

**GCSE Biology A (Gateway)**

**J247/04 Biology A B4-B6 and B7 (Higher Tier)**

**Question Set: 13**

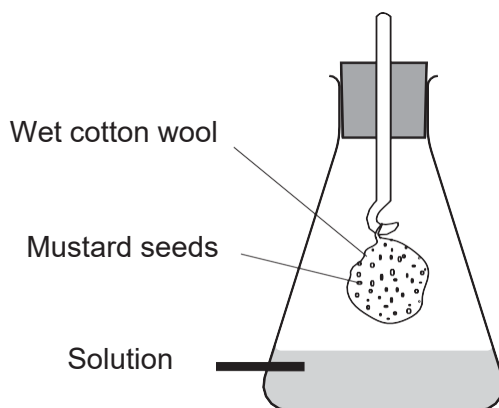
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A student investigates the effect of acid rain on seed growth.

She dips some cotton wool in 20 cm<sup>3</sup> of water. She then puts 20 mustard seeds onto the cotton wool and places it inside a flask. The student puts the remaining water into the flask with the cotton wool.

She repeats this four more times, each time using different solutions of water and dilute sulfuric acid.

One of the flasks is shown in the diagram.



After **8 days** she counts how many of the seeds have germinated.

The table shows her results.

Volume of water in flask (cm <sup>3</sup> )	Volume of dilute sulfuric acid in flask (cm <sup>3</sup> )	Number of seeds that germinated
20	0	18
16	4	15
8	12	13
4	16	6
0	20	2

(a) What is the dependent variable in this investigation?

[1]

(b) State why the student changed the volume of water in each flask.

[1]

- (c) The student kept each flask at the same temperature during the experiment to make it a fair test.

Explain **one** other reason why she kept each flask at the same temperature.

[1]

- (d) Explain what this experiment shows about the effect of acid rain on seed germination.

[2]

- (e) The student used a formula to describe the germination of seeds called the viability index (**VI**).

- (i) For the seeds in 20 cm<sup>3</sup> of sulfuric acid, the mean root length was 5 mm and the mean shoot length was 2 mm.

Calculate **VI** for these seeds

Use the equation:

$VI = \text{mean root length} \times \text{mean shoot length} \times \text{percentage of seeds that germinated}$

[2]

- (ii) Using **VI** is a better way of comparing the effects of acid rain than just using the number of seeds germinated.

Explain why.

[2]

**Total Marks for Question Set 13: 9**

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