

Bacterial growth, plant medicines and drug testing: practice questions

8 questions • 29 marks • mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 29

1 UNIT 2 STYLE [1 mark]

Which precaution during Core practical 9 helps to prevent contamination of a bacterial culture?

- A. ☐ Sealing the Petri dish completely with tape
- B. ☐ Flaming the neck of the culture bottle after opening it
- C. ☐ Incubating the dish at 37 °C
- D. ☐ Leaving the lid of the dish off while spreading the bacteria

2 UNIT 2 STYLE [3 marks]

State three conditions that bacteria need for growth.

3 UNIT 2 STYLE [4 marks]

Explain why aseptic technique is used when handling bacteria.

[6 marks]

[illegible]

[3 marks]

Mean diameter of the clear zone of inhibition	
Disc	Mean diameter of clear zone (mm)
Extract A	14
Extract B	9
Extract C	6
Solvent only	0

[illegible]

[3 marks]

[illegible]

7 UNIT 2 STYLE

[4 marks]

Explain the importance of using a placebo and a double-blind design in a drug trial.

8 UNIT 2 STYLE

[5 marks]

William Withering used a herbal mixture to treat dropsy in the 18th century. Compare and contrast his approach with modern drug testing.

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: flaming the neck of the bottle (sterilises the opening, prevents entry of microorganisms)

2. [3]

- nutrients / carbon source / nitrogen source / mineral ions
- suitable temperature
- oxygen (for aerobes) / correct oxygen level
- suitable pH
- water / moisture
- Max 3. Do not accept warmth, food or air without qualification.

3. [4]

- to prevent contamination of the culture by unwanted microorganisms
- so results are due only to the bacteria / extract being tested (valid results)
- to prevent the bacteria escaping into the environment
- to protect the person / prevent infection of the worker by pathogens
- Max 4

4. [6]

- make extracts using the same mass of plant and volume of solvent for each plant
- using aseptic technique spread a standard volume of bacterial culture over agar to form a lawn
- place sterile discs soaked in each extract for the same time on the lawn
- negative control: disc with solvent only (and positive control: antibiotic disc)
- tape the lid loosely, invert and incubate at 25 °C for a set time (for example 48 hours)
- measure the diameter of the clear zone of inhibition in two directions and take a mean
- calculate area (πr^2) and compare; repeat to calculate means
- control variables: type of bacteria, agar depth, disc size, temperature, time (any two for 1 mark)
- Max 6

5. [3]

- radius = $9 \div 2 = 4.5$ mm (1)
- area = $\pi \times 4.5^2 = 64$ mm² (accept 63.6) (1)
- extract A is most effective as it has the largest zone / area of inhibition (1)

6. [3]

- many plants make chemicals (to defend themselves) that kill or inhibit microorganisms
- plants have not been fully tested / many species have not been screened
- extracts can be purified, tested and developed into drugs (for example aspirin from willow, digitalis from foxglove)

7. [4]

- placebo allows for the placebo effect / patients improving because they believe they are being treated
- placebo group is a control to compare with the drug group
- in a double-blind trial neither patients nor researchers know who gets the drug
- prevents bias in assessment / patients' or researchers' expectations affecting the results
- patients are randomly allocated to groups so the groups are similar / differences are due to the drug
- Max 4

8. [5]

- Withering tested on patients, modern drugs are first tested in the laboratory / on cells and animals
- Withering had no control group / placebo; modern trials use a placebo or existing treatment as a control
- Withering's patients and doctor knew the treatment; modern trials are double-blind
- modern trials use three phases, starting with small groups of healthy volunteers to test safety (Phase 1)
- modern trials use large, randomly allocated groups of patients (Phase 3) so results are more reliable / less chance of bias
- both identify an effective dose / test whether the drug works (similarity)
- Max 5