1.1 Cell Biology: 30-minute Pack

AQA 8461 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Some substances are moved by active transport.

(a) State one way active transport is different from diffusion. **(1)**

(b) Root hair cells absorb mineral ions from the soil. The concentration of mineral ions is lower in the soil than inside the root hair cell. Explain why the root hair cell must use active transport to absorb these ions. **(2)**

(Total for Question 1 is 3 marks)

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2 A student investigates osmosis. Cylinders of potato of equal size are placed in sugar solutions of different concentrations. The mass of each cylinder is measured before and after being left for 30 minutes.

(a) Name the independent variable in this investigation. **(1)**

(b) State two variables that should be controlled to make this a fair test. **(2)**

(c) One cylinder had a mass of 3.20 g before and 2.72 g after. Calculate the percentage change in mass. **(2)**

(d) Explain, in terms of water movement and concentration, why this cylinder lost mass. **(2)**

(Total for Question 2 is 7 marks)

3 A student prepares a slide of onion epidermal cells to view under a light microscope.

(a) Describe how the student should prepare the slide. **(3)**

(b) Explain why iodine solution is added to the slide. **(1)**

(c) The student should start with the lowest-power objective lens. Give one reason why. **(1)**

(Total for Question 3 is 5 marks)

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4 In ideal conditions, bacteria can divide very quickly by binary fission.

(a) One type of bacterium divides every 20 minutes. A culture starts with 800 bacteria. Calculate the number of bacteria after 2 hours, assuming ideal conditions. **(2)**

(b) Write your answer to part (a) in standard form. **(1)**

(Total for Question 4 is 3 marks)

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5 Evaluate the use of stem cells from human embryos to treat human diseases. Your answer should consider the benefits and the objections.

(Total for Question 5 is 6 marks)

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Mark scheme · 1.1 Cell Biology: 30-minute Pack

Question 1

(a) active transport moves substances against a concentration gradient (low to high) OR requires energy (from respiration); diffusion does not **B1**

(a) Answer: Active transport moves substances against the concentration gradient and requires energy

(b) ions must move from a lower concentration (soil) to a higher concentration (cell), i.e. against the concentration gradient **B1**

(b) this needs energy (from respiration), which diffusion cannot provide **B1**

(b) Answer: Ions move against the concentration gradient (low soil to high cell), which requires energy from respiration

Question 2

(a) concentration of the sugar solution **B1**

(a) Answer: Concentration of the sugar solution

(b) any one of: volume of solution / temperature / time left in solution / size (surface area) of potato cylinder / same type of potato / same drying method before reweighing **B1**

(b) a second, different, correct control variable from the list **B1**

(b) Answer: Any two of: volume of solution, temperature, time, size of cylinder, type of potato, drying method

(c) (2.72 - 3.20) / 3.20 x 100 (oe: change in mass = -0.48 g) **M1**

(c) -15 (%) (allow 15% decrease) **A1**

(c) Answer: -15%

(d) the sugar solution was more concentrated (lower water concentration) than the cell contents **B1**

(d) so water moved out of the cells by osmosis (down the water concentration gradient), reducing the mass **B1**

(d) Answer: The solution was more concentrated than the cells, so water left the cells by osmosis

Question 3

(a) add a drop of water (or iodine solution) to the middle of a clean glass slide **B1**

(a) peel a thin layer of onion epidermis and place it flat on the drop (using forceps) **B1**

(a) lower a cover slip onto the sample (using a mounting needle) to avoid trapping air bubbles **B1**

(a) Answer: Drop of water/iodine on slide; thin onion epidermis layer placed flat; cover slip lowered gently

(b) it stains the cells / increases contrast so the structures can be seen more clearly **B1**

(b) Answer: It stains the cells and increases contrast so structures are easier to see

(c) easier to find the cells / larger field of view / reduces risk of the lens hitting/breaking the slide **B1**

(c) Answer: Easier to locate the cells (wider field of view; less risk of hitting the slide)

Question 4

(a) number of divisions = 120 / 20 = 6, so number = 800 x 2^6 (oe) **M1**

(a) 51200 cao **A1**

(a) Answer: 51200

(b) 5.12×10^4 (ft from part a) **B1**

(b) Answer: 5.12×10^4

Question 5

Level 3 A detailed and coherent evaluation that considers benefits AND objections, leading to a justified conclusion. The response uses relevant scientific ideas throughout and is logically sequenced. **5-6**

Level 2 Some relevant benefits and objections are given with some linking. There may be an attempt at a judgement. Scientific ideas are mostly correct. **3-4**

Level 1 One or more isolated relevant points (a benefit or an objection) with no development or judgement. **1-2**

Level 0 No relevant content. **0**

Indicative content:

- Benefit: embryonic stem cells can differentiate into almost any type of body cell, so could replace faulty or damaged cells; adult stem cells can form only a limited range of cell types.
- Benefit: could treat conditions such as paralysis (nerve cells), type 1 diabetes (insulin-producing cells) or blindness.
- Benefit: therapeutic cloning uses a nucleus from a patient's body cell inserted into an egg cell whose nucleus has been removed. The egg is stimulated to divide to form an early embryo, from which embryonic stem cells can be obtained. Their matching nuclear genetic information reduces the risk of rejection. This is distinct from collecting adult stem cells directly from the patient's bone marrow.
- Objection (ethical): the embryo is destroyed; some people believe an embryo has a right to life.
- Objection (religious/personal): some hold that using embryos in this way is wrong.
- Risk: transplanted stem cells could be infected with a virus and pass it on.
- Risk: uncontrolled cell division could lead to tumours/cancer.
- Practical: research is expensive and treatments are still being developed.
- Regulation: use of embryonic stem cells is controlled by law.
- A judgement: e.g. the potential to cure serious diseases can be weighed against the ethical cost and the risks.

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