

Exercise walk-through

2.6

Plant products, mineral ions and drug testing (statements 4.7–4.13)

Pearson Edexcel · International A-Level · Biology

A eukaryotic cell is a set of compartments

Structure	Function
Nucleus	stores DNA behind a double membrane
Rough ER	folds and transports proteins from its ribosomes
Golgi	modifies, packages and exports proteins
Mitochondrion	aerobic respiration and ATP

Mitosis preserves chromosome number

Prophase : chromosomes condense, spindle forms



Metaphase : chromosomes line up on the equator



Anaphase : chromatids pulled to opposite poles



Telophase : nuclear membranes reform

Check yourself

Your turn

A pond sample has counts 60, 20, 15 and 5. What is the index of diversity?

- A. $N(N-1)$ over the sum of $n(n-1)$: 9900 over $4150 = 2.39$
- B. add the species counts first, then divide by four
- C. the largest count over the smallest count
- D. species richness times total individuals

Exercises 2.1·2.3

2.1 Explain why a starch-based drinking cup is described as more sustainable than a plastic one. [2]

2.2 A farmer's crops show yellowing between the veins of leaves. Name the deficient ion and explain the symptom. [2]

2.3 State why a solvent-only disc is included in an antimicrobial test. [1]

Exercises 2.1·2.3

2.1 Explain why a starch-based drinking cup is described as more sustainable than a plastic one. [2]

2.1 Its starch comes from plants that regrow year on year, recently fixing atmospheric carbon, and it degrades naturally instead of persisting like petroleum plastic.

2.2 A farmer's crops show yellowing between the veins of leaves. Name the deficient ion and explain the symptom. [2]

2.2 Magnesium; magnesium is part of the chlorophyll molecule, so without it chlorophyll is lost and the leaf yellows between the veins where chlorophyll density is highest.

2.3 State why a solvent-only disc is included in an antimicrobial test. [1]

2.3 To show the solvent itself has no antibacterial effect – the zone is caused by the extract alone.

Exercise 3.1

3.1 Olive-leaf extract is tested against three bacterial species. The table gives mean inhibition-zone diameters.

Bacterium	Zone with extract / mm	Zone with solvent only / mm
A	18	0
B	9	0
C	0	0

Describe what the solvent-only column shows, compare the sensitivity of the three species, and give two conditions of the test that must be identical for a fair comparison. [5]

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3.1 The solvent has no effect on any species, so the zones are due to the extract. A is most sensitive (largest zone), B moderately sensitive, C resistant – no inhibition at all. Identical conditions: same agar and depth, same incubation temperature and time, same bacterial lawn density, same disc size and extract concentration (any two, B1, B1).

Exercises 3.2-3.3

3.2 William Buckley's 1862 trial of willow-bark tea compared patients who received the tea with patients who received nothing, and both groups knew which they received. Describe two weaknesses of this design compared with a modern double-blind randomised trial, and name the phase of modern testing that a double-blind large-scale trial belongs to. [5]

3.3 A bioplastic is made from plant starch and another from petroleum. Compare the two for carbon source, rate of regeneration of raw material and degradability, and explain why “bioplastic” alone does not guarantee sustainability unless the crops are grown sustainably. [5]

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3.2 No placebo – patients receiving nothing know it, and knowing alters reported symptoms; not blinded and not randomised – doctors' and patients' expectations bias the outcomes, and unrandomised groups may differ in severity. It belongs to phase 3.

3.3 A bioplastic is made from plant starch and another from petroleum. Compare the two for carbon source, rate of regeneration of raw material and degradability, and explain why “bioplastic” alone does not guarantee sustainability unless the crops are grown sustainably. [5]

3.3 Bioplastic carbon comes from plants that fixed atmospheric CO₂ recently and regrow – renewable; petroleum carbon is fossil, regenerating only over geological time. Bioplastic generally degrades faster than petroleum plastic. But if its crops displace food, consume irrigation and fertiliser or destroy habitat, the balance tips: sustainability depends on how the crop is grown, not on the material's name.