Edexcel B Biology A-Level

Core Practical 9

Investigate factors affecting the rate of aerobic respiration using a respirometer

A respirometer is a piece of equipment which measures **rate of respiration**. It works by the addition of a **drop of coloured liquid** to a length of tubing. As the organism respires and the volume of oxygen in the tube decreases, the **pressure also decreases** and the liquid moves down the pressure gradient towards the respirometer.

Equipment

- Respirometer
- Live animals (e.g. maggots, woodlice)
- Respiring and germinating seeds (e.g. peas)
- Soda lime wrapped in muslin
- Manometer fluid
- Spatula
- Stop clock
- Clamp and stand
- Pipette
- Balance

Method

1. Assemble the respirometer.
2. Add 5g of one organism to the boiling tube and replace the bung.
3. Place a drop of **coloured manometer fluid** in the open end of the respirometer. Use a **syringe** to draw the fluid as far from the respirometer as possible and record its starting position.
4. **Close the tap**. Start the stop clock.
5. After five minutes, open the tap. **Record the end position** of the coloured liquid.
6. Repeat the process for the other organism.

Risk Assessment

Hazard	Risk	Safety Precaution	In emergency	Risk Level
Broken glass	Cuts from sharp object	Take care when handling glass objects; keep away from edge of desk	Elevate cuts; apply pressure; do not remove glass from wound; seek medical assistance	Low
Soda lime	Corrosive	Wear eye protection; avoid contact with skin	Wash off skin immediately; flood eye/cuts with cold water	Low
Biohazard	Contamination	Use disinfectant; wash hands with soap after handling organisms	Seek assistance	Low

Analysis

- Convert distance moved by the liquid in the time into volume of gas by using the **πD** formula with the diameter of the respirometers tube to produce a **cross-section** and then multiplying by distance moved.
- Convert volume into **rate** by dividing by five minutes.
- Convert rate into rate per gram of organism by dividing by five grams.

Conclusion

- **Soda lime absorbs carbon dioxide** given out during respiration so any changes in volume are assumed to be only due to differences in oxygen uptake.
- Gas exchange due to **photosynthesis** is ignored and all of the gas is assumed to be oxygen.
- Different organisms have different rates of respiration - the **animals have a higher rate of respiration** per gram than the plants, as they have a **higher metabolic rate** and require much more energy to be released for movement/reproduction/etc.