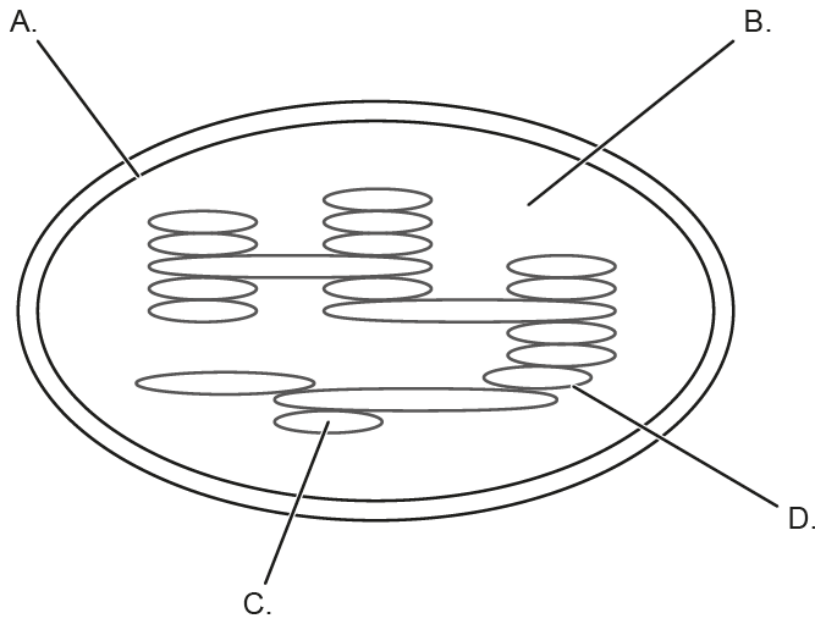


B2.2 organelles and compartmentalization [16 marks]

1. [Maximum mark: 1]

The diagram shows the structure of a chloroplast. Where does the Calvin cycle occur?

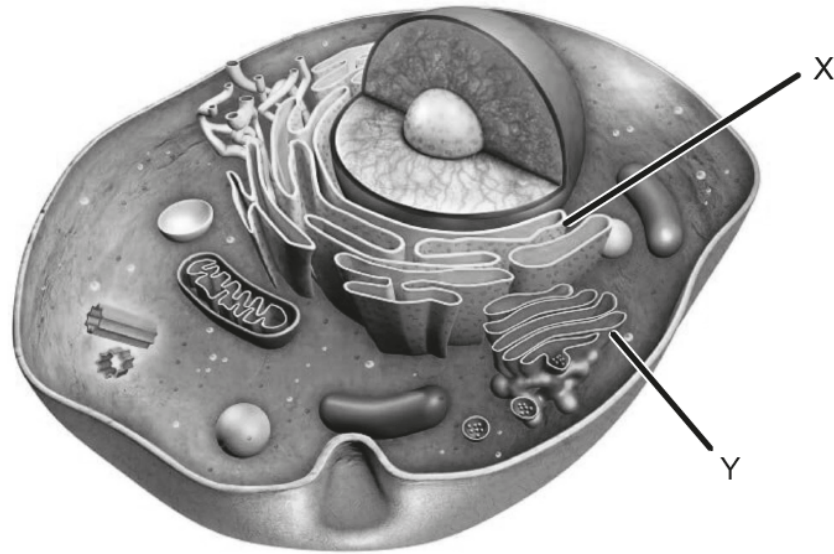


[Source: Used with permission of Springer Nature BV from *Journal of Biological Physics*, Chow, W. S., vol. 29, no. 4, 2023; permission conveyed through Copyright Clearance Center, Inc. Available at: <https://link.springer.com/article/10.1023/A:1027371022781>. Source adapted.]

[1]

2. [Maximum mark: 6]

Eukaryotic cells have certain characteristics in common.



[Source: Adobe Stock / Andrea Danti.]

- (a) State a function for structures X and Y labelled in the cell diagram.

X:	
Y:	

[2]

- (b) Describe **three** different processes that allow molecules to pass through the lipid bilayer of a cell.

[3]

.....

.....

.....

.....

.....

.....

- (c) Outline **one** difference between the structure of prokaryotic and eukaryotic cells.

[1]

.....

.....

.....

3. [Maximum mark: 1]

Leaf cells in spinach (*Spinacia oleracea*) have ribosomes in their cytoplasm with a relative molecular mass of 3 847 000 and smaller ribosomes inside their chloroplasts with a relative molecular mass of 2 448 000. What is an explanation for spinach leaf cells having ribosomes of two different sizes?

[Source: Lai, S.-H., Tamara, S. and Heck, A.J.R., 2021. Single-particle mass analysis of intact ribosomes by mass photometry and Orbitrap-based charge detection mass spectrometry. *iScience* 24(11) [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8529500/> [Accessed 2 January 2024]. Source adapted.]

- A. The chloroplasts of plant cells evolved from a photosynthetic prokaryote.
- B. Proteins inside chloroplasts are all smaller than proteins in the cytoplasm.
- C. Ribosomes in the cytoplasm are attached to endoplasmic reticulum, whereas ribosomes in chloroplasts are free.
- D. Ribosomes in the cytoplasm synthesize proteins, whereas ribosomes in chloroplasts absorb light.

[1]

4. [Maximum mark: 1]

Which statement distinguishes between the roles of free and bound ribosomes?

A. Free ribosomes synthesize proteins for use inside the cell, whereas bound ribosomes synthesize proteins mainly for export.

B. Free ribosomes synthesize proteins mainly for export, whereas bound ribosomes synthesize proteins for use inside the cell.

C. Free ribosomes synthesize proteins, whereas bound ribosomes do not.

D. Bound ribosomes synthesize proteins, whereas free ribosomes do not.

[1]

5. [Maximum mark: 7]

The electron micrograph shows parts of two cells.



[Source: Howard, Louisa. https://commons.wikimedia.org/wiki/File:Pancreatic_cells_-_TEM.jpg. Public domain.]

(a) Identify organelles I to III.

I:

..

II:

..

III:

..

[3]

(b) Using evidence from the micrograph, deduce whether the cells are prokaryotic or eukaryotic.

[2]

.....

.....

.....

.....

.....

.....

(c) State the function of flagella and ribosomes in prokaryotic cells.

Flagella:

Ribosomes:

[2]