Understandings:

1. Explain the structure of prokaryotes.

- Note that prokaryotes don't have a membrane bound structure, a.k.a. organelles.

Ribosome can however be argued as an organelle, but apart from that they don't have an organelle.

Structure	Function
Cell wall	Protective and prevents bursting from pressure by osmosis.
Plasma membrane	Controls the entry and exit. Also pumps molecules.
Ribosomes, 70s	The place where the transcribed mRNA gets translated into proteins.
Cytoplasm	Place of metabolic activity.
Mesosome	Place of respiration and energy production.
Pili	Hairs to protect the cell wall and for DNA exchange with other prokaryotes.
Flagellum	Protein structure to cause locomotion.
Nucleoid	The area where naked DNA exists. Note that the DNA is single and circular.
Plasmid	DNA that can be exchanged.
Slime layer	An unorganized layer (while slime capsule is organized) of mainly exopolysaccharide (secreted sugar by microorganisms), glycoprotein, and glycolipid. The function is to protect from antibiotics, desiccation (extreme drought) and for attaching surfaces.

2. Eukaryotes have a compartmentalized cell structure.

- By compartmentalized, it means that the cell has got organelles that have their own specialties. So what are the advantages of this compartmentalized structure?

Firstly, it enables efficient reaction between enzyme and substrate since compartment act as this "working station". Smaller area increase changes of enzymes and substrates colliding. Secondly, it keeps harmful molecules locked in such as lysosome. Thirdly, different processes require different conditions so organelles can have different conditions suited for the reaction.

3. Explain the structure of eukaryotes.

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Structure	Function
Plasma membrane	Controls the entry and exit. Also pumps molecules.
Ribosomes, 80s	The place where the transcribed mRNA gets translated into proteins.
Cytosol	Main fluid of metabolic activity.
Mitochondria	Place of respiration and energy production.
Rough Endoplasmic reticulum	Transport of the protein that will be secreted. The proteins eventually lead to the Golgi apparatus.
Lysosomes	Contain enzymes that will digest molecules.
Golgi apparatus	Modifies the proteins before excretion. It can modify other biochemical too.
Nucleus	The control panel and has double membrane. Contains chromosomes and genetic information.

4. Explain why electron microscopes have a much higher resolution than light microscopes.

- It is all about the wavelength. Light microscopes have a longer wavelength than electron microscopes so their resolution is lower. On the other hand, beam of electrons have a much shorter wavelength, so it is sensitive to smaller bumps and shapes. In fact, it is about 200 times more sensitive than light microscopes.

Thus ultrastructure is only visible with electron microscopes. Light microscopes can only show us the overviewed structure of the cell.

Extra notes

- We should also be able to identify some obvious differences between prokaryotes vs eukaryotes and animal cells vs plant cells. .

Eukaryotes	Prokaryotes
Strands of bundled DNA called chromosomes	Naked, pure DNA
DNA inside nucleus	DNA in nucleoid
Always a mitochondria	No mitochondria, but a mesosome instead
Large sized ribosomes 80s	Smaller sized ribosomes 70s
Many internal membranes (organelles)	Not many internal membranes
No plasmid	Plasmid
Introns	No introns

Animal	Plant
Only plasma membrane	Cell wall and plasma membrane
No chloroplast	Chloroplast present
Glycogen as storage compound	Starch as storage compound
Vacuoles are rare	Large vacuoles
Malleable shape	Rigid shape

Applications and skills:

1. Be able to identify and explain the structure and function of organelles within exocrine gland cells of the pancreas and within palisade mesophyll cells of the leaf.

- Since exocrine glands need to produce enzymes, hence hormones, they are dense in certain organelles. Those are: mitochondrion, rough ER, ribosomes, Golgi apparatus and lysosomes.

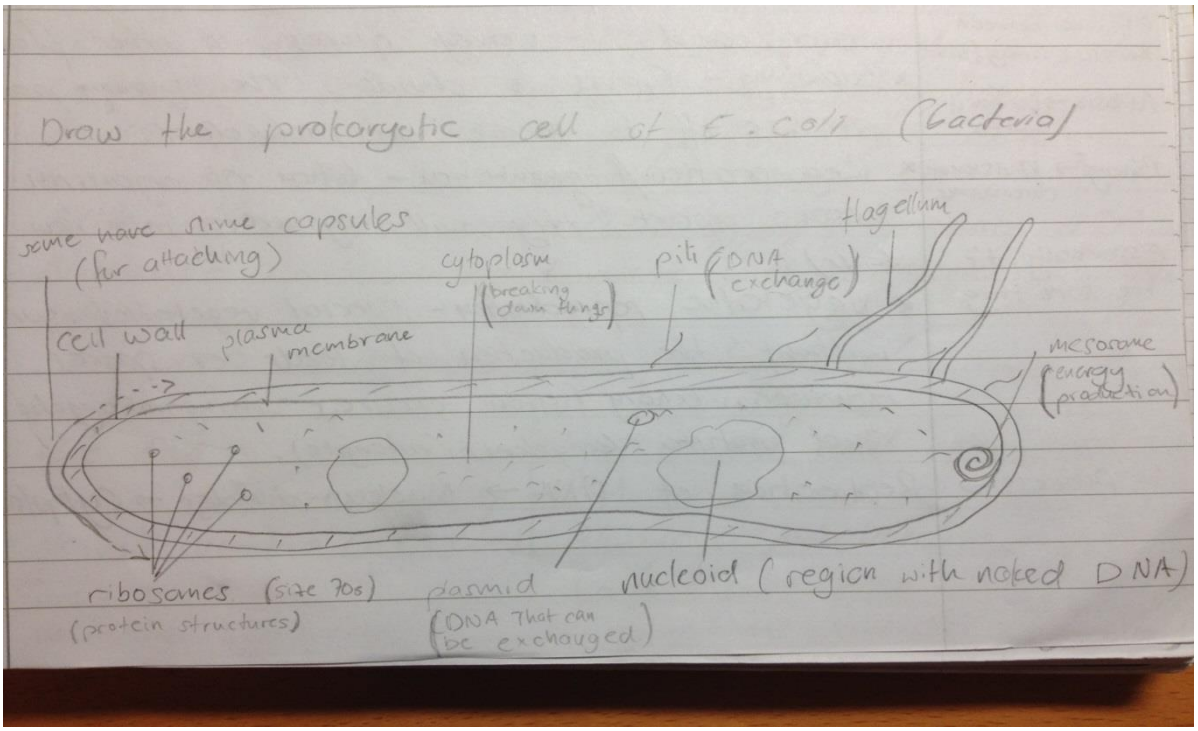
For palisade mesophylls, they need to be dense in organelles for photosynthesis. Those are: chloroplasts, mitochondrion and vacuole.

2. State that prokaryotes divide by binary fission.

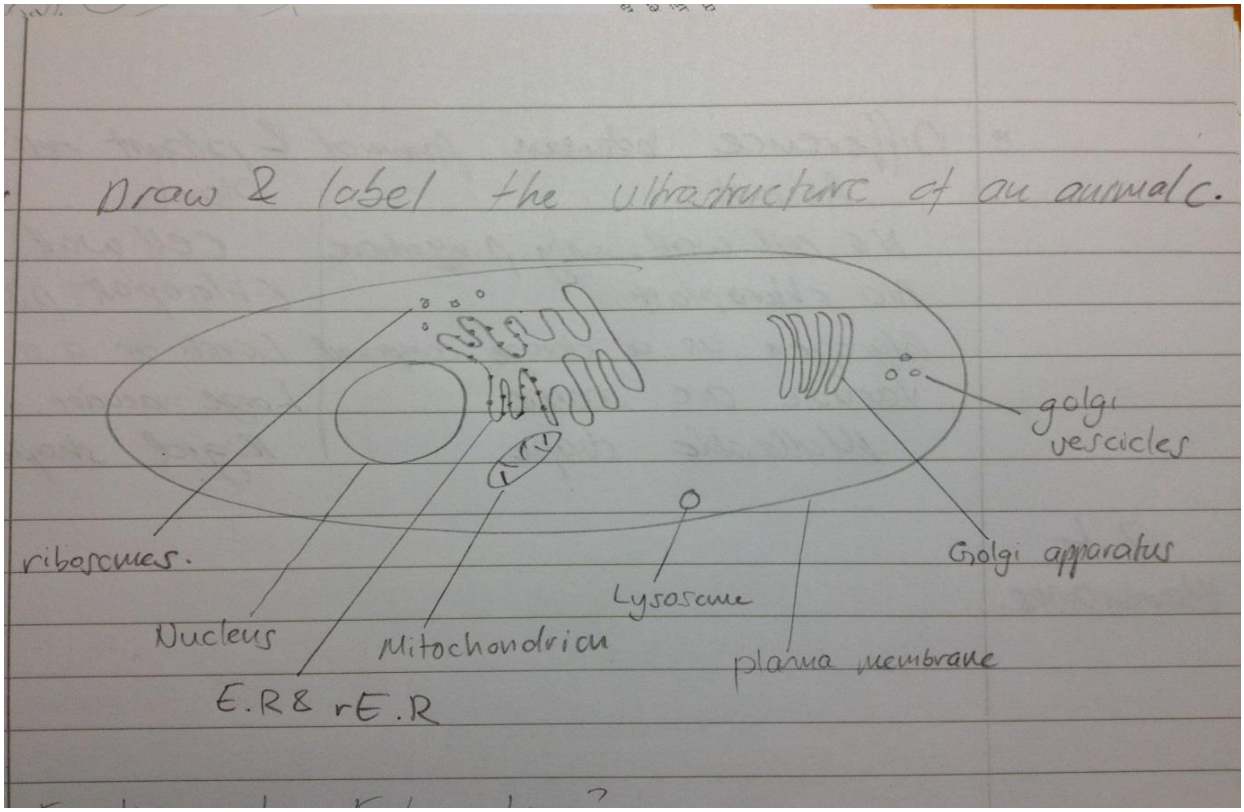
- Prokaryotes divide asexually by a process called binary fission. It is simply when the circular DNA replicates and the cell splits in half.

3. Be able to draw the ultrastructure of prokaryotic cells based on electron micrographs.

- Get familiar with drawing all these structures.



4. Skill: Drawing of the ultrastructure of eukaryotic cells based on electron micrographs



5. Be able to interpret electron micrographs to identify organelles and deduce the function of specialized cells.

- This is quite tricky, but you simply need to train and be familiar with the shapes of organelles.

TOK:

1. The world that we inhabit is limited by the world that we see. Is there any distinction to be drawn between knowledge claims dependent upon observations made by sense perception and knowledge claims dependent upon observations assisted by technology?