

Answers to end-of-chapter questions

1 Cell structure

- 1 A
2 C
3 A
4

Feature	Light microscope	Electron microscope
source of radiation	<i>light</i>	<i>electrons</i>
wavelength of radiation used	<i>400–700 nm</i>	about 0.005 nm
maximum resolution	<i>200 nm</i>	0.5 nm in practice
lenses	glass	<i>electromagnets</i>
specimen	<i>living or non-living or dead</i>	non-living or dead
stains	coloured dyes	<i>heavy metals</i>
image	coloured	<i>black and white</i>

- 5 nucleus; (smooth) endoplasmic reticulum; rough endoplasmic reticulum; 25 nm/larger/80S ribosomes; linear/non-circular DNA; chromatin/chromosome(s); lysosome(s); Golgi apparatus; mitochondrion/mitochondria; centriole(s); vacuole(s); microvilli; cilium/cilia; nucleolus/nucleoli; nuclear envelope; nuclear pore(s);
- 6 a magnification is the number of times larger an image is compared with the real size of the object; resolution is the ability to distinguish between two separate points/the greater the resolution, the greater the detail that can be seen; a statement linking the terms, such as both terms used with reference to microscopy;
- b light microscope uses light as a source of radiation; electron microscope uses electrons as a source of radiation;
- c both organelles/both found in eukaryotic cells; nucleolus is located inside nucleus; nucleus controls cell activity; nucleolus makes ribosomes;
- d chromatin and chromosomes both contain DNA (and protein/histones)/both found in nucleus; chromatin is the loosely coiled form of chromosomes;
- chromatin is the form that exists between cell/nuclear divisions; chromosomes are formed just before/during, cell/nuclear division;
- e an envelope consists of two membranes (one just inside/outside the other); a membrane is a thin (partially permeable) barrier found around cells and some organelles; example of at least one organelle surrounded by an envelope is given; membranes found in/around all cells, envelopes only in eukaryotes;
- f both consist of flattened membrane-bound sacs; both found spreading through cytoplasm of eukaryotic cells; smooth ER lacks ribosomes, rough ER has ribosomes on surface; one function of smooth ER given, e.g. makes lipids/steroids; rough ER transports proteins made by ribosomes on its surface;
- g prokaryotes have no nucleus, eukaryotes have nucleus; prokaryotes are smaller/simpler;

prokaryotes have few organelles, eukaryotes have many organelles, some membrane-bound/compartmentalisation/more division of labour;

eukaryotes evolved from prokaryotes;

h tissue is a group of cells specialised for a particular function;

one animal and one plant example given;

organ is a group of tissues specialised for a particular function;

one animal and one plant example given;

i both found in plants;

both (complex) tissues;

both vascular tissues/involved in (long distance) transport;

xylem transports water and mineral salts;

phloem transports organic solutes/sugar/sucrose;

j both are tissues;

both cover/protect surfaces;

epidermis in plants, epithelium in animals;

epidermis one cell thick, epithelium one or more cells thick;

epidermis may be covered with (waxy) cuticle;

k mesophyll cells are found in leaves;

palisade is upper layer/just below (upper) epidermis/above spongy mesophyll/OR spongy mesophyll is below palisade mesophyll;

both contain chloroplasts/specialised for photosynthesis;

palisade mesophyll cells are column-shaped, spongy mesophyll cells are irregular/pack together loosely/have large intercellular air spaces;

palisade mesophyll cells have more chloroplasts/more photosynthesis;

spongy mesophyll cells allow gas exchange/circulation of carbon dioxide (for photosynthesis);

7 Any three appropriate organelles:

a e.g. nucleolus; ribosome; centriole;

b e.g. lysosomes; rough ER; smooth ER; Golgi apparatus;

c nucleus; mitochondrion; chloroplast;

8 a Golgi apparatus;

b nucleolus;

c ribosome;

d ER/rough ER;

e rough ER;

f mitochondrion;

g nucleus;

h chloroplast;

i centriole;

j nucleus;

k membrane;

l ribosome;

Exam-style questions

Notes about mark schemes

A or **accept** indicates an alternative acceptable answer.

R = reject. This indicates a possible answer that should be rejected.

; The **bold** semi-colon indicates the award of 1 mark.

/ This indicates an alternative answer for the same mark. The alternatives may be separated from the rest of the answer by commas.

() Text in brackets is not required for the mark.

Underlining This is used to indicate essential word(s) that **must** be used to get the mark.

AW means 'alternative wording'. It is used to indicate that a different wording is acceptable provided the essential meaning is the same, and is used where students' responses are likely to vary more than usual.

AVP means 'additional valid point'. This means accept any additional points given by the student that are not in the mark scheme, provided they are relevant. But accept only as many additional points as indicated by the bold semi-colons, e.g. **AVP;;** means award a maximum of 2 extra marks.

ORA means 'or reverse argument' and is used when the same idea could be expressed in the reverse way. For example: 'activity increases between pH 2 and pH 5 **ORA**' means accept 'activity decreases between pH 5 and pH 2'.

max. This indicates the maximum number of marks that can be given.

- 9 a** 1 mark for each accurately measured 'observed size' (to within ± 2 mm) and 1 mark for each accurately calculated 'actual size' ; ; ; ; ;
1 mark for applying the formula $A = \frac{I}{M}$;
1 mark for measuring in mm and converting mm to μm for each calculation;
1 mark for rounding up actual size to no more than one decimal place; [9]
- b quality of drawing:**
sharp pencil used; more than half of available space used; clean, continuous lines/not sketchy; interpretation of structures accurate; representative parts of main organelles drawn, including those below for which label marks are awarded; [5]
labels:
nucleus; nuclear envelope; nuclear pore;
nucleolus; rough ER; ribosome(s);
mitochondrion; crista or cristae; Golgi apparatus;
Golgi vesicle/secretory vesicle; [max. 9]
- c** mitochondria will appear circular if they are cut, in transverse section/across (the long axis); **AW** [1]
- d i** **A** protein made on the ribosome is moving into the rough ER;
B rough ER buds off small vesicles; vesicles fuse to form the Golgi apparatus; (therefore) protein moves into Golgi apparatus; protein may be modified/processed inside Golgi apparatus;
C Golgi apparatus buds off Golgi vesicles;
D Golgi vesicles travel to cell surface membrane; Golgi vesicle(s) fuses with cell surface membrane; protein/enzyme leaves cell; exocytosis/secretion; [max. 8]
- ii** ribosome/messenger RNA; [1]
iii nuclear pore; [1]
iv ATP; [1]
- [Total: 35]

10 a i 100 000 *g*

ii 1000 *g*

iii 10 000 *g* [1]

b lysosomes are, similar in size to/slightly smaller than, mitochondria;

therefore sediment at same/similar, *g* force/speed;

therefore contaminate mitochondrial sample; **AW**

therefore cannot be sure whether effects due to mitochondria or lysosomes in any

experiments; [4]

[Total: 5]