

Experimental skills practice questions

7 questions • 33 marks • mark scheme at the back

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 33

- 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 |

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- | 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]

- 4** (a) A student drew a bean seed. The actual length of the seed is 21 mm. The length of the seed in the drawing is 84 mm. Calculate the magnification of the drawing. Show your working. [2] (b) A photograph of an insect has a magnification of $\times 5$. The length of the insect's body on the photograph is 40 mm. Calculate the actual length of the insect's body. Give your answer in mm. [2] **[4 marks]**

Answer =

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- 5** A student placed a lamp at different distances from some pondweed in a beaker of water and counted the bubbles released in one minute. He repeated each distance three times. His results are in the table. (a) Identify the anomalous result. [1] (b) Calculate the mean number of bubbles per minute at 20 cm. Show your working. [2] (c) The lamp heats the water. Suggest two improvements to the method. [2] **[5 marks]**

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

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- 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]

- 7** A student wants to estimate the number of daisy plants on a school field using a quadrat. [4 marks]
(a) Describe how the student could place the quadrats at random. [2] (b) Explain why the quadrats should be placed at random. [1] (c) Suggest one safety precaution the student should take. [1]

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)

7. [4]

- (a) lay out two tape measures at right angles / make a grid (1)
- (a) use random numbers / a random number generator to give coordinates (1)
- (b) to avoid bias (1) allow so that the sample is representative
- (c) wear gloves / wash hands after handling plants or soil / do not touch plants that cannot be identified (1)