1.1 Cell Biology: Test Pack

AQA 8461 · Calculator allowed · about 35 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Cells are the basic building blocks of living organisms.

(a) Give the name for the type of cell that contains chloroplasts and a cell wall. **(1)**

(b) Give the name for the cell type that has no cell wall and no chloroplasts. **(1)**

(c) Name the organelle where aerobic respiration mainly happens in cells. **(1)**

(Total for Question 1 is 3 marks)

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2 Osmosis is a special case of diffusion.

(a) Define osmosis. **(2)**

(b) A cylinder of potato is placed in pure water. Predict what will happen to the mass of the cylinder and explain your answer. **(2)**

(Total for Question 2 is 4 marks)

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3 Cells divide by mitosis as part of the cell cycle.

(a) During the first stage of the cell cycle (before mitosis), the cell grows. State two other things that happen to the contents of the cell during this stage. **(2)**

(b) Mitosis produces two daughter cells. State how the daughter cells compare genetically with the parent cell. **(1)**

(c) Give one reason why the human body needs mitosis. **(1)**

(Total for Question 3 is 4 marks)

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4 A student measures a cell using a microscope. The image of the cell is 48 mm wide. The actual width of the cell is 0.06 mm.

(a) Calculate the magnification of the image. Use the equation: magnification = size of image / size of real object. **(2)**

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(b) The student then views a chloroplast at a magnification of x2000. The image of the chloroplast is 10 mm long. Calculate the real length of the chloroplast. Give your answer in micrometres (μm). **(3)**

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(Total for Question 4 is 5 marks)

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5 Osmosis is the movement of water across a partially permeable membrane from a dilute solution to a more concentrated solution. A student places a potato cylinder in pure water and another identical cylinder in a sugar solution and measures mass before and after 30 minutes.

(a) Predict and explain what will happen to the mass of the potato cylinder in pure water. **(2)**

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(b) The potato cylinder in sugar solution lost 0.8 g mass over 30 minutes. If its original mass was 12.0 g, calculate the percentage change in mass (percentage change = change / original x 100). Give your answer to 2 significant figures. **(3)**

.....

(Total for Question 5 is 5 marks)

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6 A student builds a simple model of an exchange surface to show how its surface area affects the rate at which a substance is absorbed. The student times how long a dye takes to be absorbed across the surface.

Surface area (cm2)	Time (s)	Rate (s^{-1})
2	120	
4	60	

(a) With a surface area of 2 cm^2 the time taken is 120 s. With a surface area of 4 cm^2 the time taken is 60 s. Calculate the rate of absorption for each surface area (rate = 1 / time) and explain the pattern in the results. **(4)**

(b) Suggest one limitation of this simple investigation and one way to improve it. **(2)**

(Total for Question 6 is 6 marks)

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Mark scheme · 1.1 Cell Biology: Test Pack

Question 1

(a) plant cell cao **B1**

(a) Answer: Plant cell

(b) animal cell cao **B1**

(b) Answer: Animal cell

(c) mitochondrion (accept mitochondria) cao **B1**

(c) Answer: Mitochondrion

Question 2

(a) movement of water (molecules) from a dilute solution / higher water concentration to a more concentrated solution / lower water concentration **B1**

(a) through a partially permeable membrane **B1**

(a) Answer: Movement of water from a dilute to a concentrated solution through a partially permeable membrane

(b) mass increases **B1**

(b) water moves into the cells by osmosis because the cell contents are more concentrated than pure water (oe) **B1**

(b) Answer: Mass increases; water enters the cells by osmosis (cell contents more concentrated than pure water)

Question 3

(a) the DNA / chromosomes are replicated (copied) so there are two copies of each **B1**

(a) the number of sub-cellular structures (e.g. ribosomes and mitochondria) increases **B1**

(a) Answer: DNA/chromosomes are copied; number of sub-cellular structures (ribosomes, mitochondria) increases

(b) they are genetically identical (to the parent and to each other) **B1**

(b) Answer: They are genetically identical to the parent cell

(c) growth / repair of tissues / replacement of damaged or worn-out cells **B1**

(c) Answer: Growth, repair, or replacement of cells

Question 4

(a) 48 / 0.06 **M1**

(a) 800 (no units) cao **A1**

(a) Answer: 800

(b) real size = image / magnification = 10 / 2000 **M1**

(b) 0.005 mm converted to µm (x 1000) **M1**

(b) 5 µm cao **A1**

(b) Answer: 5 µm

Question 5

(a) predicts mass will increase **B1**

(a) explains because water moves into the potato by osmosis from the pure water (more dilute) outside to the more concentrated solution inside the cells, oe **B1**

(a) Answer: Mass will increase because water moves into the potato by osmosis from the pure water (a more dilute solution) into the potato cells (a more concentrated solution).

(b) substitutes and calculates: percentage = (0.8 / 12.0) x 100 **M1**

(b) 6.7% (accept the unrounded 6.67 or 6.666...%; accept -6.7% or 6.7% decrease / loss) cao **A1**

(b) gives the answer correctly rounded to 2 significant figures as the question asks: 6.7 (or -6.7), not 6.67 or 7 **B1**

(b) Answer: 6.7%

Question 6

(a) calculates rate for 2 cm^2: 1 / 120 = 0.0083 s^{-1} (or 0.0083 per s) **M1**

(a) calculates rate for 4 cm^2: 1 / 60 = 0.0167 s^{-1} **M1**

(a) states pattern: doubling surface area doubles the rate or rate increases as surface area increases **A1**

(a) links to diffusion: larger surface area gives more area for exchange so faster rate, oe **A1**

(a) Answer: Rate at 2 cm^2 = 0.0083 s^{-1}; rate at 4 cm^2 = 0.0167 s^{-1}. Doubling surface area doubles the rate because more area allows more exchange.

(b) identifies a limitation e.g. temperature not controlled, measurement of time imprecise, dye diffusion not identical to gas exchange, small sample size, oe **B1**

(b) gives an improvement e.g. keep temperature constant, use a stopwatch with more precise timing, use more repeats and take an average, use a gas sensor, oe **B1**

(b) Answer: Limitation: temperature not controlled which affects rate. Improvement: keep temperature constant using a water bath and repeat trials to average results.

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