

Candidate Name	Centre Number				Candidate Number				



GCSE COMBINED SCIENCE

COMPONENT 1

Concepts in Biology

FOUNDATION TIER

SAMPLE PAPER

(1 hour 45 minutes)



For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	4	
3.	14	
4.	4	
5.	9	
6.	18	
7.	11	
8.	10	
9.	5	
10.	8	
Total	90	

ADDITIONAL MATERIALS

In addition to this examination paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

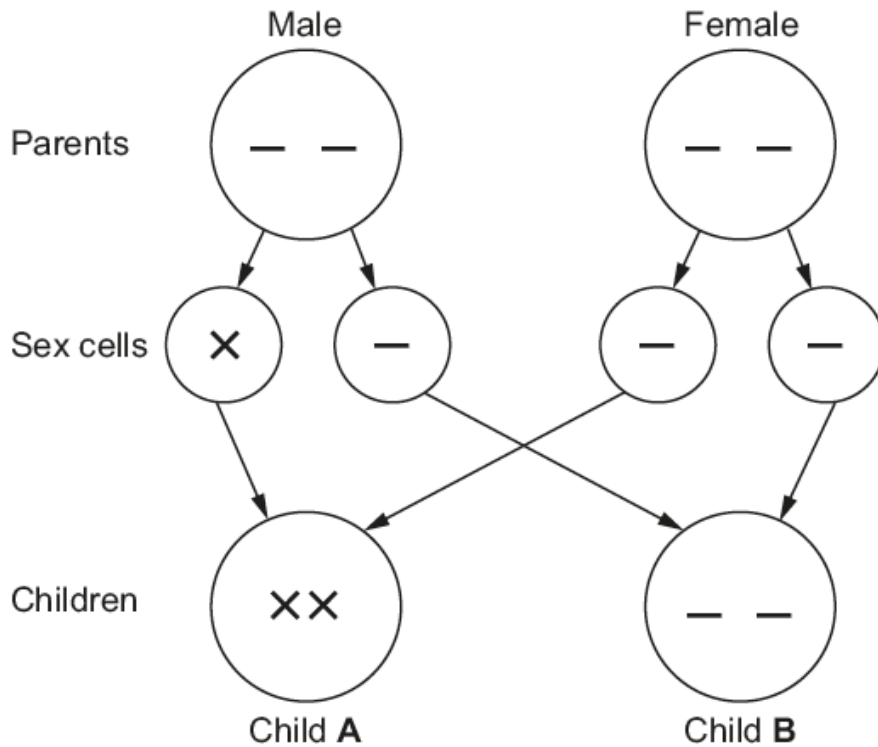
INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The assessment of the quality of extended response (QER) will take place in question **7(b)**.

Answer all questions.

1. (a) (i) **Complete the diagram below** to show the sex chromosomes present in the cells of two parents and two of their children. [3]



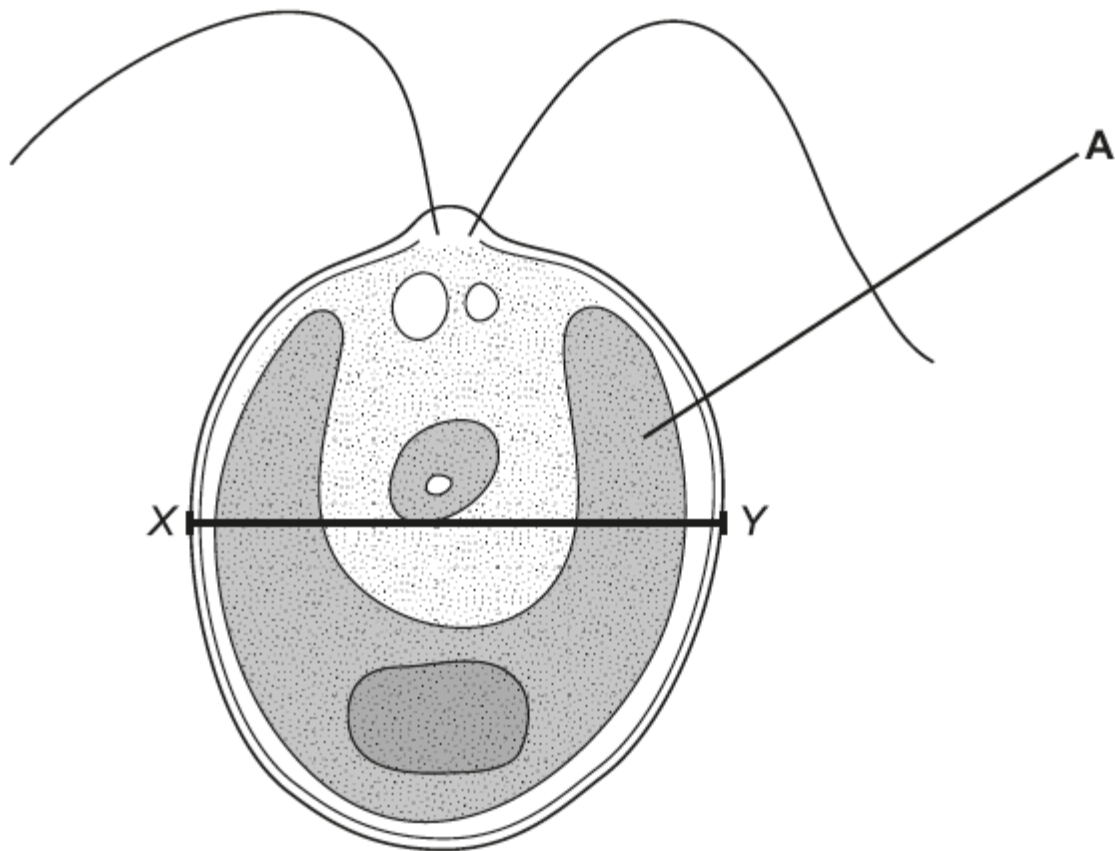
- (ii) State the sex of child **A**. [1]
- (iii) State the probability of their third child being male. [1]
- (b) (i) An egg cell of a dog (*Canis familiaris*) contains 39 chromosomes. Calculate the number of chromosomes in a **fertilised** egg cell of a dog. [1]

number of chromosomes =

- (ii) The fertilised egg cell divides to form two cells. State the name of this type of cell division. [1]

.....

2. The diagram shows an alga called *Chlamydomonas*.



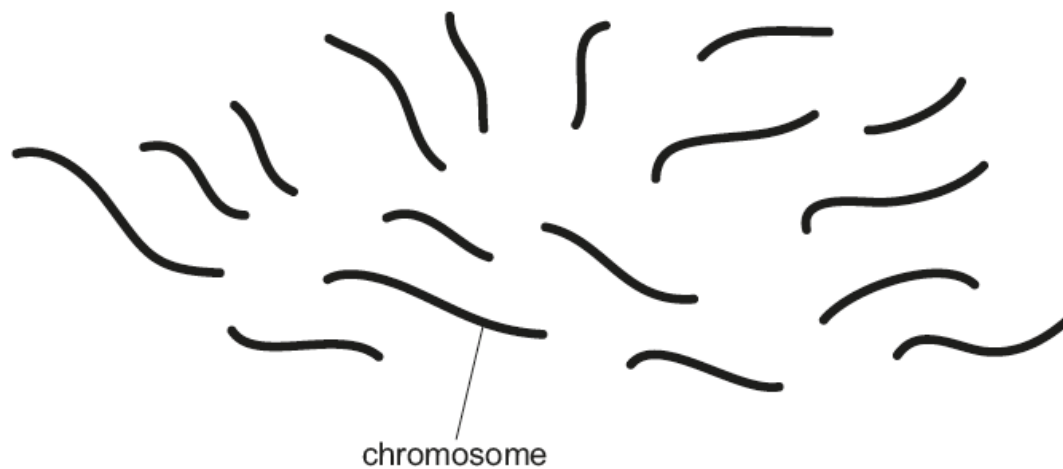
- (a) (i) The length of the line X – Y on the diagram is 71 mm.
 The diagram of *Chlamydomonas* is magnified $\times 500$.
 Calculate the actual width of *Chlamydomonas* at X – Y [1]

actual width =mm

- (ii) Structure **A** contains chlorophyll. State the name of structure **A**. [1]

.....

- (b) The diagram below shows all the 17 chromosomes which are present in *Chlamydomonas*.



Chlamydomonas has about 600 genes. Calculate the mean number of genes on each chromosome. [2]

mean number of chromosomes =

4

3. Some students were studying photosynthesis.

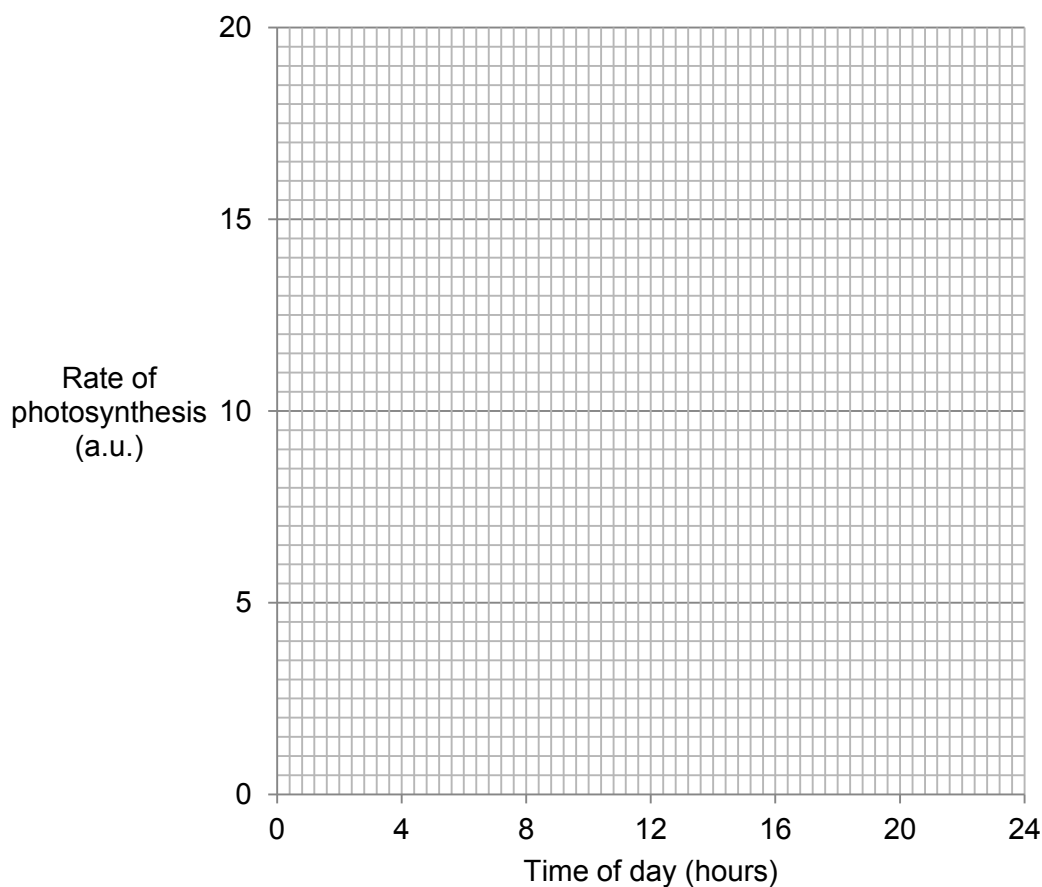
(a) State the name of **two** products of photosynthesis. [2]

..... and

(b) The students monitored the rate of photosynthesis by algae in a pond between 06.00 hrs and 18.00 hrs during one day in April. The results are shown in the table below.

Time of day	Rate of photosynthesis (a.u.)
06.00	0.0
08.00	1.0
10.00	4.5
12.00	10.0
14.00	16.5
16.00	8.0
18.00	7.0

(i) Draw a line graph of the results on the grid below by plotting the points and joining the points with a ruler. [3]



- (ii) The students concluded that changes in light intensity affected the rate of photosynthesis. Explain how the graph supports this conclusion. [3]

.....

.....

.....

.....

- (c) Give **three** other factors that would change in the pond during the day and which would affect the rate of photosynthesis. [3]

.....

.....

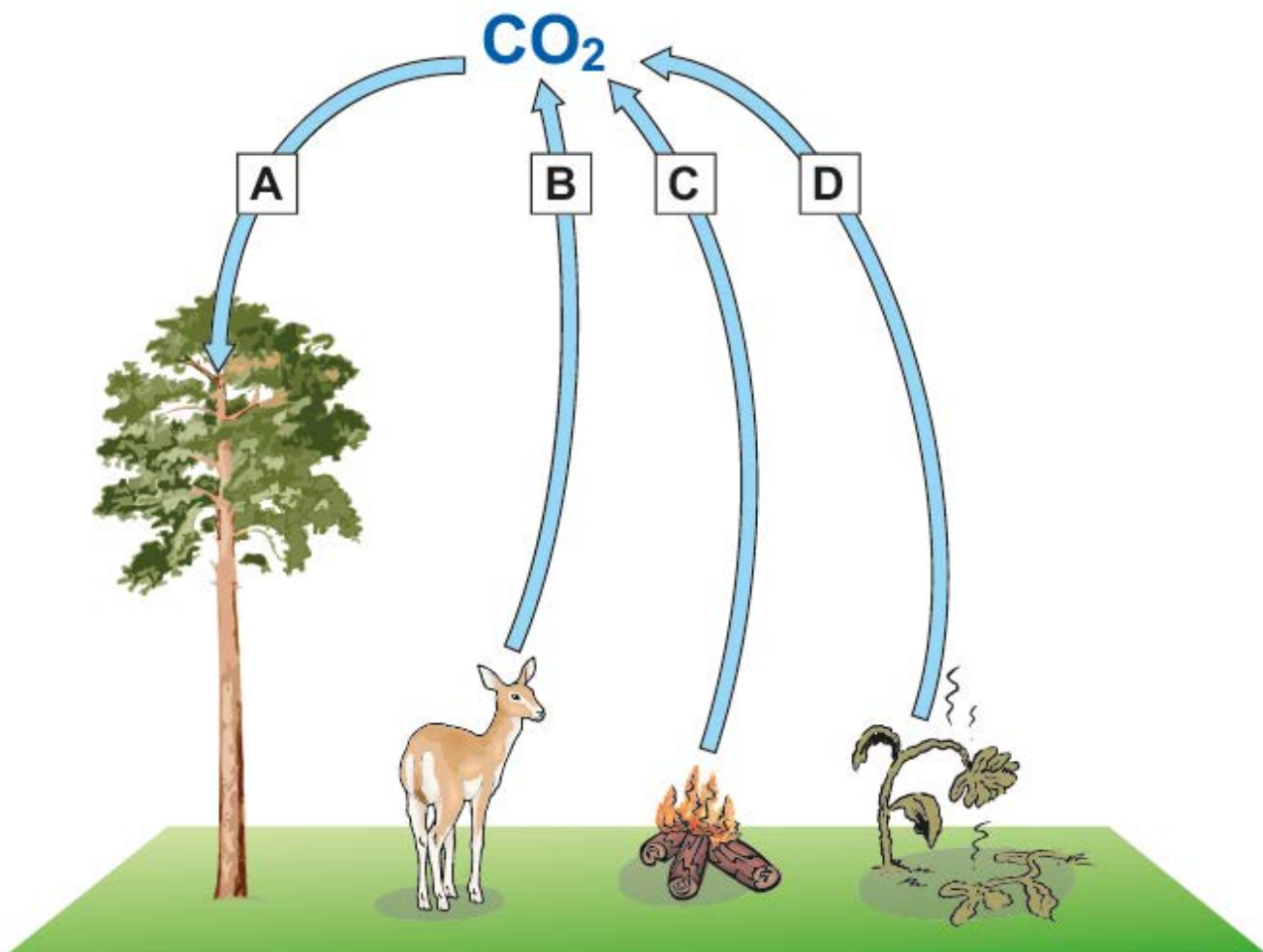
.....

- (d) What further readings should the students take to increase the confidence in the conclusion? [3]

.....

.....

4. The diagram shows four processes **A – D** in the carbon cycle.



Answer the questions below by using the letters **A – D**.

[4]

- (a) Which process is endothermic?
- (b) Which process involves the action of microorganisms?
- (c) Which process does **not** involve the action of enzymes?
- (d) Which process takes place only in the light?

4

5. (a) UV radiation can cause genes to change.

(i) Complete the sentence below. [1]

A change to a gene is known as a



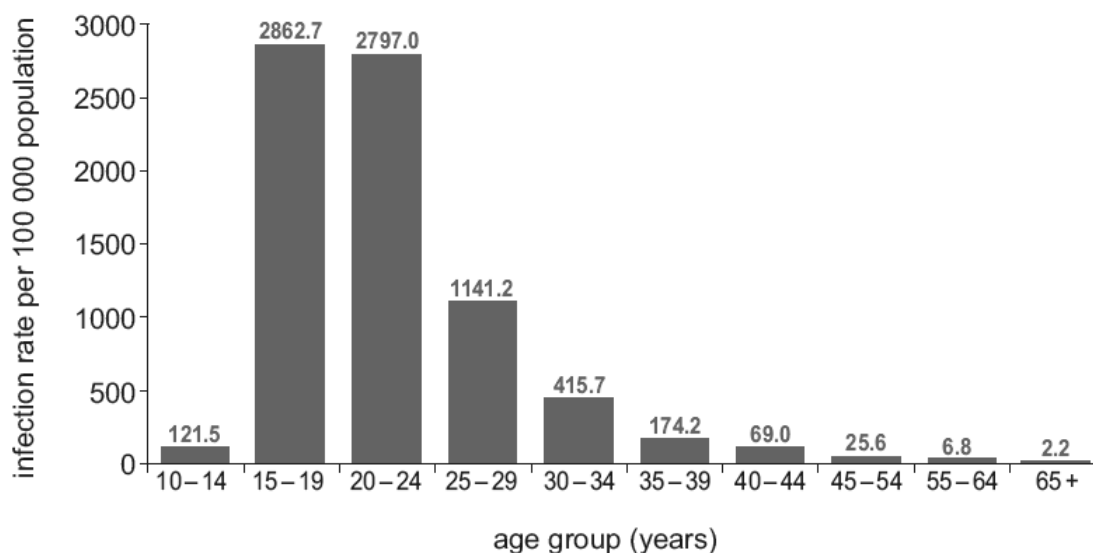
(ii) Explain how wearing a sun hat and using sun cream at the beach may help to reduce the risk of developing skin cancer. [2]

.....

.....

.....

(b) The chart below shows Chlamydia infection rates among females in the UK in 2006.



- (i) Calculate the infection rate in all females below the age of 25 years per 100 000 population. [2]

infection rate =per 100 000

- (ii) The Government recommends that all women under the age of 25 are checked for Chlamydia every year. Suggest reasons for this recommendation. [2]

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

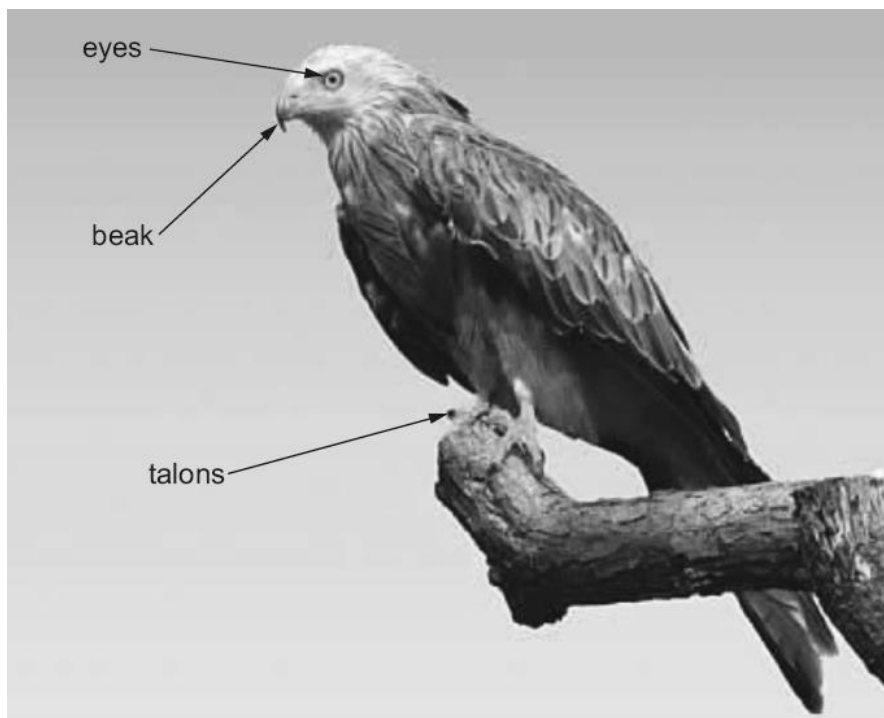
- (iii) A newspaper used the results shown in the chart to claim that:

"Chlamydia numbers continue to rise in all parts of the UK."

What further information is needed in order to support the claim made by the newspaper? [2]

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

6. The photograph shows a Red Kite (*Milvus milvus*). It also shows three structures which help Red Kites get their food.



- (a) Red Kites are carnivores.

Describe **two** of the structures labelled in the photograph and explain how each is adapted to help Red Kites get their food. [4]

.....

.....

.....

.....

.....

.....

.....

.....

- (b) An investigation of the diet of Red Kites made in March and June 2015 produced the results shown in the table.

Part of diet	% of diet	
	March	June
mice and voles	12.0	24.0
rats	32.0	9.0
rabbits	20.0	
pheasant	14.0	5.0
woodpigeon	20.0	18.0
earthworms	1.0	7.0
frogs	1.0	2.0

- (i) I Calculate the percentage of rabbits in the diet in June. [2]

% of rabbits =

- II State which part of the diet showed the greatest change between March and June: [1]

.....

- (ii) Rabbits eat plants.
Construct a food chain in the spaces below linking plants, rabbits and Red Kites. [2]

.....

(c) Read the following information.

- At one time, Red Kites were common in the UK.
- Then, for many years, Red Kites were hunted by farmers and gamekeepers.
- In 1950 there were 200 Red Kites.
- In 1981, Red Kites were protected by law.
- There were 2 000 Red Kites in the UK in 2015.

(i) Calculate the percentage increase in Red Kites between 1950 and 2015. [2]

percentage increase = %

(ii) Use the information above to explain why the Red Kite was made a protected species. [2]

.....

.....

.....

(d) In the 1950s, rabbits in the UK became serious pests, destroying large areas of crop plants. Use the above information to suggest **one** reason why the rabbits became serious pests. Explain your answer. [2]

.....

.....

.....

(e) A farmer cut down all the trees in an area of woodland on her farm. She used the space to grow wheat. Describe and explain the effect of her actions on local biodiversity. [3]

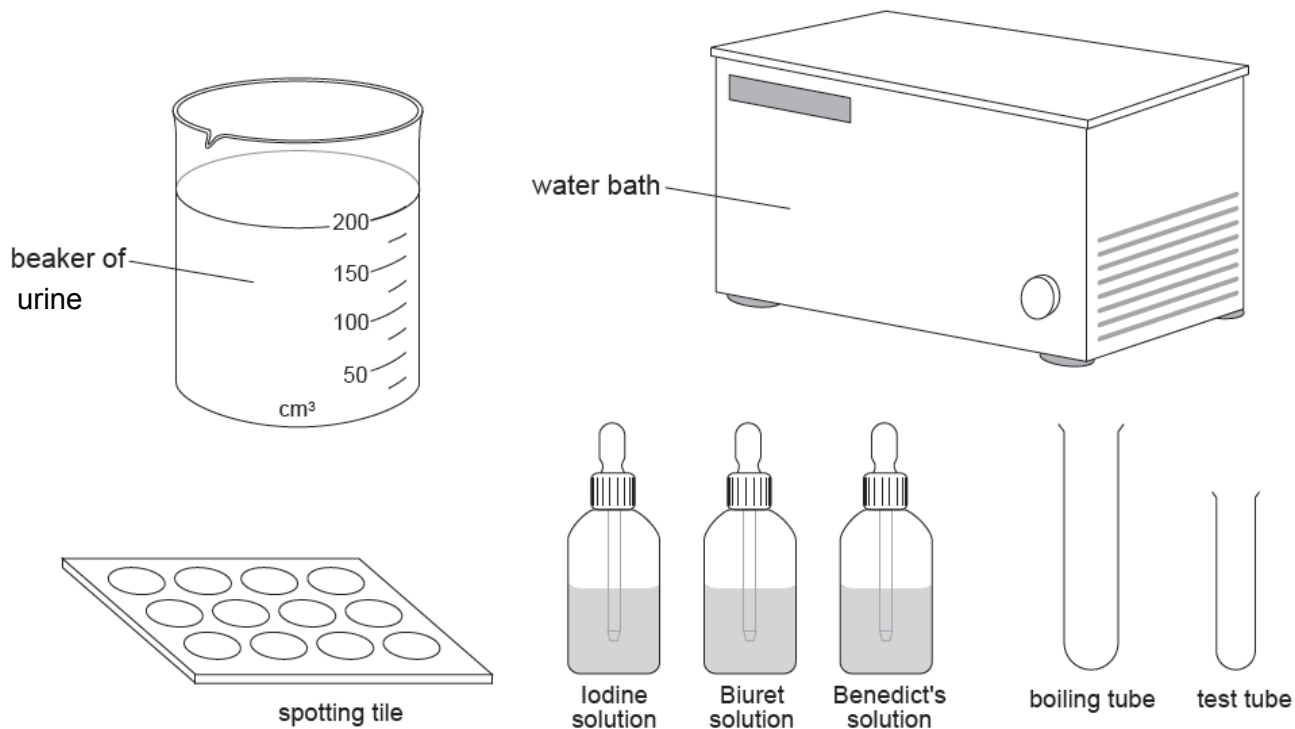
.....

.....

.....

7. Unless diabetes is controlled, blood glucose concentration can rise to dangerous levels. In some patients, their kidneys are damaged and both glucose and protein are excreted in their urine.

A student was asked to select the apparatus needed to test for glucose and protein in a sample of urine. The apparatus he selected is shown in the diagram below.



- (a) From the diagram, which apparatus should not have been selected. Give reasons for your answer. [3]

Apparatus:

.....

.....

Reason:

.....

.....

.....

.....

- (b) Describe how a diabetic could use some of the apparatus selected to test the urine sample for the presence of glucose. Explain why this test could not be used to determine how much insulin a diabetic would need to inject to control his blood glucose levels. [6 QER]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) (i) Suggest **one** practical problem of testing *real* human blood for the presence of protein. [1]

.....

- (ii) Suggest one hazard associated with taking human blood. [1]

.....

8. There are three main types of blood vessel in the human body. They all have different roles in the body and so have different structures.

(a) Give **three** differences between the structure of an artery and a vein which will allow you to distinguish between them. [3]

1.

2.

3.

(b) (i) Describe how the structure of capillaries allows the movement of molecules between the blood and the body tissues. [1]

.....

(ii) Explain the importance of a concentration gradient in maintaining the movement of molecules **from** the blood to the body tissues. [2]

.....

.....

(c) (i) State **two** molecules that pass from the blood to the body tissues. [2]

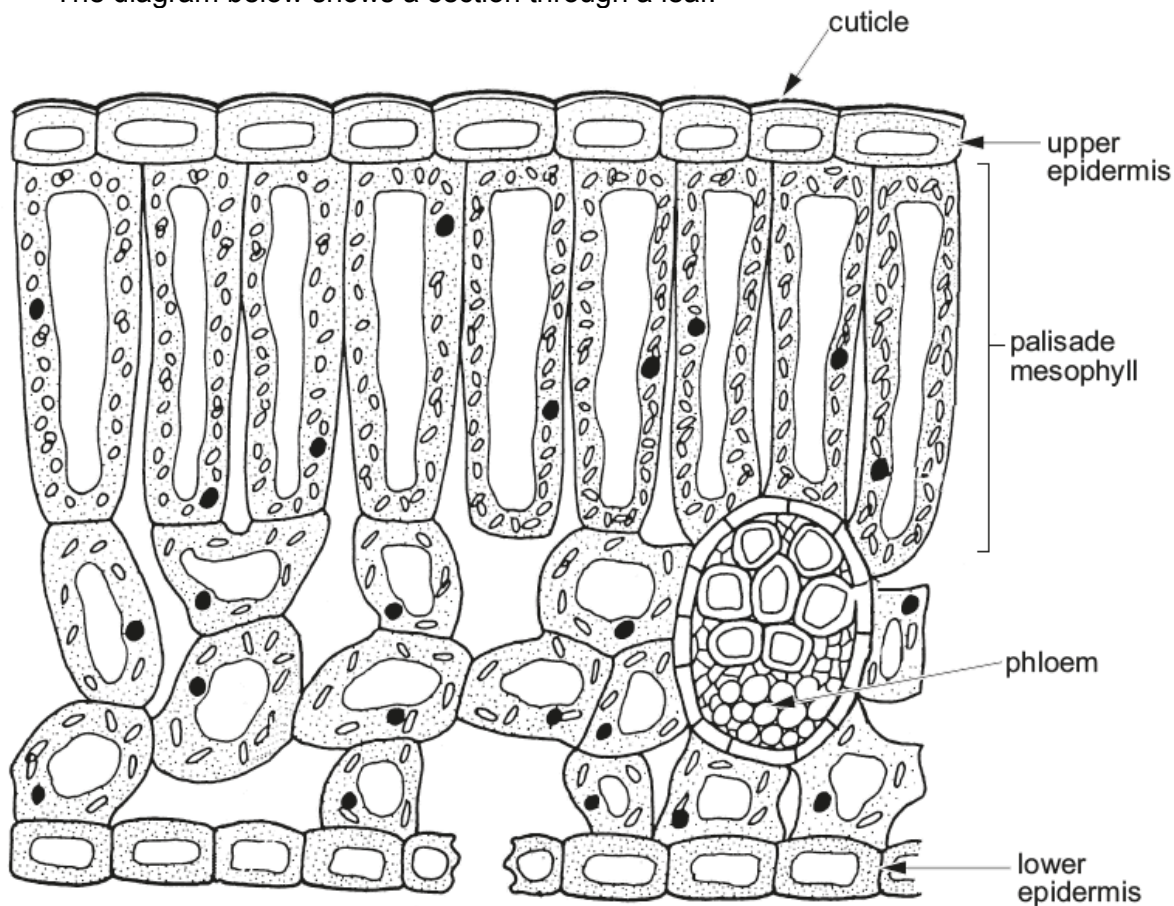
.....

(ii) State **two** molecules that pass **into** the blood from the body tissues. [2]

.....

10

9. The diagram below shows a section through a leaf.



(a) (i) State the number of stomata shown in the diagram. [1]

.....

(ii) **On the diagram** label the xylem. [1]

(iii) Draw an arrow **on the diagram** to show the path of water molecules from the xylem to the air outside the leaf. [1]

(b) Explain the effect of **increasing** air temperature on the rate of transpiration from the leaf. [2]

.....

10. John and Susan carried out an investigation into reflex actions. Susan applied a hairpin sharply to John's hand and he moved his hand away quickly. A wifi touch sensor was attached to the tip of the hairpin and a movement sensor attached to John's little finger. The time taken for the hand to move, after the hairpin was applied, was recorded on a laptop monitor. The hairpin was applied seven more times to John's hand. The results are shown in the table below.



Trial	1	2	3	4	5	6	7	8
Time taken to move hand (s)	0.22	0.27	0.23	0.23	0.27	0.22	0.25	0.24

The table below shows how the mean value for moving the hand changed with the number of readings they took.

Trials used to calculate mean	1 & 2	1, 2 & 3	1, 2, 3 & 4	1, 2, 3, 4 & 5	1, 2, 3, 4, 5 & 6	1, 2, 3, 4, 5, 6 & 7	1, 2, 3, 4, 5, 6, 7 & 8
Mean value of time to move hand (s)	0.245	0.240	0.238	0.244	0.240	0.241	0.241

- (a) What is the name given to this type of reflex action? [1]

.....

- (b) For the example shown, describe the path taken by the nerve impulse as it passes from the receptor in the skin to the effector in the arm. [3]

.....

.....

.....

.....

- (c) (i) Check that Susan and David have correctly calculated the mean for all eight readings (0.241 s). *Show your workings.* [1]

- (ii) Susan says that:

- they have not recorded the mean to the correct number of decimal places;
- they did not need to take so many repeats.

Explain whether Susan is correct. [3]

.....

.....

.....

.....

.....