Organism level system – 2021/20 GCSE Gateway Biology A

1. Nov 2021/Paper_J247/01/No.2

Which row in the table shows the order of neurones an impulse travels through in a reflex arc?

	Order of neurones in a reflex arc		
	First	**Second**	**Third**
A	sensory neurone	motor neurone	relay neurone
B	motor neurone	relay neurone	sensory neurone
C	motor neurone	sensory neurone	relay neurone
D	sensory neurone	relay neurone	motor neurone

Your answer ☐ **[1]**

2. Nov 2021/Paper_J247/01/No.3

After blood leaves the human heart it passes through different blood vessels.

Which is the correct order of these blood vessels?

A Heart → arteries → capillaries → veins

B Heart → arteries → veins → capillaries

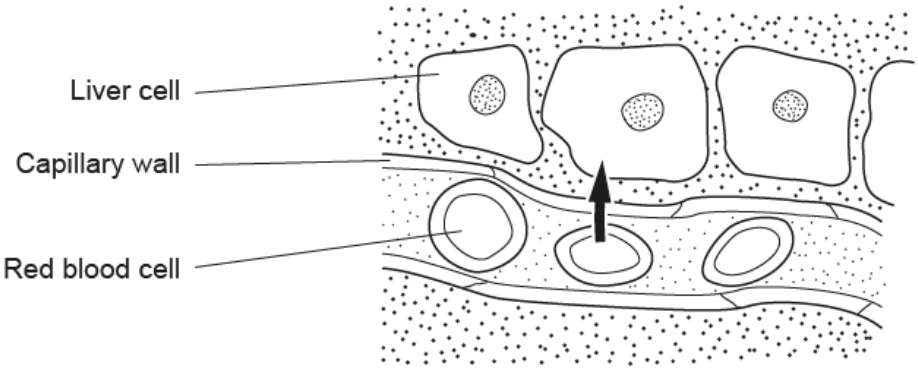
C Heart → capillaries → arteries → veins

D Heart → veins → capillaries → arteries

Your answer ☐ **[1]**

3. Nov 2021/Paper_J247/01/No.5

The diagram shows a capillary inside liver tissue.



What does the arrow represent?

A Carbon dioxide diffusing into a liver cell.

B Carbon dioxide diffusing out of a liver cell.

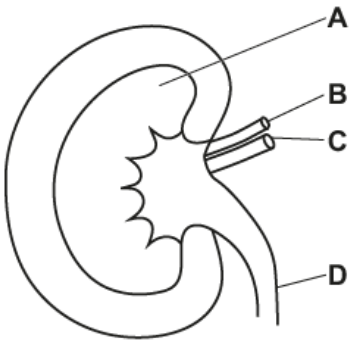
C Oxygen diffusing into a liver cell.

D Oxygen diffusing out of a liver cell.

Your answer ☐ **[1]**

4. Nov 2021/Paper_J247/01/No.6

The diagram shows a section through a kidney.



Which part **A**, **B**, **C** or **D**, is the ureter?

Your answer ☐ **[1]**

5. Nov 2021/Paper_J247/01/No.7

Which part of the brain functions as an endocrine gland?

A Cerebellum

B Cerebrum

C Medulla

D Pituitary

Your answer ☐ **[1]**

6. Nov 2021/Paper_J247/01/No.8

Which of these changes would cause an **increase** in biodiversity?

A Draining ponds to build a car park.

B Keeping tigers in a zoo.

C Reintroducing otters into an area where they had died out.

D Replacing a woodland with a field that contains wheat.

Your answer ☐ **[1]**

7. Nov 2021/Paper_J247/01/No.17

The circulatory system and gas exchange system are linked.

Two male students investigate how the type of exercise affects breathing rate.

They each record their breathing rates at rest.

Student A then exercises for 5 minutes by jogging on the spot.
Student B exercises for 5 minutes by doing star jumps.

Both students measure their breathing rate each minute during the 5 minutes of exercise.

(a) What is the **dependent** variable in this investigation?

..... **[1]**

(b) Write down **two** variables the students tried to control in their experiment.

1 .....

2 .....

[2]

(c) Why is it important to first record the students' breathing rate at rest?

..... **[1]**

(d) The results of their investigation are shown in the table.

Time (min)	Breathing rate (breaths / min)	
	Student A	Student B
0 (rest)	10	11
1	13	16
2	16	25
3	24	29
4	27	33
5	29	37

The increase in breathing rate for **student A** is 19 breaths per minute.

Calculate the percentage difference in breathing rate increase between **student A** and **student B**.

Use the formula:

$$\text{Percentage difference} = \frac{\text{increase in } \textbf{student B} - \text{increase in } \textbf{student A}}{\text{increase in } \textbf{student A}} \times 100$$

Give your answer to **1** decimal place.

Percentage difference = ... % **[3]**

(e) Use the results from the investigation to write down **two** conclusions about how exercise affects breathing rate.

1 .....

.....

2 .....

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[2]

(f) **(i)** Give **two** problems with the method used by the students.

1 .....

.....

2 .....

.....

[2]

(ii) Suggest **one** way the method could be improved.

..... **[1]**

8. Nov 2021/Paper_J247/01/No.19

(a) Insulin is a hormone that is important in controlling blood sugar levels.

Which organ in the body produces insulin?

..... **[1]**

(b) Diabetes is a disorder that results in being unable to control blood sugar levels.

Table 19.1 shows some notes written by a doctor about a patient who has **type 1** diabetes.

Patient
35 years old
symptoms developed quite quickly
patient often feels tired
cells that make insulin have been destroyed

Table 19.1

(i) Which note in **Table 19.1** indicates that the patient has type 1 diabetes and **not** type 2?

..... **[1]**

(ii) Describe how the patient should be treated.

.....

..... **[1]**

(c) **(i)** Explain how changes in blood sugar levels caused by diabetes affect the water potential of the blood.

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

(ii) Explain how surrounding cells will be affected by these changes in water potential in the blood.

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

(b) Sheep can die from a disease called bluetongue. Bluetongue is caused by a pathogen that is a virus.

The virus is spread to sheep by an insect when it bites the sheep.

(i) Write down the reason why the virus is described as a pathogen.

..... **[1]**

(ii) Farmers can spray their sheep to stop them being bitten by insects.

Which type of chemical is in the spray?

Put a (ring) around the correct answer.

antibiotic **antimicrobial** **fertiliser** **pesticide**

[1]

(c) In Europe, the insects carrying the virus are usually killed by frosts in the winter.

This **reduces** the number of sheep infected by bluetongue.

(i) Scientists think climate change could result in **more** sheep being infected with the bluetongue virus.

Explain why **more** sheep could be infected.

.....

.....

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

(ii) Scientists are trying to find a way to kill the insects using fungi.

Which term describes this type of control?

Tick (✓) **one** box.

Aseptic control ☐

Biological control ☐

Genetic control ☐

Hydroponic control ☐

[1]

(iii) Another method that scientists are investigating is **genetic engineering**.

They hope to genetically engineer the insects so that they cannot carry the virus.

Describe what is meant by the term **genetic engineering**.

.....

.....

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

(d) Glucose may be found in the urine of people who have diabetes. This happens if their blood sugar levels are too high.

The diagram shows a kidney tubule (nephron).

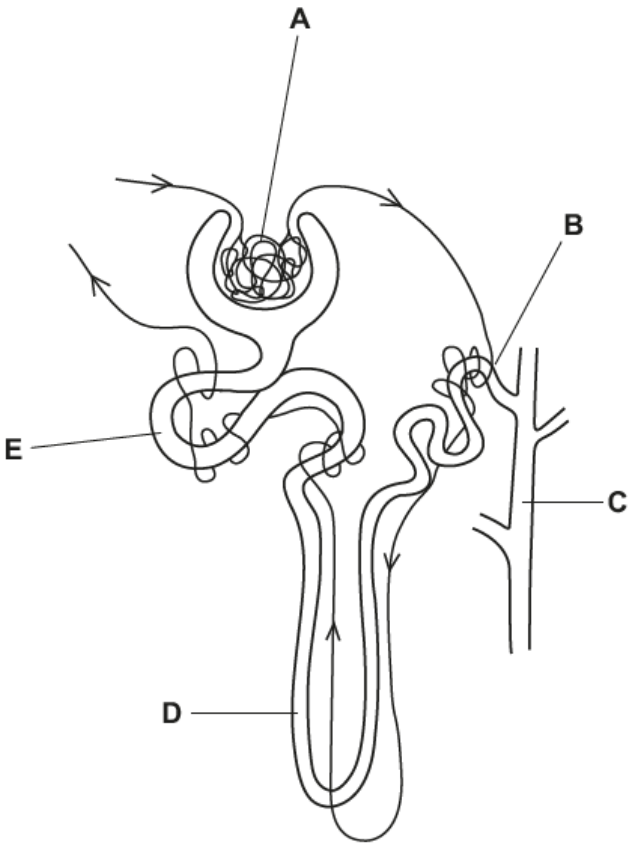

Table 19.2 shows some of the possible ways that diabetes can change kidney function.

For each change in function, write **A**, **B**, **C**, **D** or **E** to identify where in the kidney tubule each change occurs.

Change to kidney function	Part of tubule where change occurs
Glomerulus filters too much glucose from the blood.	
Proximal convoluted tubule only reabsorbs some of the glucose back into the blood.	
Collecting duct transports urine containing glucose.	

Table 19.2

[3]

9. Nov 2021/Paper_J247/01/No.20

(a) (i) **Fig. 20.1** shows a cell from the nervous system. This cell helps control the body by transmitting impulses away from receptors.

Fig. 20.1

What is the name of this cell?

..... **[1]**

(ii) The endocrine system is also involved in sending messages.

Describe how the endocrine system sends messages.

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

(b) The eye is part of the nervous system.

Different parts of the eye can perform different functions to help with sight.

Draw lines to connect the correct **eye part** to the correct **function**.
One line has been drawn for you.

Eye part	Function
Cornea	Can carry electrical impulses from retina to brain.
Iris	Changes shape to control amount of light entering eye.
Lens	Changes shape to fine focus light onto retina.
Optic nerve	Curved to refract light into eye.

[2]

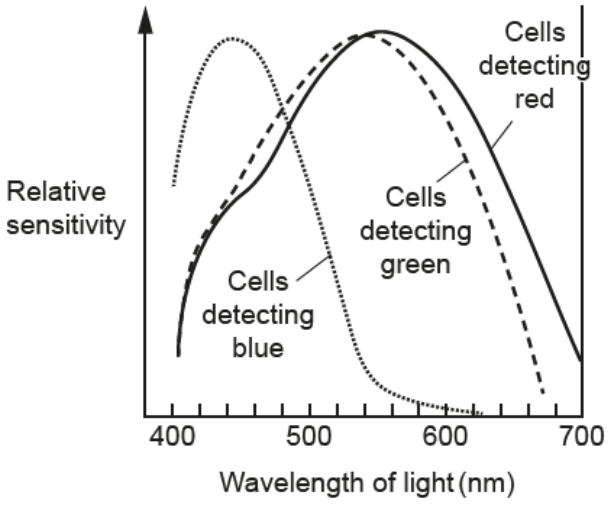
(c) (i)* All colours of visible light can be produced by combinations of blue, green and red light.

Different cells in the eye detect blue, green or red light.

Some people are colour blind because they have damaged cells that detect colours (wavelengths) of light differently.

Fig. 20.2 shows cells detecting colour in normal vision and in someone who is colour blind.

Normal vision



Colour blind

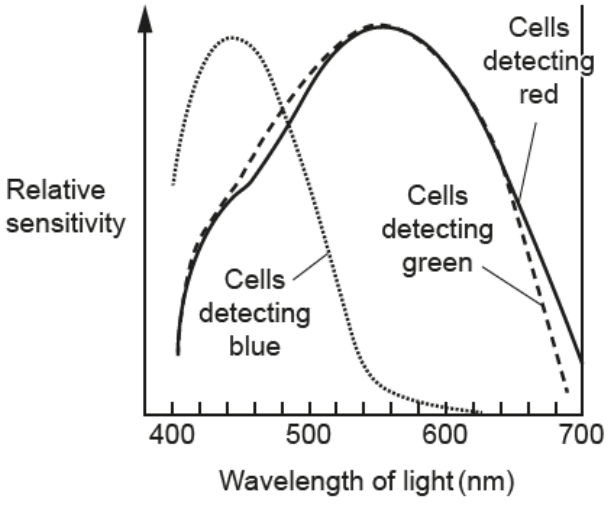


Fig. 20.2

If the cells in the eye have the same sensitivity to different colours then the brain cannot tell these colours apart.

Special glasses can be worn to remove colours in the 560 to 640 nm range of visible light.

Identify the part of the eye that contains the different types of cells and use **Fig. 20.2** to explain:

- which colours the colour blind person has trouble identifying
- how the glasses might help treat this colour blindness.

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..... **[6]**

(ii) Opsin is a protein needed to detect different wavelengths of visible light. Opsin is a protein made inside cells in the light sensitive part of the eye.

Which substance is used by the cells to make the protein opsin?

Put a (ring) around the correct answer.

amino acids **fatty acids** **glucose** **nucleotides**

[1]

(d) The brain processes information from the eyes. This occurs in the same part of the brain responsible for controlling conscious thought.

Which part of the brain is responsible for processing vision?

Put a (ring) around the correct answer.

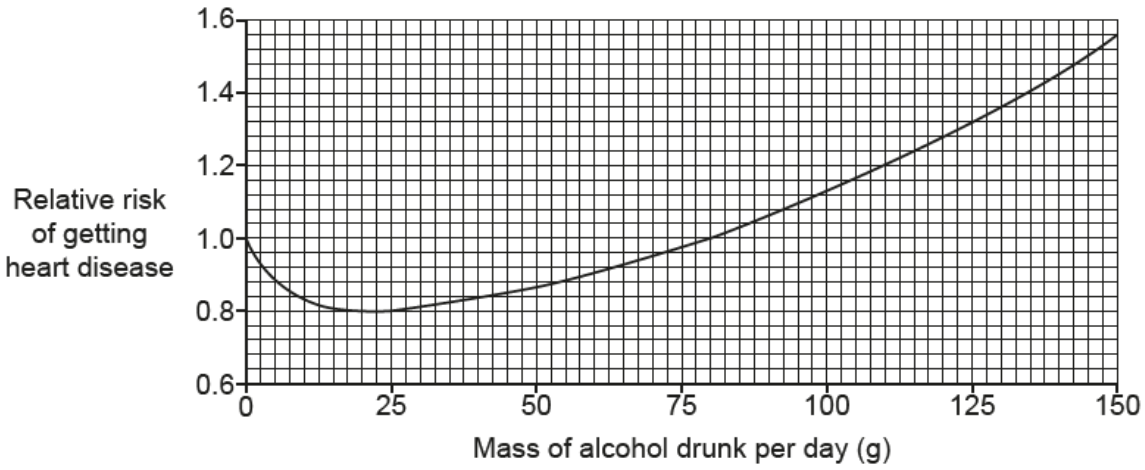
cerebrum **cerebellum** **hypothalamus** **medulla**

[1]

10. Nov 2021/Paper_J247/02/No.12

Scientists studied how the mass of alcohol drunk per day affects the relative risk of getting heart disease. The graph shows the results of their study.

A relative risk of more than 1.0 means that a person who drinks alcohol is more likely to get heart disease compared to a person who drinks no alcohol.



Which conclusion can be made from this graph?

A Drinking 80 g of alcohol a day does not increase the risk of heart disease.

B Drinking above 80 g of alcohol per day reduces the risk of heart disease.

C Drinking alcohol has little effect on the risk of heart disease.

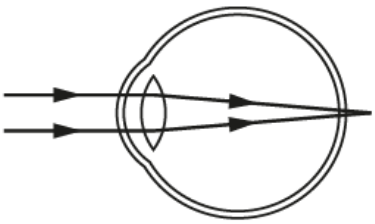
D Drinking any mass of alcohol increases the risk of heart disease.

Your answer ☐

[1]

11. Nov 2020/Paper_J247/01/No.14

Look at the diagram showing an eye defect.



What is the defect and which lens could be used to correct it?

A Long-sightedness, corrected with a concave lens

B Long-sightedness, corrected with a convex lens

C Short-sightedness, corrected with a concave lens

D Short-sightedness, corrected with a convex lens

Your answer ☐ **[1]**

12. Nov 2020/Paper_J247/01/No.15

Anaesthetics used during operations slow down breathing and heart rate.

Which part of the brain do anaesthetics act on to do this?

A Cerebrum

B Cerebellum

C Medulla

D Pituitary

Your answer ☐ **[1]**

13. Nov 2020/Paper_J247/01/No.19

Hormones are used in some methods of contraception.

(a) (i) Which **two** hormones are found in the most commonly used contraceptive pills?

Put a ring around the **two** correct answers.

FSH **Insulin** **Oestrogen** **Progesterone** **Testosterone** **[1]**

(ii) How does the contraceptive pill containing the two hormones prevent pregnancy?

.....

..... **[1]**

(b) Contraceptive hormones can be used by women in different ways.

Method 1
One contraceptive pill is taken every day at around the same time of day for 21 days.
Then no pill is taken for seven days.

Fewer than 1 in 100 women will get pregnant in a year if they use the contraceptive pill correctly. However, typically 9 in 100 women will get pregnant in a year.

Method 2
A contraceptive implant is a small flexible plastic rod containing hormones. It is inserted under the skin of a woman by a doctor or nurse. It is reversible and needs replacing after 3 years.

Fewer than 1 in 100 women using the contraceptive implant will get pregnant in a year.

Which method is more successful?

Evaluate the information to explain why.

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.....

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

(c) Non-hormonal contraceptive methods have different success rates in preventing women from getting pregnant. The graph shows the success rates of non-hormonal contraceptive methods.

Adapted from 'Effectiveness of birth control methods', from J U Adams, 'Long-term birth control is the most reliable. So why do so few young women use it?', The Washington Post, 24 April 2017, www.washingtonpost.com. Item removed due to third party copyright restrictions.

(i) Write down **two** conclusions from the graph about success rates.

1 .....

.....

2 .....

.....

[2]

(ii) Suggest **one** reason why sterilisation is not widely used in couples without children.

.....

..... **[1]**

(iii) The diaphragm is a circular dome made of thin soft latex with a flexible rim. It fits inside the vagina forming a seal.

Suggest how a diaphragm acts as a contraceptive.

.....

..... **[1]**

(iv) The cervical cap is like the diaphragm but smaller. It fits over the cervix.

Explain the difference in success rates between the cervical cap and diaphragm.

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

14. Nov 2020/Paper_J247/01/No.20

Fig. 20.1 shows a section through the skin on the back of the hand.

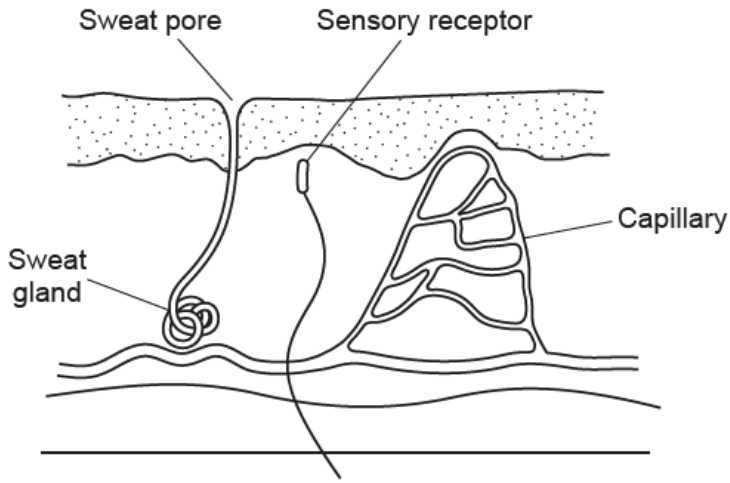


Fig. 20.1

(a) (i) Which part of the skin detects something touching the back of the hand?

..... **[1]**

(ii) The body responds when something touches the back of the hand.

Complete the sentences to explain how this happens.

The ..... receives impulses from the skin along sensory neurones.

These impulses are processed and other impulses are sent along

..... neurones to bring about responses.

[2]

(b) The skin on some areas of the body contains hairs. Modern hair shampoos contain cleaning agents. One cleaning agent is made from fatty acids.

Explain how a **polymer** found in plants and animals can be treated to obtain these fatty acids.

.....

.....

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

(c) **(i)** The skin is important for controlling body temperature.

Explain why overheating of the body may stop chemical reactions in cells.

.....

.....

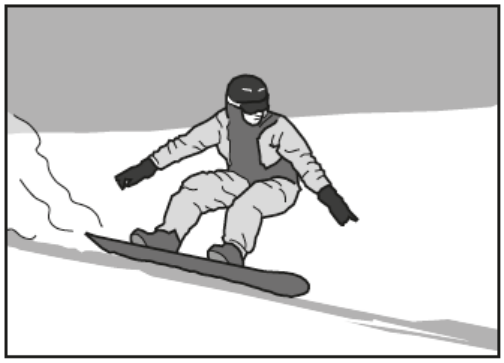
.....

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

(ii)* Look at **Fig. 20.2** which shows two people riding on boards.

Person A is riding a board on sand in a hot desert. **Person B** is riding a board on snow.

Person A



Person B

Fig. 20.2

Explain the different problems of temperature regulation for these two people and give examples of the ways their bodies solve these problems.

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..... **[6]**

15. Nov 2020/Paper_J247/01/No.22

Fig. 22.1 shows the mass of urea in the urine plotted against the BMI (Body Mass Index) for nine boys. BMI is a value often used to see if a person is a healthy mass for their height.

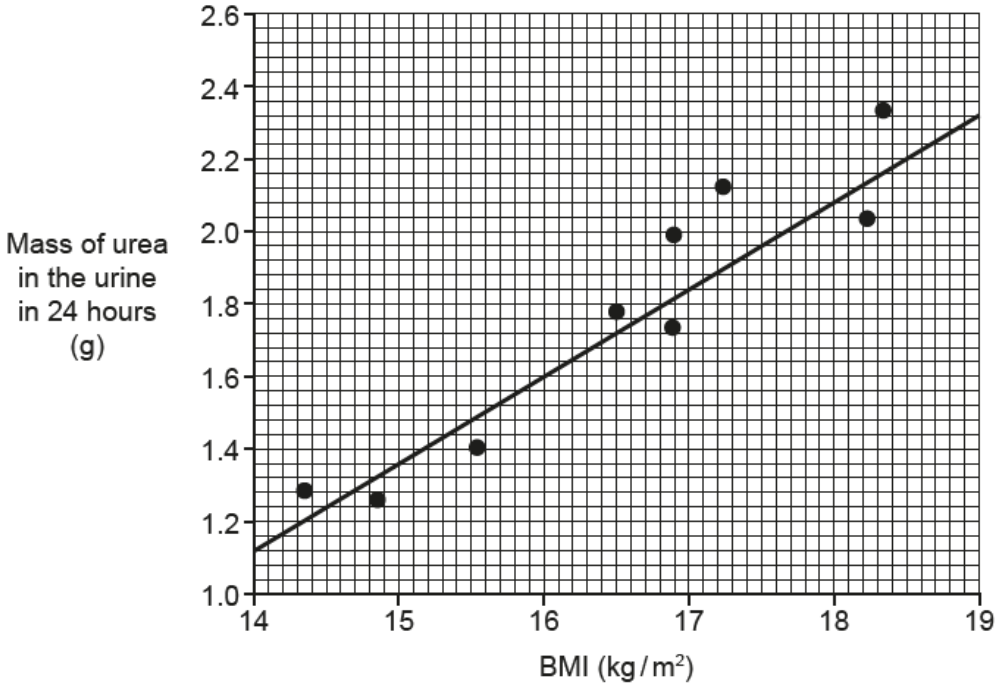


Fig. 22.1

(a) (i) What does the graph show about the relationship between BMI and the mass of urea in the urine?

..... **[1]**

(ii) A boy has a BMI of 16. He produces 1000 cm^3 of urine in 24 hours.

Calculate the concentration of urea in the boy's urine.

Concentration = ...g/cm^3

[2]

(iii) **Fig. 22.2** shows the mass of urea in the urine against the BMI for nine **different** boys.

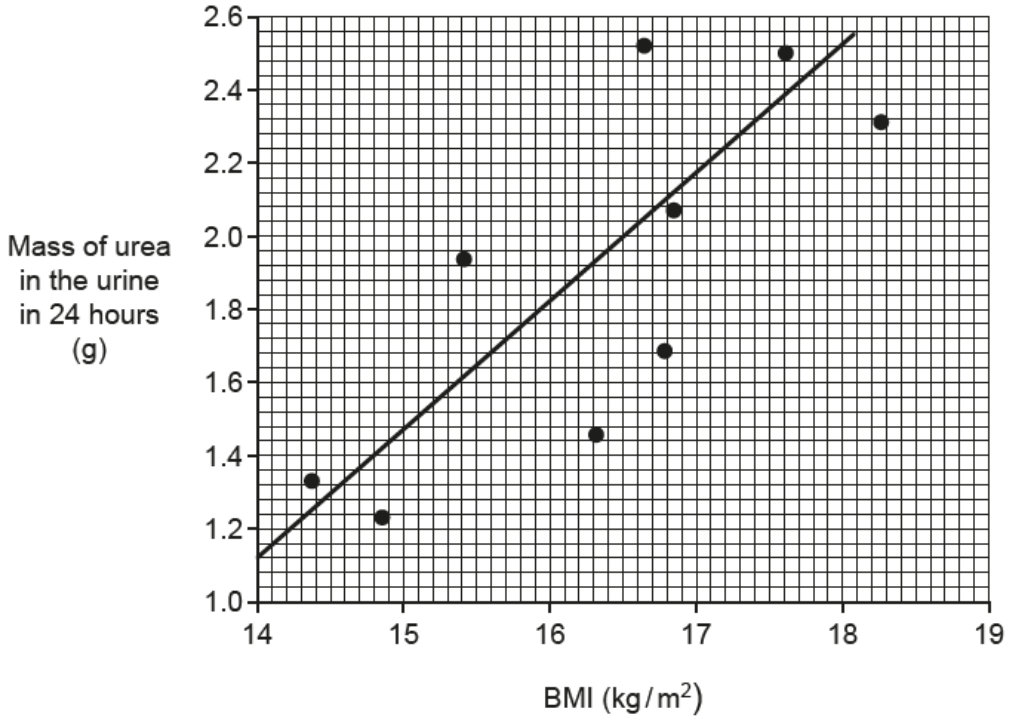


Fig. 22.2

Give **two** differences in the relationship between BMI and the mass of urea in the urine shown in **Fig. 22.1** and **Fig. 22.2**.

1 .....

.....

2 .....

.....

[2]

(b) The kidney filters the blood. The fluid produced by filtering the blood passes through kidney tubules.

Each kidney tubule contains a number of different parts.

Put a number (**1** to **5**) in the boxes to show the order of the parts that the liquid passes through.

The first one has been done for you.

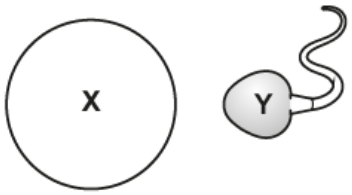
Bowman's capsule	**1**
Collecting duct	
Proximal convoluted tubule	
Loop of Henlé	
Second coiled region	

[3]

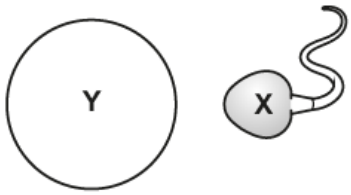
16. Nov 2020/Paper_J247/02/No.10

The diagrams show gametes and sex chromosomes.

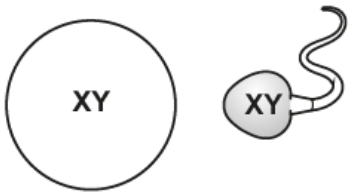
Which diagram shows the correct combination of sperm and egg to produce a **male** baby?



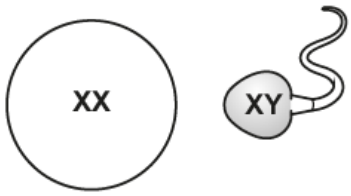
A



B



C



D

Your answer ☐ **[1]**

17. Nov 2020/Paper_J247/02/No.11

Gregor Mendel studied the inheritance of characteristics in pea plants.

Which of these is a possible reason why he chose pea plants for his experiments?

A Pea plants can produce many offspring, quite quickly.

B Pea plants can reproduce asexually.

C Pea plants do not develop mutations.

D Pea plants do not produce gametes.

Your answer ☐ **[1]**

18. Nov 2020/Paper_J247/02/No.12

Tigers have a diploid number of 38 chromosomes.

How many chromosomes are present in a tiger sperm cell?

A 2

B 19

C 38

D 72

Your answer ☐ **[1]**

19. Nov 2020/Paper_J247/02/No.13

What is meant by the term **natural classification**?

A Classifying organisms according to their uses.

B Classifying organisms using many of their common characteristics.

C Using a key to classify organisms.

D Using a single feature to classify organisms.

Your answer ☐ **[1]**

20. Nov 2021/Paper_J247/03/No.2

Q_{10} is a measure of the rate of change of a reaction when temperature is increased by 10 °C.

Q_{10} is calculated using this formula:

Q_{10} = rate at higher temperature ÷ rate at lower temperature

An enzyme reaction has a rate of 36 units / min at 30 °C and 16 units / min at 20 °C.

What is the Q_{10} for this enzyme?

A 0.44

B 2.25

C 20

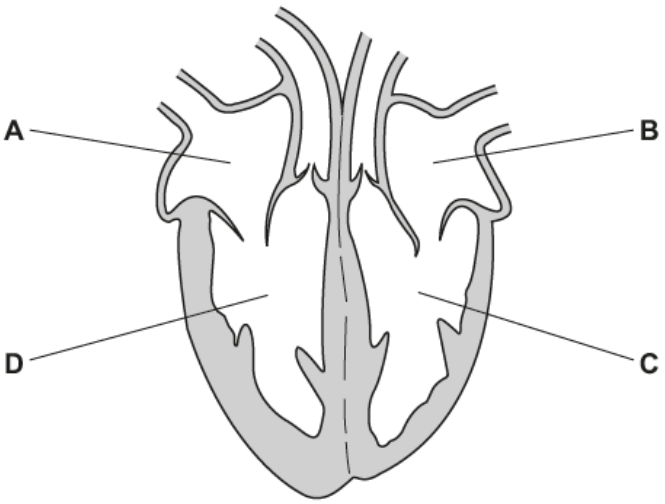
D 576

Your answer ☐ **[1]**

21. Nov 2021/Paper_J247/03/No.3

People with situs inversus have their organs reversed so they are a 'mirror image' of the usual arrangement.

The diagram shows the heart from someone with situs inversus, viewed from the front.

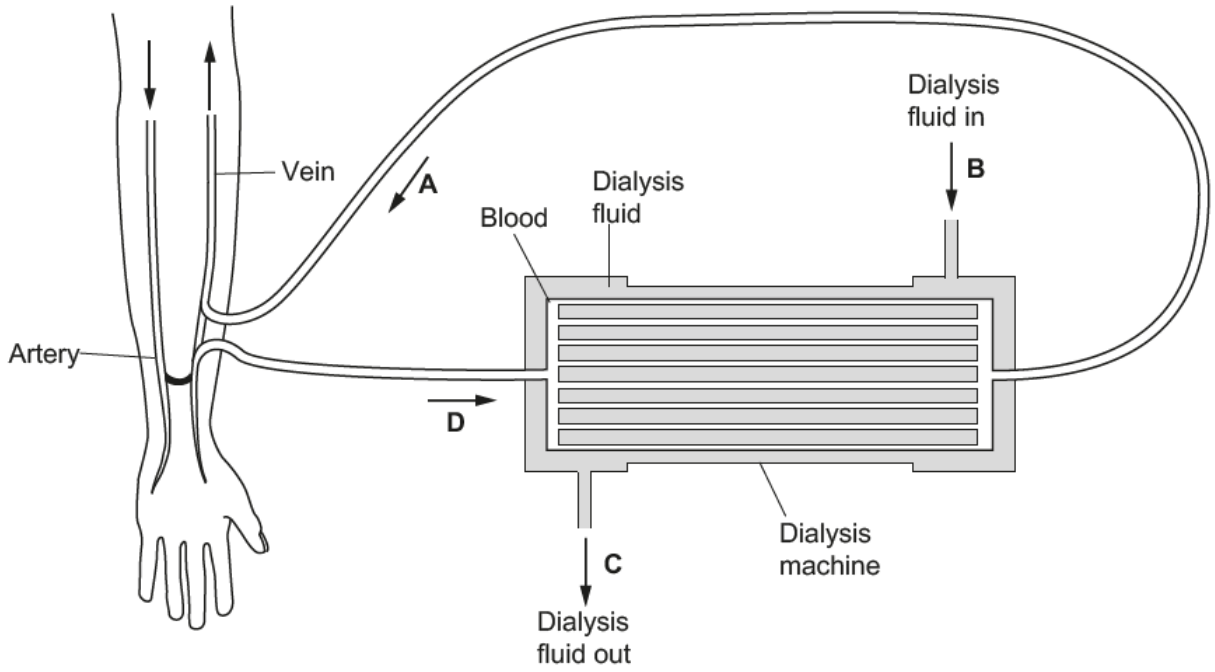


Which chamber pumps blood to the lungs in someone with situs inversus?

Your answer ☐ **[1]**

22. Nov 2021/Paper_J247/03/No.10

A dialysis machine is shown in the diagram. The dialysis machine functions in a similar way to the kidney tubule (nephron).



Which letter shows the part of the dialysis machine that represents the collecting duct of the kidney tubule?

Your answer ☐ [1]

23. Nov 2021/Paper_J247/03/No.11

Which description identifies the effect of ADH on the collecting duct of the kidney tubule?

A ADH decreases permeability to water, decreasing reabsorption.

B ADH decreases permeability to water, increasing reabsorption.

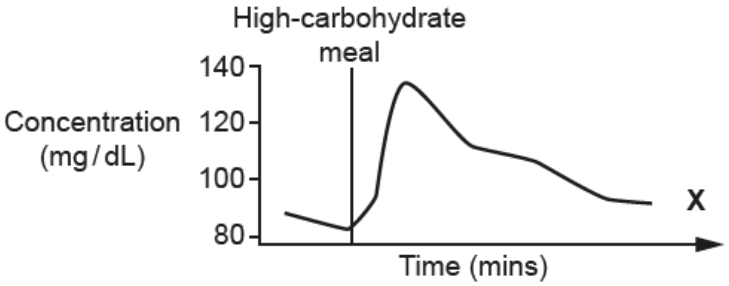
C ADH increases permeability to water, decreasing reabsorption.

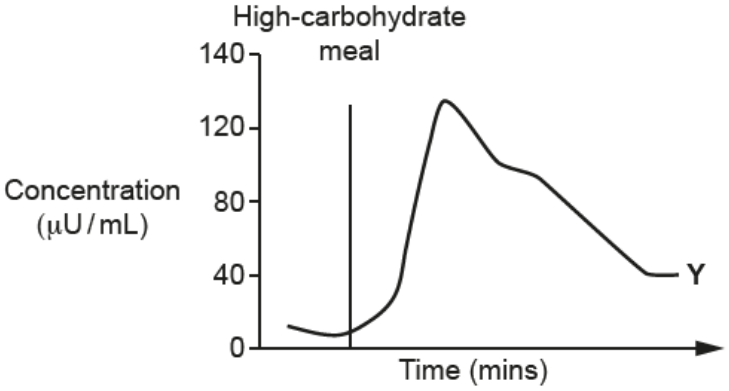
D ADH increases permeability to water, increasing reabsorption.

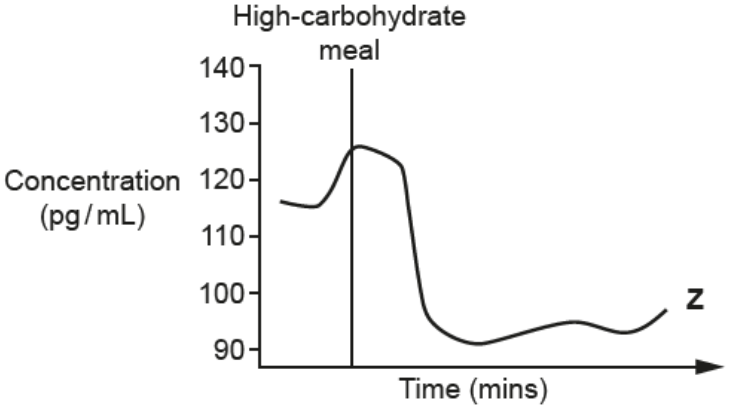
Your answer ☐ [1]

24. Nov 2021/Paper_J247/03/No.12

The graphs show the concentrations of three substances **X**, **Y** and **Z** in the blood after a high carbohydrate meal. One of the substances is glucose and the other two are hormones.







Which row of the table identifies substances **X**, **Y** and **Z**?

	Substance X	Substance Y	Substance Z
A	glucagon	insulin	glucose
B	glucose	glucagon	insulin
C	insulin	glucose	glucagon
D	glucose	insulin	glucagon

Your answer ☐ **[1]**

25. Nov 2021/Paper_J247/03/No.13

Which description is **not** a use of plant hormones by people?

A As a selective herbicide.

B To control the translocation of sugars in phloem.

C To produce roots on plant cuttings.

D To stimulate parthenocarpy for fruit development.

Your answer ☐ **[1]**

26. Nov 2021/Paper_J247/03/No.15

A cheek cell is 70 μm and a red blood cell 7 μm.

What is the order of magnitude difference between a cheek cell and a red blood cell?

A 0

B 1

C 2

D 3

Your answer ☐ **[1]**

27. Nov 2021/Paper_J247/03/No.19

This question is about homeostasis.

(a) Explain why homeostasis is important for metabolism in humans.

.....

.....

.....

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

(b) **(i)** In humans, the skin is involved in homeostasis.

Changes of blood flow in the skin occur in colder environments.

Describe **two** other changes that occur in the skin in colder environments.

1 .....

.....

2 .....

.....

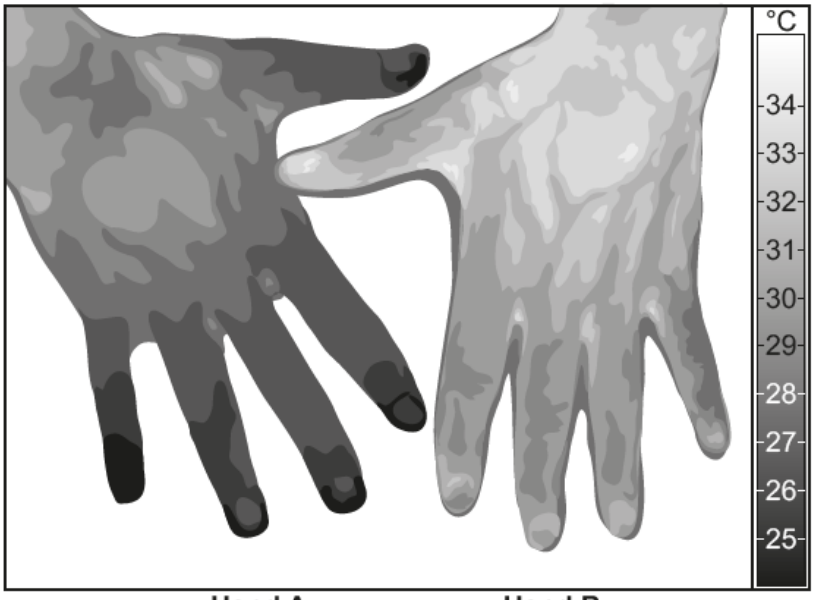
[2]

(ii) Give **one** way that the structure of blood vessels allows them to change blood flow in the skin.

.....

..... **[1]**

(iii) Raynaud's disease produces a poor flow of blood to the skin.
The thermograph image shows changes in temperature at the skin surface.



Explain which hand is from a person with Raynaud's disease.

.....

.....

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

(c) Thyroxine hormone levels in the body are maintained about a fixed point.

Explain how variables in the body are maintained about a fixed point.

.....

.....

.....

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

28. Nov 2021/Paper_J247/03/No.20

(a) **(i)** Adrenaline is produced by the body and prepares it for vigorous exercise.

Complete the sentences about adrenaline.

Adrenaline is a hormone made by ..... glands.

Hormones are ..... messengers that travel in the blood.

[2]

(ii) Explain how **two** changes caused by adrenaline prepare muscles for exercise.

1 .....

.....

.....

2 .....

.....

.....

[2]

(iii) Explain how muscle cells get the energy needed to work during exercise.

.....

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

(b) The heart pumps blood through two systems:

- A pulmonary circuit that goes to and from the lungs.
- A systemic circuit that goes to the rest of the body and back to the heart.

(i) Which chamber of the heart receives blood from the pulmonary circuit?

..... **[1]**

(ii) Which structure in the heart controls the direction of blood flow between the left atrium and left ventricle?

..... **[1]**

(iii) Which tissue in the wall of the heart contracts to pump the blood?

..... **[1]**

(c) Desert marathons take place in extreme heat. High external temperatures can cause dehydration.

Fig. 20.1 and **Fig. 20.2** show some of the effects of dehydration on the body during a race.

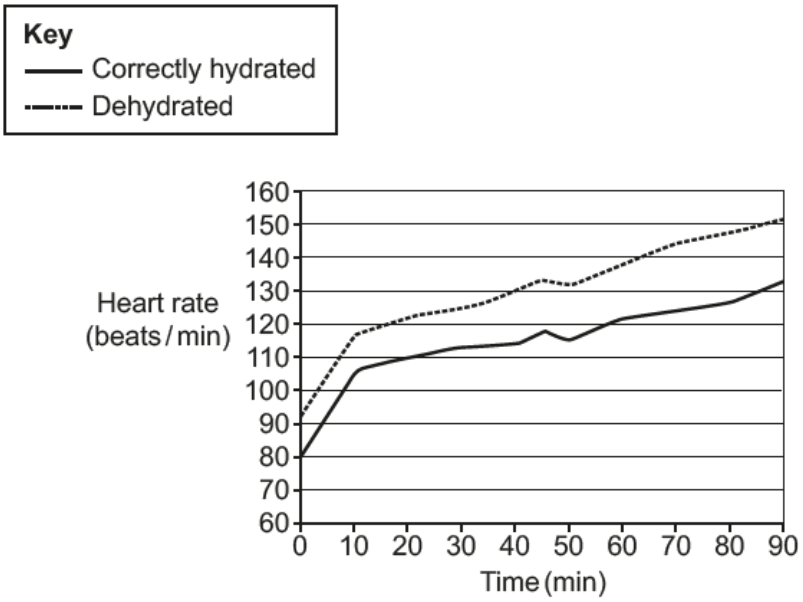


Fig. 20.1

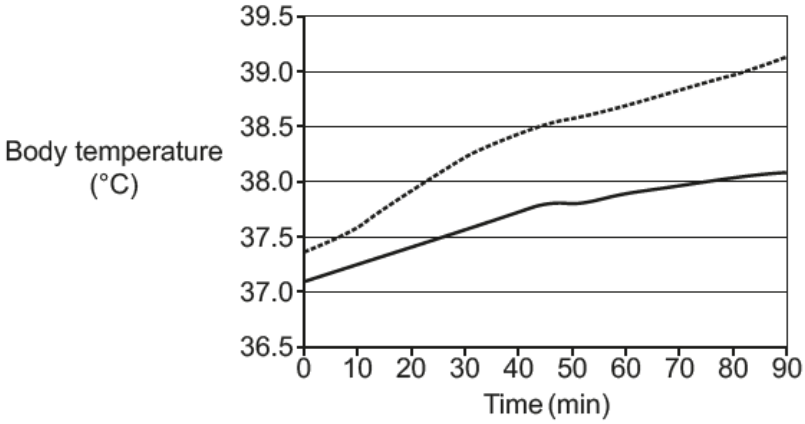


Fig. 20.2

(i) Explain the changes shown by the graphs in **Fig. 20.1** and **Fig. 20.2**.

.....

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.....

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..... **[4]**

(ii) Suggest what an athlete could do in advance to minimise the effect of these challenges during a desert marathon.

.....

.....

.....

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

29. Nov 2020/Paper_J247/03/No.3

Which row shows the correct direction of blood flow through a double circulatory system?

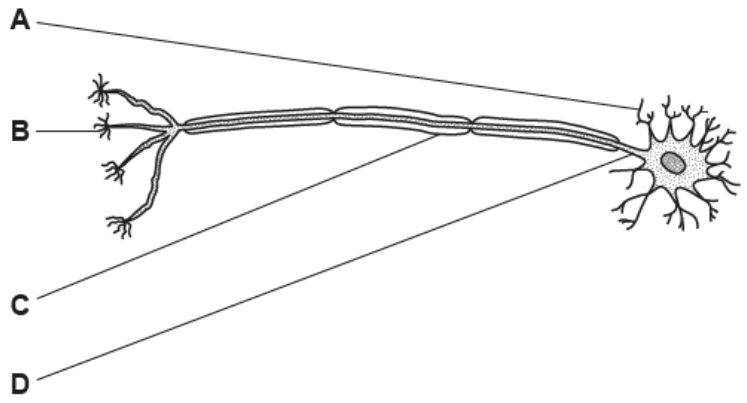
A	left side of heart	→	body organs	→	right side of heart	→	lungs
B	left side of heart	→	lungs	→	right side of heart	→	body organs
C	right side of heart	→	body organs	→	lungs	→	left side of heart
D	right side of heart	→	lungs	→	body	→	left side of heart

Your answer ☐ **[1]**

30. Nov 2020/Paper_J247/03/No.10

A motor neurone is usually stimulated by a relay neurone.

Which part of the motor neurone is first stimulated by a relay neurone?



Your answer ☐ **[1]**

31. Nov 2020/Paper_J247/03/No.11

In people with multiple sclerosis their immune cells stop working as they should. HSCT is a treatment for multiple sclerosis which destroys all the immune cells.

Once the immune cells are destroyed, cells from a patient's bone marrow can replace the immune cells.

What type of cell is used to replace the destroyed immune cells?

A Neurone cell

B Red blood cell

C Stem cell

D White blood cell

Your answer ☐ **[1]**

32. Nov 2020/Paper_J247/03/No.12

A side effect of some antibiotics is to inhibit the release of thyroxine into the blood.

What will these antibiotics do to levels of TSH and TRH?

A Both decrease

B Both increase

C Both stay the same

D TSH increases and TRH decreases

Your answer ☐ **[1]**

33. Nov 2020/Paper_J247/03/No.16

Some students investigate the effect of the surface area : volume ratio on the rate of diffusion in animal cells.

They use hydrochloric acid and gelatine cubes that have been stained blue using a pH indicator solution. The indicator will turn red in acidic conditions.

They put different sized cubes into 3 different test tubes of hydrochloric acid and time how long it takes for the cubes to completely change to red.

Fig. 16.1 shows the apparatus they use.

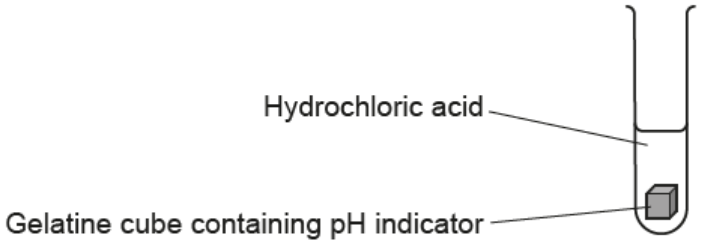


Fig. 16.1

The table shows the students' results.

Length of each side of the cube (mm)	surface area : volume ratio	Time to completely change colour (seconds)
2	.....	32
4	3 : 2	61
6	1 : 1	170

(a) (i) Calculate the surface area : volume ratio for the cube with sides of 2 mm.

surface area : volume ratio = ... **[2]**

(ii) What conclusion can be made about the effect of surface area : volume ratio on the rate of diffusion?

.....

..... **[1]**

(iii) Emphysema causes some of the walls of alveoli in the lungs to break down. This produces a smaller number of larger air sacs.

Use the results to explain the effect of emphysema on oxygen diffusing into the blood.

.....

.....

.....

.....

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

(b) In a condition called sickle cell anaemia, the red blood cells can change shape. This reduces the amount of oxygen getting to cells in the body.

Fig. 16.2 shows a red blood cell and a sickled red blood cell.

Red blood cell **Sickled red blood cell**

Fig. 16.2

Explain why sickle cell anaemia reduces the amount of oxygen getting to cells in the body.

.....

.....

.....

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

(c) Red blood cells burst when they are placed in a solution with a much higher water potential than the red blood cells. This is called lysis.

Explain why lysis happens.

.....

.....

.....

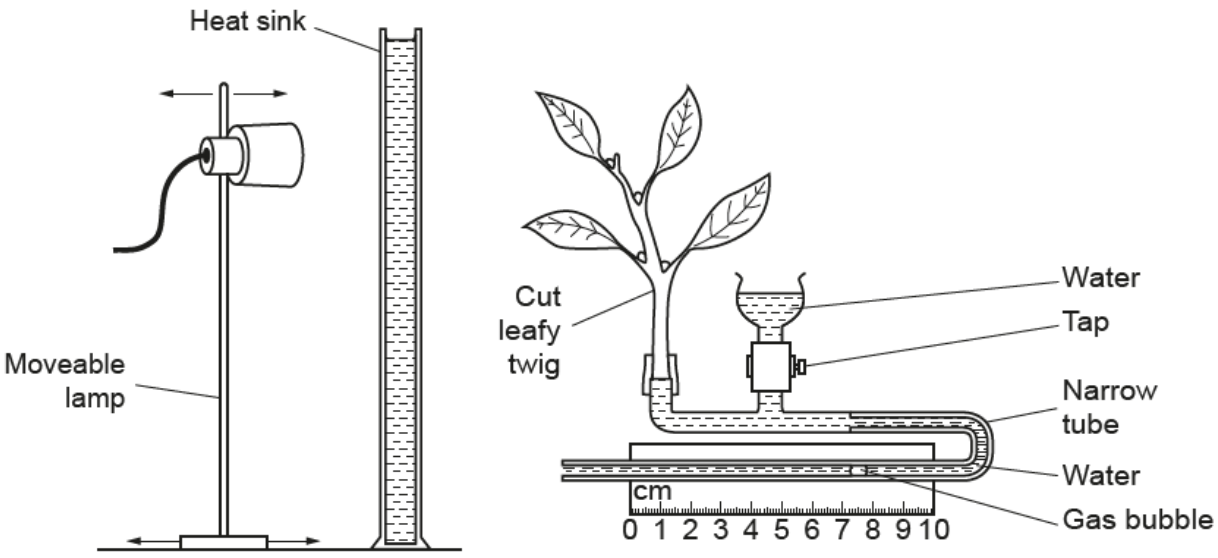
.....

..... **[3]**

34. Nov 2020/Paper_J247/03/No.19

The diagram shows a simple potometer.

The apparatus can be used to investigate the effect of light intensity on transpiration rates.



(a) (i) Describe what happens during transpiration.

.....

.....

.....

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

(ii) Describe how the apparatus can be used to investigate the effect of light on transpiration rates.

.....

.....

.....

.....

..... **[3]**

(iii) The heat sink is a transparent tube of cold water.

Explain why a heat sink is used in this experiment.

.....

.....

.....

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

(b) The table shows the results from using the potometer.

Distance of potometer from the light (cm)	Distance gas bubble moved in one minute (mm)		
	Trial 1	Trial 2	Trial 3
10	70	74	72
20	73	75	71
30	52	49	51
40	42	30	31
50	12	14	13

(i) The mean distance the gas bubble moved along the tube at 10 cm from the light was 72 mm.

The diameter of the narrow tube was 1 mm.

Calculate the volume of water taken up by the plant.

Use the equation: volume = $\pi r^2 l$
where r is the radius of the tube and l is the distance the bubble moves
$\pi = 3.14$

Give your answer to **2** significant figures.

Volume of water = ... mm^3 / minute **[3]**

(ii) Identify the anomalous reading in their recorded results and suggest a possible reason for this.

.....

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

(iii) How should the scientists deal with this anomalous reading when they process the data?

.....

..... **[1]**

(iv) The scientists described their results for **20 cm** as 73 ± 2.
Explain why they did this.

.....

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

35. Nov 2020/Paper_J247/03/No.20

(a) Carolina horsenettle is a weed that grows in crop fields in the USA.

New horsenettle shoots develop from buds on roots in spring. The shoots die in the autumn but the roots remain alive under the ground.

Effective weed control involves stopping seed production and killing the root system.

Selective herbicides are used to control Carolina horsenettle.

The best time to apply selective herbicide is when the horsenettle is actively growing between the bud and flower stage.

(i) Describe how a selective herbicide works.

.....

.....

.....

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

(ii) **Fig. 20.1** and **Table 20.1** show information about four different herbicides **A**, **B**, **C** and **D**.

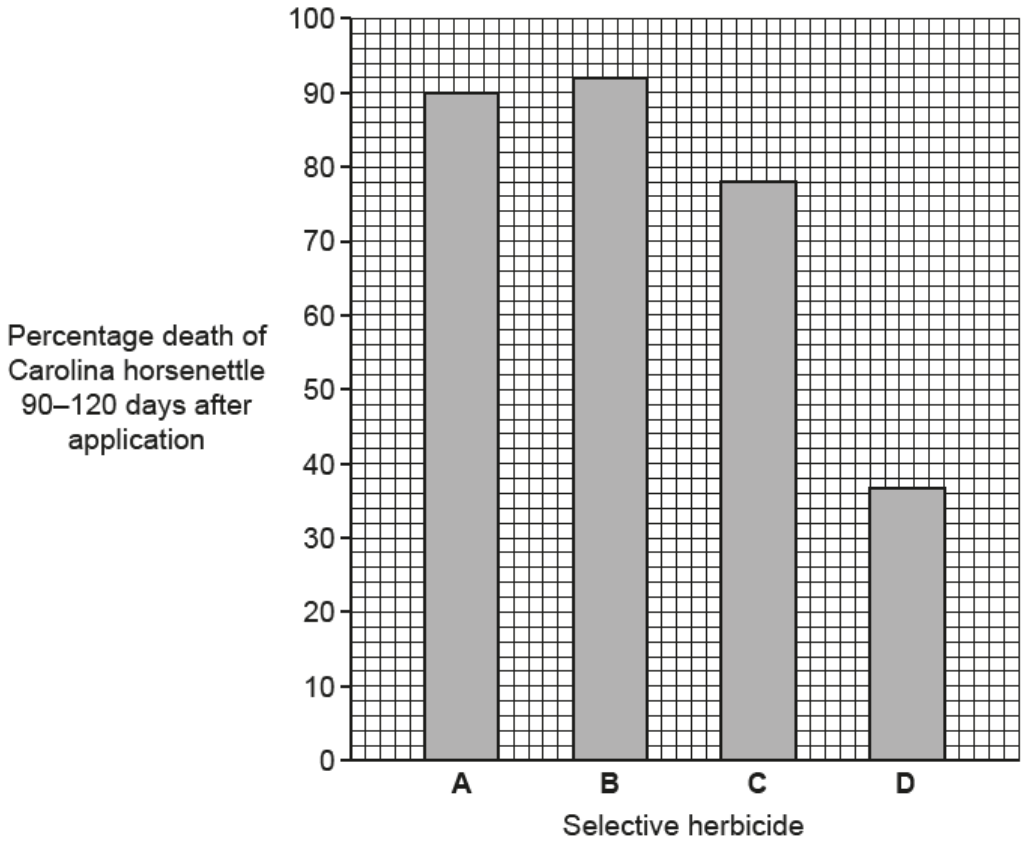


Fig. 20.1

Selective herbicide	A	B	C	D
Effect on Carolina horsenettle	prevents seeds and roots of plants growing	prevents seeds and roots of plants growing	prevents seeds and roots of plants growing	prevents shoot growth and fruiting but minimal damage to roots
What plants herbicide works on	Carolina horsenettle	Carolina horsenettle and several other broad-leaved plant species	Carolina horsenettle	Carolina horsenettle and most other broad-leaved plant species
Cost of herbicide	medium	high	medium	low

Table 20.1

Carolina horsenettle is growing in a field with a crop and other broad-leaved weeds.
Evaluate the information on selective herbicides **A**, **B**, **C** and **D**.

Which selective herbicide would be best to use and when it should be applied?
Explain your decision.

.....

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.....

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.....

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.....

.....

..... **[4]**

(b) **(i)** Describe **one** effect that gibberellin hormones have on plants.

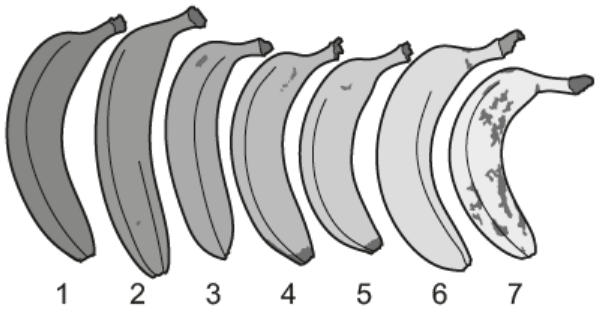
..... **[1]**

(ii) A student investigates ripening in bananas.

The student keeps bananas in different conditions. After 1 week he decides if each banana was **ripe** or **not ripe**.

The results were difficult to interpret so he planned to develop the experiment.

He found a picture that he thought he could use.



Explain how this could help develop his experiment.

.....

.....

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

(c) A process in cells is involved in producing a chemical that causes ripening of fruit.
Look at **Fig. 20.2**.

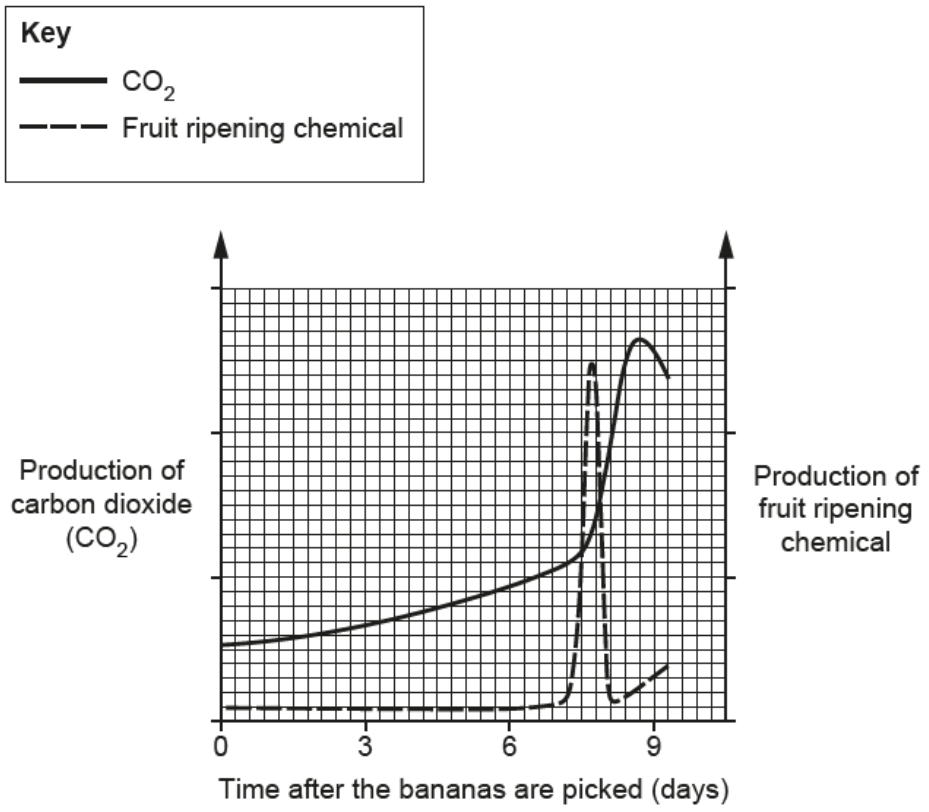


Fig. 20.2

Use evidence from **Fig. 20.2** to suggest what this process might be.

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.....

.....

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