

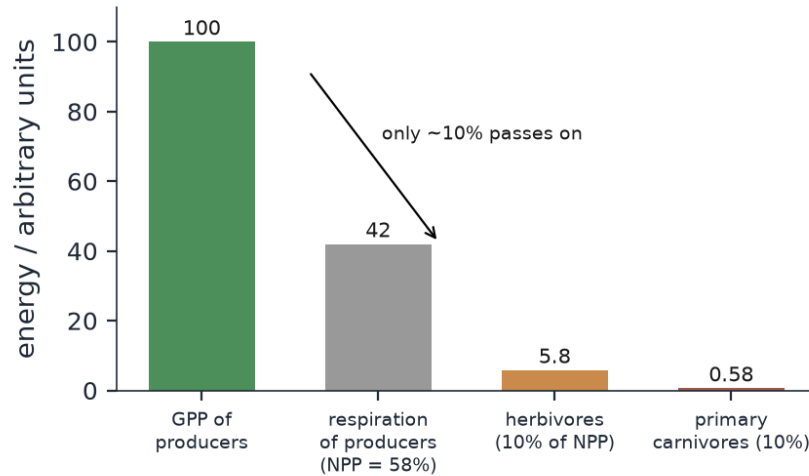
Exercise walk-through

4.7

Pathogens, infection routes and tuberculosis/HIV (statements 6.5–6.7)

Pearson Edexcel · International A-Level · Biology

Ten per cent, four losses



- 1 Fix** grassland fixes 45 000 kJ per square metre per year
- 2 Subtract** respiration spends 19 000, so $NPP = 26\ 000$
- 3 Transfer** cattle keep about 2 600; humans eating cattle keep 260

Selection filters, isolation splits

Directional : one extreme favoured,
the mean shifts - resistance alleles spread

Stabilising : the average favoured, both extremes trimmed

Isolation : barrier (allopatric) or behaviour (sympatric) stops gene flow

Speciation : diverged populations can no longer interbreed

Check yourself

Your turn

Grassland NPP is 40 000 kJ per square metre per year. At 10% per transfer, what reaches second-order consumers?

- A. 400 kJ - two transfers of 10%
- B. 4 000 kJ - one transfer
- C. 40 kJ - three transfers
- D. 400 000 kJ - the food chain multiplies energy

Exercises 2.1·2.3

2.1 Give two structures a bacterial cell has that a virus does not. [2]

2.2 Name two barriers to infection in the respiratory tract. [2]

2.3 State which cell type HIV destroys and one consequence. [2]

Exercises 2.1·2.3

2.1 Give two structures a bacterial cell has that a virus does not. [2]

2.1 Any two: cell wall, plasma membrane, ribosomes, plasmids, flagellum.

2.2 Name two barriers to infection in the respiratory tract. [2]

2.2 Mucus (traps); cilia (sweep the mucus upward).

2.3 State which cell type HIV destroys and one consequence. [2]

2.3 T helper cells; immune coordination collapses – poor antibody response and poor macrophage activation, so infections take hold.

Exercises 3.1·3.2

3.1 Compare the structure of a bacterium and a virus under the headings: genetic material, external covering, and organelles. [5]

3.2 Cholera bacteria enter through contaminated water. Name the route, describe two barriers that such bacteria must survive before reaching the gut, and explain how the acidic stomach usually destroys them. [4]

Exercises 3.1·3.2

3.1 Compare the structure of a bacterium and a virus under the headings: genetic material, external covering, and organelles. [5]

3.1 Genetic material: bacterium – DNA free in the cytoplasm as a single circular molecule plus plasmids; virus – DNA or RNA inside the capsid. Covering: bacterium – cell wall with (sometimes) a capsule; virus – protein capsid, some with a lipid envelope. Organelles: bacteria have ribosomes (70S); viruses have no organelles at all.

3.2 Cholera bacteria enter through contaminated water. Name the route, describe two barriers that such bacteria must survive before reaching the gut, and explain how the acidic stomach usually destroys them. [4]

3.2 The digestive (ingestion) route. Barriers: mucus and cilia of the airway if droplet-borne (not here) – for water: saliva's lysozyme and the stomach. Stomach acid at about pH 2 denatures bacterial enzymes and membrane proteins, killing most cells before they reach the intestine.

Exercise 3.3

3.3 Explain why a patient with advanced HIV infection may develop several opportunistic infections at once, naming the immune cell affected and two of its normal roles. [5]

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3.3 HIV destroys T helper cells. T helpers normally activate B cells to make antibodies and release cytokines that activate macrophages and T killer cells. Without them, responses to new antigens are slow or absent, so normally harmless organisms – Pneumocystis, candida, reactivating TB – all establish at once.