

Answers

Cell biology

Eukaryotic and prokaryotic cells

- In the cytoplasm as a loop of DNA and maybe as plasmids.
- 5 μm
- 2 $\times 10^2$ nm

Animal and plant cells

- 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		✓	

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

- A cell that has differentiated in order to carry out a particular function.
- 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.
- Sperm cells are not a tissue; as the cells do not work together to carry out their function.
- 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

- Stem cell
- Embryo; Plant
- Cell divides; cell is exposed to a chemical/hormone; cell changes shape/ acquires new sub-cellular structures.

Microscopy

- Higher magnification; Higher resolution/ resolving power.
- Magnification = $\frac{3 \text{ cm}}{12 \mu\text{m}}$
Magnification = $\frac{30000 \mu\text{m}}{12 \mu\text{m}}$
Magnification = $\times 2500$

- Size of the image = Magnification \times real size of cell

$$\text{Size of the image} = 12000 \times 4 \mu\text{m}$$

$$\text{Size of the image} = 48000 \mu\text{m} \text{ or } 4.8 \times 10^4 \mu\text{m}$$

Culturing microorganisms

- Bacteria divide by binary fission; The bacterium doubles in size and divides into two daughter cells.
- Sterilising equipment; sterilising inoculation loop; taping lids down/ storing Petri dishes upside down; culturing microorganisms at 25°C.
- Cross-sectional area = 3.142×200^2
= $3.142 \times 40,000$
= $125680 \mu\text{m}^2$
or $1.3 \times 10^5 \mu\text{m}^2$

Required Practical 1

- $\times 400$
- 5 μm
- 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.

Required Practical 2

- Bacterial growth is inhibited; due to the action of an antiseptic/antibiotic.
- No unwanted microorganisms on the agar plate which could affect results of investigation; Unwanted microorganisms could make someone ill.
- Cross-sectional area = 3.142×0.5^2
= 3.142×0.25
= 0.7855 cm^2

Mitosis and the cell cycle

- Growth; repair/replacement of cells; asexual reproduction.
- 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.
- Number of cells = 1×2^{24}
= 16777216 cells
= 1.7×10^7 cells

Stem cells

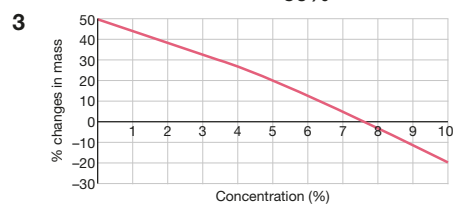
- In the root/shoot tip.
- Replacing cells; Development of the embryo; Medical treatment; Medical research.
- Take cuttings from the root tip/shoot tip; Use the cuttings to produce many cloned plants; The plants would be genetically identical.

Diffusion

- The movement of particles; from an area of high concentration to an area of low concentration.
- Any two answers from below: Increase the surface area; Increase the temperature; Increase the difference in the concentration of the particles.
- Surface area $4 \times 4 \times 6 = 96 \text{ cm}^2$;
Volume = $4 \times 4 \times 4 = 64 \text{ cm}^3$;
Surface area to volume ratio = 96:64 or 3:2 or 1.5:1

Osmosis

- Water will move out of the animal cell by osmosis; The cell will shrivel and crenate.
- Percentage increase in mass
= $\frac{12 - 8}{8} \times 100$
= 50%



(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.)

Required practical 3

- 6%
 - Mass of potato cube = 5.3 g
 - 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

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