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SPECA

GCSE Combined Science (AQA Trilogy) · Biology

Cell Biology · Mark Scheme

For use with the Worksheet. Marking points are indicative, not exhaustive: award equivalent correct answers.

Cell structure (Q1 to 4)

1) Eukaryotic cells have a nucleus enclosing their genetic material, whereas a prokaryotic cell's DNA is a single loop, not enclosed in a nucleus (1); eukaryotic cells are generally much larger than prokaryotic cells (1) [2]

2) Any three of: chloroplasts; permanent vacuole; cellulose cell wall (1 each, max 3) [3]

3) Magnification = image size ÷ real size = 40 ÷ 0.02 (1) = 2000 (1) [2]

4) Has a long, thin extension that increases surface area (1) for efficient water and mineral ion uptake (1) [2]

Differentiation, division and stem cells (Q5 to 12)

5) Most animal cell types differentiate early in development and then lose the ability to differentiate further (1); many plant cell types keep the ability to differentiate throughout life (1) [2]

6) Electron microscopy has much greater magnification and resolving power than light microscopy, allowing much smaller sub-cellular structures to be seen and understood (1) [1]

7) Growth and replication of sub-cellular structures and DNA (1); separation of chromosomes and division of the nucleus (1); division of the cytoplasm and membranes to form two genetically identical cells (1) [3]

8) An undifferentiated cell that can produce more cells of the same type and, under the right conditions, differentiate into other cell types (1) [1]

9) Bone marrow (1); can form several types of blood cell (1) [2]

10) Any one medical use, e.g. treating diabetes or paralysis (1); any one risk/objection, e.g. risk of transferring viral infection, or ethical/religious objections (1) [2]

11) The embryo produced shares the patient's own genes (1), so stem cells taken from it and used to treat the patient are less likely to be rejected by the patient's immune system (1) [2]

12) Meristem cells can differentiate into any type of plant cell throughout the plant's life (1), allowing large numbers of genetically identical, disease-resistant plants to be cloned quickly and economically (1) [2]

Transport in and out of cells (Q13 to 23)

13) The net movement of particles (1) from an area of higher concentration to an area of lower concentration, in a solution or gas (1) [2]

14) Concentration gradient (1); temperature (1); surface area (of the membrane) (1) [3]

15) It has a large surface area to volume ratio (1), so enough oxygen and nutrients can diffuse directly across its surface to meet its needs, without a transport system (1) [2]

16) Cube A: SA:V = 24:8 = 3:1 (1); Cube B: SA:V = 96:64 = 1.5:1 (1); Cube A has the higher ratio (1) [3]

17) As an organism gets larger, its surface area to volume ratio decreases (1), so diffusion alone across its outer surface is no longer enough to meet its needs: specialised exchange surfaces are needed instead (1) [2]

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18) Any two of: large surface area (villi); thin wall/membrane giving a short diffusion path; good blood supply (1 each, max 2) [2]

19) The diffusion of water (1) from a dilute solution to a more concentrated solution, through a partially permeable membrane (1) [2]

20) Change in mass = 4.6 − 5.0 = −0.4 g (1); percentage change = (−0.4 ÷ 5.0) × 100 (1) = −8% (accept 8% decrease) (1) [3]

21) Active transport is the movement of substances from a more dilute to a more concentrated solution, against the concentration gradient (1); this does not happen spontaneously, so it requires energy from respiration (1): unlike diffusion, which moves particles down the concentration gradient without needing extra energy (1) [3]

22) Mineral ion uptake into plant root hairs from a dilute soil solution, OR sugar absorption from the gut into blood that already has a higher sugar concentration (1) [1]

23) Diffusion: no (1); osmosis: no (1); active transport, yes (1) [3]

Total: 50 marks

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