AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.5.3 HORMONAL COORDINATION IN HUMANS (PACK 3)

SCORE	PERCENTAGE
/228	%

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Q1.

A person had diseased kidneys.

The table shows the concentrations of dissolved substances in this person's urine.

Substance	Concentration in grams per dm^3
Protein	6
Glucose	0
Amino acids	0
Urea	21
Mineral ions	19

(a) One of the substances found in this person's urine would **not** be found in the urine of a healthy person.

(i) Name this substance. _____

(1)

(ii) Explain why this substance would **not** be found in the urine of a healthy person.

_____

_____

_____

_____

_____

(2)

(b) A person with diseased kidneys may be treated by dialysis.

Explain how dialysis trexatment restores the concentrations of dissolved substances in the blood to normal levels.

_____

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(4)

(Total 7 marks)

Q2.

The *Invocell* device below is used in a new IVF (in-vitro fertilisation) treatment. Sperm and eggs are placed in the device which is then placed in the woman's vagina.



The table compares standard IVF treatment with *Invocell* IVF treatment.

	Standard IVF treatment	***Invocell* IVF treatment**
Success rate	29.6 %	19.7 %
Cost	£2500	£900
Laboratory equipment needed	Extra equipment needed	None
Fertility problems that can be treated	100 %	50 %
Hormone treatment needed	Yes	Yes
When the embryos can be seen	Within hours	After 3 days

Using **only** the information given in the table, answer these questions.

(a) Give **two** advantages of *Invocell* IVF treatment compared with standard IVF treatment.

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1. _____

_____

2. _____

_____

(2)

(b) Give **two** disadvantages of *Invocell* IVF treatment compared with standard IVF treatment.

1. _____

_____

2. _____

_____

(2)

(Total 4 marks)

Q3.

Drinking after exercise to replace the water lost in sweat is called rehydration. Scientists at a Spanish university investigated rehydration after exercise.

- 24 students took part in the investigation.
- All the students ran on a treadmill in a temperature of 40 °C until they were exhausted.
- 12 of the students were each given half a litre of beer to drink.
- The other 12 students were each given half a litre of tap water to drink.
- Both groups of students were then allowed to drink as much tap water as they wanted.
- The scientists measured how quickly each student rehydrated.
- The students who had been given beer rehydrated 'slightly better' than the ones given only water.

A newspaper reported the investigation.

The headline was



The newspaper headline was **not** justified.

Explain why.

_____

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_____

(Total 3 marks)

Q4.

A new fertility treatment that could allow women to have IVF in their lunch hour has been developed.

In standard IVF:

- Eggs are fertilised with sperm in a dish in a laboratory.
- Any resulting embryos are incubated and monitored in a laboratory for three to five days.
- The best embryo is transferred to the woman's womb.

Standard IVF treatment can also be used in cases where the male is infertile. In this treatment a sperm nucleus is injected into an egg. The average success rate for standard IVF treatment is 29.6 per cent.

In the *Invocell* technique:

- The *Invocell* device, shown below, is a sealed capsule that allows fertilisation to take place inside the woman's body, in the vagina.



- Eggs are removed from the ovaries while the woman is under sedation.

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- The eggs and sperm are put into the *Invocell* capsule.
- The capsule is placed inside her vagina.
- After three days the capsule is removed and the best embryo is transferred to the woman's womb.

This IVF treatment can be performed in a doctor's surgery because at no time are eggs, sperm or embryo stored outside the body. No costs are involved for laboratory incubation.

The *Invocell* company tried the technique on 800 women with a success rate of 19.7 per cent.

(a) In both IVF treatments a woman is given hormones to stimulate her ovaries.

Name the **two** hormones that stimulate the ovaries.

_____ and _____

(2)

(b) Evaluate the use of the *Invocell* technique compared with standard IVF treatment.

Remember to give a conclusion as part of your evaluation.

_____

_____

_____

_____

_____

_____

_____

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_____

_____

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_____

(4)

(Total 6 marks)

Q5.

Diabetes is a disease in which the concentration of glucose in a person's blood may rise to fatally high levels. Insulin controls the concentration of glucose in the blood.

(a) Where is insulin produced?

Draw a ring around **one** answer.

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gall bladder **liver** **pancreas**

(1)

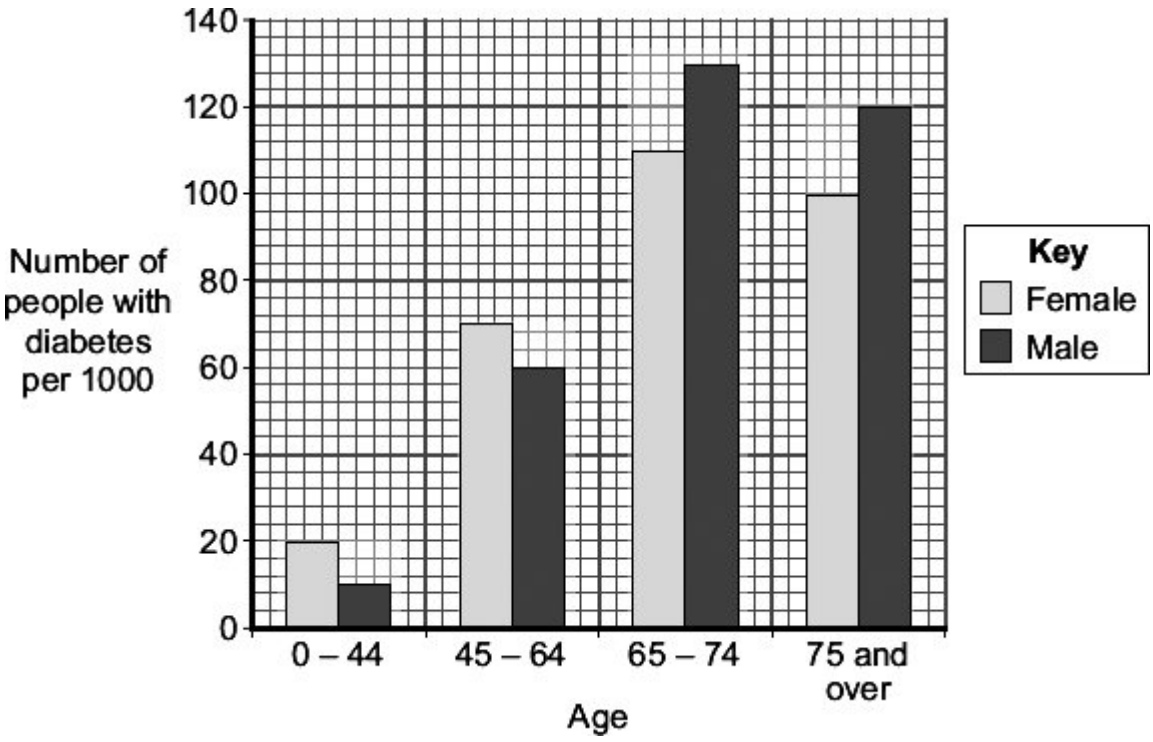
(b) Diabetics may control their blood glucose by injecting insulin.

Apart from using insulin, give **one** other way diabetics may reduce their blood glucose.

_____

(1)

(c) The bar chart shows the number of people with diabetes in different age groups in the UK.



(i) Describe how the number of males with diabetes changes between the ages of 0 - 44 and 75 and over.

_____

_____

_____

_____

_____

_____

(3)

(ii) Compare the number of males and females with diabetes:

between the ages of 0 and 64 years

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_____

_____

over the age of 65.

_____

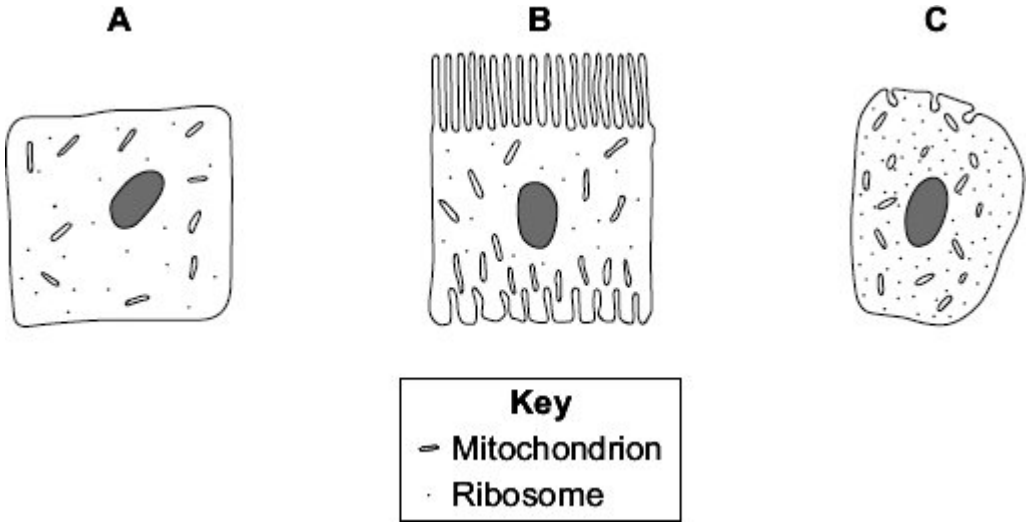
_____

(2)

(Total 7 marks)

Q6.

Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to have adaptations to increase diffusion into or out of the cell? ☐

Give **one** reason for your choice.

_____

_____

(1)

(b) (i) Cell **C** is found in the pancreas.

Name **one** useful substance produced by the pancreas.

_____

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for producing this substance.

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_____

_____

_____

_____

(2)

(Total 4 marks)

Q7.

Conditions inside the body must be kept constant.

(a) Urea must be removed from the body.

(i) Name the organ which makes urea.

_____

(1)

(ii) Which organ removes urea from the body?

_____

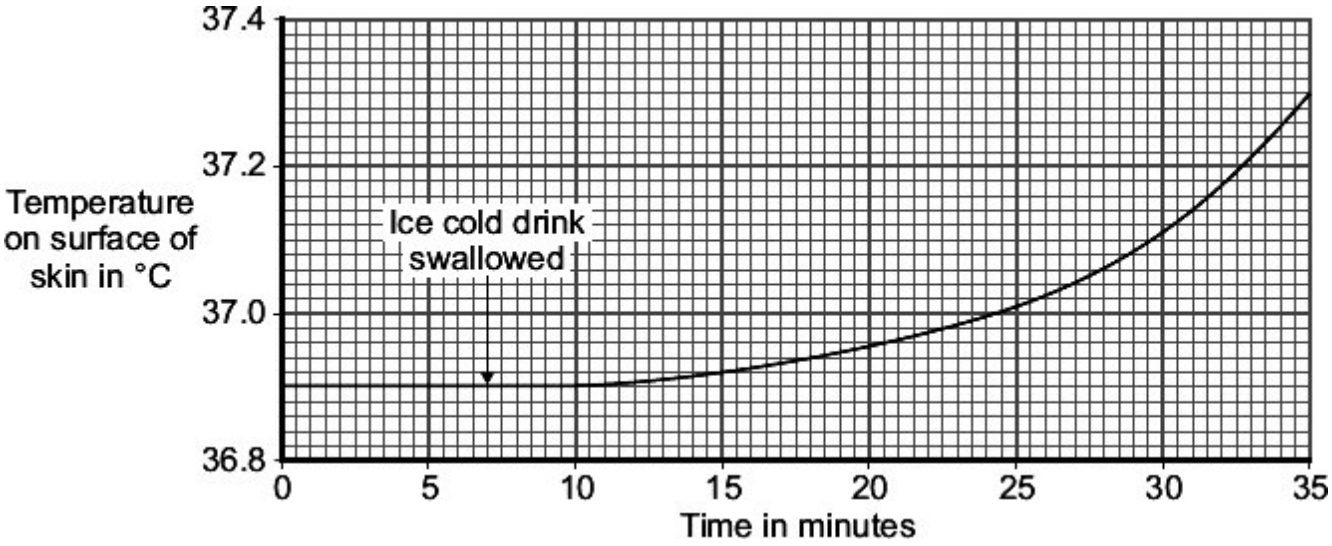
(1)

(iii) What is urea made from?

_____

(1)

A man sat in a room where the temperature was maintained at 40 °C. The temperature on the surface of his skin was monitored for 35 minutes. He swallowed an ice cold drink at the time indicated on the graph.



(b) The sweat glands contribute to the change in the temperature on the surface of the skin shown on the graph.

Explain how.

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_____

_____

_____

_____

_____

_____

(2)

(c) The blood vessels near the surface of the skin also contribute to the changes in skin temperature shown on the graph.

(i) How do the blood vessels in the skin change when the core body temperature falls?

_____

_____

(1)

(ii) How does this change in the blood vessels explain the change in the skin temperature shown on the graph?

_____

_____

(1)

(Total 7 marks)

Q8.

The table shows the concentrations of some substances in the blood plasma, kidney filtrate and urine of one person.

Substance	Concentration in grams per dm^3		
	Plasma	**Filtrate**	**Urine**
Protein	78.0	0.0	0.0
Glucose	0.8	0.8	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

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

(i) Protein is **not** found in the filtrate.

too large to pass through the filter.

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This is because protein molecules are

- used up in respiration.
- reabsorbed into the blood.

(1)

(ii) Glucose is found in the filtrate but **not** in the urine.

This is because glucose is

- too large to pass through the filter.
- used up in respiration.
- passed through the filter, then reabsorbed into the blood.

(1)

(iii) The concentration of urea is much higher in the urine than in the filtrate.

This is because

- urea is made by the kidney.
- water is reabsorbed from the filtrate into the blood.
- glucose and salts are reabsorbed from the filtrate into the blood.

(1)

(iv) The fluid entering the bladder

will contain

- water, protein, glucose, urea and sodium ions.
- water, urea and sodium ions.
- water, glucose, urea and sodium ions.

(1)

(b) An athlete ran a 10-kilometre race on a cold day. He then ran the same race on a hot day. He ate and drank the same on each day.

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

(i) On the **hot** day this athlete will produce

- more urine.
- less urine.
- the same amount of urine.

(1)

(ii) On the **hot** day the athlete's urine will be

- more concentrated.
- less concentrated.
- the same concentration.

(1)

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(Total 6 marks)

Q9.

Diffusion and active transport take place in healthy kidneys.

(a) Explain what is meant by:

(i) diffusion _____

_____

_____

_____

(2)

(ii) active transport _____

_____

_____

_____

(2)

(b) Describe, as fully as you can, how urine is produced by the kidneys.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(Total 9 marks)

Q10.

In-vitro fertilisation (IVF) is used to help infertile women to have babies.

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The table gives statistics from one clinic that gives IVF treatment.

	Age of women given IVF treatment			
	Under 35 years	35 – 37 years	38 – 39 years	40 – 42 years
Number of women treated	425	208	106	53
Number of single births	90	44	17	1
Number of sets of twins	24	8	4	1
Number of sets of triplets	1	0	0	0

Use data from the table to help you to answer these questions.

(a) How many of the women aged 38 – 39 had babies?

_____

_____

(1)

(b) What proportion of the treated women aged 35 – 37 had twins?

_____

_____

(1)

(c) For which age group was IVF treatment most successful?

_____

_____

(1)

(d) Give **two** disadvantages of IVF treatment.

1. _____

_____

_____

2. _____

_____

_____

(2)

(Total 5 marks)

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Q11.

Waste products, such as carbon dioxide and urea, have to be removed from the body.

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

(a) Carbon dioxide is produced by

breathing
diffusion
respiration

.

(1)

(b) Most carbon dioxide leaves the body through the

kidneys
lungs
skin

.

(1)

(c) Urea is produced in the

kidneys
liver
lungs

.

(1)

(d) Urea is produced from the breakdown of

amino acids
glucose
urine

.

(1)

(Total 4 marks)

Q12.

Diabetes is a disease in which a person's blood glucose concentration rises to higher levels than normal.

Diabetes is caused by insufficient insulin being produced.

(a) (i) Which organ monitors blood glucose concentration?

_____

(1)

(ii) Insulin reduces the concentration of glucose in the blood.

Describe how insulin does this.

_____

_____

(1)

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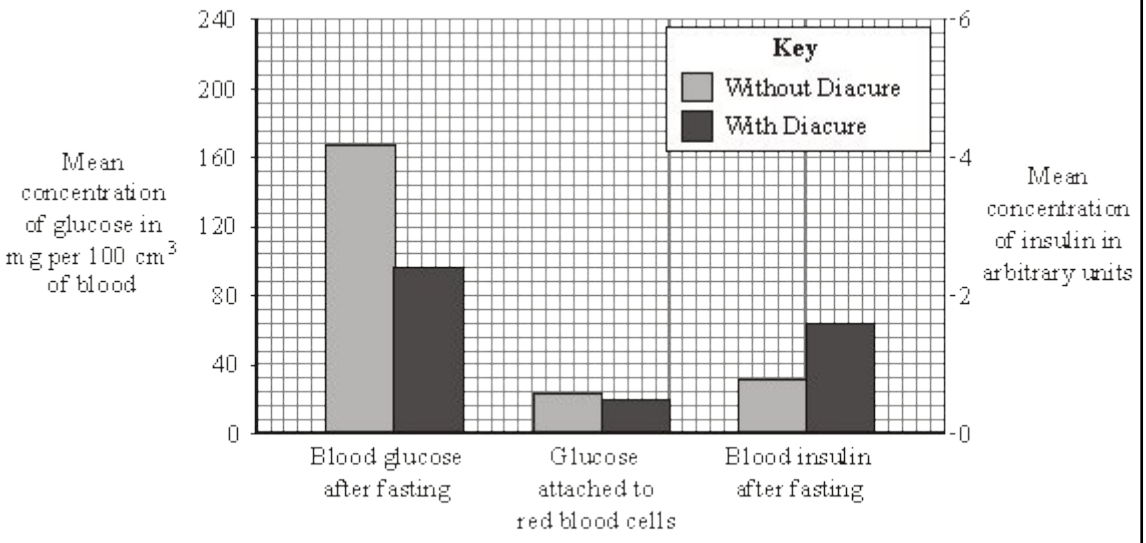
(b) A person with diabetes can be monitored in three ways:

- measuring the blood glucose concentration after fasting (going without food for 12 hours)
- measuring the amount of glucose attached to red blood cells: this is a measure of the average blood glucose concentration over the previous three months
- measuring the concentration of insulin in the blood after fasting

The manufacturer of a new treatment for diabetes, called Diacure, publishes the following two claims.

1. 98.6% of all people who used Diacure reported an improvement in their condition.

2. An independent study of 30 diabetic patients showed a significant reduction in blood glucose concentrations and a significant increase in insulin production, as shown by the graph.



(i) Which of the manufacturer's claims is **not** based on scientific evidence?

_____

_____

(1)

(ii) Why might the data in this study be unreliable?

_____

_____

_____

(1)

(iii) The manufacturer did **not** draw attention to the data for the amount of glucose attached to red blood cells.

Suggest an explanation for this.

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_____

_____

_____

_____

_____

(2)

(iv) The study of diabetic patients was carried out by an independent company.

Why is it important that the study should be independent?

_____

_____

_____

(1)

(Total 7 marks)

Q13.

(a) The kidney controls the amount of water in the body.

The table shows the volume of water filtered from the blood and the volume of urine produced in one day.

	Volume in dm^3
Water filtered from blood	180
Urine	2

Calculate the volume of water reabsorbed into the blood.

Show clearly how you work out your answer.

_____

Volume of water reabsorbed = _____ dm^3

(2)

(b) On a hot sunny afternoon, Man **A** sat in the shade, drinking beer. Man **B** went jogging in the desert.

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Man **A**



Man **B**

As a result, the volume and concentration of the urine of the two men were different.

Complete the table by writing the word '**higher**' or '**lower**' in each box.

The first line has been completed for you.

	Man A	**Man B**
Volume of urine produced	higher	lower
Volume of water reabsorbed by the kidneys		
Concentration of urine		

(2)

(Total 4 marks)

Q14.

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

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

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(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.

_____

_____

_____

_____

(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.

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 8 marks)

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Q15.

Two types of fertility treatment are in-vitro fertilisation (IVF) and in-vitro maturation (IVM).

(a) Describe the role of hormones in IVF treatment.

_____

_____

_____

_____

_____

_____

(3)

(b) Read the passage about fertility treatment.

> During normal IVF, a woman undergoes several weeks of hormone injections.
> The treatment can lead to a condition called ovarian hyperstimulation syndrome resulting in a build-up of fluid in the lungs. Very rarely, it can cause death. The syndrome occurs in about 1 % of standard IVF cycles, but in about 10 % of the IVF cycles of some women. An IVF cycle may cost up to £4300.
>
> In IVM, hormone treatment lasts for less than 7 days. Eggs are then collected from the ovaries while they are still immature. Each egg is then matured in a laboratory for up to 48 hours before being injected with a single sperm.
> A few days after fertilisation, the embryos are implanted into the mother's womb. The cost of each IVM cycle is £1700.
>
> An IVM expert says: "In IVM treatment there's a small risk of abnormalities in the sex chromosomes and also of birth deformities and cancer in the babies. These risks are not massive but they are greater than in IVF."

Evaluate the use of IVM rather than IVF in treating infertility.

Remember to give a conclusion to your evaluation.

_____

_____

_____

_____

_____

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_____

_____

_____

(4)

(Total 7 marks)

Q16.

Water can be lost from the body in several ways.
The table shows the volume of water lost by a man on a cold day.

Way in which water is lost	Volume of water lost in cm^3
In urine	2000
Through skin	600
Breathed out	300
In faeces	100
Total	**3000**

(a) Calculate the proportion of water that the man lost through his skin.

Show clearly how you work out your answer.

_____

_____

Proportion = _____

(2)

(b) More water is lost through the skin on a hot day than on a cold day.

(i) Explain why.

_____

_____

(1)

(ii) To maintain water balance in the body, the total volume of water taken in must equal the total volume of water lost.

Give **two** ways this is achieved on a hot day, when compared to a cold day.

Tick (✓) **two** boxes.

The volume of water in the urine decreases. ☐

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The volume of water in the faeces increases. ☐

The volume of water taken as food or drink increases. ☐

The volume of water breathed out decreases. ☐

(2)

(c) Use words from the box to complete the sentences.

bladder	**kidney**	**liver**	**stomach**

The body cannot store amino acids.

The body converts the amino acids it cannot use into urea.

(i) Urea is made in the _____

(1)

(ii) Urea is removed from the blood by the _____

(1)

(iii) Urine is stored in the _____

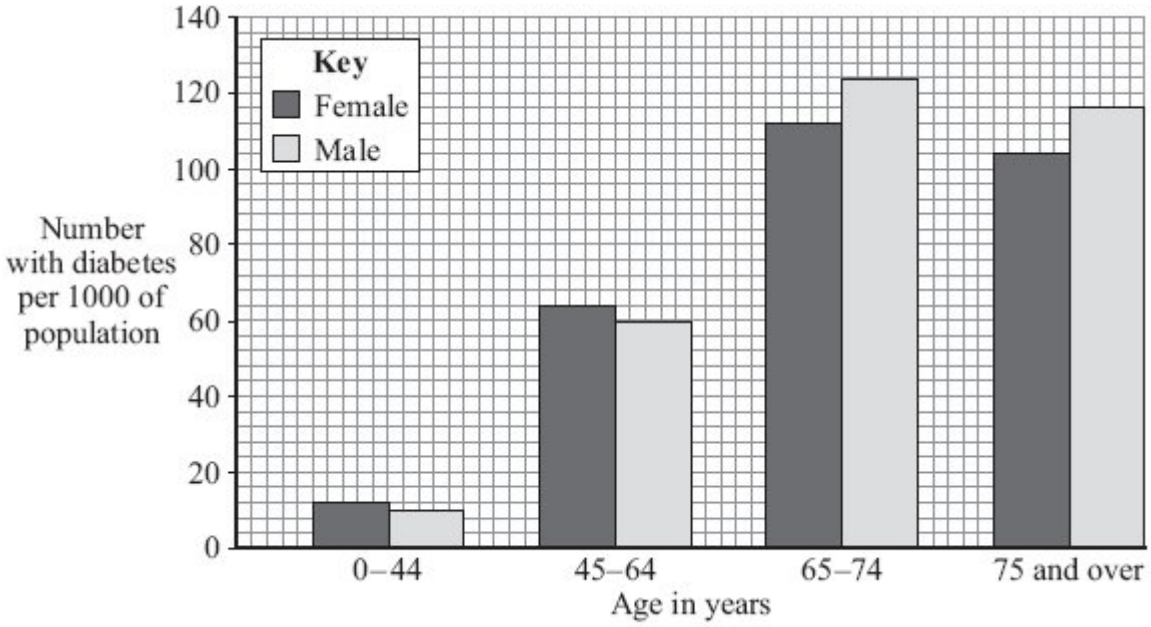
(1)

(Total 8 marks)

Q17.

Diabetes is caused when the body does not produce enough insulin.

(a) The bar graph shows the number of people with diabetes per 1000 of population.



(i) How many more males aged between 45 and 64 years of age have diabetes than males under 45 years of age?

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Show clearly how you work out your answer.

_____

_____

Answer _____ per 1000 of population

(2)

(ii) Describe the way in which the number of females with diabetes changes with age.

_____

_____

_____

_____

_____

(2)

(b) One way of treating diabetes is by injecting insulin.

Insulin is a protein.

(i) If insulin is taken by mouth, it is broken down in the digestive system.

Where in the digestive system would insulin be broken down?

Draw a ring around your answer.

liver **mouth** **stomach**

(1)

(ii) Give **one** way of treating diabetes instead of using insulin.

_____

_____

(1)

(Total 6 marks)

Q18.

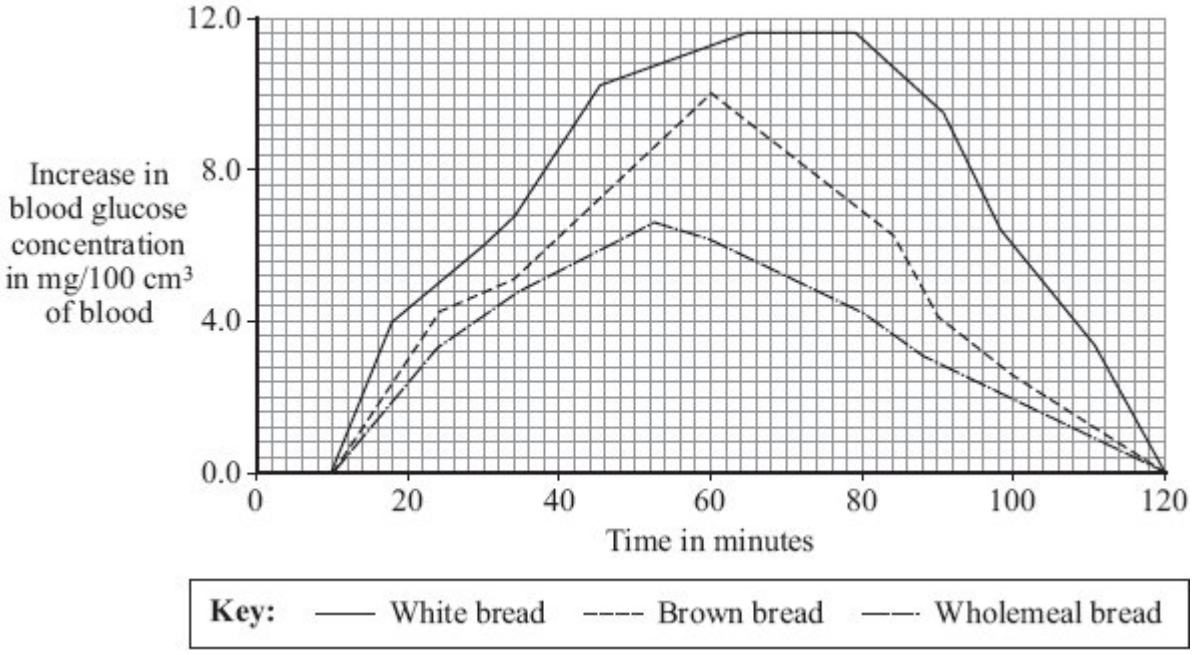
Insulin controls blood glucose concentration.

(a) The rate at which blood glucose concentration changes is affected by the food eaten.

In an experiment a person who does not have diabetes ate two slices of white bread.
The change in her blood glucose concentration was recorded over the next 120 minutes.
The experiment was repeated; first with two slices of brown bread and then with two slices of wholemeal bread.

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The graph shows the results of the three experiments.



(i) Which type of bread would be most suitable for a person with diabetes?

Type of bread _____

Give **two** reasons for your answer.

1. _____

_____

2. _____

_____

(2)

(ii) Explain, as fully as you can, the reasons for the changes in blood glucose concentration when the person ate the brown bread.

_____

_____

_____

_____

_____

_____

_____

_____

_____

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(4)

(b) *Pancreatic-cell transplantation* is a new treatment for diabetes. Insulin-making cells are taken from up to three dead donors. The cells are kept alive before being injected into the diabetic in a small operation. The cells soon begin to make insulin.

In one recent study 58 % of recipients of pancreatic-cell transplants no longer needed insulin injections.

Give the advantages and disadvantages of the new treatment for diabetes compared with using insulin injections.

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

Q19.

(a) Which **two** of the following substances are found in the urine of a healthy person?

Tick (✓) **two** boxes.

Glucose ☐

Mineral ions ☐

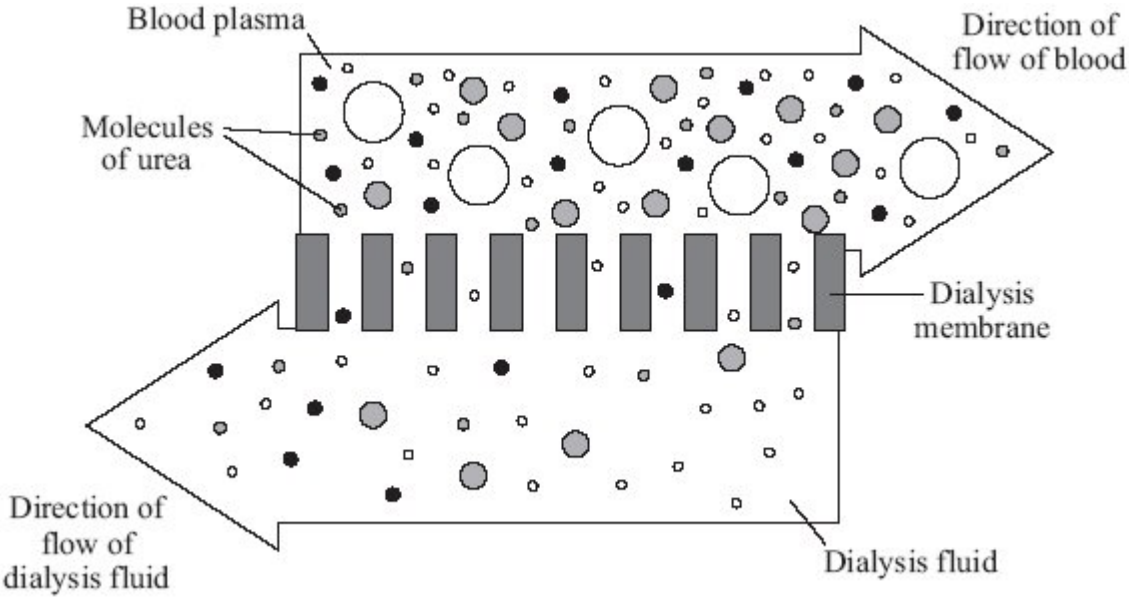
Proteins ☐

Water ☐

(2)

(b) A person with kidney disease can be treated by dialysis.
The diagram shows how dialysis works.
The circles represent molecules of different substances.

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Draw a ring around the correct word or phrase to complete each sentence.

(i) During dialysis, urea moves out of the

blood cells
blood plasma
dialysis fluid

.

(1)

(ii) During dialysis, urea moves into the

blood cells
blood plasma
dialysis fluid

.

(1)

(iii) Urea moves by the process of

diffusion
digestion
transpiration

.

(1)

(iv) To allow the movement of urea, the dialysis membrane is

impermeable
partially permeable
thick

.

(1)

(v) The urea can pass through the membrane because

the urea molecules are

large
round
small

.

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(1)

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

Tick (✓) **one** box to complete the sentence.

One major problem with a kidney transplant is that

drug treatment is needed to suppress the immune system. ☐

hospital visits are needed three times a week. ☐

yearly costs are higher than for dialysis. ☐

(1)

(Total 8 marks)

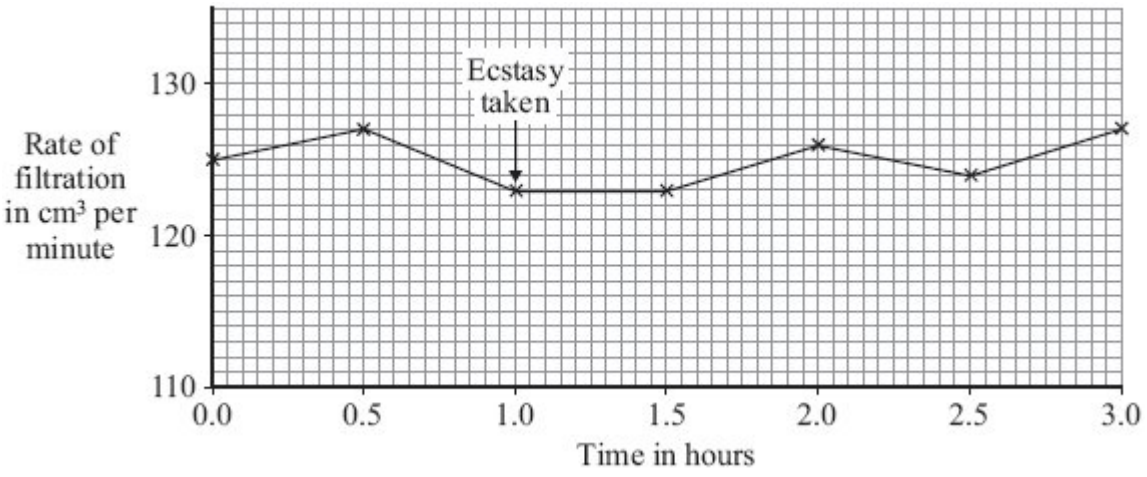
Q20.

Taking the drug ecstasy affects the rate of urine flow from the kidneys.

Graph 1 shows the rate of filtration by the kidneys of a healthy person.
Graph 2 shows the rate of urine flow from the kidneys of the same person.

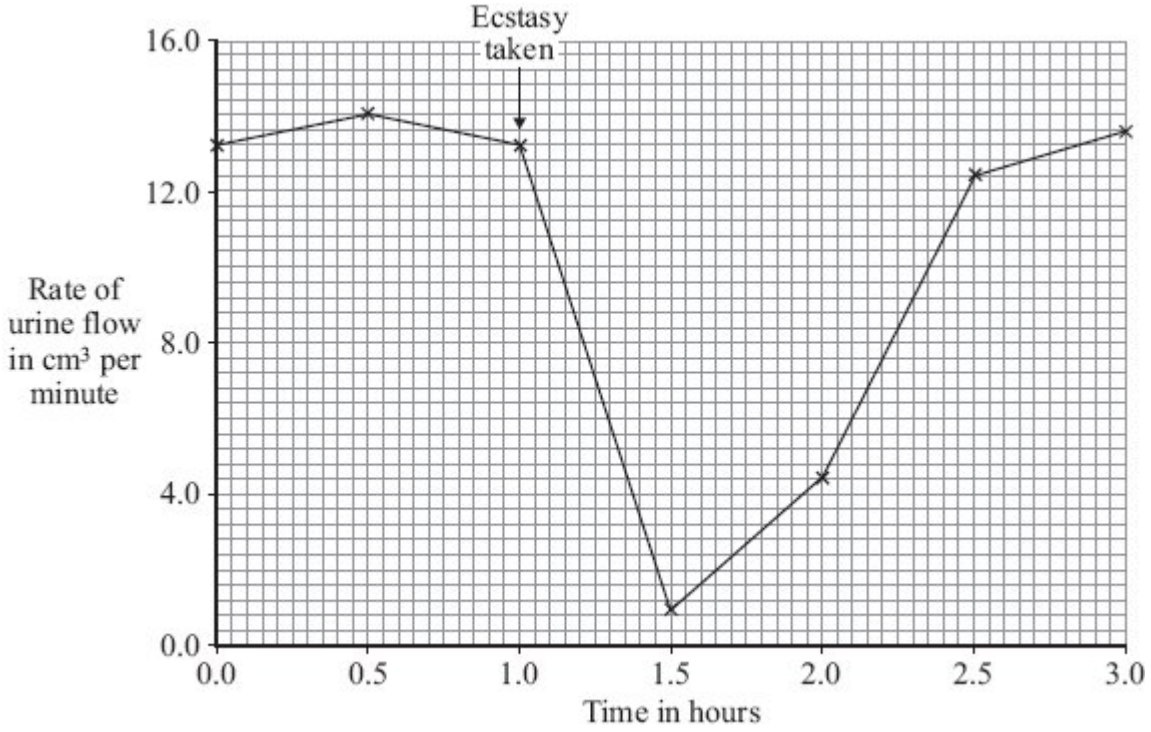
One hour after the first measurement, the person took ecstasy.

Graph 1



Graph 2

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(a) Describe the effect of taking ecstasy on

(i) the rate of filtration

_____

_____

(1)

(ii) the rate of urine flow.

_____

_____

(1)

(b) Use information from the graphs and your understanding of how the kidney works to answer the following questions.

(i) Suggest an explanation for the change in the rate of urine flow after the person took ecstasy.

_____

_____

_____

_____

(2)

(ii) After a person has taken ecstasy, the concentration of ions in the blood changes.

Suggest an explanation for this.

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_____

_____

_____

_____

(2)

(Total 6 marks)

Q21.

(a) Use words from the box to complete the sentences about controlling conditions in our bodies.

kidneys	**liver**	**lungs**	**skin**

(i) When we breathe out, water leaves the _____

(1)

(ii) When we sweat, water leaves the body through the _____

(1)

(iii) Excess water leaves the body in a liquid called urine.

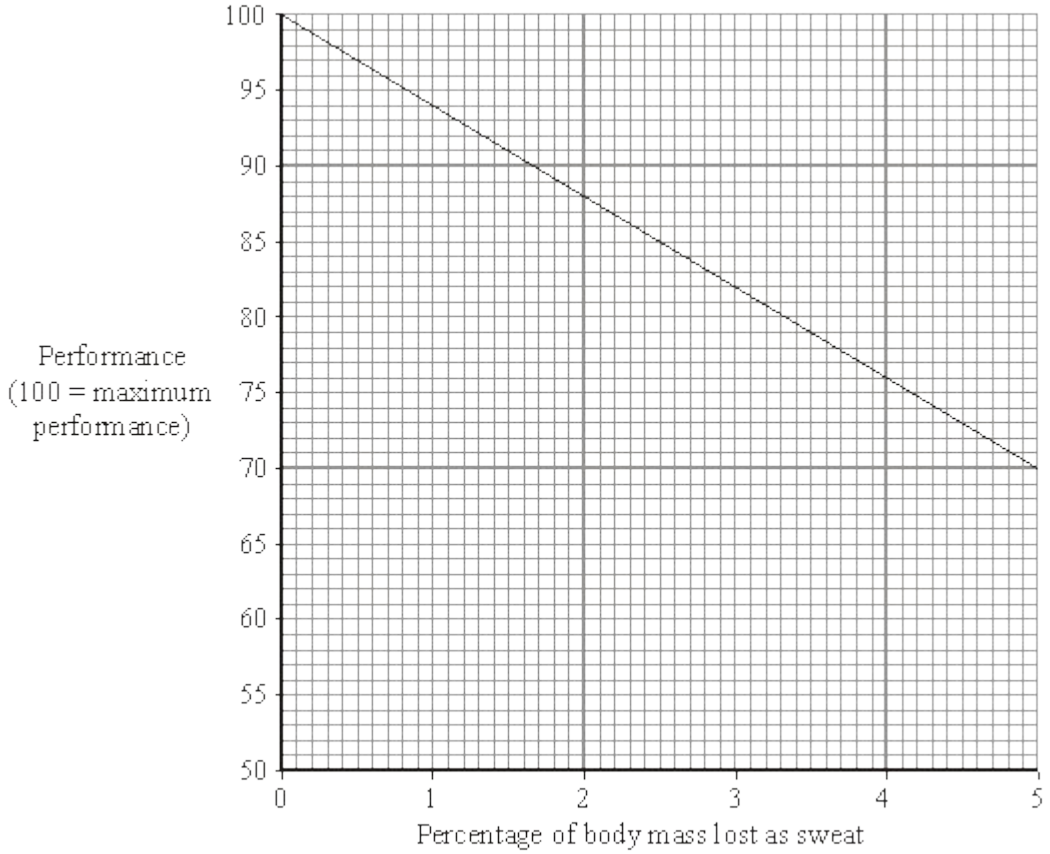
Urine is produced by the _____

(1)

(b) We lose a lot of sweat during exercise. When this happens, we cannot perform as well as we could at the start of the exercise.

The graph shows the effect of losing sweat on the performance of an athlete.

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(i) Describe the effect of losing sweat on performance.

_____

_____

(1)

(ii) How can athletes reduce this effect on performance?

_____

_____

(1)

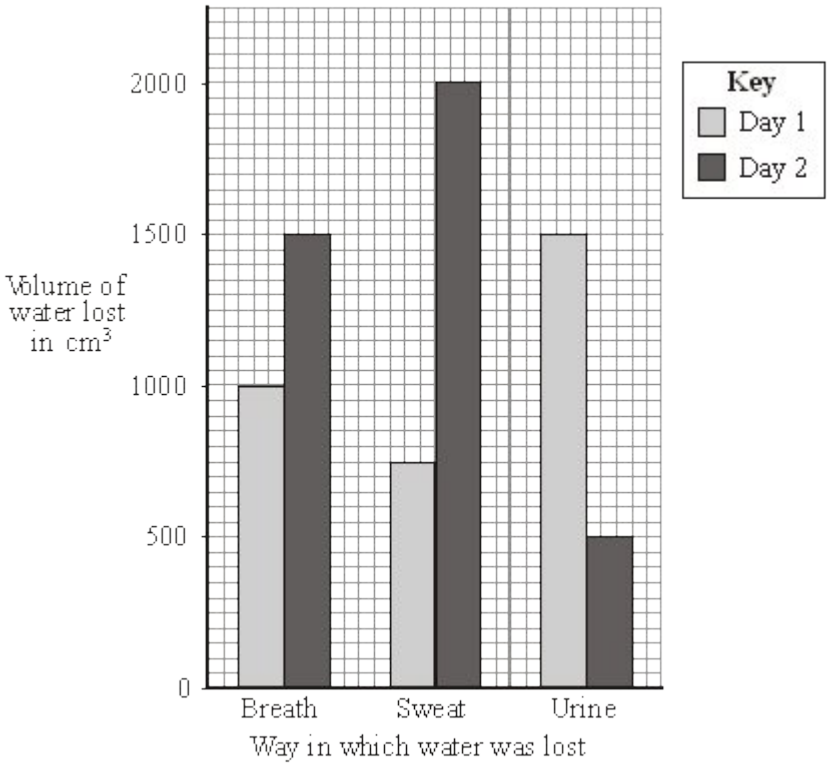
(Total 5 marks)

Q22.

The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.

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(a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2? Show all your working.

_____

_____ cm^3

(2)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day _____

Give **two** reasons for your answer.

1. _____

_____

2. _____

_____

(2)

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

Put a tick (✓) in the box next to your choice.

Breathing	☐
Osmosis	☐

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Respiration ☐

Sweating ☐

(1)

(ii) How does sweating help the body?

_____

_____

(1)

(iii) If the body loses more water than it gains, it becomes dehydrated.
The concentration of the solution surrounding the body cells increases.
This causes the cells to lose water.

By which process do cells lose water?

Put a tick (✓) in the box next to your choice.

Breathing ☐

Osmosis ☐

Respiration ☐

Sweating ☐

(1)
(Total 7 marks)

Q23.

The pancreas is involved in digestion and controlling the internal conditions of the body.

(a) Name **two** digestive enzymes produced by the pancreas.

1. _____

2. _____

(2)

(b) Diabetes may be caused by a lack of insulin.

Part of the treatment for someone with diabetes is to pay careful attention to the diet.

(i) Give **one** symptom of diabetes.

_____

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_____

(1)

(ii) Give **one** way in which a diabetic may be advised to change their diet.

_____

_____

(1)

(iii) How does this change in diet help the diabetic?

_____

_____

(1)

(iv) State **one** other way in which the symptoms of diabetes may be treated.

_____

(1)

(c) Many of the cells in the pancreas contain large numbers of ribosomes.

What is the function of ribosomes in a cell?

_____

_____

(1)

(Total 7 marks)

Q24.

(a) (i) Urine is made in the kidneys and stored for a few hours before being released from the body.

In which organ of the body is urine stored? Draw a circle around **one** answer.

bladder **large intestine** **liver**

(1)

(ii) Which **two** of the following substances are **not** found in the urine of a healthy person?

Tick (✓) **two** boxes.

glucose ☐

mineral ions ☐

protein ☐

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urea ☐

(2)

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

Read the information about dialysis and kidney transplants.

- A person needs 3 dialysis sessions a week, each lasting about 8 hours.
- Intake of protein and salt in the food is kept low between dialysis sessions.
- For each patient, dialysis costs £30 000 per year.
- The use of a general anaesthetic can sometimes cause brain damage.
- Drugs to suppress the immune system are given after a kidney transplant.
- A transplant costs £20 000 in the first year plus £6500 in each of the following years for drugs.

Use this information to answer the questions.

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

1. _____

_____

2. _____

_____

(2)

(ii) Give **one** disadvantage of treatment by having a kidney transplant.

_____

_____

(1)

(c) The table shows the amounts of some substances in the blood of one patient before dialysis and after dialysis.

Substance	**Concentration in blood plasma in grams per dm^3**	
	Before dialysis	**After dialysis**
Sodium ions	2.88	3.00
Potassium ions	0.22	0.14
Urea	4.50	0.30

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During dialysis, substances are removed from the blood.

(i) Which substance in the table decreased in concentration the most during dialysis?

_____

(1)

(ii) By how much did the concentration of this substance decrease?

_____ grams per dm^3

(1)

(Total 8 marks)

Q25.

(a) Why is glucose found in the blood but not in the urine? Use your knowledge of how the kidney works to explain your answer as fully as you can.

_____

_____

_____

_____

_____

_____

(3)

(b) The table shows the concentrations of dissolved substances in the urine of a healthy person and the urine of a person with one type of kidney disease.

Substance	Concentration in grams per dm^3	
	Urine of healthy person	**Urine of person with kidney disease**
Protein	0	6
Glucose	0	0
Amino acids	0	0
Urea	21	21
Mineral ions	19	19

(i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with the kidney disease.

_____

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_____

_____

_____

(2)

(ii) The person with the kidney disease could be treated either by using a dialysis machine or by having a kidney transplant operation.

What are the advantages and disadvantages of having a kidney transplant operation rather than dialysis?

_____

_____

_____

_____

_____

_____

_____

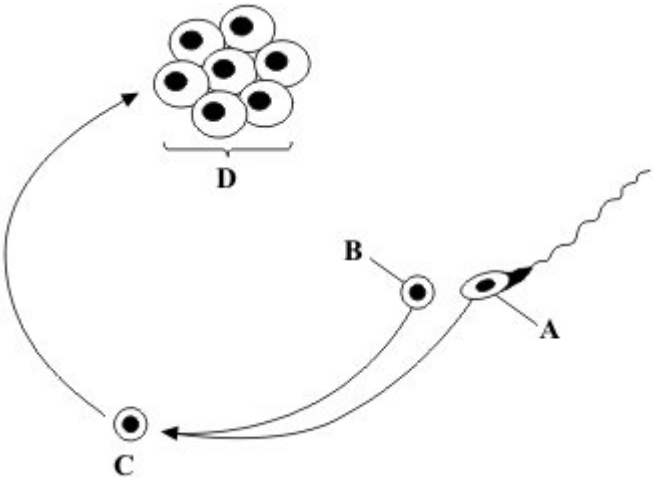
_____

(4)

(Total 9 marks)

Q26.

The diagram shows some of the stages in IVF (in-vitro fertilisation).



(a) Use words from the box to name structures **A, B, C** and **D.**

egg	**embryo**	**fertilised egg**	**ovary**	**sperm**

Structure **A** _____

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Structure **B** _____

Structure **C** _____

Structure **D** _____

(4)

(b) What do the doctors do next with structure **D**?

_____

_____

_____

_____

(2)

(c) The table gives statistics for an IVF clinic.

	Age of women treated			
	Below 35 years	**35-37 years**	**38-39 years**	**40-42 years**
Number of women treated	414	207	106	53
Number of women who produced one baby	90	43	17	1
Number of women who produced twins	24	8	4	1
Number of women who produced triplets	1	0	0	0

(i) About what proportion of the treated women aged 35 − 37 produced one or more babies?

Draw a ring around your answer.

one quarter **one third** **half**

(1)

(ii) IVF treatment is not given by this clinic to women over 42 years of age.

Use data from the table to explain why.

_____

_____

_____

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_____

_____

(2)

(iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

_____

_____

(1)

(Total 10 marks)

Q27.

The volume of water that the body loses must balance the volume of water that it gains.

Tables 1 and **2** show losses and gains of water by the body in one day.

Table 1
Losses of water by the body

Method	Volume in cm^3
breathing	300
sweating	600
faeces	
urine	100
Total	**2400**

Table 2
Gains of water by the body

Method	Volume in cm^3
drinking	1300
food	800
chemical reactions	300
Total	**2400**

(a) (i) Calculate the volume of urine lost by the body.

Show clearly how you work out your answer.

_____

_____

Volume of urine lost by the body = _____ cm^3

(2)

(ii) What proportion of water gained by the body comes from food?

Put a tick (✓) in the box next to your choice.

$\frac{1}{4}$ ☐

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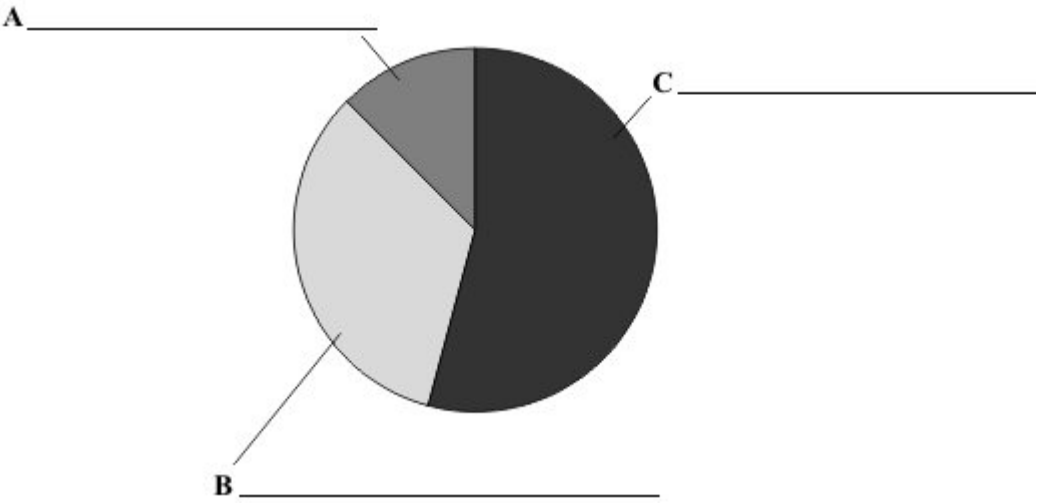
$\frac{1}{3}$ ☐

$\frac{1}{2}$ ☐

(1)

(b) One pupil decided to show the figures from **Table 2** as a pie chart.

Label sections **A**, **B** and **C** of the pie chart.



(1)

(c) How does sweating help the body?

_____

_____

(1)

(d) On a hotter day, the volumes of water lost and gained will be different.

What differences will there be?

Tick (✓) **two** answers from the list.

More sweat produced ☐

More faeces produced ☐

More food eaten ☐

Less urine produced ☐

Less liquid drunk ☐

(2)

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(Total 7 marks)

Q28.

The hormone insulin is a protein. Insulin is produced in the pancreas and controls blood glucose concentration.

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

_____

(1)

(b) We now know that a lack of the hormone insulin causes diabetes. In the early twentieth century there was no known cure for diabetes.

Frederick Banting and Charles Best carried out a number of experiments on dogs.

In the first experiment they removed part of the pancreas from a healthy dog (dog **A**). They ground up the pancreas tissue and injected an extract into dog **B**, whose pancreas had been removed to make it diabetic. Dog **B**'s diabetes was **not** cured.

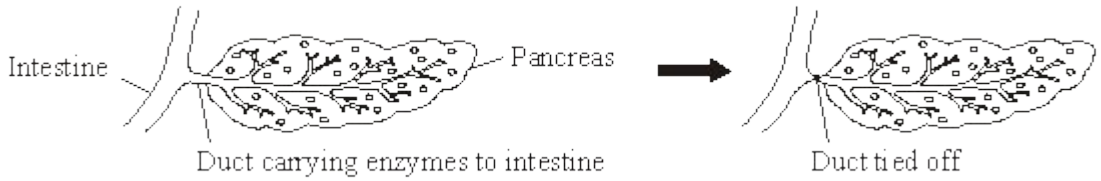
Banting thought that an enzyme produced in the pancreas of dog **A** had digested the hormone before it was injected.

Name the enzyme that might have been responsible for digesting the hormone.

_____

(1)

(c) In the second experiment with another healthy dog, Banting and Best tied off the duct which normally carries digestive enzymes out of the pancreas. This did **not** kill the dog.



(i) The dog survived even though enzymes from the pancreas could not digest food in the intestine.

Explain why the dog survived.

_____

_____

_____

(1)

(ii) As a result of these experiments, a method was developed to extract insulin from the pancreas.

Insulin is used to treat humans with diabetes.

The amount of insulin injected needs to be carefully controlled.

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Explain why.

_____

_____

_____

(1)

(d) Evaluate the use of dogs in experiments of this type.

Remember to include a conclusion to your evaluation.

_____

_____

_____

_____

_____

_____

_____

(3)

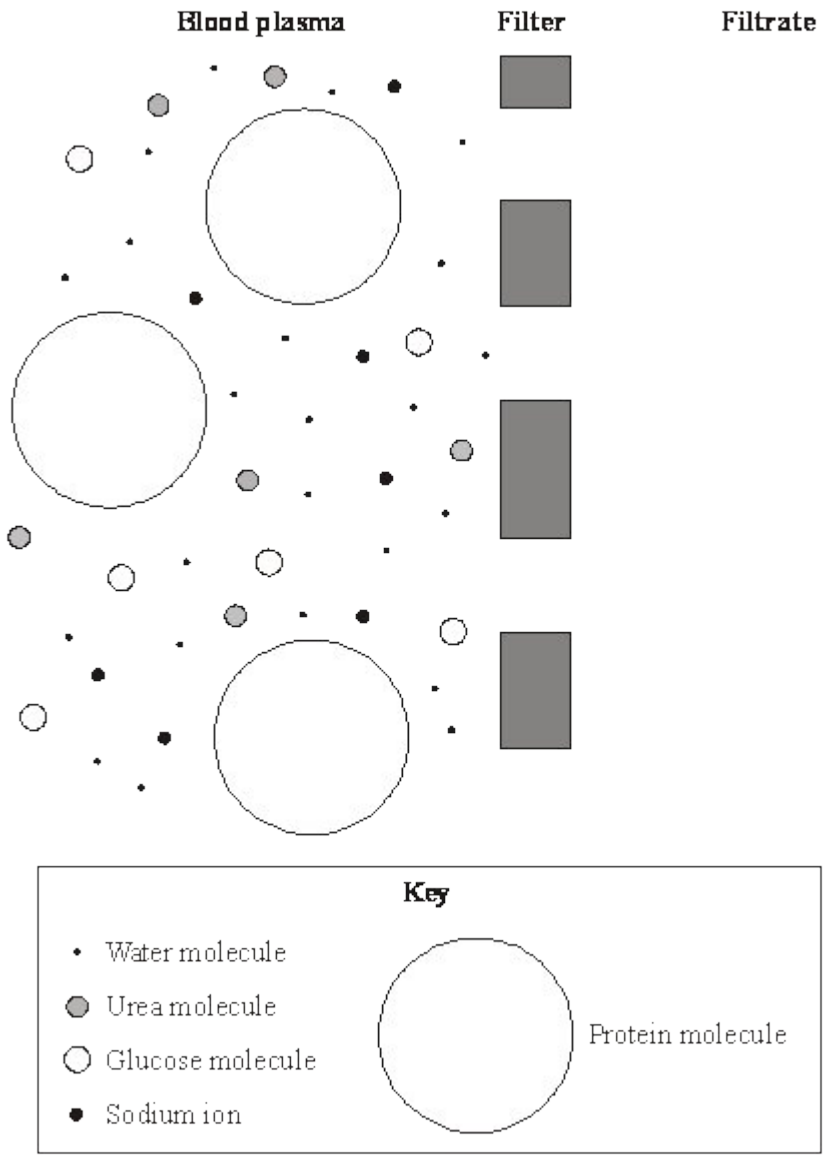
(Total 7 marks)

Q29.

The kidneys filter the blood.

The diagram shows the site of filtration in the kidney.

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

Put a tick (✓) in the box next to every substance that will pass through the filter from the blood plasma into the filtrate.

One has been done for you.

glucose	✓
urea	
water	
sodium ions	
protein	

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(2)

(b) Proteins and glucose are not present in the urine of a healthy person.

(i) Use information from the diagram to explain why protein is not found in the urine of a healthy person.

_____

_____

(1)

(ii) Complete the sentence by drawing a ring around the correct answer.

After filtration, all the glucose is

reabsorbed
released
respired

(1)

(c) An athlete trained on a hot day and on a cold day. On each day, he did the same amount of exercise and drank the same volume of water.

Complete the sentences by drawing a ring around the correct answer.

(i) On the hot day, the athlete would produce

less
more
the same amount of

urine.

(1)

(ii) This is because he would produce

less
more
the same amount of

sweat.

(1)

(Total 6 marks)

Q30.

The table shows the concentrations of some substances in one person's blood plasma, kidney filtrate and urine.

Substance	Concentration in grams per dm^3		
	Plasma	**Filtrate**	**Urine**
Water	900.0	900.0	950.0
Protein	78.0	0.0	0.0

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Glucose	0.8	0.8	0.0
Amino acids	0.4	0.4	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

(a) (i) Protein is **not** present in the filtrate.

Explain why.

_____

_____

(1)

(ii) Glucose is filtered out of the blood by the kidney and is then completely reabsorbed back into the blood.

What is the evidence for this in the table?

_____

_____

_____

_____

(2)

(iii) Glucose is reabsorbed into the blood by active transport.

Give **two** ways in which active transport differs from diffusion.

1. _____

_____

2. _____

_____

(2)

(b) The concentration of urea is much higher in the urine than in the filtrate.

Explain what causes this.

_____

_____

(1)

(Total 6 marks)

Q31.

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Long distance runners are advised to take several drinks during a race.

The table gives the composition of two drinks, Isotonic and Cola.

Drink	Sugar concentration in grams per litre	Sodium ion concentration in mmol per litre	Chloride ion concentration in mmol per litre
Isotonic	73	24	12
Cola	105	3	1

Explain why Isotonic would be the best drink for a long distance runner on a hot day.

_____

_____

_____

_____

(Total 2 marks)

Q32.

Read the passage about IVF (in-vitro fertilisation) and embryo-splitting.

> "IVF is not as successful as we would like it," says scientist Michael Tucker. "On average, only one in five or one in six of all the embryos that we generate in the IVF lab will develop as far as full-term delivery as a baby."
>
> "There is a way to perhaps double those odds. A new, identical embryo is split off from the original embryo made in the IVF lab."
>
> "What we are really doing is creating an identical twin," says scientist Dr Hilton Kort.
>
> "And that's what happens in nature every day. Cloning is creating a replica of a person or an animal."

(a) Explain why the two embryos will develop into identical twins.

_____

_____

_____

_____

(2)

(b) Explain why the embryos are **not** clones of their parents.

_____

_____

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_____

_____

(2)

(c) The scientists want to develop this technique, but are afraid to do so because public opinion might be against the technique.

Suggest an explanation for this.

_____

_____

(1)

(Total 5 marks)

Q33.

Hormones are used in contraceptive pills.

(a) Explain how a contraceptive pill works.

_____

_____

_____

_____

(2)

(b) Read the information about the trialling of the first contraceptive pill.

> The Pill was developed by a team of scientists led by Gregory Pincus. The team needed to carry out large scale trials on humans.
>
> In the summer of 1955, Pincus visited the island of Puerto Rico. Puerto Rico is one of the most densely populated areas in the world. Officials supported birth control as a form of population control. Pincus knew that if he could demonstrate that the poor, uneducated women of Puerto Rico could use the pill correctly then so could women anywhere in the world.
>
> The scientists selected a pill with a high dose of hormones to ensure that no pregnancies would occur while test subjects were taking the drug. The Pill was found to be 100% effective when taken properly. But 17% of the women in the study complained of side effects. Pincus ignored these side effects.
>
> The women in the trial had been told only that they were taking a drug that prevented pregnancy. They had not been told that the Pill was experimental or that there was a chance of dangerous side effects.

Evaluate the methods used by Pincus in trialling the contraceptive pill.

_____

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_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(Total 7 marks)

Q34.

(a) We control many conditions inside our bodies.

Name **three** conditions which are controlled inside our bodies.

1. _____

2. _____

3. _____

(3)

(b) Hormones are used to control fertility in women.

Use words from the box to complete the sentences.

antibiotic	contraceptive drug	fertility drug	vaccine

A woman can prevent pregnancy by taking a _____

A woman can be helped to become pregnant by taking a _____

(2)

(c) Some drugs are addictive.

(i) Name **one** addictive drug.

_____

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(1)

(ii) Explain why it is very difficult to give up using an addictive drug.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q35.

A woman's fertility can be controlled by using hormones.

(a) Some contraceptive pills contain oestrogen.

Name the gland which produces oestrogen.

_____

(1)

Women are being encouraged to use longer-term methods of contraception to reduce their chances of having an unwanted pregnancy.

The table summarises four long-term methods of contraception.

Method	What it is	How it works	How long does it last?	Chances of getting pregnant	Side effects
Hormone implant	Rod containing slow-release hormone inserted under the skin	Stops ovaries releasing eggs	3 years	Less than 1 in 1000	Acne in some women
Hormone injection	Injection that slowly releases hormone	Stops ovaries releasing eggs	12 weeks	Less than 4 in 1000	Weight gain in some women
IUD	Small plastic and copper coil placed in womb	Stops fertilized eggs developing in womb	5–10 years	Less than 20 in 1000	Heavier or more painful periods in some women
IUS	Plastic device containing slow-release hormone placed in womb	Stops fertilized eggs developing in womb	5 years	Less than 10 in 1000	Irregular periods in some women

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(b) Which of the methods in the table is the most reliable?

_____

(1)

(c) What is the advantage of using long-term contraception methods instead of taking a contraceptive pill every day?

_____

_____

(1)

(d) The IUD is the least reliable of the contraceptive methods shown in the table. Use information from the table to suggest a reason for this.

_____

_____

(1)

(e) Some people have ethical objections to the use of an IUD or an IUS.

Suggest **one** reason why people might object to their use.

_____

_____

(1)

(f) (i) Explain how the hormone in the implants prevents the ovary releasing eggs.

_____

_____

_____

_____

(2)

(ii) Hormones can also be used as 'fertility drugs'.

Explain how a fertility drug helps a woman to become pregnant.

_____

_____

_____

_____

(2)

(Total 9 marks)

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