

Chapter 3: Structure and Function of the Cell

I. Functions of the Cell

A. List and describe the main functions of the cell:

1. _____

2. _____

3. _____

4. _____

5. _____

II. How We See Cells

- A. Light microscopes allow us to _____
- B. Electron microscopes are used to _____
- C. What type of electron microscope is used to observe surfaces? _____
- D. What type of electron microscope can see through structures? _____

III. Plasma Membrane

A. Outermost Component of a Cell

1. Substances inside the plasma membrane are _____
2. What does "intercellular" mean? _____
3. Functionally the plasma membrane:
 - a. Encloses and _____
 - b. Attaches to _____
 - c. Ability to _____
 - d. Determines what _____
4. Membrane potential or charge difference across the plasma membrane:
 - a. The outside of the cell is: _____

- b. The inside of the cell is: _____
 - c. Allows cells to function like _____
5. Chemical composition of the plasma membrane is:
- a. 45-50% _____
 - b. 45-50% _____
 - c. 4-8% _____
 - d. Carbohydrates and lipids combined form _____
 - e. Carbohydrates and proteins combined form _____
 - f. The glycocalyx is composed of _____

B. Membrane Lipids

1. Phospholipids

- a. Assemble to form a _____
- b. Hydrophilic heads are _____
- c. Hydrophobic heads are _____

2. Cholesterol

- a. Interspersed among _____ and accounts for _____
- b. Amount present determines _____

C. Membrane Proteins

1. What does the "fluid-mosaic model" say about the plasma membrane?

2. Integral (intrinsic) proteins are found where? _____

3. Peripheral (extrinsic) proteins are found where? _____

4. Marker molecules do what? _____

5. Integrins are involved in _____

6. Channel Proteins

- a. Integral proteins arranged to form _____
- b. Nongated ion channels are always _____
- c. What is a ligand? _____
- d. List 2 types of gated ion channels: _____ and _____

7. Receptor Molecules
 - a. Proteins in the plasma membrane that can attach to _____
 - b. Receptors can be linked to _____ or _____
8. What catalyzes chemical reactions on either the inner or outer surface of the plasma membrane? _____
9. Carrier proteins function to _____

IV. Movement Through the Plasma Membrane

A. Selectively Permeable

1. Means that the membrane allows _____
2. Describe the 4 ways that material can pass through the plasma membrane:
 - a. Directly through the phospholipid membrane _____
 - b. Membrane channels _____
 - c. Carrier molecules _____
 - d. Vesicles _____

B. Diffusion

1. A solute is _____
2. A solvent is _____
3. Diffusion is the movement of _____ from an area of _____ to an area of _____
4. Diffusion occurs due to the constant _____
5. The term "concentration gradient" refers to _____

6. The rate of diffusion is influenced by:

- a. _____
- b. _____
- c. _____
- d. _____

7. Viscosity is a measure of _____

C. Osmosis

1. Osmosis is the diffusion of _____ across _____

a. Water diffuses from _____ and into _____

2. Osmotic pressure is: _____

3. The osmotic pressure provides information about _____

4. Isosmotic solutions have _____

5. A hyperosmotic solution has _____

6. A hyposmotic solution has _____

7. What happens to a cell placed in an isotonic solution? _____

8. What happens to a cell placed in a hypertonic solution? _____

9. What happens to a cell placed in a hypotonic solution? _____

10. What does crenation mean? _____

11. The process called lysis does what to a cell? _____

D. Filtration

1. In filtration, the liquid and small molecules move across the partition from: _____

E. Mediated Transport Mechanisms

1. Mediated transport mechanisms involve carrier proteins that _____

2. List and define the three characteristics of mediated transport mechanisms:

a. _____

b. _____

c. _____

3. Facilitated Diffusion

a. Facilitated diffusion moves substances into or out of cells from _____

b. Does facilitated diffusion require metabolic energy? _____

c. The rate of transport is _____

4. Active Transport

a. Does active transport require metabolic energy? _____

b. The maximum rate of transport depends on _____

c. Active transport is important because it can move substances _____

d. Active transport can also move _____

e. Some active transport mechanisms _____

5. Secondary Active Transport

a. Describe how secondary active transport works: _____

b. Cotransport means movement of the molecules is _____

c. Countertransport means movement of the molecules is _____

6. Endocytosis and Exocytosis

a. Endocytosis refers to the bulk _____

b. A vesicle is _____

c. Describe how endocytosis works: _____

d. Phagocytosis or "cell-eating" applies to _____

e. Pinocytosis or "cell-drinking" refers to _____

f. What mechanism allows endocytosis to exhibit specificity? _____

g. Describe the process of exocytosis and what it is used for: _____

V. Cytoplasm

A. Cytosol

1. Cytosol consists of _____

a. The fluid portion is _____

2. Cytoskeleton

a. What are the functions of the cytoskeleton? _____

b. Microtubules

1. Hollow tubules composed _____

2. Provide _____ and _____

3. Involved in the process of _____, _____, _____, and form _____

c. Actin Filaments or Microfilaments

1. Are small fibrils that form _____

2. Provide structure _____ and _____

3. They support the _____ and _____

d. Intermediate Filaments

1. They provide _____

3. Cytoplasmic Inclusions

a. Cytoplasmic inclusions are _____

VI. Nucleus

A. Structure

1. The nucleus contains _____

2. It is described as a large _____

-
3. The nucleus consists of _____
 - a. The nuclear envelope is composed of _____
 1. How are nuclear pores formed? _____
 2. What do nuclear pores do? _____

B. Deoxyribonucleic Acid (DNA)

1. The proteins associated with DNA are _____
2. Since the DNA and protein can be stained they are called _____
3. When is the chromatin more functional? _____
4. Chromosomes form during _____ when chromatin _____
5. DNA ultimately determines _____
6. DNA functions by means of an intermediate called _____

C. Nucleolus

1. A nucleolus is described as _____
 2. How many nucleoli per cell? _____
 3. What happens in the nucleolus? _____
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VII. Organelles

A. Ribosomes

1. Ribosomes are sites of _____
2. They are composed of 2 subunits one _____ and one _____
3. Chemically the subunits are composed of _____
4. Free ribosomes synthesize proteins _____
5. Endoplasmic reticulum ribosomes produce proteins _____

B. Endoplasmic Reticulum

1. The endoplasmic reticulum consists of _____

2. The interior spaces are called _____
3. Rough endoplasmic reticulum has attached _____
 - a. The ribosomes of the rough ER are _____

4. Smooth endoplasmic reticulum is without _____
 - a. Functions to manufacture _____
 - b. Smooth ER also participates in _____
 - c. In skeletal muscle cells the smooth ER _____

C. Golgi Apparatus

1. The Golgi apparatus is composed of _____
2. Thought of as a _____ and _____ because it _____
3. The Golgi apparatus receives vesicles from the _____
4. Forms glycoproteins by _____
5. Forms lipoproteins by _____
6. What are the proteins packaged into? _____
7. How does material leave the Golgi apparatus? _____

D. Secretory Vesicles

1. Pinch off from the Golgi apparatus and _____
2. Contents leave the cell by the process of _____

E. Lysosomes

1. Formed by the Golgi apparatus and contain _____ that function _____
2. List and describe 3 ways that lysosomes function:
 - a. _____
 - b. _____
 - c. _____

F. Peroxisomes

1. Peroxisomes are _____ than lysosomes.
2. Peroxisomes contain enzymes that _____
3. What does catalase do? _____

G. Proteasomes

1. Proteasomes consist of _____
2. Proteasomes function to _____

H. Mitochondria

1. Mitochondria provide _____
2. Constantly change shape from _____
3. They are the major sites of _____
4. Each mitochondrion has a _____ outer membrane and a _____ inner membrane.
 - a. Infoldings that project into the interior of the mitochondria are _____
5. Where is the matrix found? _____
6. Enzymes of the citric acid (Kreb's) cycle are located in _____
7. Enzymes of the electron transport chain are _____

I. Centrioles and Spindle Fibers

1. Centrioles
 - a. What shape is a centriole? _____
 - b. Two centrioles are normally located _____
 - c. Wall of centriole is composed of _____ evenly spaced, _____ orientated, _____ units, or _____
 - d. Each unit is composed of _____
 - e. The two centrioles double in number _____
 - f. During cell division the centrioles produce _____

J. Cilia and Flagella

1. Cilia
 - a. What does the 9+2 arrangement refer to? _____

 - b. Movement of cilia is important for? _____

2. Flagella
 - a. Movement of the flagella accomplishes? _____

K. Microvilli

1. They are cylindrical shaped extensions of the _____
2. They function to _____

VIII. Genes and Gene Expression

A. General

1. DNA information for one amino acid is contained in a _____
2. A gene is _____
3. Transcription is the copying of DNA information to _____
 - a. The copy is called: _____
 - b. This process occurs in the _____
4. Translation uses the information in the copy to make _____
 - a. The amino acids are transported by _____
 - b. This process occurs in the _____

B. Transcription

1. Synthesis of mRNA based on the sequence of _____
2. Occurs when DNA double strands _____
3. One of the strands serves as a _____
4. Nucleotides “complementarily base pair” how?
 - a. DNA adenine pairs with RNA _____
 - b. DNA thymine pairs with RNA _____
 - c. DNA guanine pairs with RNA _____
 - d. DNA cytosine pairs with RNA _____
5. RNA polymerase enzymes form a long mRNA by joining together nucleotides through _____
6. The mRNA contains _____
7. The “genetic code” is carried in:
 - a. Three nucleotides in the DNA called: _____
 - b. Three nucleotides in the mRNA called _____
8. The region of DNA between a start code and a stop code is called a _____

C. Translation

1. List the three types of RNA involved in the process:
 - a. _____
 - b. _____
 - c. _____
 1. All three types are produced in _____ by _____

2. Each kind of tRNA combines with a specific _____
3. Each tRNA has a three-nucleotide message called _____
4. During the process of translation the tRNA _____ must combine with the mRNA _____ based on pairing relationships.
5. During the process of matching up _____ align the tRNA and mRNA.
6. As the amino acids join together _____
7. Several ribosomes may attach to the same mRNA called a _____
8. Each ribosome attached to the mRNA produces _____

D. Regulation of Genetic Expression

1. If all cells of the body have the same DNA why is a muscle cell different from a bone cell or a neuron? _____

IX. Cell Life Cycle

A. Interphase

1. This is the phase between _____
2. What is the cell doing during interphase?
 - a. _____
 - b. _____
 - c. _____
3. The preparation for cell division includes:
 - a. _____
 - b. _____

B. DNA Replication

1. During replication the two strands of each DNA molecule _____
2. Each strand then functions as _____
3. New nucleotides _____ with existing nucleotides
4. The process is catalyzed by _____
5. The process produces _____ DNA molecules
6. Each new DNA molecule has one strand from _____ and one strand _____

C. Cell Division

1. Involves division of the _____ and _____
2. Nuclear division is called _____
3. Cytoplasmic division is called _____

D. Mitosis

1. Each nucleus produced by mitosis has _____
2. Chromosomes are _____
3. A somatic cell is _____
4. A somatic cell contains _____ chromosomes and is _____
5. The chromosomes of a somatic cell are organized into _____
 - a. One member of each pair comes from a person's _____
 - b. The other member of each pair comes from a person's _____
6. Females have _____ sex chromosomes that look alike
7. Males have one _____ and one _____
 - a. Which is smaller? _____

E. Cytokinesis

1. Refers to division of _____
2. When does cytokinesis begin? _____
3. When does cytokinesis end? _____
4. The first sign is formation of a _____
5. Actin filaments form a _____ that pulls plasma membrane inward.

X. Meiosis

A. Gamete Formation

1. Meiosis produces _____
2. In meiosis the nucleus undergoes _____
 - a. The resulting nuclei contain _____
3. The male gamete is called _____
4. The female gamete is called _____
5. A gamete contains 23 chromosomes, which is the _____ number

6. In prophase I, the four homologous chromatids join together or _____
 - a. This joining together forms a _____
 - b. While in this form chromatids can exchange pieces of DNA referred to as _____

XI. Cellular Aspects of Aging

A. List and describe five major theories of cell aging:

1. _____

2. _____

3. _____

4. _____

5. _____

XII. Genetics

A. Chromosomes

1. Deoxyribonucleic acid (DNA) is the _____ of cells & is responsible for _____
2. DNA molecules and _____ become visible during _____ as densely stained bodies called _____
3. How many chromosomes are in a somatic cell?
_____ pairs of chromosomes or _____ total chromosomes
4. How many chromosomes are in a gamete? _____
5. What is a somatic cell? _____
6. What is a gamete? _____
7. What is a karyotype? _____
8. The 23 pairs of chromosomes are divided into two groups:
 - a. _____
 - b. _____

9. In terms of sex chromosomes in each somatic cell:
 - a. A normal female has _____
 - b. A normal male has _____
10. Gametes are derived from _____ by _____
 - a. The somatic cells _____
 - b. Why is meiosis called a reduction division? _____

11. When a sperm cell and an oocyte fuse _____
each contributes _____
12. During meiosis, the chromosomes are distributed in such a way that
each gamete receives _____
13. What are homologous chromosomes? _____

14. When all the possible combinations of sperm cells with oocytes are
considered how many babies should be female? _____

B. Genes

1. Each gene is a _____
2. Each gene occupies a _____
3. The genes occupying the same locus on homologous chromosomes are
called _____
4. What does homozygous mean? _____

5. What does heterozygous mean? _____

6. Structural genes are those DNA sequences that _____

7. Regulatory genes are segments of DNA involved in _____

8. What is a genome? _____
9. Essentially a random distribution of genes is received from each parent
in a process called _____

- a. What are linked genes? _____
 - b. Sets of linked genes can be broken up when homologous chromosomes exchange genetic information by _____
10. What is nondisjunction? _____
- a. What is aneuploidy? _____
11. Dominant and Recessive Genes
- a. A trait that is expressed and masks another form of the trait is said to be _____
 - b. The trait that is masked and unseen in a heterozygous individual is said to be _____
 - c. The actual set of alleles that a person has for a given trait is _____
 - d. The person's appearance is called _____
 - e. The recessive trait is expressed when _____
 - f. What is a Punnett square used for? _____

 - g. What is a carrier? _____

12. Sex-Linked Traits
- a. Traits affected by genes on the sex chromosomes are _____
 - 1. X-linked means _____
 - 2. Y-Linked means _____
 - b. Most sex-linked traits are _____ because _____
13. Other Types of Gene Expression
- a. If the dominant gene does not completely mask the effects of the recessive gene, it is called _____
 - b. What is codominance? _____

 - c. Polygenic traits are _____

C. Genetic Disorders

1. Genetic disorders are caused by _____

2. What are congenital disorders? _____

3. What are teratogens? _____
4. A mutation is a change in a gene that usually involves _____

5. What are mutagens? _____
6. Cancer is a _____
 - a. What are oncogenes? _____
7. Many oncogenes are actually control genes involved in regulating _____

8. A change in an oncogene or in the _____ of an oncogene can result in _____ and the _____

9. What are tumor suppression genes? _____
10. Cancer may occur when a mutation:
 - a. Activates _____ or
 - b. Inactivates _____
 - c. An accumulation of several mutations is _____
11. What is a carcinogen? _____
12. What is genetic susceptibility? _____

 - a. Genetic susceptibility is also known as _____

D. Genetic Counseling

1. Genetic counseling includes:
 - a. Predicting the possible results of _____

 - b. Talking to parents or prospective parents about _____

2. What is a pedigree? _____
3. Information for a pedigree might be based on:
 - a. Phenotypes of _____
 - b. Karyotype taken from _____
 - c. Amount of a _____
4. If a fetus is suspected to have a genetic abnormality, fetal cells can be tested by:
 - a. Amniocentesis which _____

 - b. Chorionic villus sampling which _____
