

Exercise walk-through

2.7

Classification and measuring biodiversity (statements 4.14–4.18)

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 State the difference between species richness and the index of diversity. [2]

2.2 Name the three domains of life. [1]

2.3 A lake holds 200 fish: 120 of species A, 80 of species B. Calculate D. [2]

Exercises 2.1·2.3

2.1 State the difference between species richness and the index of diversity. [2]

2.1 Richness counts the number of species present; the index of diversity also weighs how evenly individuals are spread among them.

2.2 Name the three domains of life. [1]

2.2 Bacteria, Archaea, Eukarya.

2.3 A lake holds 200 fish: 120 of species A, 80 of species B. Calculate D. [2]

2.3 $D = 200 \times 199 / (120 \times 119 + 80 \times 79) = 39\,800 / (14\,280 + 6\,320) = 1.93.$

Exercise 3.1

3.1 The table gives the plants of two meadows.

Species	Meadow 1 count	Meadow 2 count
Grass A	70	20
Grass B	10	20
Clover	10	20
Orchid	10	20
Total	100	80

Calculate D for each meadow, state which is more diverse, and explain why the meadows can have the same species richness and still differ in diversity. [6]

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3.1 M1: $N_1 = 100$, numerator 9 900; denominator $= 70 \times 69 + 3 \times (10 \times 9) = 4830 + 270 = 5100$; $D_1 = 1.94$. $N_2 = 80$, numerator $80 \times 79 = 6320$; denominator $4 \times (20 \times 19) = 1520$; $D_2 = 4.16$. Meadow 2 is more diverse. Richness is equal (4 species each) but meadow 1's counts are dominated by one species, which D penalises and richness cannot see.

Exercises 3.2-3.3

3.2 An island lizard population of 400 includes 60 heterozygotes at a coat-colour locus. Calculate the heterozygosity index, compare it with a mainland population where 200 of 400 are heterozygotes, and explain why a low index matters for the island population's future. [4]

3.3 The tuatara lives only on small islands off New Zealand. Define the term describing this distribution, explain why such a species is unusually vulnerable to extinction, and describe one conservation method that directly increases its population size. [5]

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3.2 Island $H = 60/400 = 0.15$; mainland $H = 200/400 = 0.50$ – three times higher. Low heterozygosity means few allele variants, so the island population copes badly with disease or environmental change – one pathogen could pass through a genetically similar population.

3.3 The tuatara lives only on small islands off New Zealand. Define the term describing this distribution, explain why such a species is unusually vulnerable to extinction, and describe one conservation method that directly increases its population size. [5]

3.3 Endemic. The whole species lives in one small area, so a single event – storm, fire, disease or introduced predators – can remove it entirely. Captive breeding with later release, or rat eradication to protect eggs, directly raises numbers.