M1509

Intro. to Cell Biology Recitation
Midterm 1 – Practice Multiple Choice Questions

1. Hydrogen bonding is *most* important in stabilizing the _____ structure of many proteins.
a. primary
b. secondary
c. tertiary
d. quaternary
e. all of the above

2. Which of the following is NOT a characteristic of DNA?
a. arranged as two antiparallel nucleic acids
b. composed of nucleotides
c. contains ribose
d. complementary strands held together by hydrogen bonds
e. contains sugar-phosphate ester bonds

3. What is the relationship between glycogen and starch?
a. Both are polymers of cellulose, but only glycogen is found in animals.
b. Both are polymers of sugars, but only starch contains β 1→4 glycosidic bonds.
c. Both can be digested by mammals to yield simple monosaccharides, but glycogen contains glucose while starch contains fructose.
d. Both are polysaccharides, but glycogen is found in animals while starch is found in plants.
e. Glycogen is found in animals and contains α 1→4 glycosidic bonds, starch contains β 1→4 glycosidic bonds and is found in plants.

watch out for "all of the above" questions

4. The primary structure of a protein
a. is the order of amino acids from one end of the protein to another.
b. is encoded by the nucleotide sequence of a gene.
c. is the linear sequence of amino acids that are linked together by peptide bonds.
d. determines the secondary and tertiary structure of the protein.
e. all of the above.

5. The MTOC is composed of numerous rings of _____ surrounding _____.
a. alpha tubulin; GTP
b. MAPs; gamma tubulin
c. beta tubulin; alpha tubulin
d. gamma tubulin; centrioles
e. GTP; tubulin dimers

6. Which of the following is *least* likely to be found in a cell membrane?
a. enzymes
b. phospholipids
c. nucleic acids
d. glycoproteins
e. transport proteins

7. Tubulin may assemble and disassemble *simultaneously* in a process known as
a. treadmilling
b. actin-regulated assembly
c. MAP motoring
d. dynamic instability
e. microtubule organizing

8. According to the current model, which of the following is the correct sequence of microtubule assembly?
a. dimers, oligomers, sheets of protofilaments, protofilaments, closing of microtubule, elongating microtubule
b. dimers, sheets of protofilaments, closing of microtubule, oligomers, protofilaments, elongating microtubule
c. protofilaments, sheets of protofilaments, closing of microtubule, elongating microtubule, dimers, oligomers
d. dimers, oligomers, protofilaments, elongating microtubule, sheets of protofilaments, closing of microtubule
e. dimers, oligomers, protofilaments, sheets of protofilaments, closing of microtubule, elongatinve microtubule

9. Which one of the following statements about nucleosomes is false?
a. They are found only in supercoiled DNA
b. They are comprised of both DNA and proteins
c. They are found in heterochromatin.
d. They are found in euchromatin.
e. They contain histones.

10. Disulfide bonds are often found to stabilize which of the following levels of protein structure?
a. primary structure
b. secondary structure
c. tertiary structure
d. alpha helices
e. beta sheets

11. Monosaccharides are joined together to form polysaccharides by:
a. Phosphorylation of ribose to form ribose-5 phosphate, followed by cleavage of the phosphate
b. A dehydration reaction joining the carboxyl groups of two sugars
c. Oxidation of –SH groups to form covalent bonds
d. A dehydration reaction joining an amino group and a carboxylic acid group on two sugars
e. Formation of a phosphoester bond at the 5' carbons

12. Which statement best describes "dynamic instability" in cells?
a. some microtubules in cells are short, and some are long
b. microtubules undergo extensive remodeling in the switch from interphase to mitosis
c. microtubule motor proteins walk for a short distance along a microtubule, then fall off, then resume walking.
d. newly formed microtubules, if not stabilized by the attachment of microtubule associated proteins, rapidly disassemble.
e. tubulin subunits bind GTP and cleave it to yield GDP and an inorganic phosphate

13. Phospholipids can form bilayer membranes because they are:
a. Hydrophobic
b. Lipids
c. Hydrophilic
d. Amphipathic
e. Capable of forming hydrogen bonds with water.

14. What are the chemical components of fatty acids?
a. Hydrocarbons, carboxylic acid group, and glycerol
b. Hydrocarbons, hydroxyl groups, and glycerol
c. Hydrocarbons, glycerol, and phosphate
d. Hydrocarbons and carboxylic acid group
e. Hydrocarbons, glycerol, and phosphate

15. Why does the wavelength of an excitation beam matter when using either a light microscope or an electron microscope?
a. The shorter the wavelength, the more likely that a small particle will disrupt the wave, and this generates contrast at higher resolutions
b. The longer the wavelength, the stronger the signal:noise ratio, thereby improving resolution without impairing contrast
c. The shorter the wavelength, the more of the excitation beam can be bent by a condenser lens, thus illuminating the specimen with a more intense beam
d. The longer the wavelength, the more likely it will be absorbed by contrast agents, thus improving resolution
e. The shorter the wavelength, the higher the energy in the excitation beam, and thus the more likely this can pass through the specimen to be detected

16. A nucleic acid is:
a) A polynucleotide
b. Hydrophobic
c. Linked to an amino acid via a peptide bond
d. A form of energy storage in the cell
e. Linked to other nucleic acids by covalent bonds between bases

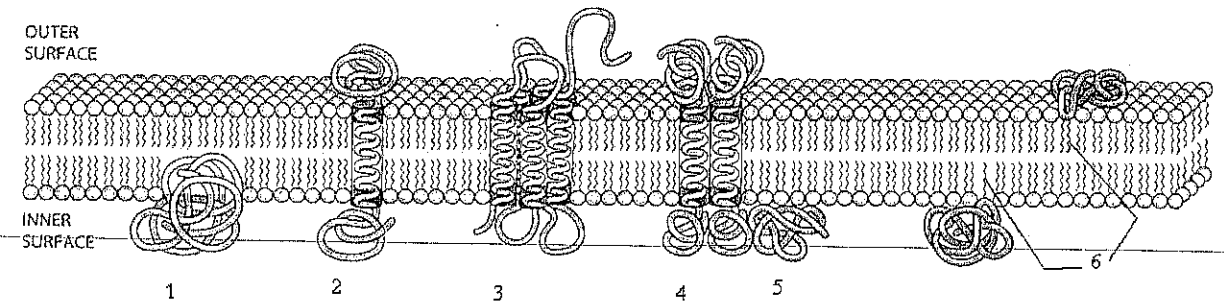
17. _____ increase(s) membrane fluidity while _____ tend(s) to stabilize the fluidity of the phospholipid bilayer.
a. Cholesterol, saturated fatty acid tails
b. Unsaturated fatty acid tails, cholesterol
c. Saturated fatty acid tails, cholesterol
d. Cholesterol, unsaturated fatty acids
e. Glycolipids, phospholipids

18. The primary advantage of phase contrast microscopy relative to other types of microscopy is:
a. Phase contrast provides much better contrast than transmission electron microscopy
b. Phase contrast provides better resolution than bright field microscopy
c. Phase contrast allows one to visualize live cells, while scanning electron microscopy does not
d. Phase contrast allows one to tag a specific protein in a cell, while bright field microscopy does not
e. Phase contrast provides better magnification than fluorescence microscopy

19. Heterochromatin is:
a. Transcriptionally active regions of prokaryotic chromosomes.
b. A strand of chromatin 30nm in diameter.
c. DNA that is enriched in "A-T" base pairs.
d. Tightly coiled chromatin found in cells that are in interphase.
e. Chromatin lacking nucleosomes.

20. Which of the following would change the primary structure of a protein?
a. Substituting one amino acid for another within the protein
b. Altering the pH of the solution in which the protein is dissolved
c. Adding reducing agents to the solution in which the protein is dissolved
d. Binding an antibody to the protein
e. Denaturing one of the subunits of the protein

Questions 21-24 correspond to the figure below.



21. Which of the above proteins could potentially form an ion channel?
a. 1
b. 3
c. 4
d. 5
e. 6

22. Which of the above proteins likely has the highest fluidity?
a. 1
b. 2
c. 3
d. 4
e. 6

23. Which of the above proteins contains more than one polypeptide?
a. 1
b. 2
c. 3
d. 4
e. 5

24. Which of the above proteins looks most like an integrin?
a. 1
b. 2
c. 3
d. 4
e. 5

25. If every cell contains water, what advantage do hydrophobic amino acids give to proteins?
a. they spontaneously cluster together
b. they form alpha helices
c. they bind things
d. they hydrolyze ATP
e. they form non-covalent bonds

26. Why does cholesterol stay in membranes?
a. because it decreases the fluidity of membranes
b. because like detergents, it is both hydrophobic and hydrophilic
c. because it increases the fluidity of membranes
d. a and c
e. a, b and c are all correct answers

27. Although electron microscopes have had the highest resolution of the most commonly used microscopes for decades, today they are rarely used to study cells. Why?
a. the extremely short wavelength of the electron beam means that very high energy electrons destroy the tissue if it is not covered with metal
b. electron microscopes cost more than most other microscopes
c. electron microscopes use metals to generate contrast
d. electron beams are hard to see with the human eye
e. specimens must be kept alive during the entire procedure

28. Arp 2/3 is:
a. an actin-binding protein that caps the plus ends of actin, preventing further elongation
b. a motor protein that slides actin filaments past each other in muscle
c. a protein that nucleates the formation of a new actin filament off the side of an already-existing filament
d. a protein that causes branching of the cytoskeleton during mitosis
e. a protein that is necessary for cells to complete the cell cycle

29. Which property of intermediate filaments best illustrates their ability to confer structural stability to cells?
a. They are not structurally polarized
b. They bind to membrane proteins
c. They are organizes into six different classes, each class being expressed in a subset of tissues
d. They are assembled as coiled coils
e. They are trimeric proteins

30. In class, we assigned the word "strength" to intermediate filaments. What kind of strength are we talking about?
a. the ability to bind many other cellular proteins together into a large molecular complex called a desmosome.
b. the ability to lift a large rock and throw it a great distance
c. the ability to resist physical trauma
d. the ability to form strong bones and muscles
e. the ability to bind to collagen

31. A proteoglycan is _____ while a glycoprotein is _____.
a. Found on the outside of cells; found on the inside of cells
b. Attached to the structural proteins in the ECM; attached to the cytoskeleton
c. Always hydrophilic; always hydrophobic
d. A structure composed of a large number of sugars, usually attached to a single polypeptide; a protein composed of one or more polypeptdies, with a small number of sugars attached to them
e. A complex network of sugars linked together by core proteins that are woven into a helical shape; a membrane protein found in the stomach

32. Which statement about microtubules is *false*?
a. They are approximately 25nm in diameter but can range in length from a few nm to several μm
b. They bind to both the endoplasmic reticulum and to the Golgi, but via different motor proteins.
c. They undergo "dynamic instability" in cells
d. They bind to both GTP and GDP
e. They form the mitotic spindle and microvilli

Intro. to Cell Biology Recitation
Review for Midterm I

****What you need to know****
The following is a list of topics you should focus on while studying. Look over all figures cited in the lecture outlines, and make sure you can do all drawings without error.

- A comparison of alpha 1,4 and beta 1,4 glycosidic bonds
- Valence shell and why it matters
- Definition of nucleosomes
- Structural comparison of DNA and RNA molecules
- Structural or functional difference between heterochromatin and euchromatin
- Antibody structure/function
- Detergents, their structure and function
- Fluorescence microscopy
- Definitions: Peptide bond, polypeptide, motif, domain, subunit
- Primary, secondary, tertiary, quaternary structure of proteins
- The "Three Traits of Proteins"
- Proteasome vs. lysosome vs. proteinase
- Types of membrane proteins
- Factors that affect membrane fluidity, cholesterol
- Intermediate filaments vs. Microtubules vs. Actin (Microfilaments), Arp 2/3
- Protein Transport (Kinesin and Dynein)
- ECM: Glycoproteins, Proteoglycans, Basil Lamina, Integrins
- Actin-binding motor proteins, cell movement

Drawings: Sugar in ring form, ATP, DNA/RNA polymer, Peptide bond, Phospholipid

Research Papers:

- Know the definition of hypothesis, and explain the hypothesis of either paper in everyday language.
- Know the format of a Logical Argument, and be able to cite an example.
- Be able to translate any research paper's title into everyday English.

Answers to Practice Midterm Multiple Choice Questions

1 b	12 d	23 d
2 c	13 d	24 d
3 d	14 d	25 a
4 e	15 a	26 b
5 d	16 a	27 a
6 c	17 b	28 c
7 a	18 c	29 d
8 e	19 d	30 c
9 a	20 a	31 d
10 c	21 b	32 e
11 b	22 e	