

## 4.1 Cell biology

### Biology (Separates) Higher Topic Test Markscheme

#### Mark scheme 01.1

**B.** Concentration of the sugar solution

[1 mark]

#### Mark scheme 01.2

Gained water

1

(Water moves) by osmosis

1

**or**

(Because) concentration of water outside the potato is greater than inside the cells / potato

*Allow converse statements*

*(Because) concentration (of sugar solution) inside the potato is greater than outside the potato / cells*

[2 marks]

#### Mark scheme 02.1

Any **one** from:

- Greater magnification
- Higher resolving power

*Allow can see (smaller) sub-cellular structures / parts*

*Allow can see more detail (inside cells)*

*Allow reference to 3-D images*

[1 mark]

#### Mark scheme 02.2

**(a)** Diffusion

1

**(b)** Active transport

*Allow active uptake*

1

[2 marks]

**Mark scheme 03.1**

Movement / spreading out of molecules / particles

*Allow movement / spreading out of (named) substances / chemicals / gases / liquids*

*Ignore reference to membranes / cells*

**1**

From (an area of) high(er) concentration to (an area of) low(er) concentration

*Allow down / with the concentration gradient*

*Ignore along / across the concentration gradient*

*Do **not** accept movement from / to a concentration gradient*

**1**

**[2 marks]**

**Mark scheme 03.2**

**C.** Increased carbon dioxide concentration in the air

**1**

**D.** Increased number of stomata that are open

**1**

**[2 marks]**

**Mark scheme 03.3**

**Name of process:** Active transport

**1**

**Explanation:**

(Because) energy is needed

**1**

(To move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)

*Allow (to move nitrate ions) against / up the concentration gradient*

*Allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell*

*Ignore reference to amount / number of nitrate ions*

*Ignore along / across the concentration gradient*

*Do **not** accept if reference to molecules / atoms moving*

**1**

**[3 marks]**



**Mark scheme 04.1**

Red blood cell / RBC

*Allow erythrocyte*

*Ignore blood cell unqualified*

*Ignore platelets*

**or**

Bacteria / prokaryote

*Allow named examples of bacteria*

*Do **not** accept virus*

**or**

Xylem (cell)

**[1 mark]**

**Mark scheme 04.2**

Controls the (activities of the) cell

*Allow contains genetic information / genes / DNA / chromosomes*

*Do **not** accept brain*

*Do **not** accept controls substances entering / leaving the cell*

**[1 mark]**

**Mark scheme 04.3**

Any **one** from:

- (Cellulose cell) wall
- Chloroplast  
*Ignore chlorophyll*
- (Permanent) vacuole  
*Allow starch grain*

**[1 mark]**

**Mark scheme 04.4**

24 (mm) **or** 2.4 (cm)

*Allow in range 23 to 25 (mm) **or** in range 2.3 to 2.5 (cm)*

**1**

$$\frac{24}{0.06}$$

**or**

$$\frac{2.4}{0.06}$$

*Allow correct calculation from their measurement of **X** to **Y** in the range 2.3 cm to 3.5 cm **or** 23 mm to 35 mm*

**1**

( $\times$ ) 400

*Allow correct magnification derived from their measurement in **mm**  
Ignore rounding errors*

**1**

*An answer of ( $\times$ ) 400 scores **3** marks*

*An answer of ( $\times$ ) 40 scores **2** marks*

**[1 mark]**

**Mark scheme 05**

- (a) Radius (of area with no bacteria growing)

*Allow diameter (of the area with no bacteria growing)*

*Ignore  $\pi r^2$  unqualified*

*Allow idea of placing agar plate onto graph paper and counting the squares not covered with bacteria*

**1**

- 
- (b) Repeat **and** look to see if results are similar

*Ignore repeat unqualified*

*Allow repeat **and** look to see if results are different*

*Allow repeat and see if there are anomalies*

*Ignore repeat and identify anomalies*

*Ignore repeat and compare unqualified*

**1**

- 
- (c) Any **one** from:

- Toxicity / side / health effects  
*Ignore harmful / dangerous*  
*Allow reference to allergies*
- Effect on other types of bacteria / pathogens  
*Allow not tested on other types of bacteria*  
*Ignore germs*
- Interaction with other cleaners
- Ease of use
- Dilution factor of each cleaner (vs. cost)  
*Ignore concentration unqualified*
- Time cleaner is effective for  
*Ignore how long the cleaner lasts for*  
*Allow reference to odour of cleaning liquid*  
*Ignore reference to cost unqualified*  
*Ignore environmental effects / flammability*

**1**

**[3 marks]**

**Mark scheme 06**

$$50 = \frac{43}{\text{size of real object}}$$

**1**

$$(\text{Size of real object} =) \frac{43}{50}$$

**1**

$$(\text{Size of real object} =) 0.86 \text{ (mm)}$$

**1**

$$(\text{Size of real object} =) 860 \text{ (}\mu\text{m)}$$

*Allow correct conversion of their calculated value*

**1**

*If no other marks awarded allow **1** mark for*

$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

*An answer of 860 ( $\mu\text{m}$ ) scores **4** marks*

**[4 marks]**

**Mark scheme 07**

Any **two** from:

**Advantages:**

- May be used to cure / treat (current / future) diseases  
**or**  
cure medical conditions  
**or**  
produce replacement cells / tissues / organs  
*Allow example e.g. diabetes / paralysis*  
*Ignore used for medical treatments*
- Cells / tissues of any type could be produced  
*Allow cells differentiate into many types*
- Cells unlikely to be rejected by the patient  
*Ignore identical cells are produced unqualified*
- Many cells produced
- Cells produced could be used for research
- Would reduce waiting time for organ transplants

*Ignore references to cost*

**2**

Any **two** from:

**Disadvantages:**

- Potential life is killed / destroyed  
*Allow embryo is destroyed*  
*Ignore cells destroyed or wasted*
- Shortage of donors / eggs
- Egg donation / collection has risks
- Do not yet know risks / side effects of the procedure on the patient  
*Allow may cause tumours / cancer*
- May transfer (viral) infection
- Poor success rate to produce viable eggs / embryo

*Ignore references to cost*

*Ignore unethical unqualified*

*Ignore references to religion / beliefs*

**2**

**[4 marks]**

**Mark scheme 08.1**

More bacteria so more divisions / reproduction (per unit time)

**[1 mark]**

**Mark scheme 08.2**

Any **three** from:

- Add (more) sugar
- Add (more) amino acids / protein  
*If neither point given, allow add (more) nutrients*
- Add (more) oxygen
- Increase temperature  
*Allow in range 26 °C to 40 °C*  
*Allow maintain optimum temperature*
- Remove toxins / waste **or** maintain pH
- Stir the culture

*If no other mark awarded allow **1** mark for add more food*

**[3 marks]**

**Mark scheme 09.1**

Any **one** from:

- Meristem(s)
- **Tip** of shoot  
*Ignore stem and embryo*
- **Tip** of root

**[1 mark]**

**Mark scheme 09.2****Stage 1**

Cell growth

**or**

Increase in number of organelles

*Allow increase in named organelle e.g. ribosomes / mitochondria*

**1**

DNA replicates

**or**

Two copies of each chromosome form

*Allow DNA duplicates / doubles*

*Ignore genetic information replicates*

*If this statement given as part of stage 2 allow **max 4** marks*

**1**

**Stage 2 / mitosis**

One set of chromosomes moves to each end of cell

*Allow chromosomes separate or are pulled apart*

**1**

Nucleus divides

*Allow nucleus splits into two*

**1**

**Stage 3**

Cytoplasm / cell membrane

divides to form two (genetically)

identical cells

*Allow cytokinesis*

**1**

**Max 4** if correct sequence but no reference to stage numbers

**Max 4** marks if no stage numbers given

*Ignore names of phases*

**[5 marks]**

**Mark scheme 10.1**

(Mass increased because) water entered by osmosis

1

From a dilute solution in the beaker to a more concentrated solution in the egg (cell)

*Allow from an area of high water concentration in the beaker to an area of low water concentration in the egg (cell)*

*Allow ref to water potential*

*Allow ref to 'strong' and 'weak' solutions*

*Ignore along / across concentration gradient*

*Do **not** accept 'amount' in place of concentration*

1

Through a partially permeable membrane

*Allow semi-permeable / selectively permeable membrane*

1

**[3 marks]**

**Mark scheme 10.2**

(Ions are moved) from an area of low concentration to high concentration

*Allow against the concentration gradient*

*Allow in terms of solution*

*Do **not** accept molecules*

1

(By) active transport

1

(Which) requires using energy

*Do **not** accept idea of energy being created*

1

**[3 marks]**