

Decide which is the BEST answer and blacken the corresponding brackets. (2 MARKS EACH)

1. Which Statement is False?

- 1) Lipid molecules in biological membranes are arranged as a continuous double layer called the lipid bilayer which is about 5 nm thick.
- *2) The 3 major types of lipids found in cell membranes are called phospholipids, cholesterol and triglycerides.
- 3) All the lipids found in membranes are said to be amphipathic because they have one hydrophilic and one hydrophobic end.
- 4) The hydrophilic end of a phospholipid consists of a polar head group and the hydrophobic end contains two fatty acid tails.
- 5) Oligosaccharide containing lipids called glycolipids are found only in the outer half of the bilayer and their sugar groups are exposed at the cell surface.

2. Which Statement is False?

- 1) A lipid bilayer is the fundamental structural component of all cell membranes.
- 2) Maintenance of the lipid bilayer in the plasma membrane requires special enzymes and the hydrolysis of ATP.
- 3) Lipid molecules cannot flip-flop across the bilayer unless phospholipid translocators are present.
- 4) Changes in membrane structure are facilitated by a high cholesterol content because unlike phospholipids cholesterol can readily flip-flop between the 2 monolayers.
- *5) The temperature at which a eukaryotic cell membrane 'freezes' is determined by how much cholesterol it contains.

3. Which Statement is False?

- 1) Proteins that extend across the bilayer and are exposed to an aqueous environment on both sides of the membrane are called transmembrane proteins.
- *2) Integral membrane proteins can be released from membranes by gentle procedures such as extraction by a salt solution.
- 3) Band 3 protein is the anion channel in red blood cells responsible for the exchange of HCO_3^- for Cl^- .
- 4) In freeze fracture electron microscopy, the face representing the hydrophobic interior of the external half of the bilayer is called the E face.
- 5) Lateral diffusion rates of membrane proteins that contain a chromophore or bind a fluorescent ligand can be quantitated using a technique called FRAP.

4. Which Statement is False?

- *1) Membrane proteins form an extended monolayer on both surfaces of the lipid bilayer.
- 2) Proteins that span a lipid bilayer twice are likely to have their transmembrane segments arranged as α -helices.
- 3) The mobility of membrane proteins can be restricted by interactions with structures outside the cell or inside the cell.
- 4) Apical and basal lateral surfaces of epithelial cells which are separated by intercellular tight junctions have different lipid composition.
- 5) The basic structure of membranes is determined by the lipid bilayer but their specific functions are carried out largely by proteins.

5. Which is the most likely candidate proteins sequence for a transmembrane segment forming an α -helix through the phospholipid bilayer.

- 1) DVKEEEEEKDKGDEEE
- 2) ITPIYFGPMAGVIGTPLLIS
- 3) ADGAAEPGVVQMIMEAAEE
- *4) GFSIGFAYGCGLLFAAHGA
- 5) MEYKKTARRAEDIKPRRE

6. Which Statement is False?

- 1) The majority of cell-surface proteins carry sugar.
- 2) Glycolipid molecules have only one oligosaccharide side chain whereas glycoproteins often have many.
- *3) Whereas all the carbohydrate in the plasma membrane faces outward on the external surface of the cell, all the carbohydrate in internal membranes faces inward toward the cytoplasm.
- 4) Proteoglycans contain more carbohydrate than protein whereas glycoproteins usually contain more protein than carbohydrate.
- 5) Although most proteoglycans are constituents of the extracellular matrix, integral membrane proteoglycans also exist.

7. Which Statement is False?

- *1) Some membrane proteins are attached to the cytoplasmic surface of the plasma membrane through a C-terminal linkage to a glycosylated phosphatidyl inositol molecule.
- 2) The initial formation of phosphatidic acid and its subsequent modifications to form other phospholipid molecules all take place in the cytosolic half of the ER lipid bilayer.
- 3) Phospholipids are added to the membrane of the endoplasmic reticulum and subsequently transferred to other organelles such as mitochondria by phospholipid exchange proteins.
- 4) During N-glycosylation of proteins, a preformed oligosaccharide is transferred from the lipid, dolichol, to an N-residue on the target protein.
- 5) Glycosylation of newly synthesized glycoproteins is effected within an oxidizing environment.

Decide which is the BEST answer and blacken the corresponding brackets. (1 MARK EACH)

8. Which statement is false

The mobility of integral membrane protein would be affected by:

- 1) Interactions with the cytoskeleton
- 2) Interactions with the extracellular matrix
- 3) Cell-cell interactions
- 4) Self assembly into large aggregates
- *5) The presence of more than one transmembrane α -helical domain

9. Which one is the best answer

The fatty acids attached to carbons 1 and 2 of the glycerol moiety in phosphoglycerides are generally:

- 1) Both saturated
- 2) Both unsaturated
- 3) Either saturated or unsaturated at position 1 and position 2
- *4) Saturated at position 1 and unsaturated at position 2
- 5) Unsaturated at position 1 and saturated at position 2

10. Carrier-mediated transport can be distinguished from simple diffusion by determining:

- 1) Whether or not there is a requirement for ATP
- 2) Whether or not a Na^+ gradient is required
- 3) Whether or not the solute becomes phosphorylated
- *4) Whether the process is inhibited by structural analogs of the solute
- 5) Whether the rate of transport varies at a fixed solute concentration

11. Which of the following studies did NOT contribute to information leading to the unified cell hypothesis?

- 1) The analysis of "pores" in woody plants.
- 2) The development of the microscope and study of "animalcules".
- 3) The discovery of protoplasm as the primary aqueous substance.
- *4) The realization that plants and animals are composed of highly different cellular units.
- 5) The identification of the nucleus as having a central role in the cell.

12. Which of the following is NOT a component of mitochondria?

- 1) DNA
- 2) inner and outer membranes
- 3) ribosomes
- 4) ATP synthetase particles
- *5) enzymes that generate and destroy hydrogen peroxide

13. Nucleoli contain:

- 1) Small ribosomal subunits.
- 2) Mature large ribosomal subunits.
- *3) 45S ribosomal precursor RNA
- 4) None of answers 1-3 are correct.
- 5) All of answers 1-3 are correct.

14. The number of nucleoli in a cell varies because of:

1. The species of origin of the cell
2. The number of ribosomal gene clusters
3. The overall synthetic activity of the cell
4. None of the answers 1-3
- *5. All of answers 1-3

15. Which of the following histone modifications is NOT believed to be involved with chromatin condensation/decondensation?

- 1) acetylation
- *2) acylation
- 3) methylation
- 4) phosphorylation
- 5) ADP ribosylation

16. Which one of the following techniques has not been used to identify the 5' end of messenger RNAs.

- 1) RACE-PCR
- *2) foot printing
- 3) Primer extension

- 4) S1 mapping
- 5) none of the above

17. Which one of the following structures is responsible for specifying the site of polyadenylation?

- 1) UAA or UGA or UAG
- 2) UA and AG
- 3) AUG or CUG
- *4) AAUAAA
- 5) none of the above

18. Which one of these proteins recognizes the TATAA box.

- 1) eIF4F
- 2) Gal4
- 3) GCN4
- *4) TFIID
- 5) c-fos

19. Which one of the following statements on reporter gene is false:

- 1) a reporter gene can be employed to identify activator and repressor domains.
- *2) to utilize a reporter gene one must know the DNA sequence of the promoter being examined.
- 3) a reporter gene can be used to perform mutational analysis in promoters
- 4) by definition a reporter gene must be positioned 3' of the promoter studied.
- 5) none of the above

20. Which one of the following statements about transcription factors is false.

- 1) In some transcription factors of the Zinc-finger family, two atoms of zinc may be bound to only six cysteines.
- 2) In leucine zipper motifs, the leucines are placed at each 7 amino acids of the alpha helix.
- 3) The distance between two recognition helices of helix-loop-helix transcription factor dimers is 3.4 nanometers.
- 4) The joining of leucine zipper JunA and JunB, represents an example of heterotypic binding association in leucine zipper transcription factor.
- *5) Zinc-finger domains contain a zinc atom attached to 4 histidines.

21. Which one of the following statements is false:

- *1) cleavage of hnRNA occurs 10 to 20 bases 5' of the AAUAAA signal.
- 2) adenylation is performed by a specific enzyme named poly Adenylase.
- 3) the polyA segment of mRNA is covered with a basic protein.
- 4) polyAdenylation of mRNAs is important for their stability and transport to the cytoplasm.
- 5) both AAUAAA and AUUAAA can be used as signal of poly Adenylation

22. What is the family of transcription factors that dimerize through hydrophobic interactions.

- 1) zinc finger DNA binding proteins
- 2) helix loop helix transcriptions factors
- 3) eIF2 and eIF2B transcriptions factors
- 4) helix-turn-helix transcription factors
- *5) leucine zipper DNA binding proteins

23. Which one of these nucleotide domains can fulfill all these statements?

- a- Increase transcription
- b- Is a specific DNA sequence
- c- Is active at either the 5' and 3' ends of a gene
- d- Important for ribosome binding

- 1) CAAT box
- 2) TATAA box
- 3) Enhancer
- 4) Kozac sequence
- *5) none of the above

24. How does translation inhibition occurs after poliovirus infection?

- 1) by protein association between eIF2 and eIF2B.
- 2) by translocation to the nucleus of the eIF2b subunit.
- 3) by phosphorylation of eIF4a
- *4) by proteolytic cleavage of the p220 cap binding protein.
- 5) by inhibiting the helicase activity of eIF4a

25. Which one of the following statements is true.

RNA editing in the ApoB gene is tissue specific because;

- 1) The ApoB gene is translated in both liver and small intestine.
- 2) The mRNA for ApoB is in greater amounts in the small intestine.
- *3) The RNA editing enzyme is only present in the small intestine.
- 4) The site of editing is absent in the liver ApoB mRNA.
- 5) None of the above

26. In which one of these examples can transcriptional activation occur by positioning a competent enhancer beside a functional promoter using DNA recombination.

- 1) Gal 4 transactivation
- *2) immunoglobulin gene activation
- 3) CAT transcriptional activation
- 4) yeast mating locus
- 5) none of the above