**Snustad Practice Quiz**

**Chapter 02**

1) Which of the following is true of carbohydrates?

a) Carbohydrates are hydrophobic, so they cannot be stored in the cytoplasm.

b) Carbohydrates can be stored as glucose, which is a long polymer that is stored in the cell to be broken down later.

c) Animal cells store carbohydrates in the form of glycogen, while plants store carbohydrates as starch.

d) Both plants and animals break down carbohydrate chains to use glucose to make energy.

e) Both C and D

Answer: e

Feedback: Carbohydrates store the energy for use in cells. The polypeptide chains, starch or glycogen, are stored within the cell for future use. The subunits of these chains are glucose, which are used as a source of chemical energy to produce ATP.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Easy**

2) Which of the following structures would you not expect to see in all eukaryotic cells?

a) lipid membranes

b) mitochondria

c) chloroplasts

d) membrane bound organelles

e) all of these are found in all eukaryotic cells

Answer: c

Feedback: Eukaryotic cells possess complicated systems of internal membranes and membrane-bound organelles. Plants and algae are the only eukaryotes that possess chloroplasts, organelles capable of capturing solar energy and converting it to chemical energy. Animals do not have these chloroplasts.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Easy**

3) Animals that are exposed to extreme cold temperatures can increase membrane fluidity and avoid freezing by varying the amounts of which molecules in their cell membrane?

a) lipids

b) proteins

c) enzymes

d) both lipids and proteins

e) none of these

Answer: a

Feedback: Although there are many types of molecules that make up the cell membrane structure, the primary components of cell membranes are lipids and proteins. The proteins serve as receptors and cell-surface proteins are involved in cell-cell interactions, whereas lipids are involved in maintaining membrane fluidity.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Medium**

4) In algal and plant cells, energy can be produced in:

a) mitochondria and chloroplasts

b) mitochondria

c) chromosomes

d) ribosomes

e) endoplasmic reticulum

Answer: a

Feedback: In plants and algae, energy can be produced in TWO locations within the cells; in the chloroplasts and in the mitochondria. Chromosomes are DNA organization structures; ribosomes and the endoplasmic reticulum are involved in the production and modification of protein.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Easy**

5) Antibiotics often act by increasing membrane permeability in bacterial cells. Why would this be an effective strategy to kill bacteria?

a) Increasing membrane permeability would disrupt the endoplasmic reticulum

b) The nuclear membrane would be compromised, so nuclear transport would be inhibited.

c) The plasma membrane leaking would cause the cell to take up fluid and burst.

d) The mitochondrial membranes would be disrupted, causing the cell to not produce ATP.

e) All of the above

Answer: c

Feedback: Prokaryotes lack membrane-bound organelles, so targeting the membranes would affect their external plasma membrane only.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Medium**

6) Suppose you want to purchase an herbicide that would effectively kill weeds in your garden without harming animals or insects. Which strategy would be your best target to minimize potential harm to other organisms?

a) Use an herbicide that targets lipids in the plasma membrane.

b) Use an herbicide that targets linear chromosomes.

c) Use an herbicide that targets chloroplasts or vacuoles.

d) Use an herbicide that inhibits both chloroplasts and mitochondria.

e) None of the above

Answer: c

Feedback: You want to choose a structure that is unique to plants. All eukaryotes have a plasma membrane, linear chromosomes, and mitochondria. Only plants have chloroplasts and vacuoles, so that would reduce potential harmful effects for other organisms.

**Section: 2.1 Cells and Chromosomes**

**Difficulty Level: Medium**

7) Vinblastine is a common chemotherapeutic agent that is known to bind to microtubules and inhibit formation of the spindle apparatus. If you treat cancer cells with vinblastine, what effect would you expect to see?

a) The cell cycle would arrest during G1 phase, so DNA synthesis cannot proceed.

b) The cell cycle would arrest during M phase, so DNA synthesis can occur but mitosis would be inhibited.

c) The cell cycle would arrest in the G0 phase, so the cell would be stuck in a quiescent state.

d) The cell cycle would proceed, but the cell cannot replicate DNA so you would expect a reductional division in chromosomes.

e) The cell cycle would be unaffected, but it would kill the cell by preventing protein synthesis.

Answer: b

Feedback: If the spindle apparatus cannot form, mitosis cannot proceed. The cell could still do DNA synthesis and protein synthesis normally, but would arrest during mitosis and this will result in cell death in rapidly dividing cells.

**Section: 2.2 Mitosis**

**Difficulty Level: Medium**

8) The longest phase during the eukaryotic cell cycle generally is:

a) G1

b) G2

c) S

d) M

e) none of these

Answer: a

Feedback: If one considers the eukaryotic cell cycle as a 24 hour period, the G1 phase of growth and metabolism would last around 10 hours. The S phase of DNA synthesis and chromosome duplication would last nearly 9 hours. The preparation for mitosis phase (G2) would last approximately 4 hours and the actual process of division (M phase; mitosis) would last about 1 hour.

**Section 2.2 Mitosis**

**Difficulty Level: Easy**

9) You want to study cell division in onion root tips, which are the site of active cell division. Which stage of mitosis would you expect to find most often in rapidly dividing root tips?

a) prophase

b) pro-metaphase

c) metaphase

d) anaphase

e) telophase

Answer: a

Feedback: Prophase is the stage of the cell cycle that takes the longest amount of time. Thus, the majority of the cells in the root tip would be expected to be in prophase.

**Section: 2.2 Mitosis**

**Difficulty Level: Medium**

10) In your onion root tip, you find a cell which appears to be smaller, but you can see that the nuclear envelope is beginning to reform. Which stage of mitosis are you likely looking at?

a) prophase

b) pro-metaphase

c) metaphase

d) anaphase

e) telophase

Answer: d

Feedback The onset of telophase is the stage where the nuclear envelope begins to reform and the chromosomes decondense.

**Section: 2.2 Mitosis**

**Difficulty Level: Medium**

11) When a prokaryotic cell reproduces by mitosis, what is the end result?

a) produces genetically identical daughter cells

b) produces haploid offspring

c) results in gametes for fertilization

d) none of these

e) all of these

Answer: a

Feedback: The process of mitosis creates two daughter cells from the parent that have the same set of chromosomes and are, thus, genetically identical.

**Section: 2.2 Mitosis**

**Difficulty Level: Easy**

12) If you observe cells undergoing synapsis, which stage(s) of the cell cycle are you observing?

a) Leptonema

b) Zygonema

c) Pachynema

d) Diplonema

e) All of the above

Answer: b

Feedback: Synapsis is the process of homologous chromosomes pairing up and aligning. Crossing over occurs during pachynema, after the chromosomes have further condensed.

**Section: 2.3 Meiosis**

**Difficulty Level: Easy**

13) How can you distinguish between prophase I and prophase II in meiosis?

a) Both prophase I and II have chiasmata, but in prophase I, crossing over occurs between non-sister chromatids only.

b) Both prophase I and II have chiasmata, but in prophase I, crossing over occurs between sister chromatids only.

c) In prophase I, crossing over occurs between non-sister chromatids.

d) In prophase II, crossing over occurs between the homologous chromosomes.

e) Both prophase I and prophase II are indistinguishable.

Answer: c

Feedback: Synapsis is unique to prophase I, so that is when you might expect the homologous chromosomes to align. Sister chromatids are genetically identical, so crossing over would not result in exchange of genetic material. Thus, the exchange must occur between the nonsister chromatids after DNA synthesis has occurred.

**Section: 2.3 Meiosis**

**Difficulty Level: Medium**

14) The diploid chromosome number in humans is 46. How many tetrads would you count if you observe a cell during prophase I?

a) 23

b) 46

c) 92

d) 184

e) None of the above

Answer: a

Feedback: The chromosomes have duplicated at the end of the S phase, so that would give you 92 chromatids. Each one is paired in the 46 homologs, and those homologs are paired to form the tetrads. It will therefore be a total of 23 tetrads.

**Section: 2.3 Meiosis**

**Difficulty Level: Hard**

15) The diploid chromosome number in mice is 40. How many chromosomes would you count if you observe a cell during metaphase II?

a) 20

b) 48

c) 40

d) 78

e) 80

Answer: c

Feedback: During metaphase II, DNA synthesis has occurred, but the sister chromatids have not yet separated. Thus, the total chromosome number is 40 because the number of centromeres is 40. When the chromatids separate, the total chromosome number would be 80.

**Section: 2.3 Meiosis**

**Difficulty Level: Hard**

16) The diploid chromosome number in mice is 40. How many chromosomes would you count if you observe a cell during anaphase II?

a) 20

b) 48

c) 40

d) 78

e) 80

Answer: e

Feedback: During metaphase II, DNA synthesis has occurred, but the sister chromatids have not yet separated. Thus, the total chromosome number is 40 because the number of centromeres is 40. When the chromatids separate, the total chromosome number would be 80.

**Section: 2.3 Meiosis**

**Difficulty Level: Hard**

17) How many chromosomally different daughter cells can be produced by a mouse cell during meiosis I?

a) 40

b) 80

c) 400

d) 1048576

e) 8388608

Answer: d

Feedback: The total number of potential chromosome combinations is 220, when 20 is the total number of chromosomes.

**Section: 2.3 Meiosis**

**Difficulty Level: Medium**

18) You are studying *S. cerevisiae*, which has a haploid number of 16. If the *S. cerevisiae* uses sexual reproduction to produce gametes, how many chromosomes would the yeast have during prophase I?

a) 8

b) 16

c) 32

d) 64

e) *S. cerevisiae* cannot reproduce sexually.

Answer: c

Feedback: After mating, the zygote is diploid. To complete meiosis, it must undergo a reductional division of chromosomes. At prophase I, the chromosomes have replicated, so there are 32 chromosomes and 64 total chromatids. This will eventually become 4 cells, each with 16 chromosomes.

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

**Difficulty Level: Medium**

19) During the life cycle of *Arabidopsis thaliana*, double fertilization results in

a) a diploid embryo and haploid endosperm

b) a diploid embryo and diploid endosperm

c) a diploid embryo and triploid endosperm

d) a haploid embryo and haploid endosperm

e) a haploid embryo and diploid endosperm

Answer: c

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

**Difficulty Level: Easy**

20) If an oogonium has 36 chromosomes, how many chromosomes would you expect to find in the secondary oocyte during anaphase II?

a) 18

b) 36

c) 72

d) 114

e) None of the above

Answer: b

Feedback: If the oogonium is 2n, then 36 chromosomes is the diploid number. At anaphase II, the sister chromatids separate into two haploid cells, so that cell would contain 36 chromosomes until it completes meiosis II. The gametes would each contain 18.

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

**Difficulty Level: Hard**