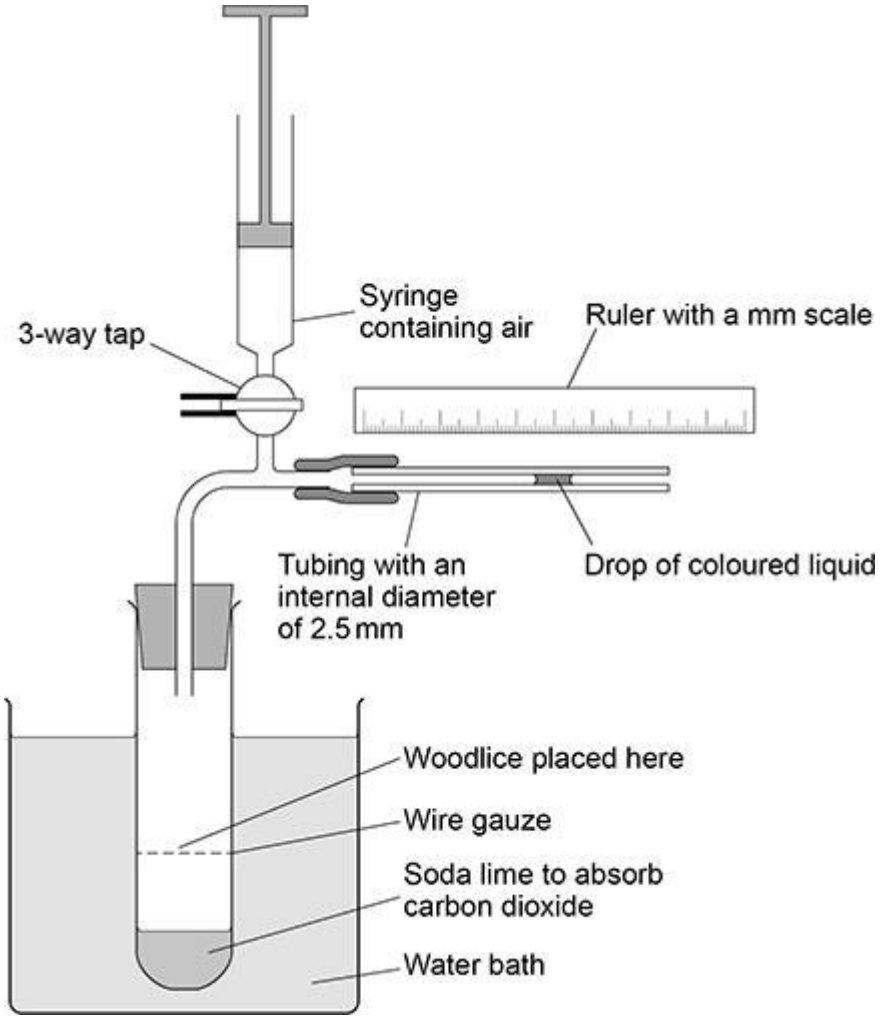
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

A student investigated the effect of temperature on the rate of aerobic respiration in woodlice.

Figure 1 shows the apparatus they used.

Figure 1



The student altered the temperature of the water bath and measured how far the drop of coloured liquid moved every minute for 5 minutes.

(a) Other than those stated, suggest **two** variables the student should have kept constant in this investigation.

1 _____

_____

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2 _____

_____

(1)

(b) Describe how the student used the apparatus in **Figure 1** to reset the drop of coloured liquid back to the **right-hand** end of the tubing.

_____

_____

_____

_____

_____

_____

(2)

(c) The student also set up a control experiment.

Suggest a suitable control experiment **and** explain why it was necessary.

Control experiment _____

_____

_____

Explanation _____

_____

_____

_____

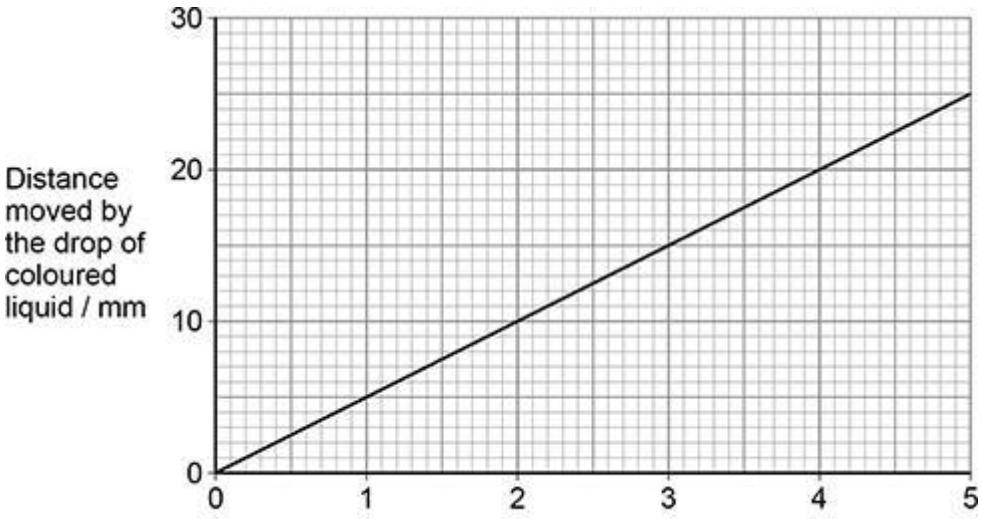
(2)

(d) **Figure 2** shows the student's results at 25 °C

The mass of the woodlice in the tube was 3.78 g

Figure 2

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Use **Figure 1** and **Figure 2** to calculate the mean rate of oxygen uptake by the woodlice in $mm^3\ s^{-1}\ g^{-1}$

The formula for the volume of the capillary tubing is $\pi r^2 l$.

Use $\pi = 3.14$ in your calculation.

Show your working **and** give your answer to 2 decimal places.

Answer _____ $mm^3\ s^{-1}\ g^{-1}$

(3)

(Total 8 marks)

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Q2.

(a) A student used chromatography to separate the different photosynthetic pigments in a chlorophyll solution. She had the following materials.

Chromatography paper
A ruler and pencil
Suitable glassware
A solvent (solvent **A**)
2 cm^3 of the chlorophyll solution

Describe how she could use these materials to separate the photosynthetic pigments by chromatography.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) Using solvent **A**, the student separated five pigments. She then repeated her method using a different solvent, **B**. Using solvent **B**, she separated six pigments.

Explain the difference between these results.

_____

_____

_____

_____

_____

(2)

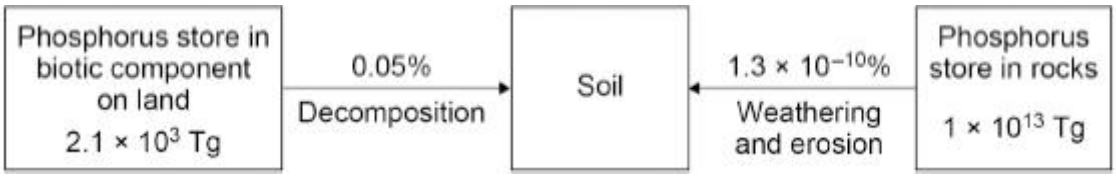
(Total 6 marks)

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Q3.

Figure 1 shows part of a phosphorus cycle, including the mass of phosphorus in two stores.

Figure 1



One teragram (Tg) is 1×10^{12} grams.

The supply of phosphorus to the soil is shown as a percentage of the total phosphorus mass of each store.

(a) Calculate in teragrams the difference in the supply of phosphorus to the soil from the two stores shown in **Figure 1**.

Show your working.

Answer _____ Tg

(2)

Water shortage can inhibit crop production. Scientists investigated the effect of the mycorrhizal species *Glomus intraradices* on the growth of tomato plants under conditions of water shortage and **no** water shortage.

- The scientists planted tomato seeds into a large number of pots containing sterilised soil.
- They added a culture of *G*. *intraradices* to 50% of the pots and 50% were left untreated.
- After the seeds had developed into seedlings (young plants), the seedlings from the untreated and treated pots were planted into four separate large greenhouses (glasshouses).
- A very limited supply of water (water shortage) was provided to two of the greenhouses. A sufficient supply of water (**no** water shortage) was provided to the other two greenhouses.
- After 60 days, the scientists determined the mean mass of tomatoes (kg m^{-2}) from each greenhouse.

Greenhouse **P** – untreated seedlings with water shortage
Greenhouse **Q** – treated seedlings with water shortage
Greenhouse **R** – untreated seedlings with **no** water shortage
Greenhouse **S** – treated seedlings with **no** water shortage

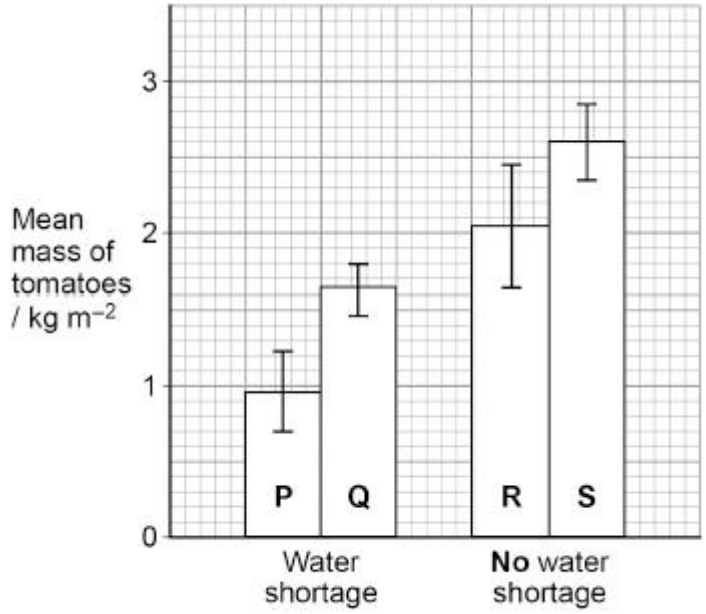
Treated seedlings are plants grown with *G. intraradices*.

Figure 2 shows the scientists' results.

The error bars represent ± 2 standard deviations from the mean, which includes over 95% of the data.

Figure 2

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(b) Using all the information, evaluate the effectiveness of using mycorrhizae to increase crop production under conditions of water shortage and **no** water shortage.

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_____

_____

_____

_____

_____

_____

(5)

(c) The tomato seeds were planted into sterilised soil.

Suggest **two** reasons why the soil was sterilised.

1 _____

_____

2 _____

_____

(2)

(d) The soil used in this investigation had the recommended concentration of fertiliser.

Suggest **two** reasons why the soil contained the recommended concentration of fertiliser.

1 _____

_____

2 _____

_____

(2)

(Total 11 marks)

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