AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.5.3 HORMONAL COORDINATION IN HUMANS (PACK 1)

SCORE	PERCENTAGE
/321	%

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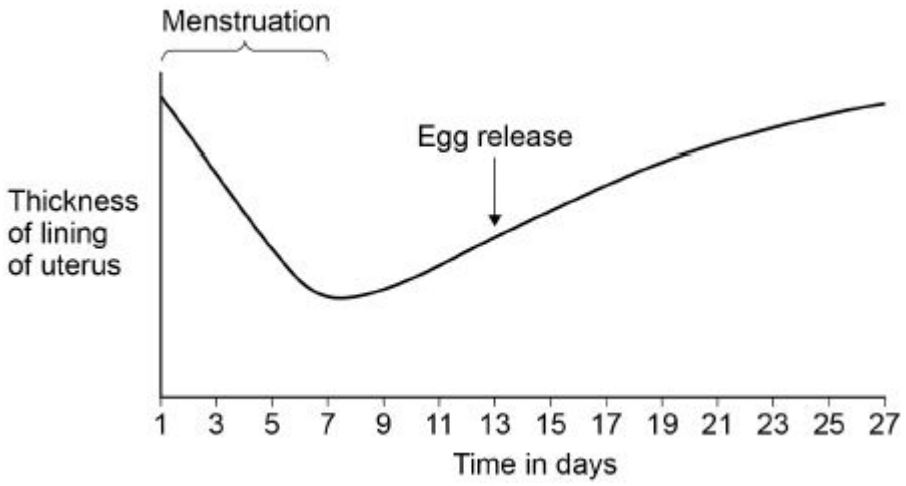
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Q1.

The graph below shows some changes that occur during the menstrual cycle.



(a) The graph above shows that the lining of the uterus thickens between days 7 and 27.

What is the purpose of thickening the lining of the uterus?

Tick **one** box.

To allow implantation of the embryo ☐

To break down waste ☐

To prevent sperm reaching the egg ☐

(1)

(b) Which hormone causes thickening of the lining of the uterus?

Tick **one** box.

Auxin ☐

Oestrogen ☐

Testosterone ☐

(1)

(c) On which day is fertilisation most likely to occur?

Use information from the graph above.

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_____

(1)

Contraception can be used to lower the chance of pregnancy.

(d) Draw **one** line from each method of contraception to how the method works.

Method of contraception	How the method works
Contraceptive pill	Barrier to prevent sperm reaching the egg
Diaphragm	Contains hormones to stop eggs maturing
Spermicidal cream	Kills sperm
	Slows down sperm production

(3)

(e) The table below gives information about some different methods of contraception.

Method	**Number of pregnancies per 100 women in one year**	**Possible Side effects**
Diaphragm and spermicidal cream	8	Usually none, but can cause bladder infection in some women
Condom	2	None
Contraceptive pill	1	Mood swings, headaches, high blood pressure, blood clots, breast cancer

A man and a woman decide to use the condom as their method of contraception.

Suggest **three** reasons for this decision.

Use information from the table above and your own knowledge.

1. _____

_____

2. _____

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_____

3. _____

_____

(3)

(Total 9 marks)

Q2.

A person with Type 1 diabetes cannot make enough insulin.

(a) Which organ makes insulin?

Tick **one** box.

Adrenal gland	☐
Pancreas	☐
Pituitary gland	☐
Thyroid	☐

(1)

(b) A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

Choose answers from the box.

DNA	**glycogen**	**kidney**
liver	**protein**	**skin**

Insulin acts on an organ called the _____ .

This organ then takes in excess glucose from the blood and changes

the glucose into _____ .

(2)

(c) Insulin cannot be taken as a tablet. This is because insulin is a type of protein.

What would happen to the insulin in the tablet if it reached the stomach?

_____

_____

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(1)

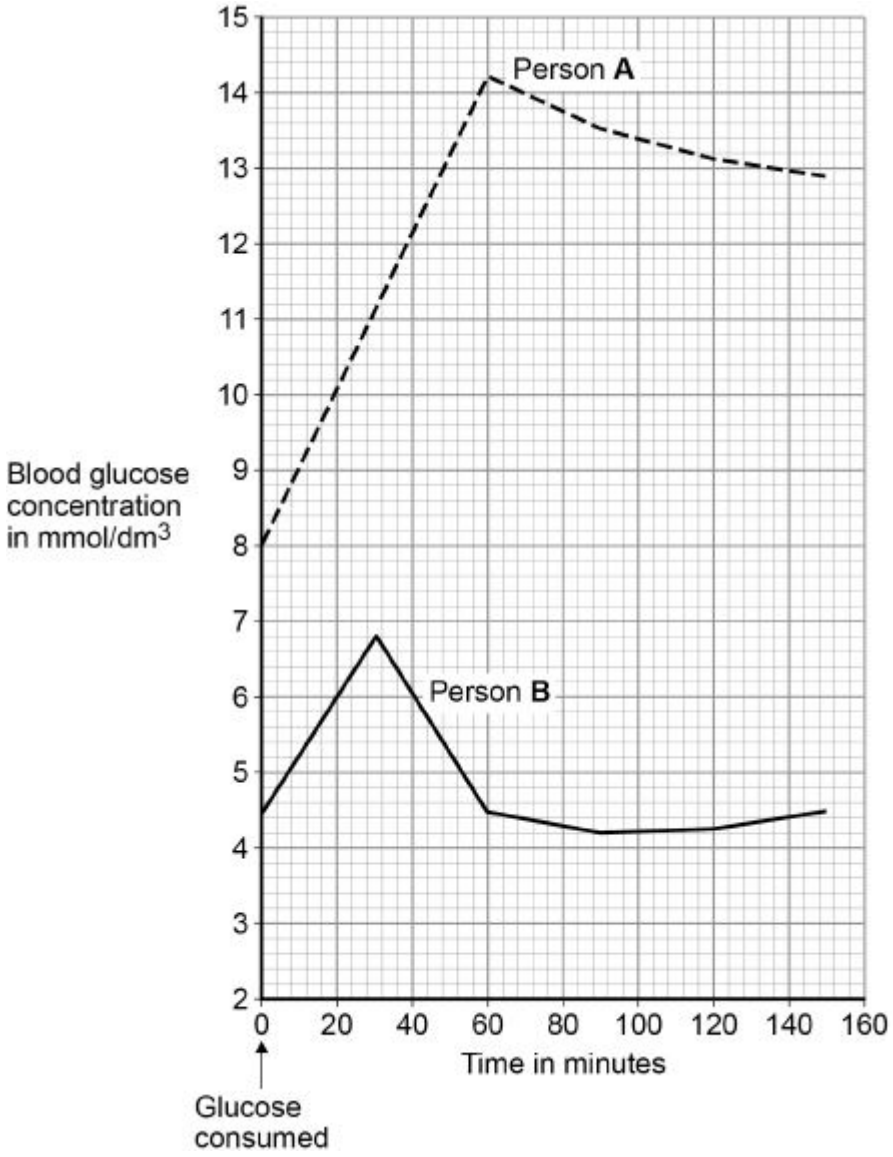
Two people each drank the same volume of a glucose drink.

Person **A** has Type 1 diabetes.

Person **B** does **not** have diabetes.

Figure 1 shows how the concentration of glucose in their blood changed.

Figure 1



(d) How much higher was the **highest** concentration of glucose in the blood of person **A** than the **highest** concentration in person **B**?

Use information from **Figure 1**.

_____

_____

_____

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_____

Answer = _____ $mmol/dm^3$

(2)

(e) Describe **one** other way that the results for person **A** were different from the results for person **B**.

Use information from **Figure 1**.

_____

_____

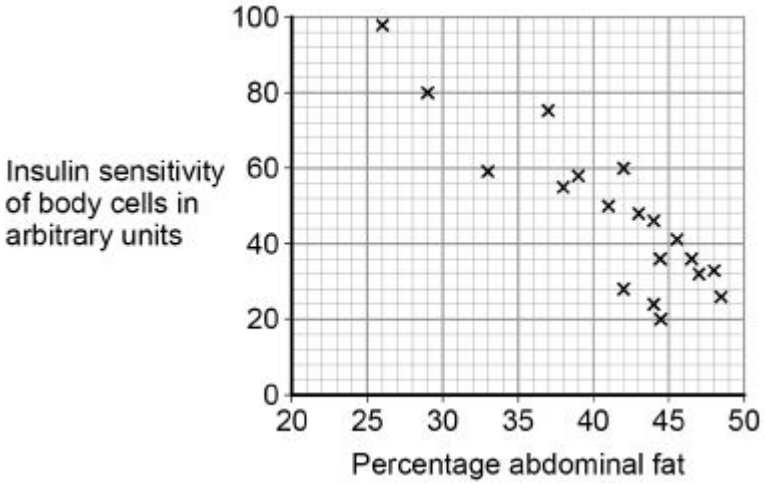
(1)

Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

Figure 2 shows information about abdominal fat and insulin sensitivity in body cells.

Figure 2



(f) What type of relationship is shown in **Figure 2**?

Tick **one** box.

A negative correlation ☐

No correlation ☐

A positive correlation ☐

(1)

(g) A person is at risk of developing Type 2 diabetes.

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Suggest **two** ways the person could lower the chance of developing Type 2 diabetes.

1. _____

_____

2. _____

_____

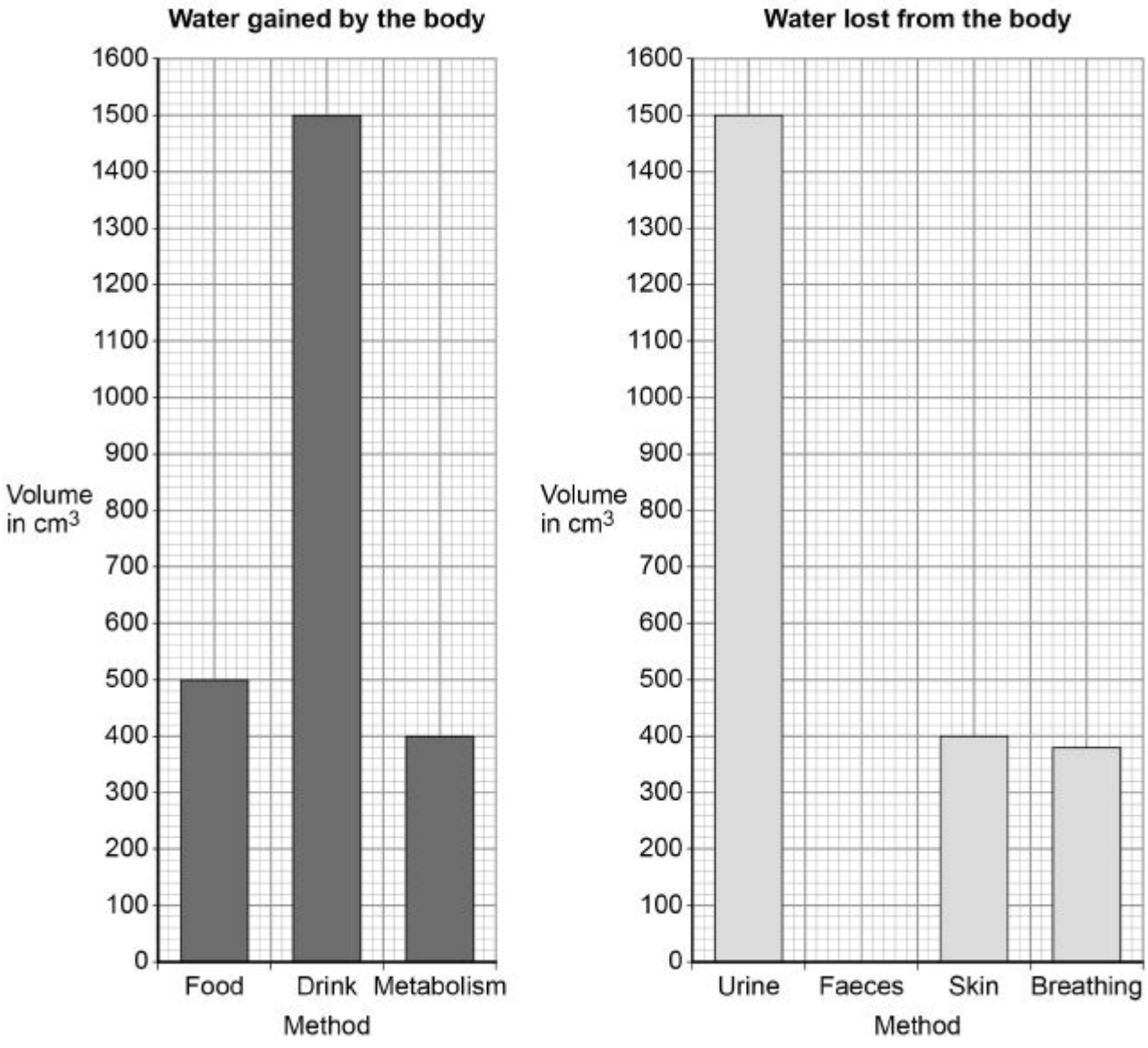
(2)

(Total 10 marks)

Q3.

It is important to maintain water balance in the body.

The graphs below show how much water a person gained and lost by different methods in one day.



When water is balanced, the volume of water taken in by the body is equal to the volume of water lost from the body.

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(a) Calculate the volume of water the person lost in one day in faeces.

Use information from the graphs above.

_____

_____

_____

_____

Volume lost in faeces = _____ cm^3

(2)

(b) The graphs above show that one method of gaining water is by metabolism.

Which metabolic process produces water?

Tick **one** box.

Breakdown of protein to amino acids	☐
Changing glycogen into glucose	☐
Digestion of fat	☐
Respiration of glucose	☐

(1)

The next day, the person ran a 10-kilometre race.

The volume of water lost from the body through the skin and by breathing increased.

(c) Explain why more water was lost through the skin during the race.

_____

_____

_____

_____

(2)

(d) Explain why more water was lost by breathing during the race.

_____

_____

_____

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_____

_____

_____

(3)

(Total 8 marks)

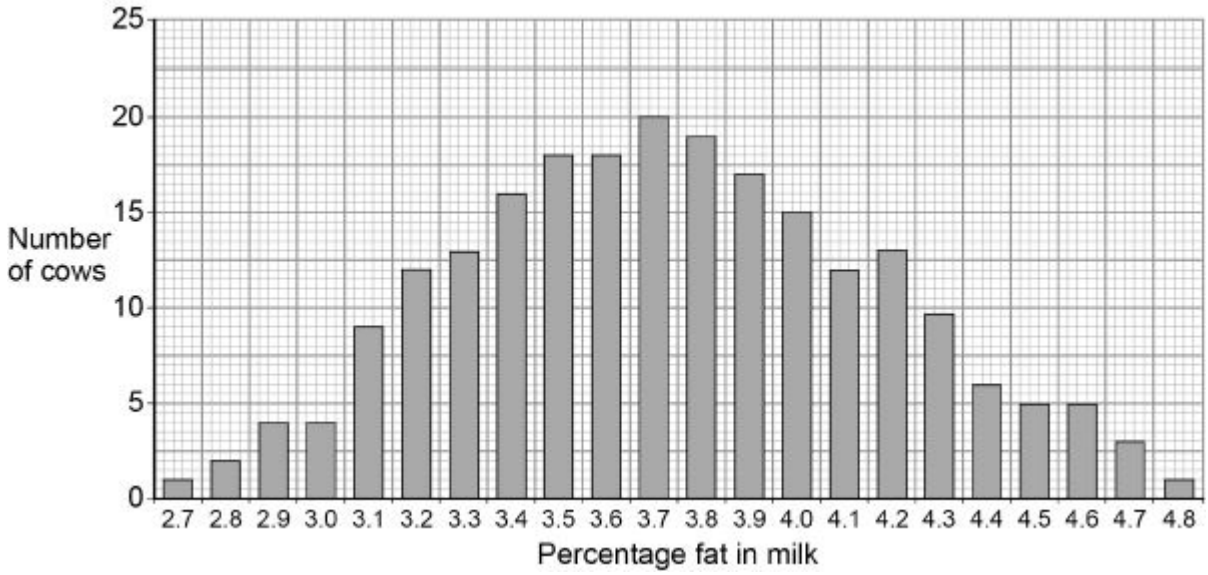
Q4.

Scientists want to breed cows that produce milk with a low concentration of fat.

Figure 1 shows information about the milk in one group of cows.

The cows were all the same type.

Figure 1



(a) In **Figure 1** the mean percentage of fat in the milk is equal to the modal value.

Give the mean percentage of fat in the milk of these cows.

Mean percentage = _____

(1)

(b) A student suggested:

'The percentage of fat in milk is controlled by one dominant allele and one recessive allele.'

How many different phenotypes would this produce?

Tick **one** box.

2		3		22		46	

(1)

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(c) Give the evidence from **Figure 1** which shows the percentage of fat in the milk is controlled by several genes.

_____

_____

(1)

(d) One of the genes codes for an enzyme used in fat metabolism.

A mutation in this gene causes a reduction in milk fat.

The mutation changes one amino acid in the enzyme molecule.

Explain how a change in one amino acid in an enzyme molecule could stop the enzyme working.

_____

_____

_____

_____

_____

_____

(3)

The scientists found one cow with a mutation.

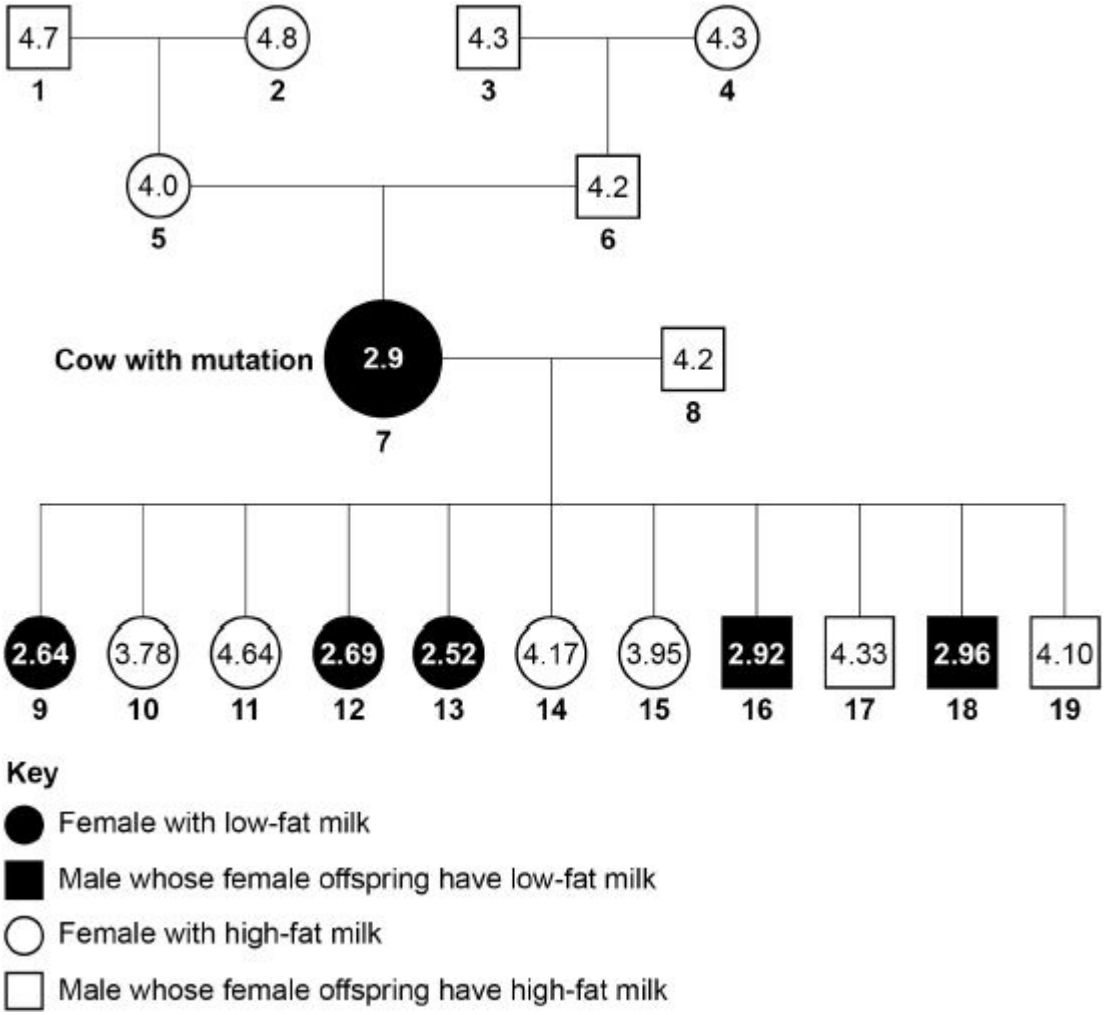
The cow's milk contained only 2.9% fat.

Figure 2 shows the percentage of fat in the milk of cattle related to the cow with the mutation.

The values for male cattle are the mean values of their female offspring.

Figure 2

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(e) Animal **8** is homozygous.

The mutation in animal **7** produced a dominant allele for making low-fat milk.

Give evidence from **Figure 2** that animal **7** is heterozygous.

_____

_____

(1)

(f) Animals **7** and **8** produced 11 offspring. These offspring were produced by in vitro fertilisation (IVF).

The embryos from IVF were transferred into 11 other cows.

Suggest why IVF and embryo transfer were used rather than allowing animals **7** and **8** to mate naturally.

_____

_____

(1)

(g) Draw a Punnett square diagram to show a cross between animals **7** and **8**.

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Identify which offspring produce low-fat milk and which offspring produce high-fat milk.

Use the following symbols:

D = dominant allele for making low-fat milk

d = recessive allele for making high-fat milk

(4)

(h) The scientists want to produce a type of cattle that makes large volumes of low-fat milk.

The scientists will selectively breed some of the animals shown in **Figure 2**.

Describe how the scientists would do this.

_____

_____

_____

_____

_____

_____

_____

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_____

_____

(4)

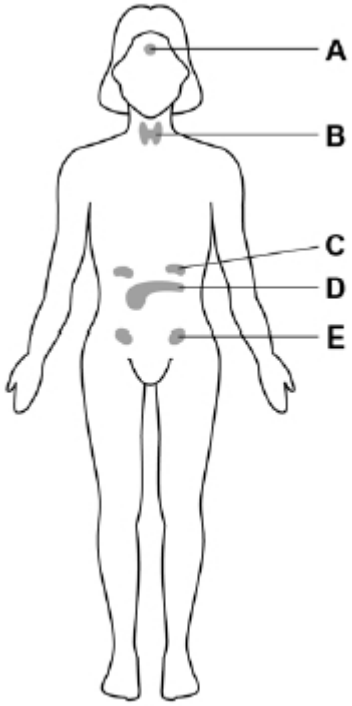
(Total 16 marks)

Q5.

The menstrual cycle in a woman is controlled by hormones.

The diagram shows some of the glands in a woman's body that produce hormones.

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The hormones that control the menstrual cycle are produced by the pituitary gland and by the ovaries.

(a) Which gland is the pituitary gland?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which gland is the ovary?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Complete the sentence.

In the menstrual cycle, one egg is released approximately every _____ days.

(1)

(d) Which hormone is used in the oral contraceptive pill?

Tick **one** box.

Adrenaline ☐

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Insulin ☐

Progesterone ☐

Testosterone ☐

(1)

(e) Describe how the oral contraceptive pill stops a woman becoming pregnant.

_____

_____

_____

_____

(2)

(f) Complete the sentences.

Choose the answers from the box.

adrenaline	insulin	oestrogen	progesterone	testosterone

Development of the female secondary sex characteristics is controlled

by _____ .

Sperm production is stimulated by _____ .

(2)

(Total 8 marks)

Q6.

Many functions of the human body are controlled by chemicals called hormones.

(a) What is a hormone?

_____

_____

_____

_____

_____

_____

(3)

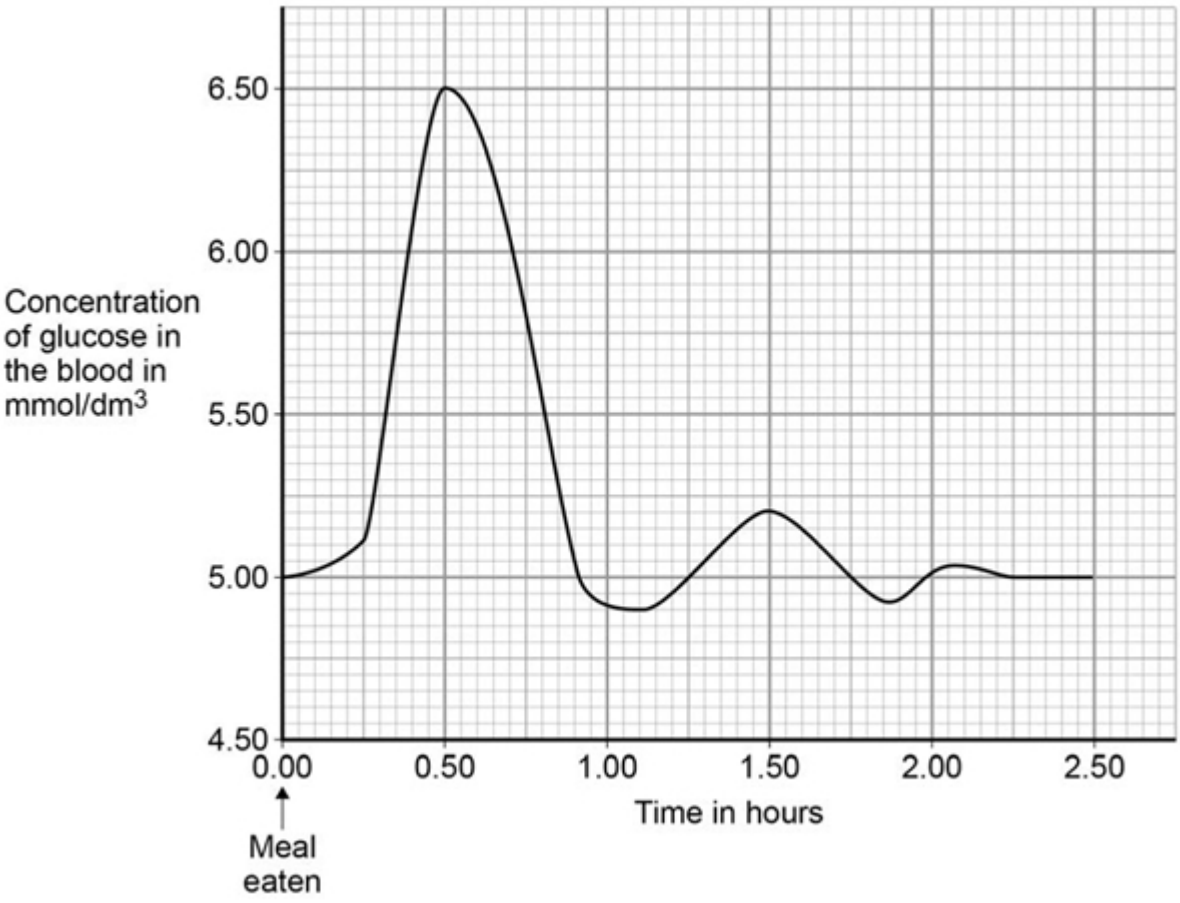
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(b) Name the **two** hormones that control blood glucose concentration.

_____ and _____

(1)

The graph shows changes in the concentration of glucose in the blood of a healthy person following a meal.



(c) Explain how negative feedback controls the blood glucose concentration during the first one and a half hours after the meal.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

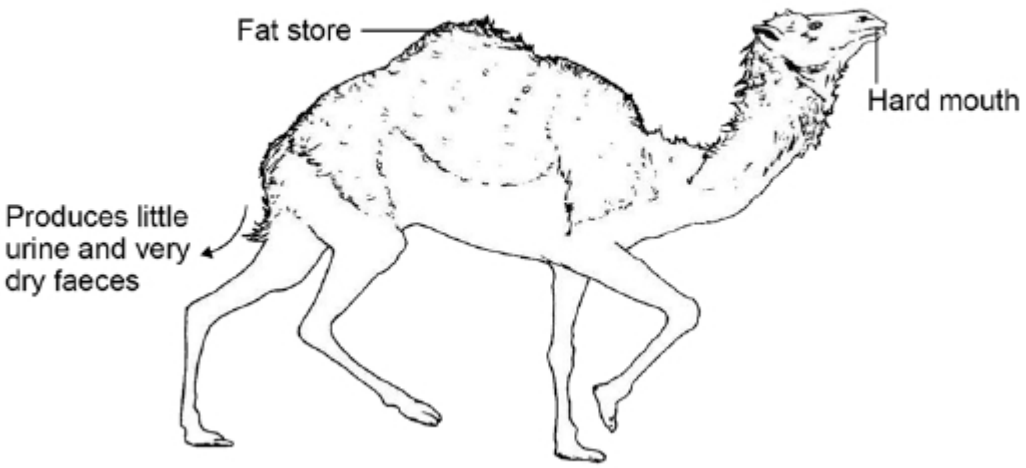
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Q7.

Figure 1 shows a type of camel called a dromedary (*Camelus dromedarius*).

The dromedary lives in hot, dry deserts.

Figure 1



(a) One adaptation of the dromedary is 'temperature tolerance'.

This means that the animal's body temperature can rise by up to 6 °C before it starts to sweat.

Explain how temperature tolerance can help the dromedary to survive in the desert.

_____

_____

_____

_____

(2)

(b) Three more adaptations of the dromedary are given in **Figure 1**.

Give a reason why each adaptation helps the animal survive in the desert.

Fat store _____

_____

Produces little urine and very dry faeces _____

_____

Hard mouth _____

_____

(3)

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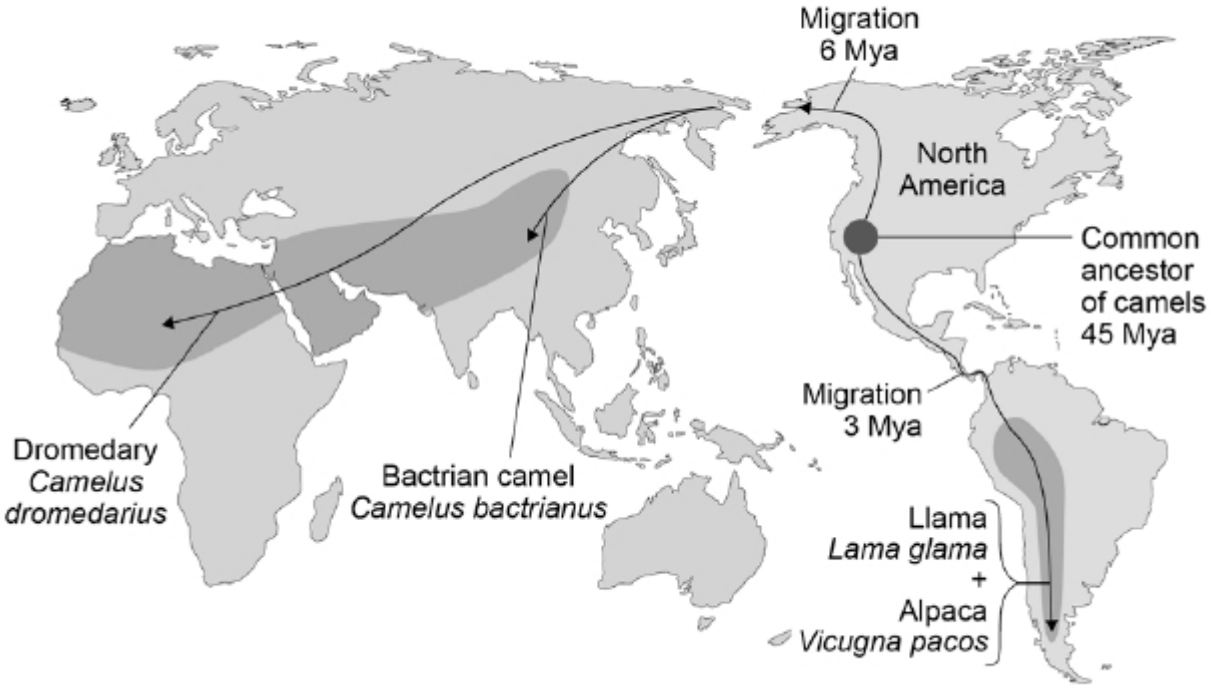
There are several species of the camel family alive today.

Scientists think these species evolved from a common ancestor that lived in North America about 45 million years ago (Mya).

Figure 2 shows:

- where four modern species of the camel family live today
- how the ancestors of these camels migrated from North America.

Figure 2



(c) Which **two** of the four modern species of camel do scientists believe to be most closely related to each other?

Give the reason for your answer.

_____ and _____

Reason _____

_____

(1)

(d) Describe the type of evidence used for developing the theory of camel migration shown in **Figure 2**.

_____

_____

_____

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_____

(2)

(e) Explain how several different species of camel could have evolved from a common ancestor over 45 million years.

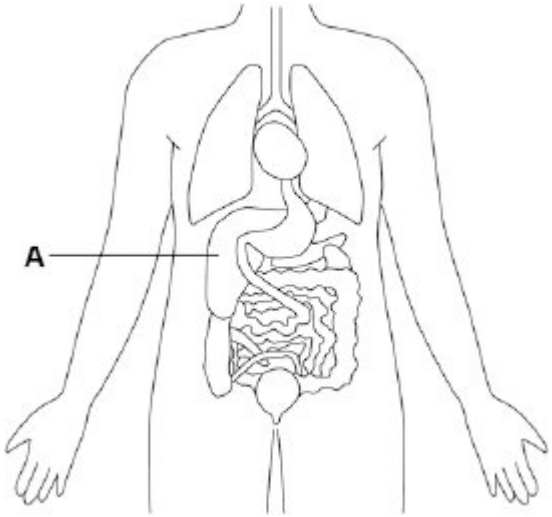
(6)

(Total 14 marks)

Q8.

Humans control their internal environment in many ways.

Look at the diagram below.



(a) Name organ **A**.

_____

(1)

(b) Organ **A** stores glucose.

People with Type 1 diabetes cannot effectively control the levels of glucose in their blood.

Name the **hormone** people with **Type 1 diabetes** have to inject to decrease their blood glucose level.

_____

(1)

(c) Which organ produces urine?

Tick **one** box.

Brain ☐

Lungs ☐

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Kidney ☐

Thyroid ☐

(1)

(d) Marathon runners often drink sports drinks during a race.

Explain why.

_____

_____

_____

_____

(2)

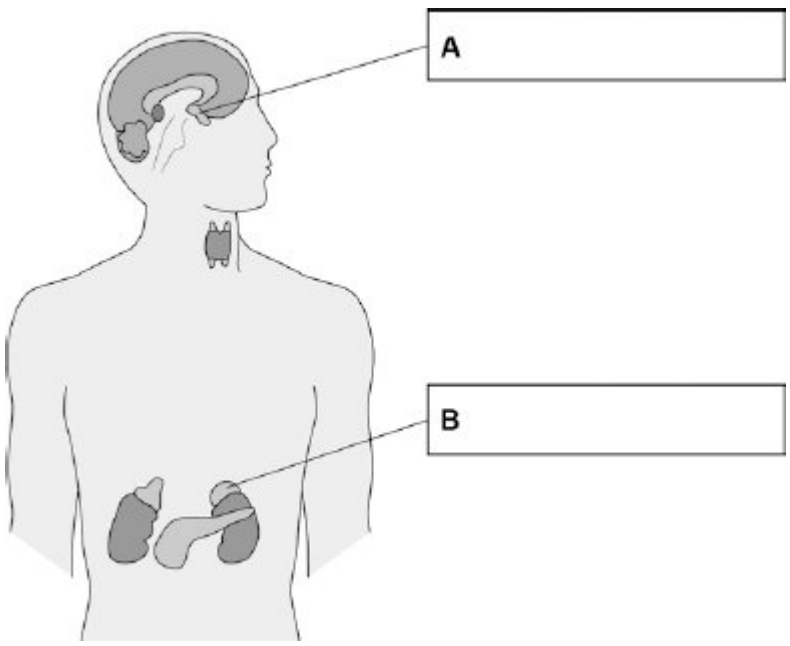
(Total 5 marks)

Q9.

Glands in the body produce hormones.

(a) Use words from the box to label gland **A** and gland **B** on the diagram below.

Adrenal	**Pancreas**	**Pituitary**	**Testis**	**Thyroid**



(2)

(b) Which gland produces oestrogen?

Tick **one** box.

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Ovary ☐

Pancreas ☐

Testis ☐

Thyroid ☐

(1)

(c) **Table 1** shows some methods of contraception.

Table 1

Type of contraception	Percentage (%) of pregnancies prevented
Oral pill	>99
Implant	99
Condom	98
Diaphragm	<96

Which method of contraception in **Table 1** is **least** effective at preventing pregnancy?

_____

(1)

(d) Which method of contraception in **Table 1** will protect against sexually transmitted diseases like HIV?

_____

(1)

(e) Another method of contraception is called the intrauterine device (IUD).

There are two main types of IUD:

- copper
- plastic.

Both types of IUD are more than 99% effective.

Look at **Table 2**.

Table 2

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	Copper IUD	Plastic IUD
How the IUD works	• releases copper • copper changes the fluids in the uterus to kill sperm	• releases a hormone • hormone thickens mucus from the cervix so the sperm have more difficulty swimming to the egg
Benefits	• prevents pregnancy for up to 10 years • can be removed at any time • can be used as emergency contraception	• prevents pregnancy for up to 5 years • can be removed at any time
Possible side effects	• very painful periods • heavy periods or periods which last for a long time • feeling sick, back pain	• painful periods • light periods or no periods • feeling sick, headaches, breast pain, acne • hormones may affect mood • ovarian cysts

Evaluate the use of the plastic IUD as a contraceptive compared to the copper IUD.

Use the information in **Table 2**.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 9 marks)

Q10.

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Homeostasis controls the internal conditions of the body.

(a) Explain how blood glucose levels are controlled in the body of someone who does **not** have diabetes.

(4)

(b) Compare how each type of diabetes is caused.

Suggest how each type of diabetes can be treated.

(4)

(c) Look at the table below.

Population of UK in 2015	6.5×10^7
Number of people diagnosed with diabetes	3.45×10^6
Estimated number of people with undiagnosed diabetes	5.49×10^5

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

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_____

_____

_____

_____

_____

Estimated percentage of population with diabetes = ___ %

(3)

(d) A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

_____

_____

(1)

(e) A blood test called the glucose tolerance test checks how well the body processes glucose.

Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are **not** allowed to eat for 8 hours before the test.

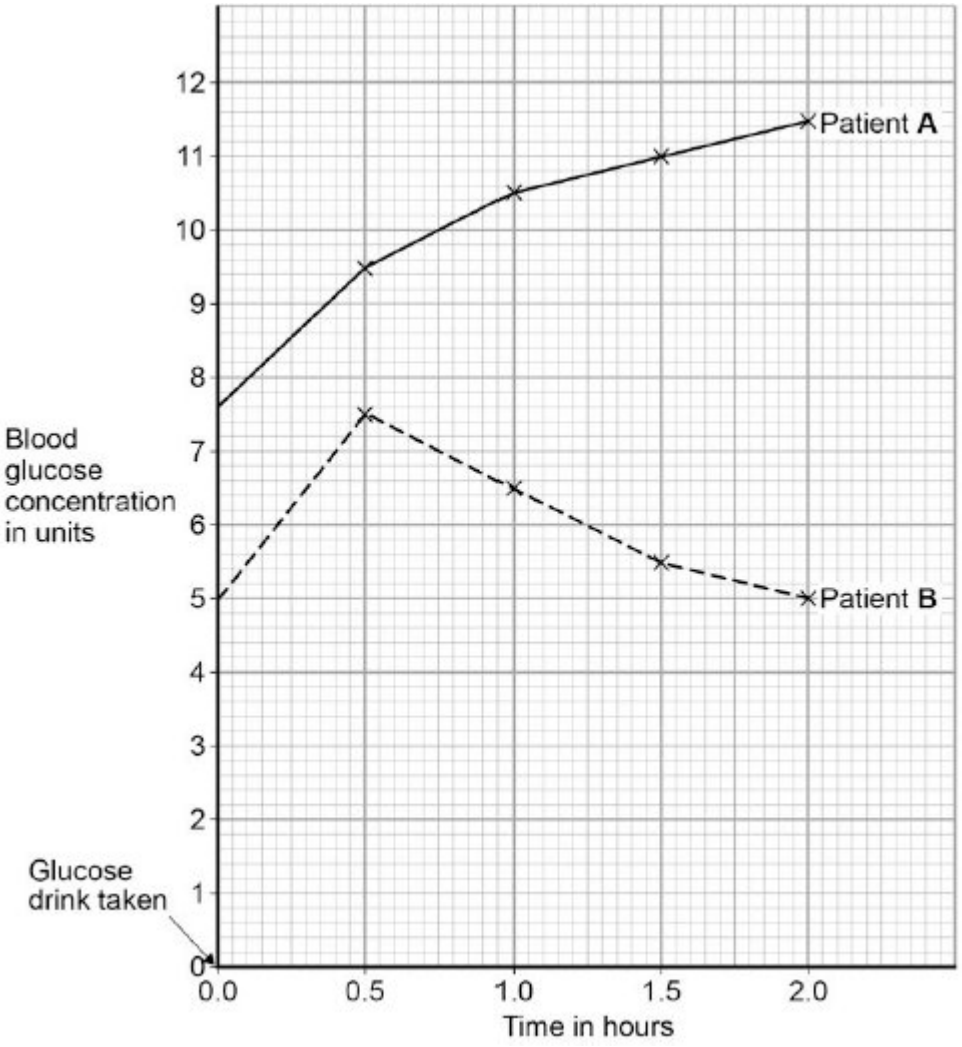
_____

_____

(1)

(f) The diagram below shows the results of a glucose tolerance test for two patients, **A** and **B**.

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Which patient has diabetes?

Justify your answer.

Patient _____

Justification _____

_____

_____

_____

(2)

(Total 15 marks)

Q11.

Endocrine glands produce hormones.

(a) Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

_____

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_____

_____

_____

_____

_____

(3)

(b) Describe the roles of FSH and LH in the menstrual cycle.

_____

_____

_____

_____

(2)

(c) The combined pill is a contraceptive that contains progesterone **and** oestrogen.

The 'mini-pill':

- is a contraceptive that **only contains** the progesterone hormone
- has to be taken at the same time each day to prevent pregnancy.

The success rate of the mini-pill in preventing pregnancy is lower than that of the combined pill.

Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

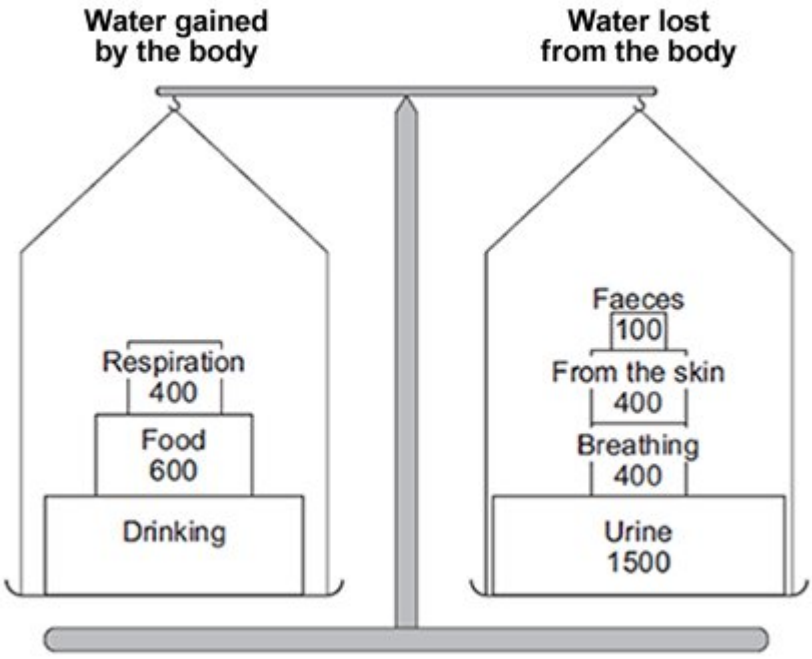
(Total 9 marks)

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Q12.

The diagram below shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm^3, the person's body gained and lost.



(a) (i) How much water was lost from the body on the cold day?

Draw a ring around the correct answer.

1800 cm^3 **2400 cm^3** **3300 cm^3**

(1)

(ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance?

_____

_____

Volume of water = _____ cm^3

(2)

(b) (i) Name the process by which water is lost from the skin.

_____

(1)

(ii) Why does the body need to lose water from the skin?

_____

_____

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(1)

(c) The next day was a hot day. The person gained the same volume of water and did the same activities.

(i) What effect did the increase in temperature have on the volume of water the person lost?

Tick (✔) **one** box.

Less water was lost through the skin. ☐

More water was lost through the skin. ☐

More water was lost in faeces. ☐

(1)

(ii) What effect would the increase in temperature have on the volume of urine the person lost?

Draw a ring around the correct answer.

decrease **increase** **no change**

(1)

(Total 7 marks)

Q13.

Hormones are involved in controlling the menstrual cycle and fertility.

(a) (i) Use the correct answer from the box to complete the sentence.

auxin	**follicle stimulating hormone (FSH)**	**thalidomide**

A hormone produced by the pituitary gland is _____

(1)

(ii) Use the correct answer from the box to complete the sentence.

luteinising hormone (LH)	**oestrogen**	**statin**

A hormone produced by the ovaries is _____

(1)

(b) (i) Why are fertility drugs given to some women?

_____

_____

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(1)

(ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman's ovaries.

How do the hormones travel to the ovaries?

Draw a ring around the correct answer.

through the bloodstream **through the neurones** **through the skin**

(1)

(c) Which **two** hormones are used in contraceptive pills?

Tick (✔) **two** boxes.

FSH	☐	oestrogen	☐
LH	☐	progesterone	☐

(2)

(Total 6 marks)

Q14.

(a) Which organ of the human body produces egg cells?

Draw a ring around the correct answer.

liver **ovary** **testis**

(1)

(b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

Draw a ring around the correct answer.

23 **46** **48**

(1)

(c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 1 shows how successful IVF was for women of different ages at one clinic.

Table 1

Age of women in years	Percentage of women who had a baby

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<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

(i) A student thought that the result for women aged 40–42 was anomalous.

Suggest why the student thought this result was anomalous.

_____

_____

(1)

(ii) Describe the general trend in the results in **Table 1**.

You should ignore the anomalous result.

_____

_____

(1)

(d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 2 shows the scientists' results.

Table 2

Age of women in years	**Number of women per 1000 who had a baby with a faulty chromosome**
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

(i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

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_____

_____

Answer = _____ times

(2)

(ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 1** and **Table 2** in your answer.

1. _____

_____

2. _____

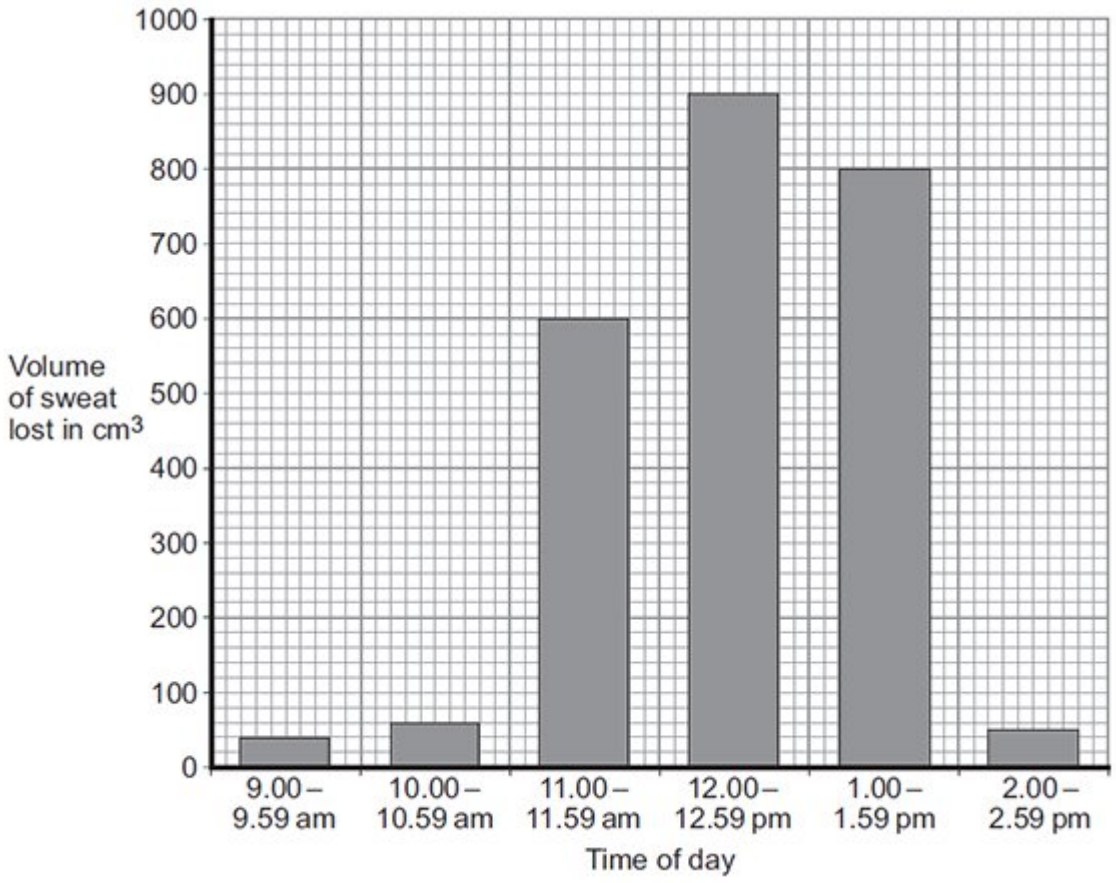
_____

(2)

(Total 8 marks)

Q15.

A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.



(a) (i) Suggest what happened at 11.00 am.

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Tick (✔) **one** box.

The person moved into a cold room. ☐

The person removed their coat. ☐

The person started running a race. ☐

(1)

(ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm.

_____

_____

Total volume of sweat lost = _____ cm^3

(1)

(iii) Suggest **one** way the person could replace the water that was lost as sweat.

_____

_____

(1)

(b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✔) **one** box.

brain ☐

kidney ☐

pancreas ☐

(1)

(ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✔) **one** box.

capillaries ☐

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glands ☐

receptors ☐

(1)

(c) How does sweating help to control body temperature?

_____

_____

(1)

(Total 6 marks)

Q16.

Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

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

Tick (✔) **one** box.

liver ☐

pancreas ☐

skin ☐

(1)

(ii) What effect does insulin have on glucose in the blood?

Tick (✔) **one** box.

Insulin causes glucose to move into the cells. ☐

Insulin increases the amount of glucose in the blood. ☐

Insulin converts glucose to starch. ☐

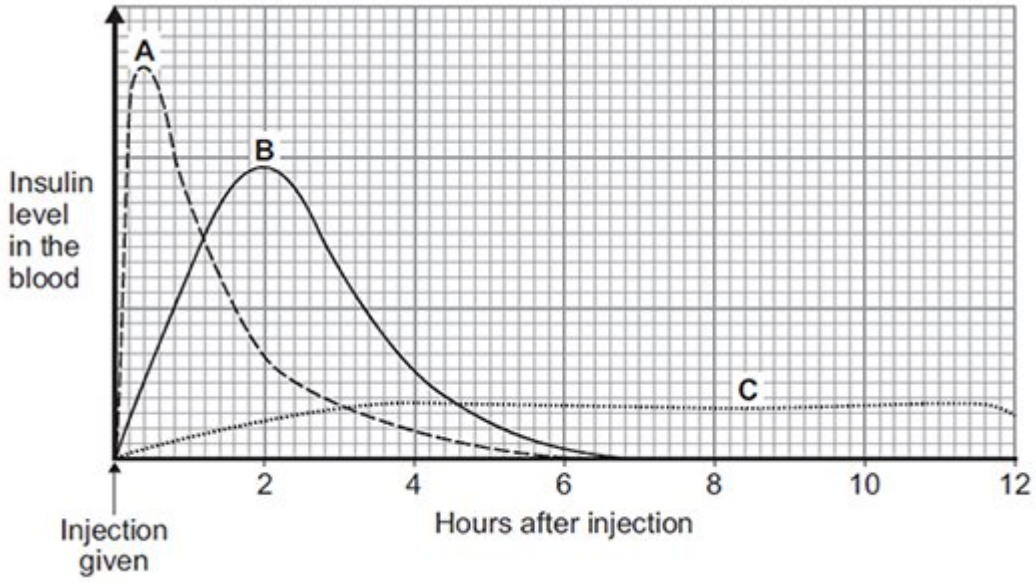
(1)

(b) Some people with diabetes inject insulin several times a day.

There are different types of insulin.

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The graph shows some information about three different types of insulin, **A**, **B** and **C**.



(i) Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

_____

Give a reason for your answer.

_____

_____

(2)

(ii) A woman with diabetes has a blood glucose level of 12 mmol per dm^3 of blood.

The woman's normal blood glucose level is 6 mmol per dm^3.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm^3.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

_____

Number of units = _____

(1)

(c) Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

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Tick (✔) **one** box.

The pancreas could be rejected. ☐

The patient will need to inject insulin every day. ☐

The patient's blood glucose levels may rise and fall too much. ☐

(1)

(Total 6 marks)

Q17.

People with type 1 diabetes inject insulin to control their blood glucose level.

A pancreas transplant is another treatment for type 1 diabetes.

One risk of a pancreas transplant is organ rejection.

(a) Explain why a transplanted organ may be rejected.

_____

_____

_____

_____

_____

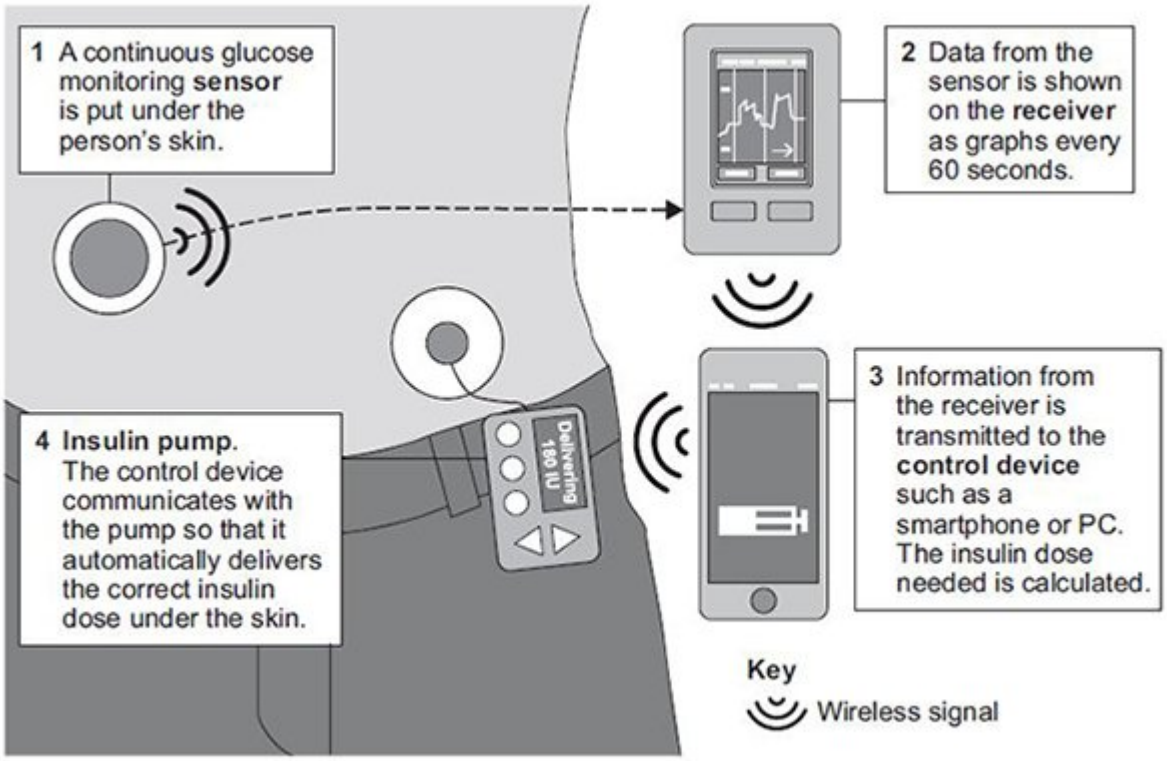
_____

(3)

(b) Scientists have developed an artificial pancreas to treat type 1 diabetes.

The diagram below shows how an artificial pancreas works.

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(i) A woman with type 1 diabetes has an artificial pancreas. The woman eats a meal high in sugar. The meal causes her blood glucose level to rise.

Use information from the diagram above to describe what happens to bring the blood glucose level of the woman back to normal.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(ii) The traditional way of monitoring and treating type 1 diabetes is to take a small sample of blood and put it on a test strip to find out how much insulin to inject.

Suggest **one** possible advantage, other than not having to do blood tests, of the method used in the diagram above.

_____

_____

(1)

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(Total 8 marks)

Q18.

This question is about hormones.

(a) (i) Hormones carry messages.

What type of messenger is a hormone?

Draw a ring around the correct answer.

chemical **electrical** **environmental**

(1)

(ii) Which part of the brain secretes hormones?

Draw a ring around the correct answer.

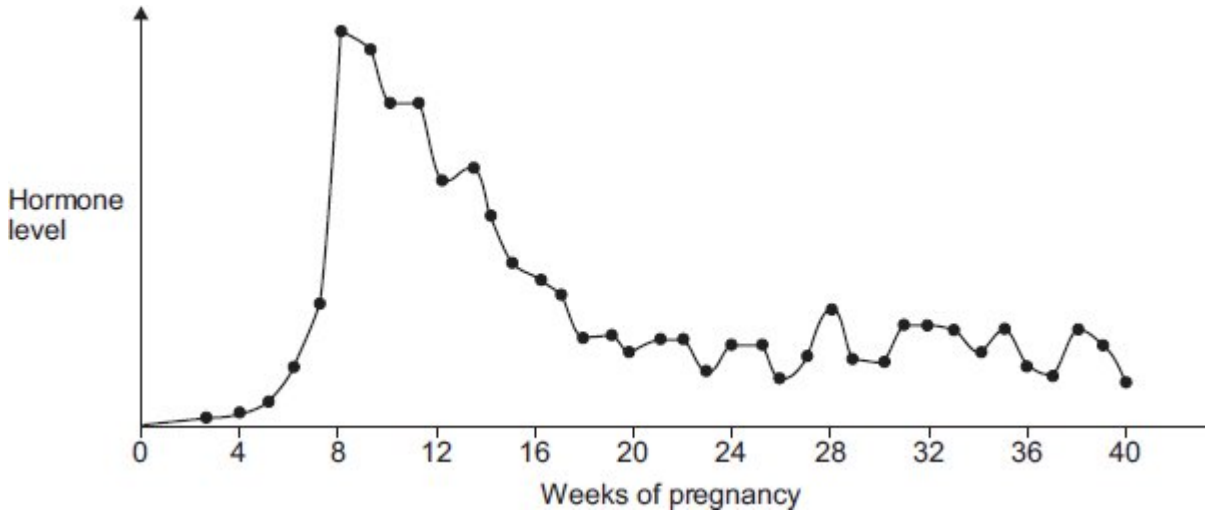
cerebellum **medulla** **pituitary gland**

(1)

(b) **Figure 1** shows the level of a pregnancy hormone over a 40-week pregnancy.

This hormone can be detected in a pregnancy test.

Figure 1



A woman takes a pregnancy test.

In which week of pregnancy is the test most likely to give a positive result?

Use information from **Figure 1**.

Write the correct answer in the box.

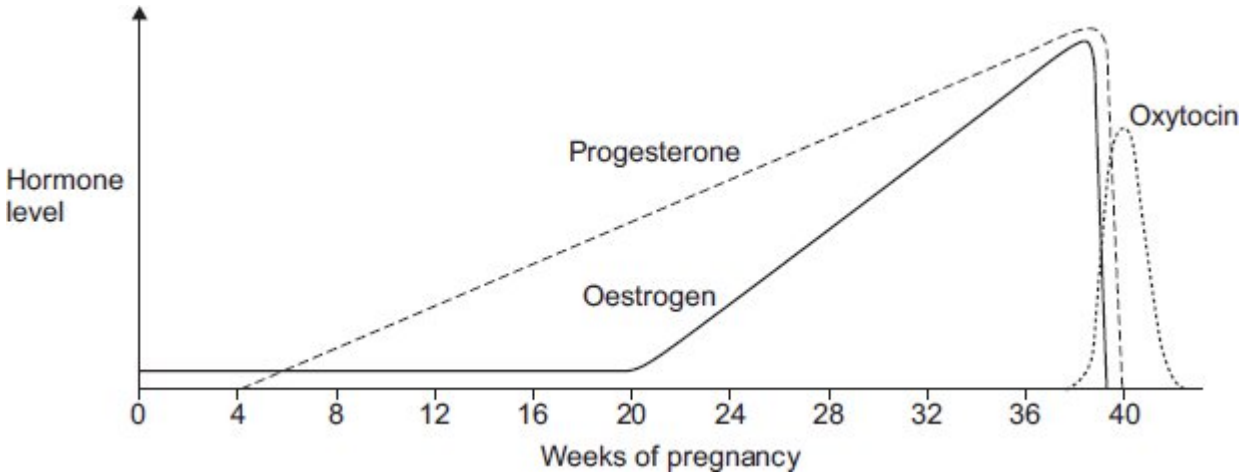
(1)

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(c) **Figure 2** shows the levels of three other hormones during pregnancy.

The baby is usually born at about 40 weeks.

Figure 2



Adaptation by kind permission of Biozone International

(i) Describe the patterns in the levels of oestrogen and progesterone from 0 to 36 weeks.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(ii) Which hormone is likely to stimulate contractions of the uterus (womb) when the baby is born?

Use information from **Figure 2** to give a reason for your answer.

_____

_____

_____

_____

(2)

(Total 9 marks)

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Q19.

(a) Control systems help to keep conditions in the human body relatively constant.

What is the general name for the processes that keep body conditions relatively constant?

Draw a ring around the correct answer.

eutrophication **homeostasis** **hydrotropism**

(1)

(b) The concentration of glucose in the blood is controlled by hormones.

Use the correct answer from the box to complete each sentence.

glucagon	**glycerol**	**glycogen**
kidney	**liver**	**pancreas**

When the blood glucose concentration increases, an organ called

the _____ releases the hormone insulin.

Insulin causes glucose to move from the blood into the cells of the muscles

and the _____ .

Inside these organs, the glucose is changed into a carbohydrate called

_____ , which can be stored.

When the blood glucose concentration falls, another hormone is released,

which causes the storage carbohydrate to break down into glucose again.

This hormone is called _____ .

(4)

(c) A person with Type 1 diabetes does not make enough insulin.

The person needs to test their blood at intervals throughout the day.

If the concentration of glucose in their blood is too high, the diabetic person needs to inject insulin.

(i) Insulin is a protein.

It must be injected and cannot be taken by mouth.

Explain why.

_____

_____

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_____

_____

(2)

(ii) Apart from injecting insulin, give **one other** way that a diabetic person could help to control the concentration of glucose in their blood.

_____

_____

(1)

(d) Pet dogs have been trained to detect if the concentration of glucose in the blood of their diabetic owners is outside the normal healthy range. These dogs are called 'medical response dogs'.
The dogs respond in different ways. They may bark, jump up, or stare at their owners. They may even fetch a blood-testing kit.

(i) Suggest what stimulus the dogs might be responding to when they behave like this.

_____

_____

(1)

(ii) **Table 1** shows how the concentration of glucose varied in blood samples from five diabetic people. Measurements were made both before and after getting a medical response dog.

Table 1

		Mean percentage of blood samples with different concentrations of glucose from the five diabetic people		
	Number of blood samples measured	**Low glucose**	**Within normal range of glucose**	**High glucose**
Before getting a dog	1704	32.6	54.8	12.6
After getting a dog	1724	18.6	61.6	19.8

A survey was made of the effect of a medical response dog on the lives of 16 diabetic people.

Table 2 shows how well these diabetic people agreed with each statement in the survey.

Table 2

Statement in	**Totally agree**	**Somewhat agree**	**Neither agree**	**Somewhat disagree**	**Totally disagree**

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survey			nor disagree		
I am more independent since getting my dog.	12	2	2	0	0
There are disadvantages to having a medical response dog.	0	0	4	4	8
I trust my dog to alert me when my sugar levels are low.	11	3	1	0	1
I trust my dog to alert me when my sugar levels are high.	6	7	0	1	2

Evaluate how useful medical response dogs are for warning diabetic people that the concentration of glucose in their blood is outside the normal range.

Use information from **Tables 1** and **2**.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(e) **Table 3** shows the concentrations of some substances in the urine of a non-diabetic person and in the urine of a diabetic person.

Table 3

	Concentration of substance in urine in g per dm^3	
Substance	**Non-diabetic person**	**Diabetic person**

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Protein	0	0
Glucose	0	2.0
Urea	20.0	19.5
Sodium ions	6.0	5.8

Compare the results for the non-diabetic person and the diabetic person.
Give reasons for any differences.

Use your knowledge of how the kidney works.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(Total 19 marks)

Q20.

(a) Humans need to remove waste products from their bodies.

Which organ removes waste carbon dioxide from the body?

Tick (✓) **one** box.

Liver ☐

Lung ☐

Skin ☐

(1)

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(b) Kidneys make urine. Urine is stored in the bladder.

Which **one** of the following stages is involved in making urine in a healthy kidney?

Tick (✓) **one** box.

Filtering the blood ☐

Reabsorbing **all** of the ions ☐

Reabsorbing **all** of the water ☐

(1)

(c) A healthy kidney keeps the correct amount of water in the blood.

If there is too much water in the blood, what might happen to the blood cells?

Tick (✓) **one** box.

They will take in water and burst. ☐

There will be no change. ☐

They will lose water and shrink. ☐

(1)

(d) A child has kidney failure.

A doctor recommends dialysis to treat the kidney failure.

Before dialysis starts, the doctor measures the concentration of glucose and of urea in the child's blood.

The concentration of glucose in the dialysis fluid is 6 mmol per dm^3.

The results are shown below in the table.

	Concentration in the blood before dialysis starts in mmol per dm^3
Glucose	6

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Urea	28

(i) Suggest what the concentration of glucose in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 6 **6** **more than 6**

(1)

(ii) Suggest what the concentration of urea in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 28 **28** **more than 28**

(1)

(iii) Give a reason for your answer to part **(d)(ii)**.

_____

_____

(1)

(e) (i) Some patients have kidney transplants. Transplanted kidneys may be rejected by the body.

Use the correct answer from the box to complete the sentence.

antibodies	**hormones**	**tissues**

Transplanted kidneys have proteins on the surface of the cells. These proteins may be attacked by the patient's _____ .

(1)

(ii) It is important to prevent rejection of a new kidney.

Which **one** of the following helps to prevent the kidney from being rejected?

Tick (✓) **one** box.

Giving the patient antibodies ☐

Giving the patient painkillers ☐

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Tissue typing the donor kidney ☐

(1)

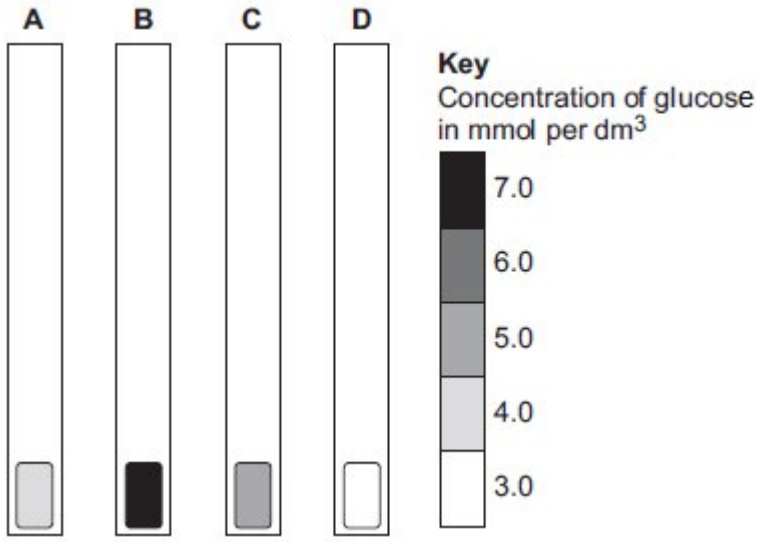
(Total 8 marks)

Q21.

Blood glucose concentration in humans must be kept between 4.4 and 6.1 mmol per dm^3.

Four students, **A**, **B**, **C** and **D**, tested their blood glucose concentration with glucose testing strips.

The diagram shows the results of their tests and the key from the test strip bottle.



(a) (i) Which student, **A**, **B**, **C** or **D**, has diabetes and has eaten a large piece of cake?

☐

(1)

(ii) Which student, **A**, **B**, **C** or **D**, is in most need of eating carbohydrates?

☐

(1)

(iii) Which student, **A**, **B**, **C** or **D**, has a healthy blood glucose concentration?

☐

(1)

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(b) (i) Name the hormone that people with diabetes inject to prevent their blood glucose concentration from becoming too high.

_____

(1)

(ii) Blood glucose concentration is monitored in the body.

Which organ monitors blood glucose concentration?

Draw a ring around the correct answer.

brain **liver** **pancreas**

(1)

(Total 5 marks)

Q22.

Many runners drink sports drinks to improve their performance in races.

A group of students investigated the effects of three brands of sports drink, **A**, **B** and **C**, on the performance of three runners on a running machine. One of the runners is shown in the image below.



© Keith Brofsky/Photodisc/Thinkstock

Table 1 gives information for each drink.

Table 1

Brand of sports drink

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Nutrient per dm^3	A	B	C
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

(a) (i) In the investigation, performance was measured as the time taken to reach the point of exhaustion.

Exhaustion is when the runners could not run anymore.

All three runners:
- ran on a running machine until the point of exhaustion
- each drank 500 cm^3 of a different brand of sports drink
- rested for 4 hours to recover
- ran on the running machine again and recorded how much time they ran until the point of exhaustion.

The speed at which the runners ran was the same and all other variables were controlled.

The students predicted that the runner drinking brand **B** would run for the shortest time on the second run before reaching the point of exhaustion.

Use information from **Table 1** to suggest an explanation for the students' prediction.

_____

_____

_____

_____

(2)

(ii) If the balance between ions and water in a runner's body is not correct, the runner's body cells will be affected.

Describe **one** possible effect on the cells if the balance between ions and water is **not** correct.

_____

_____

(1)

(b) When running, a runner's body temperature increases.

Describe how the brain monitors body temperature.

_____

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_____

_____

_____

_____

_____

(3)

(c) (i) **Table 2** is repeated here to help you answer this question.

Table 2

	Brand of sports drink		
Nutrient per dm^3	**A**	**B**	**C**
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

People with diabetes need to be careful about drinking too much sports drink.

Use information from **Table 2** to explain why drinking too much sports drink could make people with diabetes ill.

_____

_____

_____

_____

_____

_____

(3)

(ii) Other than paying attention to diet, how do people with diabetes control their diabetes?

_____

_____

(1)

(Total 10 marks)

Q23.

It is important to remove waste products from our bodies.

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Healthy kidneys help to keep our internal environment constant.

(a) Describe how a healthy kidney produces urine.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(b) A child has kidney failure and is treated with dialysis.

Before the dialysis starts, the doctor measures the concentration of urea and glucose in the child's blood.

The table shows the results.

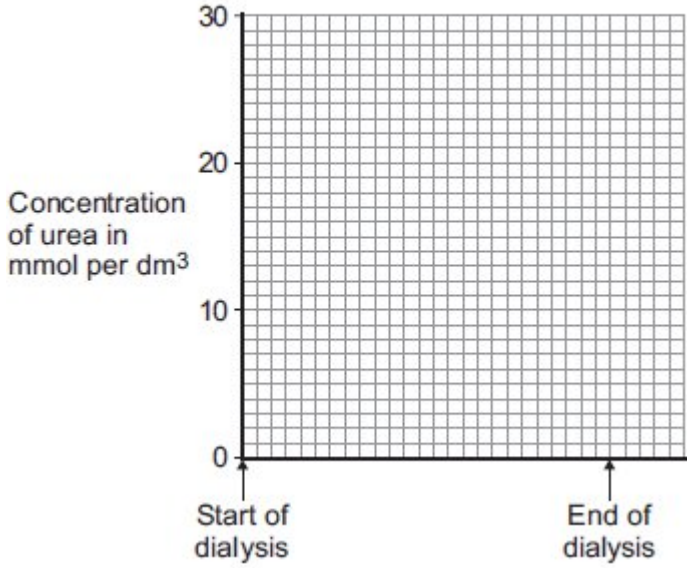
	Concentration in the blood before dialysis starts in mmol per dm^3
Urea	28
Glucose	6

The child has a normal blood glucose concentration.

(i) Sketch a graph on **Figure 1** to suggest what will happen to the concentration of urea in the blood during dialysis.

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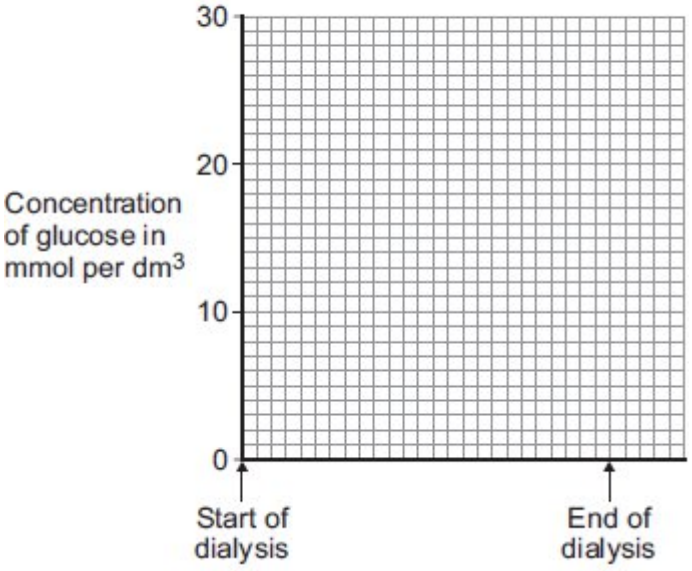
Figure 1



(1)

(ii) Sketch a graph on **Figure 2** to suggest what will happen to the concentration of glucose in the blood during dialysis.

Figure 2



(1)

(c) (i) Another way of treating kidney failure is with a kidney transplant.

A transplanted kidney can be rejected.

Explain why the new kidney may be rejected.

_____

_____

_____

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_____

_____

_____

(3)

(ii) Describe **one** way in which doctors try to prevent kidney rejection.

_____

_____

(1)

(Total 11 marks)

Q24.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Homeostasis keeps conditions in the body relatively constant.

The amount of water in the body is controlled by homeostasis.

Kidney function is controlled by a gland in the brain.

Describe how the water content of the blood is controlled.

_____

_____

_____

_____

_____

_____

_____

_____

_____

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_____

_____

_____

_____

_____

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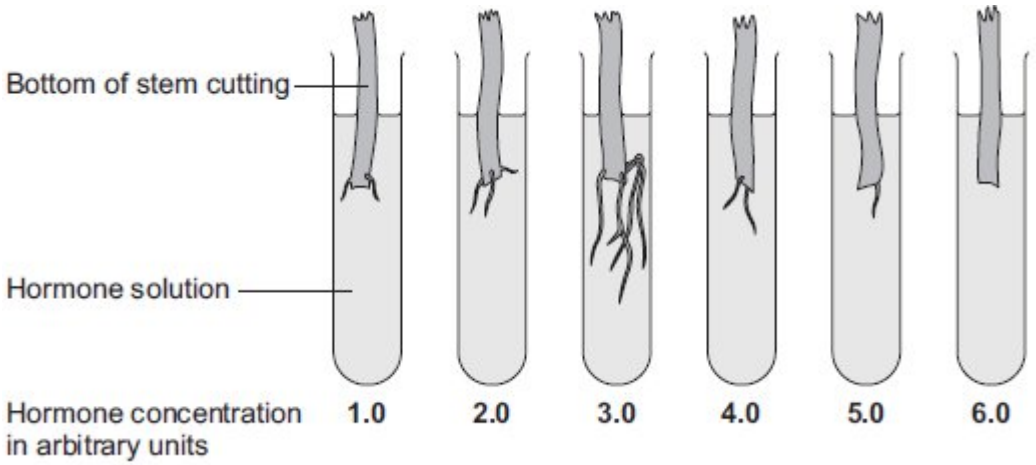
(Total 6 marks)

Q25.

(a) A student investigated the effect of a plant hormone on the growth of roots by plant cuttings.

The student took six stem cuttings from the same plant. He put the cuttings in test tubes containing hormone solutions of different concentrations.

The image below shows the six cuttings after 2 weeks.



(i) What is the best concentration of hormone for encouraging root growth?

_____ arbitrary units

(1)

(ii) Give **two** functions of plant roots.

1. _____

_____

2. _____

_____

(2)

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

Taking cuttings to produce new plants is an example of

asexual reproduction.
genetic engineering.

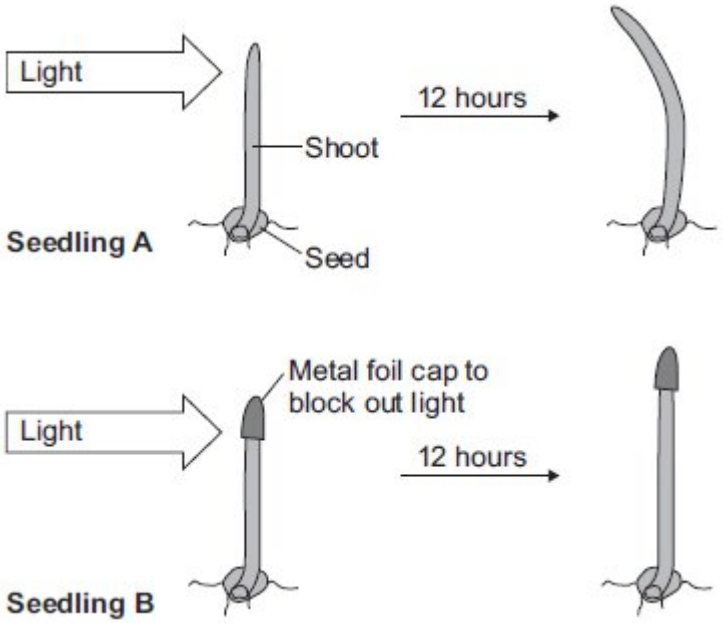
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sexual reproduction.

(1)

(b) Another student investigated the effect of light, shining from one side, on the growth of plant shoots.

The diagram below shows how the student treated the shoots and the results she obtained after 12 hours.



(i) What is the response to light shown by **Seedling A** called?

Tick (✓) **one** box.

cloning ☐

a reflex ☐

a tropism ☐

(1)

(ii) The student concluded that the shoot **tip** is sensitive to light.

What evidence is there in the diagram above for this conclusion?

_____

_____

_____

_____

(2)

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(c) The seedling produces a hormone which helps to control its response to light.

(i) What is the name of the hormone?

Tick (✓) **one** box.

auxin ☐

glucagon ☐

glycerol ☐

(1)

(ii) How does the hormone control the response of **Seedling A** to light shining from one side?

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 12 marks)

Q26.

It is important that the amount of water in the body is controlled.

(a) The table below shows the main ways that a person takes in and loses water in one day.

Water taken in		**Water lost**	
Method	**Volume in cm^3**	**Method**	**Volume in cm^3**
Drink	1450	Urine	1500
Food	800	Sweat	600
Metabolic water	350	Breath	
		Faeces	100

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Total	**2600**	**Total**	**2600**

(i) Calculate the volume of water lost from the body through breathing.

Use information from the table above.

Volume of water lost through breathing = _____ cm^3

(2)

(ii) Metabolic water is water produced by aerobic respiration.

Complete the equation for aerobic respiration.

_____ + oxygen ⟶ _____ + water (+ energy)

(2)

(iii) If the water intake stays the same, what will happen to the volumes of sweat and urine lost from the body on a much hotter day?

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

The volume of sweat will

decrease.
increase.
stay the same.

The volume of urine will

decrease.
increase.
stay the same.

(2)

(b) The kidneys help to control the water content of the body and the concentrations of substances dissolved in the body fluids. The kidneys do this by filtering the blood and then reabsorbing back into the blood the substances needed by the body.

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

Substance	**Blood plasma in g per dm^3**	**Kidney filtrate in g per dm^3**	**Urine in g per dm^3**
Protein	70	0	0
Glucose	1	1	0
Urea	0.3	0.3	20
Sodium ions	3	3	6

(i) The table below shows that sodium ions are twice as concentrated in the urine as in the blood plasma.

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Calculate how many times more concentrated **urea** is in the urine compared to the blood plasma.

Use information from the table.

_____

_____

Answer = _____ times more concentrated

(2)

(ii) What is the main cause of this increase in concentration of urea between the blood plasma and the urine?

Tick (✓) **one** box.

Increased urea production by the kidney ☐

Reabsorption of water by the kidney ☐

Increased deamination of amino acids by the liver ☐

(1)

(iii) The table shows that both protein and glucose are found in the blood plasma but **not** in the urine.

Use your knowledge of kidney functioning to explain why.

Protein _____

_____

_____

_____

Glucose _____

_____

_____

_____

(4)

(c) Some people have kidney failure.

The two main types of treatment for kidney failure are dialysis and a kidney transplant operation.

Suggest reasons why most doctors think that a kidney transplant is better than dialysis treatment.

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_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 17 marks)

Q27.

Phenylketonuria (PKU) is an inherited condition. PKU makes people ill.

(a) PKU is caused by a recessive allele.

(i) What is an allele?

_____

_____

(1)

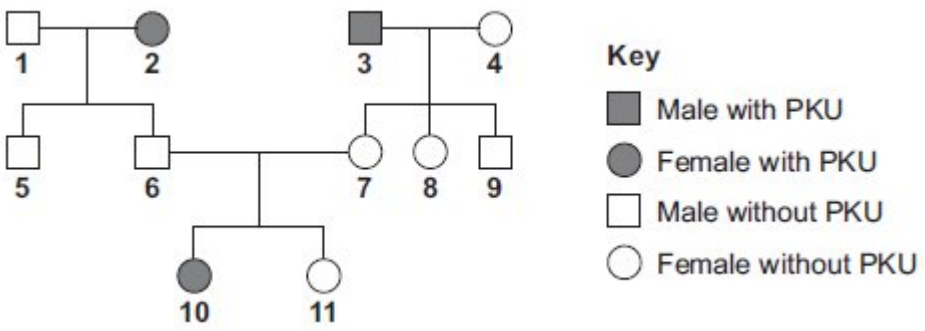
(ii) What is meant by recessive?

_____

_____

(1)

(b) The diagram below shows the inheritance of PKU in one family.



(i) Give **one** piece of evidence from the diagram that PKU is caused by a recessive allele.

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_____

_____

(1)

(ii) Persons **6** and **7** are planning to have another child.
Use a genetic diagram to find the probability that the new child will have PKU.

Use the following symbols in your answer:

N = the dominant allele for **not** having PKU

n = the recessive allele for PKU.

Probability = _____

(4)

(c) Persons **6** and **7** wish to avoid having another child with PKU.

A genetic counsellor advises that they could produce several embryos by IVF treatment.

(i) During IVF treatment, each fertilised egg cell forms an embryo by cell division.

Name this type of cell division.

_____

(1)

(ii) An embryo screening technique could be used to find the genotype of each embryo.

An unaffected embryo could then be placed in person **7**'s uterus.

The screening technique is carried out on a cell from an embryo after just three cell divisions of the fertilised egg.

How many cells will there be in an embryo after the fertilised egg has

divided three times? ☐

(1)

(iii) During embryo screening, a technician tests the genetic material of the embryo to find out which alleles are present.

The genetic material is made up of large molecules of a chemical substance.

Name this chemical substance.

_____

(1)

(d) Some people have ethical objections to embryo screening.

(i) Give **one** ethical objection to embryo screening.

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_____

(1)

(ii) Give **one** reason in favour of embryo screening.

_____

(1)

(Total 12 marks)

Q28.

Human body temperature must be kept within narrow limits.

The image shows a cyclist in a race.



© Ljupco/iStock/Thinkstock

(a) Use the correct answer from the box to complete each sentence.

blood	**brain**	**kidney**	**sweat**	**urine**

The cyclist's body temperature is monitored by a centre in the _____ .

This centre is sensitive to the temperature of the cyclist's _____ .

If the cyclist's body temperature increases, his body increases

the production of _____ .

(3)

(b) (i) Cyclists drink sports drinks after a race.

The table below shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

	Sports drink		
	A	**B**	**C**
Ratio of glucose (g per dm3) to ions (mg per dm^3)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

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Which sports drink, **A**, **B** or **C**, would replace water fastest in an athlete?

☐

(1)

(ii) Why should sports drinks contain ions?

_____

_____

(1)

(iii) Why should a person with diabetes **not** drink too much sports drink?

_____

_____

(1)

(Total 6 marks)

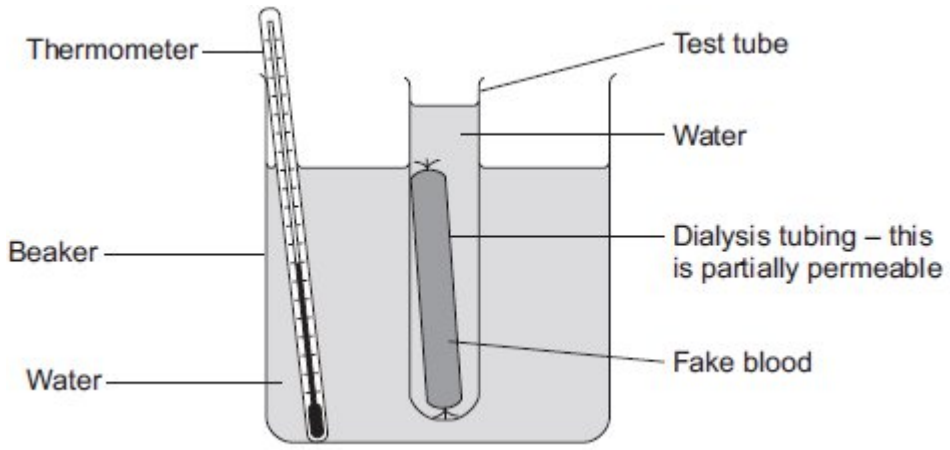
Q29.

A person's kidneys stop working. The person may be treated using a dialysis machine.

Some students made a model of a dialysis machine.

Figure 1 shows the students' model.

Figure 1



The fake blood contained:

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

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(a) (i) Suggest why the students kept the water in the beaker at 37 °C.

_____

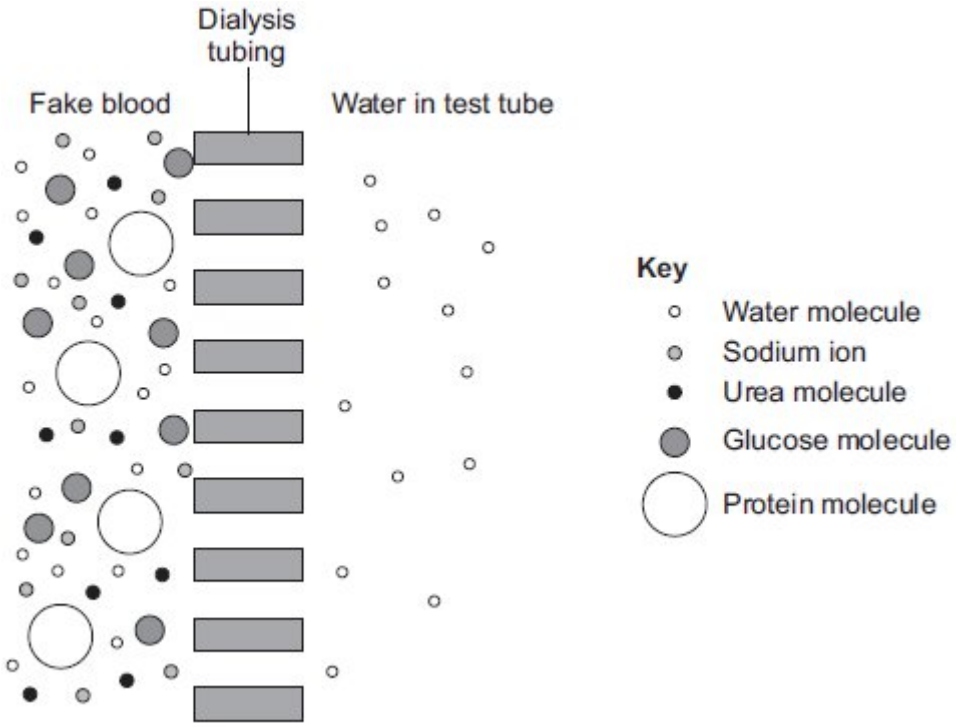
_____

(1)

(ii) The dialysis tubing separates the fake blood from the water in the test tube.

Figure 2 shows the fake blood, the dialysis tubing and the water in the test tube.

Figure 2



After 1 hour, the students tested the water in the test tube to see which substances had filtered through from the fake blood.

Name **one** substance that the students would find in the water in the test tube after 1 hour.

_____

(1)

(iii) Give a reason for your answer to part **(a)(ii)**.

_____

_____

_____

(1)

(iv) In hospitals, dialysis machines use dialysis fluid, not pure water.

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Dialysis fluid contains the same concentration of useful substances as the blood.

Which substance is at the same concentration in dialysis fluid as in blood?

Tick (✓) **one** box.

Glucose ☐

Insulin ☐

Oxygen ☐

(1)

(b) When the kidneys stop working, the person can be treated by a continuous process called CPD.

In CPD:

- dialysis fluid is put into the abdomen
- the fluid is changed four times a day at home
- changing the fluid takes about 45 minutes.

Suggest **two** advantages of having CPD instead of treatment on a dialysis machine.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

Q30.

Blood is part of the circulatory system.

(a) (i) Give **one** function of white blood cells.

_____

_____

(1)

(ii) Which of the following is a feature of platelets?

Tick (✓) **one** box.

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They have a nucleus. ☐

They contain haemoglobin. ☐

They are small fragments of cells. ☐

(1)

(b) Urea is transported by the blood plasma from where it is made to where the urea is excreted.

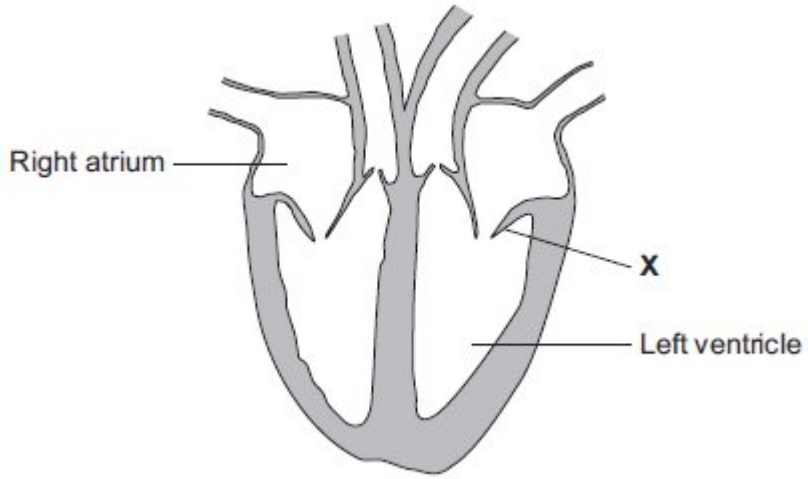
Complete the following sentence.

Blood plasma carries urea from where it is made in the _____

to the _____ where the urea is removed from the blood.

(2)

(c) The illustration shows a section through the human heart.



Structure **X** is a valve. If valve **X** stops working, it may need to be replaced.

A scientist is designing a new heart valve. The scientist knows that the valve must be the correct size to fit in the heart.

Suggest **two** other factors the scientist needs to consider so that the newly designed valve works effectively in the heart.

_____

_____

_____

_____

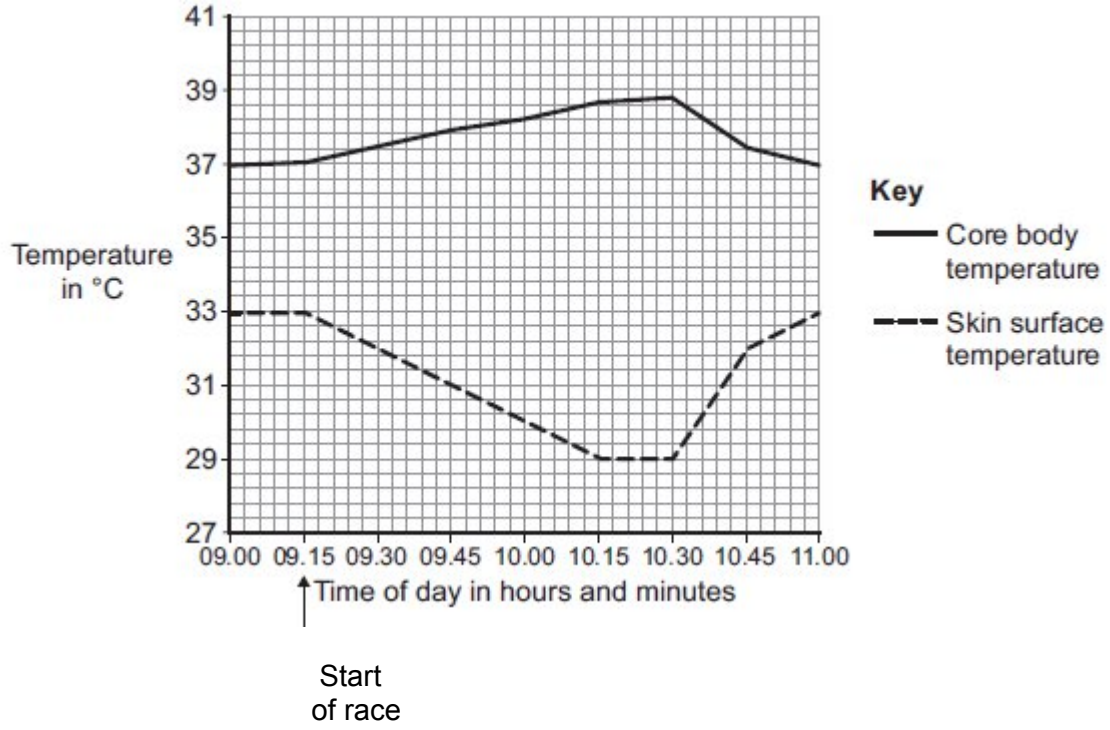
(2)

(Total 6 marks)

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Q31.

The graph shows the core body temperature and the skin surface temperature of a cyclist before, during and after a race.



(a) (i) When the cyclist finished the race, his core body temperature started to decrease.

How long did the race last?

_____

(1)

(ii) Describe and explain the different patterns shown in the core body temperature and skin surface temperature between 09.15 and 10.15.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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_____

_____

(6)

(iii) After 10.30, the core body temperature decreased.

Explain how changes in the blood vessels supplying the skin caused the skin surface temperature to increase.

_____

_____

_____

_____

_____

_____

(2)

(b) During the race, the cyclist's blood glucose concentration began to decrease.

Describe how the body responds when the blood glucose concentration begins to decrease.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 12 marks)

Q32.

The body controls internal conditions.

(a) Use words from the box to complete the sentences about water loss from the body.

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

(i) Water is lost in sweat via the _____

(1)

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(ii) Water is lost in urine via the _____

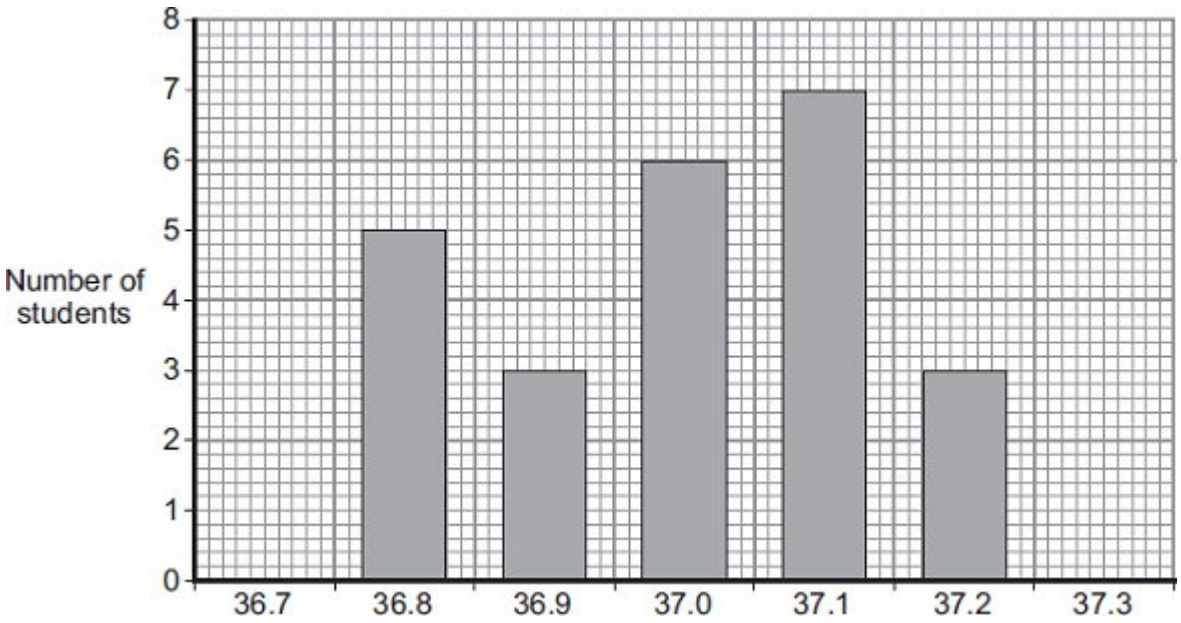
(1)

(iii) Water is lost in the breath via the _____

(1)

(b) Students investigated body temperature in the class.

The bar chart shows the results.



(i) One student used the bar chart to calculate the mean body temperature of the class.
The student calculated the mean body temperature as 37.0 °C.

How did the student use the bar chart to calculate the mean?

_____

_____

_____

_____

(2)

(ii) How many students had a body temperature higher than the mean of 37.0 °C

_____

(1)

(iii) Body temperature must be kept within a narrow range.

Why?

_____

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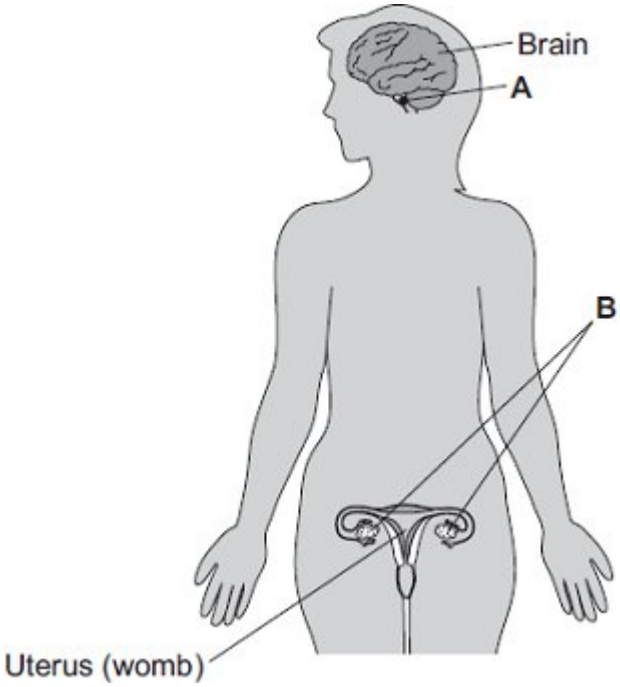
_____

(1)

(Total 7 marks)

Q33.

The diagram shows the position of two glands, **A** and **B**, in a woman.



(a) (i) Name glands **A** and **B**.

A _____

B _____

(2)

(ii) Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

How does FSH move from gland **A** to gland **B**?

_____

(1)

(b) (i) A woman is not able to become pregnant. The woman does not produce mature eggs. The woman decides to have In Vitro Fertilisation (IVF) treatment.

Which **two** hormones will help the woman produce and release mature eggs?

Tick (✓) **one** box.

FSH and Luteinising Hormone (LH) ☐

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FSH and oestrogen ☐

Luteinising Hormone (LH) and oestrogen ☐

(1)

(ii) Giving these hormones to the woman helps her to produce several mature eggs.
Doctors collect the mature eggs from the woman in an operation.

Describe how the mature eggs are used in IVF treatment so that the woman may become pregnant.

_____

_____

_____

_____

_____

_____

(3)

(iii) IVF clinics have been set a target to reduce multiple births.

> At least 76% of IVF treatments should result in single babies and a maximum of 24% of treatments should result in multiple births.

Suggest **one** reason why the clinics have been set this target to reduce multiple births.

_____

_____

(1)

(c) Two clinics, **R** and **S**, used IVF treatment on women in 2007. Doctors at each clinic used the results of the treatments to predict the success rate of treatments in 2008.

The table shows the information.

	Total number of IVF treatments in 2007	**Number of IVF treatments resulting in pregnancy in 2007**	**Predicted percentage success rate in 2008**
Clinic **R**	1004	200	18–23
Clinic **S**	98	20	3–56

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(i) Compare the success rates of the two clinics in 2007.

_____

_____

(1)

(ii) The range of the predicted success rate in 2008 for clinic **R** is much smaller than the range of the predicted success rate for clinic **S**.

Suggest why.

_____

_____

_____

_____

(2)

(Total 11 marks)

Q34.

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.

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

(1)

(b) People with diabetes may control their blood glucose by injecting insulin.

(i) If insulin is taken by mouth, it is digested in the stomach.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate **fat** **protein**

(1)

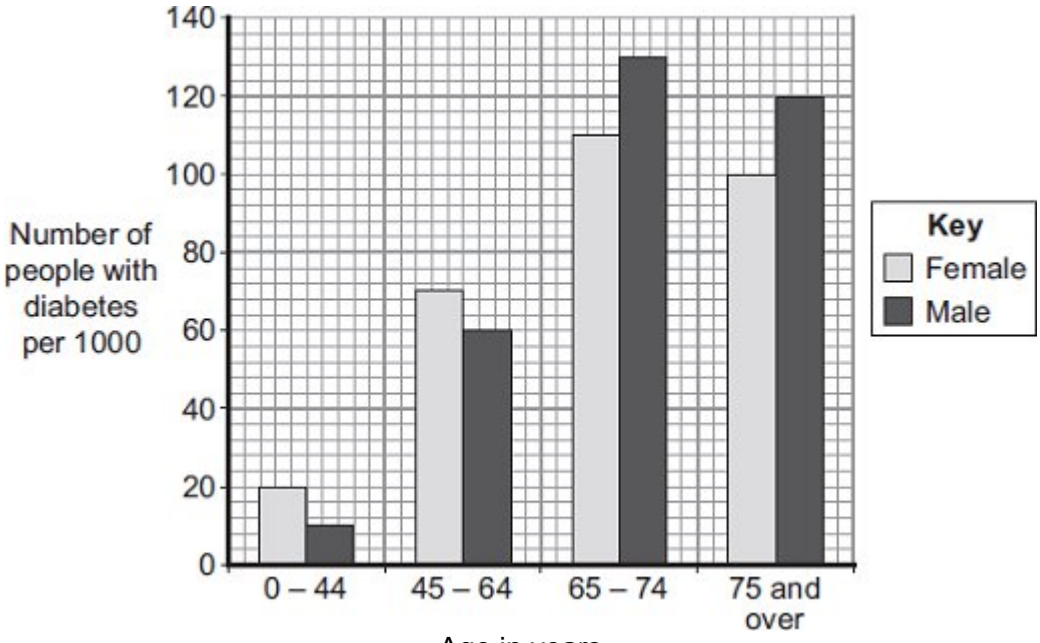
(ii) Apart from using insulin, give **one** other way people with diabetes may reduce their blood glucose.

_____

(1)

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

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

_____

_____

_____

_____

_____

_____

_____

_____

(3)

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

between the ages of 0 and 64 years

_____

_____

_____

over the age of 65 years.

_____

_____

_____

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(2)
(Total 8 marks)

Q35.

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

_____

(1)

(b) In a healthy person, insulin prevents high levels of glucose in the blood.
To make insulin, cells in the pancreas need amino acids.

Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to amino acids that cannot be stored in the body.

_____

_____

_____

_____

_____

_____

_____

_____

(3)
(Total 4 marks)

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