**Chapter 02 Test Bank**

**Question Type: Multiple Choice**

1) The most abundant molecule in the cell is:

a) Carbohydrate

b) Lipid

c) Water

d) Protein

e) Nucleic acid

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

2) A molecule that interacts easily with water is known as:

a) Hydrophonic

b) Hydrophilic

c) Hydrophobic

d) Lipid based

e) Protein based

Answer: b

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

3) A molecule that does not interact well with water is known as:

a) Hydrophonic

b) Hydrophilic

c) Hydrophobic

d) Water loving

e) Protein based

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

4) The internal liquid portion of the cell is known as:

a) Cytoplasmic membrane

b) Nucleus

c) Cytoplasm

d) Mitochondria

e) Lysosome

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

5) The function of carbohydrates in a cell is to:

a) Serve as an energy source

b) Serve as a major constituent of the cell membrane

c) Act as the genetic information inside the cell

d) None of these

e) All of these

Answer: a  
**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

6) In cells, lipids function as: The function of lipids in a cell is to:

1. An energy source

2. A major constituent of many cellular structures like the cell membrane

3. The genetic information

a) 1

b) 2

c) 3

d) 1 and 2

e) 2 and 3

Answer: d

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

7) The function of proteins in a cell is to:

a) Act as the genetic information inside the cell

b) Serve as a constituent of many cellular structures

c) Catalyze chemical reactions

d) Choice B and C are correct

e) All choices are correct

Answer: e

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

8) Proteins that catalyze biochemical reactions are known as:

a) Proteosomes

b) Lysosomes

c) Chemosomes

d) Enzymes

e) Anions

Answer: d

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

9) The main components of a membrane in a cell are:

a) Lipids

b) Proteins

c) Carbohydrates

d) Lipids and Proteins

e) Lipids and Carbohydrates

Answer: d

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

10) Which of the following is a function of the cell membrane?

a) Separates the contents of the cell from the outside environment

b) Controls the passage of substances into and out of the cell

c) Helps the cell maintain its shape

d) Contain substances that interact with the external environment

e) All of these

Answer: e

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

11) Prokaryotes can be characterized by:

1. The lack of a true nucleus or compartment in which the DNA is located

2. The unique cell walls composed of murein

3. The lack of mitochondria

4. All of these

a) 1

b) 2

c) 3

d) 4

e) 1 and 3

Answer: d

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

12) Eukaryotes can be characterized by:

1. The presence of a true nucleus or compartment in which the DNA is located

2. The presence of mitochondria

3. The presence of membrane bound organelles

a) 1

b) 2

c) 3

d) 1 and 3

e) All of these

Answer: e

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

13) In eukaryotes, where is the extranuclear DNA contained?

a) Mitochondria

b) Cell membrane

c) Chloroplasts

d) Mitochondria and cell membrane

e) Mitochondria and chloroplasts

Answer: e

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

14) Which of the following structures is found in both prokaryotic and eukaryotic cells?

a) Mitochondria

b) Murein cell wall

c) Ribosome

d) Chloroplast

e) Lysosome

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

15) The ability of a cell to move through its environment is known as:

a) Cell trafficking

b) Cell motility

c) Flagellar motion

d) Phagocytosis

e) None of these

Answer: b

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

16) The ability of the cell to move materials to specific locations within the cell is known as:

a) Cell trafficking

b) Cell motility

c) Flagellar motion

d) Phagocytosis

e) None of these

Answer: a

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

17) Which structure in the eukaryotic cell is responsible for the motion of the cell’s ability to move through its environment and its ability to move substances within the cell?

a) Nucleus

b) Lysosome

c) Cell membrane

d) Cytoskeleton

e) Endoplasmic reticulum

Answer: d  
**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

18) Which of the following structures is only found in eukaryotic cells?

a) Ribosomes

b) Cell membrane

c) Nucleus

d) Cell wall

e) None of these

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

19) Which of the following is not an example of a difference between eukaryotic and prokaryotic chromosomes?

a) Eukaryotic chromosomes are linear and the prokaryotic chromosome is circular

b) Eukaryotes have more than one chromosome and prokaryotes have only one chromosome

c) Prokaryotic chromosomes are larger than eukaryotic chromosomes

d) All of these are examples of how eukaryote and prokaryote chromosomes differ

e) None of these are examples of how eukaryote and prokaryote chromosomes differ

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

20) Eukaryotic cells that possess two copies of each chromosome are said to exist in a \_\_\_\_\_\_\_\_\_\_\_\_ state.

a) Haploid

b) Diploid

c) Aneuploid

d) Polyploid

e) None of these

Answer: b

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

21) Body cells (i.e. not sex cells) are known as:

a) Germ cells

b) Gametes

c) Somatic cells

d) spermatozoa

e) oocytes

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

22) Sex cells typically possess only one copy of each chromosome and are said to exist in a \_\_\_\_\_\_\_\_\_\_\_ state.

a) Haploid

b) Diploid

c) Anueploid

d) Polyploid

e) None of these

Answer: a

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

23) The central point that connects the two rod-like portions of the chromosome is known as:

a) Centrosome

b) Centromere

c) Central element

d) Central spindle

e) Connecting element

Answer: b

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

24) The process of cell division in a prokaryotic cell is known as:

a) Fusion

b) Fruition

c) Fission

d) Mitosis

e) Meiosis

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

25) Eukaryotic cells divide during which phase of the cell cycle?

a) G1

b) S

c) G2

d) M

e) K

Answer: d

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

26) The process that physically separates eukaryotic daughter cells from each other following nuclear division is known as:

a) Mitosis

b) Meiosis

c) Cytokinesis

d) Karyokinesis

e) None of these

Answer: c

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

27) The process through with eukaryotic cells distribute their genetic material equally and exactly to their offspring is known as:

a) Mitosis

b) Meiosis

c) Binary fission

d) Cytokinesis

e) None of these

Answer: a

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

28) During which phase of the cell cycle does chromatin replication take place?

a) G1

b) S

c) G2

d) Prophase

e) Anaphase

Answer: b

**Section: 2.1 Cells and Chromosomes  
Difficulty: Easy**

29) Which of the following cellular components is responsible for executing the distribution of chromosomes during the process of mitosis?

a) Nucleus

b) Mitochondria

c) Microtubules

d) Chloroplasts

e) Flagella

Answer: c

**Section: 2.2 Mitosis  
Difficulty: Easy**

30) Which of the following events characterizes prophase of mitosis?

1. Initial formation of spindle fibers

2. Condensation of chromosomes

3. Movement of chromosomes to the equatorial plane of the cell

a) 1

b) 2

c) 3

d) 1 and 2

e) 2 and 3

Answer: d

**Section: 2.2 Mitosis  
Difficulty: Easy**

31) Which of the following events characterizes metaphase of mitosis?

1. Attachment of spindle fibers to the kinetochores of the chromosomes

2. Movement of chromosomes to the equatorial plane of the cell

3. Separation of sister chromatids that are being pulled to the poles of the cell

a) 1

b) 2

c) 3

d) 1 and 2

e) All of these

Answer: d

**Section: 2.2 Mitosis  
Difficulty: Easy**

32) Which is the cause of the separation of sister chromatids during anaphase?

1. The kinetochore breaks apart

2. The spindle fibers shorten

3. The materials holding the sister chromatids degrade

a) 1

b) 2

c) 3

d) 1 and 2

e) 2 and 3

Answer: e

**Section: 2.2 Mitosis  
Difficulty: Easy**

33) The reformation of the nuclear membrane and the decondensing of the chromosomes are hallmark events in which phase of mitosis?

a) Prophase

b) Metaphase

c) Anaphase

d) Telophase

e) Interphase

Answer: d

**Section: 2.2 Mitosis  
Difficulty: Easy**

34) If a cell begins interphase (G1) with 4 chromatin molecules, how many chromatin molecules will each daughter cell possess at the end of telophase, after cytokinesis?

a) 2

b) 4

c) 8

d) 16

e) 32

Answer: b

**Section: 2.2 Mitosis  
Difficulty: Easy**

35) If a cell enters prophase with 10 chromosomes how many chromosomes will be in the cell at the middle of anaphase?

a) 5

b) 10

c) 20

d) 40

e) 80

Answer: c

**Section: 2.2 Mitosis  
Difficulty: Easy**

36) At the end of meiosis, each of the four daughter cells, which will be involved in sexual reproduction will exist in a \_\_\_\_\_\_\_\_\_ state.

a) Haploid

b) Diploid

c) Triploid

d) Polyploid

e) None of these

Answer: a

**Section: 2.3 Meiosis  
Difficulty: Easy**

37) Chromosomes that exist as members of a pair and have the same genetic makeup are known as:

a) Heterologues

b) Homologues

c) Homozygous

d) Heterozygous

e) None of these

Answer: b

**Section: 2.3 Meiosis  
Difficulty: Easy**

38) Which of the following is a characteristic event of Prophase 1?

1. Separation of homologues

2. Synapsis of homologues

3. Crossing over between homologues

a) 1

b) 2

c) 3

d) 1 and 3

e) 2 and 3

Answer: d

**Section: 2.3 Meiosis  
Difficulty: Easy**

39) The points where chromosomes have physically crossed over are known as:

a) Centromeres

b) Kinetochores

c) Chiasmata

d) Diplonema

e) Pachynema

Answer: c

**Section: 2.3 Meiosis  
Difficulty: Easy**

40)Which of the following occurs in Meiosis 1 but not in Mitosis?

a) Homologous chromosomes pair during prophase

b) Homologous chromosomes line up along the metaphase plate

c) Homologous chromosomes separate from each other during anaphase

d) All of these

e) None of these

Answer: d

**Section: 2.3 Meiosis  
Difficulty: Easy**

41) Which of the following events takes place during Meiosis 2?

a) Homologous chromosomes cross over

b) Sister chromatid separate and move to the poles of the cell

c) Homologous chromosomes line up along the metaphase plate

d) The number of chromosomes is reduced by half

e) All of these take place during Meiosis 2

Answer: b

**Section: 2.3 Meiosis  
Difficulty: Easy**

42) Which of the following is a reason why the daughter cells that result from the process of Meiosis are not genetically identical to the parent cell at the beginning of the process?

1. Crossing over

2. Each homologous chromosome in a pair is inherited from a different parent (i.e. one from mom and one from dad)

3. Each homologue randomly assorts into a daughter cell

a) 1

b) 2

c) 3

d) All of these

e) 2 and 3 only

Answer: d

**Section: 2.3 Meiosis  
Difficulty: Easy**

43) In plants, during which phase of the life cycle does meiosis occur?

a) Gametophytic

b) Sporophytic

c) Mitotic

d) All of these

e) None of these

Answer: b

**Section: 2.3 Meiosis  
Difficulty: Easy**

44) An organism that is favored for use in genetic research is known as a/an:

a) Model organism

b) Specialized organism

c) Clone

d) Intermediate organism

e) Mammal

Answer: a

**Section: 2.4 Life Cycles of Some Model Genetic Organisms**

**Difficulty: Easy**

45) Which of the following is considered a model organism for use in genetic research?

a) *E. coli*

b) *Saccharomyces cerevisiae*

c) *Drosophila melanogaster*

d) *Mus musculus*

e) All of these

Answer: e

**Section: 2.4 Life Cycles of Some Model Genetic Organisms**

**Difficulty: Easy**

**Question Type: Essay**

46) Briefly compare the differences between eukaryotic and prokaryotic cells.

Answer: Prokaryotic cells are usually less than a thousandth of a millimeter long, and they typically lack a complicated system of internal membranes and membranous organelles. Their hereditary material—that is, the DNA—is not isolated in a special subcellular compartment. Organisms with this kind of cellular organization are called prokaryotes. Examples include the bacteria, which are the most abundant life forms on earth, and the archaea, which are found in extreme environments such as salt lakes, hot springs, and deep-sea volcanic vents. All other organisms—plants, animals, protists, and fungi—are eukaryotes. Eukaryotic cells are larger than prokaryotic cells, usually at least 10 times bigger, and they possess complicated systems of internal membranes, some of which are associated with conspicuous organelles. The hallmark of all eukaryotic cells is that their hereditary material is contained within a large, membrane-bounded structure called the nucleus**.** The nuclei of eukaryotic cells provide a safe haven for the DNA, which is organized into discrete structures called chromosomes**.** Individual chromosomes become visible during cell division, when they condense and thicken. In prokaryotic cells, the DNA is usually not housed within a well-defined nucleus

**Section: 2.1 Cells and Chromosomes  
Difficulty: Medium**

47) Colchicine is a drug that is commonly used to treat gout, a disease characterized by the accumulation of uric acid crystals in tissues. Colchicine acts by binding and inhibiting the microtubules. What is the role of microtubules in the cell, and what would be the effect would of inhibiting microtubles?

Microtubules are key components of the cytoskeleton, so they control the location of organelles and the transport of vesicles within the cell. They also play a key role in cell division, since microtubules assemble into the spindle apparatus and attach to the chromosomes during mitosis. Inhibiting the mitotic spindle would prevent proper segregation of the chromosomes during mitosis. This means normal cell division will be inhibited, and the cells that do divide will likely be aneuploid. These cells will be destined for apoptosis, thanks to the presence of the cell cycle checkpoints.

**Section: 2.2 Mitosis**

**Difficulty: Medium**

48) You are given a set of slides to analyze, but you do not know if you are looking at an example of mitosis or meiosis. What clues can you look for at each of these stages that might help you distinguish between cells that are going through mitosis or cells that are going through meiosis I? Can you distinguish between cells undergoing mitosis and cells in meiosis II? Explain your answer.

There are three visual clues that you are looking at meiosis, and all of them occur during meiosis I.

* If you observe synapsis, that would indicate you are looking at a cell in prophase I.
* If there are tetrads aligned at the metaphase plate, you will be able to conclude that the cell is going through metaphase I.
* If you see homologous chromosomes separating but sister chromatids are still attached at the centromere, you will know you are looking at anaphase I.

If you are just looking at the cells and using DNA staining, mitosis should result in a diploid cell at the end of telophase and cytokinesis, whereas meiosis II should result in a haploid cell. In addition, if you were to stain specific DNA sequences using FISH, you could identify that crossing over had occurred, and that would indicate that you are looking at meiosis.

**Section: 2.3 Meiosis**

**Difficulty: Medium**

49) Why has *E.coli* become a commonly used model organism in genetic research?

Answer: This organism can be cultured in the laboratory on a simple medium, it is amenable to all sorts of biochemical analyses, and mutant strains with different growth requirements can be isolated easily. *E. coli* cells and the viruses that infect them are tiny creatures that can be cultured in the laboratory to produce tens of billions of their own kind in a short period of time. These large population sizes allow researchers to screen efficiently for rare events such as the occurrence of a particular kind of mutation.

**Section: 2.4 Life Cycles of Some Model Genetic Organisms**

**Difficulty: Medium**

50) Compare and contrast gametogenesis in *Arabidopsis* and mice. What is the difference between a sporophyte and a gametophyte?

In both plants and animals, the egg is produced from a diploid precursor cell, the megaspore mother cell or the oogonium. These cells undergo a reductional division during meiosis, and only one of the four sets of haploid genomes eventually becomes the egg. In plants, the other polar bodies become part of the endosperm, yielding a triploid tissue designed to nourish the developing embryo. In mice, the 3 polar bodies in mice eventually degrade, and only one haploid set form the egg. The sperm is produced by microsporogenesis in plants, so one microspore develops into four haploid pollen grains (sperm). The process of spermatogenesis also begins with one diploid precursor cell, the spermatogonia, which undergo a reductional division to yield four haploid sperm cells, or gametes.

The sporophyte is the mature plant, which is diploid. A sporophyte produces haploid spores through the process of meiosis. The gametophyte is the haploid plant structure that produces haploid gametes by mitosis.

**Section: 2.4 Life Cycles of Some Model Genetic Organisms**

**Difficulty: Medium**