Answers

Cell biology

Eukaryotic and prokaryotic cells

1 In the cytoplasm as a loop of DNA and maybe as plasmids.

2 5 µm **3** 2 x 10^2 nm

Animal and plant cells

1 Award one mark for each correct column:

Sub-cellular structure	Animal cells	Plant cells	Prokaryotic cells
Nucleus	✓	✓	
Mitochondria	✓	✓	
Ribosomes	✓	✓	✓
Cytoplasm	✓	✓	✓
Cell membrane	✓	✓	✓
Chloroplast		✓	
Permanent vacuole		✓	
Cellulose cell wall			✓

2 The more mitochondria there are, the more respiration will be carried out; Active cells need more energy.

3 The organism is not a plant; It has some features of plant cells/has chloroplasts/has a cellulose cell wall; It is one-celled/unicellular or plants are multicellular.

Cell specialisation

1 A cell that has differentiated in order to carry out a particular function.

2 A nerve cell has many dendrites for passing the nerve impulse onto nearby nerve cells.

A nerve cell has a long axon for allowing the nerve impulse to travel along a part of the body.

3 Xylem cells have no ends and are hollow to make a tube for water to move through; Lignin in the cell wall to waterproof and give strength to the cells to stop them collapsing and water leaking out.

Cell differentiation

1 Stem cell **2** Embryo; Plant

3 Cell divides; Cell is exposed to a chemical/hormone; Cell changes shape/acquires new sub-cellular structures.

Microscopy

1 Higher magnification; Higher resolution/resolving power.

2 Magnification $= \frac{3\text{ cm}}{12\ \mu\text{m}}$

Magnification $= \frac{30\,000\ \mu\text{m}}{12\ \mu\text{m}}$

Magnification = × 2500

3 Size of the image = Magnification x real size of cell

Size of the image = 12 000 × 4 µm

Size of the image = 48 000 µm or 4.8 × 10^4 µm

Culturing microorganisms

1 Bacteria divide by binary fission; The bacterium doubles in size and divides into two daughter cells.

2 Sterilising equipment; Sterilising inoculation loop; Taping lids down/storing Petri dishes upside down; Culturing microorganisms at 25°C.

3 Cross-sectional area = 3.142 × 200^2

= 3.142 × 40 000

= 125 680 µm^2

or 1.3 × 10^5 µm^2

Using a light microscope

1 x 400 **2** 5 µm

3 Four of: Place the blood sample onto a slide; Place the slide on the stage; Make sure light is passing through the sample/light is on; Bring the blood sample into focus by looking down the eyepiece lens and moving the coarse focus; Use a higher magnification objective lens and bring the blood sample into focus using the fine focus.

Investigating the effect of antiseptics/antibiotics

1 Bacterial growth is inhibited; due to the action of an antiseptic/antibiotic.

2 No unwanted microorganisms on the agar plate which could affect results of investigation; Unwanted microorganisms could make someone ill.

3 Cross-sectional area = 3.142 × 0.5^2

= 3.142 × 0.25

= 0.7855 cm^2

Mitosis and the cell cycle

1 Growth; repair/replacement of cells; Asexual reproduction.

2 At the beginning of mitosis, the chromosomes are already doubled inside the nucleus; The nucleus breaks down and the chromosomes line up in the centre of the cell; One set of chromosomes is pulled to each side of the cell to form two new nuclei; The cytoplasm and cell membranes divide to form two identical daughter cells.

3 Number of cells = 1 × 2^{24}

= 16 777 216 cells

= 1.7 × 10^7 cells

Stem cells

1 In the root/shoot tip.

2 Replacing cells; Development of the embryo; Medical treatment; Medical research.

3 Take cuttings from the root tip/shoot tip; Use the cuttings to produce many cloned plants; The plants would be genetically identical.

Diffusion

1 The movement of particles; from an area of high concentration to an area of low concentration.

2 Any two answers from below: Increase the surface area; Increase the temperature; Increase the difference in the concentration of the particles.

3 Surface area 4 × 4 × 6 = 96 cm^2;

Volume = 4 × 4 × 4 = 64 cm^3;

Surface area to volume ratio = 96:64 or 3:2 or 1.5:1

Osmosis

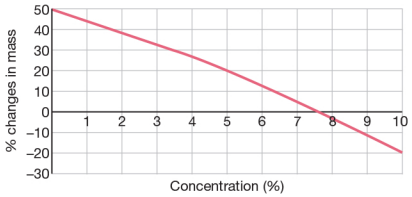
1 Water will move out of the animal cell by osmosis; The cell will shrivel and crenate.

2 Percentage increase in mass

$= \frac{(14-8)}{8} \times 100\%$

= 75%

3



(X and Y axis drawn correctly; X axis labelled as 'Concentration of salt solution (%)' and Y axis labelled as 'Percentage change in mass); points plotted correctly; points connected together with a straight line.)

Investigating the effect of a range of concentrations on the mass of plant tissue

1 **a** 6%

b Mass of potato cube = 5.3 g

c Two from: Type of plant tissue/potato; Mass of original potato; Amount of time spent in sugar concentration; Volume of each sugar concentration.

Active transport

1 The difference between the two concentrations; the greater the difference, the greater the concentration gradient.

2 Respiration

3 Mineral ions move from a dilute concentration in the soil, to a higher concentration in the cell; They move through carrier proteins in the cell membrane; This requires energy.

Review It!

1 No nucleus; No membrane bound organelles; Has plasmids.

2 **a** Place the specimen onto the stage; Line up the objective lens and the eyepiece lens; and focus the specimen by moving the stage with the coarse focus.

b 30 000 ÷ 10; = × 3000

3 **a** Root hair cells have long thin hairs; and do have chloroplasts; The thin hairs increase the surface area to take up water and minerals from the soil.

b Meristem tissue; in the root differentiates; into root hair cells.