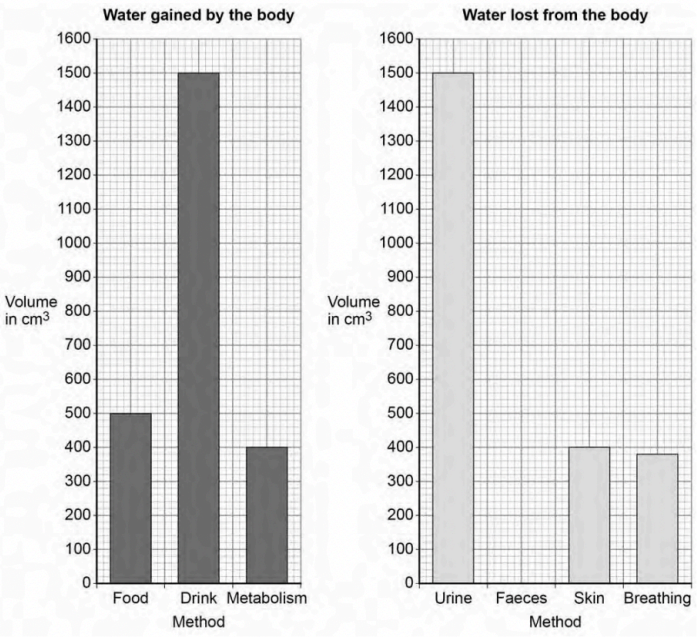
(Control of water balance (kidneys, ADH, dialysis, transplants))

Q1.a)(2018)

It is important to maintain water balance in the body.

Figure 15 shows how much water a person gained and lost by different methods in one day.

Figure 15



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 15**.

[2 marks]

Volume lost in faeces = _____ cm^3

Q1.b)(2018)

Figure 15 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.(2019)

Two of the substances the body excretes are urea and carbon dioxide.

Complete the sentence.

[1 mark]

Choose the answer from the box.

carbohydrate	**lipid**	**protein**	**salt**

A person makes a lot of urea if the person's diet contains

a lot of _____.

Q3.(2019)

Why must urea be excreted from the body?

[1 mark]

_____

_____

Q4.(2019)

Excess water must also be removed from the body.

If a person sweats a lot, less water will be excreted in the urine.

A healthy person did the same amount of exercise on each of 3 days.

Table 2 shows information for the 3 days.

Table 2

Day	Air temperature in °C	Volume of water consumed in cm^3	Relative amount of urine produced by the kidneys
1	30	1500	
2	20	1500	
3	15	2000	

Complete **Table 2**.

[2 marks]

Choose answers from the box.

least	**medium**	**most**

Q5.a)(2019)

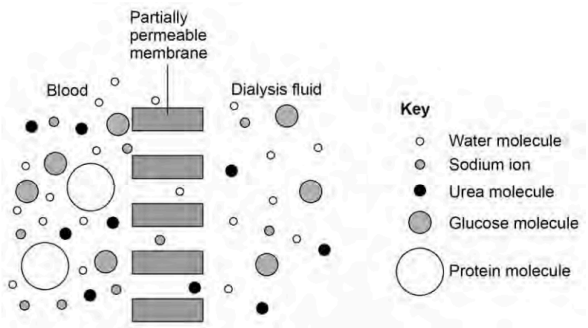
Some people have kidney disease.

Kidney disease may be treated by dialysis or by having a kidney transplant operation.

- During dialysis, a person is connected to a machine that filters the blood.
- Each dialysis session lasts about 6 hours.
- The person has several dialysis sessions each week.

Figure 12 shows how dialysis works.

Figure 12



How does urea move out of the blood during dialysis?

[1 mark]

Tick (✓) **one** box.

Diffusion ☐

Digestion ☐

Osmosis ☐

Respiration ☐

Q5.b)(2019)

Which substance in **Figure 12** does **not** pass from the blood into the dialysis fluid?

Give the reason for your answer.

[2 marks]

Substance _____

Reason _____

_____

Q6.a)(2019)

Two people have kidney disease.

- Person **A** is treated by dialysis.
- Person **B** has had a kidney transplant.

Figure 13 shows changes in the urea concentration in the blood of each person over 2 weeks.

Figure 13

How many dialysis sessions did person **A** have **each week**?

[1 mark]

_____

Q6.b)(2019)

What happens to the concentration of urea in the blood between dialysis sessions?

[1 mark]

_____

Q6.c)(2019)

Give **two** reasons why a kidney transplant is a better method for treating kidney disease than dialysis.

[2 marks]

1 _____

_____

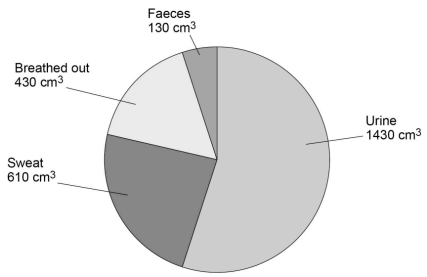
2 _____

_____

Q7.a)(2020)

Figure 5 shows the water loss from a person on one day.

Figure 5



The total water loss was 2600 cm^3.

Calculate the percentage of the total water loss that was lost as urine.

[2 marks]

Percentage lost as urine = _____ %

Q7.b)(2020)

A marathon race is 42 km long.

What happens to the volume of water lost as sweat when a person runs a marathon?

[1 mark]

Q7.c)(2020)

What must marathon runners do to prevent themselves becoming dehydrated?

[1 mark]

Q7.d)(2020)

Complete the sentences.

[3 marks]

Choose answers from the box.

digestion	**excretion**	**fertilisation**	**filtration**	**reabsorption**

Blood entering the kidneys goes through the process of

_____ .

Glucose is **not** found in urine because of _____.

Urine is removed from the body in the process of _____.

Q8.(2020)

People with kidney failure can have dialysis or a kidney transplant.

Dialysis is often needed 3 times each week and can take over 4 hours each time.

Dialysis usually happens in a hospital.

Kidney transplants require a donor and major surgery.

Describe the advantages **and** disadvantages of having a kidney transplant instead of having dialysis.

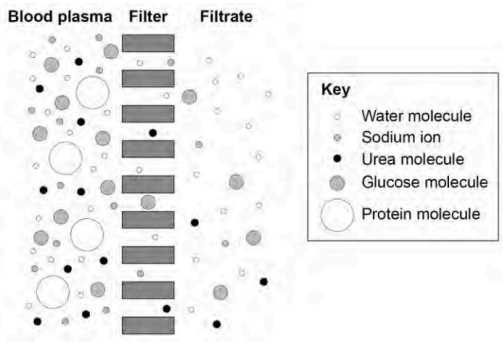
[4 marks]

Q9.(2023)

The kidneys filter the blood.

Figure 10 shows filtration in the kidney.

Figure 10



Glucose molecules are found in the blood plasma **and** in the filtrate.

Protein molecules are **only** found in the blood plasma.

Draw **one** line from each substance to the reason for where the substance is found.

[2 marks]

Substance	Reason
Glucose	The molecules are too large to pass through the filter
	The molecules are small enough to pass through the filter
Protein	The molecules are too small to pass through the filter

Q10.(2023)

The kidneys control the volume of water in the body.

Table 4 shows information about a person on one day.

Table 4

	Volume in dm^3
Water filtered from blood	160.0
Water lost in urine	1.9

Calculate the volume of water reabsorbed into the blood.

[1 mark]

Volume = _____ dm^3

Q11.(2023)

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

Figure 11 gives information about dialysis and kidney transplants.

Figure 11

Dialysis

- A person needs 3 dialysis sessions a week, with each session lasting about 8 hours.
- Most patients have dialysis in hospital.
- Protein and salt levels in food must be kept low.
- Dialysis costs £35 000 per year for each patient.

Kidney transplant

- In a surgical operation the use of a general anaesthetic can occasionally cause damage to other organs.
- After a transplant the patient must take drugs for the rest of their life to suppress the immune system.
- A transplant costs £17 000 in the first year and then £5 000 in each of the following years for drugs.
- The transplanted kidney will work well for about 10 years.

A doctor states:

'It is better to treat a person with kidney disease by using a kidney transplant rather than by dialysis.'

Evaluate the doctor's statement.

Use information from **Figure 11**.

[6 marks]

Q12.(2023)

A kidney transplant costs £17 000 in the first year and then £5 000 in each of the following years for drugs.

Calculate the total cost of treatment by kidney transplant over the first 5 years.

[3 marks]

Total cost = £ _____