PEARSON EDEXCEL IGCSE BIOLOGY · 4BI1

BIOLOGY



EXAM QUESTION PACK

SECTION 2: STRUCTURE AND FUNCTIONS IN LIVING ORGANISMS (PACK 5)

SCORE	PERCENTAGE
/210	%

STEMUP

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Q1.

Pineapple juice contains a protease called bromelain.

A student uses this method to investigate the digestion of solid gelatine protein by bromelain.

• place solid gelatine protein into a test tube up to a height of 5 cm

• mix 5 cm^3 pineapple juice with 1 cm^3 of pH 4 buffer

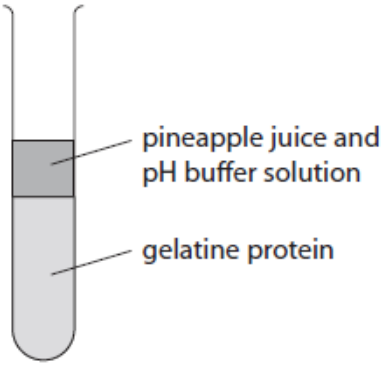
• place 1 cm^3 of the pineapple juice and buffer solution on top of the gelatine

• leave for one hour in a water bath set to 37 °C

• measure the height of the solid gelatine and use it to calculate the volume of gelatine that has been digested

Repeat the method three more times.

The diagram shows part of the student's method.



(a) The table shows the student's results for the volumes of gelatine digested at pH 4.

Tube number	Volume of gelatine digested in cm^3
1	0.55
2	1.89
3	0.54
4	0.61

(i) Calculate the mean volume of gelatine digested in cm^3.

Give your answer to two decimal places.

(3)

mean volume = ... cm^3

(ii) State what substances are produced when the gelatine protein is digested.

(1)

.....

(b) The student repeats the investigation with different pH buffers.

The table shows their results.

pH	Mean volume of gelatine digested in cm^3
3	0.32
5	0.98
7	0.51
9	0.33
11	0.01

(i) Give two variables the student should control.

(2)

1 .....

2 .....

(ii) Explain the effect of changing the pH on the mean volume of gelatine digested.

(3)

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(c) Describe how to test for the presence of protein.

(2)

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(Total for question = 11 marks)

Q2.

Pyramids of biomass and energy transfer are ways of representing what happens in an ecosystem.

(a) Diagram 1 shows pyramids of biomass for a crop field ecosystem and for a coral reef ecosystem.

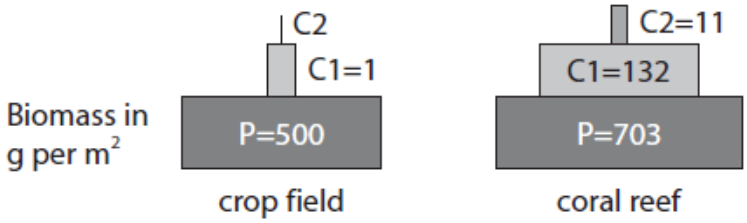


Diagram 1

(i) Use data from Diagram 1 to calculate the efficiency of the transfer of biomass from producers (P) to primary consumers (C1) in the coral reef.

(1)

producer to primary consumer = ... %

(ii) The efficiency of the transfer of biomass from primary consumers (C1) to secondary consumers (C2) in the crop field is 1%.

Calculate the biomass of the secondary consumers in the crop field in g per m^2.

(1)

biomass = ... g per m^2

(iii) Suggest why the biomass transfer is different in the coral reef compared to the crop field.

(1)

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(b) Diagram 2 shows pyramids of biomass for an ocean and a lake.

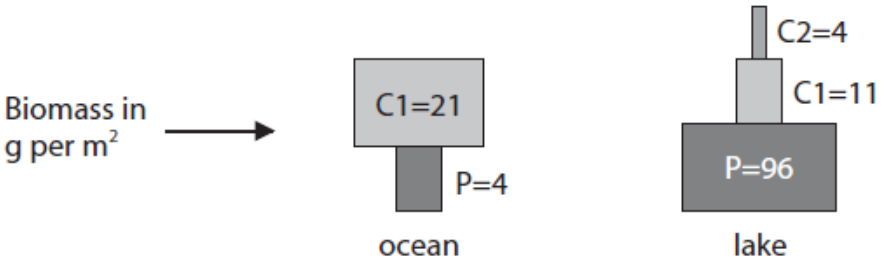


Diagram 2

Explain the shape of the pyramid of biomass for the ocean.

(2)

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(c) Suggest how scientists could estimate the energy of the producers in 1 m^2 of the crop field.

(2)

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(Total for question = 7 marks)

Q3.

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Haemolytic disease

Haemolysis is the term used to describe the bursting of red blood cells. Haemolytic disease occurs when the red blood cells burst in the body of a foetus in a pregnant woman. The bursting of the red blood cells affects the development of the foetus into a baby.

The red blood cells burst when certain antibodies from the mother pass across the placenta. The antibodies attach to protein molecules called antigens. These antigens are on the surface of the foetal red blood cells. The protein antigen is called the rhesus factor and is made using the genetic code found on the dominant allele, D, during the production of red blood cells in bone marrow.

Homozygous dominant and heterozygous individuals have cells with the antigen. These individuals have the rhesus positive blood group. Homozygous recessive individuals have cells that do not have the antigen. These individuals have the rhesus negative blood group.

During the birth of a rhesus positive baby, some red blood cells may leak into the circulatory system of the mother. This happens as the placenta pulls away from the wall of the uterus. A rhesus negative mother will make antibodies that destroy rhesus positive red blood cells. This is not a problem for the child that has just been born. However, if the mother becomes pregnant again with another rhesus positive foetus, the antibodies will harm the foetus.

Haemolytic disease can be avoided by treating a rhesus negative woman at risk of having a second rhesus positive child. This treatment involves the mother having an injection during and after pregnancy. The injection destroys rhesus positive cells in the mother's blood before the cells can cause an immune response.

If the foetus is rhesus positive, the pregnancy is carefully monitored for signs of haemolytic disease. Monitoring includes regular ultrasound scans of the foetus and measuring the amount of antibody in the mother's blood. A change in the concentration of the antibody in the mother's blood, due to her secondary immune response, can lead to dangerous haemolysis. If a foetal blood test confirms a low number of red blood cells, a blood transfusion can be done *in utero* to replace the burst foetal red blood cells.

(a) Explain why bursting of red blood cells affects the development of a foetus (lines 3 and 4).

(2)

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(b) The dominant allele codes for the production of the protein that will act as an antigen.

Describe how the dominant allele leads to the production of RNA during protein synthesis (lines 7 to 9).

(3)

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(c) Give the reason why proteins cannot be made by red blood cells (lines 7 to 9).

(1)

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(d) Give one piece of evidence from the passage that shows that antibodies are smaller than red blood cells.

(1)

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(e) (i) A mother who is homozygous recessive for the rhesus factor has a child with a father who is heterozygous.

Give the genotypes of the mother, the father, their gametes and the possible genotypes of the child.

(3)

(ii) Give the probability that the child will be rhesus positive.

(1)

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(f) Explain why the concentration of the rhesus antibody in the mother's blood rises quickly to harmful levels if she has a second child who is Rhesus positive (lines 16 to 19).

(3)

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(g) Suggest what is meant by the term *in utero* (line 30).

(1)

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(h) A foetus with haemolytic disease can be given a blood transfusion.

Suggest the blood group of the source of the cells used for this transfusion (lines 29 and 30).

(1)

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(Total for question = 16 marks)

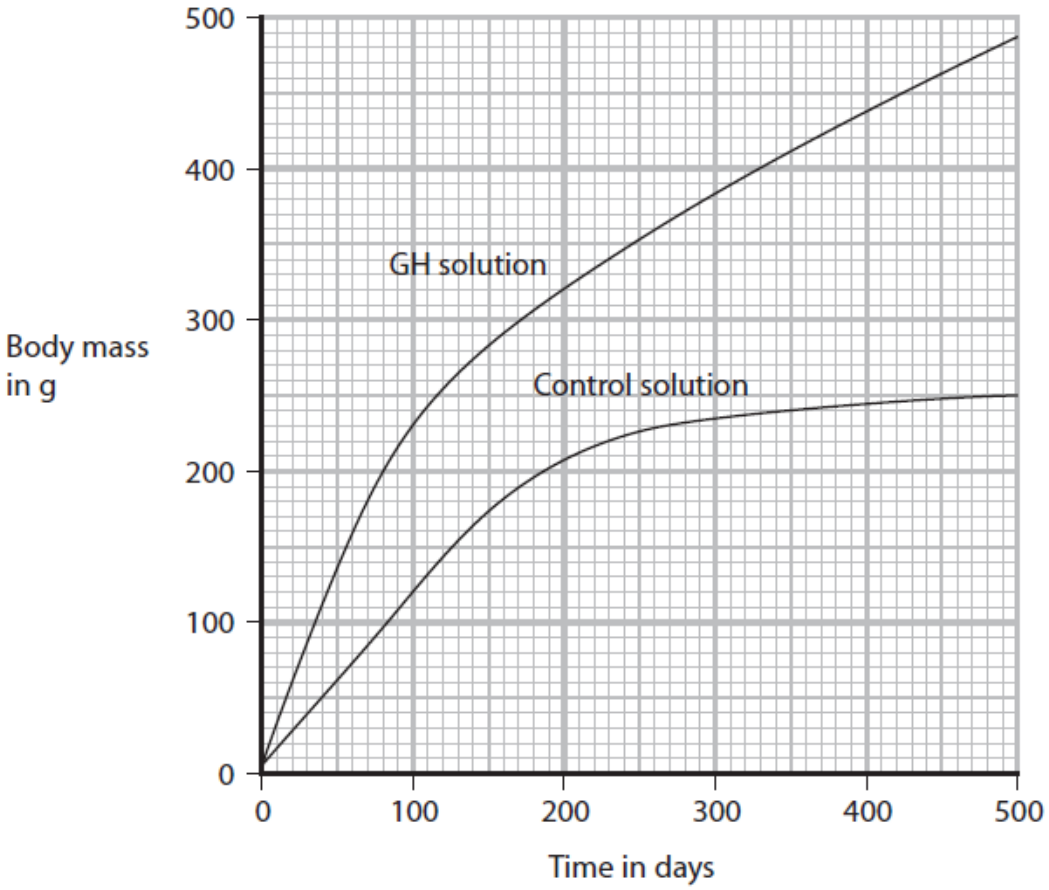
Q4.

A scientist investigates the effect of growth hormone (GH) on the body mass of rats.

This is his method.

- give one rat a GH solution every day for 500 days
- give another rat a control solution every day for 500 days
- measure the mass of each rat each week for 500 days

The graph shows his results.



(a) Suggest how the control solution differs from the GH solution.

(1)

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(b) Calculate the average rate of growth of the rat given GH solution from 100 days to 500 days.

Give your answer in g per day.

(2)

rate of growth = ... g per day

(c) The scientist controlled all the variables in his investigation.

Suggest two abiotic variables he controls.

(2)

1 .....

2 .....

(d) The scientist repeats his investigation using more rats.

Explain why using more rats improves his investigation.

(2)

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(e) GH increases transcription in cells.

Explain why this affects the growth of rats.

(3)

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(Total for question = 10 marks)

Q5.

Food items can often be spoiled if saprotrophic microorganisms such as mould fungi grow on them.

(a) Describe how a saprotrophic fungus such as mould obtains its food.

(3)

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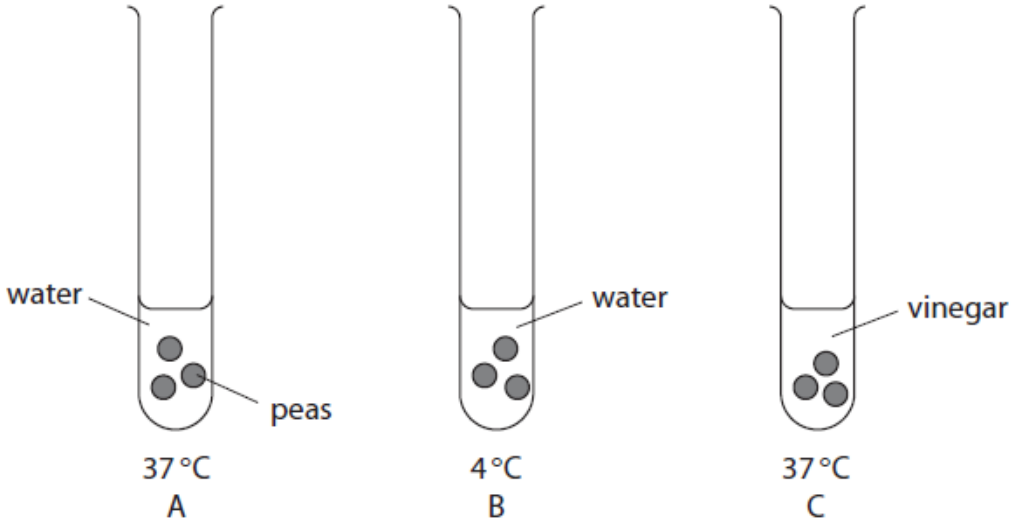
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(b) A student uses this method to investigate ways of preventing peas from being spoiled.

- place three peas in each of three test tubes as shown in the diagram
- cover the peas in test tube A with water and keep at 37 °C
- cover the peas in test tube B with water and keep at 4 °C
- cover the peas in test tube C with vinegar, which is a weak acid, and keep at 37 °C
- leave the peas for 24 hours



The student observes the level of cloudiness of the solution to determine how spoiled the peas have become.
The level of cloudiness can be used as a measure of fungal growth.

The table shows the student's results.

Test tube	Conditions peas are kept in	Level of cloudiness
A	water at 37 °C	very cloudy
B	water at 4 °C	slightly cloudy
C	vinegar at 37 °C	no cloudiness

(i) Suggest a problem with using the level of cloudiness of the solution to determine how spoiled the peas have become.

(1)

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(ii) Explain the appearance of the peas in water at 4 °C.

(2)

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(iii) Explain the appearance of the peas in vinegar at 37 °C.

(2)

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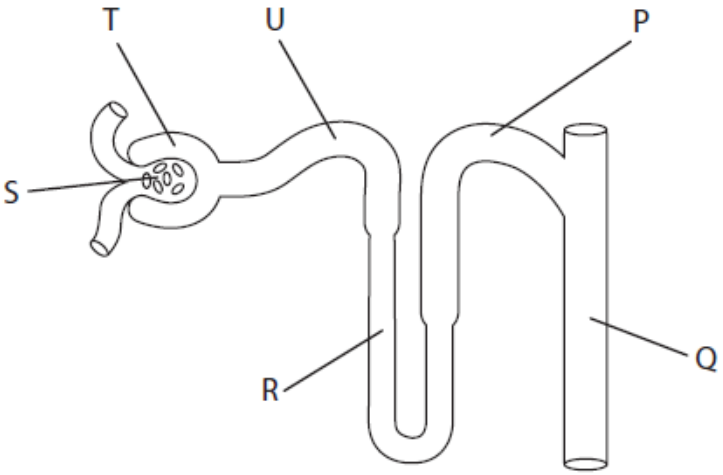
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(Total for question = 8 marks)

Q6.

The diagram shows a nephron from a human kidney.



(a) (i) From which structure does ultrafiltration take place?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(ii) From which structure is glucose reabsorbed?

(1)

☒ **A** Q

☒ **B** R

☒ **C** S

☒ **D** U

(iii) Which structure is the loop of Henle?

(1)

☒ **A** P

☒ **B** R

☒ **C** S

☒ **D** U

(b) The table gives the mean values of mass filtered per day and excreted per day for different plasma components that are filtered and reabsorbed in the nephron.

Plasma component	Mass filtered per day in g	Mass excreted per day in g	Percentage reabsorbed
water	180 000	1800	99.0
sodium	630	3.0	99.5
glucose	180	0	100.0
urea	54		44.0

(i) State what is meant by plasma components.

(1)

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(ii) Calculate the mean mass of urea excreted per day.

(2)

mean mass of urea = ... g

(iii) Explain why glucose is reabsorbed in the nephron.

(2)

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(iv) The concentration of urine is determined by the volume of water present and the mass of dissolved substances.

A person eats a meal with a high protein and salt content and drinks a small volume of water.

Comment on how this may change the values in the table and the effect it will have on urine production.

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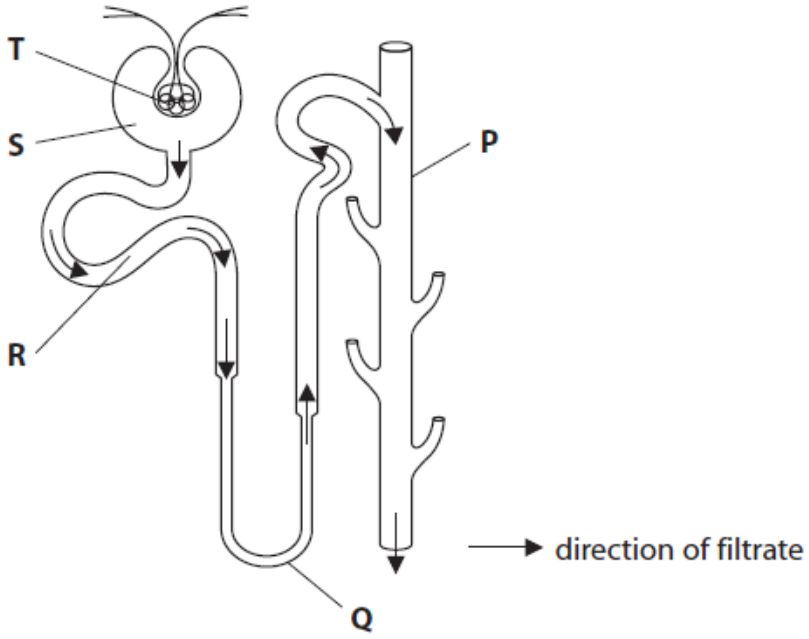
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(Total for question = 13 marks)

Q7.

The diagram shows part of a human nephron, with parts labelled P, Q, R, S and T.



(a) (i) What is the name of part P?

(1)

☒ **A** collecting duct

☒ **B** glomerulus

☒ **C** proximal convoluted tubule

☒ **D** renal artery

(ii) Where does ultrafiltration occur?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** T

(iii) Where is permeability affected by ADH?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(iv) Where is glucose selectively reabsorbed into the blood?

(1)

☒ **A** Q

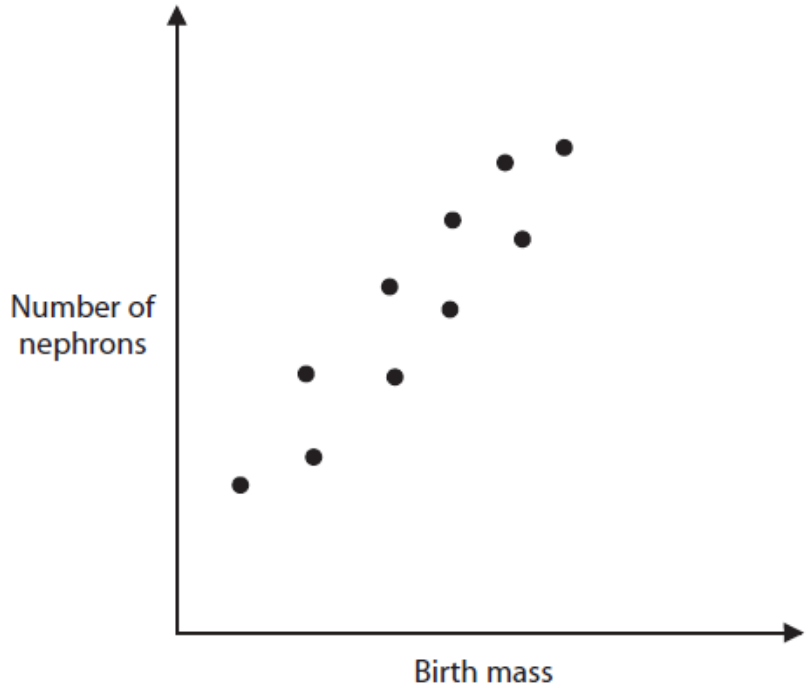
☒ **B** R

☒ **C** S

☒ **D** T

(b) Scientists investigate the relationship between birth mass and the number of nephrons in the kidney.

The scatter diagram shows their results.



(i) Describe the relationship shown by the scatter diagram.

(2)

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(ii) Babies born with low birth mass are more likely to develop high blood pressure when they become adults.

Explain why protein in the urine of these adults may be an indication of kidney damage caused by high blood pressure.

(4)

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(iii) Describe a simple test to show that a urine sample contains protein.

(2)

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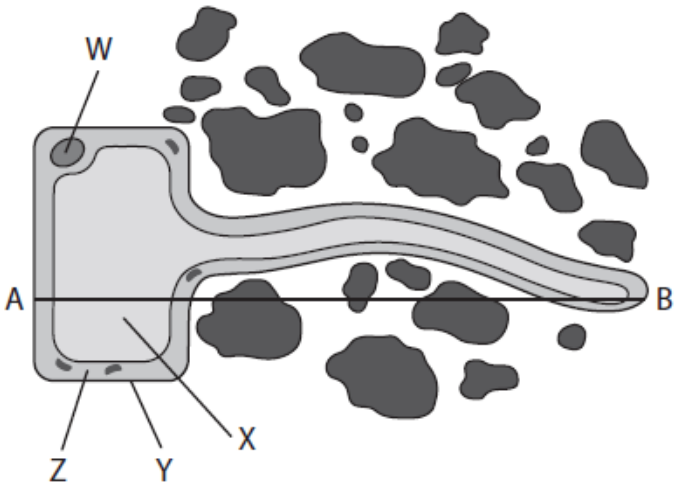
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(Total for question = 12 marks)

Q8.

The diagram shows a magnified image of a root hair cell from a young plant.



(a) Give the names of structures labelled W, X, Y and Z.

(4)

W .....

X .....

Y .....

Z .....

(b) The actual length of the cell, along the line between A and B, is 1000 µm.

Calculate the magnification of this drawing.

(2)

magnification = ...

(c) (i) Explain the role of the root hair cell in absorption of water from the soil.

(3)

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(ii) Sometimes gardeners give their plants too much water. The water fills up the air spaces in the soil around the plant roots.

Explain how this can lead to plants failing to grow properly.

(3)

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(Total for question = 12 marks)

Q9.

The surface area of a lung is increased because there are many small alveoli rather than one large one.

(a) A student uses cubes as a model to estimate the additional surface area gained by having many small alveoli.

He uses this method.

- calculate the volume of a large cube with side length 20 cm
- calculate the number of small cubes with side length 1 cm that have the same total volume as the large cube
- calculate the surface area of the large cube
- calculate the total surface area of all the small cubes

The student assumes that the small cubes are not touching so all their surfaces are exposed.

The table shows the student's results.

(i) Complete the table by giving the missing information.

(2)

Side length in cm	Surface area of one cube in cm^2	Total surface area in cm^2	Volume of one cube in cm^3	Total volume in cm^3
20	2400	2400	8000	8000
1			1	8000

(ii) Calculate the ratio of the total surface area of the small cubes to the surface area of the large cube.

(1)

ratio = ...

(b) Evaluate the student's model as a representation of the lungs.

(2)

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(c) The results show that many alveoli increase the surface area, which will increase the rate of diffusion.

Explain three other ways that alveoli are adapted to maximise gas exchange.

(3)

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2 .....

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3 .....

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(Total for question = 8 marks)

Q10.

Catalase is an enzyme found in many cells.

It speeds up the breakdown of hydrogen peroxide into water and oxygen.

The equation for the reaction is

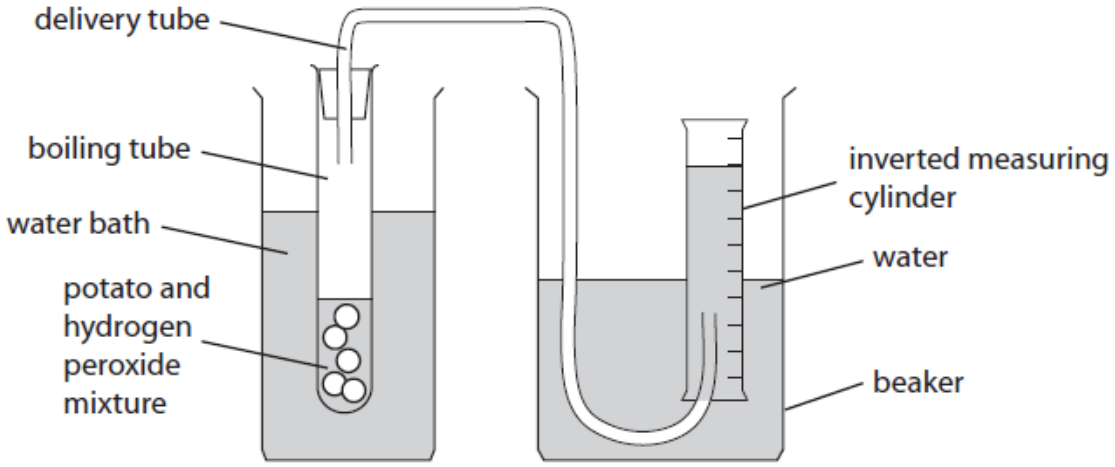
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

A teacher demonstrates the effect of increasing catalase concentration on the initial rate of the reaction.

This is the teacher's method.

- cut five equal size discs from a potato, each 0.2 mm thick
- place the discs in a boiling tube with 5 cm^3 of buffer solution
- add 5 cm^3 of hydrogen peroxide solution to the boiling tube
- place a bung and delivery tube firmly into the boiling tube
- position the other end of the delivery tube under an inverted measuring cylinder
- start a timer as soon as the first bubble of oxygen enters the measuring cylinder
- measure the volume of oxygen produced in one minute

Repeat this method three times.



The teacher uses this method with different numbers of potato discs, making sure that other conditions are unchanged.

(a) Give the expected relationship between the named independent variable and the named dependent variable in this demonstration.

(2)

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(b) Give **two** variables that the teacher controls in this demonstration.

(2)

1 .....

2 .....

(c) The table shows the teacher's results.

Enzyme concentration in number of discs	Volume of oxygen produced in one minute in cm^3				
	Reading 1	Reading 2	Reading 3	Reading 4	Mean reading
5	1.2	1.5	0.0	1.5	
10	3.5	4.5	6.0	5.5	4.9
15	6.5	7.0	7.5	8.0	7.3
20	9.0	8.5	8.0	7.5	8.3
25	15.0	11.0	11.5	12.0	12.4

(i) Calculate the mean volume of oxygen produced in one minute using 5 potato discs.

(2)

mean reading = ... cm^3

(ii) Calculate the percentage increase in mean volume of oxygen produced in one minute as the concentration of enzyme changes from 15 to 20 discs.

(2)

percentage increase = ... %

(iii) Explain the relationship between the concentration of enzyme and mean volume of oxygen produced in one minute.

(2)

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(d) Suggest why the teacher measures the volume of oxygen after the first minute of the reaction rather than after 10 minutes.

(2)

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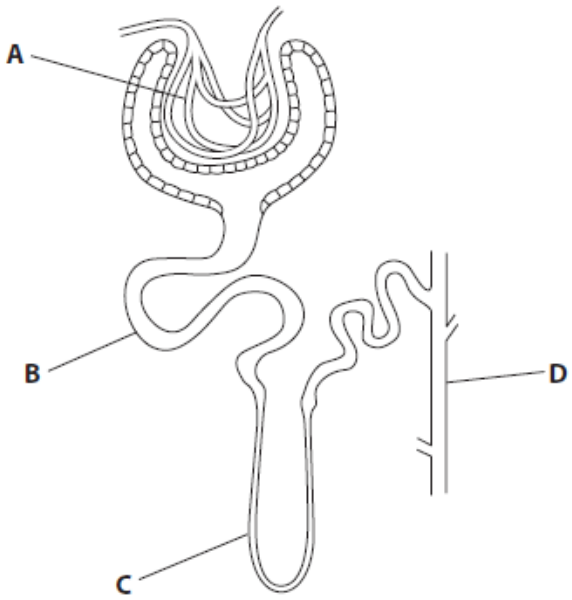
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(Total for question = 12 marks)

Q11.

The diagram shows a nephron from a human kidney, with parts labelled A, B, C and D.



(a) Use the diagram and your knowledge of kidney function to answer these questions.

(i) Where does ultrafiltration take place?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Where does reabsorption of glucose take place?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) Which part responds to a change in ADH?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) A kangaroo rat is a mammal that lives in hot desert regions of America.

(i) In kangaroo rats, the tissue surrounding the collecting duct contains a high concentration of ions.

Explain how this feature enables kangaroo rats to survive in the desert.

(3)

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(ii) Kangaroo rats stay underground during the day and only come out to feed at night.

Explain how this behaviour enables kangaroo rats to survive in the desert.

(2)

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(iii) Kangaroo rats rarely drink water.

Suggest where they get their water from.

(1)

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(Total for question = 9 marks)

Q12.

The human kidney is an organ that is able to process excretory products from human metabolism.

(a) Concentration of urine is calculated using this formula.

$$\text{concentration in milliosmoles per dm}^3 = \frac{\text{amount of waste in milliosmoles}}{\text{volume in dm}^3}$$

The amount of waste the kidneys produce per day is 600 milliosmoles.

The maximum concentration that the human kidneys can produce is 1400 milliosmoles per dm^3.

Calculate the minimum volume of urine that must be produced each day.

Give your answer in cm^3.

(2)

minimum volume = ... cm^3

(b) Name another organ that carries out excretion in the human body.

(1)

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(c) Explain the role of the nephron in osmoregulation.

(5)

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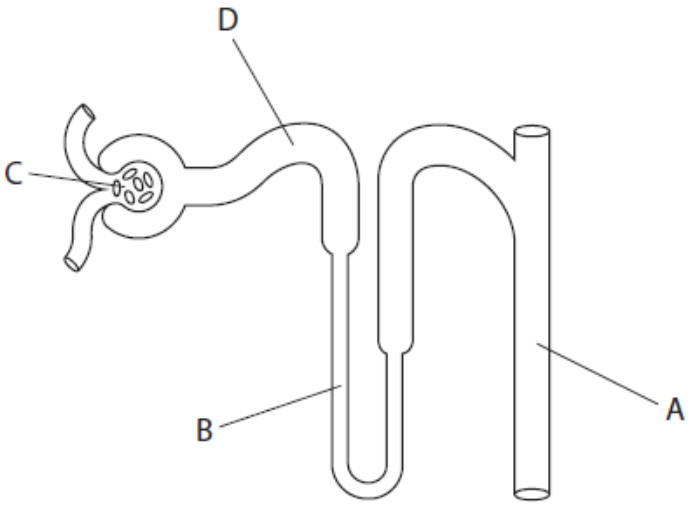
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(Total for question = 8 marks)

Q13.

The diagram shows a nephron of a kidney, with some of the structures labelled.



(a) (i) From which structure are substances forced out of the blood by ultrafiltration?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) From which structure is glucose reabsorbed into the blood by selective reabsorption?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) In homeostasis, the kidney is involved in the control of blood concentration.

(i) State the name for the control of blood concentration.

(1)

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(ii) Another function carried out by the kidney is excretion.

State what is meant by the term excretion.

(1)

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(c) Diabetes insipidus is a medical condition in which the body is unable to produce ADH.

Explain how diabetes insipidus affects the control of blood concentration.

(4)

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(d) Desmopressin is a drug used to reduce the symptoms of diabetes insipidus.

(i) Suggest what effect the drug would have on the nephron.

(1)

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(ii) Describe the effects the drug would have on urine production.

(2)

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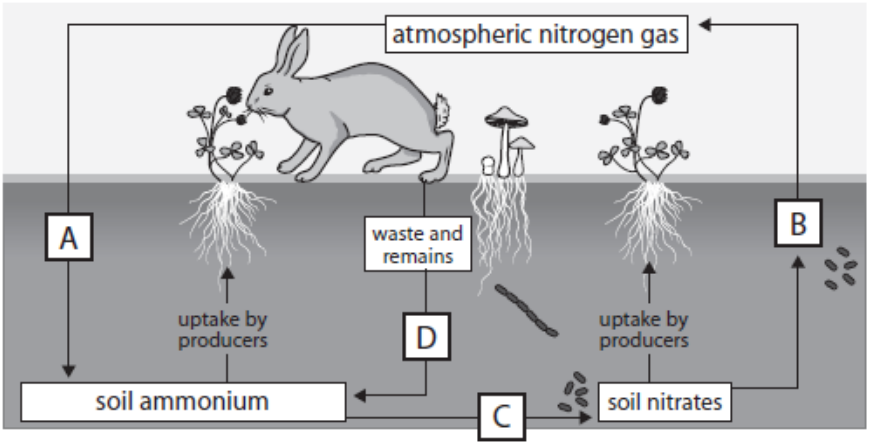
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(Total for question = 11 marks)

Q14.

(a) The diagram shows the nitrogen cycle with four processes labelled A, B, C and D.



(Source: https://www.shutterstock.com/image-vector/diagram-nitrogen-cycle-process-by-which-1400843660)

(i) Which process is nitrogen fixation?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Which process is decomposition?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) Which process is nitrification?

(1)

☒ **A**

☒ **B**

☒ **C**

☒

D

(iv) Name a type of organism that carries out process C.

(1)

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(b) A student does an investigation to determine if nitrate ions are required for plant growth.

He uses this method.

Step 1 Use a measuring cylinder to add 10 cm^3 of the control solution containing all the minerals a plant requires
to a test tube

Step 2 Cover the top of the tube with foil

Step 3 Make a small hole in the foil

Step 4 Push the root of a germinated bean seedling through the hole so it is in the solution

Step 5 Rinse the measuring cylinder with distilled water

Step 6 Repeat Steps 1 to 4 using a test solution containing all the mineral a plant requires apart from nitrate ions

Step 7 Wrap both tubes in black paper

Step 8 Place both tubes in a test tube rack in bright sunlight

(i) Explain why the control solution contains all the mineral ions the plant requires but the test solution contains all the mineral ions the plant requires except nitrate.

(2)

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(ii) State the purpose of Step 5.

(1)

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(iii) Explain the purpose of Step 7.

(2)

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(iv) Explain the measurements that the student could make to determine if nitrate ions are required for plant growth.

(2)

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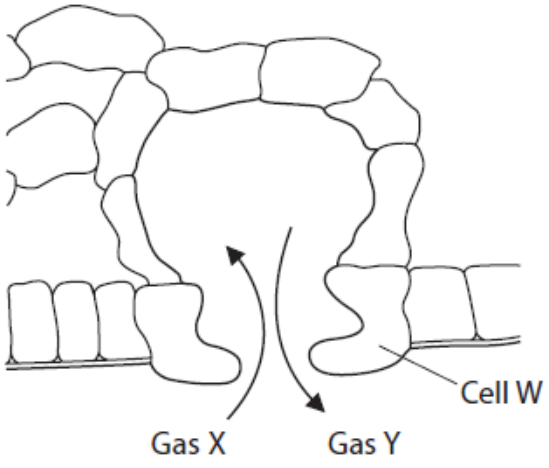
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(Total for question = 11 marks)

Q15.

The leaf contains pores called stomata.
The diagram shows a section of a leaf showing a stoma.



(a) The arrows show the diffusion of two different gases on a sunny day.

(i) Which row of the table correctly names gas X and gas Y?

(1)

	Gas in (X)	Gas out (Y)
☒ **A**	oxygen	carbon dioxide
☒ **B**	carbon dioxide	oxygen
☒ **C**	water vapour	carbon dioxide
☒ **D**	oxygen	water vapour

(ii) Which of the following is correct on a sunny day?

(1)

☒ **A** The volume of cell W increases and the stoma opens.

☒ **B** The volume of cell W decreases and the stoma closes.

☒ **C** The volume of cell W increases and the stoma closes.

☒ **D** The volume of cell W decreases and the stoma opens.

(b) Farmers spray chemicals called herbicides on their fields to kill unwanted plants called weeds.

An investigation was carried out into the effects of herbicides on weeds. Weeds were grown in two fields. One field of weeds was sprayed with herbicide and the other with a control solution.

Both sets of weeds were left for one week and the following factors were measured:

- the rate of carbon dioxide absorption by the weeds
- the rate of water loss from the stomata of the weeds
- the dry mass of the weeds.

The table shows the results.

Treatment	Dry mass of weeds / g	CO_2 absorption / μmol per cm^2 per minute	Rate of water loss / mol per m^2 per minute
control solution	33.3	0.97	55.8
herbicide solution	19.5	0.85	15.7

(i) Explain the effect of this herbicide on the growth of the weeds.

Use information from the table to support your answer.

(6)

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(ii) Calculate the difference in carbon dioxide absorption between the control and herbicide treatments in one week. Show your working.

(2)

difference in one week = ... µmol per cm^2

(iii) Calculate the percentage decrease in the dry mass of weeds when the herbicide is used.

(2)

percentage decrease = ... %

(c) A student wants to compare the transpiration rate of two weed species.

Describe how the student could measure the rate of water loss in order to make a valid comparison.

(5)

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(Total for question = 17 marks)

Q16.

Plant roots absorb water from soil.

This water is transported to the leaves and then moves into the air.

(a) Which of these processes is used to absorb water from the soil?

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** evaporation

☒ **D** osmosis

(b) Name the tissue that transports water to the leaves.

(1)

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(c) Name the process that moves water vapour into the air.

(1)

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(d) Which of these reduces the movement of water from the leaves into the air?

(1)

☒ **A** high light intensity

☒ **B** low air humidity

☒ **C** low air temperature

☒ **D** windy conditions

(e) Give two uses of water in a plant.

(2)

1 .....

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2 .....

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(Total for question = 6 marks)

Q17.

Human populations are at risk from infectious disease.

(a) Describe the different types of pathogen.

Refer to a disease that each type of pathogen causes in your answer.

(6)

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(b) Explain how vaccination protects humans from pathogens.

(3)

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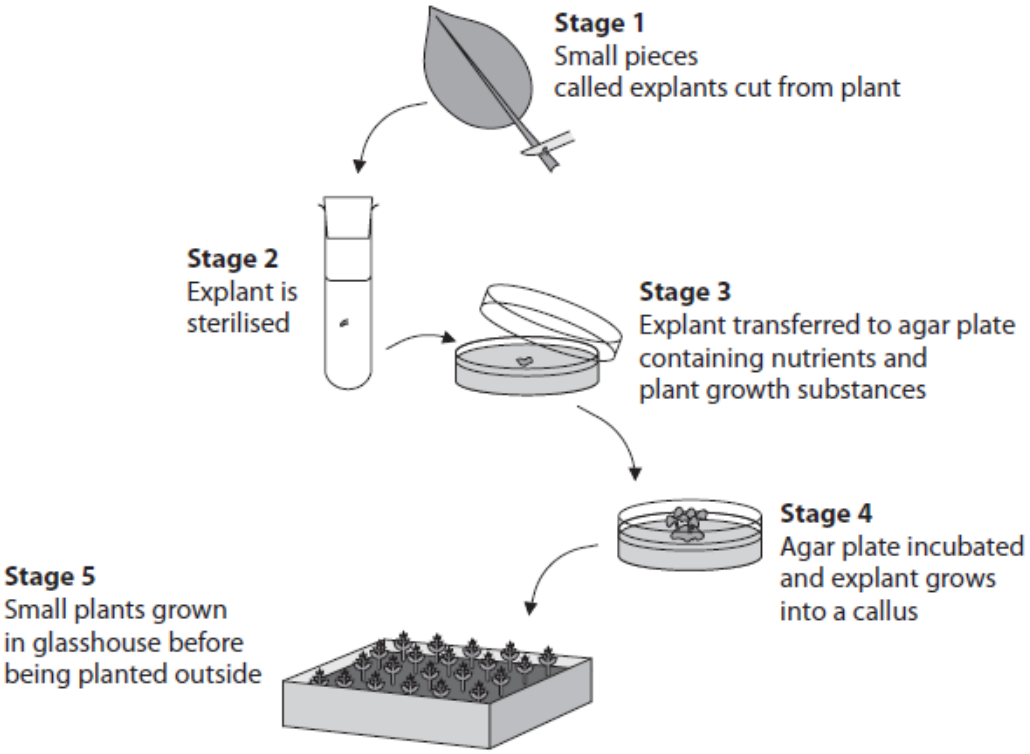
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(Total for question = 9 marks)

Q18.

Scientists produce large numbers of genetically identical plants using micropropagation.

The diagram shows some of the stages of micropropagation.



(a) (i) Give a method that could be used to sterilise the explants in stage 2.

(1)

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(ii) Give the name of one of the nutrients that should be added to the agar plate in stage 3.

(1)

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(b) In micropropagation, small pieces of plant tissue can grow into new individuals.

Explain why small pieces of animal tissue cannot grow into new individuals.

(2)

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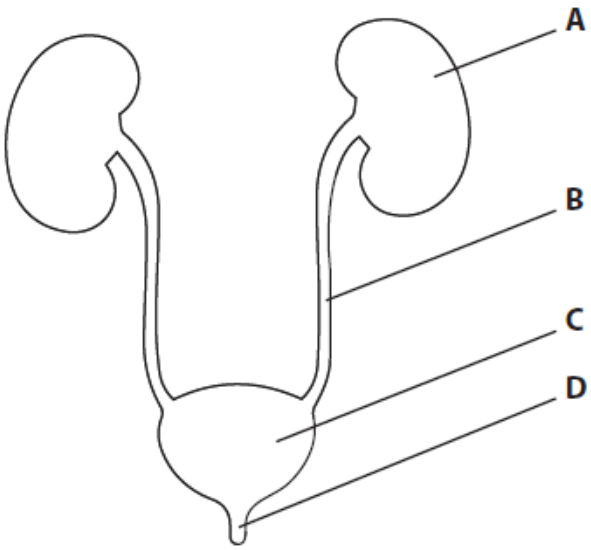
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(Total for question = 4 marks)

Q19.

The urinary system is used in excretion.

The diagram shows the urinary system with parts labelled A, B, C and D.



(a) Which part of the urinary system contains nephrons?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) The urinary system produces urine.

Name a substance found in urine.

(1)

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(c) A scientist uses this method to investigate the effect of drinking different liquids on urine production.

- drink 600 cm^3 of water in the morning
- measure the volume of urine produced during the next two hours
- drink 600 cm^3 of 0.8 % salt (NaCl) solution at the same time the following morning
- measure the volume of urine produced during the next two hours

The table shows the scientist's results.

Liquid	Volume of urine produced during two hours in cm^3
water	560
salt solution	254

(i) Explain the scientist's results.

(5)

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(ii) Give **two** other factors that affect the volume of urine produced.

(2)

1 .....

2 .....

(Total for question = 9 marks)

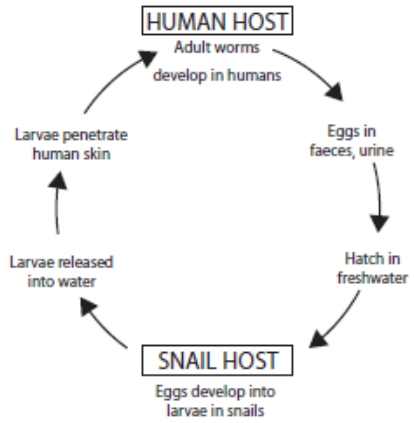
Q20.

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Schistosomiasis

Schistosomiasis is an infection caused by a parasitic worm called a schistosome. The immature or larvae of the worm live in rivers and lakes in tropical parts of the world.

The diagram shows the life cycle of the schistosome worm.



Some people in tropical parts of the world use water from these rivers and lakes for their daily lives. These people risk infection because the larvae burrow into their skin. The larvae are then transported to other parts of the body where they damage organs such as the kidneys, intestines, lungs and brain. The larvae develop into adult worms.

The adult worms lay eggs in the human body. Some of these eggs are destroyed by the immune system, but most eggs survive. These eggs can get into water if faeces or urine from infected people pass into rivers or lakes. In the water, the eggs develop into small larvae which grow inside freshwater snails. Larvae are released from the snails and infect any person they contact. These larvae develop into adult worms inside the human body.

Doctors diagnose schistosomiasis when they find eggs in the faeces or urine of infected people. Infected people also have blood cells in their urine and antibodies for the pathogen in their blood.

At present, the drug praziquantel is used to kill the worms. A dose of 0.040 g per kg of body mass is usually effective. With no treatment, affected organs can be permanently damaged, leading to death. It is estimated that 240 million people (in the world) have schistosomiasis. Every year 8×10^{-4} per cent of infected people die from the disease.

A vaccine is being developed using a plasmid. The plasmid has DNA inserted that makes a protein found on the body surface of the adult schistosome worm.

In one investigation, a vaccine made using the DNA plasmid was given to a group of infected people. The results showed a mean number of 21.53 worms per person in this group. In the control group, a mean number of 40.53 worms per person was found.

(a) Which process is affected if kidneys are damaged (line 8)?

(1)

- ☒ **A** digestion
- ☒ **B** mutation
- ☒ **C** ultrafiltration
- ☒ **D** vaccination

(b) Suggest three ways to reduce the risk of being infected by schistosomes.

(3)

1 .....

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2 .....

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3 .....

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(c) Name two different blood cells that would be found in the urine of infected people (line 17).

(2)

1 .....

2 .....

(d) An infected person has a body mass of 120 kg.

What dose of drugs would be effective for this person (lines 19 to 20)?

(1)

☒ **A** 0.04 mg

☒ **B** 4.8 mg

☒ **C** 40 mg

☒ **D** 4800 mg

(e) Using the estimated number of people in the world who have schistosomiasis (lines 21 to 22), calculate the number of people who die each year from schistosomiasis.

(2)

number = ...

(f) Which of these is the correct description of a plasmid?

(1)

☒ **A** a circle of DNA

☒ **B** a circle of mRNA

☒ **C** a circle of protein

☒ **D** a circle of tRNA

(g) Explain how a vaccine could protect people from schistosomiasis (lines 24 to 25).

(3)

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(h) (i) Suggest what is given to the control group (lines 27 to 29).

(1)

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(ii) A scientist claims that the investigation proves the vaccine is effective against schistosomiasis (lines 27 to 29).

Comment on this claim.

(3)

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(Total for question = 17 marks)