

Food production: micro-organisms and fish farming: practice questions

8 questions • 26 marks • mark scheme at the back

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Name

Total / 26

1 Which gas, made by yeast, causes bread dough to rise? [1 mark]

- A. ☐ Oxygen
- B. ☐ Carbon dioxide
- C. ☐ Ethanol
- D. ☐ Nitrogen

2 Describe the role of *Lactobacillus* in the production of yoghurt. [3 marks]

3 A student investigated the effect of temperature on the rate of anaerobic respiration in yeast. She mixed yeast with sugar solution, added a layer of oil, and collected the gas in a syringe in a water bath. (a) Explain why a layer of oil was added. (b) State two variables she should control. [4 marks]

- 4** In the investigation at 30 °C, 12 bubbles of gas were counted in 3 minutes. Calculate the mean number of bubbles produced per minute. **[2 marks]**

Answer =

- 5** An industrial fermenter has a water jacket and stirring paddles. Explain the purpose of each of these features. **[3 marks]**

- 6** Describe and explain the conditions needed in an industrial fermenter for the growth of micro-organisms. **[6 marks]**

- 7** **Biology only** **[3 marks]**

Fish farmers keep fish of similar size together in separate tanks. Explain why this helps to increase the number of fish that survive.

8

Biology only

[4 marks]

Describe four ways in which a fish farmer can make sure fish grow quickly and stay healthy.

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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. [1]

B B (1)

2. [3]

- the bacteria respire / break down lactose (milk sugar) (1)
- to make lactic acid (1)
- which lowers the pH / makes the milk proteins clump so milk thickens (1)
- allow gives a sour taste

3. [4]

- (a) oil stops oxygen entering the solution (1)
- so the yeast can only respire anaerobically (1)
- (b) any two from: volume of sugar solution / concentration of sugar / type of sugar / mass of yeast / time for collecting gas (1)(1)
- allow depth / volume of oil
- reject temperature (independent variable)

4. [2]

- $12 \div 3$ (1)
- 4 bubbles per minute (1)

5. [3]

- water jacket: cools the fermenter / keeps the temperature at the optimum (1)
- because respiration releases heat / heat would denature enzymes (1)
- paddles mix the contents so nutrients and oxygen are evenly distributed (1)

6. [6]

Level 3 5-6	Describes and explains at least four conditions, with a clear reason for each linked to growth or enzyme activity, and accurate use of terms such as aseptic, optimum, oxygenation and agitation.
Level 2 3-4	Describes at least three conditions with some explanation of why they are needed.
Level 1 1-2	Names one or two conditions with little or no explanation.

Indicative content

- aseptic precautions: sterilise equipment and nutrients to stop contamination by other microbes that compete or spoil the product
- nutrients such as glucose and nitrogen sources for growth
- optimum temperature, controlled with a cooling jacket, for fastest enzyme activity
- optimum pH, monitored with probes and controlled by adding acid or alkali, to avoid denaturing enzymes
- oxygenation: sterile air supplied for aerobic respiration, giving more energy for growth
- agitation: stirring so nutrients, oxygen and heat are evenly spread

7. [3] Biology only

- larger fish of the same species eat smaller fish (1)
- this is intraspecific predation (1)
- keeping similar sizes together reduces this, so more fish survive / more fish to harvest (1)

8. [4] Biology only

- maintain water quality / oxygen / temperature / pH (1)
- control disease with medicines / vaccines / clean water (1)
- remove waste products by filtering the water (1)
- feed a balanced diet at the right frequency / amount (1)
- selective breeding of fast-growing fish (1)
- keep predators out / separate species (1)
- Max 4