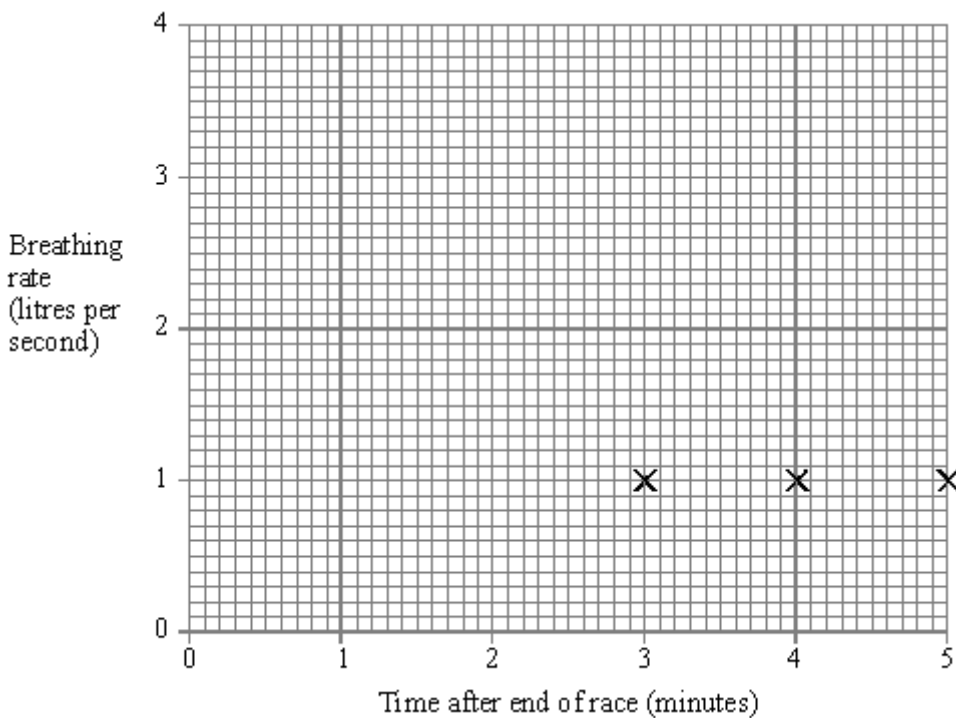


Q1. (a) (i) The table shows an athlete's breathing rate after the end of a race.

The results can be put onto a graph.
 Three of the points are already plotted.
 Plot the other points shown in the table.
 Then draw the graph.

Time after end of race (minutes)	Breathing rate (litres per second)
0	4
1	2
2	1
3	1
4	1
5	1



(4)

(ii) What is the athlete's breathing rate $\frac{1}{2}$ (half) a minute after the end of the race?

.....

(2)

- (b) One of the reasons for breathing is to get rid of carbon dioxide from your body. Choose words from the list to complete the sentences below about how your body does this.

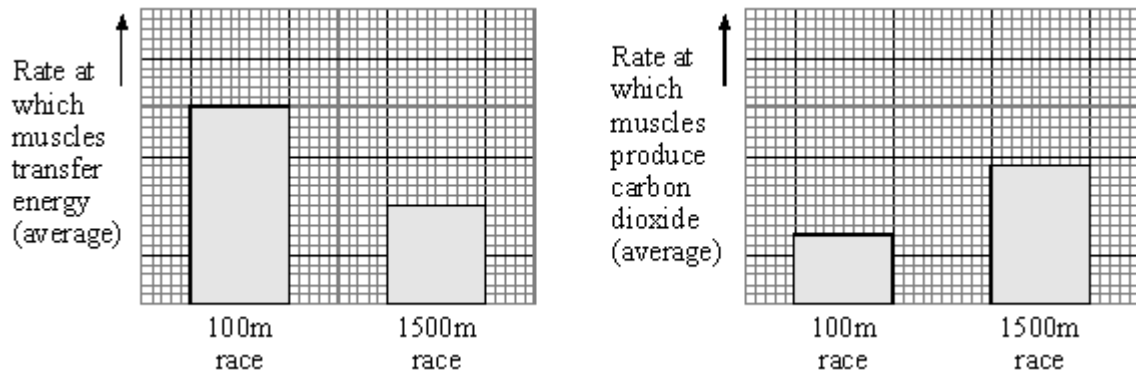
blood heart kidneys lungs urine

Carbon dioxide gets out of your body from your

The carbon dioxide is carried to this part of your body by your

(2)

- (c) The bar charts show what happens in an athlete's muscles when running in two races of different distances.



- (i) Compare what happens in the athlete's muscles when running in the two races.

.....

.....

.....

.....

(3)

- (ii) Use the information in the box to explain your answer to (i).

aerobic respiration	glucose + oxygen→	carbon dioxide + water
anaerobic respiration	glucose→	lactic acid

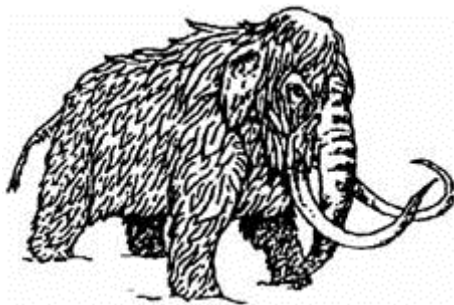
.....
.....

(2)
(Total 13 marks)

Q2. When animals die, bacteria make them decay.
Warmth, moisture and oxygen are needed for this to happen.

- (a) (i) In northern Russia whole bodies of mammoths have been found in the frozen soils.

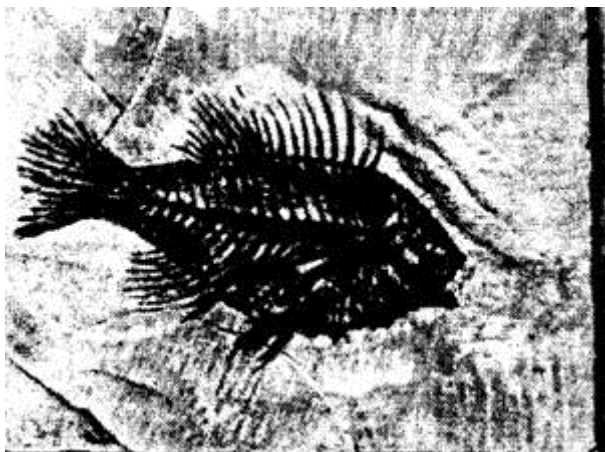
Explain why they did not decay.



.....
.....

(1)

- (ii) Fish fossils have been found in mudstone rock. Explain why they did not decay?



.....
.....

(2)

(b) Some of the mammoths had flint weapons in their bodies.

Suggest **two** things that this tells us about human evolution.

1

2

(2)

(c) Mammoths are now extinct. Suggest **two** reasons for this.

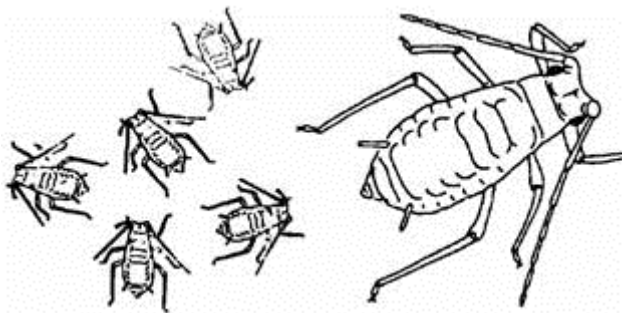
1

2

(2)

(Total 7 marks)

Q3. The bean aphid is a type of black-fly which lives on broad bean plants in summer. In the autumn, males and females mate and produce eggs.



(a) Name the type of reproduction which produces the eggs.

.....

(1)

- (b) In spring these eggs hatch. The young aphids are all female.
Explain why they are all similar but not identical to each other.

..... (1)

- (c) These females are then able to produce offspring without needing any males.

- (i) Name the type of reproduction where females do **not** need males to produce offspring.

..... (1)

- (ii) How will the offspring from one of these females:

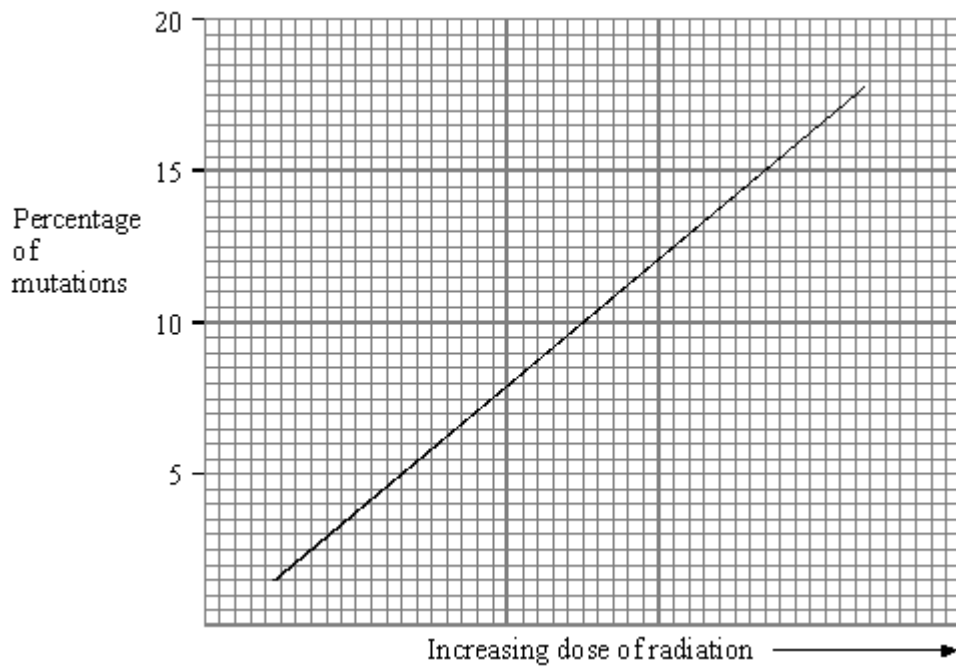
A compare with each other

.....

B compare with the offspring from other females?

..... (2)

- (d) Some scientists investigated mutations in these aphids. They exposed the aphids to X-rays.
They plotted their results.



- (i) What was the connection between the dose of X-rays and the percentage of mutations?

.....

(1)

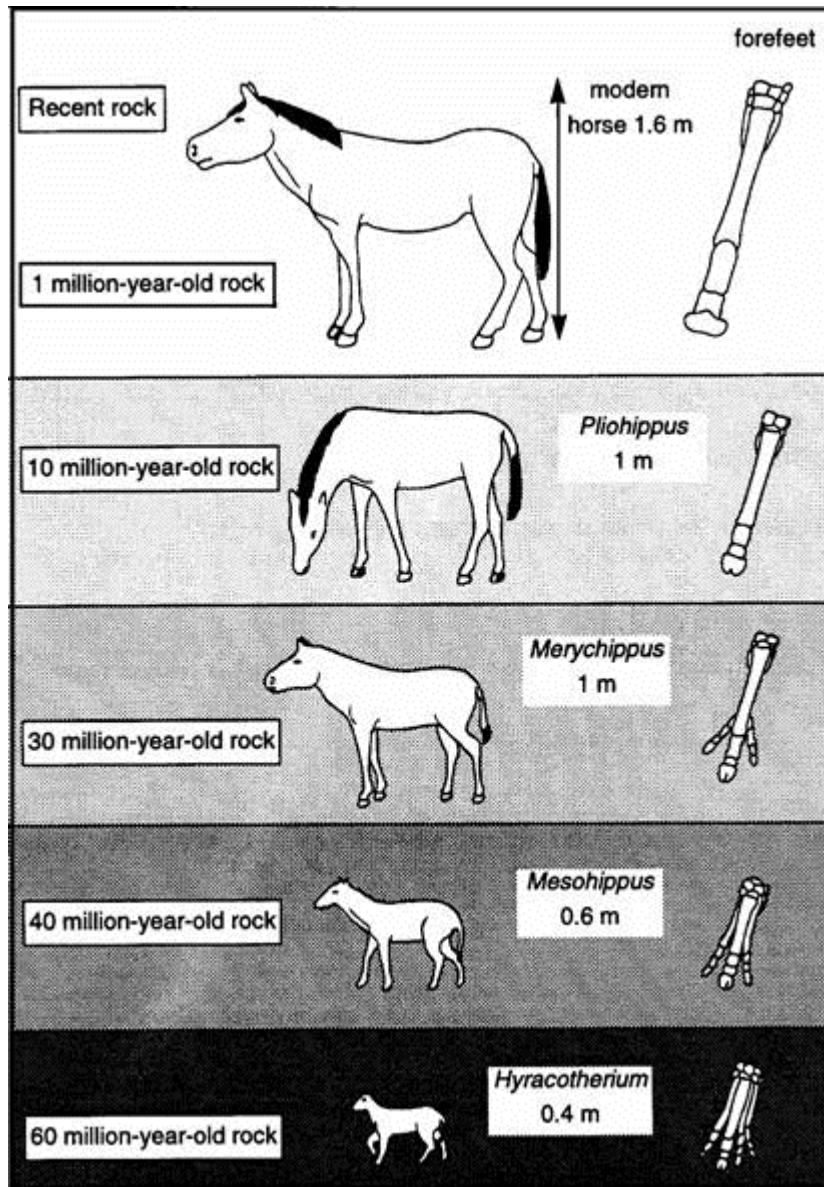
- (ii) Name **one** other possible cause of mutations.

.....

(1)

(Total 7 marks)

Q4. The diagrams show fossil animals found in rocks of different ages. Scientists have used this information to work out how the modern horse evolved.



(a) *Meshippus* became extinct over thirty million years ago. Use information from the diagrams to suggest **two** reasons why this happened.

- 1
-
- 2
-

(2)

(b) (i) How do scientists know how big these early horses were?

.....

..... (1)

(ii) How do scientists know when they lived?

.....
..... (1)

(c) Explain how the information in the diagrams supports the theory of evolution.

.....
.....
..... (3)
(Total 7 marks)

Q5. The table below shows a wheat farmer's calendar.

October	Winter Wheat is sown and germinates. Phosphate/potash fertiliser is applied.
March	Wheat plants resume growth. Nitrate fertiliser is applied.
April	Ammonium nitrate, the main fertiliser, is applied. Fungicide may be sprayed to control mildew or rust on wheat.
May	Extra ammonium nitrate fertiliser may be applied. A second spraying of fungicide may be needed. Dwarfing hormone sprayed to keep wheat straw (stalks) short.
June	Insecticide spray against aphids may be needed. Extra spraying of fungicide may be needed.
August	Wheat is harvested.
August/ September	Ground sprayed with weedkiller. Stubble (remains of wheat plants) is ploughed in ready for the next crop.

This process uses expensive fertilisers and pesticides to grow pest free crops which may be produced in excess.

What are the reasons for and against growing wheat in this way?

For

.....

.....

(3)

Against

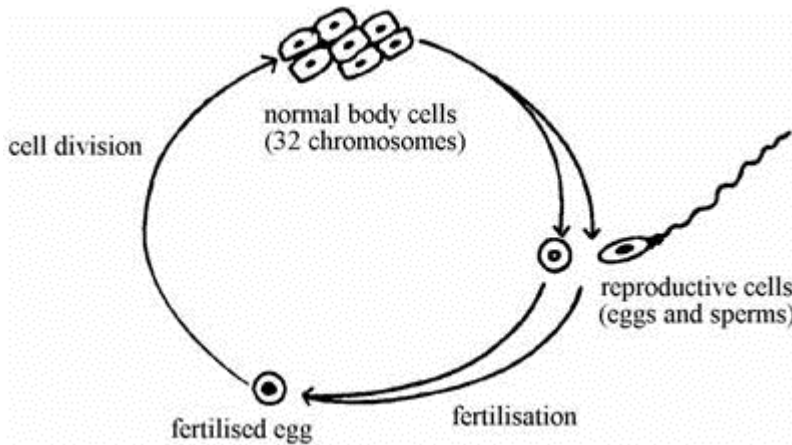
.....

.....

(4)

(Total 7 marks)

Q6. The diagram shows three types of cells in a life history of a simple animal.



(a) How do the chromosomes of the body cells compare with the chromosomes in the fertilised egg from which they came?

.....

.....

(1)

(b) Describe what happens to chromosomes in the nucleus of a body cell when it forms reproductive cells.

.....

.....

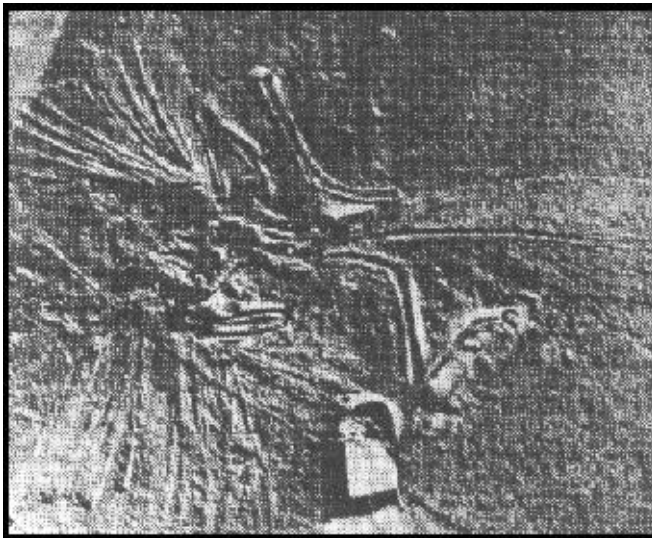
.....

.....

.....

(4)
(Total 5 marks)

Q7. The picture shows a fossil.



(a) (i) What is a fossil?

.....

.....

.....

(3)

(ii) Describe **one** way in which fossils are formed.

.....
.....
.....

(2)

(b) We only know about extinct animals and plants because they have left fossils.
What does the word "extinct" mean?

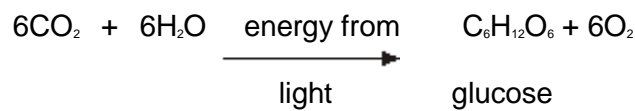
.....
.....

(1)

(Total 6 marks)

Q8. Plants are grown in glasshouses to protect them from the weather or extend the growing season.

Plants make food by photosynthesis.



In winter, when days are shorter, glasshouses are heated to keep the enzyme reactions in plants at optimum rates.

What else should a grower do to make sure that the plants are photosynthesising at the optimum rate? Give a reason for your answer.

.....
.....
.....
.....

.....
.....
(Total 3 marks)

Q9. Choose words from this list to complete the sentences below.

bones extinct fossils
muscles rocks

In the past some types of animals and plants have died out.

They have become

We know about these animals and plants because we find them as
.....

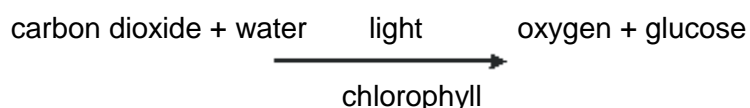
Sometimes the hard parts of animals such as did not decay.

In other cases the bodies of animals and plants were replaced by minerals.

You can still see their shape in

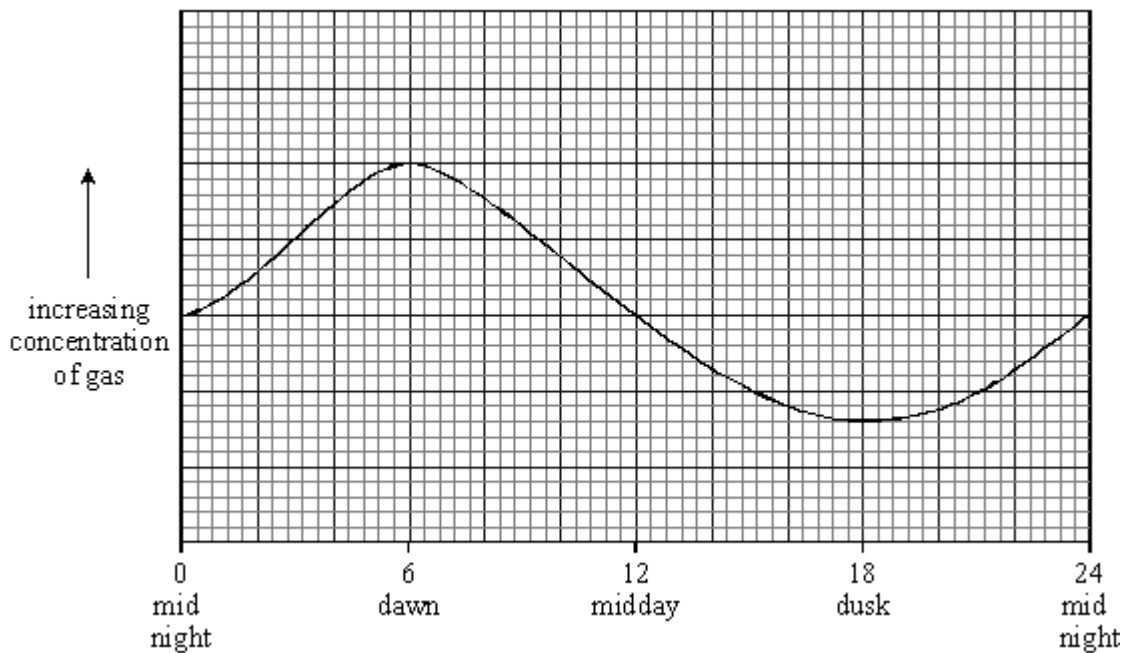
(Total 4 marks)

Q10. Plants produce glucose by a process called photosynthesis.



The plant uses glucose to grow.

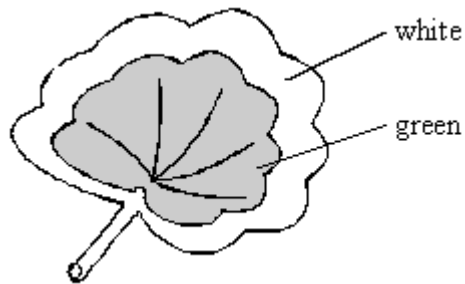
- (a) The graph shows the change in concentration of carbon dioxide in a glasshouse full of plants over 24 hours.



Draw a line on the graph to show how the concentration of oxygen changes in the glasshouse.

(3)

- (b)



Some plants have variegated leaves with white parts which contain no chlorophyll.

How do you think a variegated geranium would grow compared to a similar sized geranium with all green leaves?

Explain your answer.....

.....

.....

(2)

(Total 5 marks)

Q11. Huntington's chorea is a disease found in 5 out of every 100 000 people.

(a) Describe, as fully as you can, how the disease is likely to affect these people.

.....

.....

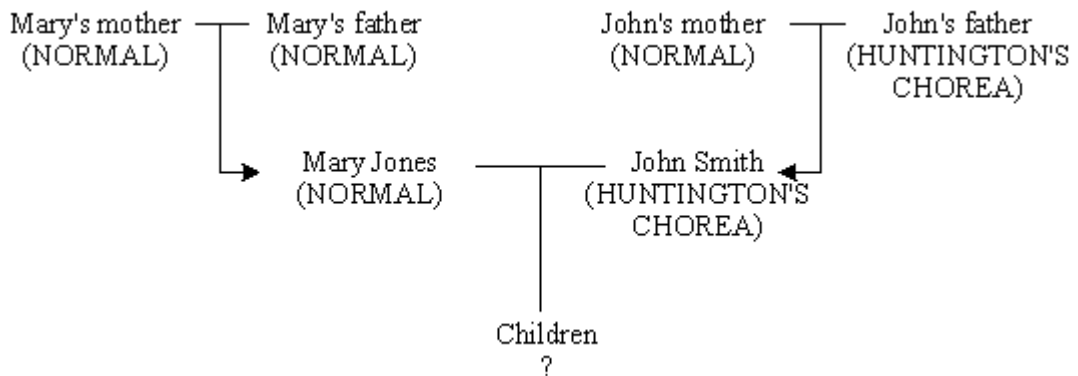
.....

.....

.....

(3)

(b) Some members of the Smith family suffer from Huntington's chorea. The family tree gives details.



(i) Are Mary and John Smith's children likely to have Huntington's chorea?

Explain your answer as fully as you can. Use a diagram if it will help.

.....

.....

.....

.....

.....

.....

.....

(4)

(ii) Suppose Mary and John both carry one gene for Huntington's chorea.

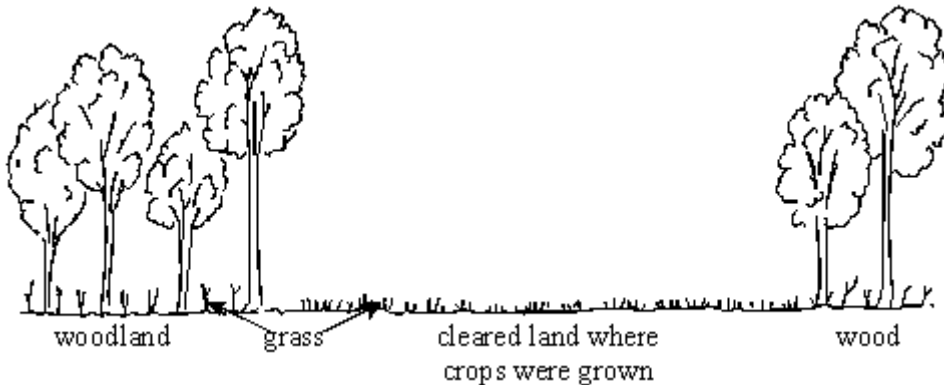
How likely are their children to have Huntington's chorea?

Explain your answer as fully as you can. Use a diagram if it will help.

.....
.....
.....
.....
.....

(2)
(Total 9 marks)

Q12. In some developing countries woodland is cut down and burned. The ash acts as fertiliser. Crops are grown for three years. The land is then left as it is too poor to grow any more crops.



- (a) In the original woodland trees and plants died and grew for hundreds of years. When cleared the land grew crops for only three years. Explain this difference in as much detail as you can.

.....
.....
.....
.....

(3)

- (b) What could farmers do to make crops grow on the cleared land for more than three years?

.....
.....

(2)

(Total 5 marks)

Q13. Cystic fibrosis is a disease which affects 1 in 1600 babies.

- (a) What are the symptoms of cystic fibrosis?

.....
.....
.....
.....
.....
.....

(3)

- (b) Two parents with normal characteristics have a child who was born with cystic fibrosis.

Explain, as fully as you can, how this can happen.

You may use a genetic diagram if you wish.

.....

.....

.....

.....

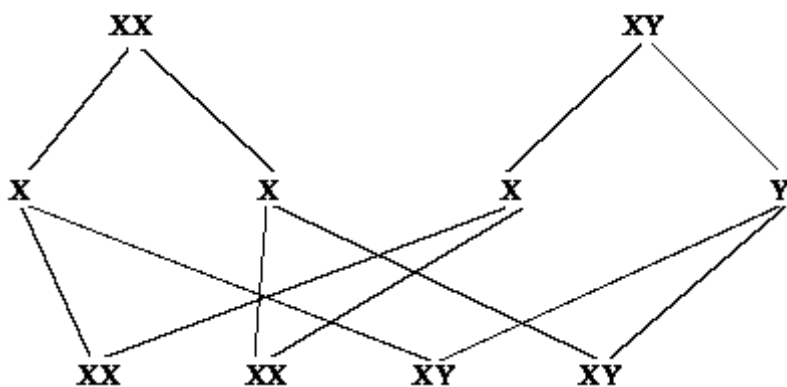
.....

.....

.....

(4)
(Total 7 marks)

Q14. The genetic diagram shows how the chromosomes divide and combine in human reproduction.



(a) Draw circles around the symbols for the **two** male gametes.

(2)

(b) State the chance of a child being a girl.

..... (1)

(c) (i) How many pairs of chromosomes are there in a human body cell?

..... (1)

(ii) How many chromosomes are there in a human egg cell?

..... (1)

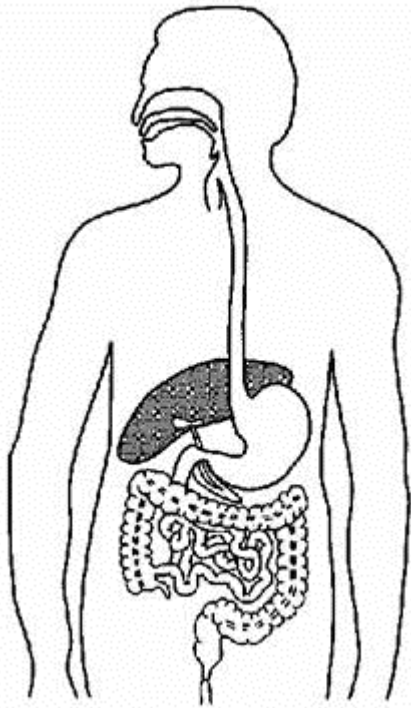
(d) Chromosomes contain genes. From what substance are genes made?

..... (1)

(e) In the process of mitosis, how do the number of chromosomes in the daughter cells compare to that in the original cell?

..... (1)
(Total 7 marks)

Q15. The diagram shows the digestive system.



(a) Complete the following sentences about digestive enzymes.

(i) Amylase works in the where it is involved in the digestion of to (3)

(ii) Lipase works in the where it is involved in the digestion of to (3)

(b) Which gland produces:

(i) amylase;
..... (1)

(ii) lipase?
..... (1)

(1)
(Total 8 marks)

##

A young athlete trains and this makes her heart work harder. The table shows part of her training record.

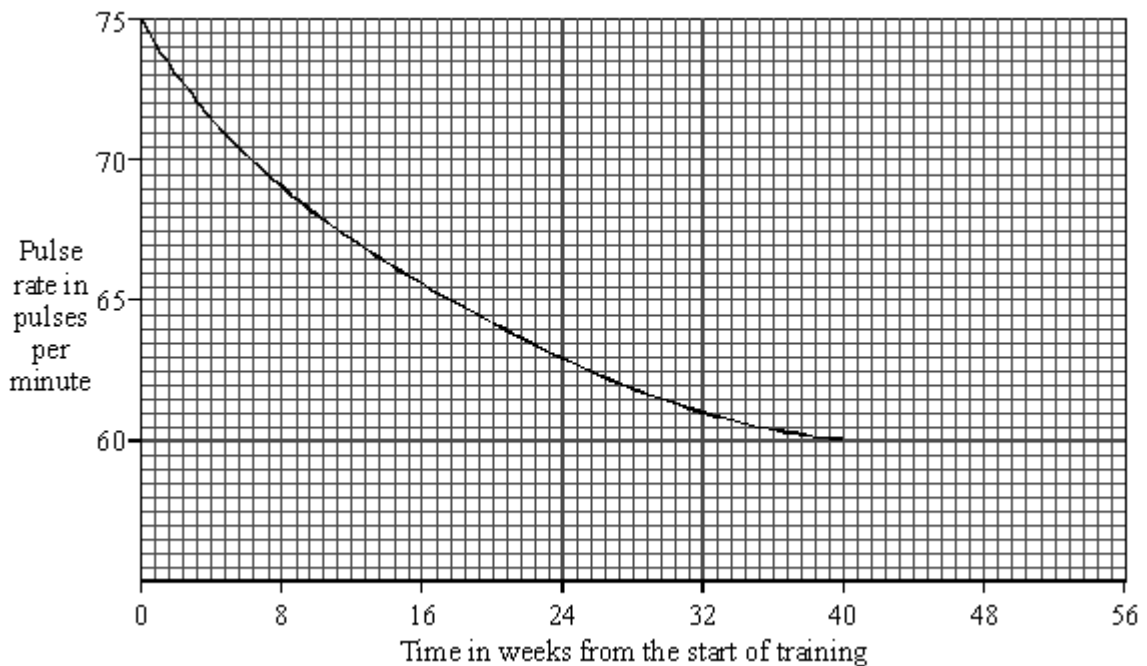
Time measured in weeks from the start of training	0	8	16	24	32	40
Resting pulse rate measured in pulses per minute	75	69	66	63	61	60

(i) Give **two** changes to her heart resulting from this training.

- 1
-
- 2
-

(2)

(ii) The graph shows a smooth curve drawn to match the data from her training record.



Use the graph:

- (A) to estimate her resting pulse rate, in pulses per minute, after 18 weeks of training;

.....

(1)

- (B) to predict her resting pulse rate, in pulses per minute, if she continues her training until the end of the year.

.....

(1)

(Total 4 marks)

Q17. Oxygen from our lungs is carried, by our blood, to cells in our body where aerobic respiration takes place.

- (i) Complete the **two** spaces to balance the chemical reaction for aerobic respiration.



(1)

- (ii) Name the substance with the formula $\text{C}_6\text{H}_{12}\text{O}_6$.

.....

(1)

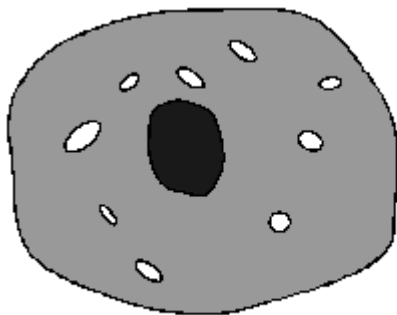
- (iii) Name the structures in the cytoplasm of our cells where aerobic respiration takes place.

.....

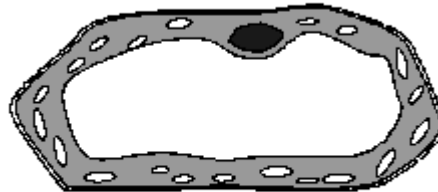
(1)

(Total 3 marks)

Q18. The diagrams show a cheek cell from a human and a leaf cell from a plant.



Cheek cell



Leaf cell

(a) The two cells have a number of parts in common.

(i) On the cheek cell, label **three** of these parts which both cells have.

(3)

(ii) In the table, write the names of the **three** parts you have labelled above and describe the main function of each part.

Part	Function
.....	
.....	
.....	

(3)

(b) Blood contains white cells and red cells. State the function of each type of cell in the blood.

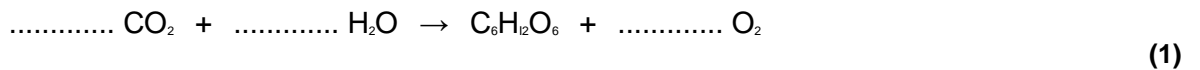
White cells

.....

Red cells

.....
(2)
(Total 8 marks)

Q19. (a) Balance the following equation for photosynthesis.



(b) Give **two** conditions necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide.

1.
2. (2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how **each** of these kinds of cell assists photosynthesis.

Guard cells
.....
.....
..... (2)

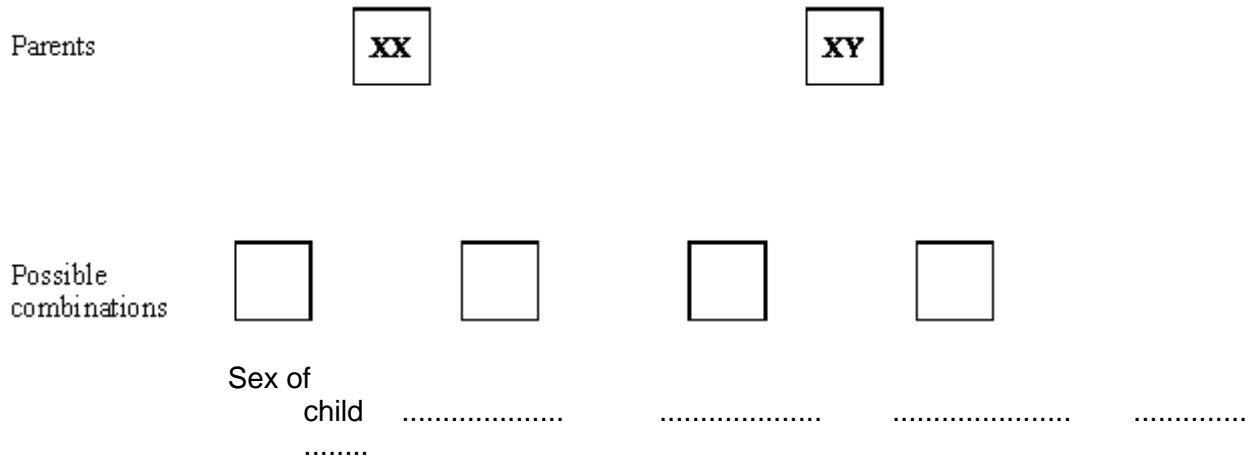
Palisade cells
.....
.....
..... (2)

(d) Glucose is a product of photosynthesis. Give **three** uses which green plants make of glucose.

1.
2.
3.

(3)
(Total 10 marks)

Q20. (a) (i) Complete the genetic diagram to show the possible combinations of gametes for the four children and state the sex of the child for each combination.



(1)

(ii) What name is given to the process when a cell divides to produce gametes?

.....

(1)

(iii) How many pairs of chromosomes are there in each human body cell?

.....

(1)

(iv) How many chromosomes are present in a human ovum?

.....

(1)

- (b) (i) Give **two** advantages to living things of reproducing sexually rather than asexually.

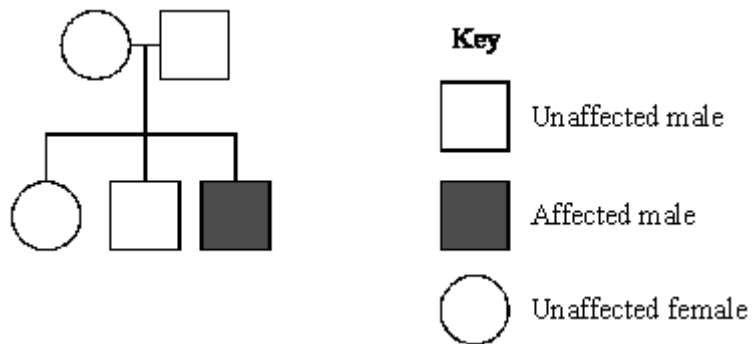
.....

.....

.....

(2)

- (ii) The genetic diagram shows two parents and three children.



Only the son has cystic fibrosis, which is caused by a recessive allele. What conclusion may be made about the parents' genes?

.....

.....

(1)

(Total 7 marks)

- Q21.** (i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose?

.....

(1)

- (ii) Name the **two** products of the process in part (i).

..... and

(1)

(Total 2 marks)

Q22. Nitrate fertilisers are important in agriculture. They help to increase crop yields and so make food cheaper to buy. Some of the nitrate fertilisers run off into rivers and get into drinking water. The problem is that the nitrates can react with iron in our blood. This reduces the blood's ability to carry oxygen. If the amount of nitrate in drinking water is too high, it can cause 'blue baby syndrome', in which babies look blue due to lack of oxygen.

The table shows the amount of nitrate fertilisers used and the crop yield.

Nitrate fertilisers in kilograms per hectare of land	0	150	250
Crop yield in tonnes per hectare of land	5	8	7

Use the information above to suggest what should be done, by farmers and government, to prevent 'blue baby syndrome'. Explain the reasons for your suggestions.

.....

.....

.....

.....

.....

.....

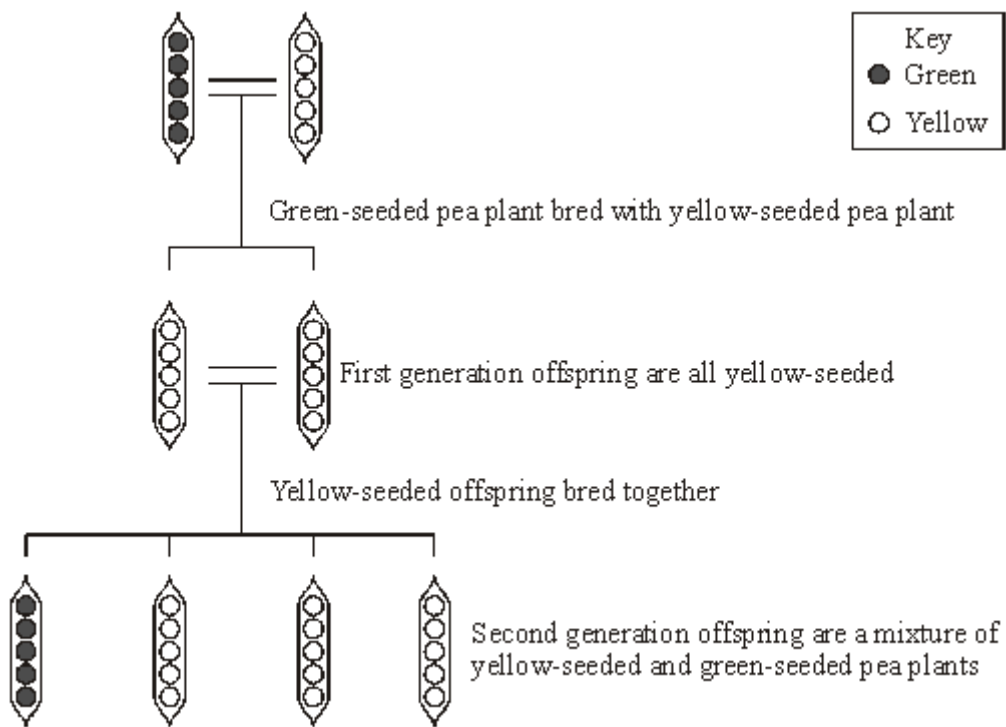
.....

.....

.....

(Total 3 marks)

Q23. The diagram shows one of the experiments performed by a scientist called Mendel in the 1850s. He bred pea plants which had different coloured pea seeds.



(a) Use words from the box to help you to explain the results of this experiment.

dominant factor recessive

.....

.....

.....

.....

.....

.....

(3)

(b) Mendel explained these results in terms of *inherited factors*.

(i) What do we now call *inherited factors*?

.....

(1)

(ii) Where, in a cell, are these *inherited factors* found?

.....
(1)
(Total 5 marks)

Q24. In humans, one of the pairs of chromosomes in each cell carries the genes which determine sex.

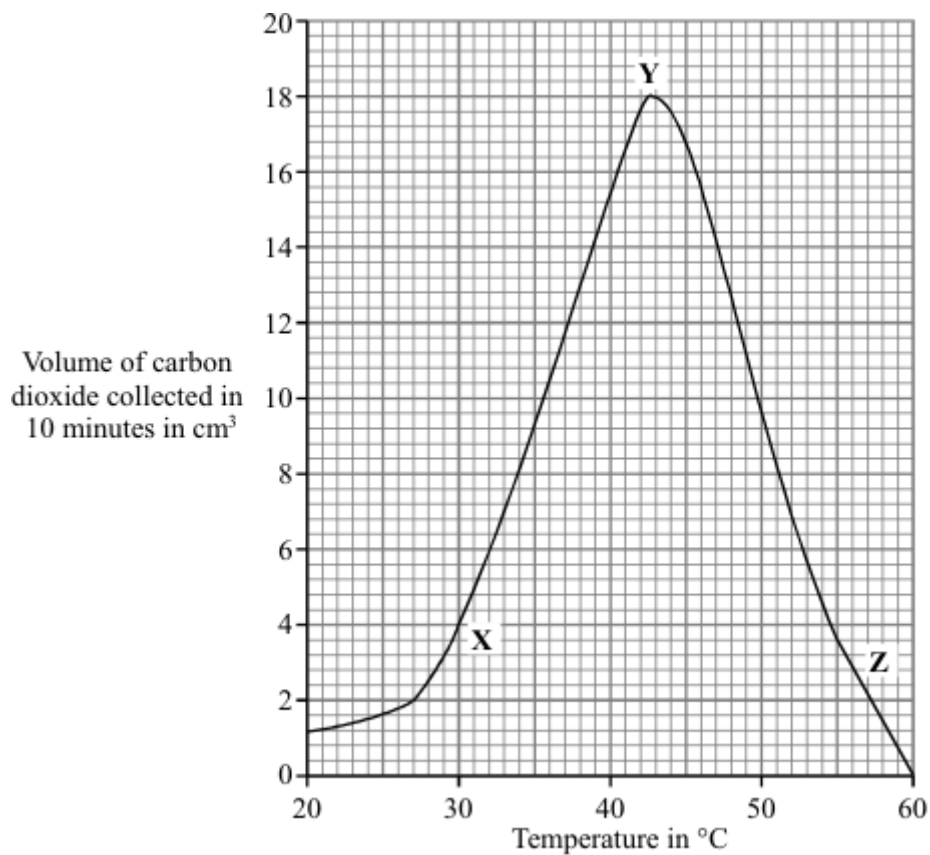
What is the difference between the sex chromosomes of a man and a woman?

.....
.....
.....
.....

(Total 2 marks)

Q25. Fermentation of sugar by yeast produces carbon dioxide.

The graph shows the effect of temperature on the production of carbon dioxide by fermentation.



- (a) By how much did the volume of carbon dioxide collected change when the temperature was raised from 30°C to 40°C?

..... cm³

(1)

- (b) Complete the sentences to explain the shape of the curve between X and Y.

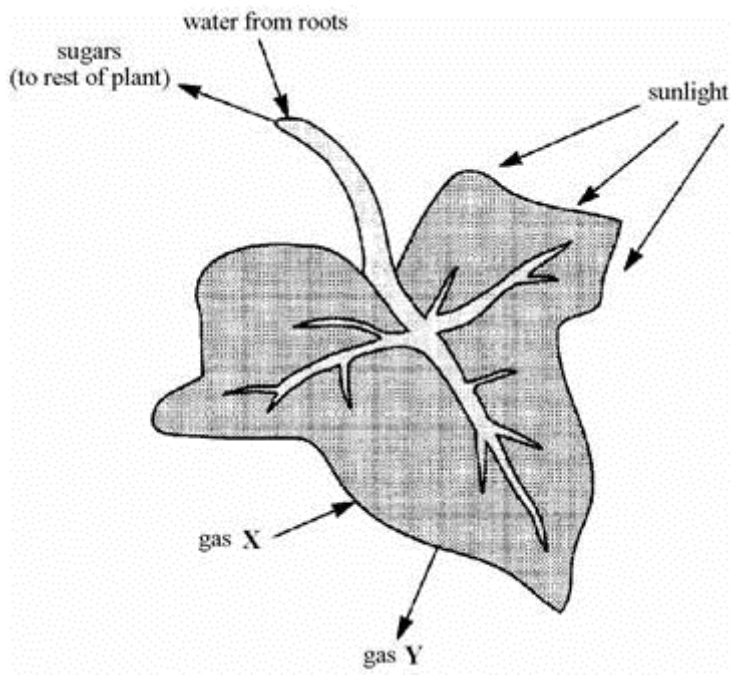
Raising the temperature the speed of the reacting particles.

These particles collide more and more

(3)

(Total 4 marks)

Q26. The diagram shows a plant leaf during photosynthesis.



(a) Name:

(i) gas X;

(ii) gas Y.

(2)

(b) Why is sunlight necessary for photosynthesis?

.....

(1)

(Total 3 marks)

Q27. This couple has just found out that the woman is pregnant. They wonder whether the child will be a boy or a girl.



Sex chromosomes

Sex chromosomes

(a) Fill in the boxes to show the sex chromosomes of the woman and the man.

(2)

(b) The couple already has one girl. What is the chance that the new baby will be another girl?

.....

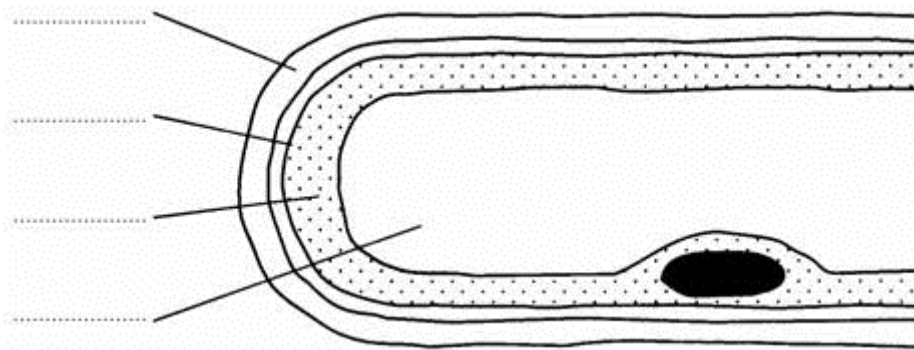
Explain the reason for your answer. You may use a genetic diagram if you wish.

.....
.....
.....
.....

.....
.....

(3)
(Total 5 marks)

Q28. The drawing shows part of a root hair cell.

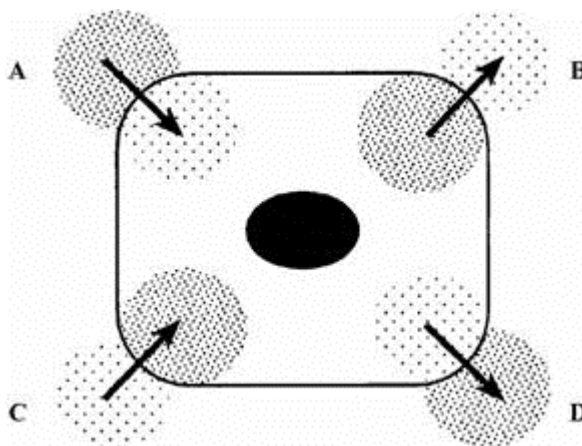


(a) Use words from the list to label the parts of the root hair cell.

cell membrane cell wall cytoplasm nucleus vacuole

(4)

(b) The diagram shows four ways in which molecules may move into and out of a cell. The dots show the concentration of molecules.



The cell is respiring aerobically.
Which arrow, **A**, **B**, **C** or **D** represents:

- (i) movement of oxygen molecules;
- (ii) movement of carbon dioxide molecules?

(2)

(c) Name the process by which these gases move into and out of the cell.

.....

(1)

(Total 7 marks)

Q29. (a) Use words from the list to complete the sentences.

alleles chromosomes gametes genes mutations

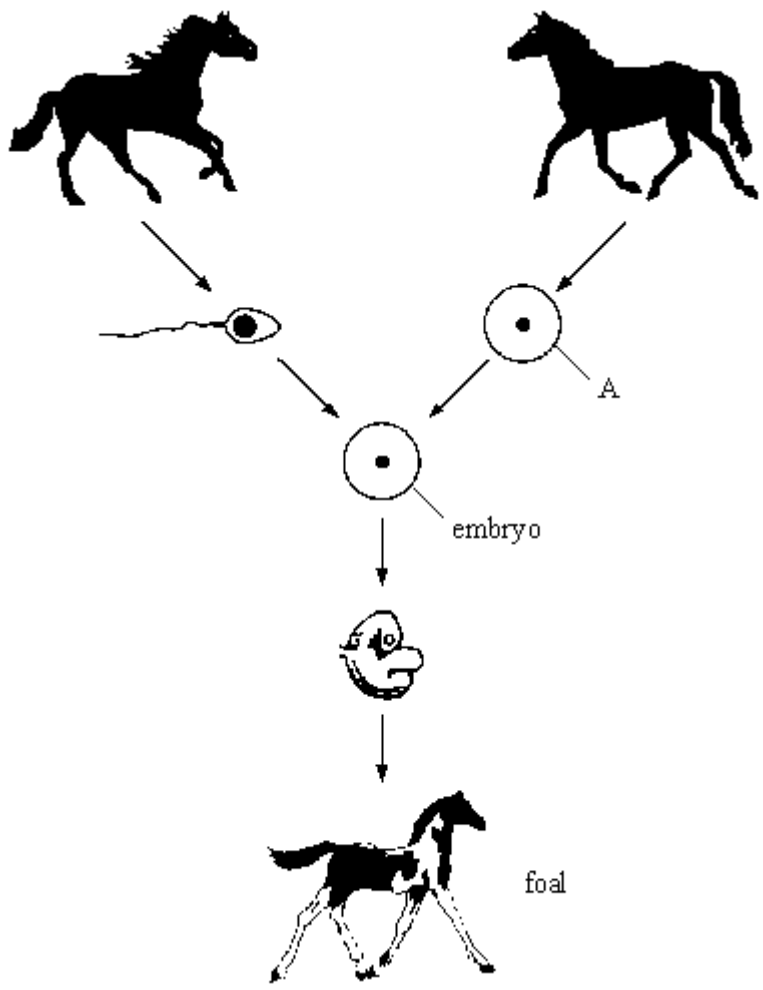
The nucleus of a cell contains thread-like structures called

The characteristics of a person are controlled by

which may exist in different forms called

(3)

(b) The drawing shows some of the stages of reproduction in horses.



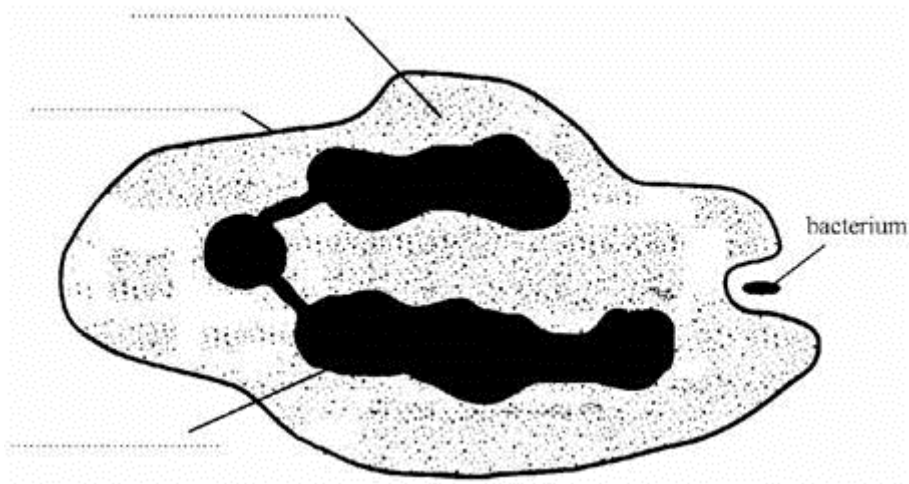
- (i) Name this type of reproduction (1)
- (ii) Name the type of cell labelled **A** (1)

- (c) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.
- (i) Explain why it will look similar to its parents.
.....
..... (1)
 - (ii) Explain why it will **not** be identical to either of its parents.
.....

.....
.....
.....

(2)
(Total 8 marks)

Q30. The drawing shows a white blood cell ingesting a bacterium.



Label the parts of the white blood cell.

(Total 3 marks)

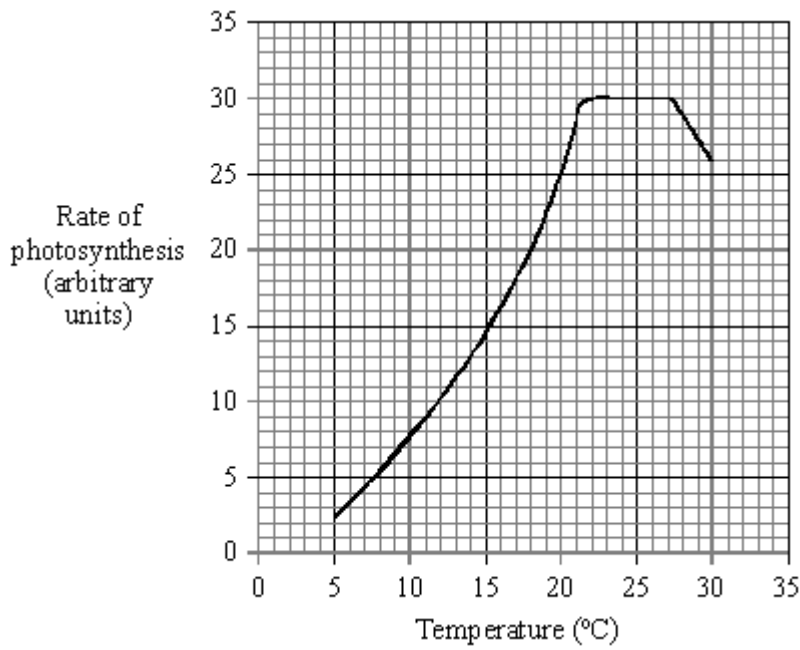
Q31. Green plants make food in their leaves.

(a) From where do the leaves get the energy that they need to make food?

.....

(1)

(b) The graph shows the effect of temperature on the rate of photosynthesis.



(i) Between which temperatures is the rate of photosynthesis fastest?

..... and °C

(1)

(ii) Suggest why the rate of photosynthesis stays the same between these two temperatures.

.....

(2)

(iii) A greenhouse owner wants to grow lettuces as quickly and cheaply as possible in winter.

At what temperature should he keep his greenhouse in order to grow the lettuces as quickly and cheaply as possible?

..... °C

Explain your answer.

.....

.....
.....
.....

(3)
(Total 7 marks)

Q32. The table shows the amounts of carbohydrate, fat and protein in 100 g portions of five foods, A - E.

FOOD	MASS IN 100 g PORTION (g)		
	CARBOHYDRATE	FAT	PROTEIN
A	0	1	20
B	50	2	8
C	0	82	0
D	12	0	1
E	20	0	2

(a) A person eats 50 g of food E.

How much carbohydrate would the person eat?

..... g

(1)

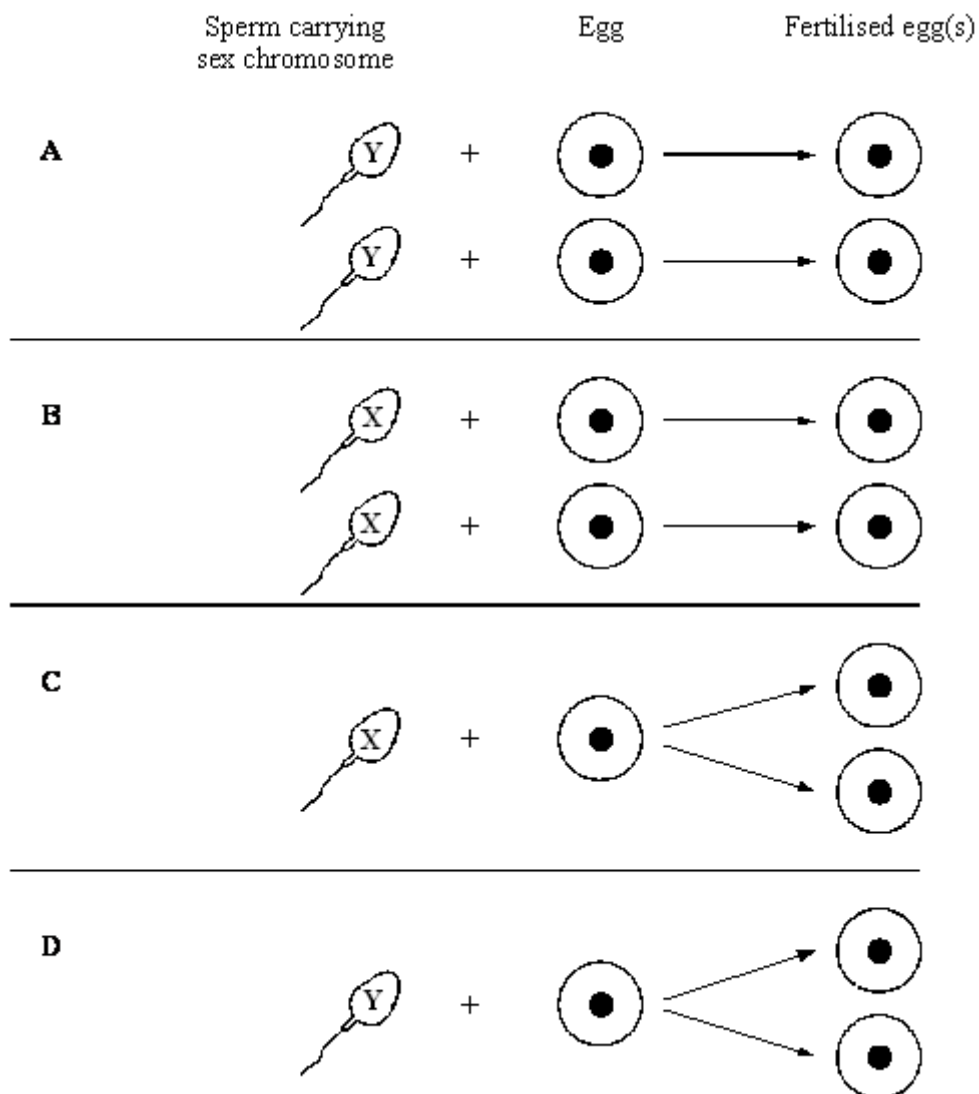
(b) Describe, in as much detail as you can, what happens to the protein after food A is swallowed.

.....
.....
.....
.....

.....

(4)
 (Total 5 marks)

Q33. The diagrams show four ways in which human twins may be formed.



Which diagram, **A**, **B**, **C** or **D**, shows the process which will produce genetically identical

twin boys?

.....

Explain the reason for your choice.

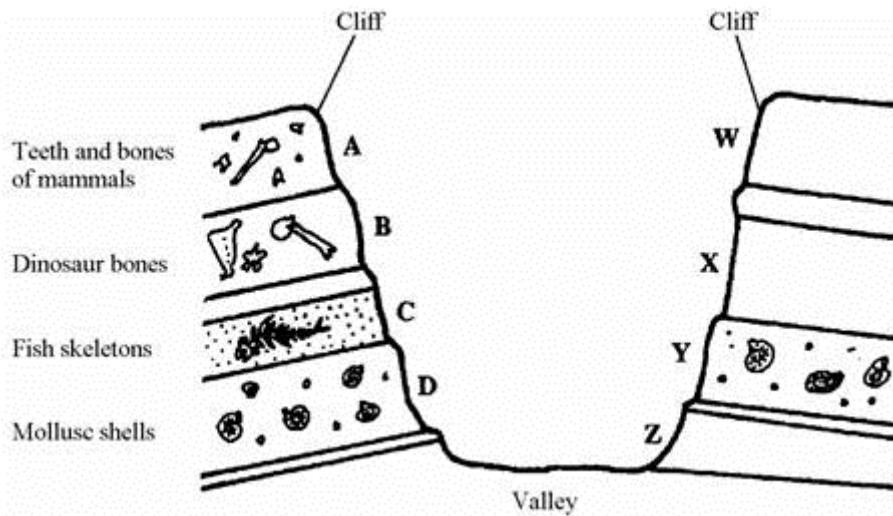
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(Total 3 marks)

Q34. The drawing shows some of the fossils found in the layers of rock in two cliffs.

The two cliffs are on opposite sides of a large valley.

Geologists think that the valley has been carved out by rivers, and that the order of rock layers has not changed.



- (a) (i) Which of the rock layers, **A, B, C** or **D**, is the oldest? (1)
- (ii) Give the letters of **two** layers of rock on opposite sides of the valley that are the same age.

..... and (1)

- (b) How do fossils provide evidence for the theory of evolution?

.....

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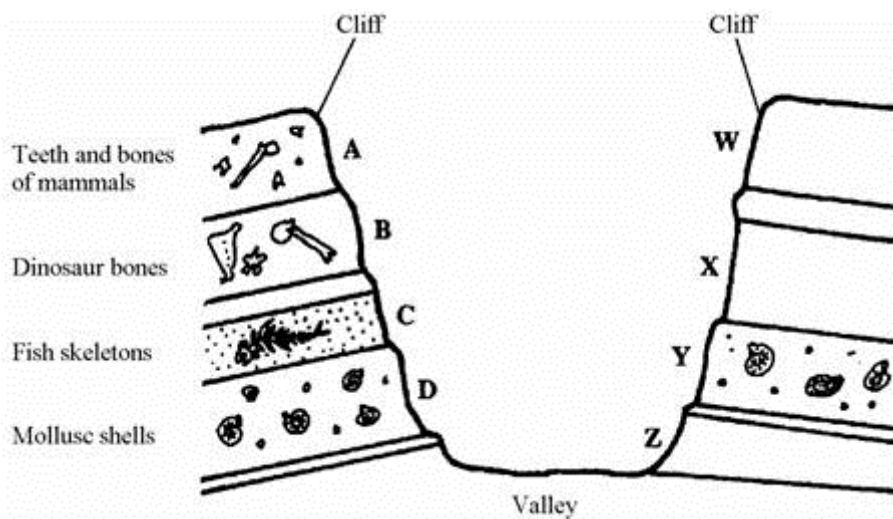
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(2)
(Total 4 marks)

Q35. The drawing shows some of the fossils found in the layers of rock in two cliffs.

The two cliffs are on opposite sides of a large valley.

Geologists think that the valley has been carved out by rivers, and that the order of rock layers has not changed.



(a) (i) Which of the rock layers, **A**, **B**, **C** or **D**, is the oldest? (1)

(ii) Give the letters of **two** layers of rock on opposite sides of the valley that are the same age.
..... and (1)

(b) How do fossils provide evidence for the theory of evolution?
.....
.....
.....
.....

(2)
(Total 4 marks)