

Experimental skills practice questions

6 questions • 29 marks • mark scheme at the back

For Cambridge IGCSE Combined Science 0653. **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 29

- 1** A student investigates the effect of temperature on the activity of amylase. She mixes amylase solution with starch suspension in water baths at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C. Every 30 seconds she puts one drop of the mixture into iodine solution on a spotting tile. She records the time taken until the iodine solution stays orange-brown. (a) Identify the independent variable. [1] (b) Identify the dependent variable. [1] (c) State two variables that she should keep constant. [2] (d) Explain why she should leave the amylase and the starch in the water bath for five minutes before mixing them. [1] **[5 marks]**

- | The student's results table | | | |
|-----------------------------|-------------------|-------------|-------------------|
| Sucrose concentration | Mass at start (g) | Mass at end | Percentage change |
| 0.0 | 2.50 | 2.75 g | +10.0 |
| 0.2 | 2.48 | 2.60 | +4.8 |
| 0.4 | 2.52 | 2.40 | |
| 0.6 | 2.5 | 2.30 | −8.0 |

[illegible]

- | Rate of photosynthesis at different temperatures | |
|--|---|
| temperature / °C | rate of photosynthesis / bubbles per minute |
| 10 | 6 |
| 20 | 14 |
| 30 | 25 |
| 40 | 31 |
| 50 | 12 |

[illegible]

- Answer =

[illegible]

- | Number of bubbles released per minute | | | | |
|---------------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------|
| distance of lamp / cm | bubbles per minute: trial 1 | bubbles per minute: trial 2 | bubbles per minute: trial 3 | mean bubbles per minute |
| 10 | 32 | 30 | 34 | 32 |
| 20 | 21 | 9 | 23 | |
| 30 | 12 | 14 | 13 | 13 |

[illegible]

- 6** (a) State the colour change seen when carbon dioxide is bubbled through limewater. [1] (b) **[4 marks]**
Some germinating seeds were placed in a sealed tube above red hydrogencarbonate indicator solution and left for two hours. State the colour of the indicator after two hours and explain your answer. [2] (c) Describe how a student could use universal indicator solution to find the pH of a sample. [1]

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Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [5]

- (a) temperature (1)
- (b) time taken for starch to disappear / for iodine to stay orange-brown (1) allow time taken for starch to be broken down
- (c) volume / concentration of amylase (1)
- (c) volume / concentration of starch (1)
- (c) pH (1) allow use of a buffer
- (c) volume of iodine solution (1) ignore amount unqualified
- Max 2 for (c)
- (d) so that the solutions reach the temperature of the water bath (before the reaction starts) (1)

2. [5]

- (a) concentration of sucrose / mol dm^{-3} and mass at start / g (1)
- (a) mass at end / g and percentage change (in mass) / % (1) all four needed with solidus for 2 marks; any two correct for 1 mark
- (b) unit (g) written in the body of the table (1) OR 2.5 not recorded to the same number of decimal places / should be 2.50 (1)
- (c) $(2.40 - 2.52) \div 2.52 \times 100$ (1)
- (c) -4.8 (%) (1) allow -4.76

3. [6]

- (a) axes: temperature on x-axis and rate on y-axis, each labelled with quantity and unit, using solidus (1)
- (a) scale: linear, sensible ratio (e.g. 2 cm = 10 °C; 2 cm = 5 bubbles per minute) and data plotted over more than half the grid in both directions (1)
- (a) all five points plotted correctly to within half a small square, as × or ⊙ (1)
- (a) ruled straight lines between points or a smooth best-fit curve, not extended beyond the first and last points (1)
- (b) rate increases from 10 °C to 40 °C (1)
- (b) maximum / highest rate at 40 °C (1)
- (b) rate decreases from 40 °C to 50 °C (1)
- (b) quotes data with units, e.g. 31 bubbles per minute at 40 °C (1)
- Max 2 for (b)

4. [4]

- (a) $84 \div 21$ (1)
- (a) $\times 4$ (1) allow 4
- (b) $40 \div 5$ (1)
- (b) 8 mm (1)

5. [5]

- (a) 9 (bubbles per minute) at 20 cm, trial 2 (1)
- (b) $(21 + 23) \div 2$ (1) anomalous result excluded
- (b) 22 (1) allow 17.7 or 18 for 1 mark only if the anomaly is included
- (c) place a heat shield / beaker of water between lamp and pondweed (1) allow use an LED lamp
- (c) use a thermostatically controlled water bath / monitor the temperature with a thermometer and keep it constant (1)
- (c) collect the gas and measure its volume (with a gas syringe / measuring cylinder) instead of counting bubbles (1)
- (c) leave the pondweed for a few minutes at each distance before counting (1)
- (c) carry out in a dark room so that the lamp is the only light source (1)
- Max 2 for (c)

6. [4]

- (a) colourless / clear to milky / cloudy (white) (1)
- (b) yellow (1) allow orange
- (b) seeds respire and release carbon dioxide (which increases the carbon dioxide concentration) (1)
- (c) add (a few drops of) universal indicator and compare the colour with a (pH) colour chart (1)