A Level Biology A

H420/01 Biological Processes

Question Set 14

14 (a) (i) A scientist used a respirometer to investigate the rate of respiration and photosynthesis ofmaize in different light intensities.

- The scientist placed ten maize seedlings in a respirometer and kept it in the dark forthree hours.
- The respirometer contained soda-lime to remove any CO_2 produced by the seedlings.
- The scientist placed ten maize seedlings in a separate respirometer without soda-lime and placed it in different light intensities for three hours at a time.

Light intensity(lux)	Distance moved by fluid in respirometer (mm)
0	–3.7
1020	–0.8
1510	0.0
1700	1.2
2000	2.9

Table 22.1

The diameter of the capillary tubing was 0.1 mm.

The volume of a cylinder can be calculated using the following formula:
volume of cylinder = $\pi r^2 l$

Calculate the **rate of oxygen uptake** by the seedlings in the dark. Give your answer to **two** significant figures. Show your working.

$\frac{\pi \times 0{\cdot}05^2 \times 3{\cdot}7}{3} = 9{\cdot}7 \times 10^{-3}\ mm^3\ h^{-1}$

Answer = …$9{\cdot}7 \times 10^{-3}$… $mm^3\,h^{-1}$ **[3]**

14 (a) (ii) 1700 lux is a typical light intensity on a cloudy day in the UK.

Calculate the percentageincrease in gas production between 1700 and 2000 lux. Show your working.

$\frac{2.9 - 1.2}{1.2} \times 100 = 142\%$

Answer =.....142..... % **[2]**

14 (a) (iii) Suggest why soda-lime was **not** placed in the respirometer with the seedlings grown inthe light. **[1]**

The soda lime would absorb CO_2 which would prevent the plant from photosynthesising.

14 (b) The scientist made the following claim:

These results suggest that, in maize seedlings, the rate of photosynthesis exceeds the rate of respiration only when the light intensity is above 1510 lux.

Use the data in Table 22.1 to explain why the scientist made this claim. **[2]**

At 1510 lux, the distance moved by the fluid in the respirometer is 0 mm, so the rate of photosynthesis equals the rate of respiration. Above 1510 lux, the net change in the volume of the respirometer will be positive, so the rate of photosynthesis will exceed the rate of respiration.

Total Marks for Question Set 14: 8

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