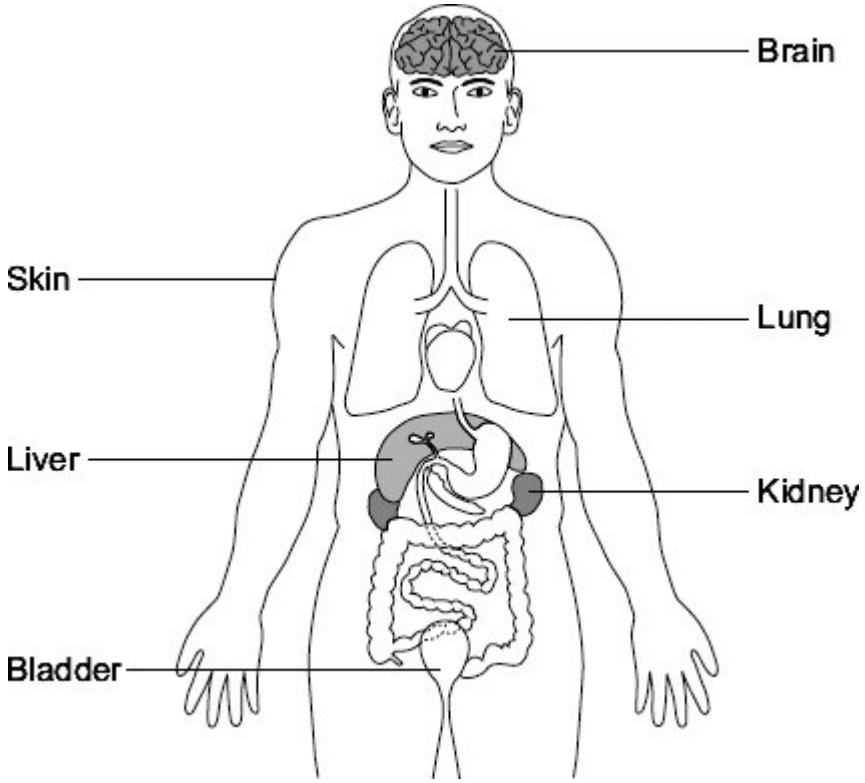
(4)

(Total 6 marks)

Q23.

(a) The diagram shows organs which help to control conditions inside the body.

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Draw a ring around the correct answer to complete each sentence.

(i) Carbon dioxide is removed from the body by the

kidney.
lung.
skin.

(1)

(ii) Urine is made in the

kidney.
lung.
skin.

(1)

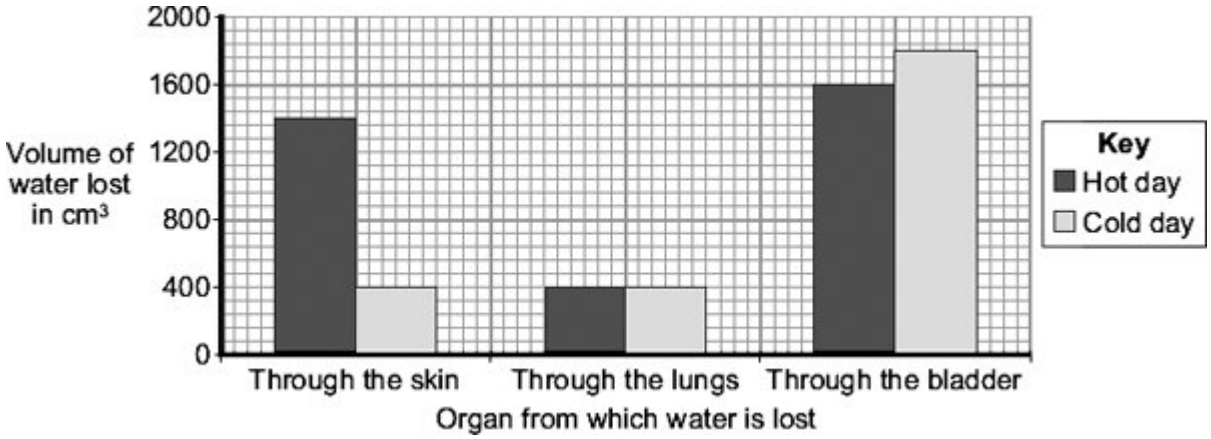
(iii) Urine is stored in the

bladder.
liver.
skin.

(1)

(b) The bar chart shows the volume of water lost from different organs of the body.
The information is shown for a hot day and for a cold day.

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(i) Look at the bar chart.

How does the volume of water lost on the hot day compare with the volume of water lost on the cold day for each organ?

Complete the table using words from the box.

the same	less	more

Organ	Volume of water lost on a hot day compared with volume of water lost on a cold day
Skin	
Lungs	
Bladder	

(3)

(ii) In total, more water is lost on the hot day than on the cold day.

How does the increase in the volume of water lost on the hot day help to control the body temperature?

_____

_____

(1)

(Total 7 marks)

Q24.

In diabetics blood glucose concentrations are sometimes abnormal.

(a) Name the organ that monitors the concentration of glucose in the blood.

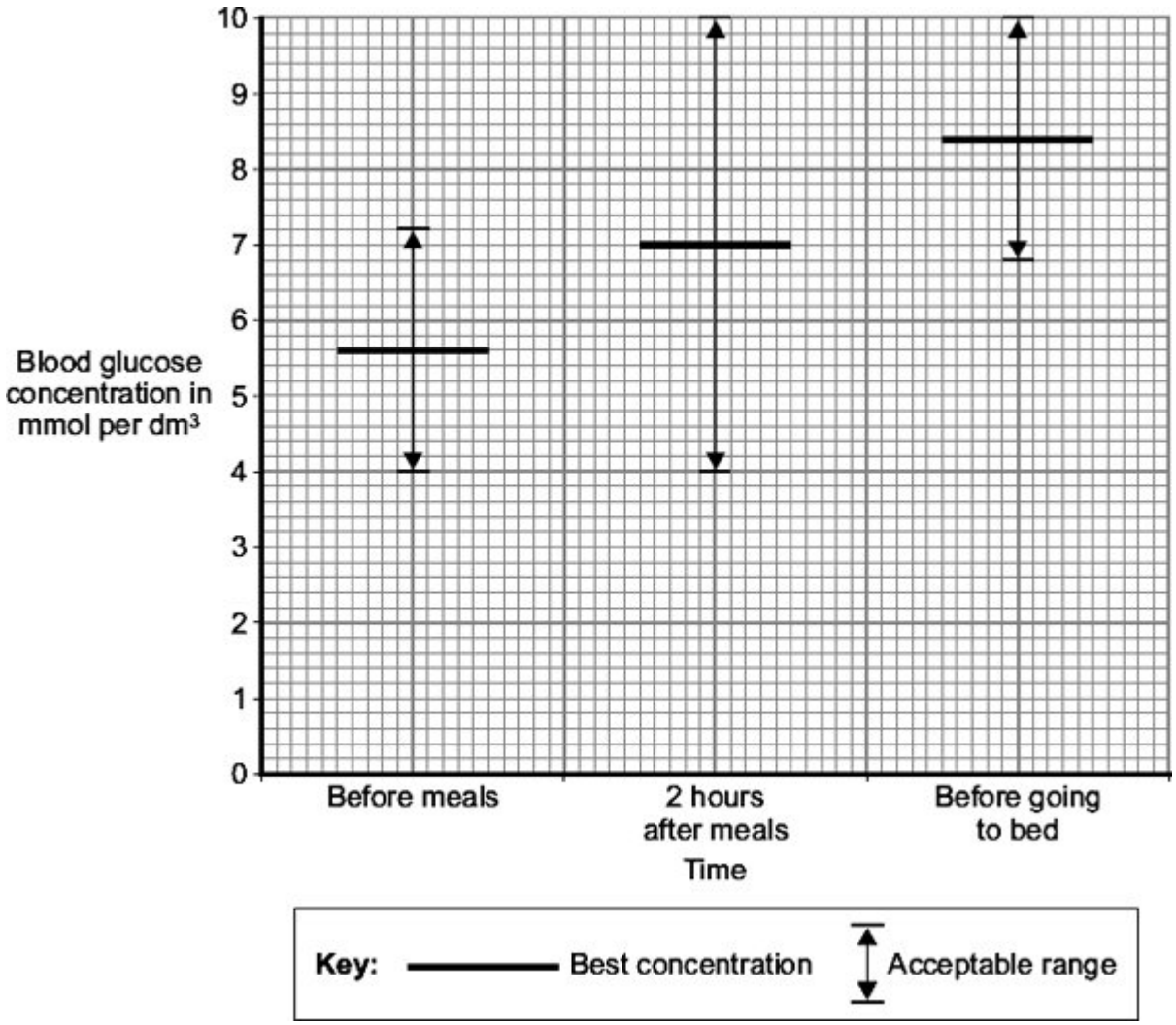
_____

(1)

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(b) Diabetics can measure their blood glucose concentration.

The graph shows the best blood glucose concentration and the acceptable range of blood glucose concentration at different times.



What is the acceptable range for the blood glucose concentration before meals?

From _____ to _____ mmol per dm^3

(1)

(c) The amount of insulin a diabetic injects can be changed so that blood glucose concentration is kept near to the best level.

Two hours after eating breakfast a diabetic measures his blood glucose concentration.
His blood glucose concentration is 13 mmol per dm^3.

He reads these instructions:

- for every 2 mmol per dm^3 of blood glucose *above* the best concentration, inject 1 unit *more* of insulin
- for every 2 mmol per dm^3 of blood glucose *below* the best concentration, inject 1 unit *less* of insulin.

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How should he change his normal insulin injection to bring his blood glucose level to the best concentration?

Show clearly how you work out your answer.

_____

_____

_____

_____

_____

_____

_____

_____

Answer = _____

(3)

(Total 5 marks)

Q25.

(a) Urine contains mineral ions, and other substances, dissolved in water.

What effect will each of the activities in **Table 1** have on the concentration of mineral ions in the urine?

Use words from the box to complete **Table 1**.

increase	decrease	stay the same

Table 1

Activity	Concentration of mineral ions in urine
Drinking a large bottle of water	
Eating salty foods such as potato crisps	

(2)

(b) A person with kidney disease may be treated by having a kidney transplant.

Table 2 shows the effect of a person's age on the success of a kidney transplant.

Table 2

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	Age of patient	
	50-59 years	**Over 60 years**
Percentage of kidneys rejected	38	23
Percentage of kidneys which continued to work for at least 5 years	82	87
Percentage of patients who survived for at least 10 years	82	76

Some doctors think that people over 60 years of age should not be given transplants.

From the data in the table, do you agree with these doctors?

Draw a ring around your answer. **Yes / No**

Give **two** reasons for your answer.

1. _____

_____

2. _____

_____

(2)

(Total 4 marks)

Q26.

Urine consists of water, ions and other substances such as urea.
Urine is formed in the kidney by filtering the blood.
The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	**Diameter of molecule in nanometres**
A	10 to 20
B	1.0
C	0.6
D	0.5
E	0.2

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Use information from the table and your own knowledge to answer the questions.

(a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein? ☐

(1)

(ii) Explain why protein is **not** found in the urine of a healthy person.

_____

_____

(1)

(b) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.
The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but can be found in the urine of a person with haemolytic anaemia.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q27.

Hormones control the menstrual cycle.

(a) Name **two** of the hormones involved in the menstrual cycle.

1. _____

2. _____

(2)

(b) Hormones are used in some types of contraception.

Complete the sentence.

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When used as contraceptives, hormones stop _____ becoming mature.

(1)

(c) There are several ways of using hormones as contraceptives.

These include:

- taking a contraceptive pill each day for 21 days of the menstrual cycle
- using a contraceptive implant.

The contraceptive implant is put under the skin of a woman's arm.

The implant releases contraceptive hormones for three years before the implant needs to be replaced.

(i) Suggest **one** advantage of using this implant rather than taking contraceptive pills.

_____

_____

(1)

(ii) Suggest **one** disadvantage of using this implant rather than taking contraceptive pills.

_____

_____

(1)

(Total 5 marks)

Q28.

Hormones can be used as contraceptives.

(a) Explain **one** way in which a hormone can prevent conception (pregnancy).

_____

_____

_____

_____

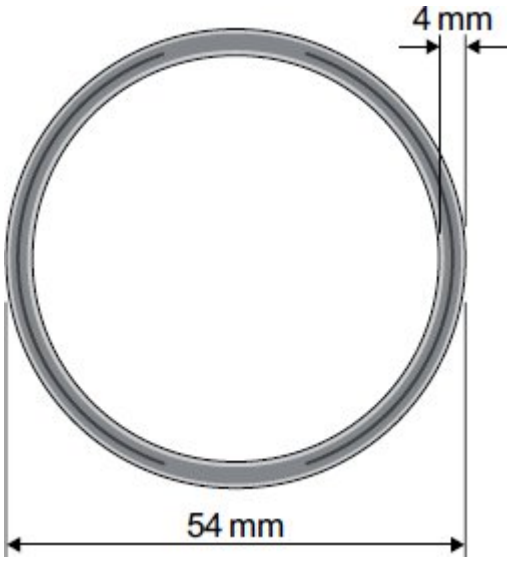
(2)

(b) Two methods of giving contraceptive hormones to a woman are the vaginal ring and the hormone implant.

Vaginal ring

The vaginal ring is a flexible ring 54 mm in diameter containing hormones.

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The woman puts in and takes out the vaginal ring herself; there is no ‘wrong□ way to put the ring in.
Each ring is designed for one cycle of use, which is three weeks of continuous ring use, followed by one week without the ring.
About 0.3 % of women become pregnant in the first year of ring use.
4 % of women stop using the ring because of vaginal discomfort.

Hormone implant

A health professional puts the hormone implant under the skin of the woman’s arm.
The implant releases contraceptive hormones for three years before the implant needs to be replaced.
The hormone implant is 100 % effective.
About 2 % of women stop using the hormone implant, mainly because of irregular menstrual bleeding.

Evaluate the use of the vaginal ring compared with the hormone implant.

Remember to give a conclusion to your evaluation.

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(4)

(Total 6 marks)

Q29.

Our bodies control the concentration of glucose in the blood.

Draw a ring around the correct answer to complete each sentence.

(a) The concentration of glucose in the blood is controlled by a

hormone called

- carbohydrase.
- insulin.
- protease.

(1)

(b) This hormone is produced by the

- intestine.
- stomach.
- pancreas.

(1)

(c) If the body does not produce enough of this hormone,

the person develops

- diabetes.
- cystic fibrosis.
- Huntington's disease.

(1)

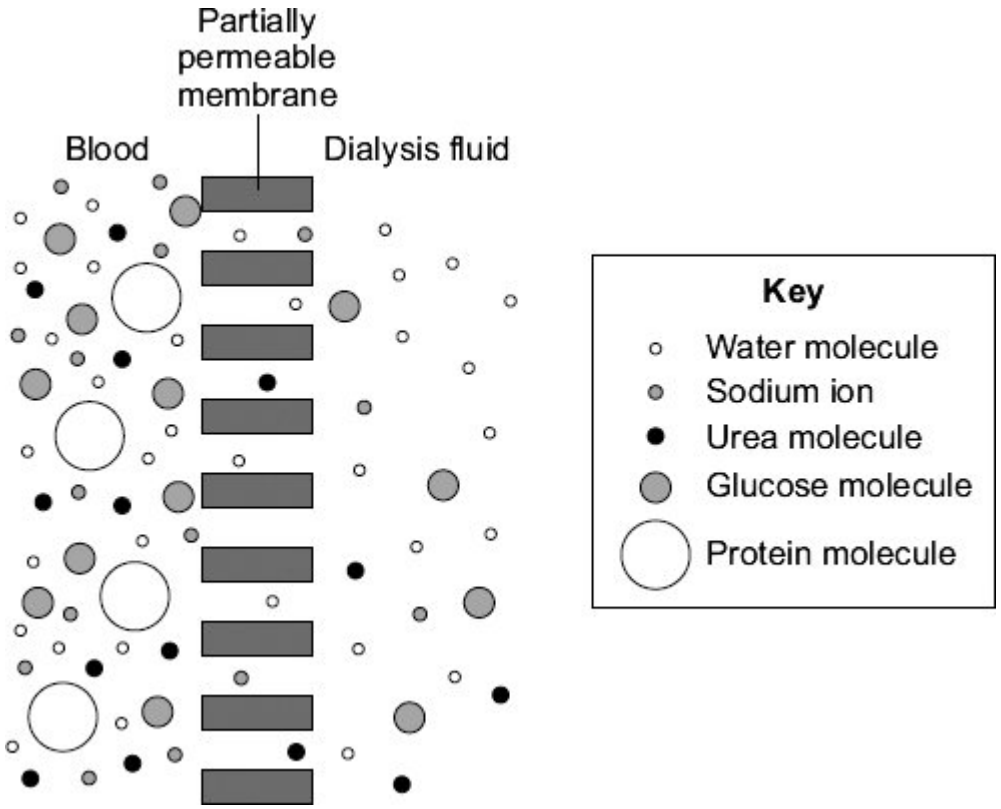
(Total 3 marks)

Q30.

Dialysis can be used to treat a person with kidney disease.

The diagram shows blood and dialysis fluid separated by a partially permeable membrane.

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Blood plasma and dialysis fluid contain several substances dissolved in water.

The table shows the concentrations of some of these substances in dialysis fluid and in the blood plasma of a person with kidney disease immediately before dialysis.

Substance	Concentration of substance in grams per dm^3	
	Blood plasma of person with kidney disease	**Dialysis fluid**
Sodium ions	3.26	3.15
Urea	0.45	0.00
Glucose	0.90	0.99
Protein	60.00	0.00

(a) Protein molecules are **not** able to move from the blood to the dialysis fluid.
Use information from the diagram to explain why.

_____

_____

(1)

(b) Urea molecules move from the blood into the dialysis fluid.

(i) Give the name of this type of movement. _____

(1)

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(ii) Why do the urea molecules move in this direction?

Use information from the table to help you to answer this question.

_____

_____

(1)

(c) The concentration of sodium ions in the blood plasma will change during dialysis.

Suggest a value for the concentration of sodium ions in the plasma at the end of dialysis.

Use information from the table.

Concentration of sodium ions = _____ grams per dm^3

(1)

(d) For most patients a kidney transplant is better than continued treatment by dialysis.

(i) Give **two** advantages of having a kidney transplant rather than treatment by dialysis.

1. _____

_____

2. _____

_____

(2)

(ii) Give **two** possible disadvantages of having a kidney transplant.

1. _____

_____

2. _____

_____

(2)

(Total 8 marks)

Q31.

The human menstrual cycle is controlled by hormones.

Name the gland which produces:

(i) FSH

_____

(1)

(ii) oestrogen.

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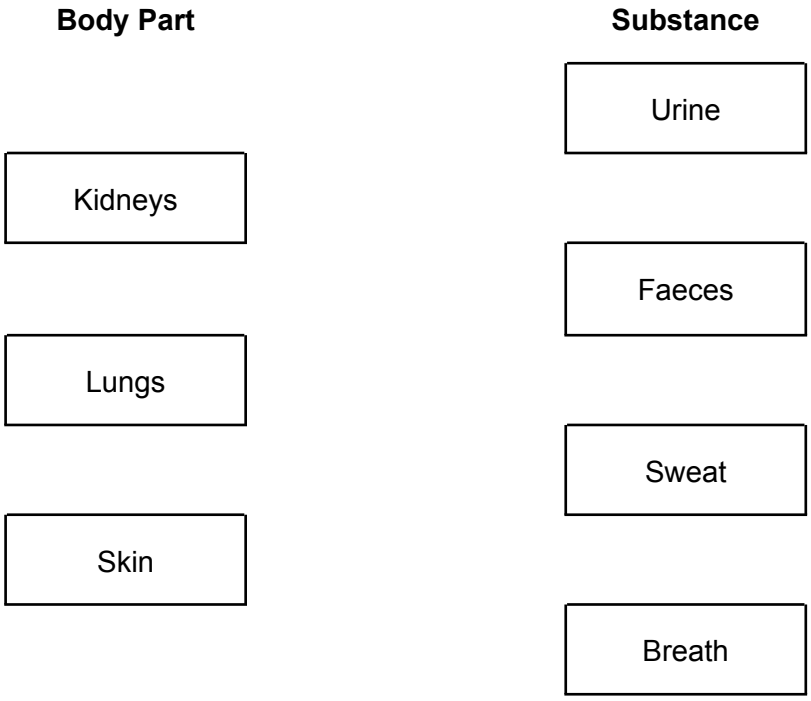
(1)

(Total 2 marks)

Q32.

Water is lost from several parts of the body.

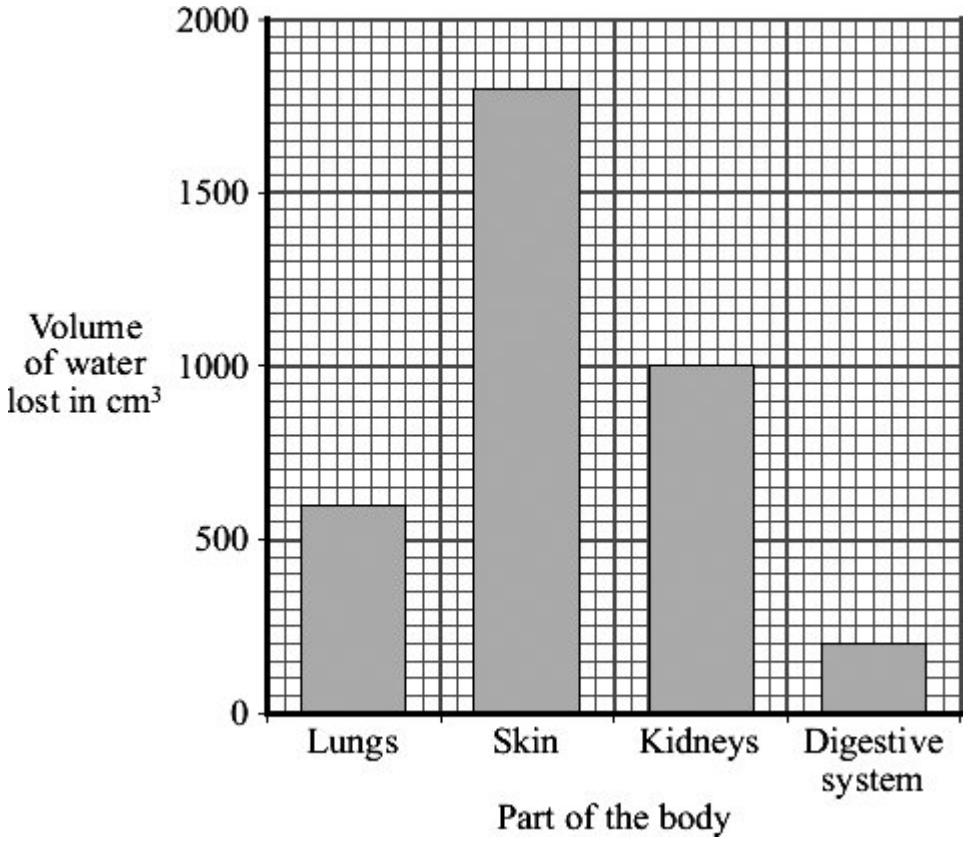
(a) Draw **one** line from each body part to the substance in which water is lost.



(3)

(b) The bar chart shows the volume of water a person lost from different parts of the body during a warm day.

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(i) What volume of water was lost through the skin on the warm day?

Tick (✓) **one** box.

600 cm^3 ☐

1600 cm^3 ☐

1800 cm^3 ☐

(1)

(ii) What effect would colder weather have on the amount of water lost through the skin?

Draw a ring around your answer.

decreases **increases** **stays the same**

(1)

(iii) Give a reason for your answer.

_____

_____

(1)

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(c) What effect does cold weather generally have on the amount of urine produced?

Draw a ring around your answer.

decreases **increases** **stays the same**

(1)

(Total 7 marks)

Q33.

Diabetes is a disease in which blood glucose (sugar) concentration may rise more than normal.

(a) Which organ in the body monitors this rise in blood sugar?

Draw a ring around your answer.

liver **pancreas** **stomach**

(1)

(b) One way of treating diabetes is by careful attention to diet.

Chart 1 shows the recommended diet for a person with diabetes.

Chart 2 shows a diet for a person without diabetes.

Chart 1 Person with diabetes

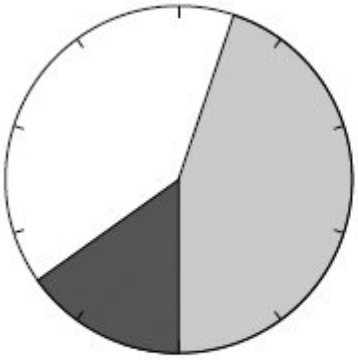
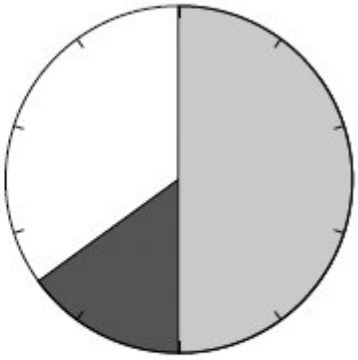
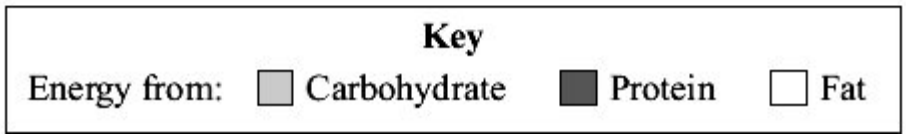


Chart 2 Person without diabetes





How is the recommended diet of a person with diabetes different from the diet of a person without diabetes?

Use information from the charts.

Tick (✓) **two** box.

The diabetic should get more energy from fat. ☐

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The diabetic should get more energy from protein. ☐

The diabetic should get less energy from carbohydrate. ☐

The diabetic should get less energy from protein. ☐

(2)

(c) Other than diet, give **one** way in which diabetes may be treated.

_____

_____

(1)

(Total 4 marks)

Q34.

(a) (i) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

_____

(1)

(ii) In a healthy person, insulin prevents high levels of glucose in the blood.

How does it do this?

_____

_____

(1)

(b) There are two forms of diabetes.

In type 1 diabetes, the body produces little or no insulin.
In type 2 diabetes, the body cells do not respond to insulin.

There are two ways in which diabetes can be treated.

Draw lines to join the type of diabetes to the way or ways in which it can be treated.

Type of diabetes	**Treatment**
Type 1	Careful attention to diet only

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	Careful attention to diet **and** injection of insulin
Type 2	
	Injection of insulin only

(2)

(c) To make insulin, cells in the pancreas need amino acids.
A *small section of DNA* in the pancreas cells is involved in making insulin from the amino acids.

(i) Insulin is a hormone.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate **lipid** **protein**

(1)

(ii) What term is used to describe the *small section of DNA* which controls the production of insulin?

_____

(1)

(iii) Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to the excess amino acids.

You may wish to use the following words in your explanation:

liver **kidneys** **bladder**

_____

_____

_____

_____

_____

_____

_____

_____

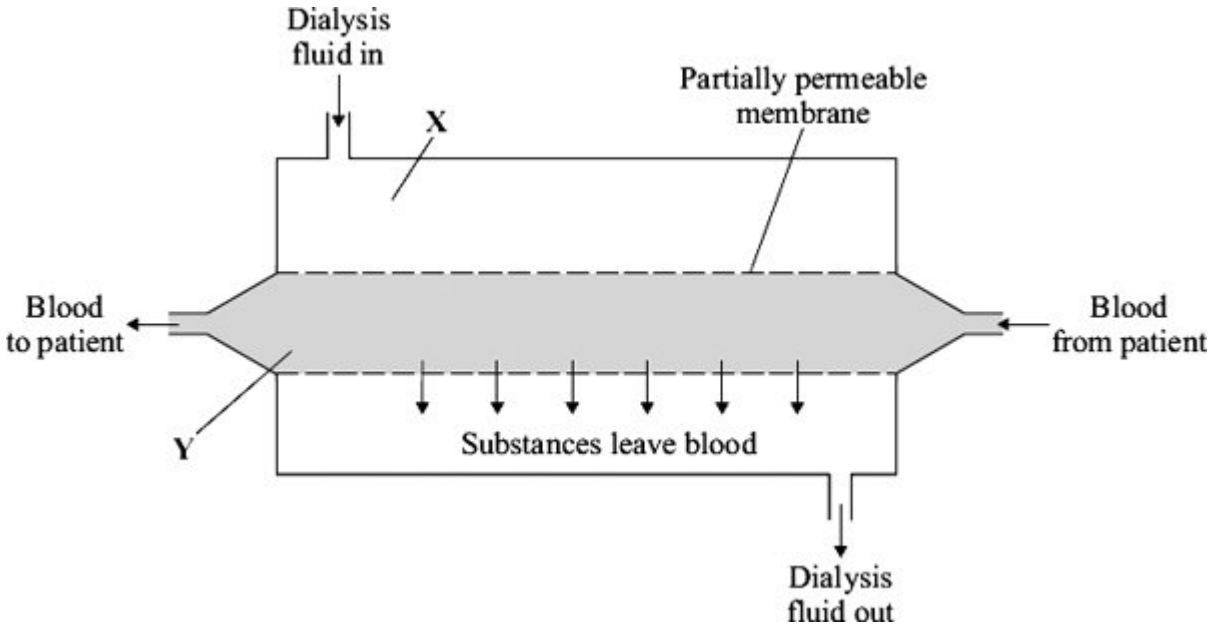
(3)

(Total 9 marks)

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Q35.

People with kidney disease may be treated by dialysis.
The diagram shows a dialysis machine.



(a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(i) This person lost mass mainly because the substance

salt
urea
water

was removed from the blood.

(1)

(ii) This substance was able to pass through the partially permeable membrane

because its molecules are

large.
round.
small.

(1)

(iii) The concentration of sodium ions at **X** is 3.15 grams per dm^3.

At the end of a dialysis session, the most likely concentration of sodium ions

at **Y** would be

0.00
3.15

grams per dm^3.

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6.85

(1)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	Cost per year in pounds
Dialysis	30 000
Kidney transplant: operation + first year's medical care medical care in each further year	 51 000 5 000

(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is dialysis treatment? _____ pounds

(1)

(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years **3 years** **4 years**

(1)

(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is this necessary?

_____

_____

(1)

(Total 6 marks)

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