

Eukaryotes

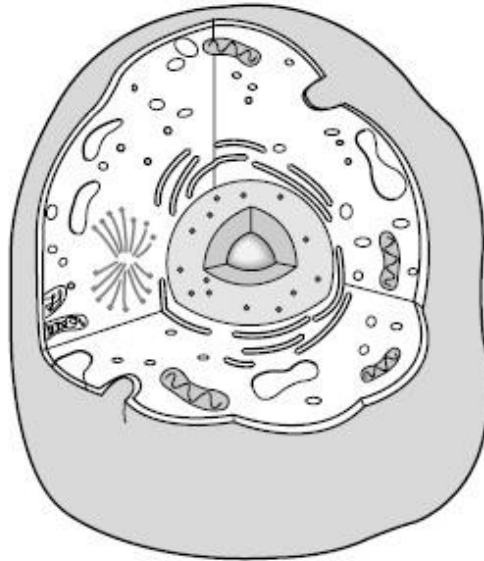
Essential Idea(s):

Eukaryotes have a much more complex cell structure than prokaryotes

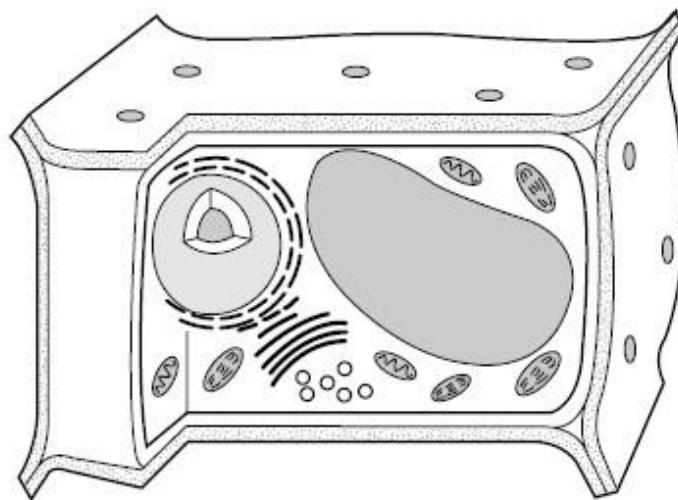
IB Assessment Statements	Unit Objectives. <i>Students will be able to:</i>
1.1.U4 Multicellular organisms have properties that emerge due to the interaction of their cellular components	1. Define and give examples of emergent properties
1.2.U2 Eukaryotes have a compartmentalized cell structure	2. Describe the structure and function of the following: <ul style="list-style-type: none"> • Cytoplasm (including cytosol and cytoskeleton) • Nucleus (including envelope, pores, nucleolus and chromatin)
1.2.A1 Structure and function of organelles within exocrine gland cells of the pancreas and within palisade mesophyll cells of the leaf	<ul style="list-style-type: none"> • Mitochondria • Chloroplasts • 80s Ribosomes • Vacuole • Lysosomes
1.2.S2 Drawings of the ultrastructure of eukaryotic cells based on electron micrographs (include plasma membrane, cytoplasm, 80s ribosomes, nucleus, mitochondria, cell wall, other organelles)	<ul style="list-style-type: none"> • Centrioles • Extracellular components
1.2.S3 Interpretations of electron micrographs to identify organelles and deduce the function of specialized cells	3. Identify the structures listed above in diagrams and electron micrographs of eukaryotic cells.
1.5.U3 The origin of eukaryotic cells can be explained by the endosymbiotic theory (evidence is expected, don't need to include origin of cilia and flagella)	4. Describe how organelles of the endomembrane system function together to produce and secrete proteins: <ul style="list-style-type: none"> • Rough ER • Smooth ER • Golgi • Vesicles
	5. Compare the structures found in plant and animal cells.
	6. List eukaryotic structures formed through infolding and endosymbiosis.
	7. Describe the evidence for the endosymbiotic theory.

Animal Cell/Plant Cell



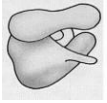
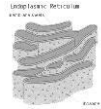


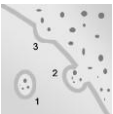
Animal Cell



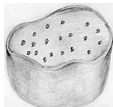
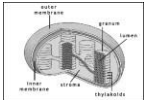


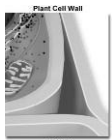
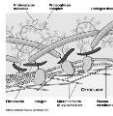


Plant Cell



Eukaryotic Cell Structure and Function

Cell Component	Details			
		Plant	Animal	Visible in light microscope?
 <p>1</p>	<p>Name: Plasma (cell) membrane</p> <p><i>Function:</i> Gives the cells shape and regulates the movement of substances into and out of the cell.</p>	X	X	Yes (but not at the level of detail shown in the diagram)
 <p>2</p>	<p>Name: Mitochondria</p> <p><i>Function:</i></p>			
 <p>3</p>	<p>Name: Ribosome</p> <p><i>Function:</i></p>			
 <p>4</p>	<p>Name: Rough Endoplasmic Reticulum</p> <p><i>Function:</i></p>			
 <p>5</p>	<p>Name: Smooth Endoplasmic Reticulum</p> <p><i>Function:</i></p>			
 <p>6</p>	<p>Name: Golgi</p> <p><i>Function:</i></p>			
 <p>7</p>	<p>Name: Vesicle</p> <p><i>Function:</i></p>			

Cell Component	Details			
		Plant	Animal	Visible in light microscope?
8 	Name: Nucleus Function:			
9 	Name: Vacuole Function:			
10 	Name: Plastid Function:			
11 	Name: Chloroplast Function:			
12 	Name: Cytoskeleton Function:			
13 	Name: Cilia and flagella Function:		X	
14 	Name: Cell Wall Function:			
15 	Name: Extracellular matrix Function:			

ENDOMEMBRANE SYSTEM

Definition of ENDOMEMBRANE SYSTEM:

Includes:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

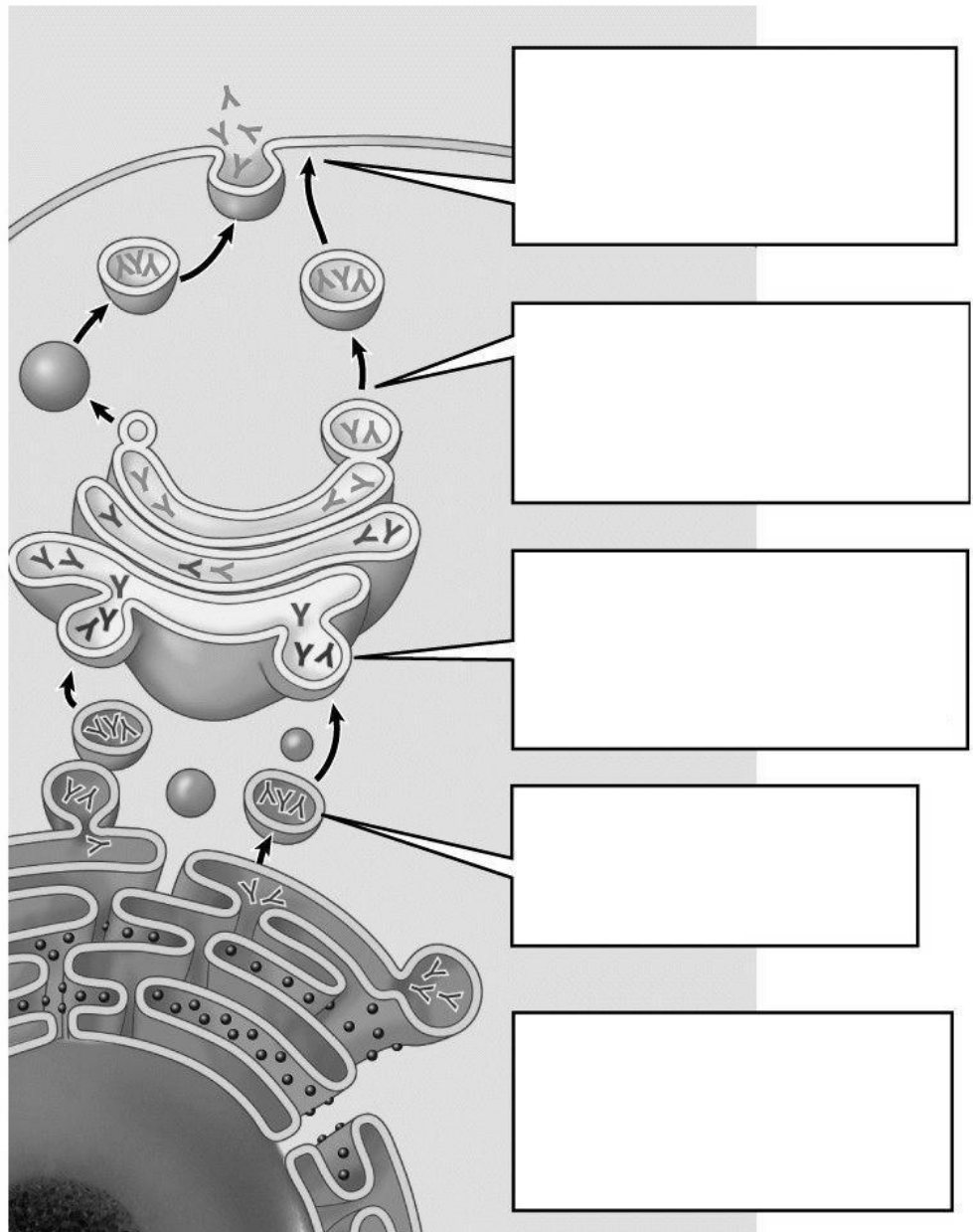
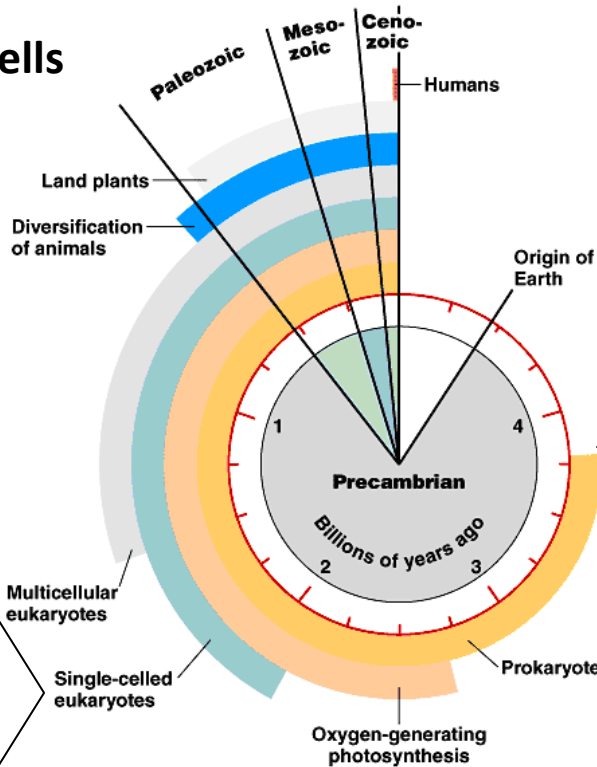


Figure 4-14 Biology: Life on Earth, 8/e
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Where did it come from?

- The hypothesis is that eukaryotes evolved from prokaryotes.
- In the early prokaryotic cells, there was an infolding of the plasma membrane into the cytoplasm. We see this in some prokaryotic cells today (the mesosoma, although scientists do not all agree).
- The infolded membrane began to specialize for particular tasks.

Origin of Eukaryotic Cells



Nearly all are:
Accordingly, they could not have evolved before at least some free oxygen was present in the atmosphere

Multicellular eukaryotes
Single-celled eukaryotes

Life originated:

Dominated life on Earth:

By cyanobacteria: a type of prokaryote with...

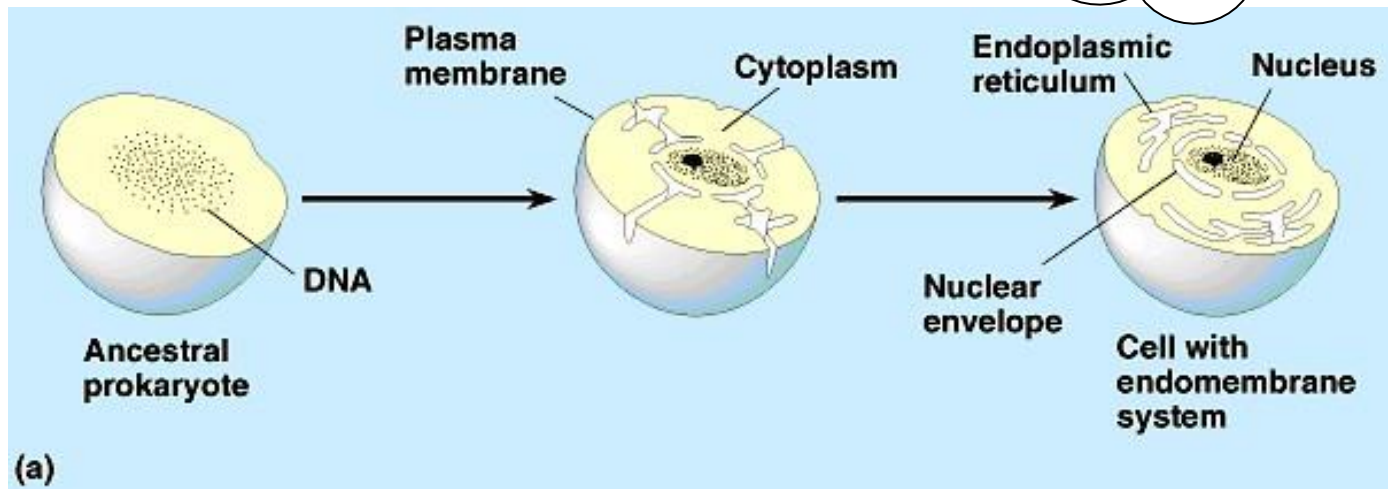
Oxygen accumulates in atmosphere.
Evidence:
Makes:

Two processes are thought to have led to the origin of eukaryotes....

1

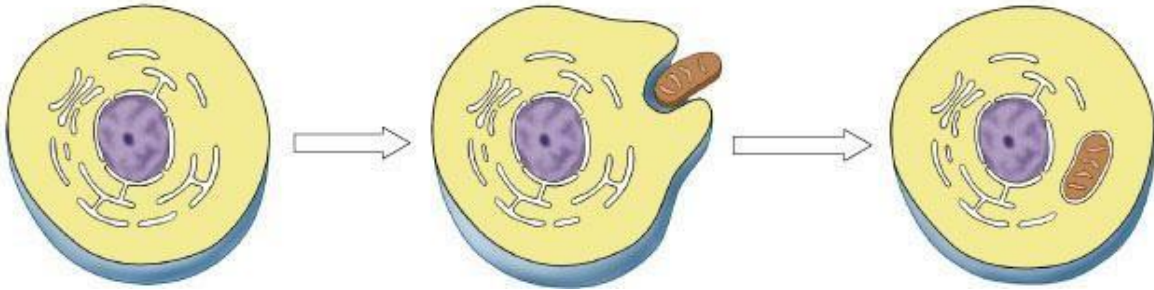
Infoldings of the prokaryotic cell membrane
Creates internal micro-environments
Advantage = increase efficiency

These organelles are thought to have arisen via infolding:

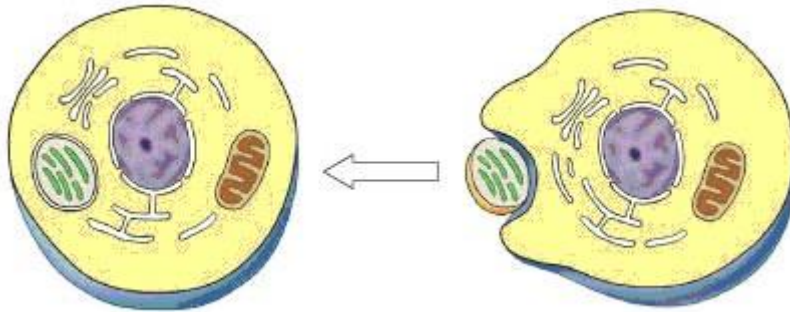


(a)

Early eukaryotic cells engulfed aerobic bacteria *but did not digest them*. Led to the origin of mitochondria.



Early eukaryotic cells engulfed photosynthetic bacteria *but did not digest them*. Led to origin of chloroplasts.



Evidence for Endosymbiosis

Structural evidence *Both mitochondria & chloroplasts*

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-
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Genetic evidence *Both mitochondria & chloroplasts*

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-

Functional evidence *Both mitochondria & chloroplasts*

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