AQA – Cells – AS Biology P2

1. May/2020/Paper_2/No.3

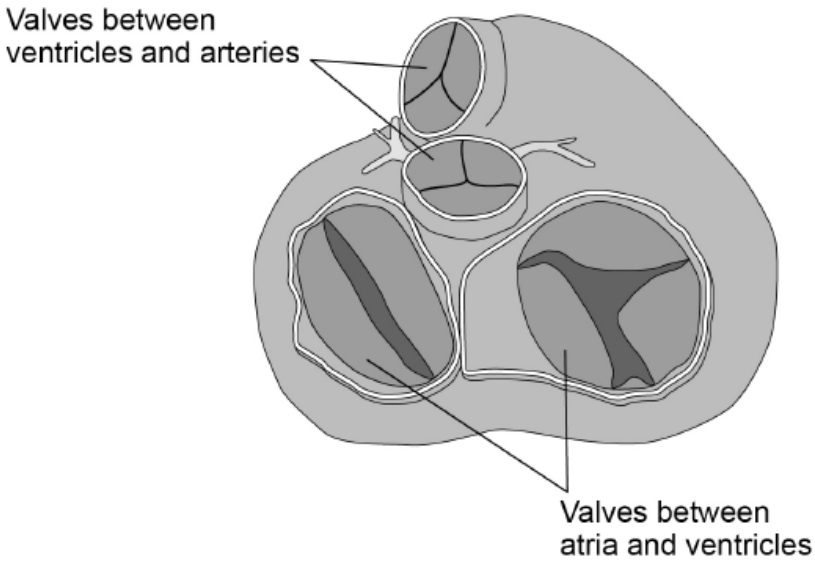
0 3 . 1 Explain how an arteriole can reduce the blood flow into capillaries.

[2 marks]

Figure 1 shows heart valves during one stage of a cardiac cycle.

Ventricles are visible through the open valves.

Figure 1



0 3 . 2 What can you conclude from the appearance of valves in **Figure 1** about heart muscle activity and blood movement between:

1. ventricles and arteries?

[2 marks]

2. atria and ventricles?

[2 marks]

0 3 . 3 Tick (✓) **one** box next to the blood vessel carrying blood at the lowest blood pressure.

[1 mark]

Capillary ☐

Pulmonary vein ☐

Renal vein ☐

Vena cava ☐

0 3 . 4 A scientist measured the heart rate and the volume of blood pumped in a single heart beat (stroke volume) of an athlete before exercise and calculated the cardiac output.

Cardiac output is calculated using this equation.

cardiac output = heart rate × stroke volume

Her results are shown in **Table 1**.

Table 1

Heart rate / beats minute^{-1}	Stroke volume / cm^3	Cardiac output / cm^3 minute^{-1}
62	80	4960

After exercise, the athlete's stroke volume increased by 30% and the cardiac output was 13 832 cm^3 minute^{-1}

Calculate the athlete's heart rate after exercise.

Give the answer to 2 significant figures. Show your working.

[2 marks]

Heart rate _____ beats minute^{-1}

2. May/2020/Paper_2/No.4

0 4 A student investigated the effect of ethanol, hydrochloric acid and temperature on the loss of red pigment from beetroot cells.

During the procedure, the student:

- added 10 cm^3 water into one test tube
- added 10 cm^3 ethanol into a second test tube
- added 10 cm^3 hydrochloric acid into a third test tube
- put the three tubes into a 25 °C water bath
- cut four cylinders of tissue from a beetroot
- put a cylinder into each tube and fitted bungs
- added 10 cm^3 water into a fourth test tube and put this tube into a 70 °C water bath
- placed the fourth cylinder into this tube and fitted a bung
- later removed the cylinders from the tubes
- estimated the intensity of red pigment in each solution by eyesight.

0 4 . 1 Give **one** way in which the student could ensure the first three beetroot cylinders were kept at 25 °C throughout her experiment.

[1 mark]

0 4 . 2 Give **two** variables that the student did **not** control in her procedure.

[2 marks]

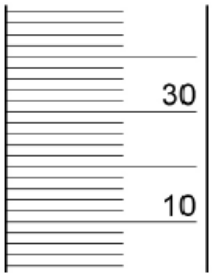
1 _____

2 _____

0 4 . 3 The student used a measuring cylinder to obtain 10 cm^3 of each solution.

Figure 2 shows some of the scale graduations on the side of this measuring cylinder.

Figure 2



What is the uncertainty of taking a reading of 10 cm^3 with this measuring cylinder?

Suggest how you could reduce the uncertainty calculated.

[2 marks]

Uncertainty ± _____ cm^3

Reducing uncertainty _____

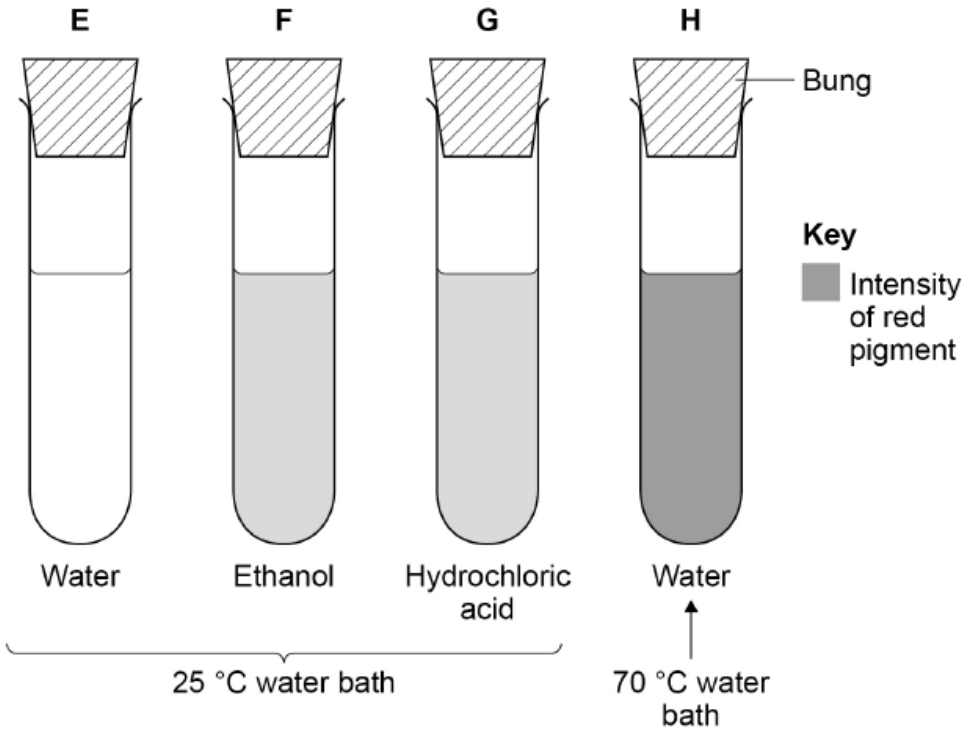
_____

_____

_____

A different student used the same procedure and she controlled **all** variables appropriately. Her results are shown in **Figure 3**.

Figure 3



0 4 . 4 Using **Figure 3**, what can you conclude about the damage caused to beetroot cells by water, ethanol, hydrochloric acid and different temperatures?

Provide explanations for your conclusions.

[4 marks]

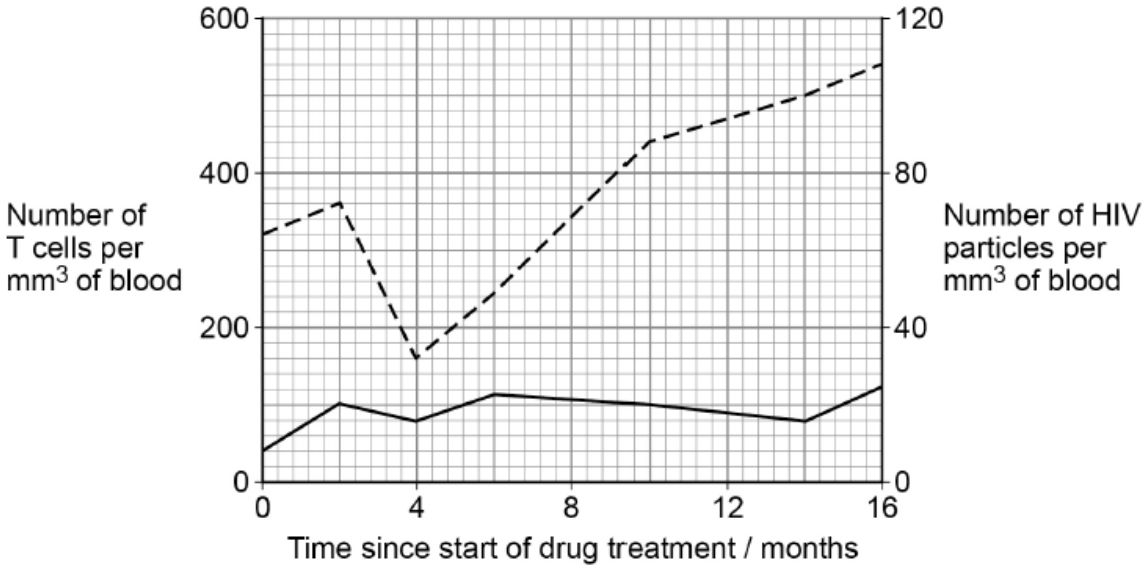
3. May/2020/Paper_2/No.7

0 7 . 1 Explain how HIV affects the production of antibodies when AIDS develops in a person.

[3 marks]

0 7 . 2 A scientist measured the effect of a drug on the number of T cells and the number of HIV particles in blood taken from a person with AIDS. The results are shown in **Figure 5**.

Figure 5



Key

– – – T cells

—— HIV particles

Symptoms of AIDS occur when the number of T cells is below 200 cells mm^{-3}

Use all of this information to evaluate the effectiveness of the drug in treating AIDS.

[5 marks]

4. May/2020/Paper_2/No.8

0 8 . 1 A scientist measured the pressure in a phloem tube in a willow plant stem.
He repeated his measurements to obtain nine readings.

His results are shown in **Table 3**.

Table 3

Phloem pressure / arbitrary units								
7.4	8.0	7.0	8.6	8.2	9.3	7.4	9.1	8.8

The percentage error of the mean phloem pressure in this phloem tube is calculated using this equation.

$$\text{Percentage error} = \frac{\text{uncertainty in measurement}}{\text{mean}} \times 100$$

The uncertainty in measurement is half the range of the measured values.

Calculate the percentage error of the mean phloem pressure in this phloem tube.

Show your working.

[2 marks]

Percentage error _____ %

0 8 . 2 The mass flow hypothesis is used to explain the movement of substances through phloem.

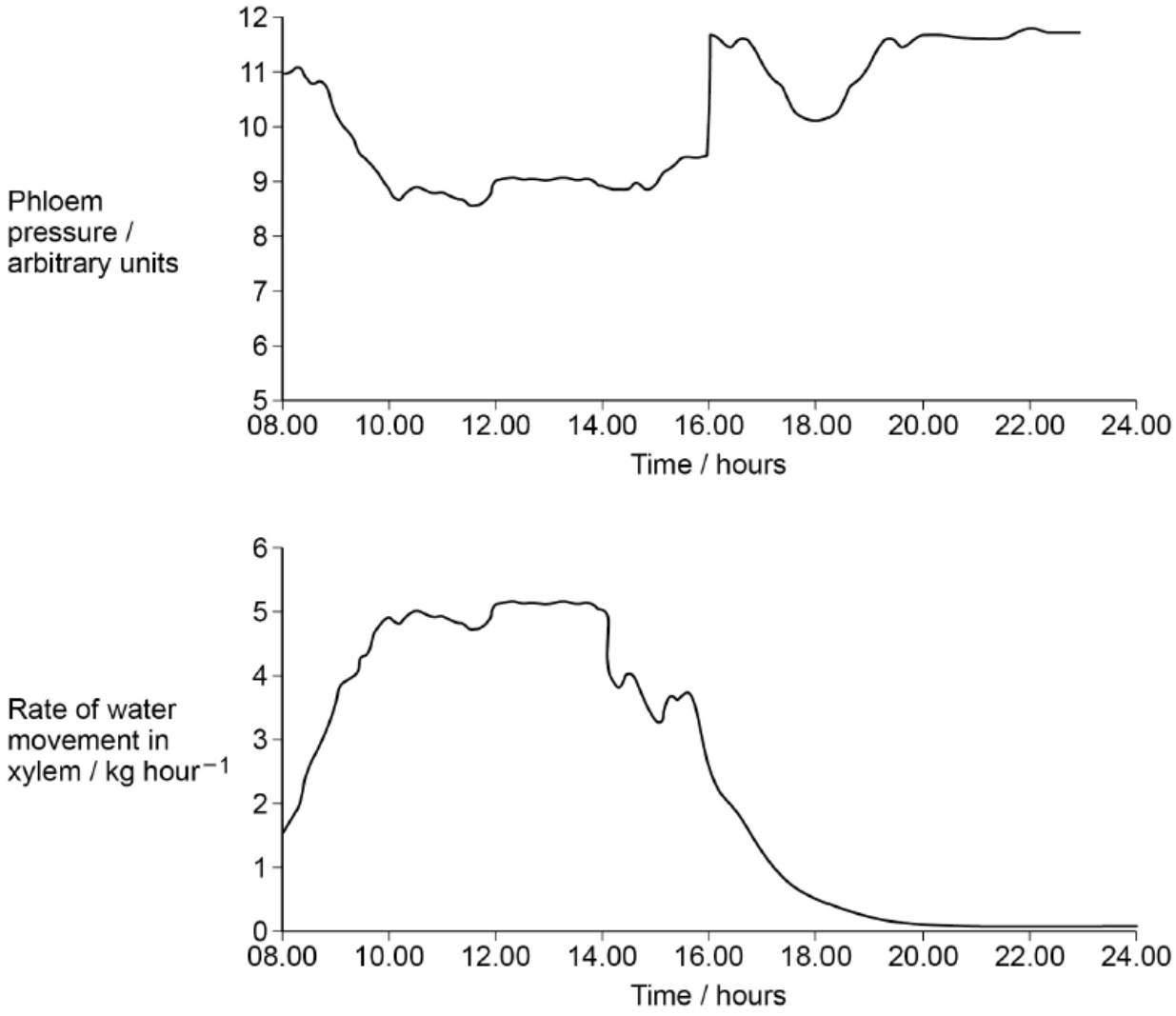
Use your understanding of the mass flow hypothesis to explain how pressure is generated inside this phloem tube.

[3 marks]

0 8 . 3 The scientist also measured changes in the phloem pressure and changes in the rate of water movement in the xylem of a willow plant at intervals during a day.

His results are shown in **Figure 6**.

Figure 6



Describe the relationship between phloem pressure and the rate of water movement in xylem in this plant.

[1 mark]

0 8 . 4 Phloem pressure is reduced during the hottest part of the day. Use information in **Figure 6** along with your understanding of transpiration and mass flow to explain why.

[3 marks]

5. May/2019/Paper_2/No.2

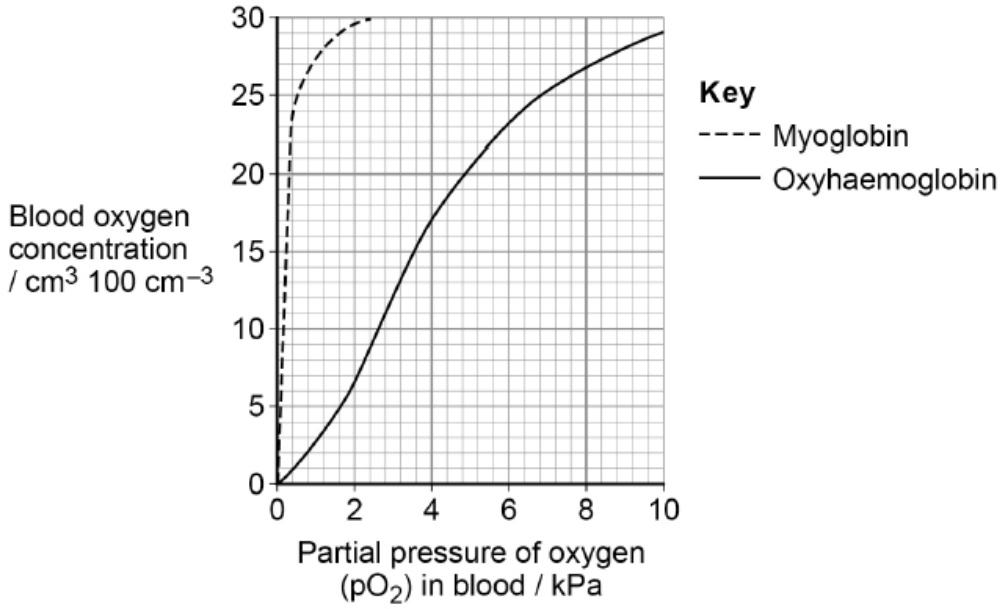
0 2 . 1 Describe and explain the effect of increasing carbon dioxide concentration on the dissociation of oxyhaemoglobin.

[2 marks]

Seals are diving mammals. They fill their lungs with air before they dive and hold their breath during the dive.

Figure 3 shows the dissociation curves for seal oxyhaemoglobin and seal myoglobin. Myoglobin is an oxygen-carrying protein found in muscles.

Figure 3



0 2 . 2 Use information in **Figure 3** to explain how the seal's myoglobin dissociation curve shows the seal is adapted for diving.

[2 marks]

[Extra space]

0 2 . 3 Scientists measured the oxygen carrying capacity of seal blood.
They found the haemoglobin in a 190 kg seal contained 1.07×10^4 cm^3 oxygen.
When the seal dived, it used 5.2 cm^3 oxygen per minute per kg of body mass.

Use this information to calculate the maximum number of minutes the seal can remain under water. Assume that all of the oxygen attached to the haemoglobin is released during the dive.

[2 marks]

Answer = _____ minutes

6. May/2019/Paper_2/No.4

0 4 . 1 Describe and explain the role of antibodies in stimulating phagocytosis.

Do **not** include details about the process of phagocytosis.

[2 marks]

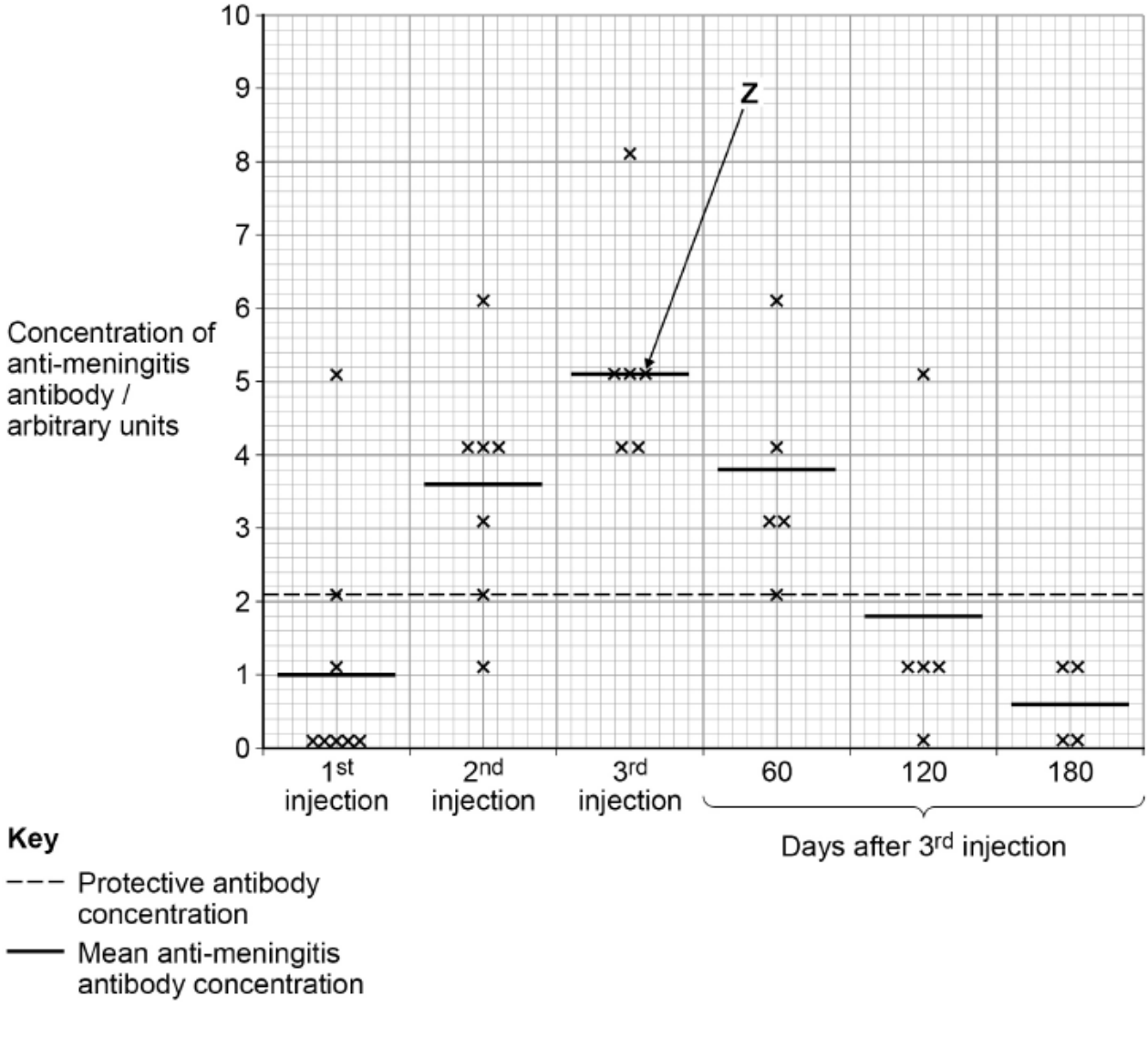
Meningococcus bacteria cause a disease called meningitis. Scientists investigated a new meningitis vaccine (MenG) by measuring changes in blood anti-meningitis antibody concentration in mice.

Each mouse was given three separate MenG injections. The concentration of anti-meningitis antibody was measured in a sample of blood taken soon after each injection.

After the 3rd injection, the concentration of anti-meningitis antibody in the blood was also measured after 60 days, after 120 days and then after 180 days.

Figure 4 shows the scientists' results. Each plotted point in **Figure 4** is the result for a different mouse.

Figure 4



0 4 . 2 The scientists discovered that the concentration of anti-meningitis antibody of the mouse labelled **Z** in **Figure 4** decreased after the 3rd injection at a constant rate of 0.027 arbitrary units per day.

Use this information and **Figure 4** to calculate the number of days after the 3rd injection the antibody concentration is higher than the protective antibody concentration for this mouse.

[2 marks]

Answer = _____ days

0 4 . 3 Using **Figure 4**, what can you conclude about the effectiveness of each injection on the immune response of these mice?

[4 marks]

0 4 . 4 The scientists hypothesised that memory B cells had formed in the mice 180 days after the 3rd injection.

Suggest and explain a practical method the scientists could use to test this hypothesis.

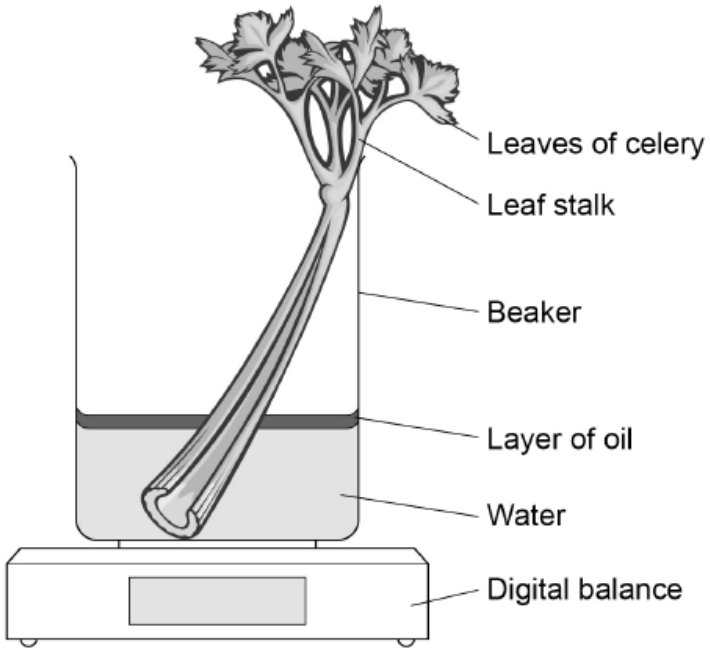
[2 marks]

[Extra space]

7. May/2019/Paper_2/No.5

0 5 A student used the apparatus shown in **Figure 5** and a digital balance to determine the rate of water movement in a celery stalk in grams per hour per group of xylem vessels.

Figure 5



0 5 . 1 The student measured the time taken for water movement.
Give **two** other measurements he made to calculate the rate of water movement.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 5 . 2 Give the reason for adding a layer of oil to the water in the beaker.

[1 mark]

_____

_____

_____

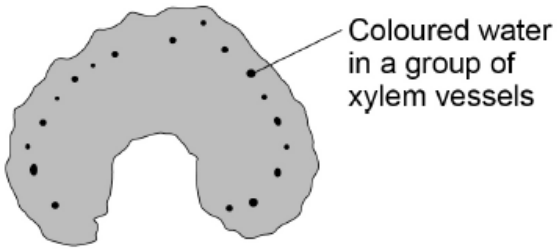
0 5 . 3 A different student used coloured water to investigate the movement of water in leaf stalks of celery.

During the procedure she:

- cut equal lengths of stalk from each plant
- put the cut end of each stalk into coloured water
- left these stalks to take up the coloured water for 20 minutes
- used a sharp scalpel to cut slices from the stalks at 1 mm intervals until she reached a slice with no coloured water.

Figure 6 shows a slice of leaf stalk with coloured water inside groups of xylem vessels.

Figure 6



Explain why coloured water moved up the stalks.

[3 marks]

0 5 . 4 The student used a sharp scalpel to cut the celery. Describe how she should ensure she handled the scalpel safely during this procedure.

[2 marks]

The student measured the distance the coloured water had travelled in eight celery stalks.
Her results are shown in **Table 1**.

Table 1

Distance / mm							
70	35	40	35	30	80	42	44

0 5 . 5 The student had to choose whether to summarise her measurements by calculating the mean, the median or the mode.

Circle the most appropriate measure for this set of measurements.
Give a reason for your choice and find the value using the measurements from all eight stalks.

[2 marks]

Mean* Median* Mode*

*circle one word.

Reason:

Calculation:

Answer =

8. May/2019/Paper_2/No.9

0 9 . 1 Describe the roles of iron ions, sodium ions, and phosphate ions in cells.

[5 marks]

[Extra space]

0 9 . 2 The movement of substances across cell membranes is affected by membrane structure. Describe how.

[5 marks]