

Cell Structure

Model Answers 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Foundations in Biology
Topic	Cell Structure
Booklet	Model Answers 1

Time allowed: 47 minutes

Score: /35

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

(a) Table 6.1 gives the functions of certain organelles in a eukaryotic cell.

Complete the table by stating the function associated with each organelle.

[3]

The first row has been completed for you.

Organelle	Function
nucleus	contains the genetic material
smooth endoplasmic reticulum	transport/ synthesis of lipids
lysosome	contain hydrolysing enzymes
ribosome	protein synthesis

Table 6.1

Remember! The rough endoplasmic reticulum is associated with protein synthesis, so do not get this confused with the SER

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- (b) One theory about the evolution of organelles is the endosymbiotic theory. This theory suggests that the mitochondria and chloroplasts found in eukaryotic cells represent formerly free-living bacteria that were absorbed into a larger cell.

The following list describes a number of features of mitochondria and chloroplasts.

Place a tick (✓) next to the **three** statements that could be used as evidence for the endosymbiotic theory.

mitochondria contain ribosomes that are smaller than those found in the cell cytoplasm	<input checked="" type="checkbox"/>
chloroplasts contain chlorophyll and other photosynthetic pigments	<input type="checkbox"/>
mitochondria are a similar size to bacteria	<input checked="" type="checkbox"/>
the inner membrane of a mitochondrion is folded to form cristae	<input type="checkbox"/>
chloroplasts contain many disc-shaped membranes called thylakoids	<input type="checkbox"/>
chloroplasts have their own circular DNA	<input checked="" type="checkbox"/>

[3]

These points could support the theory as they all directly suggest links between free-living cells and mitochondria/ chloroplasts.

- 'Chloroplasts contain chlorophyll and other photosynthetic pigments' does not suggest any link with bacteria.
- 'The inner membrane of a mitochondrion is folded to form cristae' is also correct, but this doesn't suggest that this is due to endosymbiosis.
- 'Chloroplasts contain many disc-shaped membranes called thylakoids' is also true, but is not supportive of the theory.

[Total: 6]

Question 2

Plant and animal cells have different structural features.

(a) (i) Name **two** features of plant cells that are not features of animal cells.

[2]

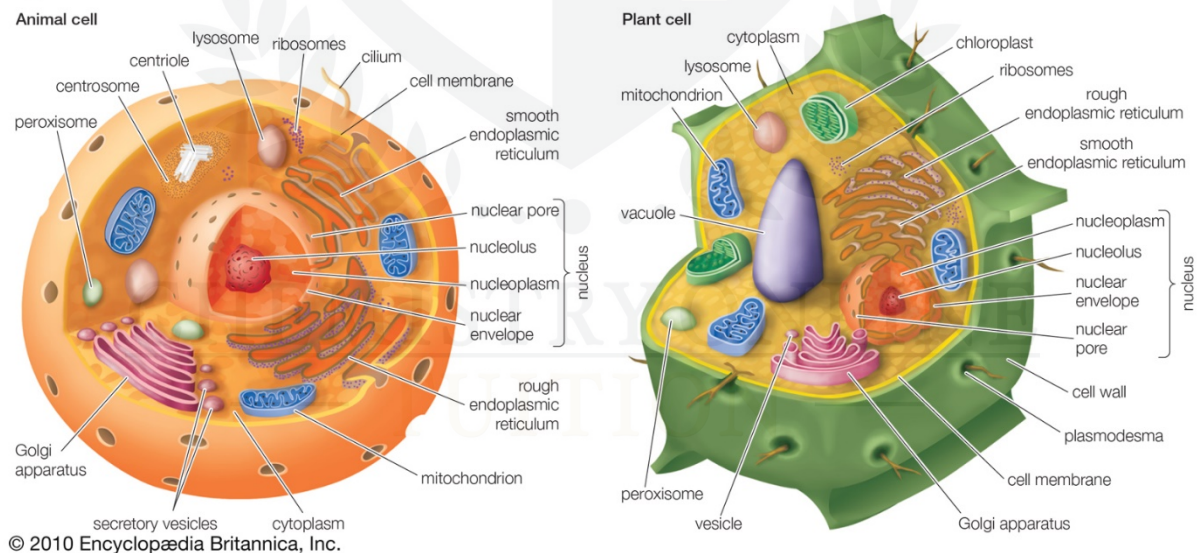
Any two from:

- Cellulose cell wall
- Chloroplasts
- Starch grains
- Large, permanent vacuole
- Tonoplast
- Plasmodesmata

Note: you must ensure that you specify a 'cellulose' cell wall and a 'large' or 'permanent' vacuole to gain these marks

Diagram to show the comparison between a plant and an animal cell:

Typical animal cell and plant cell



(ii) Name **one** structure present in animal cells that is not present in plant cells.

[1]

Any one of:

- Centrioles
- Glycogen granules

(iii) The cytoskeleton in cells consists of microtubules and microfilaments.

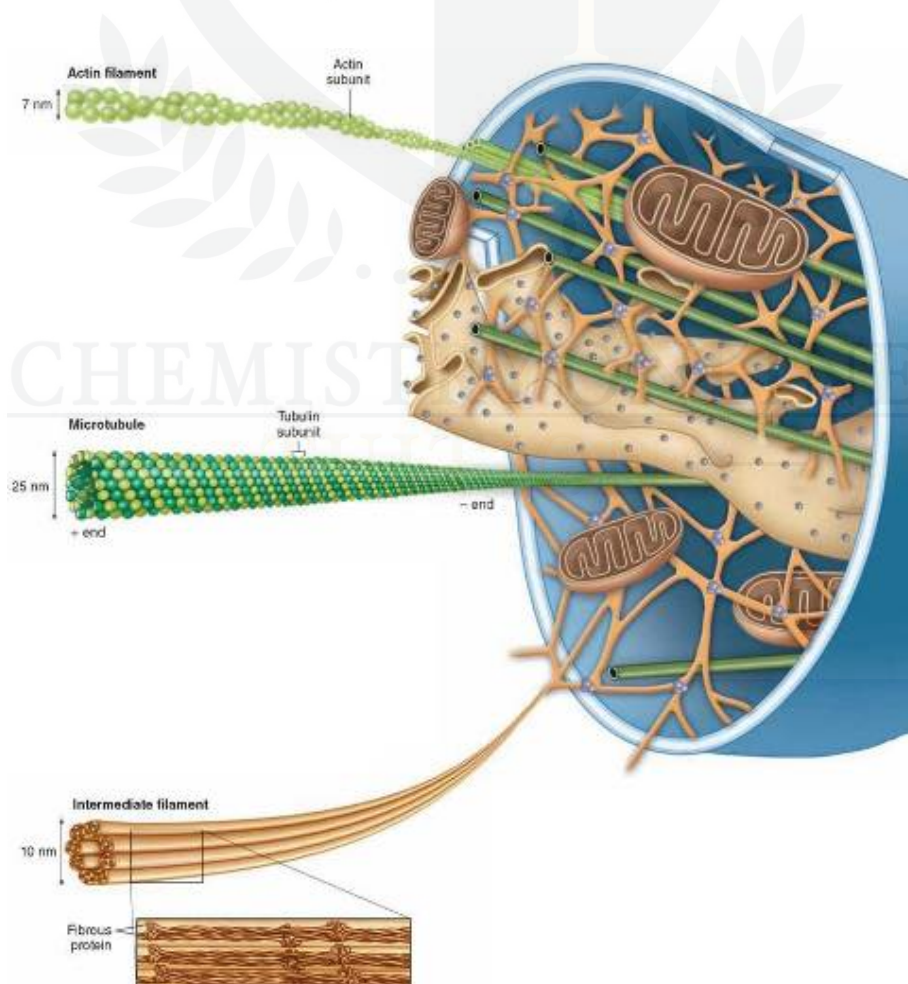
Describe the roles of the cytoskeleton.

[3]

At least three of:

- The cytoskeleton provides cell **support**
- It also allows for the movement of **cilia/flagella/undulipodia** within a cell
- The cytoskeleton allows the **shape** of the cell to **change** (e.g. cytokinesis/phagocytosis)
- It also allows for **movement** of **organelles**
- And for the **movement** of **chromosomes** during cell division

[Diagram to show the cytoskeleton structure within a cell. Here you can see the linkages throughout the cytoplasm and between organelles:](#)



(b) The pancreas is an organ that secretes protease enzymes.

Outline how the organelles in pancreatic cells work together to produce and release these protein molecules from the cells.



In your answer you should use appropriate technical terms, spelled correctly.

[5]

At least four of:

- The **nucleus** is the site of **transcription** of the genes coding for protease enzymes
- **Ribosomes** are the site of **translation/ protein synthesis**
- **Vesicles transport** the polypeptide from the RER to the Golgi
- At the **Golgi** apparatus the proteins are **modified**
- Secretory vesicles transport the enzyme to the **plasma membrane**

***Exam tip:** To gain marks here you need to name the organelle **and** its function. You also need to include all the technical terms, shown here in bold, for the QWC mark*

[Total: 11]

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Question 3

Fig. 1.1 is a diagram of a plant cell.

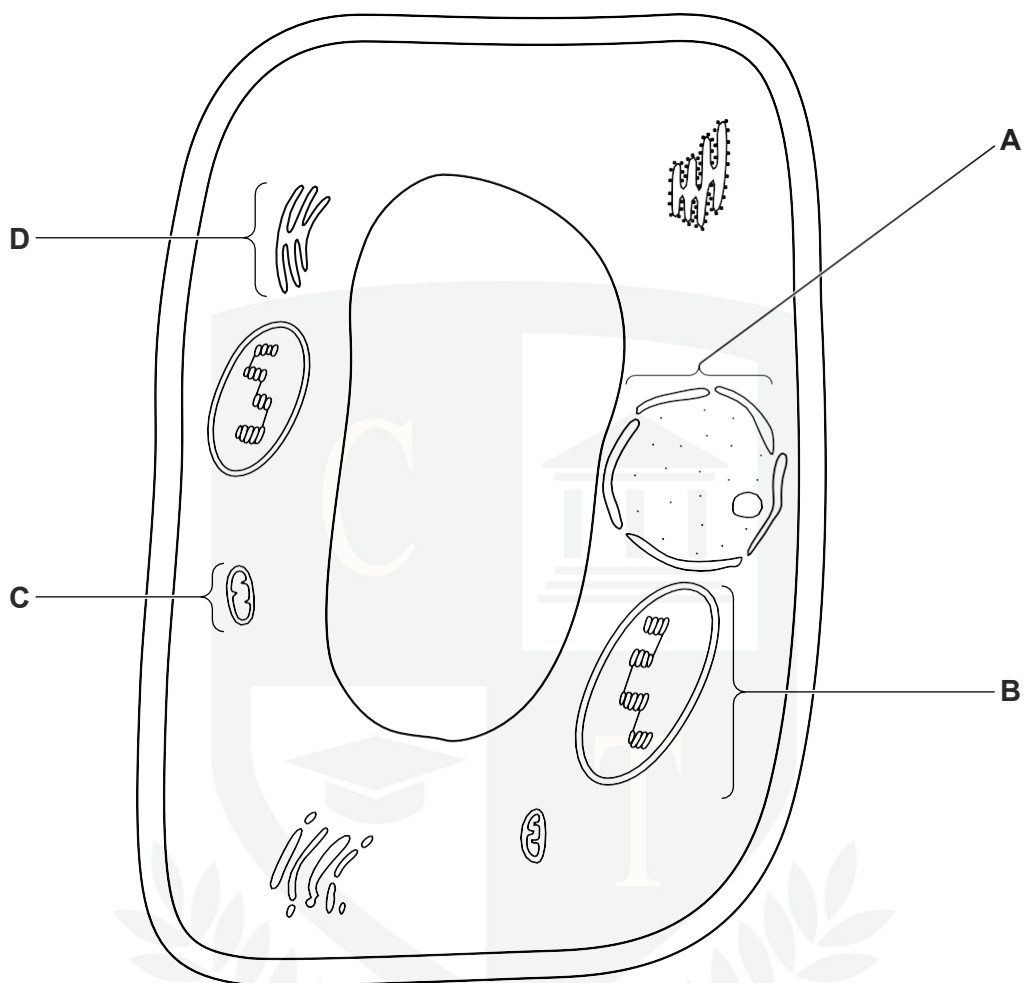


Fig. 1.1

- (a) (i) Name the cell components labelled **A** and **B**.

[2]

A **Nucleus**

B **Chloroplast**

- (ii) State the **functions** of the components labelled **C** and **D**.

[2]

C The function of the **mitochondrion** is to produce **ATP in respiration**

D The function of the **smooth endoplasmic reticulum** is to process **lipids**

Exam tip: learn the structure and functions of organelles carefully!

(b) A student suggested that the details of component **C** could be seen clearly with a very good light microscope.

Explain why the student is **not** correct.

[2]

- C is a mitochondrion, which is **too small** to be seen
- The **resolution** of the light microscope is not high enough (only 200nm)
- The **wavelength** of the light is too long

Resolution is the smallest separation at which two separate objects can be distinguished. A light microscope has low resolution, so some smaller organelles are not clearly seen, even at higher magnification: Using a microscope with a more powerful magnification will not increase this resolution any further.

The resolution of an image is limited by the wavelength used to view the sample. This is because when objects in the specimen are much smaller than the wavelength of the light being used, they do not interrupt the waves, and so are not detected.

(c) Staining is a process often used in microscopy.

Describe the **advantages** of staining specimens to be viewed under a microscope.

[2]

The advantages of staining are:

- Makes specimens more **visible**
- It increases the **contrast**
- Allows the **identification** of **organelles**
- It allows the **identification** of different **compounds**.

[Total: 8]

Question 4

Fig. 2.1 is a diagram of a cell showing the organelles involved in the production and secretion of an extracellular protein. The rough endoplasmic reticulum (RER) is shown enlarged at the side of the diagram.

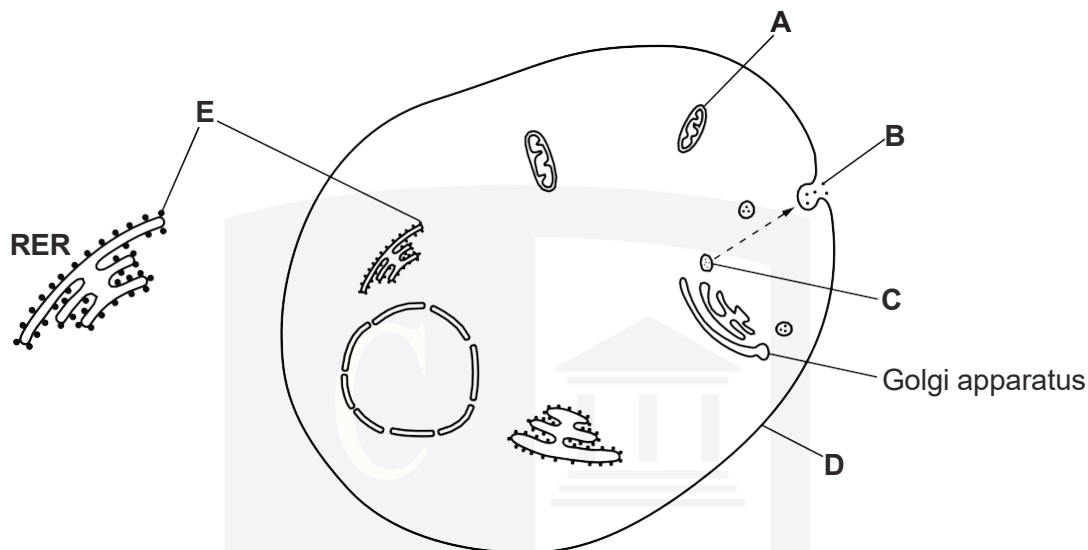


Fig. 2.1

- (a) (i) Name the structures labelled **C**, **D** and **E**. [3]

C secretory vesicle

D plasma membrane

E ribosome

*Exam tip: make sure you are **specific** with the structures: a secretory vesicle is one that leaves the Golgi apparatus*

- (ii) Suggest **one** type of extracellular protein secreted at **B**. [1]

One type of extracellular protein release from the cell might be:

- Enzyme/ hormone

- (iii) Organelle **A** provides ATP which is a source of energy.

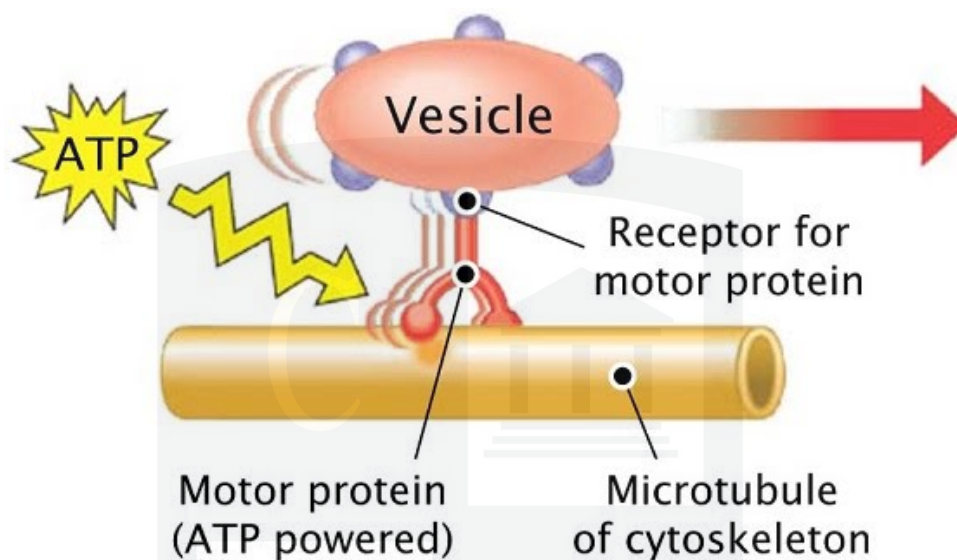
Suggest **one** stage during the secretion of a protein that requires energy. [1]

One stage of protein synthesis that requires energy is:

- Transport of vesicles to plasma membrane
- Exocytosis

The movement of vesicles occurs within the cell due to attachment to the cytoskeleton and movement by motor proteins.

The diagram below shows the attachment of a vesicle to the cytoskeleton and the use of ATP for transport:



(iv) Outline the role of the Golgi apparatus.

[2]

The role of the Golgi apparatus is:

- To receive proteins from the RER / ribosomes
- To modify proteins or make glycoproteins
 - To package them into vesicles
- To make lysosomes
- To replenish the plasma membrane

(b) The cell shown in Fig. 2.1 is a eukaryotic cell.

(i) Identify **two** features, **visible in Fig. 2.1**, which would **not** be present in a prokaryotic cell.

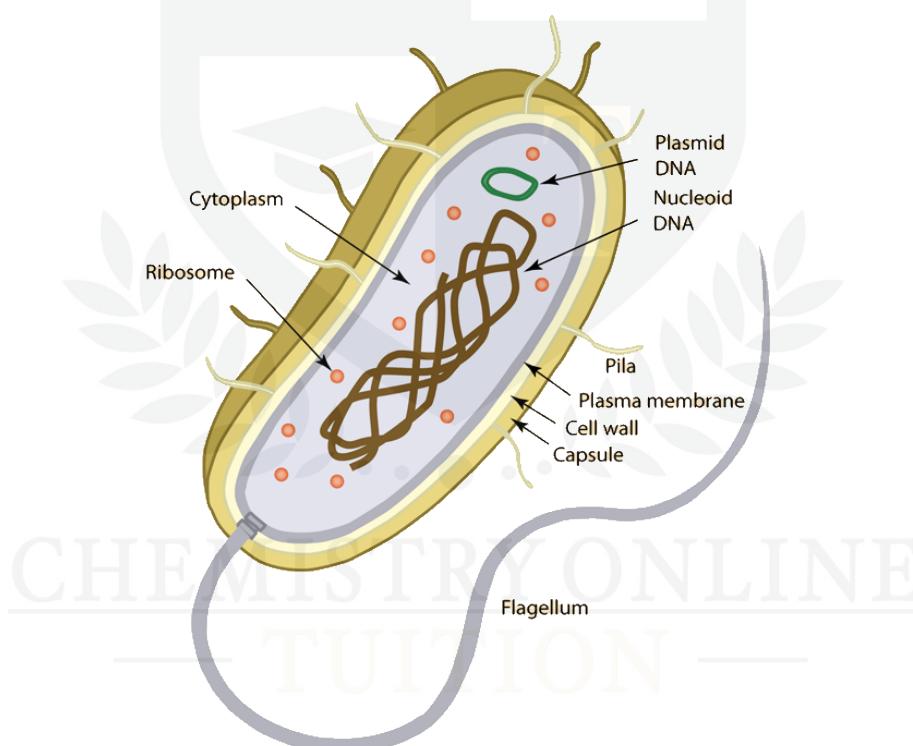
[2]

Features not visible in prokaryotic cells are:

- nucleus or nuclear envelope
- mitochondria
- Golgi apparatus
- vesicles

Note: remember that prokaryotes do not have DNA within a nucleus or any membrane-bound organelles. They **do** have ribosomes, as these are not membrane-bound, but they are smaller than eukaryotic ribosomes.

Diagram to show features of a prokaryotic cell:



(ii) Name **one** feature that would be present in the cytoplasm of a prokaryotic cell that is **not** found in a eukaryotic cell.

[1]

One feature found in a prokaryote, not found in a eukaryotic cell is:

- free DNA
- plasmid
- smaller (18nm) ribosomes

[Total: 10]