Kidney

Q:1(a) (i) Urine is made in the kidneys and stored for a few hours before being released from the body.

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

Bladder large intestine liver

(1 mark)

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

Tick (✓) two boxes.

Glucose ☐

mineral ions ☐

protein ☐

urea ☐

(2 marks)

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

Read the information about dialysis and kidney transplants.

✓✓✓A person needs 3 dialysis sessions a week, each lasting about 8 hours.

✓✓Intake of protein and salt in the food is kept low between dialysis sessions.✓✓✓For each patient, dialysis costs £30 000 per year.

✓✓✓The use of a general anaesthetic can sometimes cause brain damage.

✓✓✓Drugs to suppress the immune system are given after a kidney transplant.

✓✓A transplant costs £20 000 in the first year plus £6500 in each of the following years✓for drugs.

Use this information to answer the questions.

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

1 _____

_____

2 _____

_____

(2 marks)

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

_____

_____

(1 mark)

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

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

During dialysis, substances are removed from the blood.

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

_____

(1 mark)

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

. _____ grams per dm3

(1 mark)

Q:2 **(a)** Why is glucose found in the blood but not in the urine?

Use your knowledge of how the kidney works to explain your answer as fully as you can.

_____

_____

_____

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(3 marks)

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

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

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

(2 marks)

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

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

(4 marks)

Q:3 **(a)** The kidney controls the amount of water in the body.

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

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

Calculate the volume of water reabsorbed into the blood.

Show clearly how you work out your answer.

_____

_____

Volume of water reabsorbed = _____ dm3

(2 marks)

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

Man A

Man B

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

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

The first line has been completed for you.

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

(2 marks)

Q:4 Urine consists of water, ions and other substances such as urea. Urine is formed in the kidney by filtering the blood.The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	Diameter of molecule in nanometres
A	10 to 20
B	1.0
C	0.6
D	0.5
E	0.2

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

(a)(i) Which substance, A, B, C, D or E, is protein?

(1 mark)

(a)(ii) Explain why protein is not found in the urine of a healthy person.

(2 marks)

(b) Substance B is not found in the urine of a healthy person. Suggest an explanation for this.

(2 marks)

(c) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.

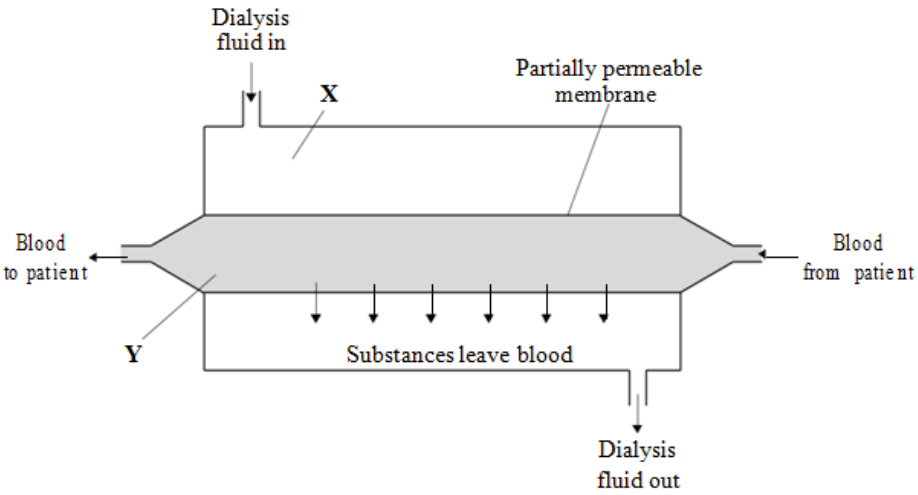
The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is not found in the urine of a healthy person, but can be found in the urine of a person with haemolytic anaemia.

Explain why.

(3 marks)

Q:5 People with kidney disease may be treated by dialysis. The diagram shows a dialysis machine.



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

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(a)(i) This person lost mass mainly because the substance

salt
urea
water

was removed from the blood.

(1 mark)

(a)(ii) This substance was able to pass through the partially permeable membrane because its molecules are

large.
round.
small.

(1 mark)

(a)(iii) The concentration of sodium ions at X is 3.15 grams per dm3.

At the end of a dialysis session, the most likely concentration of sodium ions at Y would be

0.00
3.15
6.30

grams per dm3.

(1 mark)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	Cost per year in pounds
Dialysis	30 000
Kidney transplant:	
operation + first year's medical care	51 000
medical care in each further year	5 000

(b)(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is dialysis treatment?

pounds

(1 mark)

(b)(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis. How many years would it take?

Draw a ring around one answer.

2 years 3 years 4 years

(1 mark)

(b)(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is this necessary?

_____

_____

(1 mark)

Q:6 A person had diseased kidneys.

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

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

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

(a)(i) Name this substance

_____

(1 mark)

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

_____

_____

_____

_____

_____

(2 marks)

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

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4 marks)

TOTAL MARKS=42