

Cell structure: practice questions

13 questions • 36 marks • mark scheme at the back

For AQA GCSE Biology 8461 and Combined Science: Trilogy 8464. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Name

Total / 36

1 Which structure is a small ring of DNA found in a bacterial cell? [1 mark]

- A. ☐ Cell wall
- B. ☐ Plasmid
- C. ☐ Nucleus
- D. ☐ Ribosome

2 State two differences between a bacterial cell and an animal cell. [2 marks]

3 A plant cell is 1×10^{-4} m long. A bacterial cell is 1×10^{-6} m long. How many orders of magnitude longer is the plant cell? [1 mark]

- A. ☐ 1
- B. ☐ 2
- C. ☐ 4
- D. ☐ 6

4 Describe the function of each of these sub-cellular structures: nucleus, mitochondria, ribosomes. [3 marks]

- 5** A student draws a plant cell. The drawing is 45 mm long and the magnification is $\times 500$. **[3 marks]**
Calculate the real length of the cell. Give your answer in micrometres (μm).

Answer =

- 6** Explain how the development of the electron microscope has increased our understanding of sub-cellular structures. **[3 marks]**

- 7** A muscle cell contains many mitochondria and protein fibres that can shorten. Explain how these features help the muscle cell to carry out its function. **[3 marks]**

- 8** Explain why cell differentiation is important in a multicellular organism. Describe one difference in differentiation between animals and plants. **[3 marks]**

9 Describe how you would use a light microscope to observe a plant cell and make a labelled drawing, including a magnification.

[6 marks]

[illegible]

10 Triple only

[2 marks]

A bacterium divides once every 30 minutes. Calculate the number of bacteria produced from one bacterium in 4 hours.

Answer =

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11 Triple only Higher tier

[3 marks]

A bacterium divides once every 20 minutes. Calculate the number of bacteria produced from one bacterium in 10 hours. Give your answer in standard form to 2 significant figures.

Answer =

[illegible]

12

Triple only

[3 marks]

Explain why, when preparing an uncontaminated culture of bacteria in a school laboratory: (a) the inoculating loop is passed through a flame, (b) the lid of the Petri dish is secured with adhesive tape, (c) the culture is incubated at 25 °C and not at a higher temperature.

13

Triple only

[3 marks]

A student places a disc soaked in an antibiotic on an agar plate covered in bacteria. After incubation, the clear zone around the disc has a diameter of 16 mm. Calculate the area of the clear zone. Use the equation $\text{area} = \pi \times r^2$ and $\pi = 3.14$.

Answer =

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B: plasmid (1)

2. [2]

- bacterial cell is much smaller / animal cell is larger (1)
- bacterial cell has a cell wall, animal cell does not (1)
- bacterial DNA is a single loop / not enclosed in a nucleus, animal cell DNA is in a nucleus (1)
- bacterial cell may have plasmids, animal cell does not (1)
- Max 2. Ignore references to mitochondria.

3. [1]

B B: $2 (10^{-4} \div 10^{-6} = 10^2)$ (1)

4. [3]

- nucleus contains genetic material / DNA / controls the activities of the cell (1)
- mitochondria: where aerobic respiration takes place / release energy (1)
- ribosomes: where proteins are made / protein synthesis (1)

5. [3]

- real size = image size $\div$ magnification (1)
- $45 \div 500 = 0.09$ mm (1)
- $0.09 \times 1000 = 90$ μm (1)
- Correct answer of 90 μm gains all 3 marks. Allow 9×10^1 μm . 0.09 mm with no conversion gains 2 marks.

6. [3]

- electron microscopes have a much higher magnification (than light microscopes) (1)
- and a higher resolving power / resolution (1)
- so smaller sub-cellular structures (such as ribosomes) / more detail of structures (such as the inside of mitochondria) can be seen (1)

7. [3]

- protein fibres shorten so the cell contracts (1)
- (contraction) causes movement (1)
- mitochondria release energy by respiration (1)
- energy is needed for contraction (1)
- Max 3.

8. [3]

- cells acquire different sub-cellular structures (1)
- so they can carry out specific functions / become specialised (1)
- most animal cells differentiate at an early stage, but many plant cells keep the ability to differentiate throughout life (1)

9. [6]

Level 3 5-6	A clear, logical and complete method covering preparation of the slide, focusing from low power, and drawing with labels and a magnification. Scientific terms are used correctly and there are few or no errors.
Level 2 3-4	A method that covers most stages in a sensible order, but with some detail missing, such as focusing or the drawing technique.
Level 1 1-2	Some relevant points are made, but the method is incomplete or in the wrong order.

Indicative content

- thin slice of plant tissue placed on a slide with a drop of water or a stain (such as iodine)
- cover slip lowered at an angle to avoid air bubbles
- start with the lowest-power objective lens and focus using the coarse focus knob
- then use the fine focus knob to get a sharp image, moving to a higher-power lens if needed
- draw with a sharp pencil, clear lines and no shading
- label the cell structures (such as cell wall, nucleus, vacuole)
- calculate and write the magnification (size of drawing $\div$ real size), or draw a scale bar

10. [2] Triple only

- 8 divisions ($240 \div 30$) (1)
- $2^8 = 256$ bacteria (1)
- Correct answer of 256 gains both marks.

11. [3] Triple only Higher tier

- 10 hours = 600 minutes, so 30 divisions (1)
- $2^{30} = 1\,073\,741\,824$ (1)
- 1.1×10^9 (1)
- 1 073 741 824 not in standard form, or 1.07×10^9 (wrong number of significant figures), gains 2 marks.

12. [3] Triple only

- (a) to sterilise it / kill other microorganisms (1)
- (b) to stop microorganisms from the air getting in / the cultured microorganisms escaping (1)
- (c) to prevent growth of pathogens (harmful to humans) (1)

13. [3] Triple only

- radius = $16 \div 2 = 8$ mm (1)
- area = 3.14×8^2 (1)
- = 201 mm^2 (allow 200.96 mm^2 , 200 mm^2 or $2.0 \times 10^2 \text{ mm}^2$) (1)
- Correct answer gains all 3 marks. Using the diameter ($3.14 \times 16^2 = 804 \text{ mm}^2$) gains 1 mark only.