1.2 Cells: 30-minute Pack

AQA 7402 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Table 1 compares some features of a typical bacterial (prokaryotic) cell and a typical animal (eukaryotic) cell.

Table 1

Feature	Bacterial cell	Animal cell
Membrane-bound nucleus	...	...
Circular DNA (plasmid)	...	...
80S ribosomes	...	...
Mitochondria	...	...

(a) Complete Table 1 by writing 'present' or 'absent' for each feature in each cell type. **(4)**

(b) Mitochondria have a folded inner membrane called cristae. Explain how this feature of mitochondrial structure relates to its function. **(3)**

(c) Describe the pathway taken by a protein from its synthesis to its secretion from a eukaryotic cell. **(4)**

(Total for Question 1 is 11 marks)

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2 This question tests key facts about the phagocytic and specific immune responses. For each part, identify the correct option.

(a) Which type of lymphocyte matures in the thymus gland? **(1)**

- ☐ A) B lymphocyte
- ☐ B) T lymphocyte
- ☐ C) Phagocyte
- ☐ D) Erythrocyte

(b) Which cell type differentiates from an activated B lymphocyte and secretes large quantities of antibody? **(1)**

- ☐ A) T helper cell
- ☐ B) T killer cell
- ☐ C) Plasma cell
- ☐ D) Memory cell

(c) Which type of immunity is provided by injecting a person with ready-made antibodies? **(1)**

- ☐ A) Natural active immunity
- ☐ B) Artificial active immunity
- ☐ C) Natural passive immunity
- ☐ D) Artificial passive immunity

(d) Which statement correctly describes why monoclonal antibodies are described as 'monoclonal'? **(1)**

- ☐ A) They are produced by a single clone of genetically identical plasma cells, so all antibody molecules are identical
- ☐ B) They bind to many different antigens at once
- ☐ C) They are produced from a mixture of different B cell clones
- ☐ D) They are only found in monozygotic twins

(Total for Question 2 is 4 marks)

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3 A student used a light microscope fitted with an eyepiece graticule to examine a section of onion epidermis. Before taking measurements, the student calibrated the eyepiece graticule against a stage micrometre scale.

(a) At a particular magnification, 20 eyepiece graticule units aligned exactly with 0.40 mm on the stage micrometre scale. Calculate the value of 1 eyepiece unit in micrometres at this magnification. **(2)**

(b) The student then measured the width of one epidermal cell as 15 eyepiece units. Calculate the actual width of this cell in micrometres. **(2)**

(c) A photomicrograph of the same cell measured 45 mm across the image. Calculate the magnification of this image. Give your answer as 'x' followed by a whole number. **(3)**

(d) State two differences between the magnification and the resolution of a microscope. **(2)**

(Total for Question 3 is 9 marks)

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Mark scheme · 1.2 Cells: 30-minute Pack

Question 1

(a) membrane-bound nucleus: absent (bacterial); present (animal) **B1**

(a) plasmid: present (bacterial); absent (animal) **B1**

(a) 80S ribosomes: absent, bacteria have 70S (bacterial); present (animal) **B1**

(a) mitochondria: absent (bacterial); present (animal) **B1**

(a) Answer: Bacterial: nucleus absent, plasmid present, 80S ribosomes absent (has 70S), mitochondria absent. Animal: nucleus present, plasmid absent, 80S ribosomes present, mitochondria present

(b) cristae increase the surface area of the inner membrane (oe) **B1**

(b) providing more space for electron transport chain proteins / ATP synthase enzymes **B1**

(b) increasing the rate of ATP production by aerobic respiration **B1**

(b) Answer: Cristae increase the surface area of the inner mitochondrial membrane, providing more space for electron transport chain proteins and ATP synthase, increasing the rate of ATP production by aerobic respiration

(c) protein synthesised by ribosomes on the rough endoplasmic reticulum (RER) **B1**

(c) protein enters the RER and is folded/processed, then a vesicle buds off carrying the protein **B1**

(c) vesicle fuses with the Golgi apparatus, where the protein is modified and packaged **B1**

(c) a secretory vesicle buds off the Golgi, moves to and fuses with the cell-surface membrane, releasing the protein by exocytosis **B1**

(c) Answer: Ribosomes on the RER synthesise the protein; it enters the RER and is packaged into a vesicle; the vesicle fuses with the Golgi apparatus where the protein is modified and packaged; a secretory vesicle buds off the Golgi and fuses with the cell-surface membrane, releasing the protein by exocytosis

Question 2

(a) B **B1**

(a) Answer: B

(b) C **B1**

(b) Answer: C

(c) D **B1**

(c) Answer: D

(d) A **B1**

(d) Answer: A

Question 3

(a) converts 0.40 mm to 400 micrometres (or equivalent correct method) **M1**

(a) 20 micrometres cao **A1**

(a) Answer: 20 micrometres

(b) 15 x 20 (or correct method using their value from (a), ft) **M1**

(b) 300 micrometres cao (ft from (a)) **A1**

(b) Answer: 300 micrometres

(c) converts 45 mm to 45000 micrometres **M1**

(c) magnification = image size / actual size = 45000 / 300 (dependent on M1) **dM1**

(c) x150 cao **A1**

(c) Answer: x150

(d) magnification is the ratio of image size to actual (real) object size, i.e. how much bigger the image is (oe) **B1**

(d) resolution is the minimum distance between two points at which they can still be distinguished as separate (oe) **B1**

(d) Answer: Magnification = how much bigger the image is than the real object (ratio of image size to actual size); Resolution = the minimum distance between two points at which they can still be seen as separate objects

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