

1

(a) Describe, as fully as you can, the job of

(i) the circulatory system.

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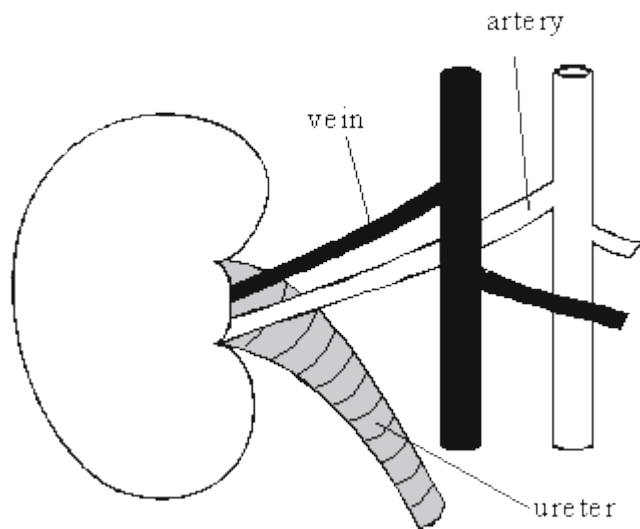
(2)

(ii) the digestive system.

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(3)

(b)



The drawing shows a kidney, its blood supply and the ureter (a tube which carries urine from the kidney to the bladder). The amount and composition of the urine flowing down the ureter change if the blood in the artery contains too much water. Describe these changes and explain how they take place.

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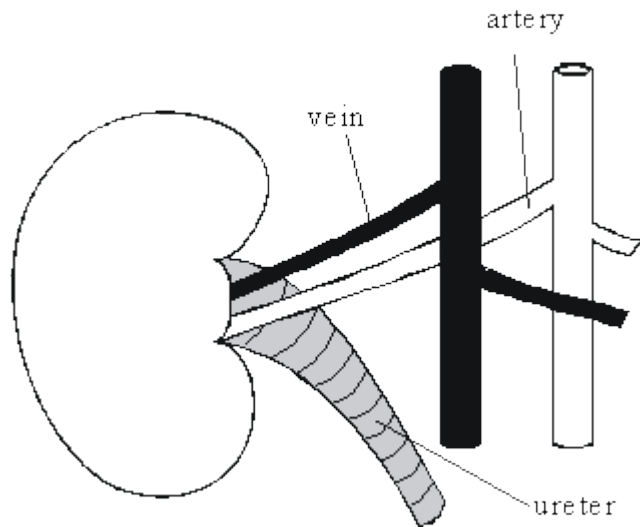
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(4)
(Total 9 marks)

2



- (a) The drawing shows a kidney, its blood supply and the ureter (a tube which carries urine from the kidney to the bladder). The amount and composition of the urine flowing down the ureter changes if the blood in the artery contains too much water. Describe these changes and explain how they take place.

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(4)

- (b) (i) Describe, as fully as you can, **two** methods of treating patients who suffer from kidney failure.

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(ii) Compare the advantages and disadvantages of the two methods of treatment which you have described.

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(5)
(Total 13 marks)

3

Marathon runners are recommended to have a high carbohydrate diet prior to a race. Three athletes tried out three dietary regimes prior to a marathon race.

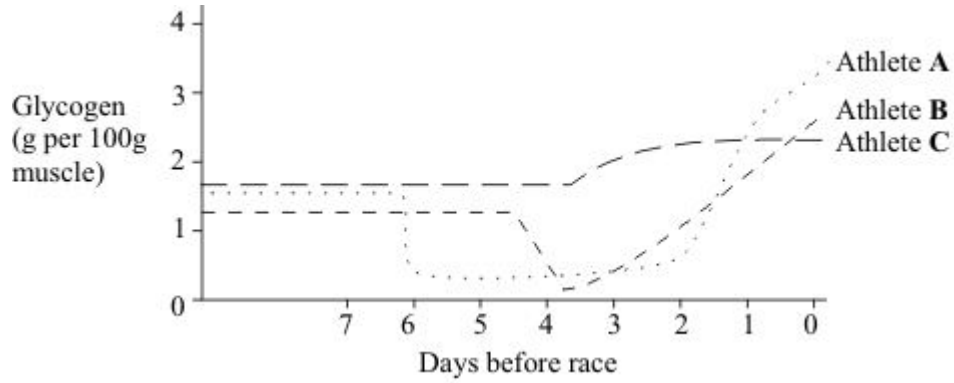
These three dietary regimes were as follows.

- Athlete A** Up to 7 days before the race - Normal mixed diet
- 7 days before the race - Prolonged extreme physical activity
- 6-3 days before the race - Protein and fat diet; no carbohydrate
- 2 and 1 days before the race - Large carbohydrate intake

- Athlete B** Up to 5 days before race - Normal mixed diet
- 5 days before the race - Prolonged extreme physical activity
- 4-1 days before the race - Large carbohydrate intake

- Athlete C** Up to 4 days before the race - Normal mixed diet
- 4-1 days before the race - Large carbohydrate intake

The graph below shows the effect of each of these dietary regimes on glycogen levels in the athletes' muscles



(a) (i) What is the immediate effect of extreme physical activity on the glycogen content of muscles?

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(1)

(ii) Describe how this effect occurs.

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(b) (i) Evaluate the three regimes as preparation for a marathon race.

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(ii) Suggest a possible explanation for the different effects of the three regimes.

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(2)
(Total 9 marks)

4

(a) Describe, as fully as you can, how a human foetus gets rid of the carbon dioxide produced during respiration.

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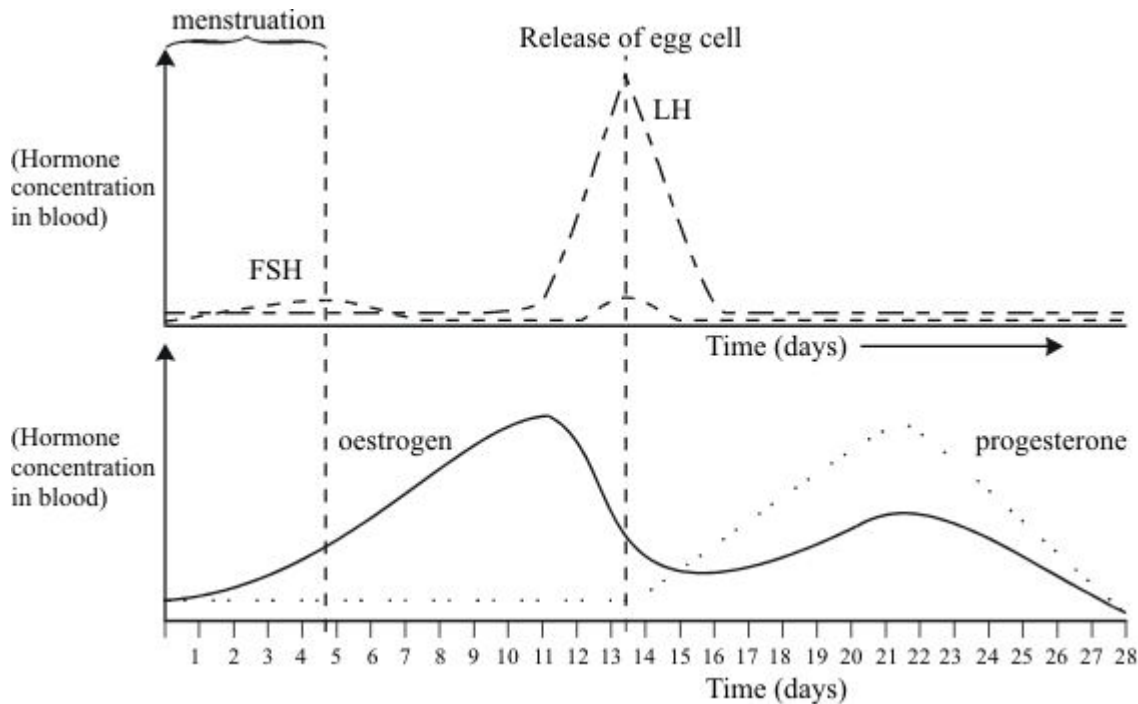
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(3)

(b) The female menstrual cycle is controlled by a number of hormones. The graph below shows the concentrations of four of these hormones at different times during the menstrual cycle.



The functions of the four hormones include:

FSH – stimulates the development of immature cells into eggs in the ovary.

LH – stimulates the release of the mature egg cell.

Oestrogen – stimulates production of LH, but inhibits FSH production.

Progesterone – inhibis production of both LH and FSH.

Use this information to explain as fully as you can:

- (i) how the concentration of oestrogen can affect and control the development and release of an egg during the monthly cycle;

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(3)

- (ii) why progesterone continues to be produced throughout pregnancy.

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(3)

- (c) Explain, as fully as you can, how one or more of these hormones could be used to treat infertility.

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(3)

- (d) A hormone called mifepristone is used in low doses as a female contraceptive. Higher doses can be used to induce an abortion. As a consequence mifepristone is often referred to as 'the morning-after pill'. The use of mifepristone is currently tightly controlled by the medical profession.

Evaluate the benefits and problems which might arise from making this hormone more freely available.

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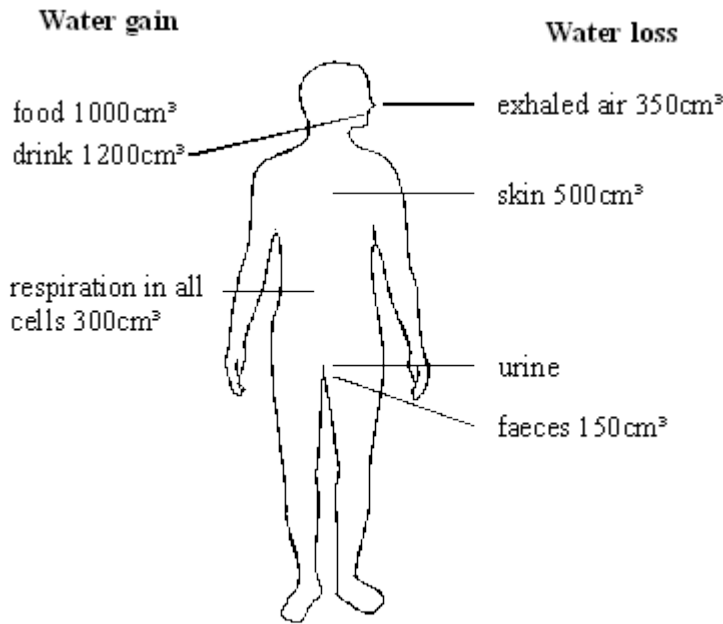
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(4)

(Total 16 marks)

5

The diagram shows the mean daily input and output of water for an adult.



The kidneys keep the water content of the body constant by controlling the volume of water passed out in the urine.

- (i) Use data from the diagram to calculate the mean daily output of water in urine. Show your working.

Answer cm³

(2)

- (ii) Describe how the amount of water in the body is controlled by the kidneys.

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(3)

(Total 5 marks)

6

Read the following passage which is from an advice book for diabetics.



Insulin Reactions

Hypoglycaemia or 'hypo' for short, occurs when there is too little sugar in the blood. It is important always to carry some form of sugar with you and take it immediately you feel a 'hypo' start. A hypo may start because:

- you have taken too much insulin, or
- you are late for a meal, have missed a meal altogether, have eaten too little at a meal, or
- you have taken a lot more exercise than usual.

The remedy is to take some sugar.

An insulin reaction usually happens quickly and the symptoms vary – sweating, trembling, tingling of the lips, palpitations, hunger, pallor, blurring of the vision, slurring of speech, irritability, difficulty in concentration.

Do not wait to see if it will pass off, as an untreated 'hypo' could lead to unconsciousness.

(a) Many diabetics need to take insulin.

(i) Explain why.

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(2)

(ii) Explain why there is too little sugar in the blood if too much insulin is taken.

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(3)

(iii) Explain why there is too little sugar in the blood if the person exercises more than usual.

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(3)

(b) Suggest why sugar is recommended for a 'hypo', rather than a starchy food.

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(3)

(c) Explain how the body of a healthy person restores blood sugar level if the level drops too low.

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(3)

(d) Explain, using insulin as an example, what is meant by negative feedback.

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(3)

(Total 17 marks)

7

The kidneys remove waste materials from the liquid part of the blood.

(a) What name is given to the solution of waste stored in the bladder?

(1)

(b) The table shows the concentration of certain substances

- in the liquid part of the blood
- in the liquid that has just been filtered from the blood in the kidneys
- in the solution in the bladder.

SUBSTANCE	CONCENTRATION (%)		
	IN LIQUID PART OF BLOOD	IN LIQUID THAT HAS BEEN FILTERED IN THE KIDNEYS	IN LIQUID IN THE BLADDER
Protein	7.0	0	0
Salt	0.35	0.35	0.5
Glucose	0.1	0.1	0
Urea	0.03	0.03	2.0

(i) Which **one** of these substances does **not** pass into the liquid that is filtered in the kidneys?

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(1)

(ii) Suggest **one** reason why this substance does **not** pass out of the blood.

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(1)

(c) What happens to the glucose in the liquid that is filtered in the kidneys?

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(1)

(d) Explain why the concentration of urea in the liquid in the bladder is much greater than the concentration of urea in the liquid that is filtered in the kidneys.

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(1)

(Total 5 marks)

8

The kidneys remove waste materials from the liquid part of the blood.

The table shows the concentration of certain substances

- in the liquid part of the blood
- in the liquid that has just been filtered from the blood in the kidneys
- in the solution in the bladder.

SUBSTANCE	CONCENTRATION (%)		
	IN LIQUID PART OF BLOOD	IN LIQUID THAT HAS BEEN FILTERED IN THE KIDNEYS	IN LIQUID IN THE BLADDER
Protein	7.0	0	0
Salt	0.35	0.35	0.5
Glucose	0.1	0.1	0
Urea	0.03	0.03	2.0

(a) (i) Which **one** of these substances does **not** pass into the liquid that is filtered in the kidneys?

.....

(1)

(ii) Suggest **one** reason why this substance does **not** pass out of the blood.

.....

(1)

(b) Explain why the concentration of urea in the liquid in the bladder is much greater than the concentration of urea in the liquid that is filtered in the kidneys.

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(1)

(c) (i) Describe how a kidney dialysis machine works.

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(3)

(ii) Use the data in the table to suggest the concentration that the salt in the dialysis fluid should be. Explain your answer.

Concentration

Explanation

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(2)

(Total 8 marks)

9

High levels of oestrogen inhibit the production of FSH by the pituitary gland.

(i) Explain how this is an example of negative feedback.

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(2)

- (ii) One drug that is used to treat female infertility is clomiphene. Clomiphene blocks the inhibitory effect of oestrogen on FSH production.

Explain how this may help in the treatment of infertility.

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(2)
(Total 4 marks)

10

- (a) Explain, as fully as you can, why respiration has to take place more rapidly during exercise.

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(2)

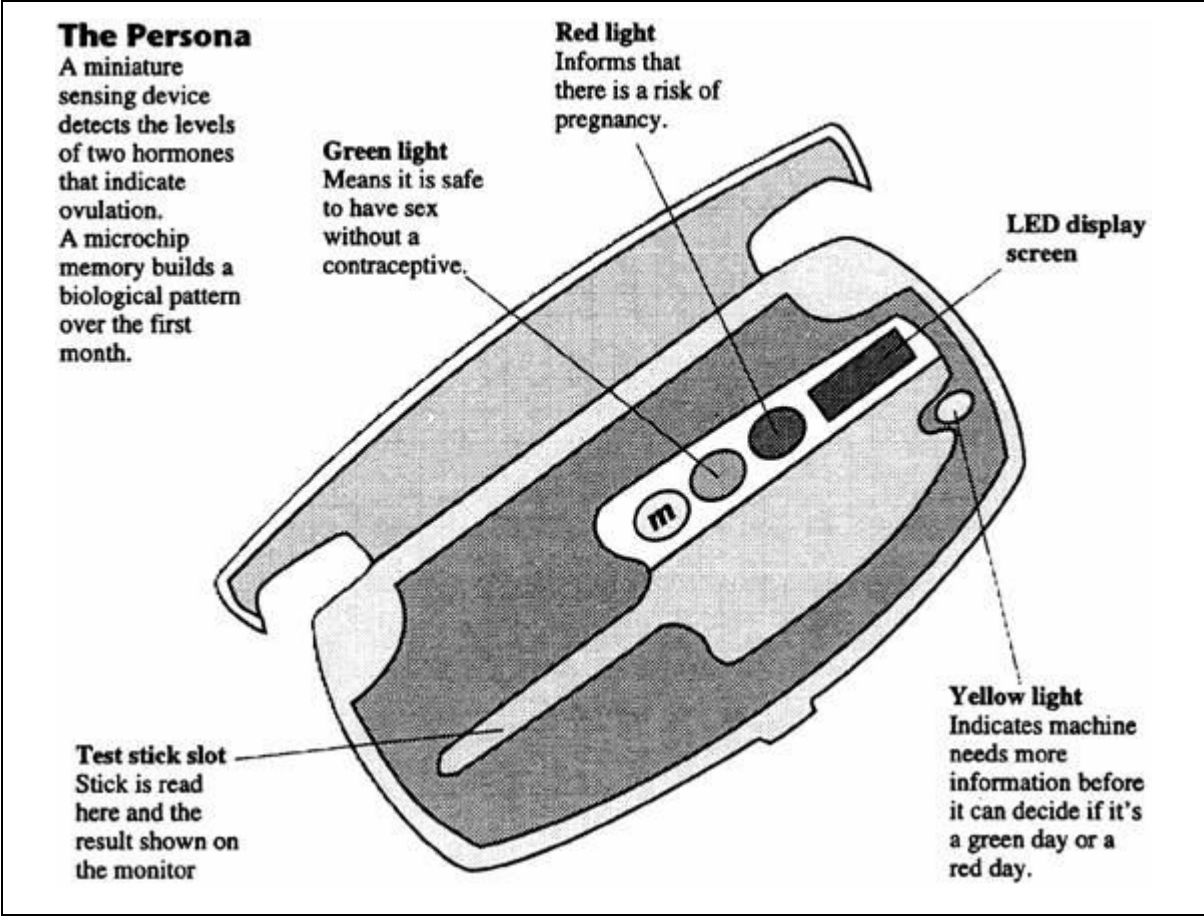
- (b) During exercise the process of respiration produces excess heat. Explain how the body prevents this heat from causing a rise in the core (deep) body temperature.

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(4)
(Total 6 marks)

11

In women, two hormones control ovulation (the release of eggs from the ovaries). The drawing shows a monitoring machine which women can use to measure the amounts of the two hormones. A test stick is dipped in the woman's urine each morning, then placed in a slot in the machine.



(a) The machine monitors the levels of two hormones.

(i) What is a hormone?

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(1)

(ii) How are hormones transported around the body?

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(1)

- (b) A woman is unlikely to become pregnant if she has sex on the days when the machine shows a green light during the test. Use information from the drawing to suggest why.

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(1)
(Total 3 marks)

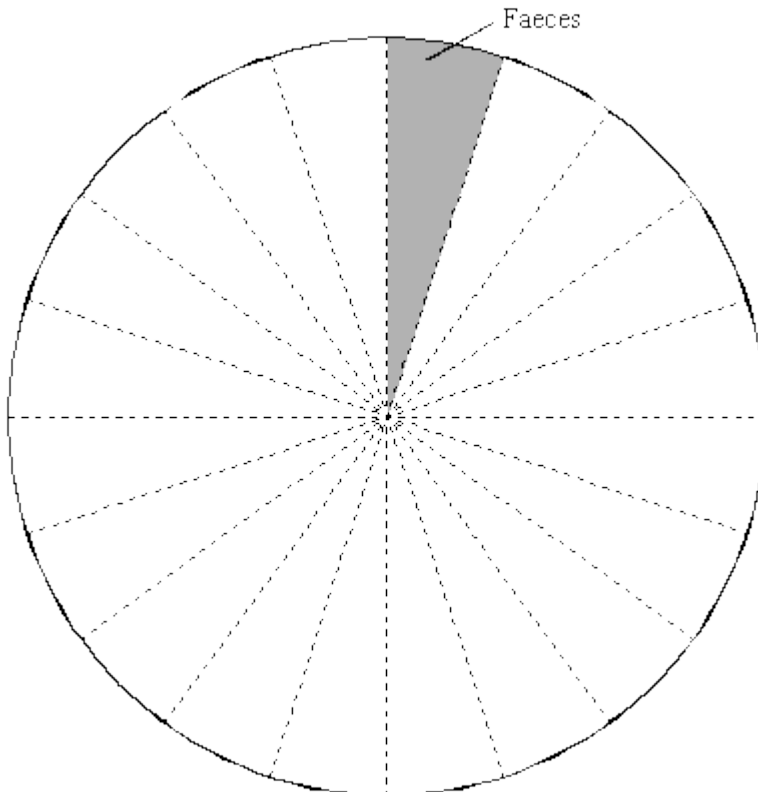
12

The table shows how much water is lost in different ways from a student's body.

Way in which water is lost	Percentage of total
Breath	15
Faeces	5
Sweat	50
Urine	30

- (a) Complete the pie chart.

One part has been done for you. Remember to label the pie chart.



(3)

(b) The table is about waste products which are removed from the student's body.

Complete the table by using the correct words from the box.

amino acids breath circulation digestion fatty acids
 glucose respiration sweat urine

Waste product	How it is produced	How it leaves the body
carbon dioxide	by	in
urea	from	in

(4)
 (Total 7 marks)

13

The monthly cycle of women is controlled by hormones.

(a) Name the **two** glands that secrete these hormones.

- 1
- 2

(2)

(b) Describe **two** ways in which fertility in women can be controlled by giving hormones.

- 1
-
- 2
-

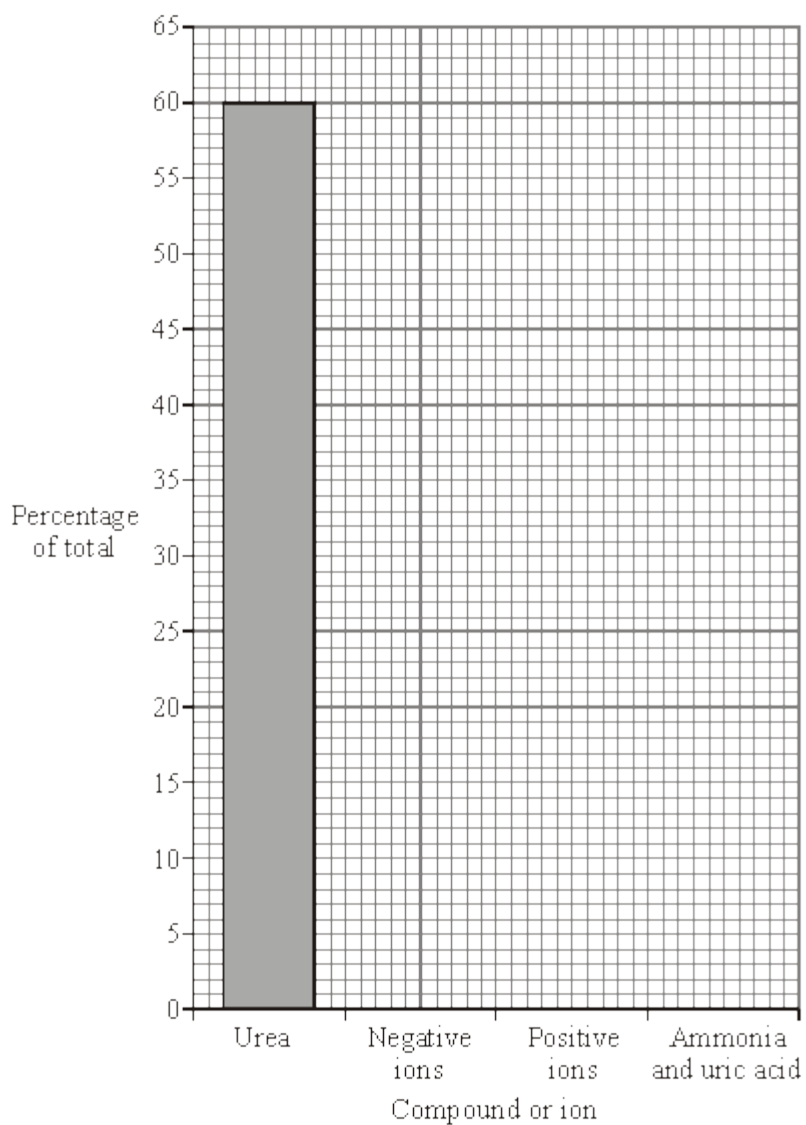
(2)
 (Total 4 marks)

14

(a) The table shows the compounds and ions dissolved in a student's urine.

Compound or ion	Percentage of total
urea	60
negative ions	25
positive ions	10
ammonia and uric acid	5

(i) Complete the bar chart. One bar has been drawn for you.



(2)

(ii) There is a total of 10 g of compounds and ions dissolved in a sample of this student's urine. Calculate the mass of urea in the sample. Show clearly how you work out your answer.

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Mass of urea g

(2)

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

anus bladder kidneys liver lungs

Plasma transports carbon dioxide from the body to the

Plasma transports urea from the to the

(3)

(Total 7 marks)

15

This question is about the hormones that control the monthly cycle in women.

Complete the sentences.

Hormones control the monthly release of an egg from a woman's

They also control the thickness of the lining of her

Hormones that are given to women to stimulate the release of eggs are called

..... drugs.

Hormones that are given to women to prevent the release of eggs are called

oral

(Total 4 marks)

16

The table shows the amounts of some of the substances filtered, reabsorbed and excreted by the kidneys in one day.

Substance	Amount filtered	Amount reabsorbed	Percentage reabsorbed	Amount excreted
water		178.5 litres	99.2 %	1.5 litres
urea	56 g	28 g	50 %	28 g
glucose	800 units	800 units	100 %	0
sodium	25 200 units	25 050 units		150 units
chloride	18 000 units	17 850 units	99.2 %	150 units

(a) Calculate the amount of water filtered by the kidneys in one day.

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Amount litres

(1)

(b) Calculate the percentage of the filtered sodium that was reabsorbed. Show clearly how you work out your answer.

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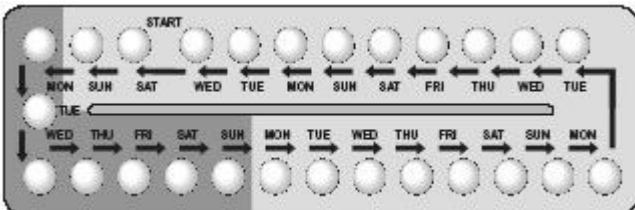
Percentage reabsorbed

(1)

(Total 2 marks)

17

The picture shows some birth control (contraceptive) pills for women.



These are some facts about using the birth control pills:

- birth control pills are 99 per cent effective in preventing pregnancy
- the hormones in the pills have some rare but serious side effects
- this method of birth control gives no protection against sexually transmitted diseases
- the hormones in the pills give protection against some women's diseases
- the woman has to remember to take the pill every day
- the woman's monthly periods become more regular.

Use the information above to answer these questions.

(a) Give **two** advantages of using birth control pills.

1

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2

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(2)

(b) Give **two** disadvantages of using birth control pills.

1

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2

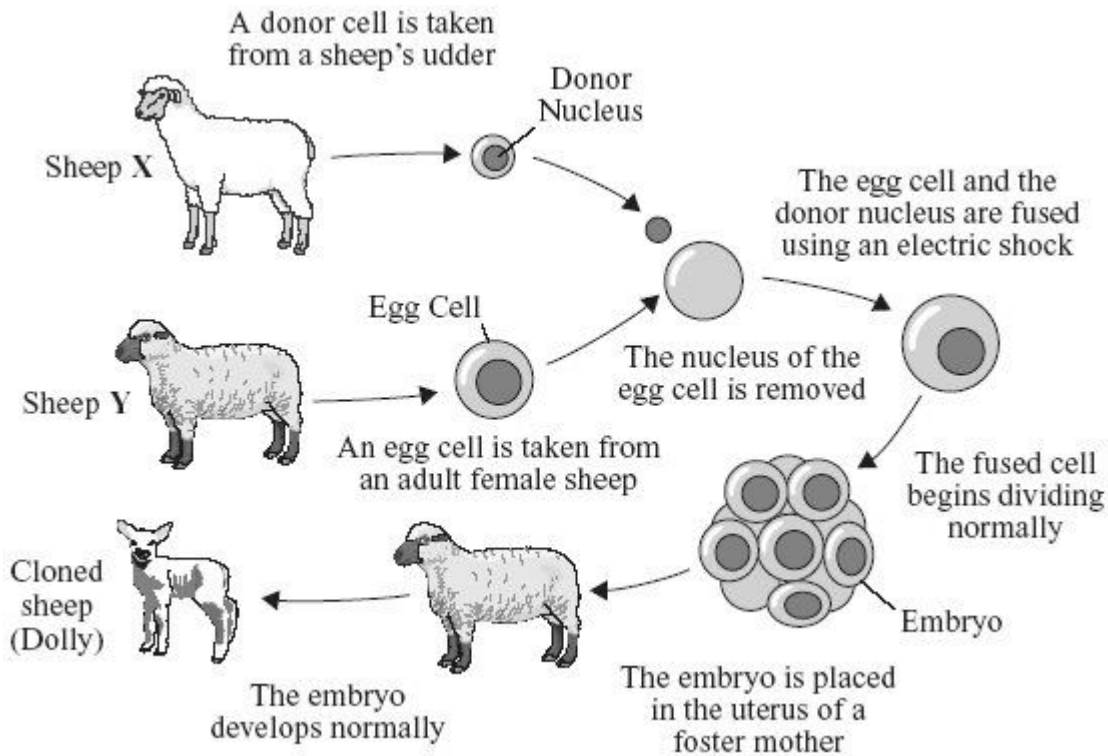
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(2)

(Total 4 marks)

18

The diagram shows how Dolly the sheep was cloned.

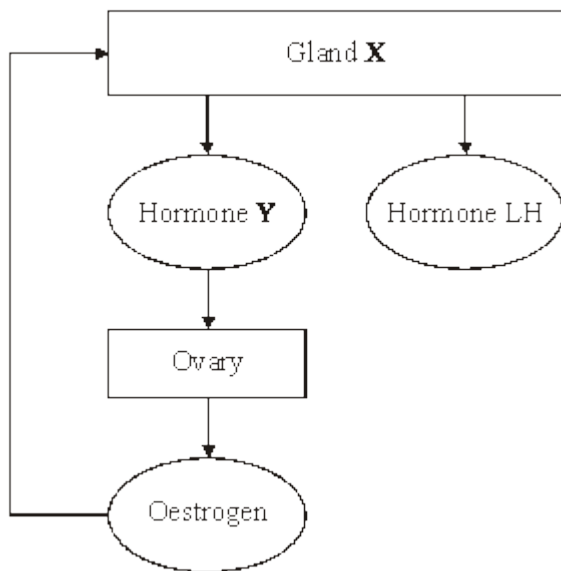


(a) Name the type of cell division that occurs:

- (i) as the egg cell is produced;
- (ii) as the fused cell begins to divide normally.

(2)

(c) The diagram below shows the relationships between the glands and hormones that control the menstrual cycle of a woman.



- (i) Name:
gland **X**;
hormone **Y**.

(2)

- (ii) Give **two** effects of the hormone oestrogen on gland **X**.

1

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2

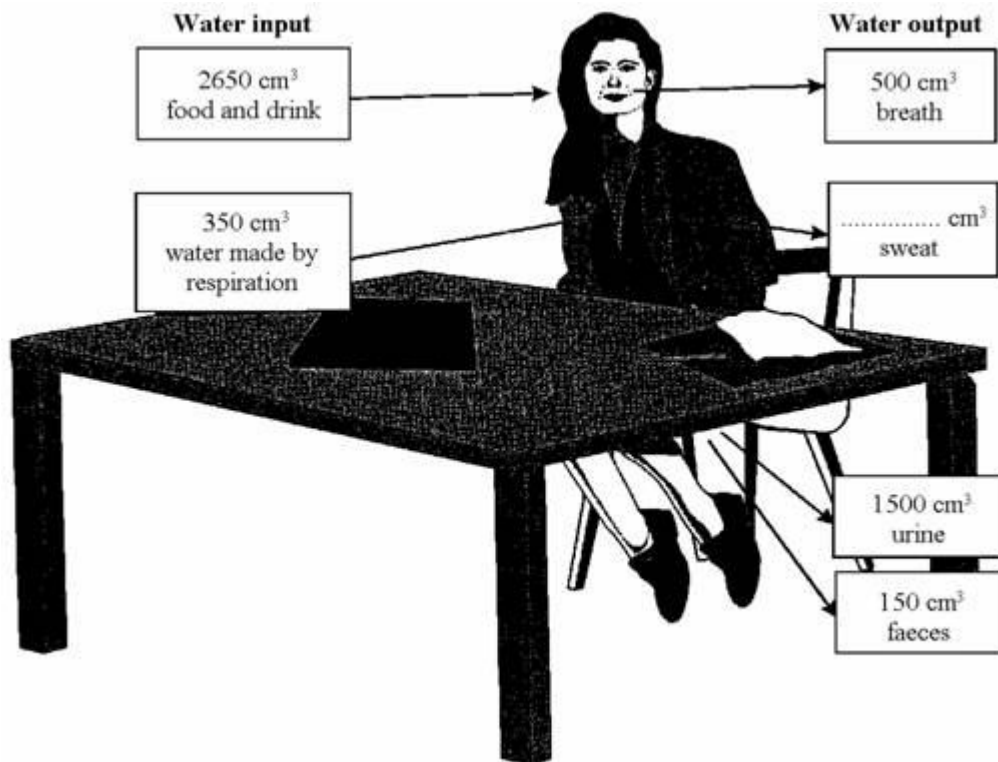
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(2)
(Total 6 marks)

19

The diagram shows a water balance for a girl who spends most of the day working at a desk. It is not complete.

- (a) Complete the diagram by writing in the volume of sweat produced.



(1)

(b) The next day she spent much of the day training, doing many different types of exercise.

State how **each** of the following would change and why it would be different from the previous day.

(i) The amount of water given off as sweat.

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(2)

(ii) The amount of water breathed out.

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(2)

(iii) The amount of urine passed, if she had the same water intake as on the previous day.

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(2)

(c) Which organ controls the amount of water in the body?

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(1)

(Total 8 marks)

20

Information is passed to target organs in the body by hormones.

(a) (i) How do hormones travel around the body?

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(1)

(ii) What name is given to the organs that secrete hormones?

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(1)

(b) Explain the cause of diabetes and how it is controlled.

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(3)
(Total 5 marks)

21

The table compares the percentages of various substances in a person's blood and their urine.

Substance	Blood	Urine
Water	92.00%	95.00%
Glucose	0.10%	0
Salt	0.37%	0.60%
Urea	0.03%	2.10%

(a) How does the level of urea in urine compare with the level of urea in the blood?

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(2)

(b) The kidney produces urine by filtering the liquid part of blood and then re-absorbing some of the filtered substances.

Use this information to explain the difference in the level of urea in urine compared to the level of urea in blood.

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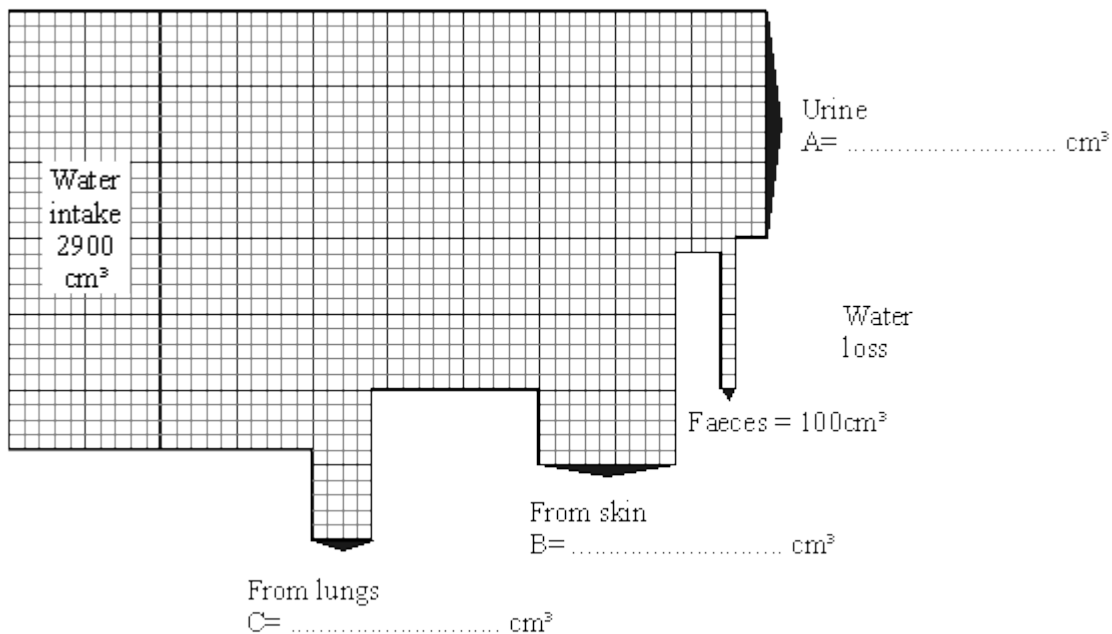
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(2)
(Total 4 marks)

22

The diagram shows the amount of water lost by an adult in one day.

The width of the arrows shows how much water is lost in each way.



- (a) Work out from the diagram the water loss for urine, skin and lungs and write the correct figures in the spaces on the diagram.

(4)

- (b) When it is hot, much more water is lost from the skin. Which other method of water loss would also change significantly?

Explain your answer.

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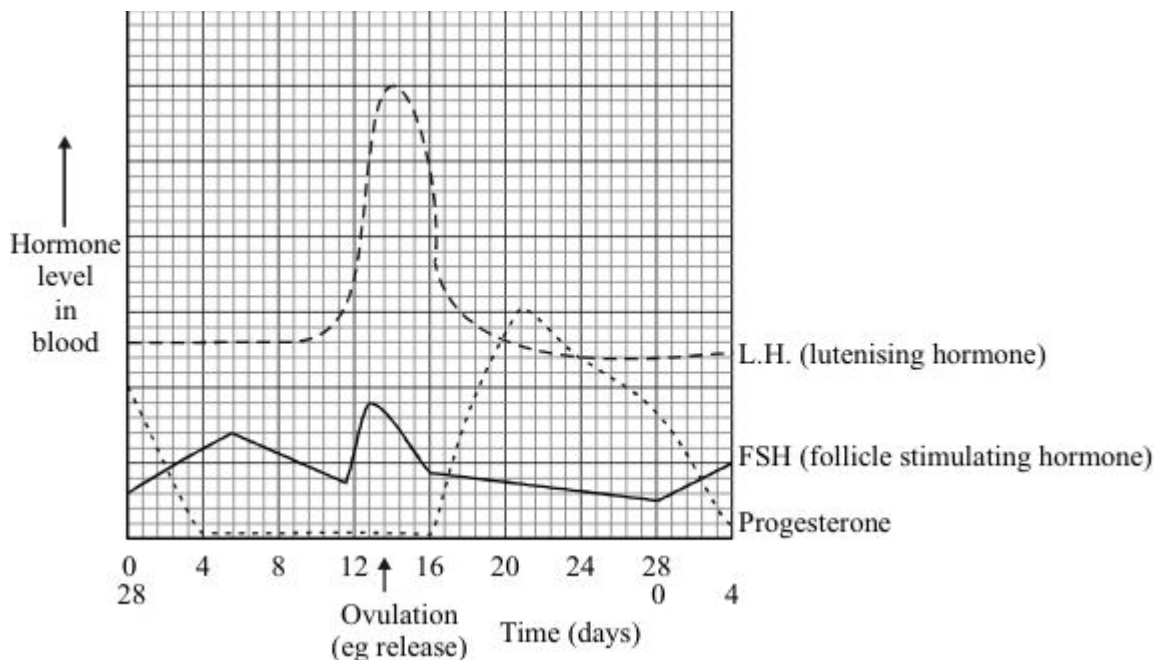
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(3)
(Total 7 marks)

23

The graph shows changes in the levels of three hormones in a menstrual cycle.



(a) What does the graph suggest the stimuli might be which cause the egg to be released?

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(3)

(b) One type of contraceptive pill keeps the level of progesterone high for most of the cycle. Suggest how this might work.

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(2)

(c) Outline **two** arguments for and **two** against using hormones as contraceptives.

For: 1

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2

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Against: 1.
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2.
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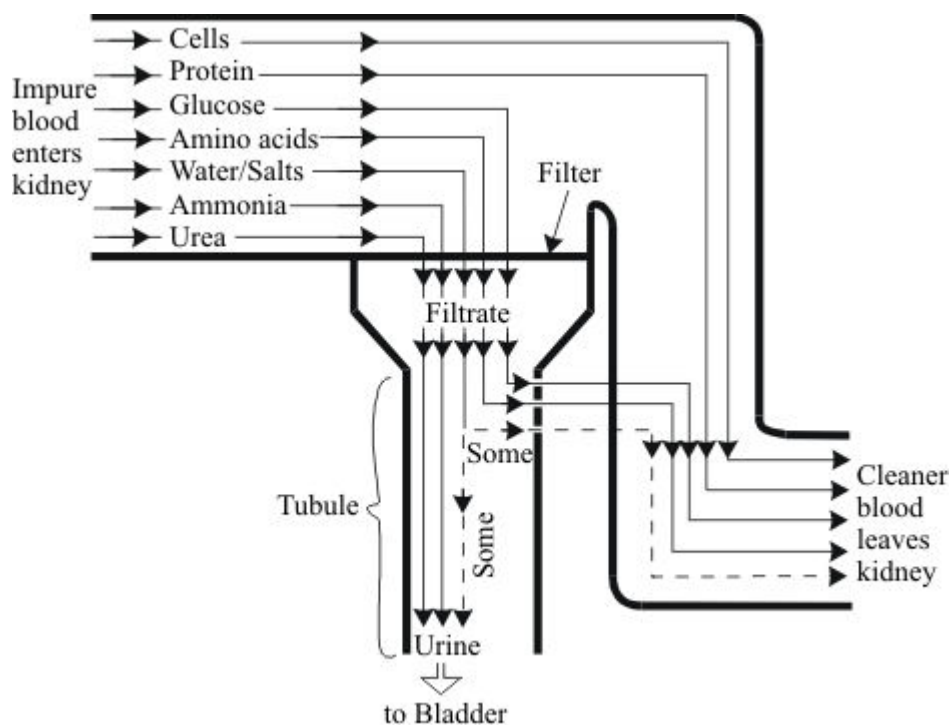
(4)
(Total 9 marks)

24

The job of our kidneys is to remove unwanted substances from our blood.

Substances which are needed in the blood must not be lost.

The flow-diagram below shows how the kidneys do this job.



(a) Describe what happens to the glucose and amino acids in the kidney.

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(4)

(b) A man has 5 litres of blood in his body.

- In one day:
- the kidneys filter out 170 litres of liquid from the blood.
 - he produces 1.5 litres of urine.

(i) What % of the filtered liquid is reabsorbed?

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(2)

(ii) The man became ill because his kidneys would not absorb as much of the filtered liquid.

Write down **two** ways the man would be affected by this.

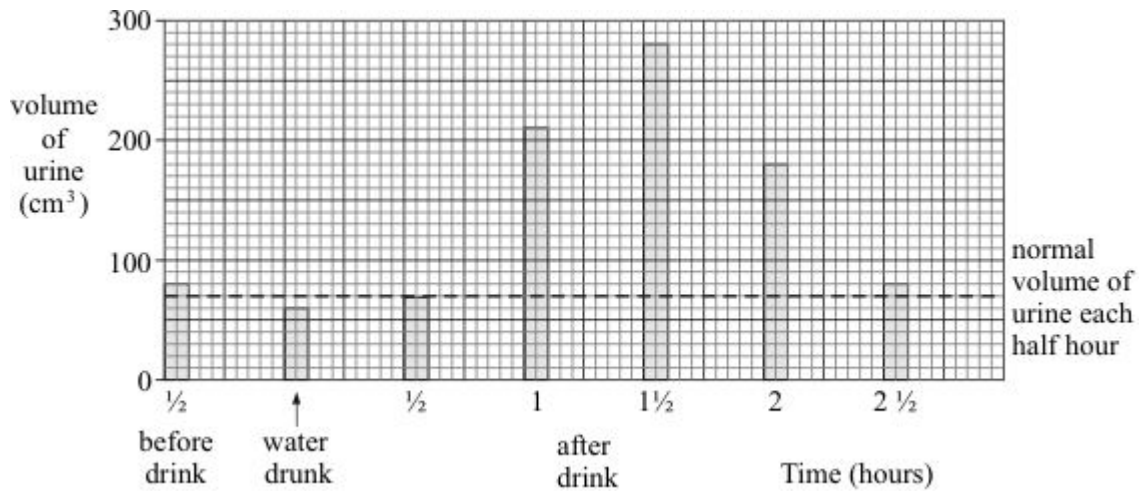
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(2)

(c) In an experiment the man drank 800cm³ of water.

The diagram shows the effect this had on the volume of urine the man produced each 30 minutes.



Describe, in as much detail as you can, how drinking the water affected the volume of urine produced afterwards.

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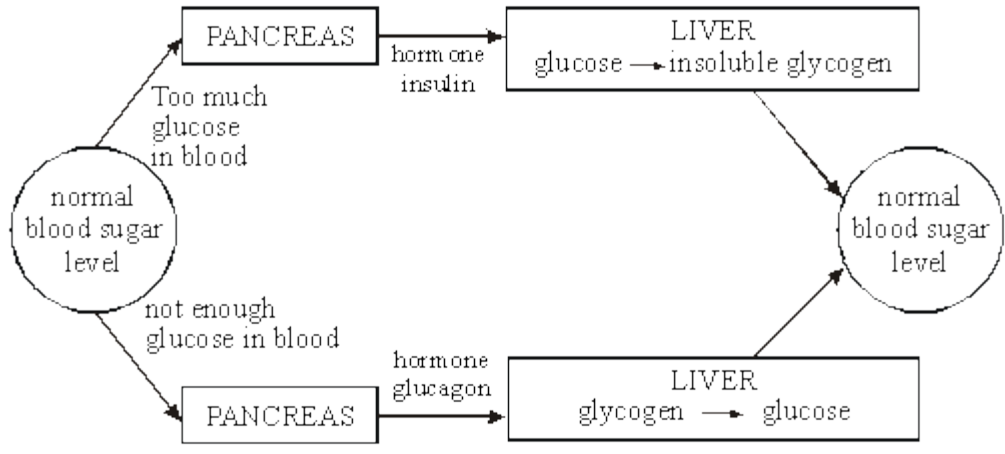
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(5)
(Total 13 marks)

25



The diagram shows how the blood sugar level is controlled in the body.

Explain fully what would happen if somebody ate some glucose tablets.

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(Total 4 marks)

26

Kidneys are important as they remove waste from blood and balance our water needs.

Kidney failure can be treated by transplant or dialysis using a kidney “machine”.

The money for expensive treatment for a few people could be used to provide more patients with less expensive treatment for other complaints.

Dialysis – kidney “machines”
Most expensive
Need own machine or share machine in hospital
Restricted life – special diet, must return to machine
Can be used while patient waits for transplant

Kidney transplant
Very expensive but cheaper than dialysis
Need kidney from relative or from “newly” dead person
Independent
Transplant may be rejected

Discuss the advantages and disadvantages of using dialysis or kidney transplants to keep people alive.

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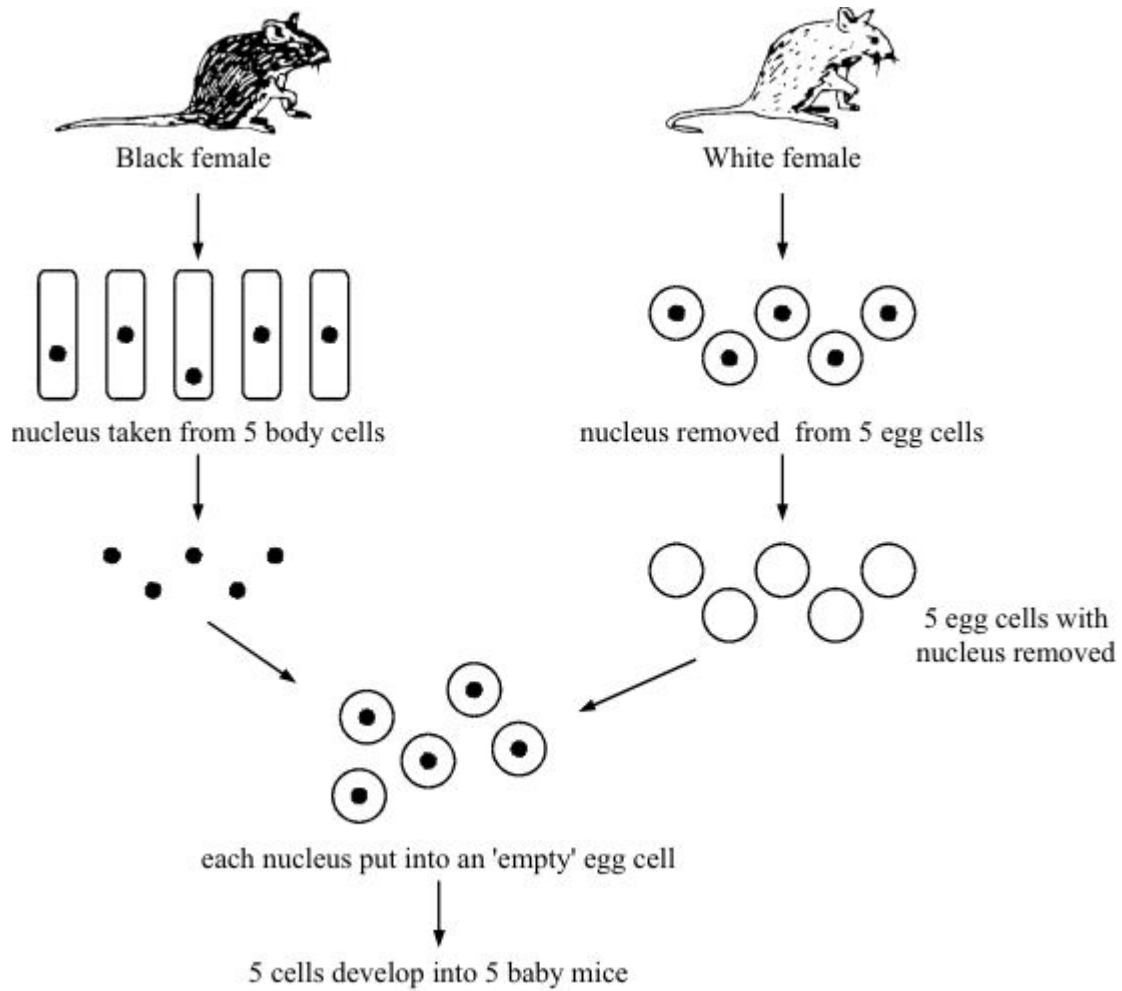
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(Total 5 marks)

27

The diagram shows how you can breed mice without using male sex cells.



(a) (i) What type of reproduction is shown above?

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(1)

(ii) Which part of the nucleus carries the information to make a mouse black or white?

.....

(1)

(iii) Carefully describe how the baby mice

(A) compare with each other,

.....

(B) compare with the parent mice

.....

(3)

(b) Mice normally reproduce in a similar way to humans.

(i) Which organs in the white mouse released the five egg cells?

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(1)

(ii) What treatment could you give the white mouse to make her release more eggs?

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(1)

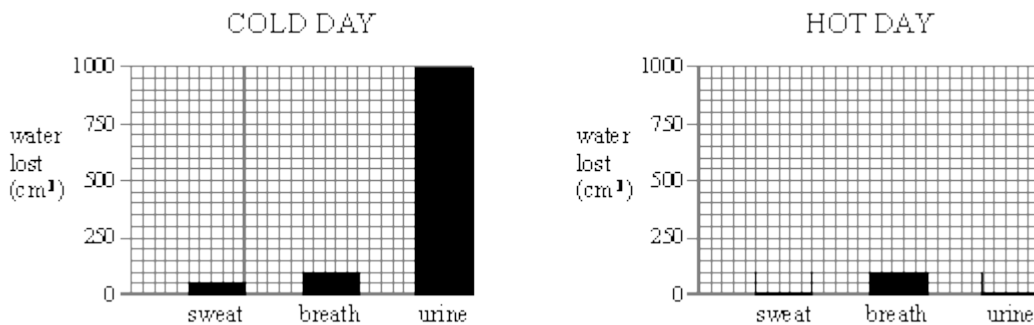
(Total 7 marks)

28

The table shows how much water is lost from a boy's body on a cold day and on a hot day.

WATER LOST (cm ³)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100
in urine	1000	750

(a) Use the figures in the table to complete the bar-chart for a hot day.



(2)

(b) How do the figures for the hot day compare with those for the cold day?
Answer in as much detail as you can.

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(4)

(c) The boy does the same things for the same amount of time on both days.
Explain why the amounts of water lost in sweat and urine change.

Sweat

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Urine

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(2)

(Total 8 marks)

29

The table shows how much water is lost from a boy's body on a cold day and on a hot day.

WATER LOST (cm ³)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100
in urine	1000	750

- (a) How do the figures for the hot day compare with those for the cold day?
Answer in as much detail as you can.

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(2)

- (b) The boy does the same things for the same amount of time on both days.
Explain why the amounts of water lost in sweat and urine change.

Sweat

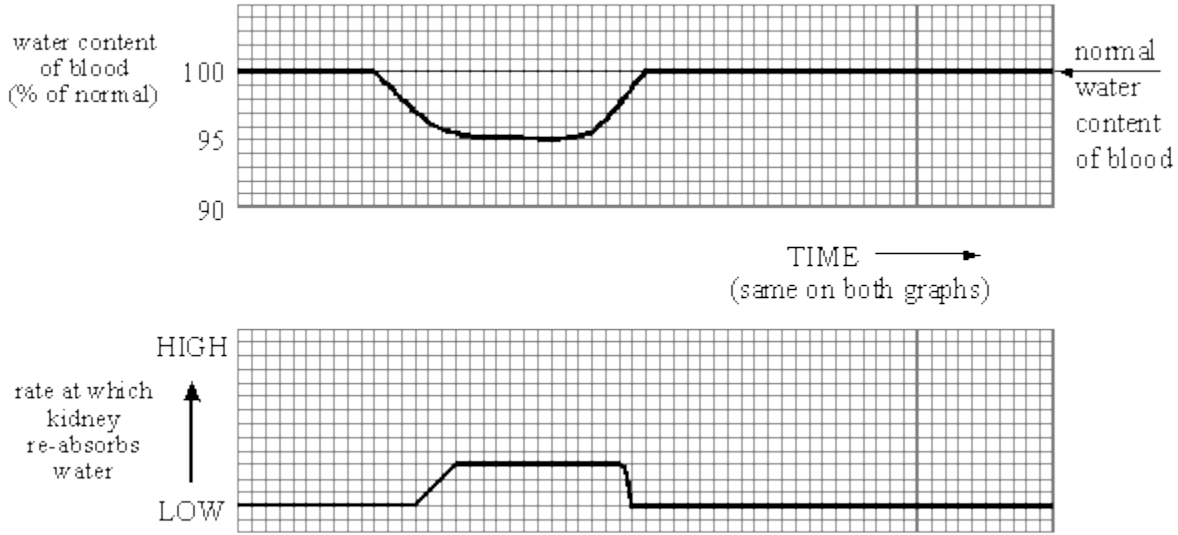
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Urine

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(2)

- (c) The rate at which the kidney re-absorbs water depends on the percentage of water in the blood.



Describe, as fully as you can, what the graphs tell you.

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(4)

- (d) How does your body control the rate at which your kidney re-absorbs water?

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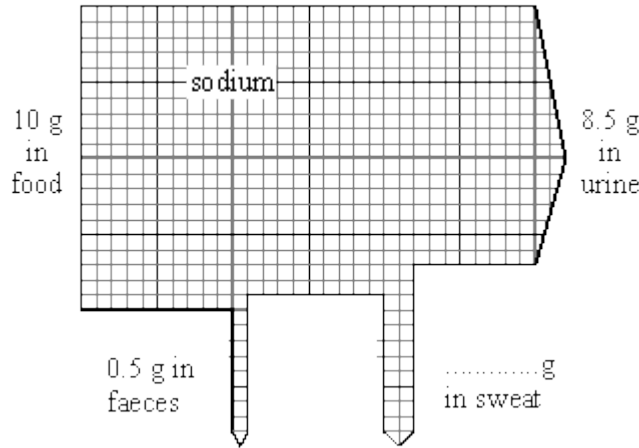
(2)

(Total 10 marks)

30

To stay healthy, the amount of sodium in your body must not change very much.

On average, a girl takes in 10 grams of sodium a day in the food she eats. The diagram shows what happens to this sodium.



(a) Add the missing figure to the diagram. (1)

(b) Choose words from this list to complete the sentences below.

- bladder kidneys lungs skin**

Sweat is produced by the girl's

Urine is produced by the girl's

(2)

(c) The girl goes on holiday to a very hot place. Her diet stays the same but she now loses 12 g of sodium each day in sweat.

(i) How will this affect the amount of sodium she loses each day in her urine?

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(1)

(ii) What should the girl do to make sure that her body still contains enough sodium?

.....

(1)
(Total 5 marks)

31

A woman wants to have a baby. She has been told that her body is not making and releasing eggs. However she has thousands of cells which could develop into them. A possible treatment is to give her a hormone called FSH. This hormone will start the development of these cells.

Once the eggs have developed, explain what causes their release.

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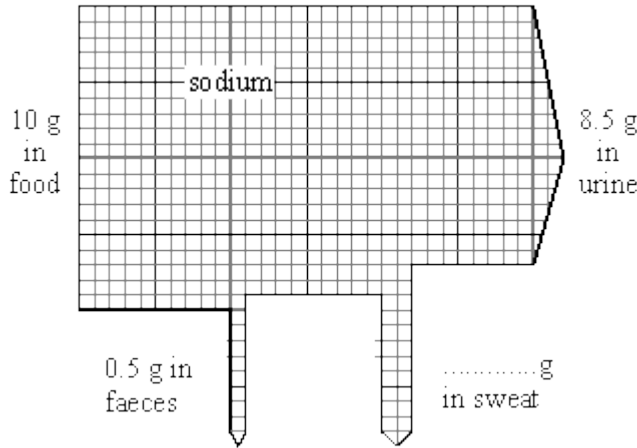
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(Total 4 marks)

32

To stay healthy, the amount of sodium in your body must not change very much.

On average, a girl takes in 10 grams of sodium a day in the food she eats. The diagram shows what happens to this sodium.



(a) Add the missing figure to the diagram.

(1)

- (b) The girl goes on holiday to a very hot place.
Her diet stays the same but she now loses 12g of sodium each day in sweat.
- (i) How will this affect the amount of sodium she loses each day in her urine?
.....
(1)
- (ii) What should the girl do to make sure that her body still contains enough sodium?
.....
(1)
- (c) Usually, there is no glucose in urine. All of the glucose is re-absorbed from your kidney tubules back into your blood. Complete the following sentences to describe how this happens.

The glucose is re-absorbed by a process called

This process is needed because some of the glucose is re-absorbed against

.....

(2)
(Total 5 marks)