19 Which substance has a main constituent that contains only one carbon atom per molecule?

A bitumen
B kerosene
C naphtha
D natural gas

20 Which statement about vegetable oil and margarine is correct?

A Both vegetable oil and margarine are liquids at room temperature.
B Margarine has a higher melting point than vegetable oil.
C Vegetable oil has fewer carbon-carbon double bonds than margarine.
D Vegetable oil is made from margarine by hydrogenation.

21 A cell is being examined.

Which feature would enable you to identify it as a plant cell or an animal cell?

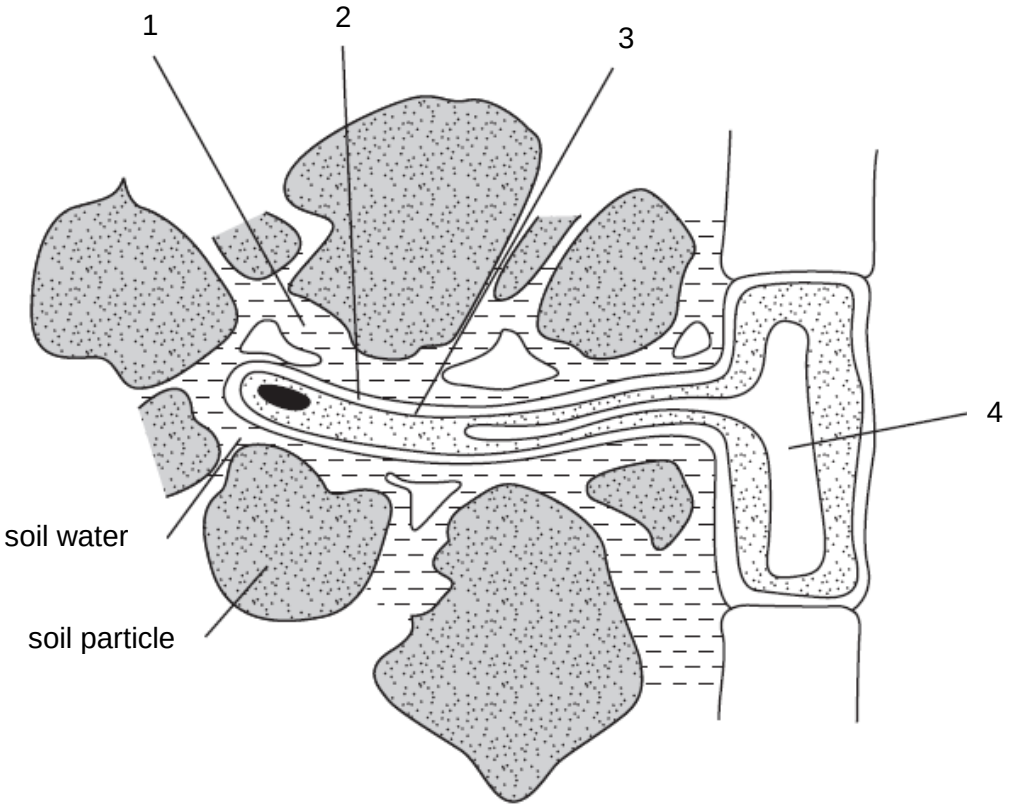
A The cell contains a single large sap vacuole space.

B The cell contains glucose and amino acids.

C The cell contains stored fat.

D The cell surface membrane is partially permeable.

22 The diagram shows a root hair cell and surrounding soil particles.

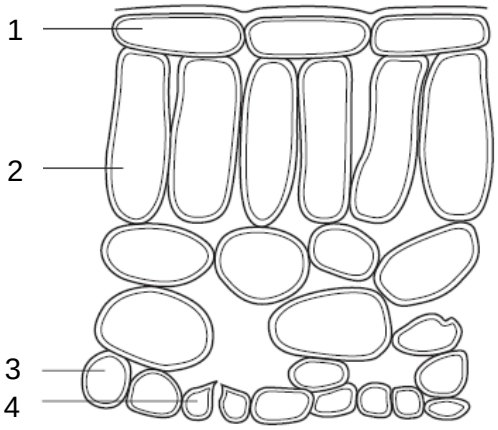


Osmosis occurs when solutions of different water potential are separated by a partially permeable membrane.

For root hair cell to absorb water, which of the following correctly identifies the regions and partially permeable membrane?

	higher water potential	partially permeable membrane	lower water potential
A	1	2	4
B	1	3	4
C	4	2	1
D	4	3	1

23 The diagram shows the arrangement of cells inside the leaf of a green plant.
(No cell contents are shown.)



Which cells normally contain chloroplasts?

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

24 Protease enzyme breaks down protein to amino acids.

In the 'lock and key' hypothesis, what is the lock and what is the key?

	'lock'	'key'
A	amino acid	protease
B	protease	amino acid
C	protease	protein
D	protein	protease

25 The diagram shows the shape of a red blood cell.

What is an advantage of this shape?

A allows it to carry more haemoglobin

B allows it to move more quickly in arteries

C increases its surface area for diffusion

D prevents it getting trapped in valves in veins

26 Which of the following happens to the excess amino acids in the blood?

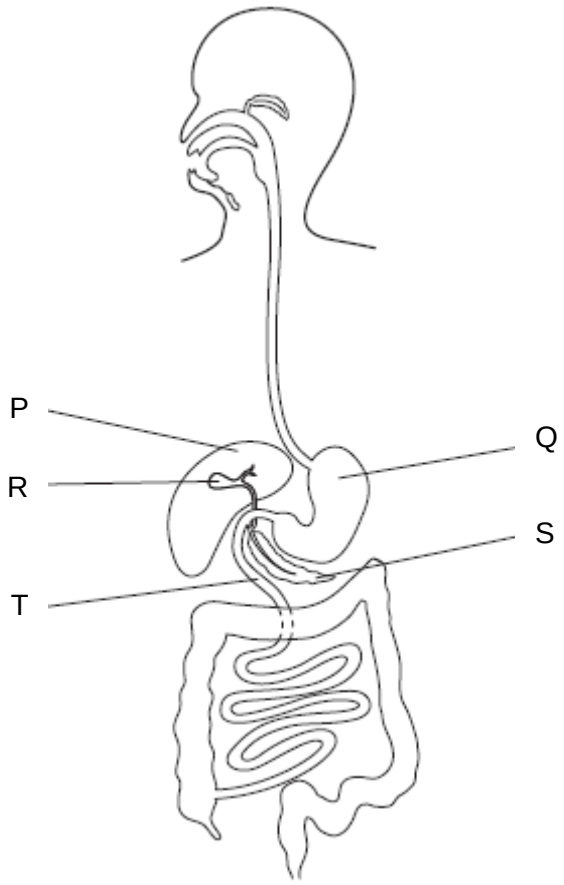
A broken down to urine in the bladder

B broken down to urine in the liver

C broken down to urea in the bladder

D broken down to urea in the liver

27 The diagram shows the human gut.



Where is bile made, where is it stored and where does it act?

	where it is made	where it is stored	where it acts
A	P	Q	R
B	P	R	T
C	Q	S	P
D	Q	T	S

28 Which of the following will likely result in a dangerously high level of blood glucose in a diabetic patient?

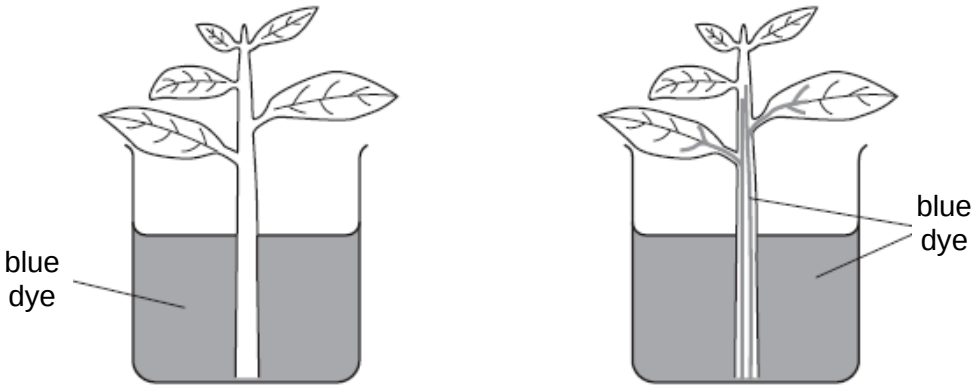
A caused by eating too much fat

B reduced frequency of insulin injections

C losing too much water by sweating

D not producing enough glucagon

29 A piece of a plant with a transparent stem was placed in a beaker containing a blue dye and then examined 5 hours later.



start 5 hours later

Which statement explains the change in appearance?

A Blue dye diffuses through the cells of the plant.

B Blue dye diffuses up the stem by osmosis.

C Blue dye moves up through the phloem.

D Blue dye moves up through the xylem.

30 Four similar leafy shoots are exposed to different conditions. The rates of water uptake and the rates of water loss are measured.

The results are shown in the table.

Which shoot is most likely to wilt?

	water uptake /mm^3 per min	water loss /mm^3 per min
A	5	2
B	5	5
C	10	8
D	10	12

31 A woman has fewer platelets than normal.

What would be the effect of this?

A Her blood contains high levels of urea.

B Her blood does not clot properly.

C Her body cells do not get enough oxygen.

D She cannot fight off infections.

32 Which is the correct route for blood flow in a human?

A left atrium → left ventricle → lungs → right ventricle → right atrium

B left atrium → left ventricle → right ventricle → right atrium →lungs

C right atrium → right ventricle → left ventricle → left atrium →lungs

D right atrium → right ventricle → lungs → left atrium →left ventricle

33 A boy looks at his mother standing next to him, then looks at an ice cream shop about 1 kilometer away.

Which of the following correctly describes the changes in the components of his eye in producing a focused image as he looks away from his mother to look at the ice cream shop?

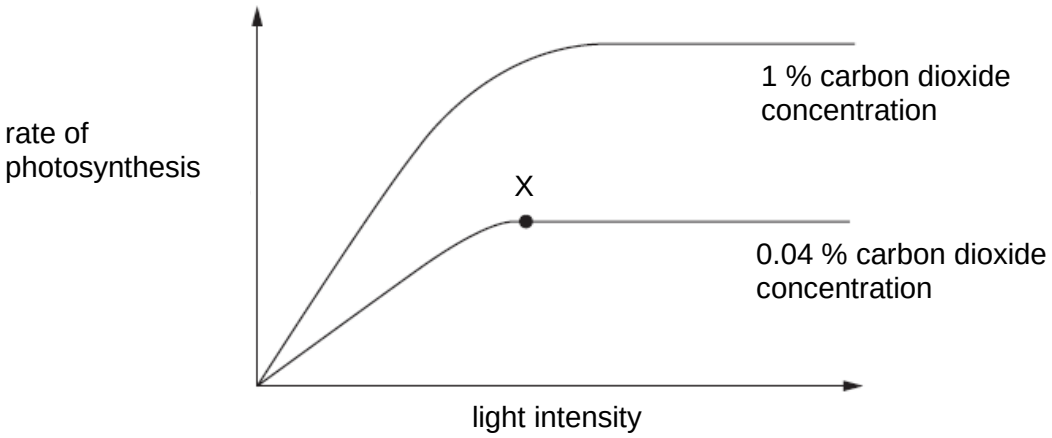
A ciliary muscles contract → suspensory ligament become taut → lens become less convex

B ciliary muscles contract → suspensory ligament slacken → lens become more convex

C ciliary muscles relax → suspensory ligament become taut → lens become less convex

D ciliary muscles relax → suspensory ligament slacken → lens become more convex

34 The graph below shows how the rate of photosynthesis in a plant varies with light intensity at two different carbon dioxide concentrations. The temperature is kept constant at 20 °C.



What is the limiting factor at X?

A carbon dioxide concentration

B light intensity

C temperature

D humidity

35 Which human feature shows discontinuous variation?

A agility

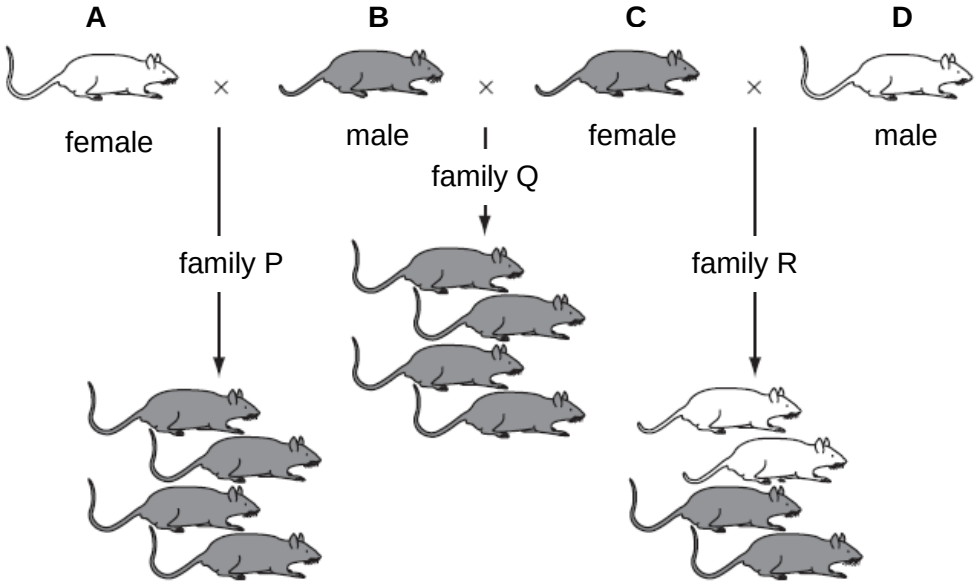
B body height

C obesity

D sickle cell anaemia

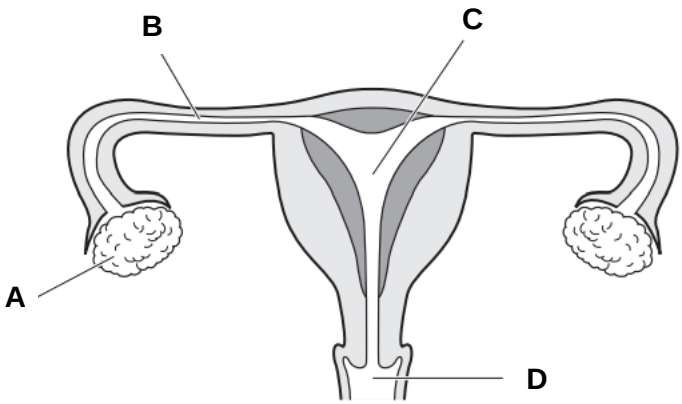
36 The diagram shows the inheritance of coat colour in mice.

Which mouse is heterozygous for coat colour?



37 The diagram shows the female reproductive system.

Where does fertilisation take place?



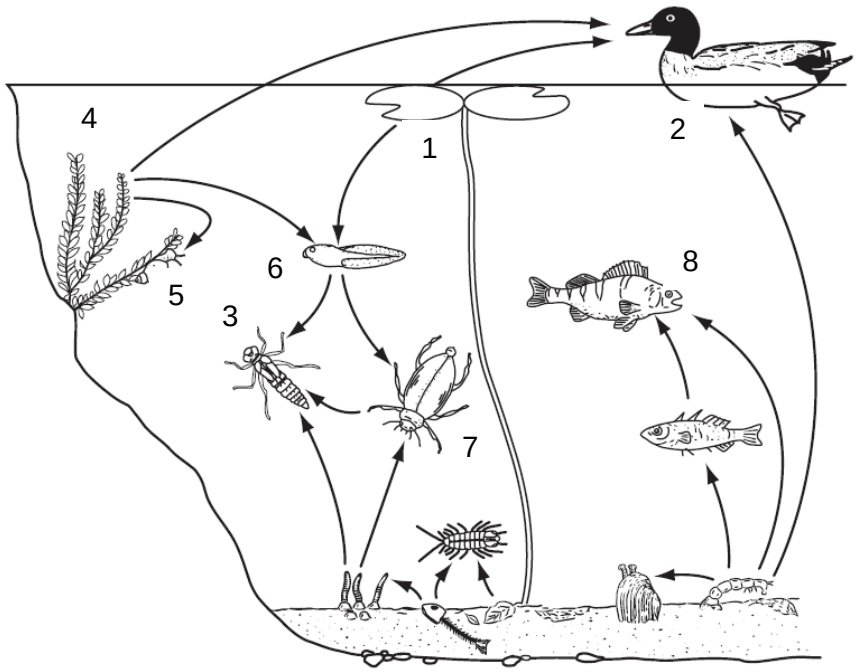
38 The table shows the amount of energy flowing into four trophic (feeding) levels in an ecosystem.

Which letter represents the producers?

trophic level	energy flowing in/ kJ per m^2 per year
A	3
B	32
C	301
D	3000

39 The diagram shows a food web in a freshwater pond.

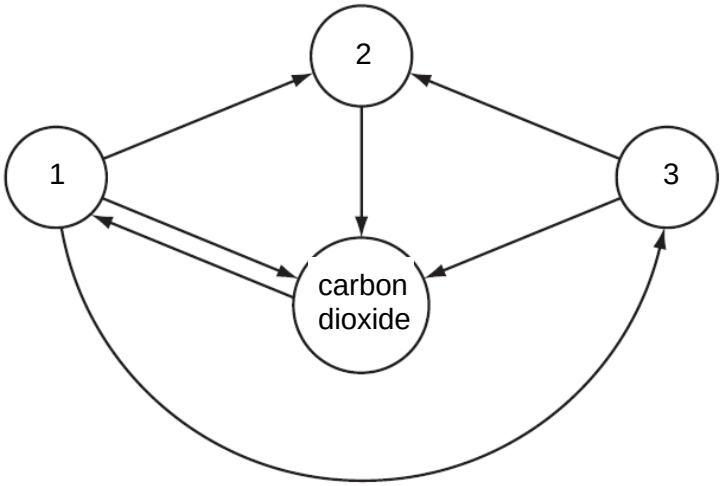
Which of the organisms is a producer, a herbivore or a carnivore?



Which of the organisms is a producer, a herbivore or a carnivore?

	producer	herbivore	carnivore
A	1	6	7
B	2	4	5
C	4	2	6
D	7	3	8

40 In the diagram, arrows represent the movement of carbon compounds in the carbon cycle. The circles represent carbon compounds in animals, decomposers, plants and in the air.



What is represented by each circle?

	1	2	3
A	animals	decomposers	plants
B	decomposers	animals	plants
C	decomposers	plants	animals
D	plants	decomposers	animals

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Name:	Index Number:	Class:

YIO CHU KANG SECONDARY SCHOOL
O-LEVEL PRELIMINARY EXAMINATION 2024
SECONDARY FIVE NORMAL (ACADEMIC)

SCIENCE (BIOLOGY)

Paper 4 5078/04

1 hour 15 minutes

23 August 2024 (Friday)

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the cover page.
Write in dark blue or black ink.
You may use a soft pencil for any diagrams or graphs. Do not use staples, paper clips, glue or correction fluid.

Section A
Answer **all** questions in the spaces provided.

Section B
Answer any **two** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
You are advised to spend no longer than one hour on Section A and no longer than 30 minutes on Section B. At the end of the examination, fasten all your work securely together.

For Examiner's use

Section A	/ 45
Section B	/ 20
Total	/ 65

Parent's / Guardian's signature

Setter: Ms Foo Ger Maine

Section A

Answer **all** the questions in the spaces provided.

1 DNA controls cell function by controlling the production of proteins.

These proteins determine the phenotype of an organism, including blood group in humans.

(a) Describe the structure of a DNA molecule.

……

……

……

……[4]

(b) One parent of a child has brown eyes, and the other parent has blue eyes.

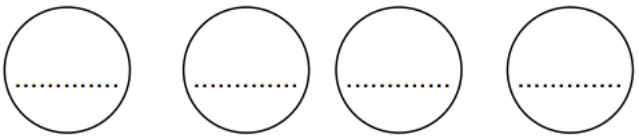
The child has blue eyes.

The parents decide to have another child.

(i) Given that the allele for brown eyes (B) is dominant over the allele for blue eyes (b), complete the genetic diagram in Fig. 1.1 to show the possible eye colours for the second child of these parents.

genotype of parents ..... x .....

gametes



possible genotypes of child ....

possible eye colours of child ....

[4]

Fig. 1.1

1 (b) (ii) State the probability that the second child of these parents:

has the same sex as the first child .....

has the same eye colour as the first child .....

[2]

[Total: 10]

2 **(a)** Fig. 2.1 shows an open stoma on the lower surface of a leaf.

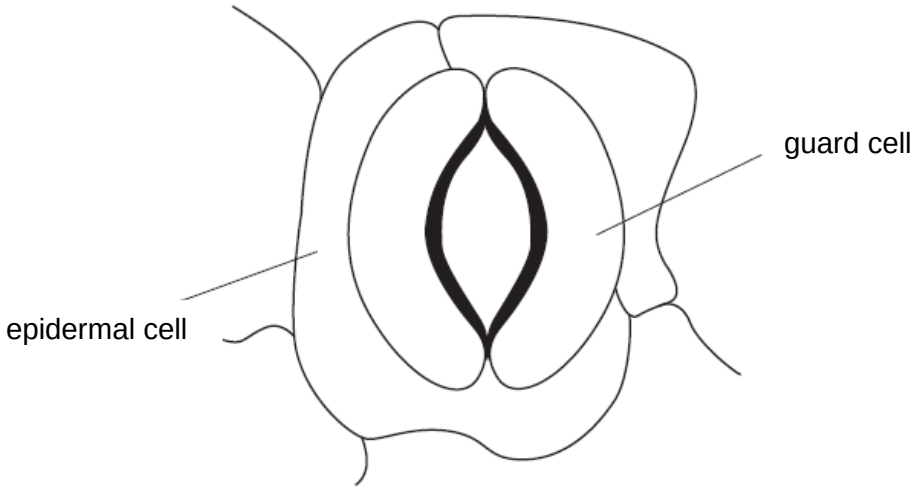


Fig. 2.1

(i) The stoma can open and close. This involves the process of osmosis.

Explain how osmosis is involved in the opening of a stoma.

……...

……..

……..

……..[2]

(ii) The opening of stomata is essential for photosynthesis.

Write the word equation for photosynthesis.

……..[1]

(iii) Explain why the opening of stomata is essential for photosynthesis.

……

……..[1]

2 **(b)** Fig. 2.2 shows how the concentration of sugars in the leaves and stem of a green plant change during a 24-hour period.

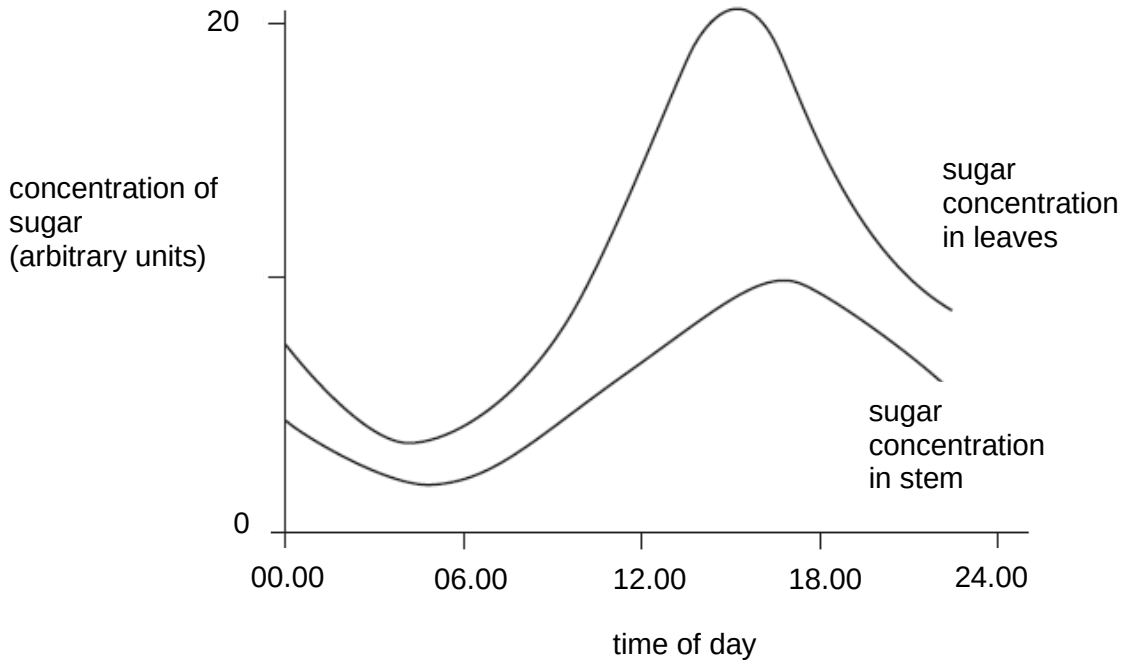


Fig. 2.2

In a green plant, sugar is made by the process of photosynthesis.

(i) Use information from Fig. 2.2 to describe how the rate of photosynthesis in the leaves varies during this 24-hour period.

……..[1]

(ii) Suggest an explanation for these changes in the rate of photosynthesis.

……

……..[1]

(iii) Sugar made in the leaves is transported down the stem to the roots.

How does the graph show that this statement is true?

……

……..[1]

(iv) Through which vessel in the stem is sugar transported?

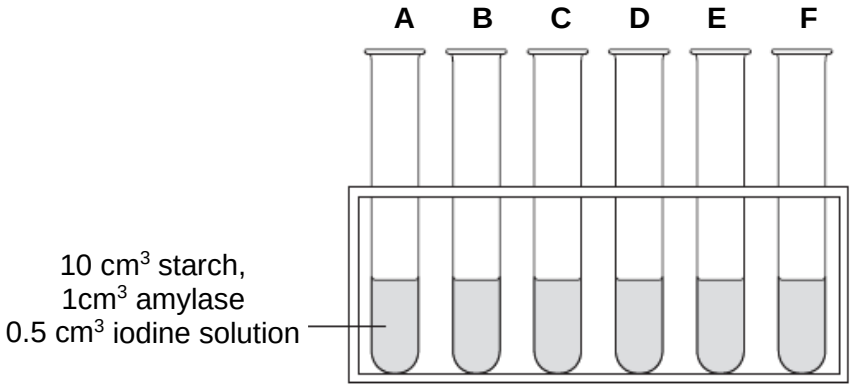
……..[1]

[Total: 8]

3 A student investigated the effect of pH on the reaction between the enzyme amylase and starch.

Six test-tubes were set up, each containing the same volume of iodine solution.
Drops of acid were added to tubes **A**, **B** and **C** to produce a range of pH values.
Amylase was added to all test tubes.
Starch was added to all test-tubes.
All the test-tubes were kept at the same temperature.
The time taken for the mixture in each test tube to change from blue to colourless was recorded.

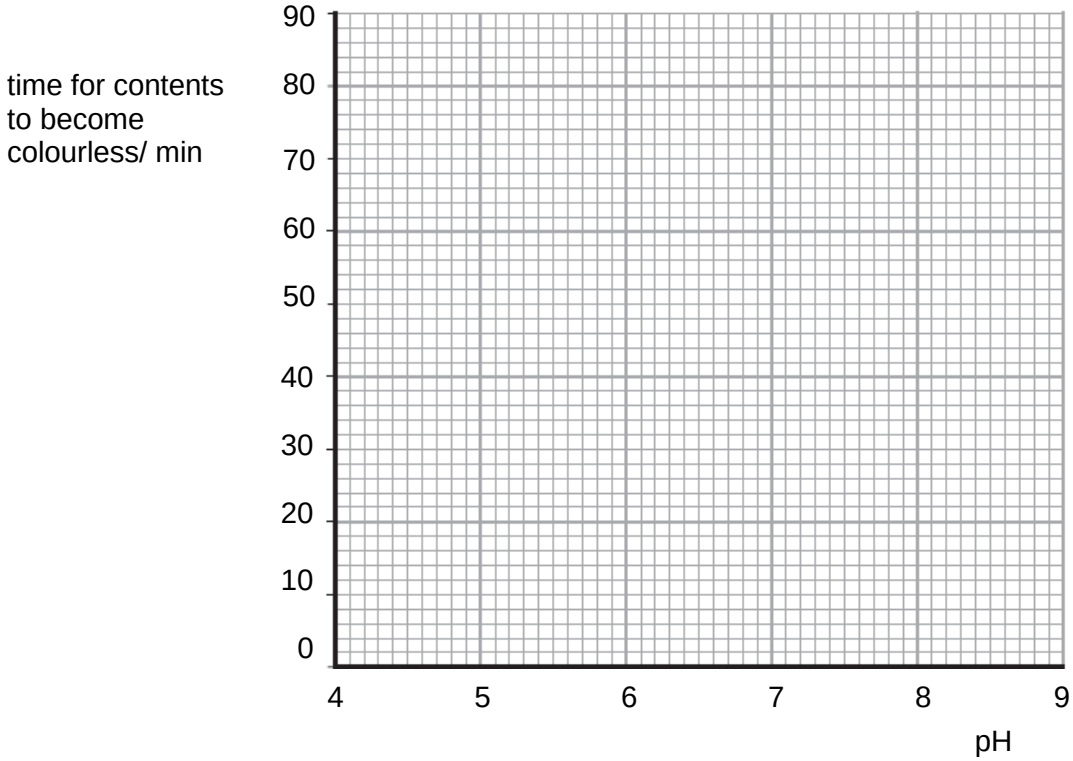
Fig. 3.1 shows the experimental set-up and the results.



pH of contents	4	5	6	7	8	9
time for contents to turn colourless (mins)	75	55	25	5	20	80

Fig. 3.1

(a) (i) On the graph paper below, draw a line graph of the results.



[2]

3 **(a)** **(ii)** State the pH at which the enzyme was the most active.

……..[1]

(iii) Explain why the mixture changed from blue to colourless.

……

……

……

……..[2]

(b) Name **two** parts of the human digestive system where amylase acts.

1 ……..

2 …….. [2]

[Total: 7]

4 **(a)** Fig. 4.1 shows a section through the heart of an unborn baby, showing the hole in the wall between the left and right atria.

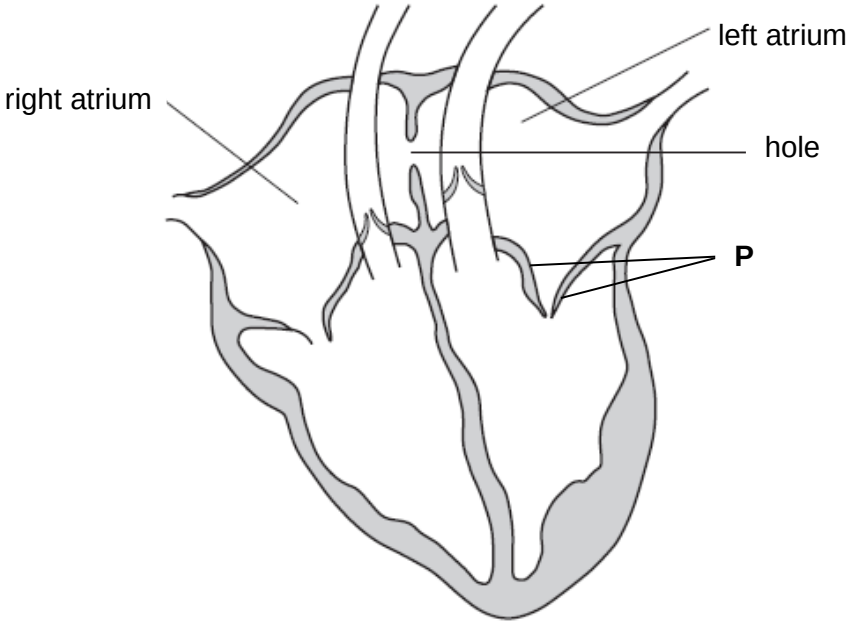


Fig. 4.1

(i) On the diagram, draw a line to name **and** label the following:

1 the blood vessel that carries blood to the lungs

2 the chamber which exerts the highest pressure when its walls contract [2]

(ii) Explain how the presence of this hole will affect the flow of blood through the heart.

……

……..[1]

(iii) Shortly after birth, the hole in the wall between the atria seals itself. In some babies, this does not happen and the baby is said to have a ‘hole in the heart’. This condition may be dangerous if not treated immediately. Explain why.

……

……

……

……..[2]

4 **(a)** **(iv)** State the function of structure **P**.

……

……..[1]

(b) The graph shows the pulse rate and the output of blood from the left side of the heart before, during and after a period of exercise.

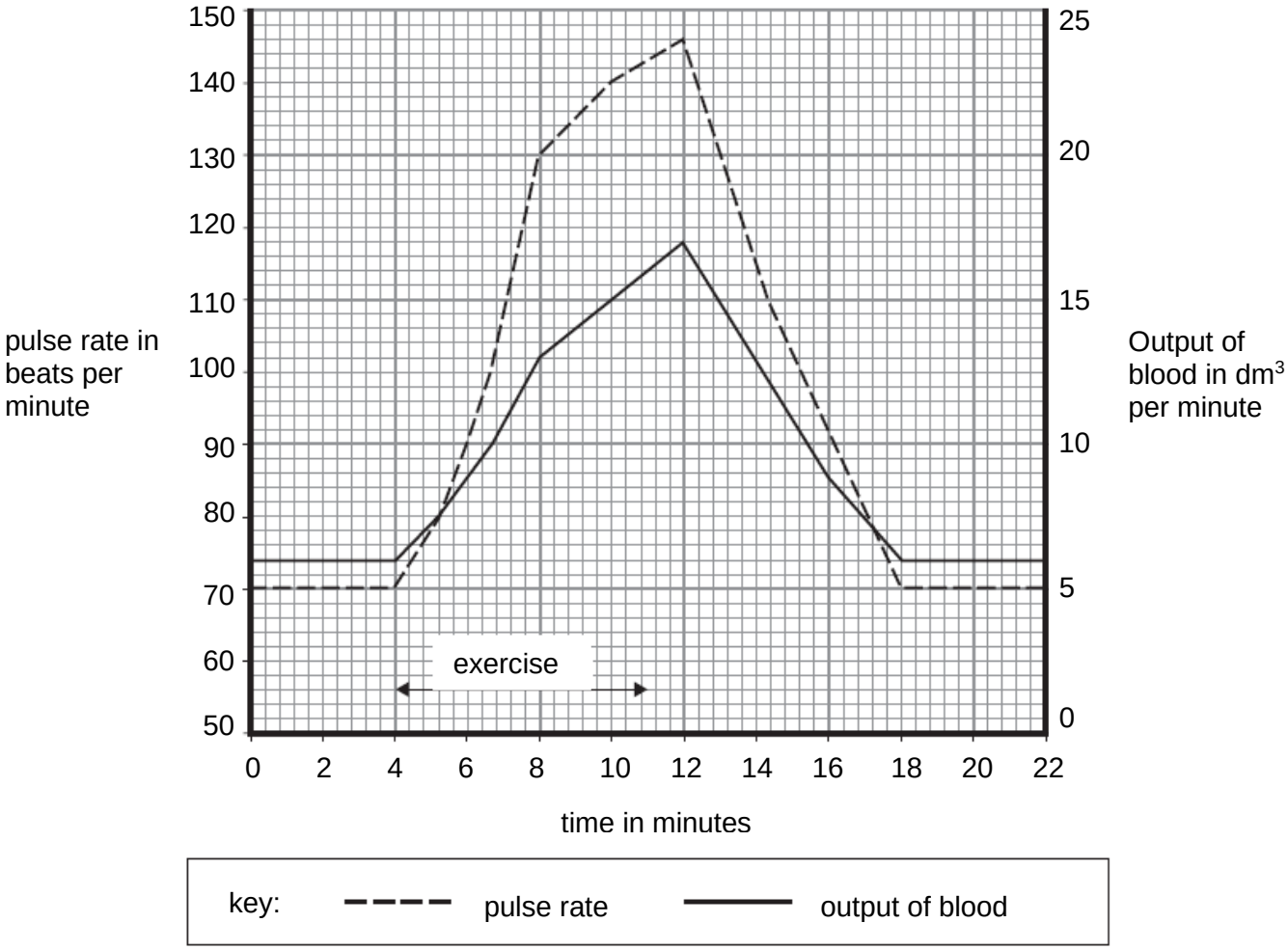


Fig. 4.2

(i) What was the output of blood from the left side of the heart when the exercise ended?

……. dm^3 per minute [1]

(ii) How does exercise affect the pulse rate and the output of blood?

……..[1]

[Total: 8]

5 A plant species lives in ponds.

Fig. 5.1 show the whole plant and a section through one of its leaves.

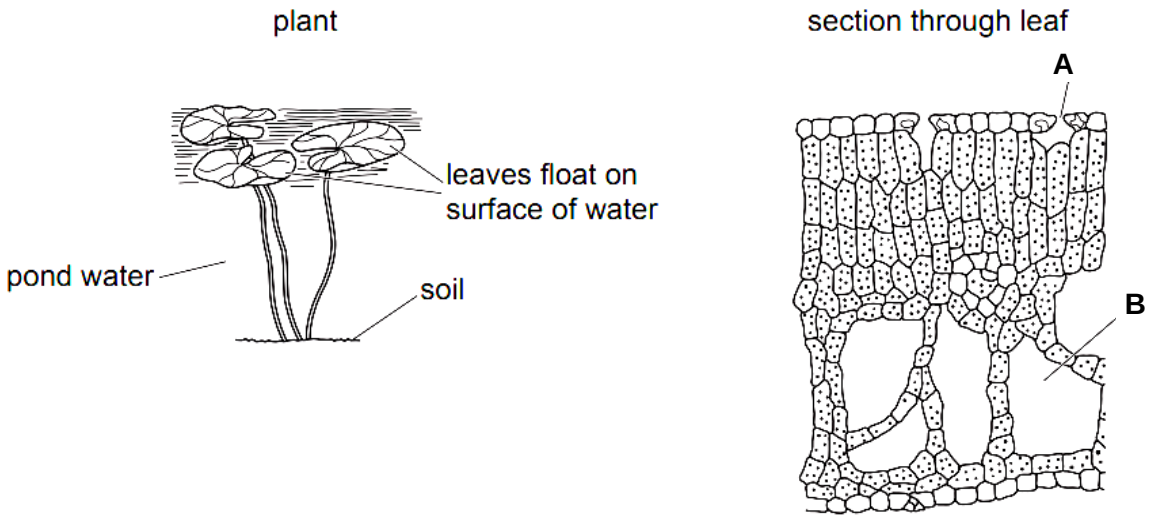


Fig. 5.1

(a) The leaves are adapted to float on the surface of the water.

(i) Suggest **one** advantage to the plant of the leaves floating on the surface of water.

……....

……..[1]

(ii) Name the parts of the leaf labelled **A** and **B**.

A ……

B …… [1]

(iii) With reference to parts **A** and **B**, describe and explain how the structure of the leaf is adapted to a pond environment.

……...

……..

……..

……..[2]

(b) The plant is part of a food web in a pond.

State its trophic level.

……..[1]

[Total: 5]

6 A group of students examined a sample of leaf litter from an oak woodland. They weighed the leaves. They captured and identified all the animals that they could find in the leaf litter. They then divided the animals into two feeding types, those which feed on leaves and those which feed on small animals. They weighed each sample.

The results are shown in the table.

Sample	Mass in grams
Leaves	600
Animals feeding on leaves	80
Animals feeding on small animals	20

(a) Complete the pyramid of biomass for these results in Fig. 6.1.

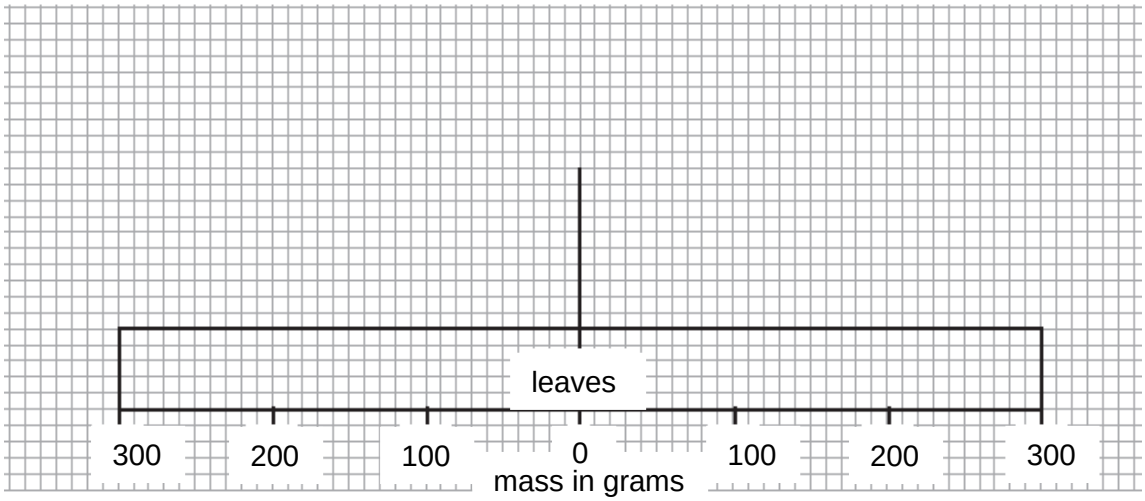


Fig. 6.1 [2]

(b) What fraction of biomass in the leaf litter is transferred to the animals which feed on it?

…… [1]

(c) **(i)** Much of the biomass transferred to the small animals is used in respiration.

Why does respiration make the biomass decrease?

……

.....[1]

(ii) State **one** way in which the animals might use the energy released in respiration.

……..[1]

6 (c) (iii) State **two** reasons why the biomass in the leaves might not be transferred to the animals.

……..

……

……..[2]

[Total: 7]

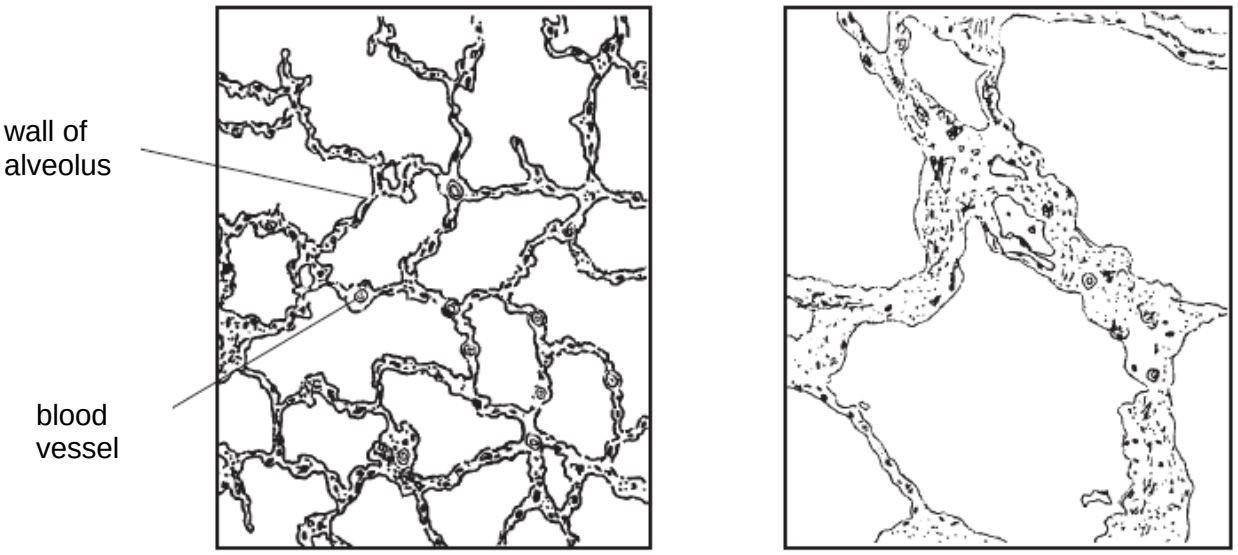
Section B

Answer **two out of three** questions from this section.

Write your answers in the space provided.

7 **(a)** The diagrams show sections of the lung, showing the alveoli. The two sections are drawn to the same scale.

The section of diseased lung is from a smoker with the disease emphysema.



A
thin section of healthy lung tissue

B
thin section of diseased lung tissue

Fig. 7.1

(i) Describe how gaseous exchange takes place in the alveoli.

……

……

……

……[3]

(ii) Use the information in the diagram to explain how smoking damages the lung.

……

……

……

……[3]

7 (b) (i) State **three** differences between aerobic and anaerobic respiration in humans.

……...

……...

……...

……[3]

(ii) Describe the circumstances under which anaerobic respiration may occur in human muscle tissue.

……..[1]

[Total: 10]

8 Fig. 8.1 shows the main events during a menstrual cycle.

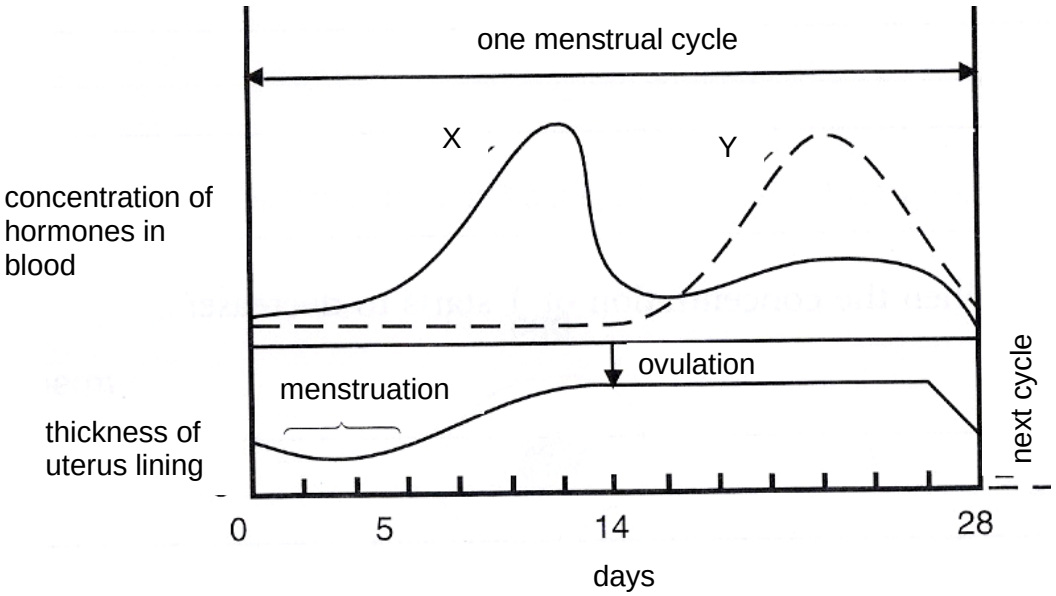


Fig. 8.1

(a) Name hormones **X** and **Y**.

X: ……

Y: …… [2]

(b) What effect does **X** have on the uterus during this period?

……..[1]

(c) Describe what takes place in the ovary when the concentration of **X** starts to decrease.

……...

……..[1]

(d) State **one** effect that **Y** have on the uterus during this period.

……...

……..[1]

(e) Describe what happens when the concentration of **Y** drops to a very low level.

……...

……..[2]

8 (f) (i) Fig. 8.2 represents four genes on part of the chromosome pair 11 from the body cell of a woman.

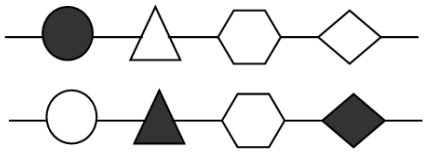


Fig. 8.2

In the space below, draw these genes as they might appear in one of her ova (gametes).

[1]

(ii) Fig. 8.3 shows the same section of one of the chromosomes in another cell of the same person in which the structure of one of the genes has changed.

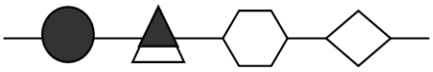


Fig. 8.3

State the name given to such a change in a gene **and** suggest a possible cause of such changes in genes.

.....

.....[2]

[Total: 10]

9 **(a)** Fig. 9.1 shows the state of the muscle of the iris and the size of the pupil at normal room light condition.

With reference to Fig. 9.1, complete Fig. 9.2 to show the action of the muscles of the iris and the size of the pupil in **dim** light condition. Label your drawing.

normal light condition

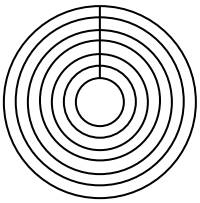


Fig. 9.1

dim light condition

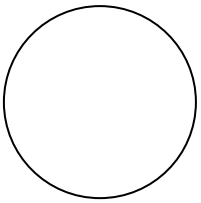


Fig. 9.2

[3]

(b) Define the term *hormone*.

……...

……..[2]

(c) Describe the sequence of events that results in a reflex action when a person touches a hot object.

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……..[5]

[Total: 10]

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For Answer please email :

LAPOOPOO555@GMAIL.COM

to share with you.