

Decide which is the BEST answer and blacken the corresponding brackets. (4 MARKS EACH)

Which of the following is NEVER characteristic of peripheral membrane proteins?

- 1) Attachment to the membrane through a modification such as fatty acylation, which allows insertion into the lipid bilayer.
- *2) Spanning of the membrane by a single transmembrane region.
- 3) Attachment to the intracellular domain of a membrane protein.
- 4) Attachment to the extracellular domain of a membrane protein.
- e) All of the above CAN BE characteristic of peripheral membrane proteins.

2. Which of the following statements is FALSE?

- *a) Nuclear pores traverse the single layer nuclear membrane permitting communication between the nucleus and cytoplasm.
- b) Nuclear pores vary in number with the transcriptional activity of the cell.
- c) Nuclear pores are highly structured and are comprised of several glycoproteins.
- d) Nuclear pores are comprised of 8 protein structures forming 'rosettes'.
- e) Nuclear pores limit the size of molecules that can pass between the nucleus and cytoplasm.

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

- a) The species of origin of the cell.
- b) The number of ribosomal gene clusters.
- c) The overall synthetic activity of the cell.
- d) None of answers 1-3.
- *e) All of answers 1-3.

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

- a) acetylation
- *b) acylation
- c) methylation
- d) phosphorylation
- e) ADP ribosylation

5. Which of the following statements is FALSE?

- a) much protein, carbohydrate and lipid synthesis takes place in G1.
- b) synthesis of histones is largely in S-phase
- *c) B cyclin is degraded in G2
- d) division of centrioles takes place during mitosis
- e) D cyclins increase during G1

6. Which of the following statements is INCORRECT concerning DNA synthesis?

- a) DNA synthesis in eukaryotic cells is semi-conservative.
- b) daughter chromatids are composed on one old and one newly synthesized strand.
- c) DNA synthesis is bi-directional.
- d) DNA polymerase requires an RNA primer.
- *e) DNA synthesis is continuous on both strands.

7. Which is NOT typical of metaphase cells undergoing mitosis?

- a) condensed chromosomes
- *b) $2n$ DNA content
- c) high levels of cyclin B
- d) poorly attached to the substratum
- e) high levels of cdc2 kinase

8. Which of the following would tend to INHIBIT the onset of mitosis?

- a) binding of cyclin B to Cdc2/28
- *b) phosphorylation of Cdc2/28 by Wee1
- c) phosphorylation of Wee1 by Cdc2/28
- d) dephosphorylation of Cdc2/28 by Cdc25
- e) dephosphorylation of Wee1 by Pyp1 or Pyp2

9. Which of the following is NOT a substrate for mammalian MPF?

- a) histone H1
- b) regulator of mitotic spindle assembly (RMSA-1)
- *c) lamin B
- d) microfilamental protein myosin

e) cyclin B protease

10. What is the major regulator of entry of yeast G2 cells into mitosis?

- a) the level of nutrients
- b) the level of Cdc2/28
- c) the amount of chromosome condensation
- d) completion of S-phase
- *e) the level of cyclin B

11. Which of the following DOES NOT bind to and interact with one or more Cdks?

- a) p15
- b) p16
- c) p21
- d) p27
- *e) p53

12. Place the following in the correct order in the mammalian Ras signalling pathway.

- A. Activation of Ras
- B. Activation of a tyrosine kinase transmembrane receptor.
- C. Activation of MAP kinase

- A. ABC
- B. ACB
- *C. BAC
- D. BCA
- E. CBA

13. What is acquired during the progression of ALL tumor formation?

- a) loss of the RB gene
- *b) mutations
- c) the ability to synthesize growth factors
- d) activation of tumor suppressors
- e) all of the above

14. Which one of these genes is regulated by RNA editing?

- *a) The ApoB gene
- b) The snRNA 7
- c) The splicing factor snRNA 4
- d) The fos transcription factor
- e) The RNA editing enzyme

15. What is ribosome frameshifting?

- a) An alternative splicing event that results in a change in reading frame
- b) Initiation of translation at either of two AUGs.
- *c) The event of a ribosome complex switching from one open reading to another during translation.
- d) The event of a ribosome complex translating through a termination codon.
- e) None of the above.

16. Which one of these snRNAs inhibits splicing by binding to the catalytic U6 snRNA?

- *a) U4
- b) U7
- c) U3
- d) U2
- e) U1

17. Which one of these snRNAs is involved in the process of cleaving the 3' end of histone pre mRNA?

- a) U1
- b) U4
- *c) U7
- d) U12
- e) U2

18. Which one of the following translation factors is involved in the formation of a ternary complex with GTP during initiation?

- a) eEF2

- b) eIF5
- c) EF4
- *d) eIF2
- e) eEF1a

19. What is the key event arising on a protein that leads to its association with a proteasome?

- a) Phosphorylation
- b) by transport from nucleus to the cytoplasm
- c) homodimerization
- *d) ubiquitination
- e) proteolytic

20. Which one of the following examples of gene regulation involves DNA recombination?

- a) Mouse metallothionein induction
- b) Transferrin receptor stabilization
- c) Homeobox gene expression
- d) Expression of heterodimer transcription factor complex
- *e) Immunoglobulin gene expression

21. Which one of the following statements on 5' RNA motifs decreases the translational strength of a mRNA?

- a) the presence of a Kozak's sequence
- b) the presence of a CAP structure
- c) the absence of palindromic sequence
- *d) the presence of a long 5' untranslated sequence
- e) none of the above

22. Which statement is False:

- *a) The phospholipid head groups on the outside of the cell carry a net positive charge due to the choline groups of phosphatidylcholine.
- b) The cytosolic face of the red blood cell membrane carries a net negative charge due to the relative excess of phosphatidyl serine present on this side of the bilayer.
- c) Glycolipids are never found on the cytosolic face of membranes in eukaryotic cells.
- d) Glycolipids that contain sialic acid are called gangliosides one of which is the receptor for cholera toxin.
- e) One of the first identified phospholipid translocators for phosphatidylcholine translocation across the membrane bilayer is multidrug resistance protein 2.

23. Which statement is False:

- 1) Lipid molecules in biological membranes are arranged as a continuous double layer called the lipid bilayer which is about 4-5 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.

24. Only one is correct:

Which of the following 20 amino acid sequences is the most likely candidate for a transmembrane sequence:

- *a) ITLIYFGVMAGVIGTILLIS
- b) ITPIYFGPMAGVIGTPLLIS
- c) ITEIYFGRMAGVIGTDLLIS
- d) ITDIYFGKMAGVIGSELLIS
- e) ITKIYFGSMAGVIGKLLIS

25. All answers are correct except:

The following arrangements of membrane and membrane associated proteins have been identified:

- 1) Single pass transmembrane proteins with covalently attached N-linked oligosaccharides facing the extracellular space.
- 2) Proteins associated with cytosolically oriented domains of multispinning membrane proteins.
- 3) Proteins associated with the phospholipid bilayer due to covalent lipid modifications.
- 4) Membrane proteins with covalently attached carbohydrate linked to the membrane by a glycosylphosphatidyl inositol moiety.
- *5) Single pass transmembrane proteins with covalently attached N-linked oligosaccharides facing the cytoplasm.