Full Name:	Civics group: 21S	Date:	12

Core Idea 1: The Cell and Biomolecules of Life
Marked Assignment 1
Cell Ultrastructure

A student drew a sketch of the chloroplast as shown in Fig. 1.

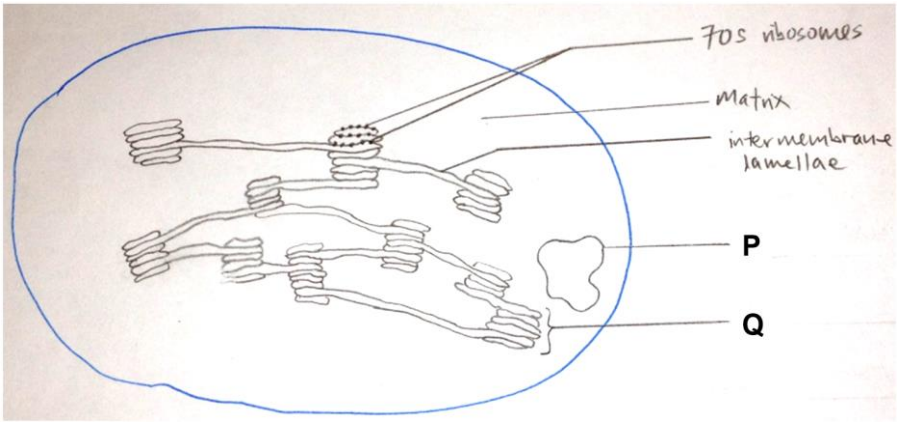

Fig. 1

(a) State **four** mistakes the student committed in the sketch.

…… [4]

1 The 70S ribosomes should be freely in the stroma, not embedded on the thylakoid membranes.
2 The intergranal lamella [reject lamellae] is labelled wrongly as "intermembrane lamellae".
3 The chloroplast stroma is labelled wrongly as "matrix".
4 Chloroplast should have a double membrane / an envelope instead of a single membrane.

Reject: chloroplast should be lens shaped (too minor), starch grains are missing (focus on what is present in the drawing which are wrong, instead of what is missing)

(b) Name and describe the role of structures **P** and **Q**.

…… [3]

1 **P** is circular DNA / starch granule while **Q** is a granum/stack of thylakoids (reject grana). [need to name both correctly to get this mark. No half-mark marking]
2 The role of the circular DNA is to provide genetic information for the synthesis of proteins used within the chloroplast.
/ The circular DNA is involved in the replication of chloroplast independently of the cell.
OR
Starch granules store excess sugars made via photosynthesis in the form of starch.
3 The granum increases surface area for embedding many chlorophyll molecules, electron carriers and ATP synthases in the membrane for more efficient capture of solar energy and photophosphorylation;

(c) Compare structure **P** with nuclear DNA.

…… [2]

For students who put P as circular DNA:

1 [Difference] **P** is circular DNA while nuclear DNA is linear.
2 [Similarity] Both are double stranded / double helices.

For students who put P as starch granule:

1 [Difference] **P** is made up of glucose monomers while nuclear DNA is made up of nucleotide monomers.
2 [Similarity] Both are long polymers.

(d) The presence of 70S ribosomes and circular DNA (both of which are characteristics of prokaryotic cells) in chloroplasts gave rise to the endosymbiosis theory. The endosymbiosis theory suggests that the chloroplast was once a free-living prokaryote which was later incorporated into a larger eukaryote.

(i) State the process which could have taken place.

…… [1]

1 Endocytosis / Phagocytosis

(ii) If food particles were incorporated into an amoeba in the same way, suggest what happens to them once they entered the cell.

…… [2]

1 The membrane of the phagosome will **fuse** with the membrane of a lysosome.
2 **Hydrolytic enzymes** in the lysosome will digest the food particles.
3 Useful products will be absorbed into the cytoplasm while undigested material will be removed from the cell.

- **END OF PAPER -**