CAMBRIDGE IGCSE BIOLOGY · 0610

BIOLOGY



EXAM QUESTION PACK

MIXED TOPICS (CLASSIFIED QUESTIONS)

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1. Insulin is a hormone produced to control blood glucose levels. Diabetics do not have a natural ability to control these levels.

(a) Define the term *hormone*.

.....

..... [2]

(b) With reference to the pancreas and the liver, describe the role of insulin in controlling blood glucose levels.

.....

.....

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.....

.....

..... [4]

(c)

- Insulin is a protein.
- Diabetics can control their blood glucose levels artificially by injecting insulin.
- Many medicines are swallowed as tablets.

Explain what would happen to the insulin in the stomach if it was swallowed as a tablet.

.....

.....

..... [2]

(d) An alternative treatment to injecting insulin is being developed. The insulin is inhaled into the lungs as a spray. It is then absorbed into the bloodstream.

(i) Suggest the path the spray would take from the mouth to enter the alveoli.

.....

..... [3]

(ii) Suggest the process by which the insulin would pass from the alveoli into the bloodstream.

..... [1]

(iii) State three features of the alveoli that might help the insulin to pass into the blood stream efficiently.

1. .....
2. .....
3. ..... [3]

[Total: 15]

2 Fig. 2.1 shows the blood supply for the liver of a mammal.

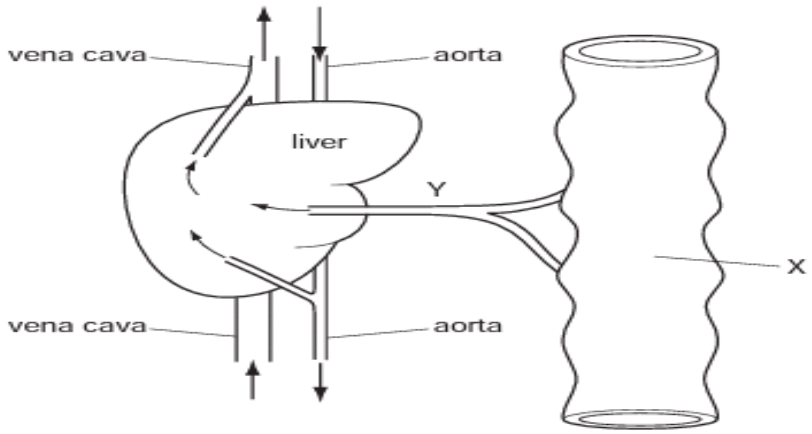


Fig. 2.1

(a) Blood from organ **X** is carried to the liver by blood vessel **Y**.

Name

(i) organ **X**,

..... [1]

(ii) blood vessel **Y**.

..... [1]

Liver cells absorb glucose and amino acids from the blood and help to regulate the concentrations of these substances in the blood.

(c) Explain how liver cells help to regulate the concentration of glucose in the blood in response to hormones from the pancreas in each of the following situations.

Blood glucose concentration is higher than normal.

.....

.....

.....

.....

.....

.....

Blood glucose concentration is lower than normal.

.....

.....

.....

.....

.....

..... [5]

(d) Describe what happens to amino acids inside liver cells.

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.....

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.....

.....

.....

.....

..... [3]

[Total: 15]

3. Fig. 5.1 shows a capillary inside a tissue.

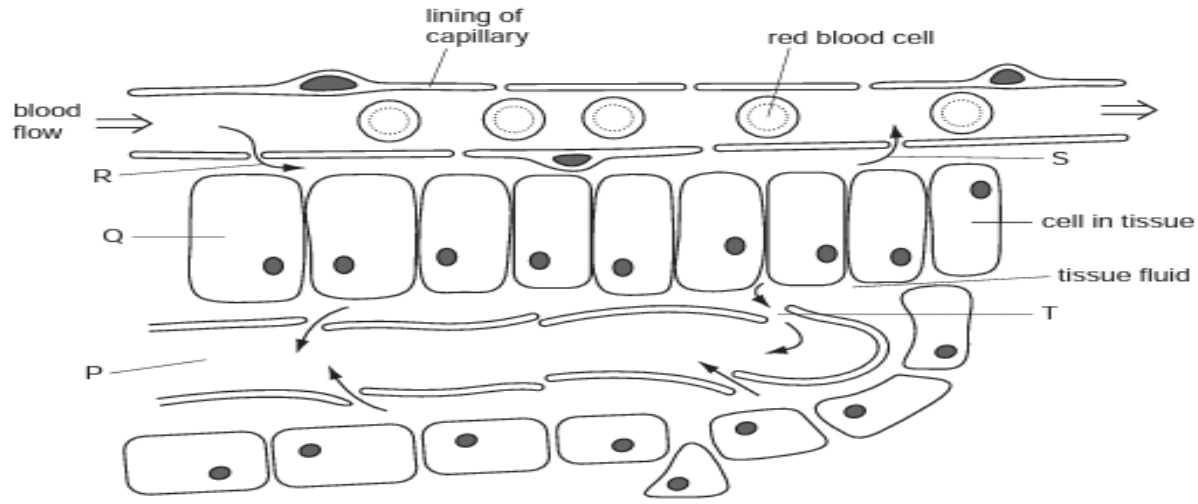


Fig. 5.1

(a) (i) State how oxygen passes from the capillary into cell **Q and** describe the function of this gas in a cell.

.....

..... [2]

(ii) Name two substances required by cells, **other than oxygen**, that pass from the blood to the tissue fluid at **R**.

1. .....

2. ..... [1]

(iii) Name two substances **produced by cells** that pass from the tissue fluid to the blood at **S**.

1. .....

2. ..... [1]

(b) With reference to Fig. 5.1, describe and explain **two** ways in which capillaries are adapted to their function.

1. .....

.....

.....

2. .....

.....

..... [4]

(c) Tissue fluid drains into vessel **P** at **T** and eventually returns to the blood.

(i) Name the type of vessel labelled **P**.

..... [1]

(ii) Explain how fluid passes along these vessels.

.....

..... [1]

[Total: 10]

4. Fig. 1.1 shows a section of a villus at two different magnifications.

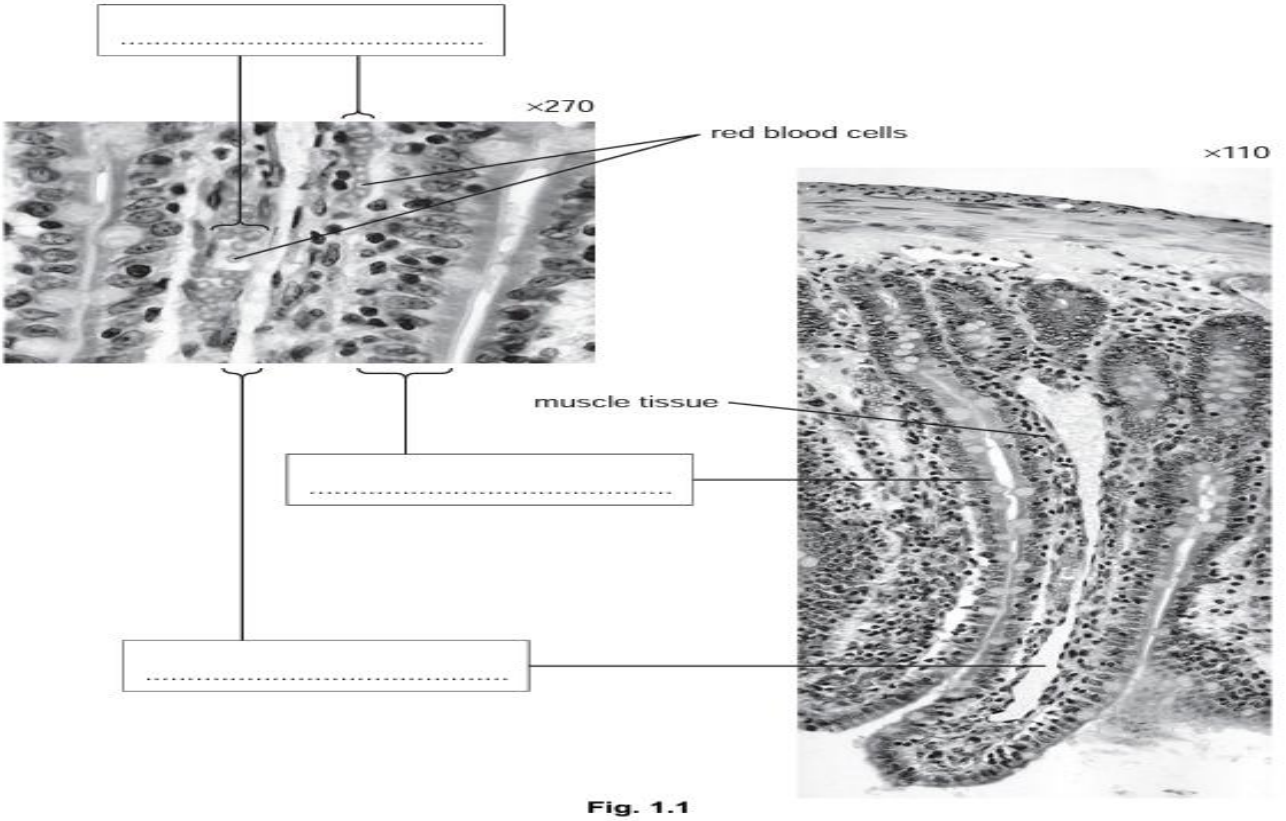


Fig. 1.1

(a) Label the structures shown in Fig. 1.1.

Write the labels in the boxes in Fig. 1.1. [3]

(b) Suggest the role of the muscle tissue shown in the villus in Fig. 1.1.

.....

.....

.....

.....

..... [2]

Fig. 1.2 shows an experiment to investigate the uptake of glucose by cells of the villi.

- Two leak-proof bags were set up.
- One bag was made from artificial partially permeable membrane (Visking tubing).
- The other bag was made from a piece of small intestine containing living cells, with its inner surface inside the bag.
- The bags were filled with equal volumes of a dilute glucose solution.
- The bags were suspended in the same glucose solution for two hours.
- After two hours, the volumes of the bags were measured and the contents were tested for the concentration of glucose.

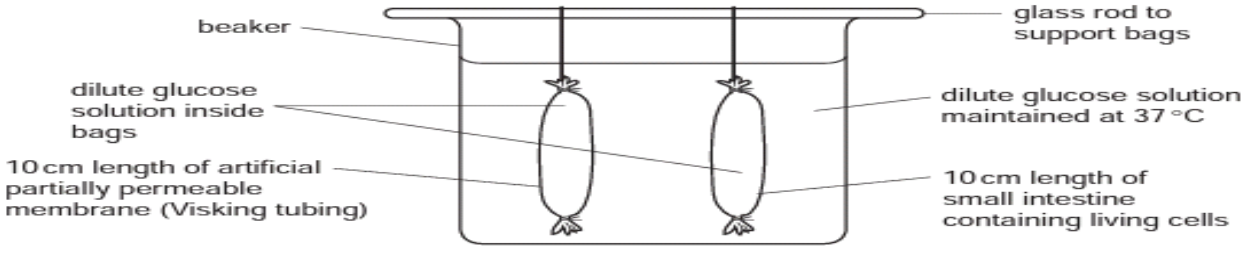


Fig. 1.2

Inside the bag made from small intestine the volume and concentration of the glucose solution decreased. There were no changes to the volume and concentration in the Visking tubing bag.

(c) State **and** explain the process responsible for the **decrease** in the glucose concentration in the bag made from small intestine.

.....

.....

.....

..... [2]

(d) After two hours there was less water in the bag made from small intestine.

The volume of water in the bag made from small intestine decreased, but the volume in the bag made from Visking tubing did **not** change. Explain why.

.....

.....

.....

.....

.....

..... [3]

(e) An investigation studied the flow of water into and out of the human alimentary canal. Table 1.1 shows the results.

Table 1.1

water **into** the alimentary canal		water **out of** the alimentary canal	
source of water	volume of water / dm^3 per day	method of water loss	volume of water / dm^3 per day
water from diet	2.5	stomach to the blood	0.00
saliva	1.5	small intestine to the blood	9.00
gastric juice	2.4	large intestine to the blood	0.85
bile	0.8	in the faeces	0.15
pancreatic juice	0.8		
intestinal secretions	2.0		

(i) Name the part of the alimentary canal that secretes most water in a digestive juice.

..... [1]

(ii) Name the part of the alimentary canal that absorbs most water.

..... [1]

(iii) Explain why water is added to food by the secretions shown in Table 1.1.

.....

.....

.....

.....

.....

.....

..... [3]

(iv) Explain why it is important that water is absorbed in the alimentary canal.

.....

.....

.....

.....

..... [2]

[Total: 17]

5. Fig. 3.1 shows a fetus in the uterus immediately before birth.

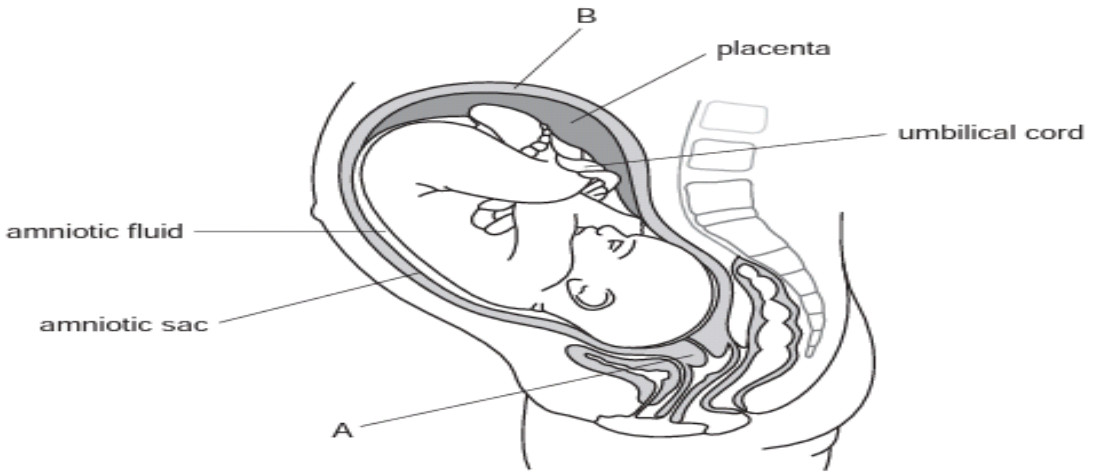


Fig. 3.1

(a) Describe the functions of the amniotic sac and amniotic fluid.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) List three functions of the placenta.

1. .....

.....

2. .....

.....

3. .....

..... [3]

(c) State what happens to structures **A** and **B** during birth.

.....

.....

.....

..... [2]

(d) Discuss the advantages **and** possible disadvantages of breast-feeding.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 13]

6. Male and female sex hormones control the development of secondary sexual characteristics.

Table 3.1

sex hormones		testosterone	oestrogen
site of production		.....	.....
secondary sexual characteristics	1	.....	.....
	2	.....	.....

(a) Complete Table 3.1.

Write your answers in the boxes in Table 3.1. [3]

(b) Some women do not release eggs. The hormone FSH is used in fertility treatment for such women.

Name the organs in the female body responsible for the following:

(i) production of FSH,

..... [1]

(ii) release of eggs.

..... [1]

7. **(a)** Fig. 1.1 is a diagram of the human digestive system.

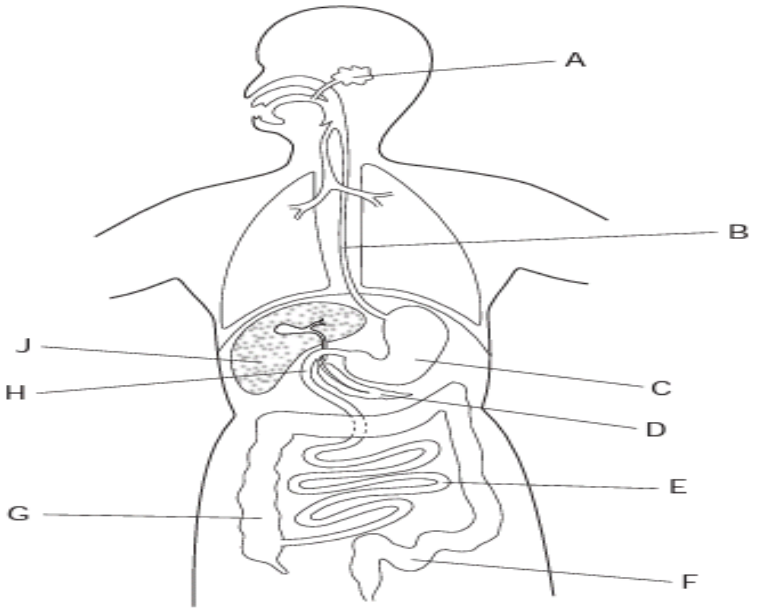


Fig. 1.1

Use the letters from Fig. 1.1 to complete Table 1.1 to give the part of the human digestive system that is identified by each function.

Write one letter only in each box. You may use the same letter more than once. There are some letters that you will not use. The first one has been done for you.

Table 1.1

function	letter
peristalsis	**B**
protein digestion	
insulin production	
deamination	
partially digested food is mixed with bile	
most water is reabsorbed	

[5]

The human diet provides nutrients for the synthesis of biological molecules that make up cells, cell products and tissues.

(b) (i) Complete Table 1.2 to show the nutrients that are absorbed from food to synthesise the large molecules listed.

Table 1.2

large molecules	nutrients absorbed
protein	
glycogen	
fat	

[3]

(ii) Mineral ions are required in the human diet in small quantities.

State the mineral ion required for each process:

making bone .....

making haemoglobin. ..... [2]

(iii) State another type of nutrient required in the human diet in small quantities.

..... [1]

8. Fig. 1.1 **A** shows a cell from the lining of the alimentary canal.

Fig. 1.1 **B** shows a cell from the lining of a kidney tubule.

Both cells absorb substances into the blood.

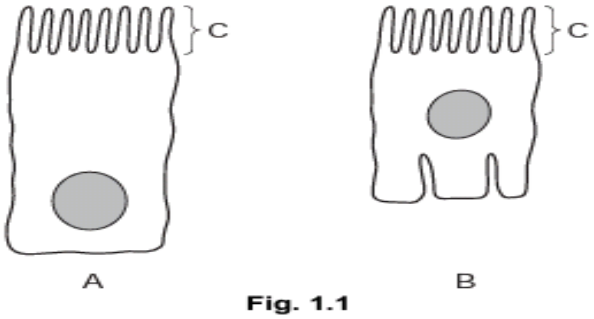


Fig. 1.1

(a) Name the structures labelled **C** on the cells in Fig. 1.1.

..... [1]

(b) List three substances that are absorbed by **both** cells shown in Fig. 1.1.

1 .....

2 .....

3 ..... [3]

(c) Explain how **both** cells shown in Fig. 1.1 are adapted for absorption of substances into the blood.

.....

.....

.....

.....

..... [2]

(d) Name the part of the alimentary canal that is lined by the cells shown in Fig. 1.1 **A**.

..... [1]

[Total: 7]

9. Fig. 4.1 shows a vertical section of a human heart.

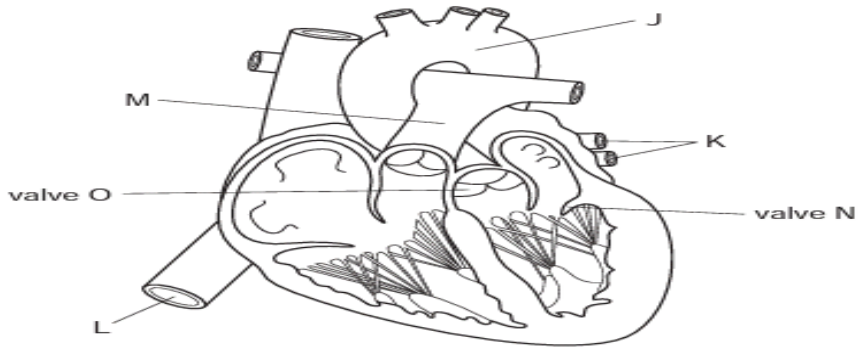


Fig. 4.1

(a) Identify the blood vessels labelled **J** to **M**.

J .....

K .....

L .....

M ..... [4]

(b) Sensors that detect changes in blood pressure were placed into the blood vessels surrounding the heart. Recordings were taken at the times when the ventricles contracted and when they relaxed.

The blood pressures recorded are shown in Table 4.1.

Table 4.1

blood vessel	blood pressure / kPa	
	contraction of the ventricles	relaxation of the ventricles
J	16.0	10.0
K	0.3	0.3
L	0.3	0.3
M	2.0	0.5

(i) Explain why the pressure in blood vessel **J** is greater than the pressure in blood vessel **M**.

.....

.....

.....

.....

..... [2]

(ii) Explain why the pressure in blood vessels **K** and **L** is much less than the pressure in blood vessels **J** and **M**.

.....

.....

.....

..... [2]

(c) Explain how the valves at **N** and **O** maintain one-way flow of blood through the heart.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Other than in the heart, state where valves similar to those at **O** are found in the circulatory system.

.....

..... [1]

[Total: 13]

10. Fig. 5.1 shows the human male reproductive system and part of the urinary system.

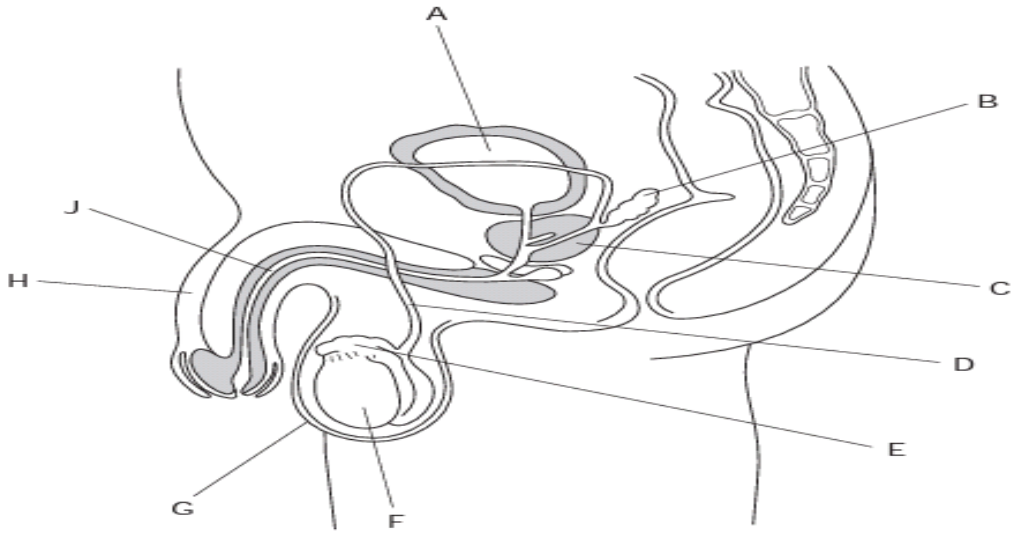


Fig. 5.1

(a) Complete Table 5.1 by identifying the structure in the male reproductive system shown in Fig. 5.1 that carries out each of the functions listed.

Write one letter only in each box. You may use the same letter more than once. There are some letters that you will not use. The first one has been done for you.

Table 5.1

function	structure
stores urine	**A**
produces gametes	
produces seminal fluid	
moves gametes by peristalsis	
produces testosterone	

[4]

(b) Describe how human male gametes differ from human female gametes.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Some women have difficulty becoming pregnant. They can be helped by taking fertility drugs. They can also be helped by artificial insemination.

(i) Describe how fertility drugs help women to become pregnant.

.....

.....

.....

.....

.....

..... [3]

(ii) Describe how artificial insemination is carried out.

.....

.....

.....

..... [2]

[Total: 13]

11. The liver is an organ with a large number of different functions.

Fig. 4.1 shows the liver, its blood supply and some other organs. The blood vessels are labelled **P** to **R**.

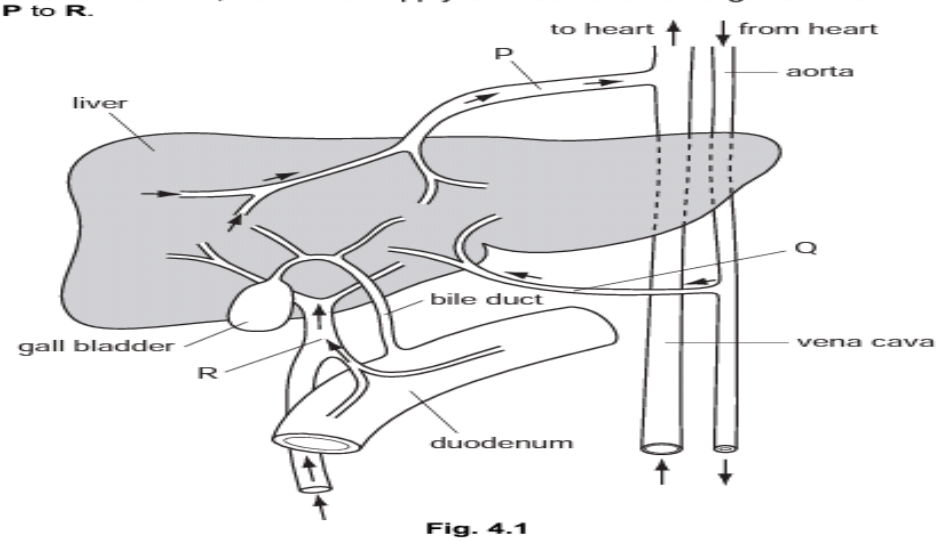


Fig. 4.1

(a) A person eats a meal containing protein and carbohydrate.

Complete Table 4.1 to show the blood vessel that has the **highest** concentration of glucose, oxygen and urea as this meal is absorbed.

Use the letter, **P**, **Q** or **R** to identify each blood vessel.

Table 4.1

substance transported by blood	letter of blood vessel in Fig. 4.1
glucose	.....
oxygen	.....
urea	.....

Write the letters for the blood vessels with the **highest** concentration of each substance in the spaces on Table 4.1. [3]

(b) Amino acids are absorbed from the small intestine and transported to the liver.

Describe how the liver is involved in the metabolism of amino acids.

.....

.....

.....

.....

.....

..... [3]

(c) Describe the effects on the liver of the following.

(i) insulin released from the pancreas

.....

.....

.....

.....

..... [2]

(ii) adrenaline released from the adrenal glands

.....

.....

.....

.....

..... [2]

(iii) excessive long-term consumption of alcohol

.....

.....

.....

.....

..... [2]

(d) Cholesterol can accumulate in the gall bladder to form gall stones. These gall stones may stop bile flowing from the liver through the bile duct and into the duodenum.

Explain the possible effect of gall stones on the digestion of fat.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 16]

12. The egg cell is the female gamete. Fig. 5.1 shows an ovum at the time of ovulation. The ovum is surrounded by a 'jelly coat' and many follicle cells.

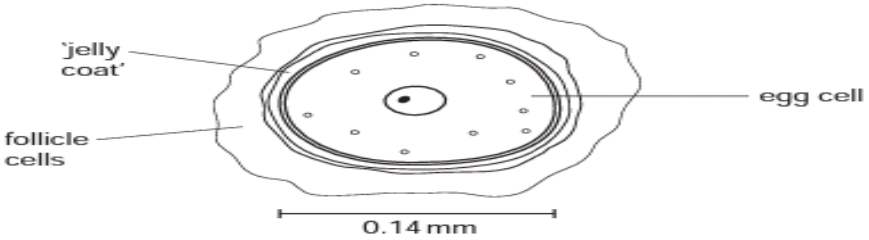


Fig. 5.1

(a) Calculate the magnification of the egg cell as shown in Fig. 5.1.

Show your working and express your answer to the nearest whole number.

answer = ... [2]

(b) State three ways in which the **structure** of an egg cell, as shown in Fig. 5.1, differs from the **structure** of a sperm cell.

1 .....

2 .....

3 ..... [3]

(c) Meiosis is involved in the production of male and female gametes.

Explain why it is important that meiosis occurs during the production of gametes.

.....

.....

.....

.....

..... [2]

Some women are unable to become pregnant because they or their partner are infertile.

(d) Suggest one reason why a man may be infertile and one reason why a woman may be infertile.

man .....

.....

.....

woman .....

.....

..... [2]

One way to treat infertility in a woman is to use artificial insemination (AI) using her partner's sperm.

The stages involved in AI are as follows.

1. If the doctor decides that AI is suitable, the woman will be given a course of a fertility drug at an appropriate stage of her menstrual cycle.
2. After two weeks, ultrasound is used to find out when the woman is likely to ovulate.
3. Sperm are collected from the man.
4. The sperm are placed into the uterus of the woman near the time of ovulation.
5. The woman is given an injection of a hormone to encourage the corpus luteum in the ovary to secrete progesterone.

(e) Explain why the sperm must be placed in the uterus near the time of ovulation.

.....

.....

.....

.....

.....

.....

..... [3]

(f) Explain why it is important that progesterone is secreted after ovulation.

.....

.....

.....

.....

.....

.....

..... [3]

(g) The success rate of AI is about 16 %.

Suggest how the success rate of AI is calculated.

.....

..... [2]

[Total: 17]

13. **(a)** Fig. 1.1 shows the human head, neck and thorax.

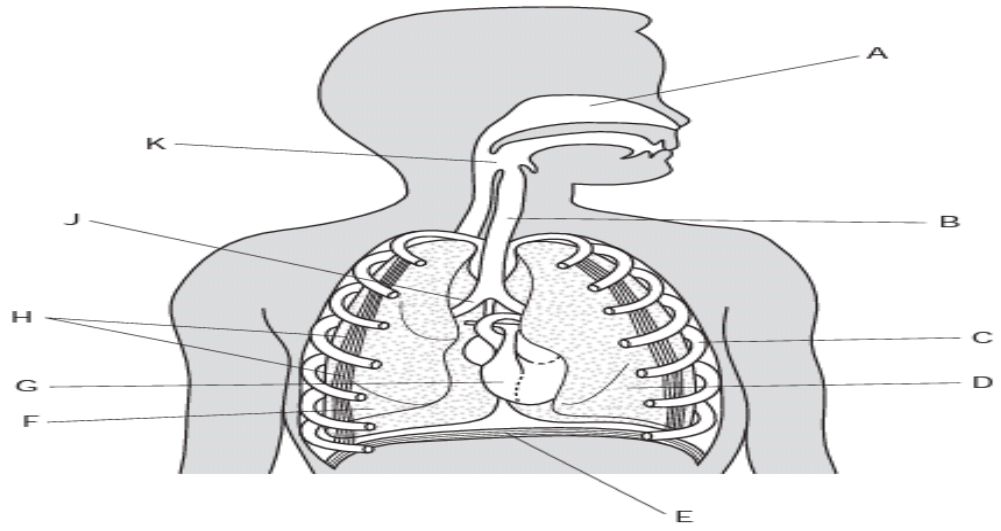


Fig. 1.1

Complete Table 1.1 by writing **one** letter from Fig. 1.1 to identify the named structures.

The first one has been done for you.

Table 1.1

structure	letter from Fig. 1.1
left lung	**D**
bronchus	
diaphragm	
intercostal muscle	
rib	
trachea	

[5]

14. The kidneys remove metabolic waste from the liquid part of the blood.

Name:

(i) the liquid part of the blood;

..... [1]

(ii) the process that involves removing metabolic waste from the body.

..... [1]

Fig. 1.1 shows a kidney tubule and its associated blood vessels.

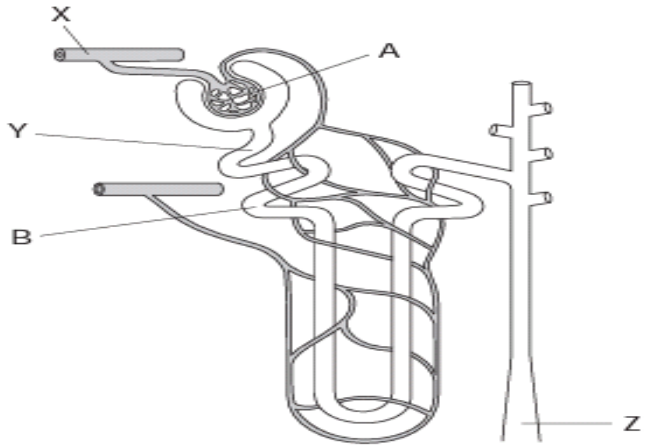


Fig. 1.1

(b) Describe the functions of the regions labelled **A** and **B**.

A .....

.....

.....

B .....

.....

..... [4]

Table 1.1 shows the concentrations of some substances in the blood at **X**, the fluid at **Y** and the urine at **Z**.

Table 1.1

substance	concentration / g per 100 cm^3		
	blood at **X**	fluid at **Y**	urine at **Z**
glucose	0.1	0.1	0.0
protein	7	0	0
sodium ions	0.35	0.35	0.5
urea	0.03	0.03	2.0

(c) Name the substance shown in Table 1.1 that:

(i) has molecules that are too large to pass through the walls of capillaries;

..... [1]

(ii) is all reabsorbed in the kidney;

..... [1]

(iii) is a metabolic waste product.

..... [1]

(d) Explain why the concentrations of sodium ions and urea are greater at **Z** than at **Y**.

.....

.....

.....

..... [2]

(e) People who have acute kidney failure are given dialysis treatment.

In dialysis machines, the blood flows through narrow tubes made from partially permeable membranes, surrounded by dialysis fluid.

(i) Dialysis fluid contains sodium ions.

Use the information in Table 1.1 to suggest the concentration of sodium ions that should be in the fluid and give a reason for your answer.

concentration ..... g per 100 cm^3

reason .....

.....

..... [2]

(ii) State **two** components of blood that are **not** in dialysis fluid.

1 .....

2 ..... [2]

(f) Heparin is added to the blood before it returns to the body from the dialysis machine. Heparin prevents a person's blood from clotting.

Describe the process of blood clotting.

.....

.....

.....

.....

.....

..... [3]

[Total: 18]

15. The alimentary canal is adapted for chemical and mechanical digestion.

(a) Explain how chemical digestion differs from mechanical digestion.

.....

.....

.....

.....

.....

..... [3]

Fig. 5.1 is a diagram of the human alimentary canal.

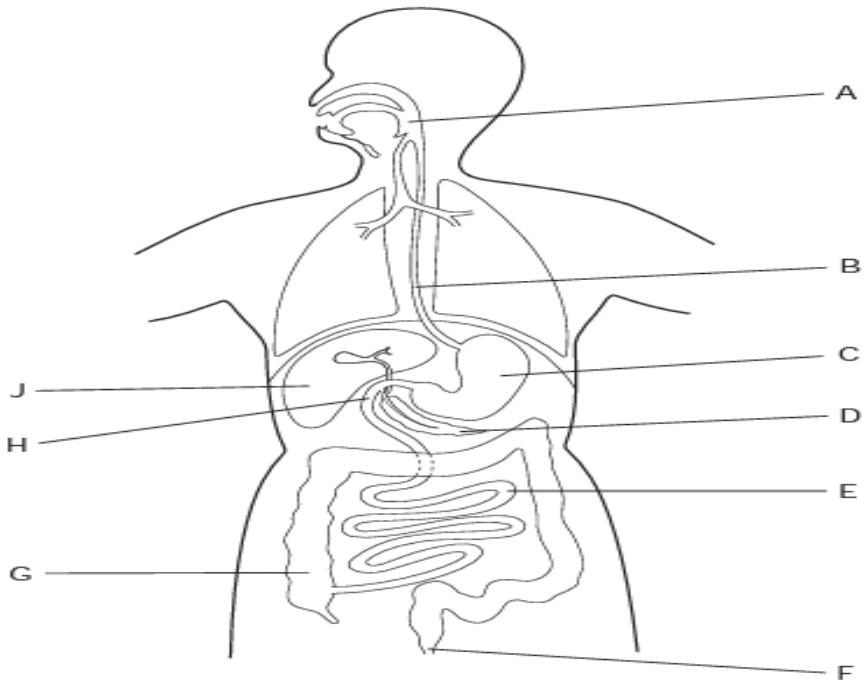


Fig. 5.1

(b) Table 5.1 shows four functions of the alimentary canal.

Complete the table by:

- naming the part of the system that carries out each of the functions;
- using the letters from Fig. 5.1 to identify the part of the system named.

One row has been completed for you.

Table 5.1

function	name of part	letter from Fig. 5.1
produces bile	liver	**J**
most soluble food is absorbed into the blood		
indigestible food is egested		
hydrochloric acid is produced		
protease, lipase and amylase are produced		

[4]

(c) Some people develop gallstones, made of cholesterol, that accumulate in the gall bladder and the bile duct. Gallstones block the flow of bile.

Explain how gallstones can affect the digestion of fat.

.....

.....

.....

.....

.....

..... [3]

(d) Cholesterol can also accumulate in the walls of the coronary arteries.

Explain the effects that this might have.

.....

.....

.....

.....

.....

..... [3]

[Total: 13]

16. Fig. 3.1 shows a diagram of a cell from the pancreas that secretes the hormone, insulin.

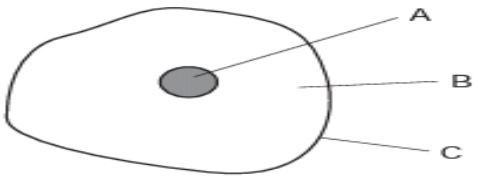


Fig. 3.1

(a) State **one** function of each of the parts of the cell labelled **A**, **B** and **C**.

A .....

B .....

C ..... [3]

(b) Glucose in the blood is absorbed by liver cells and muscle cells. These cells convert glucose to glycogen for storage.

Explain why glucose needs to be converted to glycogen for storage rather than remaining dissolved in the blood.

.....

.....

.....

.....

..... [2]

(c) Other cells in the pancreas secrete the hormone glucagon.

Glucagon stimulates liver cells, but has no effect on muscle cells.

(i) State the effect that glucagon has on liver cells.

.....

..... [1]

(ii) State how hormones, such as glucagon and insulin, travel around the body.

.....

..... [1]

(d) Hormone Growth Promotants (HGPs) are hormones. HGPs are used to improve the production of food from animals.

Many of these HGPs are hormones that are secreted naturally by the gonads (ovaries and testes).

Name **two** hormones that are secreted by the gonads.

1 .....

2 ..... [2]

(e) The hormones are given to cattle by placing implants behind the ears. These release the hormones slowly during the animal's life time.

The advantages of using HGPs in meat production are:

- more meat is produced per animal;
- a 15 to 30 % increase in growth rate;
- a 5 to 15 % improvement in conversion of feed into meat;
- a decrease in greenhouse emissions from cattle.

Suggest:

(i) the advantages of an increase in the conversion of feed into meat for the farmer;

.....

.....

.....

.....

..... [2]

(ii) how the use of HGPs leads to a decrease in greenhouse emissions from cattle.

.....

.....

.....

.....

..... [2]

(f) HGPs are used in animal production systems in North America and Australia.

The European Union (EU) has banned the use of HGPs and the import of meat from countries where the hormones are used.

Suggest reasons for the ban on the use of HGPs in the EU.

.....

.....

.....

.....

..... [2]

[Total: 15]

17. Blood is distributed through the body of a mammal in blood vessels. The blood supply to muscles changes considerably at the start and at the end of exercise.

Fig. 4.1 shows a cross section of a blood vessel as seen with an electron microscope.



Fig. 4.1

(a) Name:

(i) cell **X**;

..... [1]

(ii) liquid **Y**;

..... [1]

(iii) the type of blood vessel shown in Fig. 4.1.

..... [1]

(b) State **three** substances that move across the wall of the blood vessel at **Z**.

1 .....

2 .....

3 ..... [3]

(ii) Explain why it is necessary for the blood supply to muscles to increase during exercise.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(iii) The volume of blood to different organs varies as shown in Table 4.1.

During exercise, blood flow to the skin increases and to the kidneys decreases.

Describe the changes that occur in blood vessels to cause blood flow to increase **and** to decrease.

increase blood flow .....

.....

.....

.....

.....

decrease blood flow .....

.....

.....

.....

..... [4]

[Total: 16]

18. Mammals and flowering plants both have internal fertilisation and internal development.

(a) Describe what happens after pollination that results in fertilisation in flowering plants.

.....

.....

.....

.....

.....

..... [3]

(b) Fig. 5.1 shows a fetus developing inside the uterus.

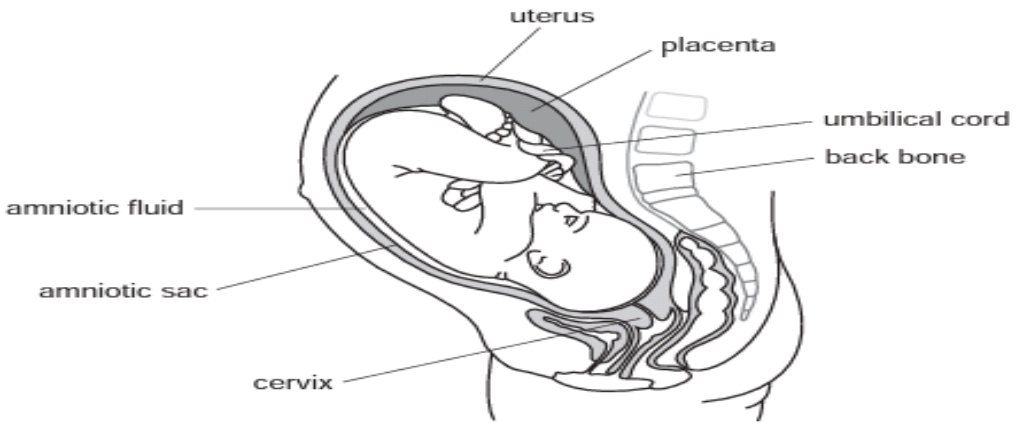


Fig. 5.1

Describe how the structures **named in Fig. 5.1** provide the following needs of the fetus.

protection .....

.....

.....

.....

.....

constant temperature .....

.....

.....

.....

.....

nutrients .....

.....

.....

.....

.....

excretion of metabolic waste .....

.....

.....

.....

..... [8]

[Total: 11]

19. **(a)** Define the term *respiration*.

.....

.....

.....

.....

.....[2]

(b) A rowing machine is a piece of apparatus that is used in many fitness centres.

Fig. 4.1 shows a man training on a rowing machine. The man in the photograph has his arms extended during the rowing stroke as shown in Fig. 4.2.



Fig. 4.1

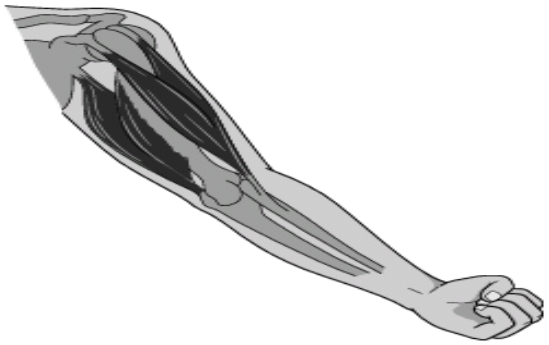


Fig. 4.2

Use Fig. 4.2 to describe how the hand is moved closer to the chest during the rowing stroke.

.....

.....

.....

.....

.....

.....

.....[3]

20. Fig. 2.1 shows the changes in a human ovary during the first part of the menstrual cycle and after the fertilisation of an egg.

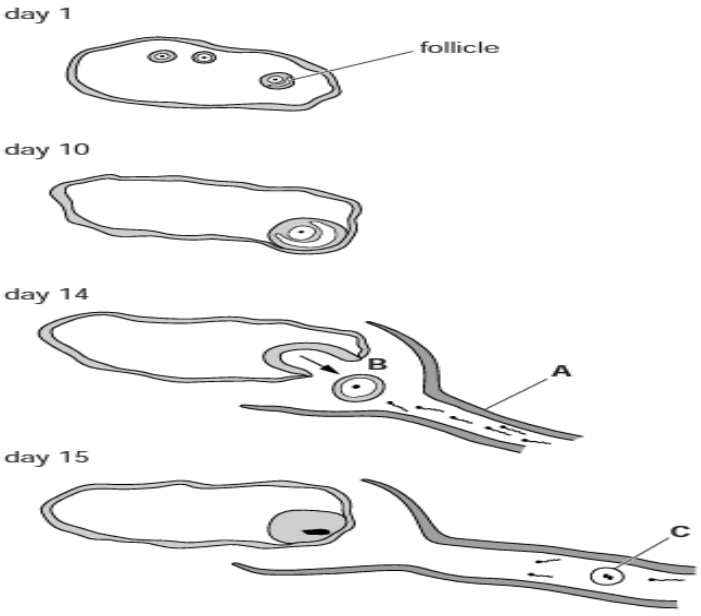


Fig. 2.1

(a) **(i)** Name:

organ **A** .....

process **B** .....

cell **C**. ..... [3]

(ii) Name the hormone that promotes:

the growth of the follicle .....

process **B**. ..... [2]

(iii) Explain how a sperm cell is adapted for its functions.

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

(b) Explain the advantages of sexual reproduction to an animal species.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 13]

21. **(a)** Describe how food is moved along the small intestine.

.....

.....

.....

.....[2]

(b) The small intestine is lined by many villi.

Fig. 5.1 shows a longitudinal section of a villus.

Fig. 5.2 shows a cross-section of the same villus at **V** – **W**.

The diagrams are not drawn to the same scale.

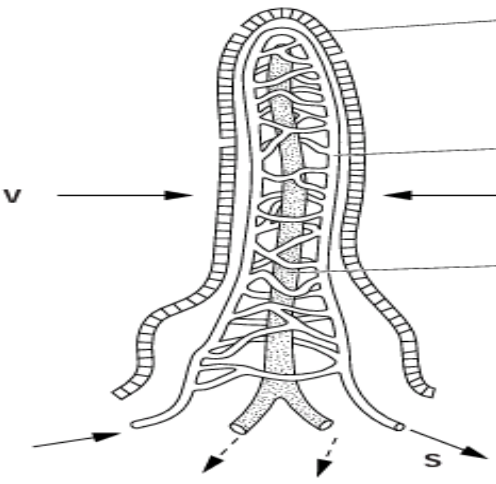


Fig. 5.1

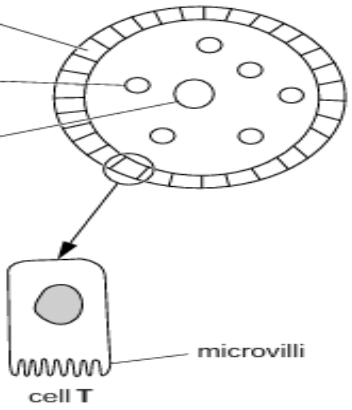


Fig. 5.2

(i) Name structures **P**, **Q**, and **R**.

P .....

Q .....

R .....[3]

(ii) The blood that flows from **S** enters a vein.

Name the vein that transports blood away from the small intestine.

.....[1]

(iii) Cell **T** is an example of the cells that form the surface of the villi.

Explain why there are many microvilli on cell **T**.

.....

.....

.....

.....

..... [2]

(iv) Some of the cells on the surface of the villi secrete mucus for protection.

Suggest what the villi need to be protected against.

.....

.....

.....

..... [2]

[Total: 10]

22. Fig. 5.1 shows a cross-section of a kidney.

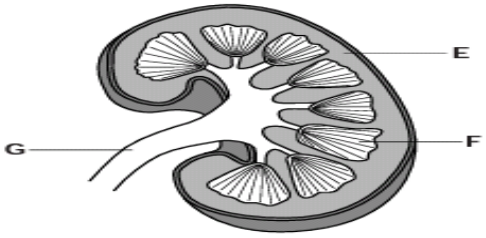


Fig. 5.1

(a) Name the structures labelled, **E**, **F** and **G** as shown in Fig. 5.1.

E .....

F .....

G .....

[3]

(b) Explain the function of the renal capsule in the kidney.

.....

.....

.....

.....

.....

.....

.....[3]

(c) Glucose is reabsorbed, back into the blood, by active transport.

Define *active transport*.

.....

.....

.....

.....

.....[2]

(d) Give **one** example, other than glucose, of a substance that is reabsorbed into the blood from the renal tubule.

.....[1]

(e) Dialysis is a treatment for kidney disease.

Fig. 5.2 shows a dialysis machine.

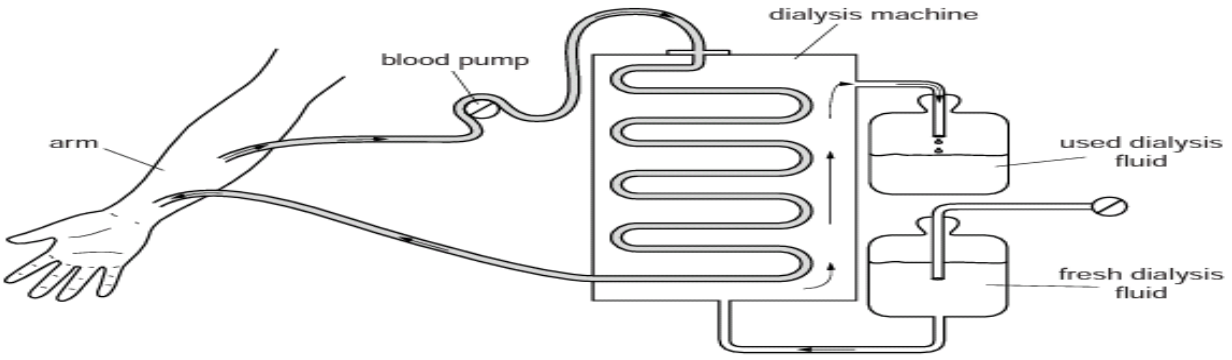


Fig. 5.2

STEMUP.CO.UK

(i) The composition of the dialysis fluid changes as it passes through the dialysis machine.

Complete Table 5.1 using the words 'low', 'high', 'same' or 'none' to show how the concentration of each substance changes in the dialysis fluid.

The last one has been done for you.

Table 5.1

substance	concentration of substance in: blood before dialysis	**used** dialysis fluid	**fresh** dialysis fluid
glucose	normal		
salts	high		
urea	high		
toxins	high	high	low

[3]

(ii) Explain how a dialysis machine filters blood.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(f) Kidney transplants are the most common organ transplants.

Describe the **advantages** of a kidney transplant compared with dialysis.

.....

.....

.....

.....

.....

.....

.....[3]

(g) Before a kidney is transplanted, it is important to match the tissue type of the donor with the tissue type of the recipient.

State why this is necessary.

.....

.....[1]

[Total: 20]

23. Mammals have a double circulation system.

(a) Explain what is meant by a double circulation system.

.....

.....

.....[1]

(b) Table 5.1 shows some of the main organs in a mammal and the vessels that deliver blood and take it away.

Complete the table.

Table 5.1

organ	blood vessel	
	delivers blood	takes blood away
heart	1 ..... 2 ..... vein	1 aorta 2 ..... artery
lungs	pulmonary artery	.....
liver	1 hepatic artery 2	hepatic vein
kidney	..... artery	..... vein

[5]

(c) Table 5.2 shows the blood pressure in the different blood vessels that supply and drain a muscle in the leg.

Table 5.2

blood vessel	mean blood pressure / kPa
aorta	13
femoral artery	12
distributing / muscular artery	9
arteriole in muscle	6
capillary in muscle	4–1.3
venule in muscle	1.1
femoral vein	< 1.0

(i) The table shows that the mean blood pressure decreases from 13 kPa in the aorta to 6 kPa in the arterioles.

Explain why blood pressure must decrease in the arterioles before entering the capillaries.

.....

.....

.....

.....

.....[2]

(ii) Explain how blood returns to the heart in the femoral vein against the pull of gravity.

.....

.....

.....

.....

.....

.....

.....[3]

(d) Fig. 5.1 shows a section across part of an artery.

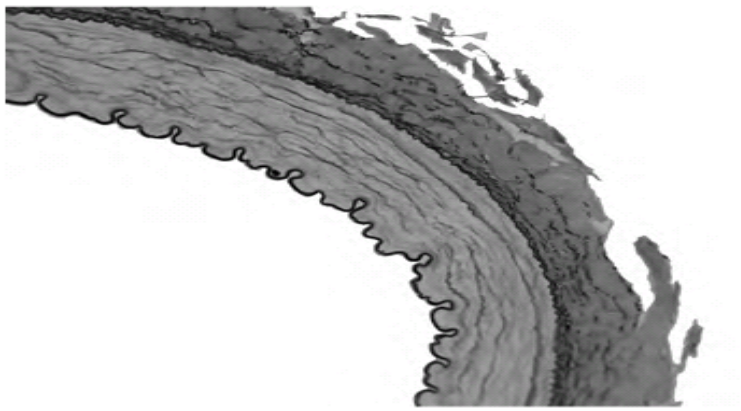


Fig. 5.1

With reference to Fig. 5.1, explain how the structure of an artery is related to its function.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 14]

24. Fig. 3.1 shows images of red blood cells from a human, **A**, and a bird, **B**.

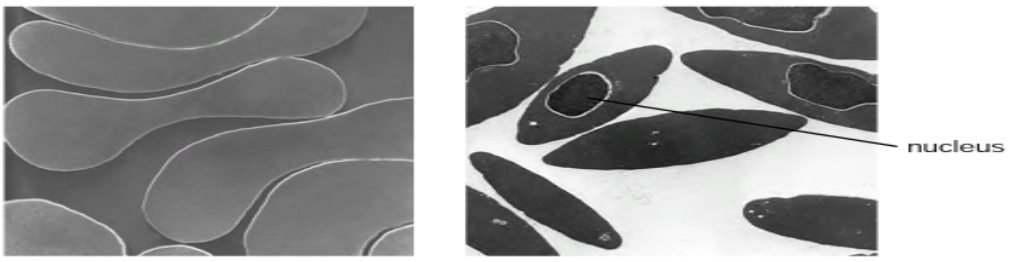


Fig. 3.1

(a) State the function of red blood cells.

.....

.....

..... [1]

(b) There is a nucleus present in each of the red blood cells of the bird, as shown in Fig. 3.1.

(i) State the function of a nucleus.

.....

.....

..... [1]

(ii) Human red blood cells do not contain a nucleus.

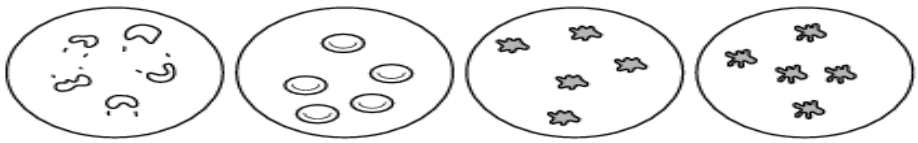
State an advantage of this.

.....

.....

..... [1]

Red blood cells from humans were placed into three test-tubes. Each test-tube contained a salt solution of a different concentration. A sample was taken from each test-tube and viewed using a microscope. The results are shown in Fig. 3.2.



salt concentration / mol dm^{-3}	0.10	0.15	0.20	0.25

Fig. 3.2

(c) **(i)** Describe the appearance of the red blood cells in the 0.15 mol dm^{-3} salt solution and the red blood cells in the 0.20 mol dm^{-3} salt solution.

0.15 mol dm^{-3} .....

.....

0.20 mol dm^{-3} .....

..... [2]

(ii) The red blood cells in the 0.10 mol dm^{-3} salt solution burst.

Explain why the red blood cells burst.

.....

.....

.....

.....

.....

.....

..... [3]

(iii) Suggest why a plant cell in 0.10 mol dm^{-3} salt solution would not burst.

.....

.....

..... [1]

(d) Some people in accidents lose a lot of blood. Doctors give patients fluid to replace lost blood.

(i) Use the information in Fig. 3.2 to predict and explain the concentration of fluid replacement given to patients who have lost blood.

prediction .....

explanation .....

.....

..... [2]

(ii) Describe the process of blood clotting.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 14]

25. Fig. 4.1 shows part of the human gas exchange system.

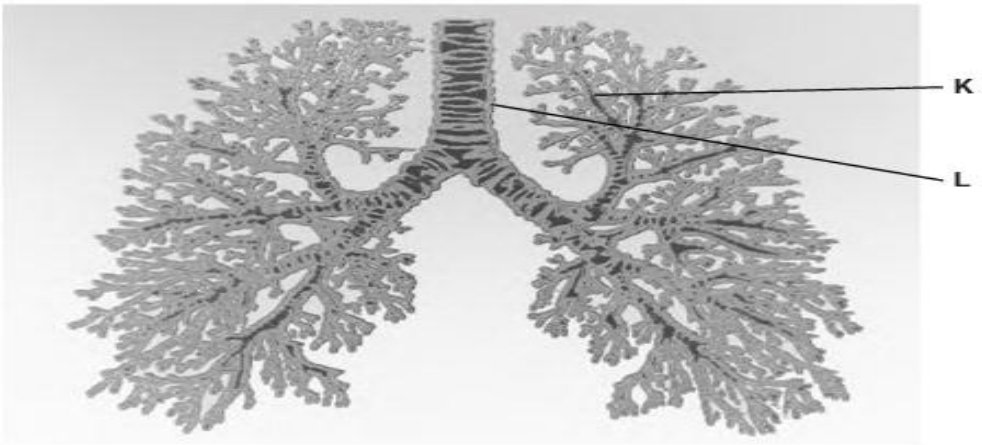


Fig. 4.1

(a) **(i)** Name structure **K**.

..... [1]

(ii) Ciliated cells and goblet cells line structure **L**.

Explain the function of these cells in structure **L**.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Gas exchange occurs at the alveoli.

(i) Describe how oxygen molecules move from the alveoli into the blood.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) During inspiration, air moves from the atmosphere into the lungs.

Describe the mechanism of inspiration.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(iii) Name **one** gas that is found in a higher concentration in expired air than in inspired air.

..... [1]

(c) Tobacco smoke affects the gas exchange system.

Name **two** components of tobacco smoke and describe their effect on the gas exchange system.

component 1 .....

effect .....

.....

.....

component 2 .....

effect .....

.....

.....

[4]

[Total: 16]

26. The growth and development of an embryo begins immediately after fertilisation.

(a) Fig. 5.1 shows some of the events (**S** to **Y**) between fertilisation and birth.

S	development of the heart
T	placenta forms
U	hormones are released by mother to start contractions
V	implantation of the embryo in the lining of the uterus
W	embryo forms into a ball of eight cells
X	development of sex organs
Y	fertilised ovum divides into two cells by mitosis

Fig. 5.1

(i) Put the events into the correct sequence. Two have been done for you.

Y					**X**	

[2]

Fig. 5.2 shows a developing fetus and part of the reproductive system of the mother.

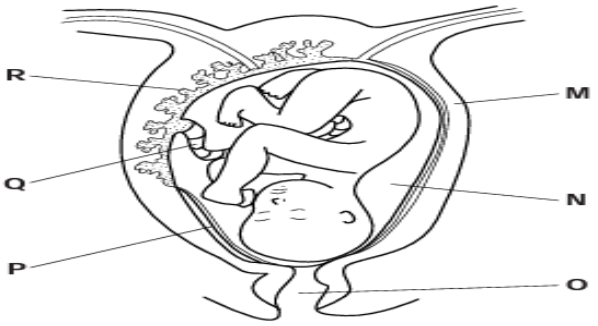


Fig. 5.2

(ii) Table 5.1 shows some functions and names of parts of the developing fetus and pregnant mother.

Complete the table. One row has been done for you.

Table 5.1

letter from Fig. 5.2	name	function during pregnancy
P	amniotic sac	encloses the amniotic fluid
		attaches the placenta to the fetus
	amniotic fluid	
		contracts to push the baby through the birth canal
	placenta	
		widens during labour to allow the head of the baby to pass

[5]

(b) Fig. 4.1 is a vertical section of the kidney.

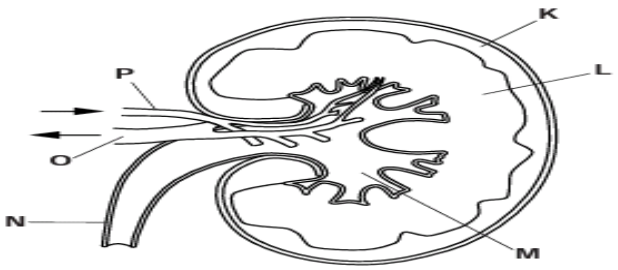


Fig. 4.1

Table 4.1 shows the functions of parts of the kidney.

Complete the table by:

- naming the part of the kidney that carries out each function
- using letters from Fig. 4.1 to identify the part of the kidney named.

One row has been completed for you.

Table 4.1

function	name of part	letter from Fig. 4.1
blood is filtered		
concentration of urine is determined	medulla	**L**
urine flows to the bladder		
blood is carried into the kidney		
blood flows out of the kidney		

[4]

(c) People with kidney disease are often treated in renal dialysis clinics. Their blood passes through tubes lined with a special membrane for about three hours.

(i) State **two** waste substances that are removed from the blood by dialysis.

1 .....

2 .....
[2]

(ii) Kidney patients may be given a kidney transplant. State **one** advantage and **one** disadvantage of kidney transplants compared with dialysis.

advantage .....

.....

.....

disadvantage .....

.....

.....
[2]

[Total: 15]

26. The menstrual cycle involves monthly changes in the ovary and the uterus.

(a) Fig. 5.1 shows the sequence of changes within the ovary that occur during the menstrual cycle.

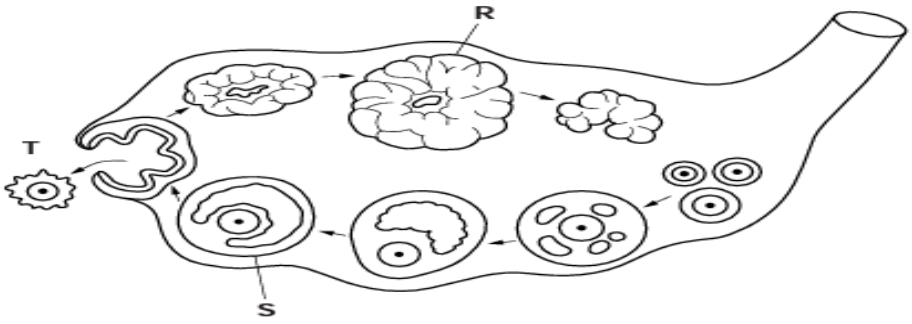


Fig. 5.1

(i) Name structures **R** and **S**.

R .....

S .....
[2]

(ii) State the name of the process that is occurring at **T**.

.....[1]

(b) The ovary secretes hormones that control the growth and maintenance of the lining of the uterus.

Name the hormone that stimulates:

(i) the growth of the lining of the uterus during the first half of the menstrual cycle

.....[1]

(ii) the maintenance of the lining of the uterus during the second half of the menstrual cycle.

.....[1]

(c) Fig. 5.2 is an electron micrograph showing a sperm cell on the surface of an egg cell.

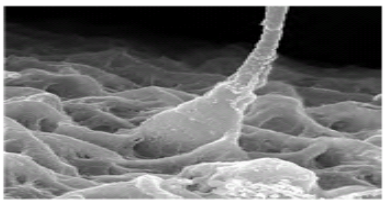


Fig. 5.2

(i) State **three** ways in which a sperm cell differs from an egg cell.

1 .....

2 .....

3 .....[3]

(ii) Human body cells have 46 chromosomes. Human egg and sperm cells have 23 chromosomes each.

What term is used to describe the number of chromosomes in a gamete, such as an egg cell or a sperm cell?

.....[1]

(iii) State the organ in which fertilisation occurs in humans.

.....[1]

(iv) Describe what happens between the event shown in Fig. 5.2 and implantation in the uterus.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

27. A healthy kidney controls the excretion of urea and other waste products of metabolism from the blood.

After kidney failure there are two possible treatments: dialysis or a kidney transplant.

Fig. 4.1 shows how blood and dialysis fluid move through a dialysis machine.

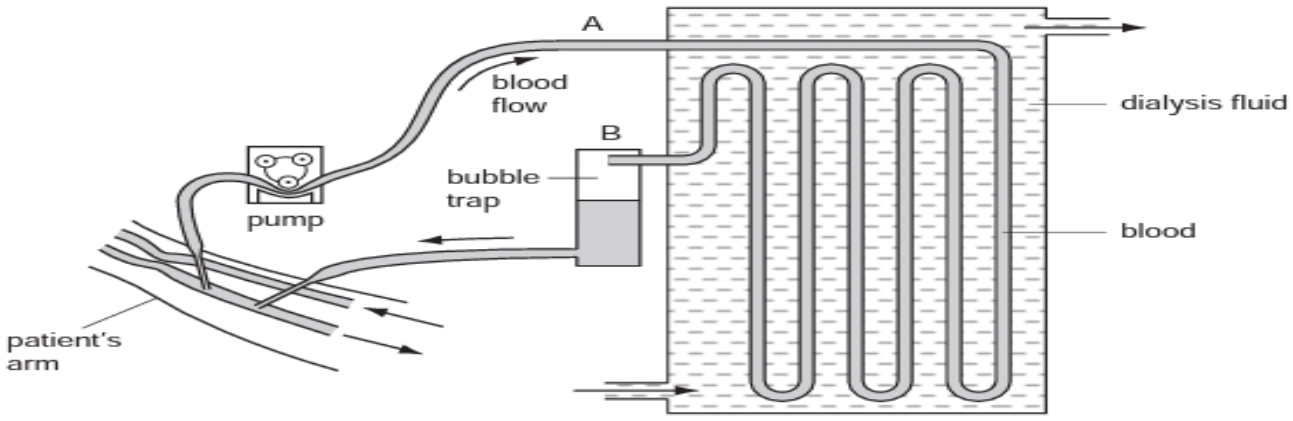


Fig. 4.1

(a) Describe the changes that occur to the blood as it flows through the dialysis machine from **A** to **B**.

.....

.....

.....

.....

..... [2]

(b) Discuss the advantages of kidney transplants compared with dialysis.

.....

.....

.....

.....

.....

.....

.....

..... [3]

28. Fig. 3.1 shows a human egg cell and a human sperm cell.

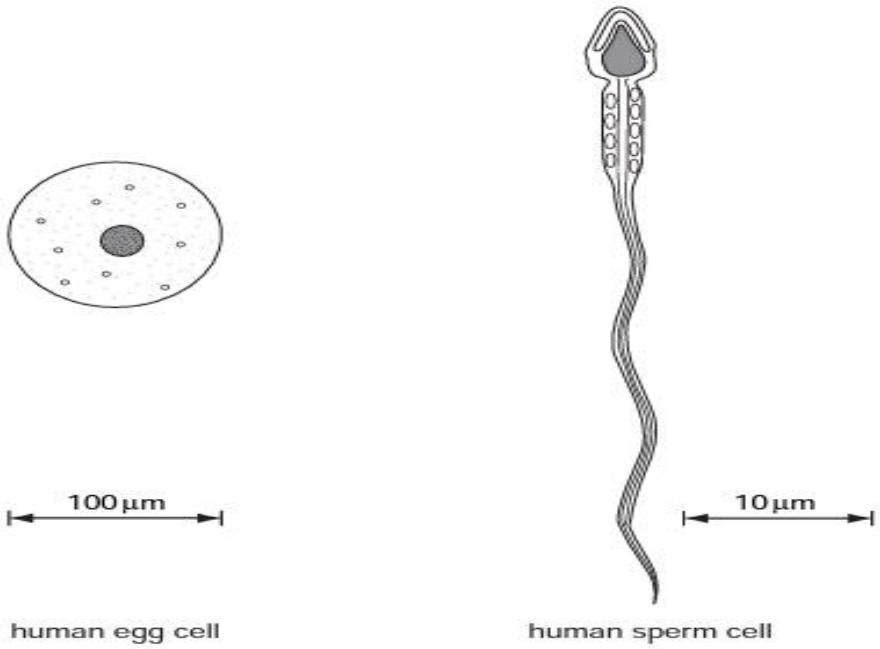


Fig. 3.1

(a) **(i)** What is the name given to the release of eggs from the ovary?

..... [1]

(ii) Sperm cells and egg cells are haploid. State the meaning of the term *haploid*.

..... [1]

(b) Complete the table to compare egg cells with sperm cells.

feature	egg cells	sperm cells
site of production		
relative size		
numbers produced		
mobility		

[4]

(c) Three hormones that control the menstrual cycle are:

- follicle stimulating hormone (FSH)
- luteinising hormone (LH)
- oestrogen.

(i) Name the site of production and release of oestrogen.

..... [1]

(ii) Describe the role of oestrogen in controlling the menstrual cycle.

.....

.....

.....

..... [2]

(d) Artificial insemination is sometimes used as a treatment for female infertility.

Outline how artificial insemination is carried out in humans.

.....

.....

.....

..... [2]

[Total: 11]

29. Over-consumption of alcohol is a problem in some countries.

(a) (i) State two long term effects on the body of drinking too much alcohol.

1 .....

2 ..... [2]

Some alcohol producers have started to promote 'responsible drinking'. Fig. 2.1 shows the label on a bottle of beer.

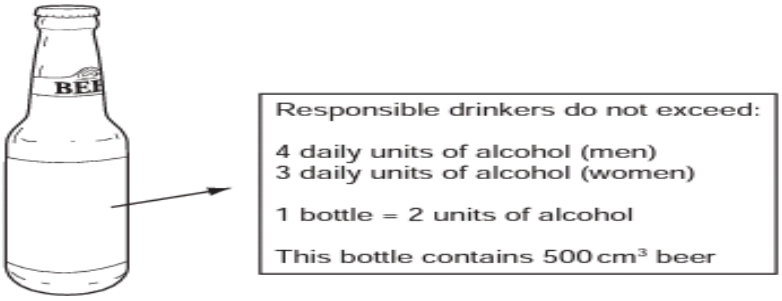


Fig. 2.1

(ii) Using information from this label, calculate the volume of beer which would provide the recommended daily maximum alcohol intake for a responsible male drinker.

..... cm^3 [1]

(b) Unlike most food nutrients, alcohol does not need to be digested. Instead, it is readily absorbed into the blood from, for example, the stomach.

(i) Explain why most food nutrients **do** need to be digested.

.....

.....

..... [2]

(ii) State the main site of absorption of most products of digestion.

..... [1]

(iii) Name **one** product of digestion which is **not** absorbed directly into the blood stream.

..... [1]

30. To stay healthy we need a balanced diet.

(a) Define the term *balanced diet*.

.....

.....

..... [2]

Protein is one nutrient present in a balanced diet. The body cannot store protein, so any excess amino acids are broken down in the process of deamination, as shown in Fig. 5.1.

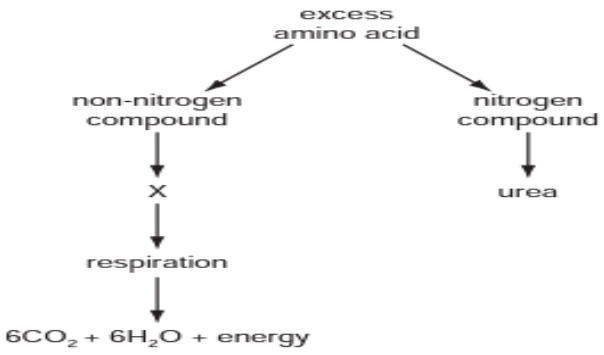


Fig. 5.1

(b) (i) Name the organ where deamination takes place.

..... [1]

(ii) Compound **X** is used as an energy source in respiration.

Suggest the name of compound **X**.

..... [1]

(iii) State the type of respiration shown in Fig. 5.1.

Explain your answer.

type of respiration .....

explanation .....

..... [2]

(c) The urea produced is transported to the kidney, where it is excreted.

Describe how urea is transported in the blood to the kidney.

.....

..... [2]

Fig. 5.2 shows a kidney tubule (nephron) and its associated blood vessels.

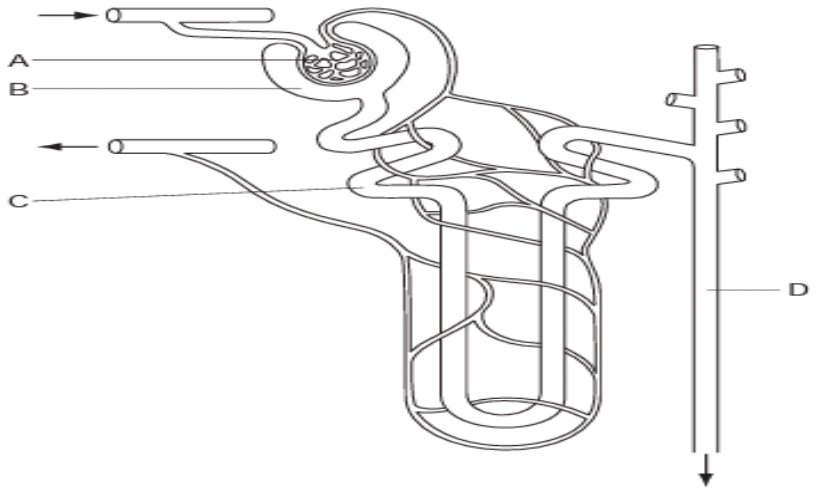


Fig. 5.2

(d) Complete the table by naming the parts labelled **A** to **D** and stating **one** function for each.

	name of part	function
A	.....	.....
B	.....	.....
C	.....	.....
D	.....	.....

[8]

(e) The volume of blood filtered by the kidneys is 1.18 dm^3 min^{-1}.

(i) Calculate the total volume of blood filtered in 24 hours.

Show your working.

volume = ... [2]

(ii) If the total volume of urine produced in 24 hours is 1.7 dm^3, calculate the percentage volume of the filtered blood excreted as urine in 24 hours.

Show your working.

% volume = ... [2]

[Total: 20]

31. Fig. 5.1 shows stages in the formation of a human fetus.

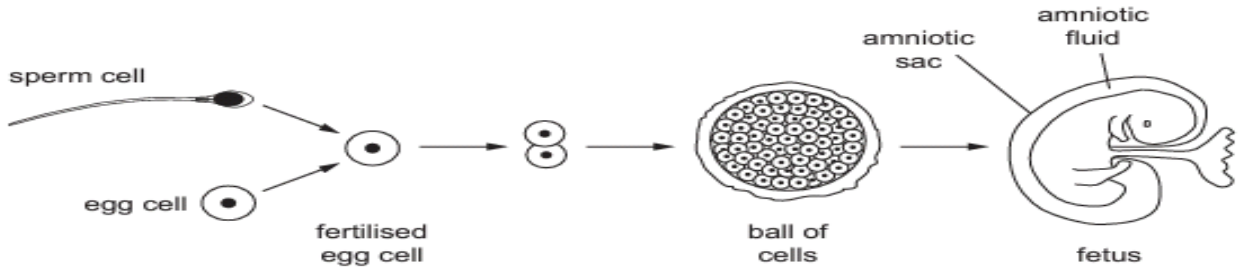


Fig. 5.1

(a) **(i)** Name the process of cell division that results in the formation of sperm cells.

..... [1]

(ii) State **one** way in which the sperm cell is different from cells in the developing fetus.

..... [1]

(iii) State the term used to describe the fertilised egg cell.

..... [1]

(iv) Explain what determines that a fertilised egg cell develops into a girl rather than a boy.

.....

..... [1]

(b) State where each of the following is produced.

(i) the egg cell .....

(ii) the fertilised egg .....

(iii) the fetus ..... [3]

(c) The fetus is surrounded by amniotic fluid and an amniotic sac.

State their functions.

amniotic fluid .....

.....

amniotic sac .....

..... [2]

(d) **(i)** Outline the role of the placenta in the development of the fetus.

.....

.....

.....

.....

..... [4]

(ii) Describe the role of the placenta in maintaining pregnancy.

.....

.....

..... [2]

[Total: 15]

32. Experts predict that 75% of the British population will be obese in 8 years time. The problem is blamed on the popularity of 'junk food'. This sort of diet is unbalanced.

(a) Define the term *balanced diet*.

.....

.....

.....[2]

A human diet consists of:

carbohydrates fats fibre minerals proteins vitamins water.

(b) Underline **two** foodstuffs from the list above that, when eaten in excess, would be most likely to lead to obesity. [2]

(c) Fig. 2.1 shows a chart to find a person's ideal mass.

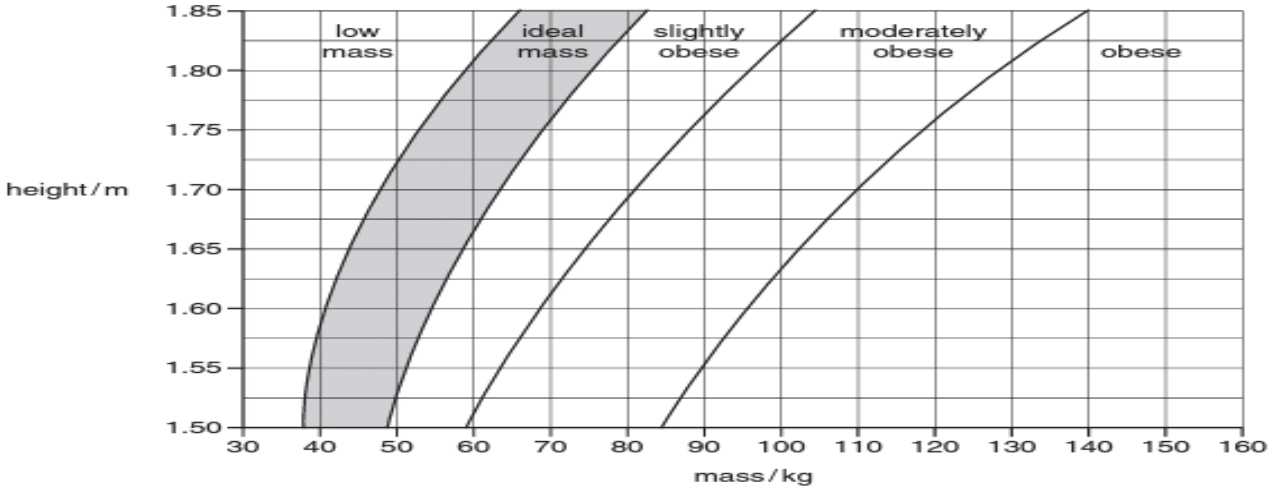


Fig. 2.1

The following data was collected for three students, **X**, **Y** and **Z**.

student	mass / kg	height / m
X	50.8	1.55
Y	63.8	1.85
Z	114.3	1.65

(i) Identify the student who is

1. obese; .....

2. of low mass; .....

3. of ideal mass. ..... [3]

(ii) Suggest two health problems that could be caused by obesity.

1. .....

2. .....[2]

(d) Large food molecules are made up of smaller units. Some of these smaller units are listed below.

amino acids fatty acids glycerol simple sugars

Name the units that make up

1. starch; .....

2. fats; .....

3. protein. .....[4]

(e) Large food molecules are broken down to form smaller molecules in the digestive system.

(i) Name the type of chemical that speeds up digestion.

.....[1]

(ii) Explain why large molecules need to be broken down into small molecules in the digestive system.

.....

.....

.....[2]

[Total : 16]

33. Table 3.1 shows a student's daily water gains and losses.

Table 3.1

water gain / cm^3		water loss / cm^3	
drink	1650	urine	1500
food	800	faeces	100
water released in chemical reactions	350	expired air	400
		sweat	.....
total	2800	total	2800

(a) **Complete the table** by calculating the volume of sweat lost by the student.

Show your working in the space below.

[1]

(b) Name the **organ** responsible for

1. excreting water in expired air; .....

2. releasing water by sweating; .....

3. forming urine; .....

4. reabsorbing water from undigested food to form faeces. .....

[4]

(c) On a hot day the student still took in 2800 cm^3 of water.

(i) Suggest and explain what would happen to the volume of sweat and urine produced.

sweat .....

.....

.....[2]

urine .....

.....

.....[2]

The volume of water gained and lost by the student is balanced.

(ii) Name the term used for the maintenance of a constant internal environment.

.....[1]

(d) Use words from the list below to complete the paragraph.

excretion glucose glycogen insulin liver oestrogen pancreas secretion starch stomach sucrose

The blood stream transports a sugar called ..... .

The blood sugar level has to be kept constant in the body.

If this level falls below normal, a hormone called glucagon is released into the blood by an endocrine organ called the ..... .

The release of a substance from a gland is called ..... .

Glucagon promotes the breakdown of ..... to increase the blood sugar level.

If the blood sugar level gets too high, the endocrine organ secretes another hormone called ..... into the blood.

This hormone promotes the removal of sugar from the blood and its conversion to glycogen in the ..... . [6]

[Total : 16]

34. Fig. 3.1 shows structures in the human thorax.

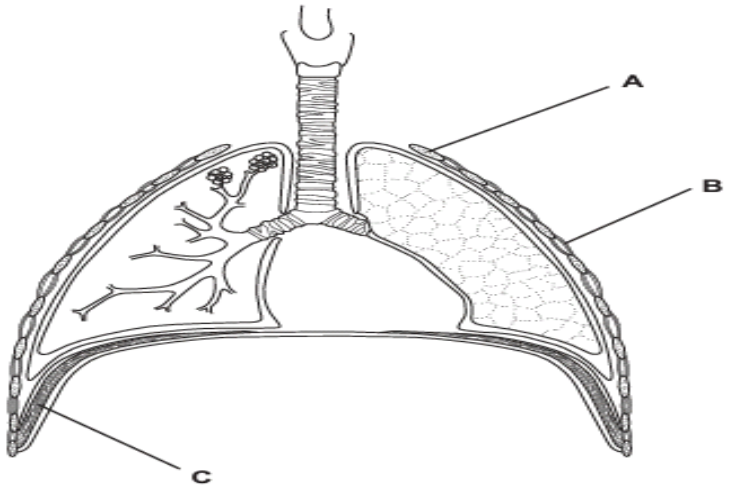


Fig. 3.1

(a) Complete the table by identifying parts **A**, **B** and **C** and describing their roles in breathing in.

part	name	role in breathing in
A	.....	....
B	.....	....
C	.....	....

[6]

Fig. 3.2 shows some cells from the lining of the bronchus.

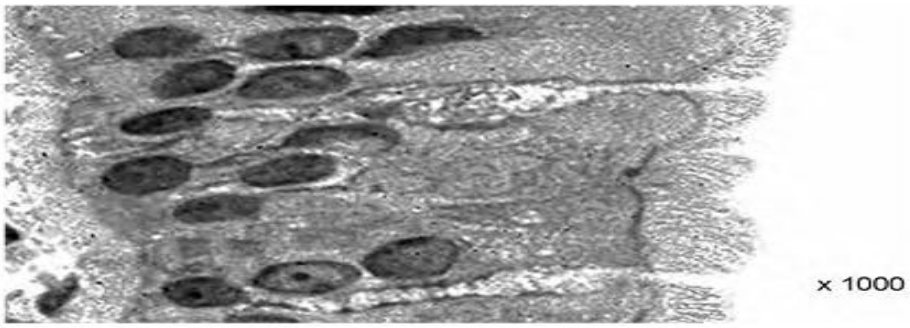


Fig. 3.2

(b) (i) Explain how these cells help to keep the bronchus free from dust and bacteria.

.....

.....

.....

.....

..... [4]

(ii) Describe how the actions of these cells would be affected by **one named** compound of tobacco smoke.

.....

.....

..... [2]

[Total: 12]

35. Fig. 1.1 shows an incomplete diagram of the female urinary system.

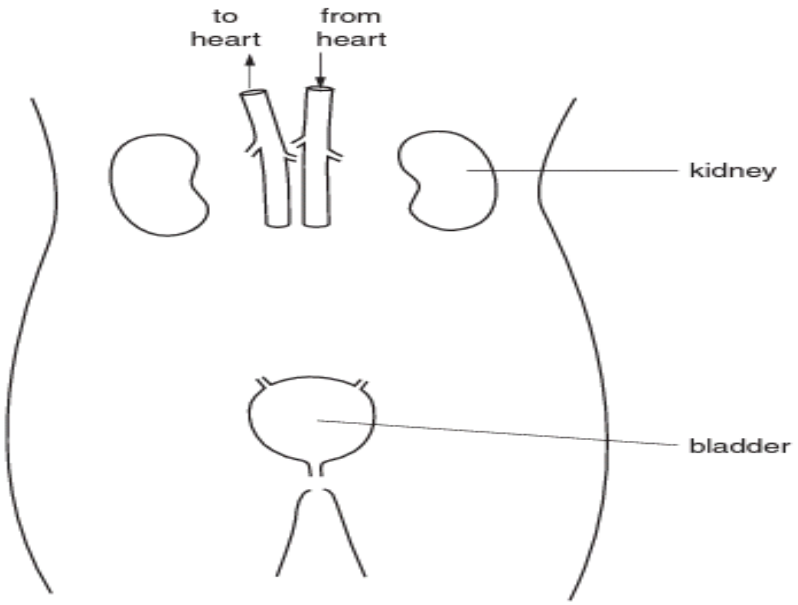


Fig. 1.1

(a) On Fig. 1.1, draw and label the following parts:

renal artery, urethra and ureter. [4]

(b) Name three components that are present in the urine of a healthy person.

1. .....

2. .....

3. .....[3]

(c) If the kidneys fail, the patient may be put on a kidney machine.

Explain how a kidney machine works.

.....

.....

.....

.....

.....[4]

(d) The kidneys are part of the body's homeostatic mechanism.

(i) Define *homeostasis.*

.....

.....

.....[2]

(ii) Outline the role of the kidneys in homeostasis.

.....

.....

.....[2]

(iii) Name another organ of the body also involved with homeostasis and outline its role.

name of organ .....

role .....

.....

.....[3]

[Total : 18]

1 Fig. 1.1 is a photomicrograph of a leaf of the tea plant, *Camellia sinensis*.

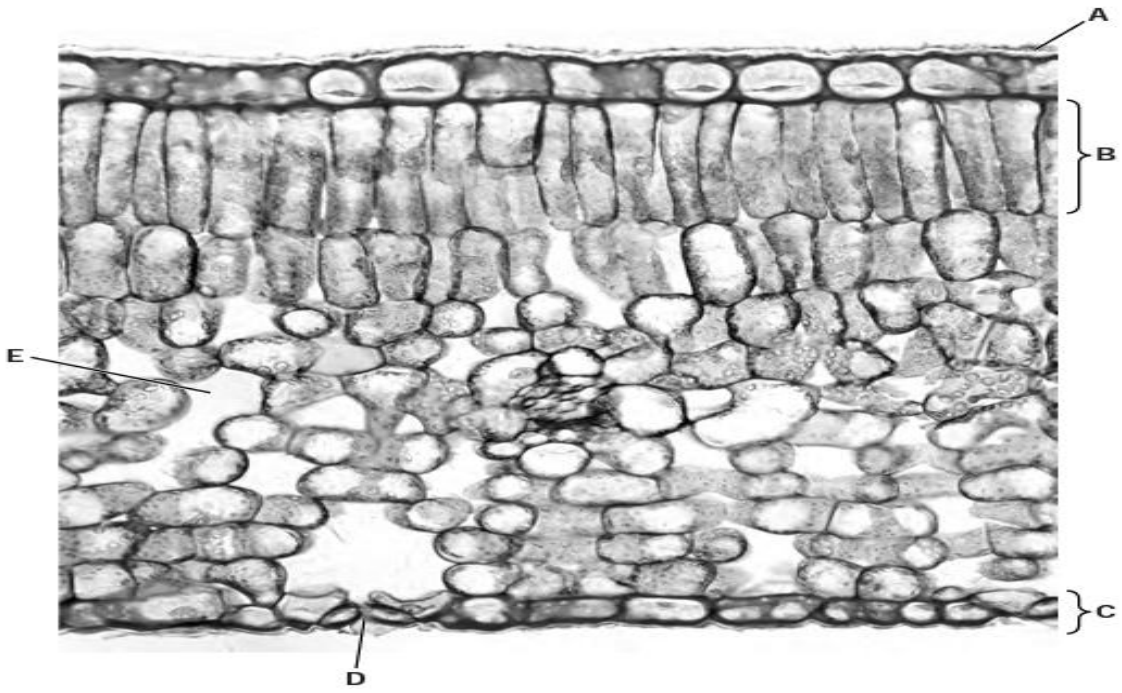


Fig. 1.1

(a) Name **A** to **E**.

A .....

B .....

C .....

D .....

E ..... [5]

(b) Fig. 1.2 shows a cell from region **B** of the leaf shown in Fig. 1.1.

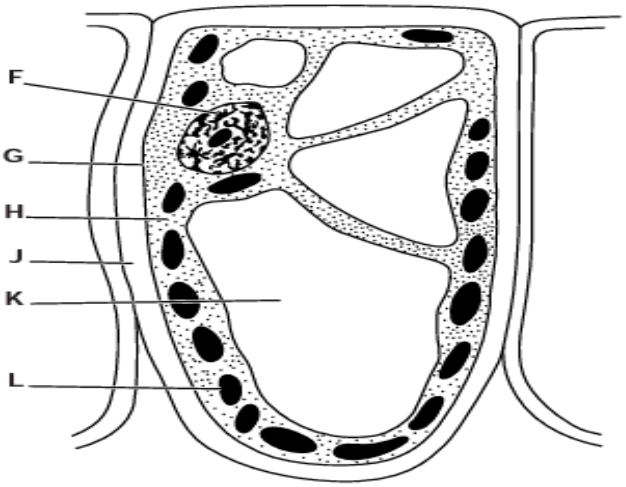


Fig. 1.2

Use the letters from Fig. 1.2 to complete Table 1.1.

Write **one** letter only in each box to identify the function. You may use each letter once, more than once or not at all.

Table 1.1

function	letter from Fig. 1.2
controls movement of substances into and out of the cell	
exerts a pressure to help maintain the shape of the cell	
produces sugars using light as a source of energy	
withstands the internal pressure of the cell	
controls all the activities of the cell	

[5]

2. Fig. 1.1 shows an animal cell and a plant cell as seen with a light microscope.



animal cell plant cell

Fig. 1.1

(a) Table 1.1 shows some structural features of the animal cell and the plant cell in Fig. 1.1.

Complete the table by

- finishing the row for nucleus
- adding **three** structural features, visible in Fig. 1.1, and indicating whether they are present (✓) or absent (✗) in the animal cell and in the plant cell.

Table 1.1

structural feature	animal cell	plant cell
cell wall	✗	✓
nucleus		

[4]

(b) The cells were kept in a dilute salt solution. They were then transferred to distilled water.

Explain what will happen to each of these two cells when they are placed into distilled water.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) Magnesium is a plant nutrient. Scientists think that magnesium is involved in the transport of sucrose from the leaves to the rest of a plant.

(i) Name the tissue that transports sucrose in plants.

.....[1]

The scientists grew some tomato plants with their roots in a solution that contained all the mineral nutrients that plants require. After a while, the plants were divided into two groups.

- Group **A** continued to receive the solution containing all the nutrients.
- Group **B** received a solution that did not contain any magnesium.

After 12 days, measurements were made on the leaves and the results are shown in Fig. 1.2.

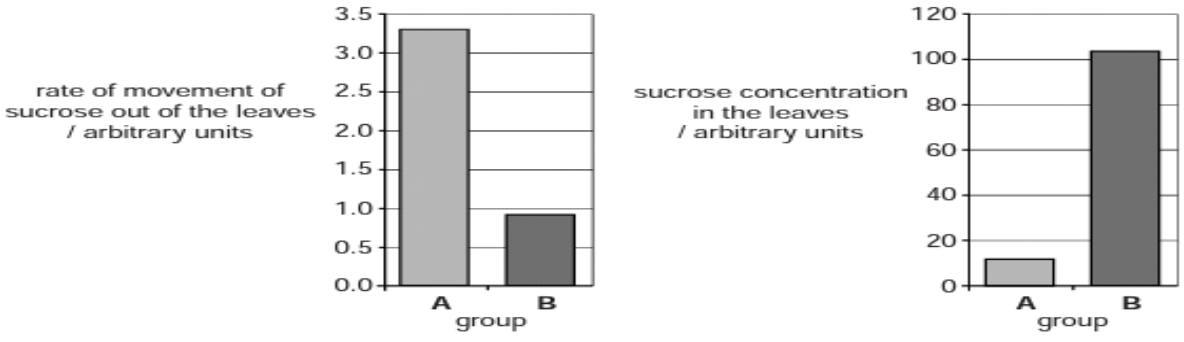


Fig. 1.2

(ii) Describe the effect of magnesium deficiency on the transport of sucrose out of the leaves and the sucrose concentration in the leaves.

transport of sucrose out of the leaves .....

.....

.....

.....

.....

concentration of sucrose in the leaves .....

.....

.....

.....

.....[4]

(iii) The plants in Group **B** remained in the magnesium-deficient solution for longer than 12 days. At the end of this time they showed symptoms of magnesium deficiency.

Describe and explain the symptoms that the plants would show.

.....

.....

.....

.....

.....[3]

[Total: 16]

3. An experiment was carried out to find out if carbon dioxide is needed for photosynthesis.

Stage 1.	Two plants, **A** and **B**, of the same size and species were kept in a dark place for 48 hours.
Stage 2.	A leaf from each plant was then tested for the presence of starch using iodine solution, to show that destarching was complete.
Stage 3.	Both plants were placed in sealed glass containers, for 24 hours, as shown in Fig. 5.1. Plant **A** was in the presence of potassium hydroxide beads (which absorb carbon dioxide). Plant **B** was in the presence of glass beads. All other conditions needed for photosynthesis were provided for both plants.
Stage 4.	After 24 hours a leaf from each plant was tested for the presence of starch.

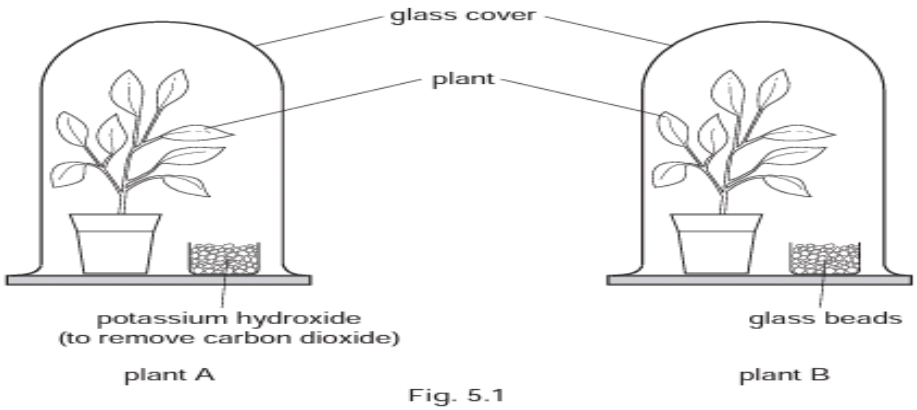


Fig. 5.1

(a) (i) The stages involved in testing a leaf for starch are shown below.
The stages are in the correct sequence, but the reasons are in the wrong order.
Use straight lines to match the stages with the correct reasons. One has been done for you.

stage	reason
boil the leaf in water	ethanol (alcohol) is flammable
turn off any naked flames	to test for starch
boil the leaf in ethanol (alcohol)	to break down cell membranes
soak the leaf in water	to remove chlorophyll
add iodine solution to the leaf	to soften the leaf

[4]

(ii) Explain why chlorophyll is removed from the leaf before testing it for starch.

.....

..... [1]

(b) State two factors, **other than carbon dioxide**, that both plants would need in order to photosynthesise.

1. .....

2. ..... [2]

(c) Plant **B** was used as a control in the experiment. Explain the importance of this control.

.....

..... [1]

(d) Explain why the plants were destarched.

.....

..... [1]

(e) Complete the table. Use ticks and crosses to show if the starch test for plants **A** and **B** would be positive (✓) or negative (×) at **stage 2** and **stage 4**. In each case, explain your answer.

stage	leaf from plant	starch test (✓ or ×)	explanation
2	A and B		
4	A		
	B		

[3]

(f) In a further experiment, another destarched plant was kept in the dark.

The concentration of carbon dioxide in the container was measured at regular intervals and was found to increase with time.

Explain why the concentration of carbon dioxide increased.

.....

.....

.....

..... [3]

[Total: 15]

4. Fig. 2.1 shows crop productivity for a range of plants but the bar graph is incomplete.

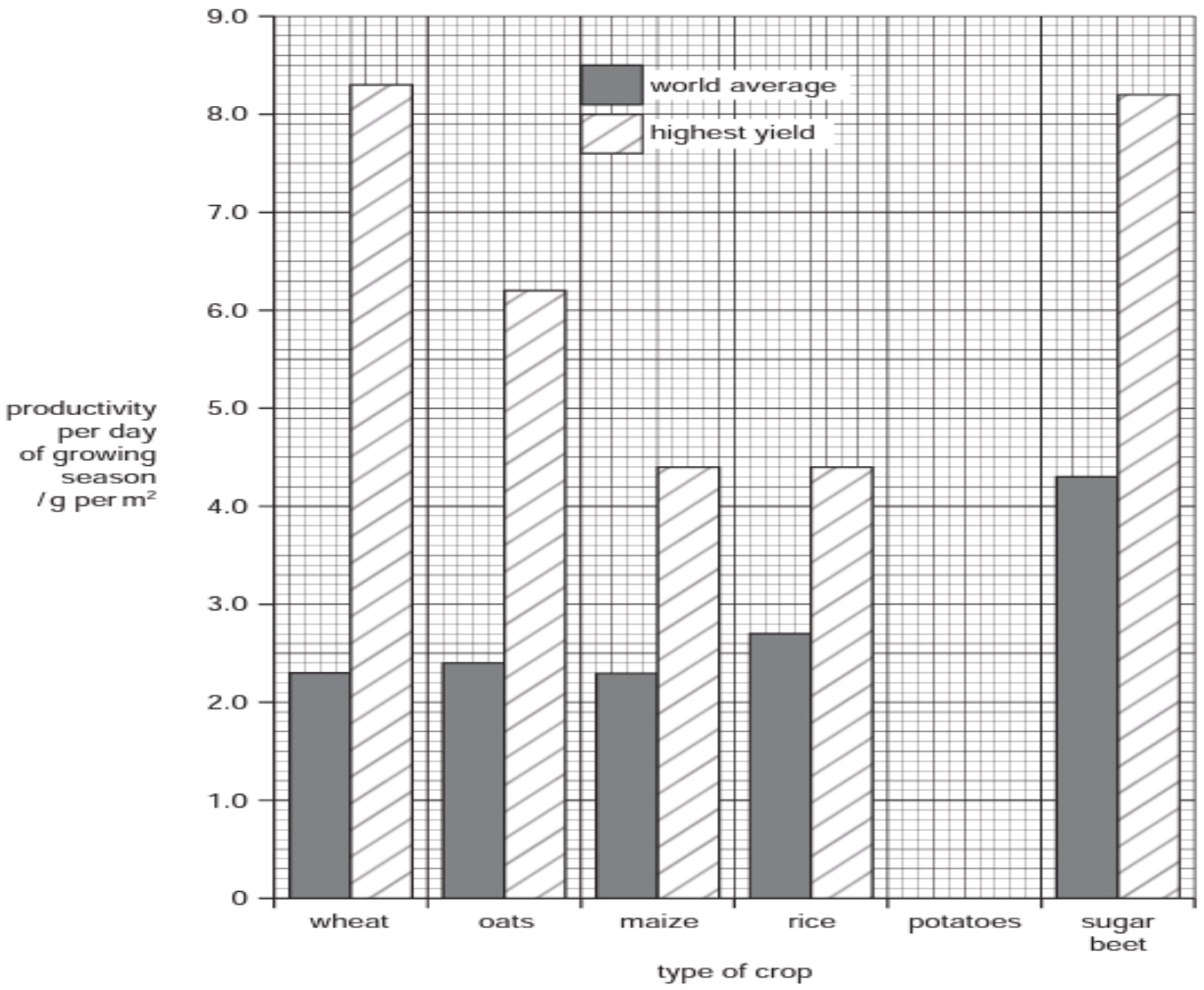


Fig. 2.1

(a) Complete Fig. 2.1 using the following data.

crop	productivity per day of growing season / g per m^2	
	world average	highest yield
potatoes	2.6	5.6

[2]

(b) State which crop has

(i) the highest average productivity,

.....

(ii) the greatest difference between the average yield and the highest yield.

..... [2]

(c) Outline how modern technology could be used to increase the productivity of a crop from the average yield to a high yield.

.....

.....

.....

..... [3]

(d) When the yield is measured, dry mass is always used rather than fresh mass.

Suggest why dry mass is a more reliable measurement than fresh mass.

.....

..... [1]

(e) Maize is often used to feed cows, which are grown to provide meat for humans.

Explain why it is more efficient for humans to eat maize rather than meat from cows that have been fed on maize.

.....

.....

..... [3]

(f) **(i)** Complete the equation for photosynthesis.

$$6CO_2 + 6H_2O \xrightarrow{\text{light energy}} C_6H_{12}O_6 + \text{.....}$$

[1]

(ii) Describe how leaves are adapted to trap light.

.....

.....

..... [2]

(iii) With reference to water potential, explain how water is absorbed by roots.

.....

.....

.....

..... [3]

(iv) Explain how photosynthesising cells obtain carbon dioxide.

.....

.....

..... [2]

[Total: 19]

5. **(a)** List four chemical elements that are found in proteins.

1. .....
2. .....
3. .....
4. ..... [4]

Fig. 6.1 is a photograph of some root nodules from a pea plant, which is a type of legume.

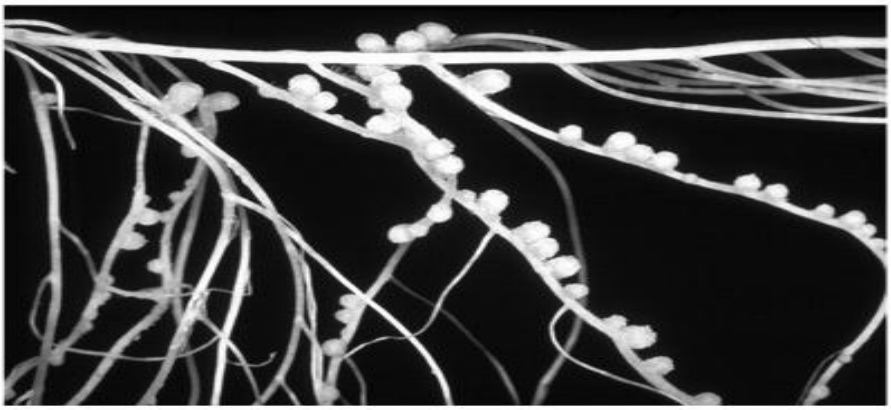


Fig. 6.1

(b) Nodules like those in Fig. 6.1 develop on the roots of pea plants and other legumes when the soil is lacking in nitrate ions.

Explain what happens inside the nodule to help legume plants grow in soils lacking nitrate ions.

.....

.....

.....

.....

.....

..... [3]

(c) After the peas have been harvested, the plants are ploughed back into the soil.

Describe what happens in the soil to convert dead plant material into nitrate ions that plants can absorb.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(d) Nutrients in the soil can act as a limiting factor for crop growth.

List three **other** factors that may limit the growth of a crop plant.

1. .....
2. .....
3. ..... [3]

6. Fig. 1.1 shows a vertical section through a flower of soybean, *Glycine max*, following self-pollination. Fig. 1.2 shows part of the section at a higher magnification.

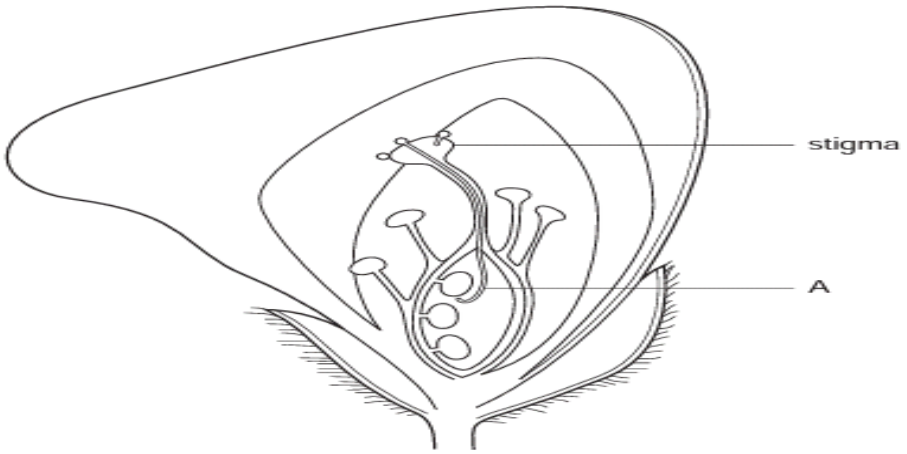


Fig. 1.1

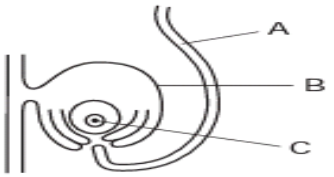


Fig. 1.2

(a) (i) Name the parts labelled **A** to **C** shown in Figs. 1.1 and 1.2.

A .....

B .....

C ..... [3]

(ii) Describe what happens to the structures shown in Figs. 1.1 and 1.2 to bring about fertilisation. You may refer to the structures labelled **A** to **C** by their letters if you wish.

.....

.....

.....

.....

.....

..... [3]

(iii) Explain the advantages **and** disadvantages of self-pollination for flowering plants, such as soybean.

advantages .....

.....

.....

.....

disadvantages .....

.....

.....

.....

..... [4]

(b) Soybean is a dicotyledonous plant.

(i) Name the genus to which the soybean belongs.

..... [1]

(ii) State two features which are **only** found in dicotyledonous plants.

1. .....

2. ..... [2]

[Total: 13]

7. Seeds of the mung bean, *Phaseolus aureus*, were germinated and grown in a dish for a few days in the dark. The dish was then placed as shown in Fig. 7.1 **A**.

Fig. 7.1 **B** shows the seedlings after a further two days in the dark.

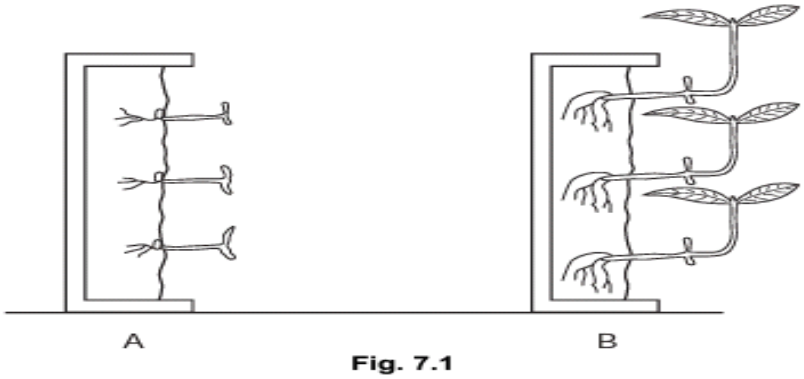


Fig. 7.1

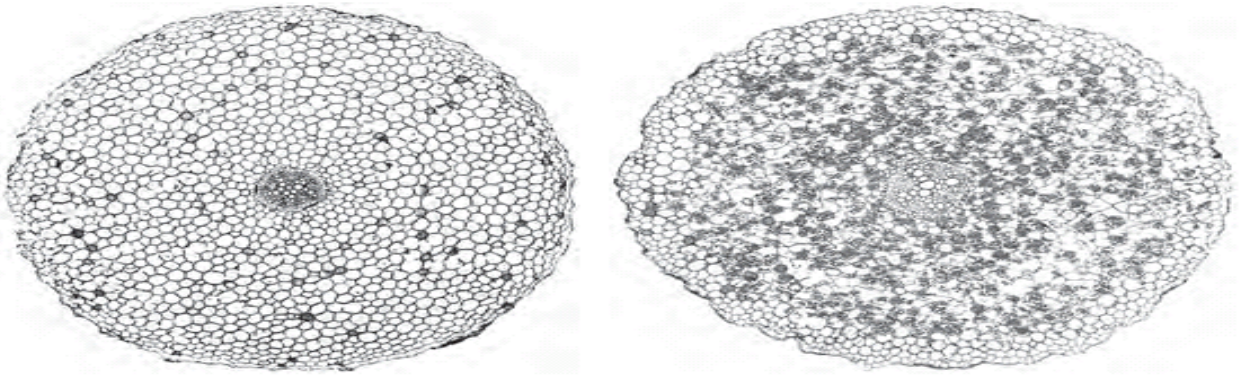
(a) Name the response shown by the roots in Fig. 7.1.

.....

.....

.....

8. Fig. 1.2 shows a transverse section through a buttercup root at the end of the cold winter (**W**) and at the end of the warm, moist summer (**S**). At the end of the winter, the cells contain very few starch grains. At the end of the summer, most of the root cells contain many starch grains.



W S

Fig. 1.2

(b) Suggest why there are few starch grains in the cells of **W** compared with a large number of starch grains in the cells of **S**.

.....

.....

.....

.....

.....

..... [3]

(c) Describe how enzymes in root cells synthesise starch.

.....

.....

.....

.....

..... [3]

(d) As temperature is increased, for example from 10 °C to 30 °C, enzyme activity increases.

Explain how increasing temperature affects enzyme activity.

.....

.....

.....

..... [2]

[Total: 10]

9. Fig. 1.1 shows a flowering shoot of tiger lily, *Lilium tigrinum*.



Fig. 1.1

(a) State the name of the genus of the tiger lily.

..... [1]

(b) Name the parts labelled **A** to **D**.

A .....

B .....

C .....

D ..... [4]

(c) The tiger lily plant is a monocotyledon.

List two features, **visible in Fig. 1.1**, that show it is a monocotyledon.

1 .....

2 ..... [2]

(d) The tiger lily in Fig. 1.1 reproduces sexually.

Plants reproduce sexually and asexually.

Complete Table 1.1 to show the advantages and disadvantages of asexual and sexual reproduction to a flowering plant species.

Table 1.1

type of reproduction in flowering plants	advantages	disadvantages
asexual		
sexual		

[4]

[Total: 11]

10. The sweet potato plant, *Ipomoea batatas*, has fibrous roots and storage roots. Fibrous roots absorb water and ions from the soil. Storage roots store insoluble carbohydrates.

Fig. 3.1 shows the growth of these roots on a sweet potato plant.

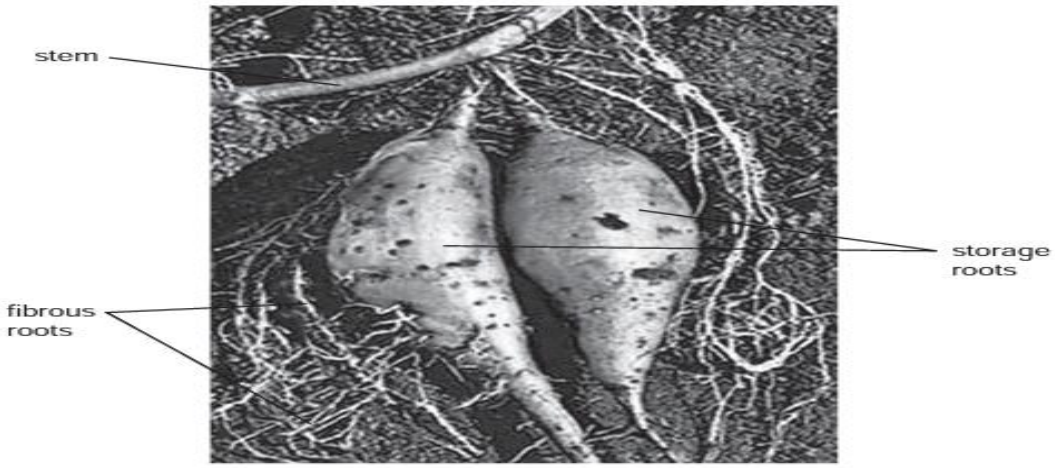


Fig. 3.1

(a) Explain, using the term **water potential**, how fibrous roots absorb water.

.....

.....

.....

.....

.....

..... [3]

The membranes of root hair cells contain proteins for the absorption of ions.

(b) Describe how root hair cells are adapted for the absorption of ions.

.....

.....

.....

.....

.....

..... [3]

Sweet potato plants produce flowers to reproduce sexually. Sweet potato plants also reproduce asexually when shoots grow from the storage roots to form new plants.

Fig. 3.2 shows the life cycle of sweet potato. The diploid number of this species is 90.

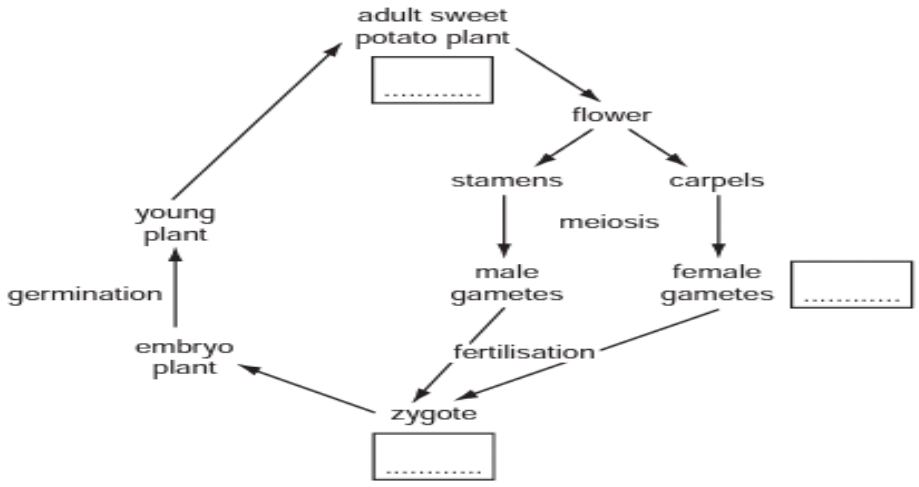


Fig. 3.2

(c) Complete Fig. 3.2 by writing the number of chromosomes in the three boxes. [2]

(b) Some farmers increase the fertility of their soils by adding organic fertilisers, such as manure, and by using legume crops in a crop rotation. Manure contains protein, urea and ammonia in the waste from farm animals.

(i) Explain how nitrogen, in the form of nitrate ions, becomes available in a soil after the addition of manure.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Explain why legume crops, such as peas, beans, alfalfa and clover are used in crop rotations.

.....

.....

.....

.....

.....

..... [3]

(c) The overuse of fertilisers can lead to environmental problems. Soils, rivers, lakes, the sea and the atmosphere have all been affected by this pollution.

Outline the undesirable effects of the overuse of fertilisers.

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 17]

11. Fig. 4.1 shows a cross section of part of a stem of buttercup, *Ranunculus*.

Fig. 4.2 is an outline drawing of one vascular bundle from the stem of *Ranunculus*.

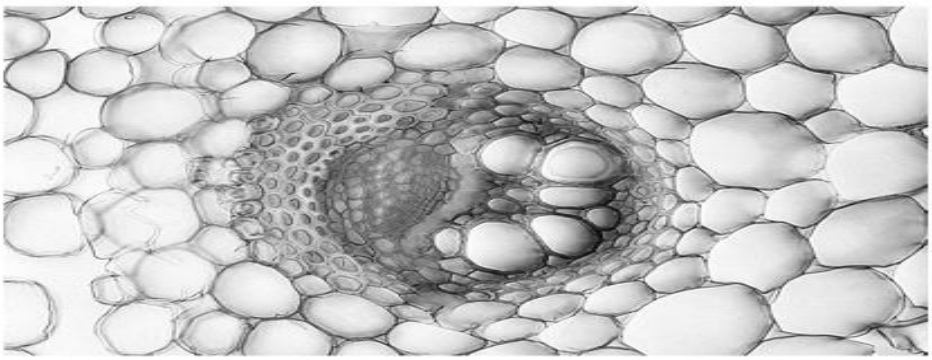


Fig. 4.1

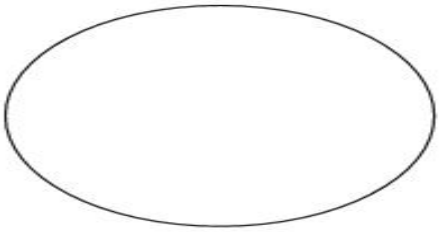


Fig. 4.2

(a) Draw **and** label the position of the xylem and the phloem in the outline of the vascular bundle in Fig. 4.2. [2]

(b) Name the carbohydrate that is transported in the phloem.

..... [1]

(c) Substances transported in the phloem are carried upwards in the stem at some times of the year and downwards at other times.

Explain why substances are transported in the phloem upwards at one time of the year **and** downwards at another.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Define the term *transpiration*.

.....

.....

.....

.....

.....

..... [3]

(e) The rattan palm is a plant that climbs on rainforest trees to heights of about 40 metres.

Explain how water is moved to the tops of tall plants, such as the rattan palm.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 14]

12. The pea plant, *Pisum sativum*, is a legume which is grown both as a human food and as livestock feed.

Fig. 6.1 shows some of the root nodules on a pea plant.

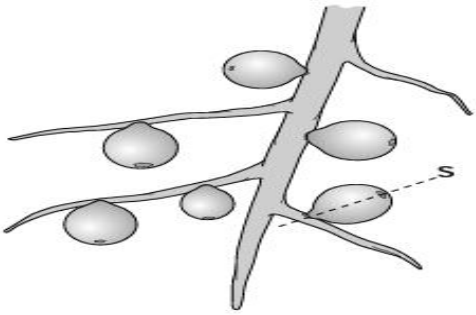


Fig. 6.1

Fig. 6.2 shows a cross-section through the root nodule at **S** on Fig. 6.1.

T indicates the transport tissue in the root.

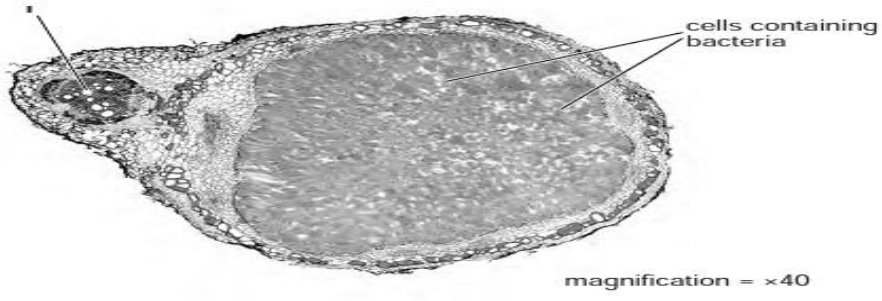


Fig. 6.2

(a) The maximum diameter of the root nodule in Fig. 6.2 is 73 mm.

Calculate the actual diameter of the root nodule.

actual diameter ..... [1]

(b) Describe the role of the bacteria in the root nodules of *P. sativum*.

.....

.....

.....

.....

.....[2]

(c) The bacteria require carbohydrates that are supplied by the pea plant.

Describe how the carbohydrates are produced and transported by the plant to the bacteria.

(i) produced

.....

.....

.....

.....[2]

(ii) transported

.....

.....

.....

.....[2]

(d) Pea plants grow well in soils that are deficient in nitrogen.

Explain how root hair cells of pea plants absorb nitrate ions from soils with low nitrate concentrations.

.....

.....

.....

.....

.....[2]

[Total: 9]

13.

(a) Fig. 4.1 shows a section through the anther of a lily flower. The cells in the centre are dividing by meiosis.

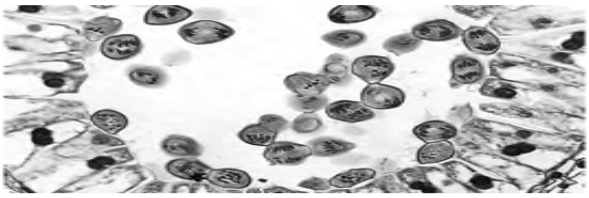


Fig. 4.1

(i) Name the product of meiosis that is formed in anthers.

.....[1]

(ii) Explain the importance of meiosis in sexual reproduction.

.....

.....

.....

.....

.....[2]

(b) Fig. 4.2 shows a flower of *Lilium polyphyllum,* a lily that grows in the Himalayan mountains. This species is cross-pollinated by insects.



Fig. 4.2

(i) Explain what is meant by *cross-pollination*.

.....

.....

.....

.....

.....[2]

(ii) Name **one** feature **visible** in Fig. 4.2 that helps to attract insects.

.....[1]

(c) Plants of this species that grow at low altitudes produce flowers 60 days before the plants of the same species that grow at high altitudes.

(i) Suggest **one** environmental reason why lilies that grow at lower altitudes flower earlier than the lilies at higher altitudes.

.....[1]

(ii) Explain why flowering time is an example of continuous variation.

.....

.....

.....

.....

.....[2]

(d) Scientists think that plants of *L. polyphyllum* growing at high altitudes may evolve into a new species.

Explain how natural selection could lead to the evolution of a new species of lily.

.....

.....

.....

.....

.....

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.....

.....

.....

.....[5]

[Total: 14]

14. Some plants can be grown in water using the technique of hydroponics. The roots are in water and supplied with the ions that they need at the concentrations that support maximum growth. Some ions can be absorbed both by diffusion and by active transport.

(a) (i) State **two** features of diffusion that do not apply to active transport.

1 .....

.....

2 .....

.....

[2]

(ii) Explain how roots are adapted to absorb ions.

.....

.....

.....

.....

.....[2]

A group of students investigated the effect of soaking small onion bulbs in different concentrations of sodium chloride solution. They peeled off the outer papery leaves of the onion bulbs and divided the onions into 6 batches, each with 10 onions.

The onions were surface dried with paper towels and weighed. The mean mass of the onions in each batch was calculated. The onions were then left in sodium chloride solutions for three hours.

After three hours the students surface dried the onions and weighed them again. Their results are given in Table 2.1.

Table 2.1

concentration of sodium chloride solution / g dm^{-3}	mean mass of onions / g		percentage change in mass
	before soaking	after soaking for 3 hours	
0	147	173	+17.7
25	153	165	+7.8
50	176	172	−2.3
100	154	149	−3.2
150	149	142	−4.7
200	183	175	

(b) (i) Calculate the percentage change in mass of the onions that were in the most concentrated solution of sodium chloride. Show your working. Write your answer in Table 2.1.

[2]

(ii) Explain why the students calculated the percentage change in mass of the onions.

.....

.....

.....

.....

.....[2]

(c) The students plotted a graph of the results as shown in Fig. 2.1.

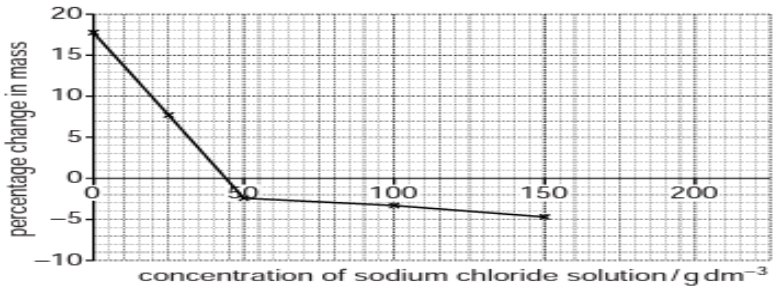


Fig. 2.1

(i) Complete the graph using your answer to **(b)(i)**. [1]

(ii) Use the graph in Fig. 2.1 to estimate the concentration of the sodium chloride solution that has the same water potential as the onions.

.....[2]

(d) Using the term **water potential**, explain why the onions:

gained mass when soaked in dilute solutions of sodium chloride

.....

.....

.....

.....

lost mass when soaked in concentrated solutions of sodium chloride.

.....

.....

.....

.....

[4]

[Total: 15]

15. Fig. 1.1 shows a longitudinal section through a broad bean seed.

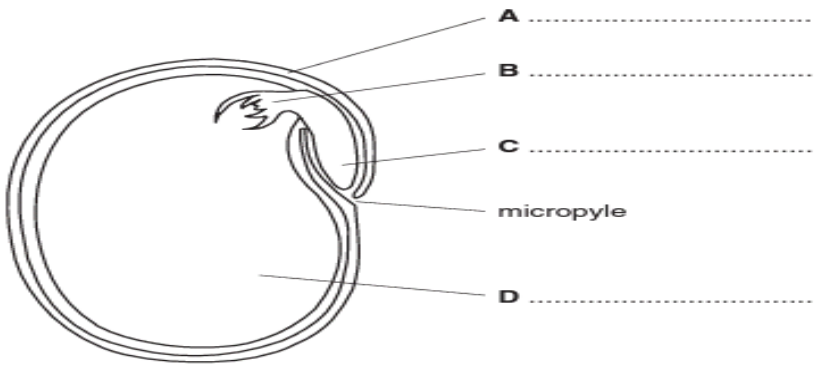


Fig. 1.1

(a) On Fig. 1.1, label parts **A**, **B**, **C** and **D**. [4]

(b) Name the part of the flower in which the seed was formed.

.....[1]

(c) Broad bean flowers are pollinated by insects such as bees.

(i) Describe the function of bees in pollination.

.....

.....

.....[2]

(ii) State two structural adaptations you would expect to find in a flower, such as a broad bean, that would attract bees.

1. .....

2. .....[2]

(iii) The activity of bees usually results in cross-pollination.
Explain why cross-pollination may be an advantage to a species of plant.

.....

.....

.....[2]

(d) The micropyle is shown on Fig. 1.1.
Describe the role of the micropyle in

(i) fertilisation;

.....

.....

.....[2]

(ii) germination.

.....

.....[1]

(e) The carbohydrate stored inside the broad bean seed is mainly starch.

What must happen to the starch before the seed can use it for growth?

.....

.....[1]

[Total : 15]

16. **(a)** With reference to a suitable example, define the term *tissue*. [3]

(b) Identify parts **A**, **B**, **C** and **D** shown on Fig. 7.1 and describe their main features and functions.

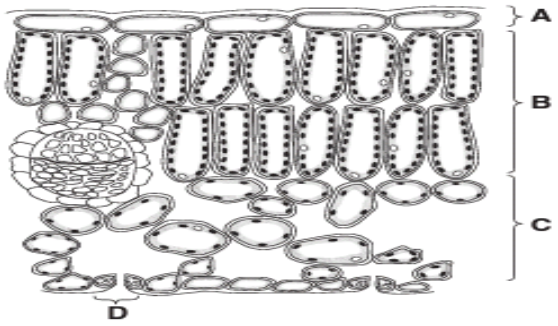


Fig. 7.1

[12]

[Total : 15]

.....

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.....

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.....

.....

17. In an experiment, pea seeds were germinated on moist cotton wool.

Ten seedlings with straight radicles were selected.

Five of these seedlings were pinned to a vertical piece of cork and enclosed in a transparent cover (apparatus **X**). The other five were treated in the same way, but the cork was attached to a motor that turned the seedlings four times an hour (apparatus **Y**).

Both sets were left in the dark for 24 hours. The results are shown in Fig. 5.1.

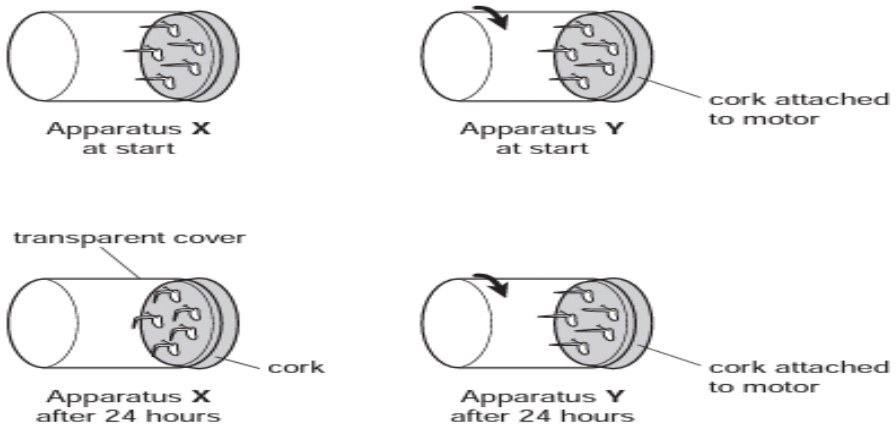


Fig. 5.1

(a) **(i)** Name the response shown by the seedlings in apparatus **X**.

.....[2]

(ii) Explain the mechanism that caused the roots in apparatus **X** to grow downwards.

.....

.....

.....

.....[3]

(iii) State two advantages to a plant of this response.

1. .....

2. .....[2]

(b) **(i)** Explain the purpose of apparatus **Y** in this experiment.

.....[1]

(ii) Explain why the experiment was carried out in the dark.

.....

.....[1]

(c) After obtaining the results, another sample of germinating pea seeds was left in the dark for several days. A further sample was kept in the light. Describe how the plumules of the seedlings kept in the dark would differ from those of the seedlings kept in the light.

.....

.....

.....[2]

[Total: 11]

18. In 2003, 25 000 square kilometres of Amazon rainforest were cut down and cleared. The land was then used for agriculture, producing beef and soya beans for export. However, within three years the land was no longer suitable for agriculture and had to be abandoned.

(a) **(i)** State the term used for cutting down and clearing areas of forest.

..... [1]

(ii) Complete Table 3.1, to state different reasons why forests are cut down. The first has been done for you.

Table 3.1

	reason
1	for agricultural land
2	
3	

[2]

(iii) Outline and explain the likely effects of clearing forests.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) Soya beans and beef produced on the land are both good sources of protein. Table 3.2 shows the nutritional content of products made from soya and beef.

Table 3.2

	nutritional content per 100 g of product			
product	energy / kJ	protein / g	saturated fat / g	fibre / g
corned beef	905	26.9	12.1	0.0
soya sausages	1128	19.0	2.1	2.0

(i) Using data from Table 3.2, state and explain two reasons why soya sausages may be healthier than corned beef as a major item in the diet.

1 .....

.....

.....

2 .....

.....

..... [4]

(ii) Soya beans are harvested from plants. Corned beef is produced from cattle that have fed on grass.

Explain why it is more energy efficient for humans to eat soya products as a source of protein than corned beef. Use the food chains involved to support your answer.

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 17]

19. **(a)** A typical dicotyledonous leaf contains a number of different types of cells, including:

guard cells, **palisade mesophyll**, **spongy mesophyll** and **upper epidermal** cells.

Using the types of cells listed above, complete the table by

(i) writing the types of cells in the order that sunlight passes through them,

(ii) stating the proportion of chloroplasts in each of the types of cells. Use the terms **none**, **some** and **many**.

type of cell	number of chloroplasts

[3]

Stomatal pores are surrounded by pairs of guard cells. When the stomata are closed the rate of photosynthesis is affected, due to a limiting factor.

(b) **(i)** Write a balanced equation, **using chemical symbols,** for the process of photosynthesis.

..... [2]

(ii) Define the term *limiting factor*.

.....

.....

..... [2]

(iii) State the factor that limits photosynthesis when the stomata are closed.

..... [1]

(c) Vascular bundles, containing xylem and phloem tissue, are situated in the leaf.

(i) Describe the structure of xylem tissue.

.....

.....

.....

..... [3]

(ii) State the functions of xylem and phloem.

Function of xylem .....

.....

Function of phloem .....

..... [4]

(d) Some plants close their stomata during the hottest part of the day, despite the effect on photosynthesis. Suggest what benefit this might be to the plants.

.....

..... [1]

[Total: 16]

20. Crop production in many areas of the world needs the application of large volumes of water. However, when the water evaporates from the soil, traces of salts are left behind. After several years, the soil becomes too salty for most plants to grow in it.

(a) (i) State three functions of water in plants.

1. .....

2. .....

3. ..... [3]

(ii) With reference to the water potential gradient, explain why plants may die when grown in salty soil.

.....

.....

.....

..... [3]

(b) Some plants are able to pump salts out of their roots.

(i) Name the process plants could use to pump salts out of their roots.

..... [1]

(ii) Suggest how the process named in **(i)** could affect the rate of growth of the plants if the process was operating all the time.

.....

.....

.....

..... [2]

(iii) Plants need mineral salts for normal, healthy growth. Complete the table by naming two minerals that plants need and stating their functions.

mineral	name	function
1	.....	.....
		.....
2	.....	.....
		.....

[4]

(c) An article in a school science magazine stated, 'Many plants contain genes which enable them to pump salts out of their roots. These genes can be made more active by genetic engineering, enabling the plants to remove salts before the plants are damaged.'

Explain whether you think that the process described in the article above **is** an example of genetic engineering.

.....

.....

.....

..... [3]

(d) Some scientists believe that washing the salts out of the soil using even more water is a better alternative to genetic engineering.

State two problems that could be caused by washing the soil with extra water.

1. .....

2. ..... [2]

[Total: 18]

21. Transpiration and translocation are processes responsible for transporting materials around a plant.

(i) Complete the table by stating the materials moved by these processes, their sources and their sinks.

process	materials moved	source of materials in the plant	sink for materials in the plant
transpiration	1 ..... 2	.....	.....
translocation	1 ..... 2	.....	.....

[6]

(ii) State **two** reasons why the source and sink for translocation in a plant may change at different stages in the growth of a plant.

.....

.....

..... [2]

[Total: 8]

22. Fig. 4.1 is a photograph of a root of radish covered in many root hairs.



Fig. 4.1

(a) Using the term *water potential*, explain how water is absorbed into root hairs from the soil.

.....

.....

.....

.....

.....

..... [3]

A potometer is a piece of apparatus that is used to measure water uptake by plants.

Most of the water taken up by plants replaces water lost in transpiration.

A student used a potometer to investigate the effect of wind speed on the rate of water uptake by a leafy shoot. As the shoot absorbs water the air bubble moves upwards.

The student's apparatus is shown in Fig. 4.2.

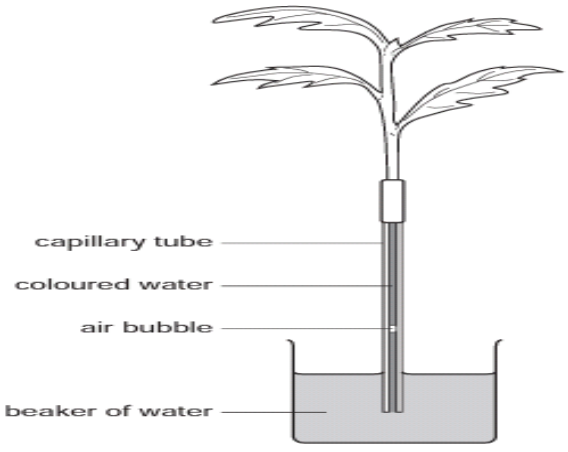


Fig. 4.2

The student used a fan with five different settings and measured the wind speed. The results are shown in Table 4.1.

Table 4.1

wind speed / metres per second	distance travelled by the air bubble / mm	time / minutes	rate of water uptake / mm per minute
0	4	10	0.4
2	12	5	2.4
4	20	5	4.0
6	35	5	7.0
8	40	2	.....

(b) Calculate the rate of water uptake at the highest wind speed and write your answer in the table.

[1]

(c) Describe the effect of increasing wind speed on the rate of water uptake. You may use figures from Table 4.1 to support your answer.

.....

.....

.....

..... [2]

(d) State two environmental factors, **other than wind speed**, that the student should keep constant during the investigation.

1. .....

2. ..... [2]

(e) Some of the water absorbed by the plants is **not** lost in transpiration.

State two **other** ways in which water is used.

1. .....

2. ..... [2]

(f) Water moves through the xylem to the tops of very tall trees, such as giant redwoods of North America. The movement of water in the xylem is caused by transpiration.

Explain how transpiration is responsible for the movement of water in the xylem.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(g) Plants that live in hot, dry environments show adaptations for survival.

State three **structural** adaptations of these plants.

1. .....

2. .....

3. ..... [3]

[Total: 17]

23. Fig. 2.1 shows the root systems of two species of desert plant, **A** and **B**.

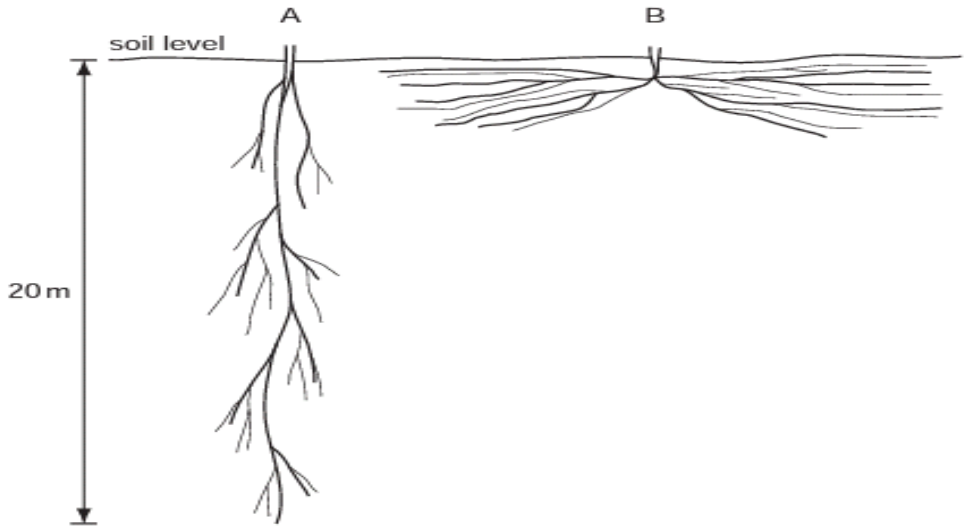


Fig. 2.1

(a) Describe the two root systems shown in Fig. 2.1 **and** explain how each is an adaptation for survival in a desert ecosystem.

.....

.....

.....

.....

.....

.....

..... [4]

(b) Describe **and** explain two ways in which the **leaves** of desert plants reduce water loss in transpiration.

1. .....

.....

.....

2. .....

.....

..... [4]

(c) Xylem and phloem are transport tissues in plants. They transport substances from organs that are known as sources to organs known as sinks.

Complete the table to show:

- **two** substances being transported in each tissue
- an organ that is a source for substances being transported in each tissue
- an organ that is a sink for substances being transported in each tissue.

tissue	substances being transported	source of substances in the plant	sink for substances in the plant
xylem	1 ..... 2		
phloem	1 ..... 2		

[6]
[Total: 14]

24. **(a)** Write a balanced equation for photosynthesis using symbols.

.....

[3]

Plants that live in water are called hydrophytes.

Fig. 5.1 shows a cross-section of a leaf of the hydrophyte, *Nuphar lutea*. The leaves of *N. lutea* float on the surface of water.

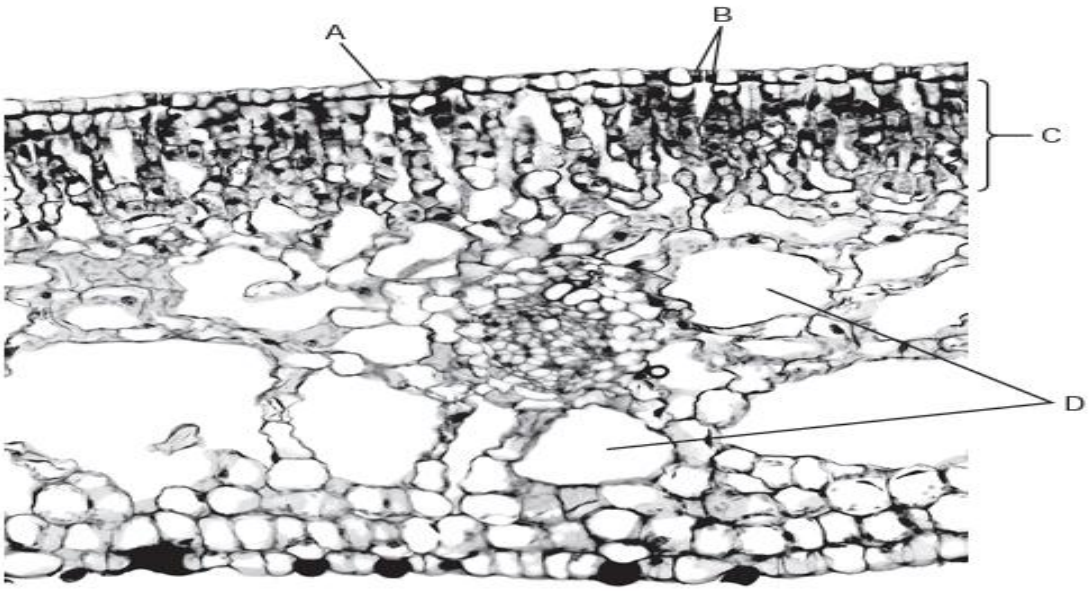


Fig. 5.1

(b) Complete Table 5.1 by describing the function of each feature.
The function for feature **A** has already been completed.

Table 5.1

feature	function
A	transparent to allow light to penetrate into the leaf
B	.....
C	.....
D	.....

[3]

(c) State **and** explain **one** way in which the leaves of *N. lutea* are adapted to their environment.

.....

.....

.....

..... [2]

25 **(a)** Define the term *growth*.

.....

.....

.....

..... [2]

Some students investigated the responses of tomato seedlings to receiving light from one side (unidirectional light).

The students germinated tomato seeds in the dark and then placed the seedlings in test-tubes with water. The seedlings were treated in four different ways, **E** to **H**, as shown in Fig. 2.1. The responses of the seedlings are shown in Fig. 2.2.

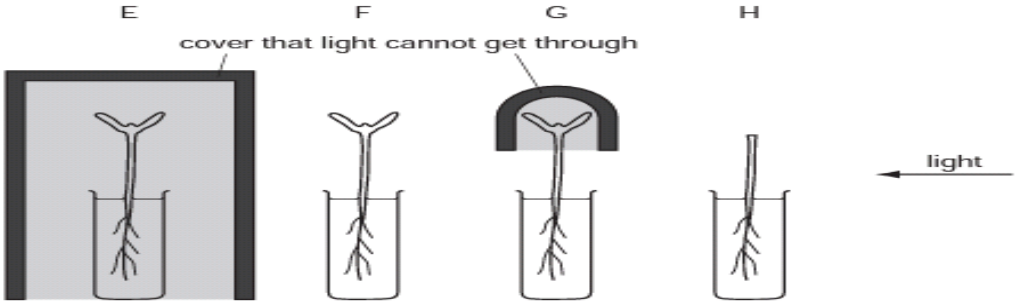


Fig. 2.1

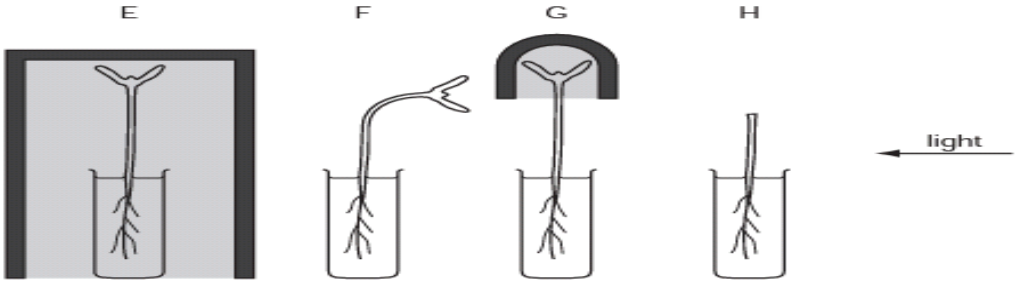


Fig. 2.2

(b) Name the response shown by the tomato seedling, **F**, which has bent 90° towards the light.

..... [2]

(c) Using the results shown in Fig. 2.2, suggest what conclusions may be made about how the tomato seedlings detected the stimulus of unidirectional light.
You may refer to the seedlings by the letters **E** to **H**.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(d) Explain the advantage of the response shown by seedlings to unidirectional light.

.....

.....

.....

.....

..... [2]

(e) Responses to light are coordinated by plant growth substances known as auxins.

Explain the role of auxins in coordinating the response.

.....

.....

.....

.....

..... [2]

26. Many growers of crops in glasshouses use carbon dioxide enrichment to improve yields.

(a) Explain the advantages of carbon dioxide enrichment of glasshouses.

.....

.....

.....

..... [2]

Fig. 3.1 shows the carbon dioxide concentrations inside three glasshouses, **D**, **E** and **F**, on a hot day with bright sunlight.

- Glasshouses **D** and **E** received carbon dioxide enrichment and were ventilated by opening the windows.
- Glasshouse **F** did not receive any extra carbon dioxide and the windows were closed.

The carbon dioxide concentrations in the glasshouses and in the atmosphere were measured. The concentration in the atmosphere was 0.039 %.

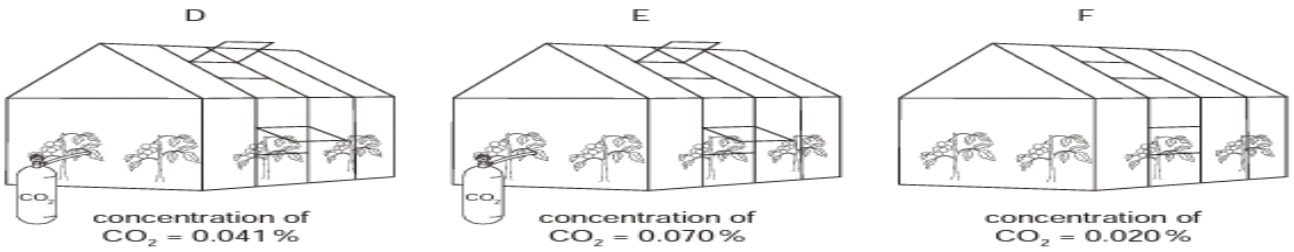


Fig. 3.1

The rate of uptake of carbon dioxide by the crop plants was measured in grams of carbon dioxide absorbed per square metre of glasshouse per hour. These results are shown in Table 3.1.

Table 3.1

glasshouse	rate of uptake of carbon dioxide by crop plants / g per m^2 per hour
D	2.5
E	5.7
F	1.0

(b) Suggest why it may **not** be cost effective to maintain a high concentration of carbon dioxide in glasshouse **E** compared to the concentration of carbon dioxide in the atmosphere.

.....

.....

.....

.....

.....

..... [2]

(c) **(i)** Concentrations of carbon dioxide in all three glasshouses in Fig. 3.1 increased at night. State why this happened.

.....

..... [1]

(ii) Explain why it is important to ventilate glasshouses by opening the windows.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 9]

27. Fig. 6.1 shows a leaf and a flower of *Helleborus orientalis*.



Fig. 6.1

(a) *H. orientalis* is a dicotyledonous plant.
State three features **visible** in Fig. 6.1 that show it is a dicotyledonous plant.

1. .....
2. .....
3. ..... [3]

Fig. 6.2 is a photograph of a section through a leaf of *H. orientalis*.

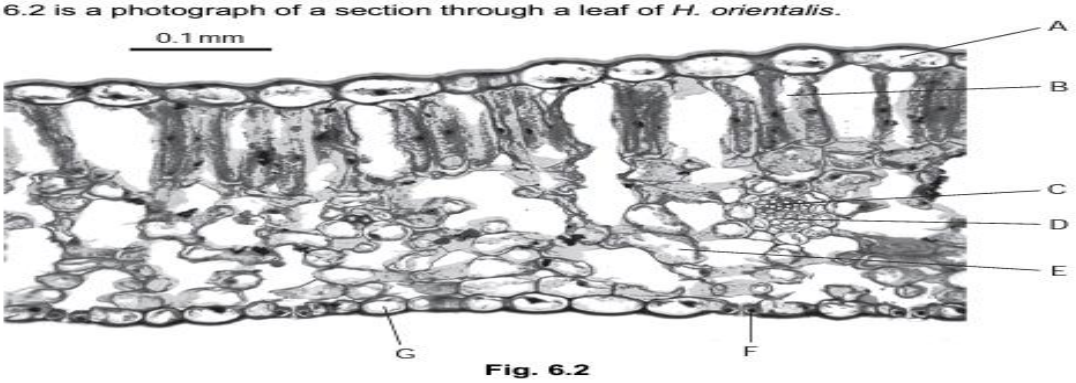


Fig. 6.2

(b) Complete the table, using ticks (✓), to show the cells that carry out photosynthesis.

cell	cells that carry out photosynthesis
A	
B	
C	
D	
E	
F	
G	

[2]

(c) Explain how two features of leaves, **visible** in sections such as that shown in Fig. 6.2, are adaptations for efficient photosynthesis.

1. .....
.....
.....
2. .....
.....
..... [4]

(d) During the period when *H. orientalis* is photosynthesising at a fast rate, substances are transported through the plant in the phloem from sources to sinks.

(i) Name **two** substances that are translocated from a source to a sink.

.....
..... [2]

(ii) For these substances state the source and **two** possible sinks.

source .....
sink 1 .....
sink 2 ..... [2]

[Total: 13]

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28. Three plants were grown to study the effects of nitrate and magnesium ion deficiency on their development. They were kept in the same conditions, except for the types of minerals supplied.

Plant **A** was provided with all essential minerals.

Plant **B** was given all minerals except nitrate ions.

Plant **C** was given all minerals except magnesium ions.

Fig. 1.1 shows the plants a few weeks later.

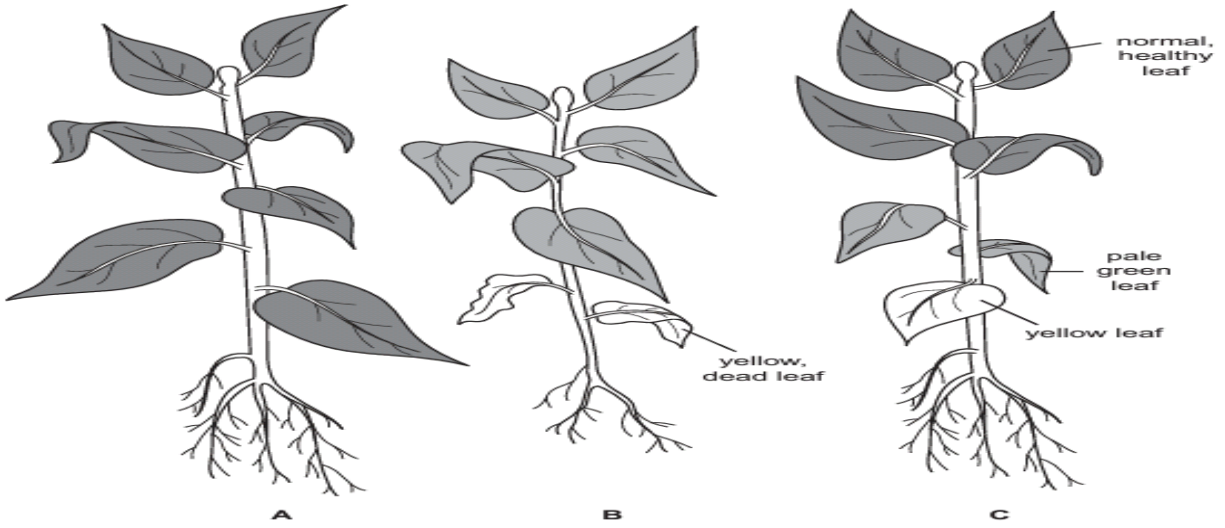


Fig. 1.1

(a) State three conditions, **other than** water and the concentration of mineral ions, that would need to be kept the same for all the plants, in order to make the investigation a fair test.

1. .....
2. .....
3. ..... [3]

(b) Describe and explain the effect on plant growth of

(i) a deficiency of nitrate ions on plant **B**;

description .....

.....

.....

explanation .....

.....

..... [4]

(ii) a deficiency of magnesium ions on plant **C**.

description .....

.....

explanation .....

..... [2]

(c) A farmer tested the soil in a field and found that there was a high nitrate ion concentration.

The farmer then grew a crop in this field.

After the crop was removed, the soil was tested again. The nitrate ion concentration had decreased.

(i) Suggest two reasons why the nitrate ion concentration had decreased.

1. .....
2. ..... [2]

(ii) Describe two methods the farmer could use to improve the nitrate ion concentration in the soil.

1. .....

.....

2. .....

..... [2]

(d) Some species of plant grow well in soil that is always low in nitrate ions.

Explain how they can obtain a source of nitrogen compounds.

.....

.....

.....

..... [3]

[Total: 16]

29. Fig. 4.1 shows a transverse section through an *Ammophila* leaf. This plant has very long roots.

Fig. 4.2 shows a cactus plant.

Both plants live in very dry conditions.

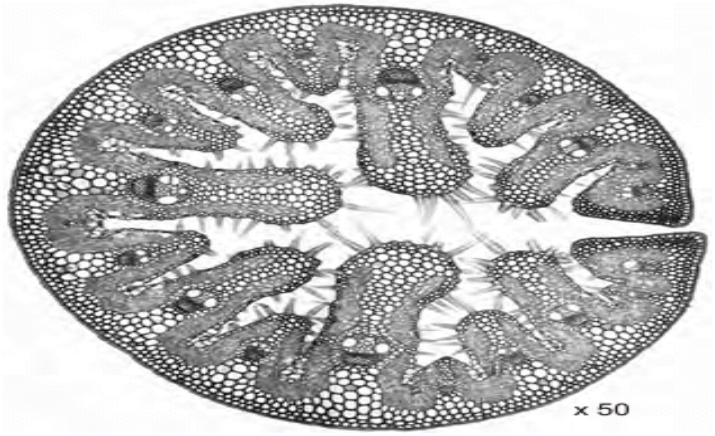


Fig. 4.1

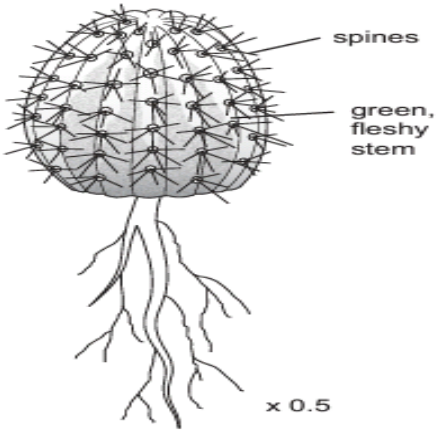


Fig. 4.2

(a) Suggest how each of the following adaptations would enable the named plant to survive in very dry conditions.

(i) *Ammophila*

1. rolled leaves with stomata on the inside of the leaf

.....

.....

..... [2]

2. thick waxy cuticle on the outside of the leaf

.....

.....

..... [1]

(ii) Cactus

1. very long roots

.....

.....

..... [1]

2. fleshy green stem

.....

.....

..... [2]

(b) Suggest why having only a few, very small leaves could be a disadvantage to a plant.

.....

.....

..... [2]

(c) Water is involved in a number of processes in plants.

Complete the table by

(i) naming the processes described;

(ii) stating one variable that, if increased, would speed up the process.

description of process	name of process	variable that, if increased, would speed up the process
absorption of water from the soil	.....	....
using water to form glucose	.....	....
movement of water vapour out of leaves	.....	....

[6]

[Total: 14]

30. Fig. 4.1 shows part of a root.

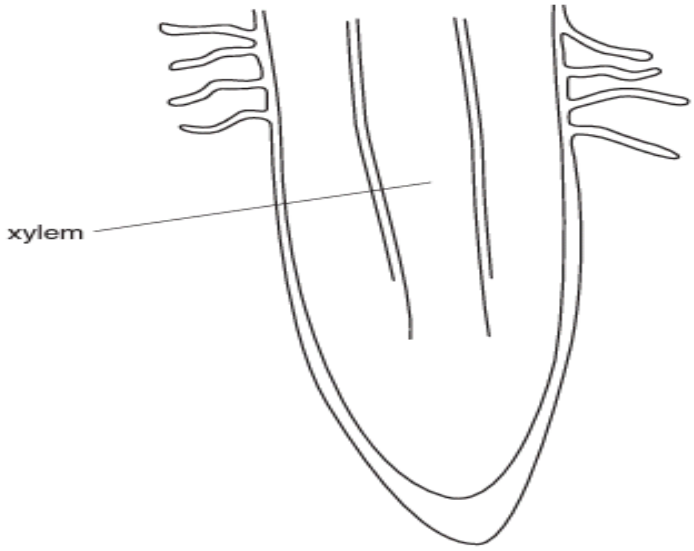


Fig. 4.1

(a) Explain how the presence of root hair cells on roots enables the efficient absorption of water and minerals.

.....

.....

.....[2]

(b) Root hair cells can absorb mineral ions by diffusion and active transport.

(i) Define the term *active transport*.

.....

.....[2]

(ii) Explain why respiration rates may increase in root hair cells during the uptake of mineral ions.

.....

.....[1]

(c) Fig. 4.1 shows the position of xylem in the root.

(i) Describe how the structure of xylem tissue is adapted to its functions.

.....

.....

.....

.....[3]

(ii) Describe the mechanism of water movement through the xylem.

.....

.....

.....[2]

[Total : 10]