

### Biology AQA Topic1 Mark Scheme

**Q1. Onion cell and nucleus** (a) Two parts of a plant cell not found in animal cells:

- Cell wall (1)
  - Chloroplasts (1)
- Accept:** Vacuole as an alternative to chloroplasts.

(b) Function of nucleus:

- Controls the activities of the cell (1)
- Accept:** Contains genetic material (1)
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**Q2. Bacterial cells** (a) Type of cell:

- Prokaryotic (1)

(b) Structures in a bacterial cell:

- Cell membrane (1)
  - Plasmid / cytoplasm / cell wall / flagellum (any one) (1)
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**Q3. Diffusion** (a) Definition:

- The movement of particles from a high to a low concentration (1)
- Down a concentration gradient (1)

(b) Factor affecting diffusion:

- Temperature / surface area / concentration difference / distance (1)
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**Q4. Osmosis** (a) Definition:

- Movement of water (1)
- From a dilute to a concentrated solution through a partially permeable membrane (1)

(b) Plant cell in salty solution:

- Water leaves the cell (1)
  - The cell becomes flaccid / shrinks / cytoplasm pulls away from the cell wall (1)
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**Q5. Microscopes and size** (a) Microscope:

- Electron microscope (1)

(b) Scale bar usefulness:

- Allows size of structures to be estimated or measured (1)

(c) Conversion:

- $0.05 \text{ mm} = 50 \text{ }\mu\text{m}$  (1 for correct conversion factor, 1 for correct answer) (2)
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**Q6. Specialised cells** (a) Definition:

- A cell that has a specific job or function (1)

(b) Examples and adaptations:

- Sperm cell: tail for swimming (1)
  - Nerve cell: long to carry signals (1)
  - Muscle cell: many mitochondria for energy (1)
  - Accept other correct alternatives
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**Q7. Stem cells** (a) Stem cell:

- An unspecialised cell that can become other cell types (1)

(b) Medical use:

- Treat diseases / replace damaged tissues / grow organs (1)

(c) Ethical issue:

- Involves destruction of embryos (1)
  - Some people believe it is morally wrong (1)
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**Q8. Active transport** (a) Transport using energy:

- Active transport (1)

(b) Location:

- small intestine (1)
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**Q9. Cheek cells** (a) Use of stain:

- To make cell structures easier to see (1)

(b) Two structures seen:

- Nucleus (1), cell membrane (1)  
**Accept:** Cytoplasm
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**Q10. Mitosis** (a) Purpose:

- For growth and repair (1)

(b) Place in body:

- Skin / bone marrow / lining of the gut / any tissue that grows (1)

(c) Genetic material:

- Chromosomes duplicate (1), then are shared equally into two cells (1)
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**Q11. Root hair cell** (a) Function:

- Absorbs water and minerals (1)

(b) Shape adaptation:

- Long extension (1) increases surface area (1)
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**Q12. Growing bacteria** (a) Safety rule:

- Use sterile techniques / don't open petri dish after incubation / wear gloves (1)

(b) Petri dish upside down:

- To prevent condensation dripping onto the culture (1)

(c) Maximum temperature:

- 25°C (1)
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**Q13. Mitochondria** (a) Function:

- Releases energy / site of respiration (1)

(b) Muscle cells:

- Need lots of energy (1), for contraction (1)
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**Q14. Cell structures** Three structures:

- Nucleus (1), cytoplasm (1), cell membrane (1)  
**Accept:** Mitochondria, ribosomes
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**Q15. Magnification** (a) Formula:

- Image size / real size (1)

(b) Calculation:

- $2 / 0.02 = 100$  (1 for method, 1 for correct answer) (2)
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**Q16. Cell types** (a) Difference:

- Prokaryotic cells have no nucleus (1)

(b) Nucleus:

- Eukaryotic cells (1)
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**Q17. Red blood cells** (a) No nucleus:

- More space for haemoglobin (1) and oxygen (1)

(b) Main function:

- To carry oxygen (1)
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**Q18. Sperm cell** (a) Adaptation:

- Tail (1), helps it swim to egg (1)  
**Accept:** Mitochondria for energy
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**Q19. Osmosis and potatoes** (a) Concentrated solution:

- Water moves out (1), mass decreases (1)

(b) Blotting:

- Removes surface water to get accurate mass (1)
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## Q20.

(a) Name the part of the cell where photosynthesis takes place.

- *Chloroplast*  
(1 mark)

(b) Describe how the structure of a palisade cell helps it carry out photosynthesis.

- Contains many chloroplasts to absorb light (1)
  - Tall and closely packed to absorb maximum light (1)  
(2 marks)
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## Q21.

(a) What is meant by diffusion?

- Movement of particles from an area of high concentration to low concentration  
DOWN a concentration gradient (2 marks)  
(1 mark for "movement of particles" and 1 mark for "from high to low concentration  
down the concentration gradient")

(b) Explain how temperature affects the rate of diffusion.

- Higher temperature gives particles more kinetic energy (1)
  - Particles move faster, so diffusion rate increases (1)  
(2 marks)
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## Q22.

(a) Name the process by which cells divide to produce identical daughter cells.

- *Mitosis*  
(1 mark)

(b) Describe what happens to the chromosomes during this process.

- Chromosomes duplicate (1)
- Chromosomes line up and separate into two identical sets (1)  
(2 marks)

(c) Why is this type of cell division important in multicellular organisms?

- Growth (1)
- Repair or replacement of damaged cells (1)  
(2 marks)

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### Q23.

(a) State one advantage of using an electron microscope over a light microscope.

- Higher magnification / higher resolution / can see smaller structures (1)

(b) Give one reason why electron microscopes are not used in schools.

- Expensive / large / complicated to use / need specialist training (1)

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### Q24.

(a) Describe a method to investigate how different concentrations of sugar solution affect the mass of potato cylinders.

- Cut potato cylinders of same size / length / diameter (1)
- Measure initial mass / record initial mass (1)
- Place cylinders in different sugar concentrations / label solutions (1)
- Leave for set time (e.g., 30 minutes) (1)

(b) State one variable that should be controlled in this experiment.

- Temperature / time / size of potato cylinders / volume of solution (any one) (1)
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### Q25.

(a) Describe the difference between embryonic and adult stem cells.

- Embryonic stem cells can become any cell type / pluripotent (1)
- Adult stem cells can only become certain cell types / multipotent (1)

(b) Suggest two potential uses of stem cells in medicine.

- Repair damaged tissues / organs (1)
- Treat diseases like diabetes / Parkinson's / blood diseases (1)

(c) Give one argument against the use of embryonic stem cells.

- Ethical concerns / destruction of embryos (1)
  - Possible rejection by immune system (1)
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### Q26.

(a) State the equation to calculate magnification.

- Magnification = image size  $\div$  actual size (1)

(b) An image measures 5 mm and the actual size of the object is 0.05 mm. Calculate the magnification.

- Magnification =  $5 \div 0.05 = 100$  (2 marks)  
(1 mark for correct formula, 1 mark for correct calculation)
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### Q27.

(a) Name two structures found in bacterial cells that are not found in animal cells.

- Cell wall (1)
- Plasmid / flagellum (1)

(b) Name the type of cell a bacterium is.

- Prokaryotic (1)
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### Q28.

(a) Explain how the structure of a nerve cell is related to its function.

- Long axon to carry electrical impulses over long distances (1)
  - Branched dendrites to connect with other nerve cells (1)
  - Insulating sheath (myelin) speeds up impulse transmission (1)
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### Q29.

(a) Explain how having no nucleus helps the red blood cell carry out its function.

- More space for haemoglobin / oxygen carrying (1)
- Allows it to carry more oxygen (1)

(b) Describe the function of red blood cells.

- Transport oxygen around the body (1)
  - Carry oxygen from lungs to tissues (1)
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### Q30.

(a) Describe the process of mitosis. Include the changes to chromosomes.

- Chromosomes replicate / duplicate (1)
  - Chromosomes line up along the centre of the cell (1)
  - Chromatids pulled apart to opposite ends of the cell (1)
  - Nuclear membranes form around each set of chromosomes (1)
  - Cytoplasm divides / cell splits into two (1)
  - Two identical daughter cells with same chromosome number (1)
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**Q31.**

(a) State the function of a goblet cell in the small intestine.

- To produce mucus / secrete mucus (1)

(b) Explain why the cells lining the small intestine have many mitochondria.

- To provide energy / ATP for active transport of nutrients (1)
  - Active transport requires energy from respiration (1)
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**Q32.**

(a) Describe how the tail and mitochondria help the sperm cell carry out its function.

- Tail helps swim / move towards egg (1)
- Mitochondria provide energy / ATP for movement (1)

(b) What is the role of the acrosome in the sperm cell?

- Contains enzymes to digest / break down egg membrane (1)
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**Q33.**

(a) What would happen to a potato cylinder in a solution with a higher water concentration than inside the potato?

- Water moves into potato cells by osmosis (1)
- Potato cells swell / gain mass (1)

(b) Why should the student repeat the experiment three times?

- To ensure reliability / reduce effect of anomalies (1)
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### Q34.

(a) Explain why single-celled organisms can rely on diffusion alone.

- Large surface area to volume ratio (1)
- Allows sufficient diffusion to meet needs of cell (1)

(b) Why do multicellular organisms need transport systems?

- Smaller surface area to volume ratio (1)
  - Diffusion alone is too slow / insufficient to supply all cells (1)
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### Q35.

(a) What is the main function of a chloroplast?

- To carry out photosynthesis (1)

(b) Describe the role of chlorophyll inside the chloroplast.

- Absorbs light energy for photosynthesis (1)
  - Converts light energy into chemical energy (1)
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### Q36.

(a) Describe how to prepare a slide of onion cells and view them under a microscope. Include safety precautions.

- Peel thin layer / epidermis of onion (1)
- Place on microscope slide (1)
- Add iodine / stain (1)
- Place coverslip carefully to avoid air bubbles (1)
- Use low power objective lens first to locate cells (1)
- Adjust focus / fine focus to see cells clearly (1)
- Safety: handle glass slides carefully to avoid cuts / wash hands after using stains (1)  
(*max 1 mark for safety*)

### Q37. Plant Cell

(a) Name the part of the cell where photosynthesis occurs.

- Chloroplast (1)

(b) Explain how the structure of the chloroplast is related to its function.

- Contains **chlorophyll** which absorbs light (1)
- Has **internal membranes (thylakoids)** to increase surface area for photosynthesis (1)

(c) Describe the role of the cell wall in plant cells.

- Provides **structure/support** to the cell (1)
- Prevents the cell from **bursting due to water intake** (1)

[Total: 5 marks]

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### Q38. Bacteria and Prokaryotes

(a) State two differences between prokaryotic and eukaryotic cells.

- Prokaryotic cells have **no nucleus** / DNA is free in the cytoplasm (1)
- Prokaryotic cells **do not have membrane-bound organelles** / are smaller (1)  
*Allow: Prokaryotes have plasmids, eukaryotes don't*

**(b) Describe the function of the plasmid in bacterial cells.**

- Carries **extra genetic information** / can contain **genes for antibiotic resistance** (1)

**(c) Explain why bacteria can reproduce quickly.**

- They are **simple/small** and have a **short cell cycle** (1)
- Can **divide rapidly** by binary fission (1)

**[Total: 5 marks]**

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### **Q39. Diffusion**

**(a) Define diffusion.**

- The **spreading out of particles** (1)
- From an area of **high concentration to low concentration**, down a concentration gradient (1)

**(b) Describe how surface area to volume ratio affects the rate of diffusion in cells.**

- Larger surface area to volume ratio = **faster diffusion** (1)
- Smaller cells have **more surface area** relative to their volume (1)

**(c) Explain why large organisms need specialised exchange surfaces.**

- Because they have a **small surface area to volume ratio** (1)
- Diffusion alone would be too slow to meet the needs of all cells (1)

**[Total: 6 marks]**

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## Q40. Nucleus and Protein Synthesis

(a) Describe the role of the nucleus in a cell.

- Controls cell activities / contains **genetic material** (1)

(b) Explain how the nucleus controls protein synthesis.

- Contains **DNA** with instructions to make proteins (1)
- **Genes** are transcribed into mRNA (1)
- mRNA leaves the nucleus and goes to the **ribosomes** where proteins are made (1)

[Total: 4 marks]

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## Q41. Osmosis

(a) Define osmosis.

- The movement of **water molecules** (1)
- From a **high water concentration** to a **low water concentration** through a **partially permeable membrane** (1)

(b) Predict what will happen to a plant cell placed in a concentrated salt solution. Explain your answer.

- Water will move **out of the cell** (1)
- The **cell will shrink** / become plasmolysed (1)
- Because the solution has a **lower water potential** than the cell (1)

[Total: 5 marks]

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## Q42. Microscopes

(a) Compare light microscopes and electron microscopes in terms of resolution and magnification.

- Electron microscopes have a **higher resolution** (1)
- Electron microscopes have a **higher magnification** (1)
- Light microscopes are **lower in both** (1)

**(b) Suggest one reason why electron microscopes are not commonly used in schools.**

- They are **expensive** / require **special training** / **large and not portable** (1)

**[Total: 4 marks]**

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### **Q43. Mitosis**

**(a) Describe what happens to the chromosomes during mitosis.**

- Chromosomes **duplicate** before mitosis begins (1)
- Chromosomes **line up at the centre** of the cell (1)
- Chromatids are **pulled apart to opposite ends** of the cell (1)

**(b) Explain why mitosis is important in multicellular organisms.**

- For **growth and repair** (1)
- Produces **genetically identical cells** (1)

**[Total: 5 marks]**

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### **Q44. Stem Cells**

**(a) Describe the difference between embryonic and adult stem cells.**

- Embryonic stem cells can become **any type of cell** (1)
- Adult stem cells can become **only certain types of cells** (1)

**(b) Explain two potential uses of stem cells in medicine.**

- To **replace damaged cells**, e.g. in spinal cord injuries or diabetes (1)
- To **grow new tissues/organs** for transplants (1)  
*Allow: Treatment of leukaemia / Parkinson's / blindness (1 max per valid example)*
- To **test drugs on lab-grown tissues** (1)

[Total: 6 marks]

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### Q45. Nerve Cell

(a) Describe two adaptations of a nerve cell that help it transmit impulses quickly.

- **Long axon** to carry impulses over distances (1)
- **Myelin sheath** insulates and speeds up transmission (1)
- Has **branched ends (dendrites)** to connect with other neurons (1)

(b) Explain how the structure of the axon is related to its function.

- Long and thin to **transmit impulses efficiently** (1)
- Covered with myelin to **prevent signal loss** and **increase speed** (1)

[Total: 5 marks]

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### Q46. Mitochondria

(a) Explain the function of mitochondria.

- Site of **aerobic respiration** / releases **energy** (1)

(b) Describe why muscle cells contain many mitochondria.

- Muscle cells need a lot of **energy** to contract (1)
- Mitochondria release **energy from glucose** via respiration (1)
- More mitochondria = **more ATP production** (1)

[Total: 4 marks]

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### Q47. Red Blood Cells

(a) Name two adaptations of red blood cells.

- **Biconcave shape** (1)
- **No nucleus** (1)  
*Allow: contains haemoglobin*

(b) Explain how these adaptations help red blood cells carry oxygen.

- Biconcave shape **increases surface area** for oxygen exchange (1)
- No nucleus allows **more room for haemoglobin** (1)
- Haemoglobin binds to oxygen for **transport** (1)

[Total: 5 marks]

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### Q48. Active Transport

(a) Define active transport.

- Movement of substances **against a concentration gradient using energy** (1)

(b) Describe one example of active transport in the human body.

- **Absorption of glucose** from the small intestine into the blood (1)
- Occurs even when glucose concentration is **lower in the intestine** than the blood (1)

(c) Explain why active transport requires energy.

- Substances are moved **against their concentration gradient from low to high** (1)
- This process uses energy from **respiration (ATP)** (1)

[Total: 5 marks]

### Q49. Surface Area to Volume Ratio

(a) Calculate the surface area to volume ratio of a cube-shaped cell with sides of 2  $\mu\text{m}$ . Show your working.

- Surface area =  $6 \times (2 \times 2) = 24 \mu\text{m}^2$  (1)
- Volume =  $2 \times 2 \times 2 = 8 \mu\text{m}^3$  (1)
- SA:Vol ratio =  $24 \div 8 = 3:1$  (1)

(b) Explain why cells are small based on the surface area to volume ratio.

- Small cells have a **larger SA:Vol ratio**, making **diffusion more efficient** (1)
- Larger cells would not get enough substances quickly enough (1)

[Total: 5 marks]

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### Q50. Specialised Plant Cells

(a) Describe the structure and function of xylem vessels.

- Made of **dead cells** joined end to end (1)
- Walls reinforced with **lignin** to strengthen and support (1)
- Carries **water and minerals** from roots to leaves (1)

(b) Describe the structure and function of phloem tubes.

- Made of **living cells**, including sieve plates and companion cells (1)
- Transports **sugars (glucose)** produced in photosynthesis (1)
- Allows movement **up and down the plant (translocation)** (1)

[Total: 6 marks]

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### Q51. Preparing a Slide

(a) Describe how to prepare the slide safely.

- Use **forceps** to peel a thin layer of onion epidermis (1)
- Place on slide, add a **drop of iodine** stain (1)
- Use a **coverslip** and avoid trapping air bubbles (1)  
*Credit: use of paper towel to remove excess liquid*

(b) Explain why a stain is used when observing cells under a microscope.

- Stains help to **highlight structures** (1)
- Makes **nucleus/cell wall** more visible (1)

[Total: 5 marks]