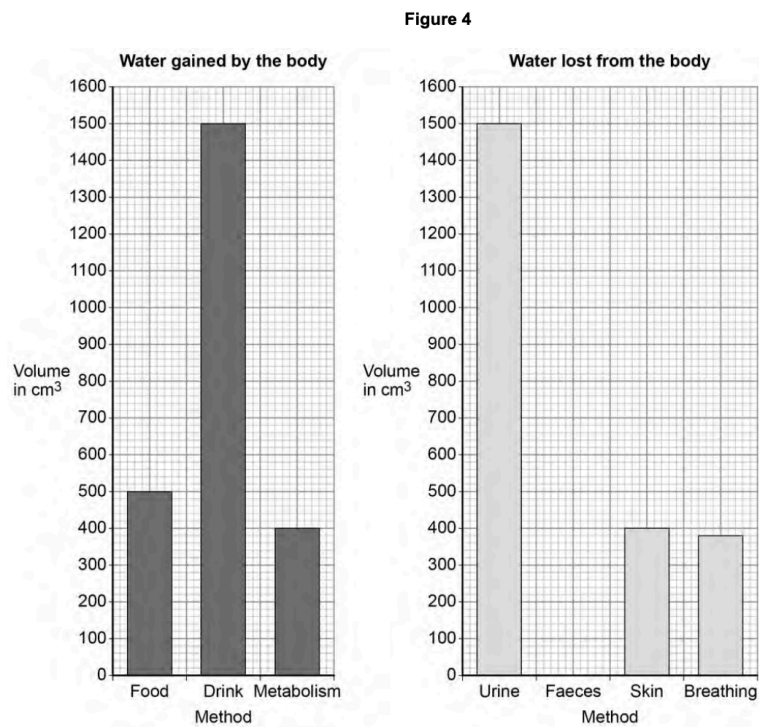


(Control of water balance (kidneys, ADH, dialysis, transplants))

Q1.a)(2018)

It is important to maintain water balance in the body.

Figure 4 shows 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.

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

Use information from **Figure 4**.

[2 marks]

Volume lost in faeces = _____ cm³

Q1.b)(2018)

Figure 4 shows that one method of gaining water is by metabolism.

Which metabolic process produces water?

[1 mark]

Tick **one** box.

Breakdown of protein to amino acids

☐

Changing glycogen into glucose

☐

Digestion of fat

☐

Respiration of glucose

☐

Q1.c)(2018)

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.

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

[2 marks]

Q1.d)(2018)

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

[3 marks]

Q2.a)(2019)

Homeostasis and Response

<http://www.pcfgstudy.com>

Water conservation is important to the human body.

Which gland releases the hormone that controls water loss from the body?

[1 mark]

Tick (✓) **one** box.

Adrenal	☐
Pancreas	☐
Pituitary	☐
Thyroid	☐

Q2.b)(2019)

Which hormone helps the kidneys to control water loss from the body?

[1 mark]

Tick (✓) **one** box.

ADH	☐
Adrenaline	☐
LH	☐
Thyroxine	☐

Q2.c)(2019)

A man is walking across a desert.

The man has used up his supply of drinking water.

Explain how the gland you named in Question 06.1 and the kidneys reduce water loss.

[3 marks]

Q3.(2019)

Some people have kidney failure.

Doctors may treat patients with kidney failure by either:

- dialysis
- a kidney transplant.

Explain **two** biological reasons why most doctors think that a kidney transplant is a better method of treatment than dialysis.

Do **not** refer to cost or convenience.

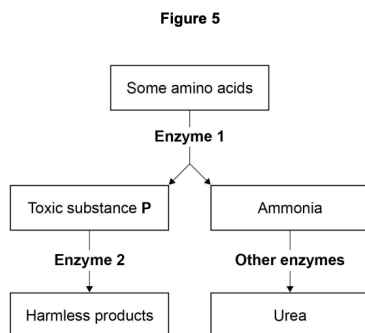
[4 marks]

Reason 1 _____

Reason 2 _____

Q4.a)(2022)

Figure 5 shows chemical reactions involved in the normal breakdown of some types of amino acid inside body cells.



A person with MSUD **cannot** make **Enzyme 2**.

One of the final products shown in **Figure 5** is urea.

Where in the human body are the reactions shown in **Figure 5** most likely to occur?

[1 mark]

Tick (✓) **one** box.

Kidney	☐
Liver	☐
Pancreas	☐
Small intestine	☐

Q4.b)(2022)

Scientists can analyse blood samples or urine samples to see if a person has MSUD.

The test identifies high concentrations of toxic substance **P**, shown in **Figure 5**.

Explain why the **blood** of a person with MSUD will have a high concentration of toxic substance **P**.

Use information from **Figure 5**.

[3 marks]

Q4.c)(2022)

Explain why the **urine** of a person with MSUD will have a high concentration of toxic substance **P**.

[2 marks]

Q4.d)(2022)

Explain why a person with MSUD must have a low-protein diet.

[3 marks]

Q5.a)(2022)

Homeostasis and Response

<http://www.pcfgstudy.com>

An athlete trained in a hot climate.

The athlete lost a large volume of water each day in sweat.

The athlete's energy intake each day from food was 20 000 kJ.

Evaporation of 1 cm³ of sweat requires 2.5 kJ of energy.

40% of the athlete's daily energy intake was used to evaporate sweat.

Calculate the volume of sweat the athlete lost each day.

Give your answer in dm³

1 dm³ = 1 000 cm³

[3 marks]

Volume of sweat lost in one day = _____ dm³

Q5.b)(2022)

Suggest why the athlete was advised to take salt tablets each day.

[1 mark]

Q6.(2023)

ADH is a hormone made by the pituitary gland.

ADH controls how much water is reabsorbed from the kidney tubules.

Table 2 shows effects of ADH.

Table 2

Concentration of ADH in the blood in nanograms/dm ³	Concentration of dissolved substances in urine in arbitrary units	Rate of urine production in cm ³ /minute
0.0	50	20.0
1.25	700	8.8
2.50	980	3.9
3.75	1110	1.8
5.00	1170	0.9

The concentration of ADH in a man's blood was 3.75 nanograms/dm³.

The concentration of ADH in his blood decreased to 1.25 nanograms/dm³.

Explain how the decrease in the concentration of ADH would cause the changes to the urine shown in **Table 2**.

[4 marks]

Q7.(2024)

The kidneys have an important role in homeostasis.

Describe what happens to **glucose**, **protein** and **urea** in the kidneys.

[4 marks]

Q8.(2024)

Explain how ADH affects the production and concentration of urine by the kidneys.

[4 marks]
