a place of mind

FACULTY OF EDUCATION

Department of
Curriculum and Pedagogy

Biology
Cell Biology:
Cell Structure I

Science and Mathematics Education
Research Group

Supported by UBC Teaching and Learning Enhancement Fund 2012-2015

Question I

Fill in the blanks below by choosing one of the combinations provided

> ___1___ suggests that all living things are composed of cells, and cells are the basic units of structure and function in all living organisms. It explains how new cells are produced from ___2___.
>
> A(n) ___3___ is the collection of living matter enclosed by a barrier that separates the cell from its surroundings, sometime is called the basic unit of all living form.

A. {1. Cell Theory, 2. pre-existing cell, 3. cell}

B. {1. Cell Theory, 2. neighboring cell, 3. cell}

C. {1. Active transport, 2. neighboring cell, 3. atom}

D. {1. Cell cycle, 2. organism, 3. nucleus}

E. {1. Facilitated diffusion, 2, nucleus, 3. organism}

Solution I

Answer: A

Justification:

1. Cell Theory suggests that all living things are composed of cells, and cells are the basic units of structure and function in all living organisms. It explains how new cells are produced from 2. pre-existing cells.

A(n) 3. cell is the collection of living matter enclosed by a barrier that separates the cell from its surroundings, sometime is called the basic unit of all living form.

Therefore, A is the correct answer.

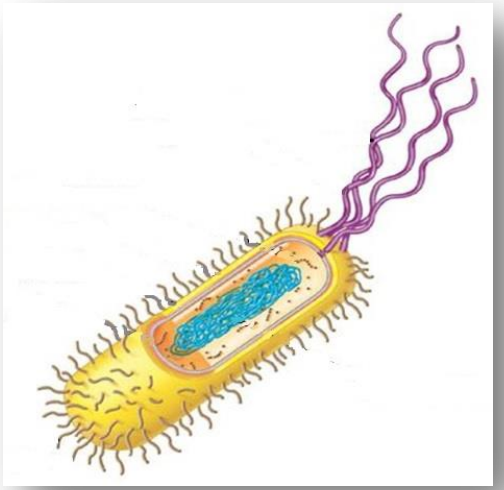
Watch TED-Ed Video on the history of Cell Theory for more information:
http://www.youtube.com/watch?v=4OpBylwH9DU

Question II

The prokaryotic cells have:

I. membrane-bound organelles
II. pili and flagella
III. compartmentalized organelles
IV. DNA but it is not contained within a membrane or separated from rest of the cell
V. ribosomes but it is a only membrane-bound organelles in the cell

A. I
B. I and II
C. II and III
D. II and IV
E. IV and V



Solution II

Answer: E

Justification:

Prokaryotic cells have no membrane-bound organelles, therefore cells have DNA but is not compartmentalized or separated from other parts of cell.

In addition, prokaryotic cells have ribosomes but it has no membrane-bound organelles.

As shown in diagram on the right, the prokaryotic cells have hair-like structures called pili and flagella.

Therefore, E is the correct answer.

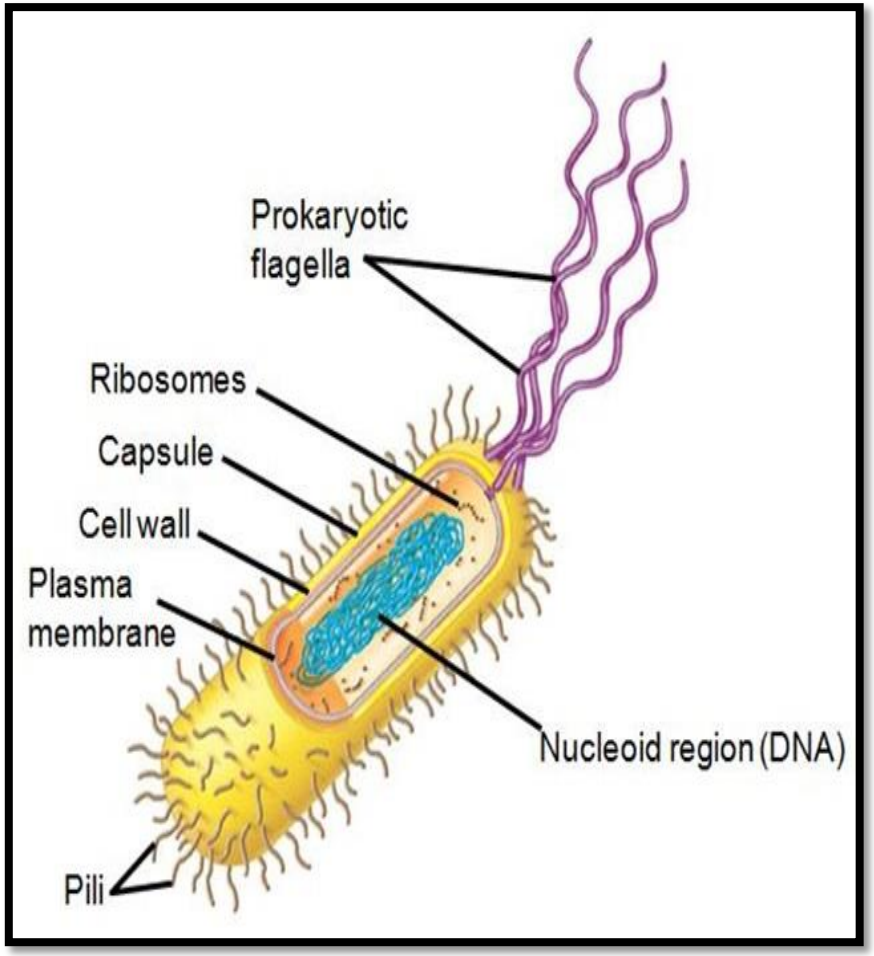


Image retrieved from Campbell, Biology 6th Edition

Question III

A scraping of material from Emily`s nail revealed many bacteria (prokaryotes) found on the nail surface. Such bacteria remained to the nail surface by structures called

A. ribosomes
B. Anchoring junctions
C. pili
D. mitochondria
E. flagella

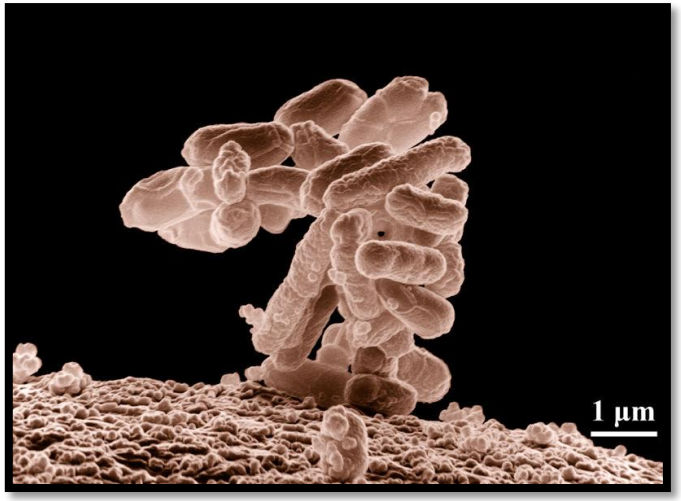


Image retrieved from psychobabbleblog.blogspot.com

Solution III

Answer: C

Justification:

Pili is a short, hair-like structure on the surface of prokaryotic cells. This structure involved in specific attachment of prokaryotes to surfaces, other cells or tissues in nature. In other hand, A flagella is a long whip-like attachment that stands out from the cell body of prokaryotic and eukaryotic cells. The primary role of the flagella is locomotion (cell movement).

Anchoring junctions occur at points of cell-cell and cell-matrix contact in all tissues. Also it involved in mainly between proteins.

Also, mitochondria and ribosomes are organelles found inside eukaryotic & prokaryotic cells and involved with different functions.

Therefore, C is the correct answer.

Question IV

The typical animal cell contains all of the following except:

A. Nucleus
B. Lysosomes
C. Chloroplast
D. Mitochondrion
E. Microtubules

Solution IV

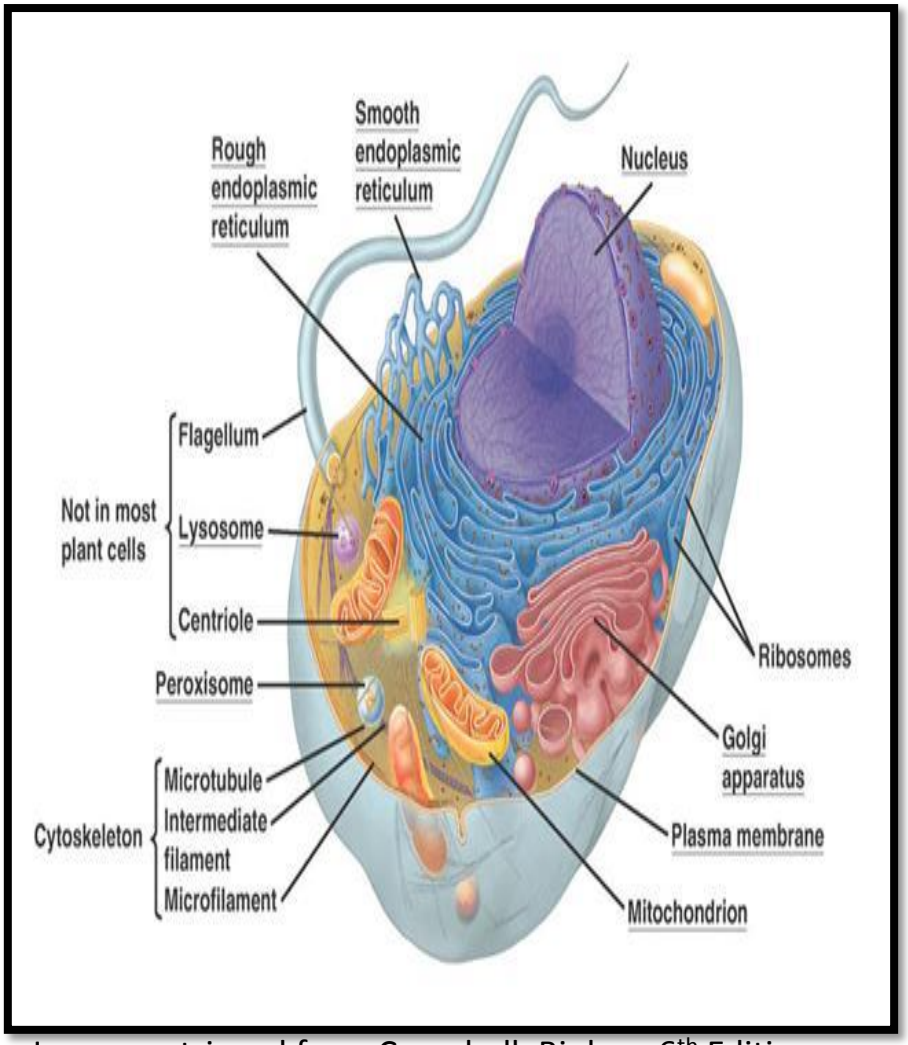
Answer: C

Justification:

Chloroplast is photosynthetic organelle which converts energy of sunlight to chemical energy during photosynthesis. Therefore, it is obvious that only plant cells contain the chloroplasts.

The eukaryotic animal cells contain all the other examples given in the question.

Therefore, the correct answer is C.



Images retrieved from Campbell, Biology 6th Edition

Question V

Which organelle or structure is ONLY present in Eukaryotic plant cell?

A. Cell wall
B. Chloroplasts
C. Ribosomes
D. Cytoskeleton
E. Filament

Solution V

Answer: B

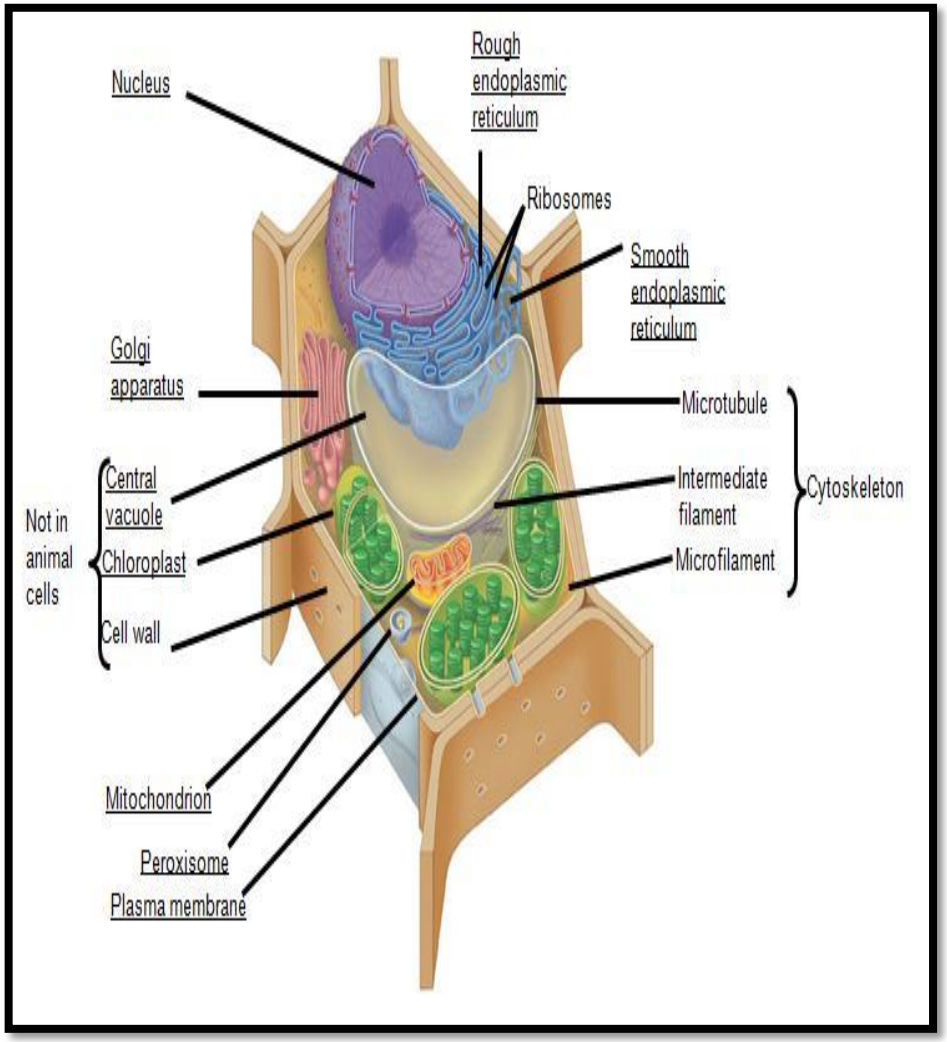
Justification:

Chloroplast is photosynthetic organelle which only found in the eukaryotic plant cells.

Cell wall is found in the plant cells but also possible to find them in prokaryotic cells, too.

Ribosomes, Cytoskeleton, and Filament are commonly found in all eukaryotic cells.

Therefore, the correct answer is B.



Images retrieved from Campbell, Biology 6th Edition

Question VI

Cells with the rigidity (support) in the cell wall are _____ cells.

A. Bacterial
B. Fungal
C. Animal
D. Plant
E. More than one answer is correct

Solution VI

Answer: D

Justification:

For this question, we first need to think about how the animals and plants grow.

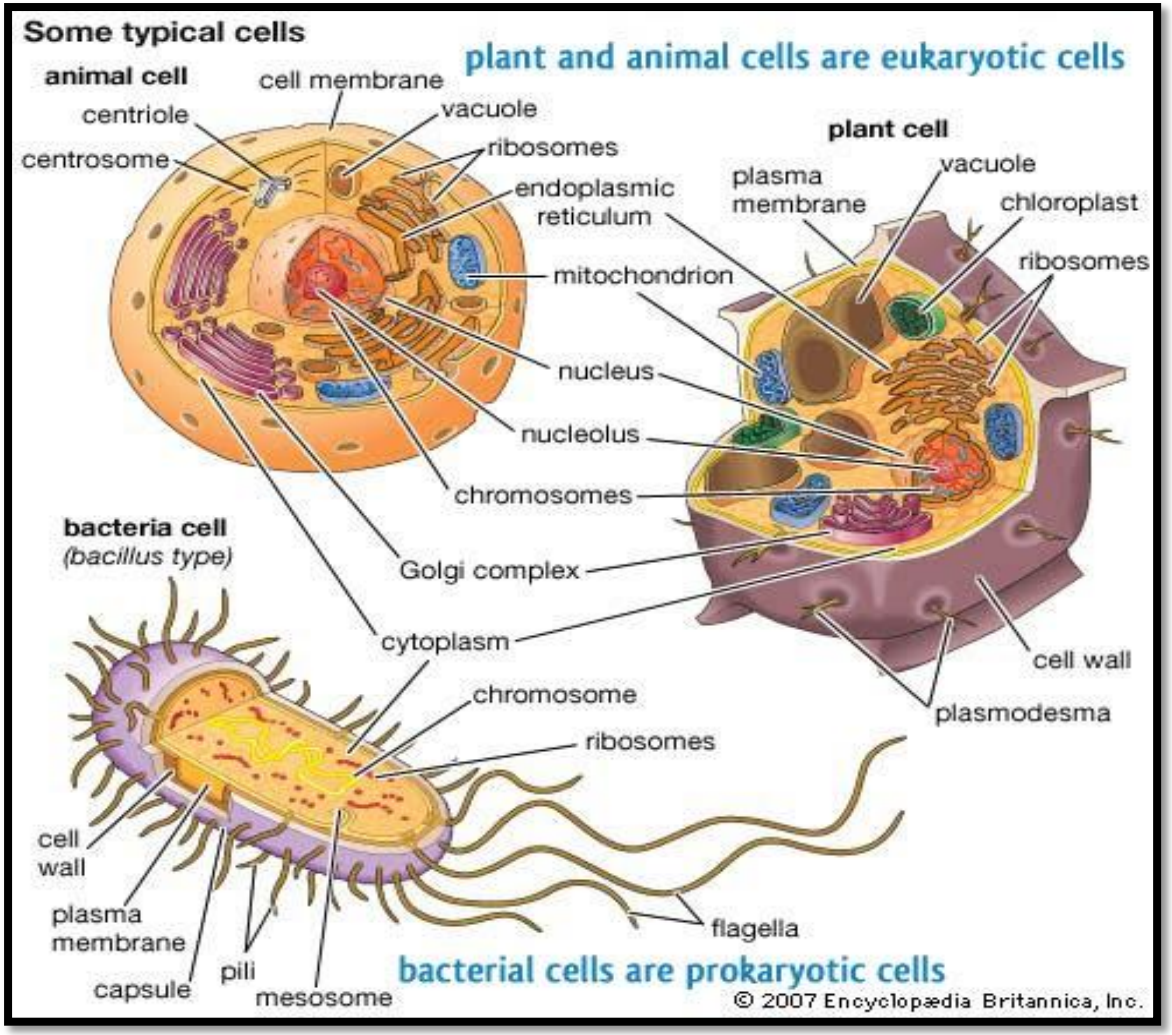
Plants are self-supporting (No endoskeleton) and it`s tissues/ skin grow upright, however, animals have endoskeleton and their tissues/skin can expanded to any directions.

Therefore, cell walls are used by plant cells for the rigidity, so the plant can self-support while it grow upright.

Also some of the bacteria cells and fungi have cell walls to protect themselves from water loss or other functions.

Therefore, the correct answer is D.

Review: Types of Cells



Do you see similarities and differences in these cells?

Review: Prokaryotic Cell vs. Eukaryotic Cell

Types of strcuture	Present in Prokaryotic	Present in Animal (Eukaryotic)	Present in Plant (Eukaryotic)
Cell Membrane	YES	YES	YES
Cell Wall	YES	NO	YES
Nucleus	NO	YES	YES
Mitochondria	NO	YES	YES
Chloroplasts	NO	NO	YES
ER	NO	YES	YES
Ribosomes	YES (small amount)	YES (large amount)	YES (large amount)
Vacuoles	NO	YES (small amount)	YES
Lysosomes	NO	YES, Usually	NO, Usually
Cytoskeleton	NO	YES	YES
Centrioles	NO	YES	NO

Question VII

The fluid mosaic model describes the plasma membrane as consisting of

A. a single layer of lipids
B. a protein bilayer
C. a phospholipids bilayer with embedded proteins
D. a phospholipid single layer with embedded proteins
E. two layers of phospholipids with protein embedded outside

Solution VII

Answer: C

Justification:

In all organisms, cell membranes are made of molecules known as phospholipids and these molecules forms a structure called phospholipid bi-layer.

The phospholipid bi-layer makes the cell membrane selectively permeable to some molecules. (proteins) Therefore, the fluid mosaic model describes the plasma membrane as consisting of a phospholipid bilayer with embedded proteins.

- See the fluid mosaic model

Therefore, the correct answer is C.

The Fluid Mosaic Model

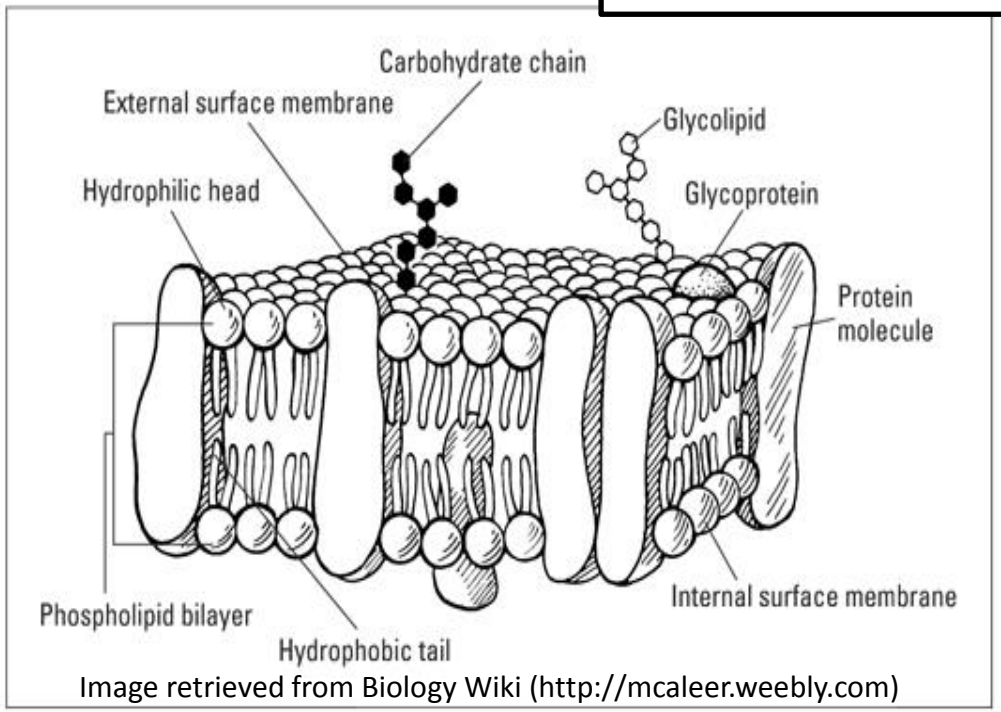


Image retrieved from Biology Wiki (http://mcaleer.weebly.com)

Question VIII

What is the difference between inner membrane of chloroplast and nucleus envelope?

A. Nucleus envelope has nuclear pores to connect with the outer side of membrane, but inner membrane of chloroplast has no pores.

B. The inner membrane of chloroplast has a lipid bilayer but Nucleus envelope has no lipid bilayer.

C. The inner membrane of chloroplast is not permeable to any types of ions and metabolites but, nucleus envelope is permeable to selected types.

D. The inner membrane of chloroplast converts the ATP into the chemical energy but , nucleus envelope converts the chemical energy into the ATP.

E. There is no difference.

Solution VIII

Answer: A

Justification:

Nuclear envelope has nuclear pores, so it can connected to the outer nuclear envelope membrane. However, the inner membrane of chloroplast don't have pores.

Also both membranes have lipid bilayer and both are semi-permeable to any types of ions and metabolites .

So, the correct answer is A.

Question IX

The Endoplasmic Reticulum serves several functions including the transport of synthesized protein. Which organelle directly involved in transportation of the synthesized protein after endoplasmic reticulum?

A. Peroxisomes
B. Mitochondria
C. Vacuoles
D. Golgi apparatus
E. Ribosomes

Solution IX

Answer: D

Justification:

Think about the cell structure & the protein pathway, synthesized proteins always move from the 'centre', nucleus toward the 'exterior', cell membrane

Therefore, the proteins transport in following order,

Nucleus → Endoplasmic Reticulum → Golgi Apparatus

Watch The Protein Pathway video for more information:

http://wps.pearsoncustom.com/wps/media/objects/3014/3087289/Web_Tutorials/04_A02.html

Question X

The _____ acts as a primary “packaging” area and processing center in the cell to process proteins.

A. Ribosome
B. Rough E.R.
C. Nucleus
D. Golgi Apparatus
E. Lysosomes

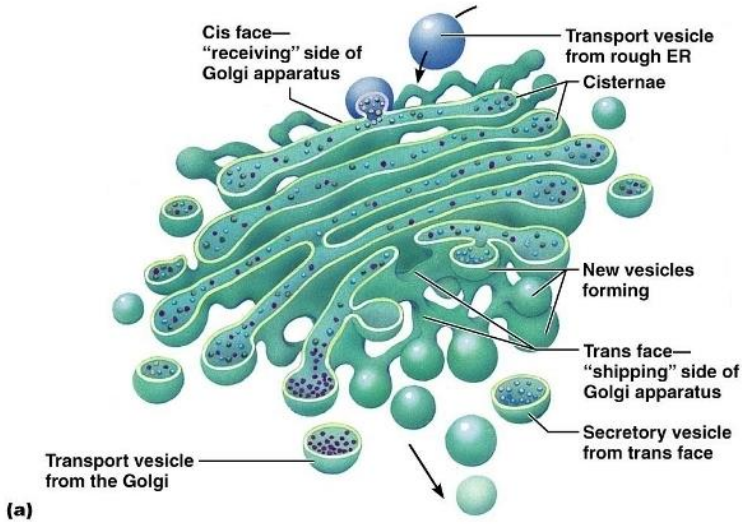
Solution X

Answer: D

Justification:

The __Golgi Apparatus__ acts as a primary "packaging" area and processing center in the cell to process proteins

The major function of Golgi Apparatus is to sort, modify and package the molecules that enters in the body. Also this organelle helps with the lipid transportation around the cell and helps in the creation of lysosomes.



Question XI

A biology 12 student is exploring a slide of plasma membrane surface through a microscope. She finds some proteins bound to the surface of the membrane. What part of the proteins is bound to the surface?

A. Hydrophilic region

B. Hydrophobic region

C. Protein region

D. Phospholipid region

E. All of the choices are correct

Solution XI

Answer: B

Justification:

The answer is B. Hydrophobic region.

Typically a protein will span the plasma membrane a number of times, with hydrophobic ("water-hating") regions in the membrane and hydrophilic ("water-loving") regions inside the cell or outside of the cell. Therefore, most proteins contain residues with hydrophobic side chains that interact with the hydrophilic region of the membrane, cannot span the plasma membrane or whole phospholipid region.

Also, proteins cannot go through the protein region without any help or naturally.

Therefore, the correct answer is B.

Question XII

During the biology 12 laboratory, Jim accidently removes all the peroxisomes from an animal cell. Which organelle of the animal cell will be affected first?

A. Nucleus

B. Golgi apparatus

C. Smooth E.R.

D. Mitochondrion

E. Endoplasmic reticulum

Solution XII

Answer: D

Justification:

The first affected organelle is mitochondrion. The reason is that peroxisomes break down fats and amino acids into smaller molecules that can be used for energy production by mitochondria.

Nucleus, Golgi apparatus, and Smooth E.R. and Mitochondrion will be affected Sooner or later and also.

So, the correct answer is D.

Question XIII

In a biology 12 classroom, one student found a mutated cell in a prepared microscope slide. The cell fails to destroy worn-out cell part, but saves it in the cytoplasm. What kind of mutation might have happened within the cell?

A. Mitochondrion mutation

B. Ribosomes mutation

C. Golgi Apparatus mutation

D. Lysosomes mutation

E. Endoplasmic Reticulum mutation

Solution XIII

Answer: D

Justification:

The cell had lysosomes mutation, because, the lysosomes are responsible for destroying worn-out cell parts.

Therefore, if lysosomes have problems, the worn-out cell parts will not be destroyed, and will float around in the cytoplasm region.

Also, if a cell have mutation on its organelle, the organelle`s primary functions are usually affected due to failure of the organelles'` system.

(i.e.. Mitochondrion mutation, Ribosomes mutation, Golgi Apparatus mutation, and Endoplasmic Reticulum mutation)

So, the correct answer is D.

Question XIV

During the biology 12 field trip, Sara found an animal at a local laboratory. Her teacher told her to identify the species of the animal. What is the best method to identify the species of the animal?

A. Compare the exterior characteristics with similar looking animals
B. Check the family tree of the animal.
C. Measure the body parts and compare with similar looking animals
D. Check the number, and shape of chromosomes and check for species with same number, and shape of chromosomes
E. Check the number, size, and shape of chromosomes and check for species with same number, size, and shape of chromosomes

Solution XIV

Answer: E

Justification:

All species have different number, shape, and size of chromosomes. For example, humans have 46 chromosomes, but chimpanzees have 48 chromosomes. This fact is very useful method to distinguish between species.

Therefore, if Sara finds the difference between the two animal's chromosomes, she can identify whether the two animals are same species or not.

So, the correct answer is E.