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UNIVERSITY OF GHANA

BSc ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING

FIRST SEMESTER EXAMINATIONS: 2015/ 2016

BMEN 201: GENERAL BIOLGY (2 CREDITS)

INSTRUCTIONS: MULTIPLE CHOICE QUESTIONS. ANSWER ALL QUESTIONS BY CIRCLING THE RIGHT ANSWER. 2:00

1. A sugar-phosphate backbone of the DNA forms the_____shell on the helix
   (A) Inner
   (B) Outer
   (C) Adjacent
   (D) Middle
   (E) Proixmal

2. A protein is first translocated into _____before it is folded into its tertiary structure
   (A) Mitochondria
   (B) Endoplasmic Recticulum
   (C) Meristoplasm
   (D) Golgi apparatus
   (E) None of the above
3. Chromosome is thickest during
   (A) Prophase
   (B) Metaphase
   (C) Anaphase
   (D) Interphase
   (E) Protophase

4. There are five major types of histones in eukaryotic cells. One of these is not part of the structure of nucleosomes and is thought to participate in forming the 30-nm condensed chromatin fiber. Which histone is this?
   (A) H1
   (B) H2A and B
   (C) H3
   (D) H4
   (E) H2B and H1

5. Non-dividing cells are in cell cycle arrest in
   (A) G1
   (B) G0
   (C) Metaphase
   (D) Anaphase
   (E) Telophase

6. G-protein coupled receptors have essentially
   (A) 7 helices
   (B) 6 helices
   (C) 8 helices
   (D) 9 helices
   (E) 5 helices

7. Checkpoint controls prevent DNA replication or
   (A) Protein Synthesis
   (B) Mitosis of damaged cells
   (C) RNA processing
   (D) DNA-RNA complex formation
   (E) Duplex formation

8. Which is the source of energy for amino acid activation?
   (A) ATP
   (B) GTP
   (C) CTP
   (D) TTP
   (E) UTP

9. The codon is found in:
   (A) DNA
   (B) rRNA
   (C) tRNA
   (D) mRNA
   (E) protein

10. During transcription:
   (A) nucleotides are polymerized by DNA polymerase
   (B) initiation occurs at a site recognized by the sigma factor

(C) only single gene-sized mRNA molecules are synthesized
(D) both DNA strands of a single gene are used as templates simultaneously
(E) thymine in RNA pairs with adenine in DNA

11. What is the anticodon that recognizes CGA:
(A) UGC
(B) CGA
(C) GCU
(D)GCT
(E) CAN

12. The anticodon is in:
(A) DNA
(B) mRNA
(C) tRNA
(D) rRNA
(E) SiRNA

13. Two functions of the rough endoplasmic reticulum are to
(A) detoxify and transport drugs
(B) modify and activate hormones
(C) synthesize and transport enzymes
(D) join with and hydrolyze food vacuoles
(E) communicate with the nucleus

14. Inside which portion of a cell does translation take place?
(A) The endoplasmic reticulum
(B) The nucleus
(C) The cytosol
(D) The Golgi complex
(E) The cell membrane

15. Movement of cell against concentration gradient is called
(A) Osmosis
(B) Active transport
(C) Diffusion
(D) Passive transport
(E) Normal transport

16. An experiment is set up with a culture of algae undergoing normal photosynthesis. A pulse of radioactive carbon, in the form of $^{14}CO_2$ is inserted into the culture at time zero. At five-second intervals, some of the cells are removed by dropping them into boiling water to halt metabolic processes. What is the first organic material that would be identified as being radioactive during this process?
(A) ATP
(B) PGA
(C) ADP

(D) Glucose
(E) Acetyl-CoA

17. Cells which require large amounts of energy would likely contain relatively high numbers of
(A) centrioles
(B) chloroplasts
(C) Golgi bodies
(D) mitochondria
(E) Caveoli

18. A new biological structure has been discovered. It is larger than most bacteria. Although primarily composed of protein, it is covered with a lipid-based membrane. Its genetic material is double-stranded DNA, but the structure lacks RNA. The interior of the structure has ribosomes and a few enzymes. What is this?
(A) A virus
(B) A protozoan
(C) An alga
(D) A bacterium
(E) A prion

19. Cell membranes are composed mainly of
(A) sugars and phosphates
(B) phospholipids and proteins
(C) carbohydrates and cellulose
(D) nucleotides and carbohydrates.
(E) alcohols and cellulose

20. Each amino acid in a protein is specified by
(A) several genes
(B) a promoter
(C) an mRNA molecule
(D) a codon
(E) a DNA

21. What is the symbol for the amino acid Arginine?
(A) A
(B) G
(C) R
(D) I
(E) E

22. During the different levels of Chromosome DNA packaging, a terminology known as "beads-on –the-string is often used to describe the chromatin, what protein forms is involve in this process?

(A) Lipase
(B) Ligase
(C) enzyme
(D) Fibroin
(E) Histone

23. If an mRNA codon reads UAC, its complementary anticodon will be
(A) TUC
(B) ATG
(C) AUG
(D) CAG
(E) TTA

24. Which of the following mutations would be easiest to revert:
(A) an insertion of 10 base pairs
(B) a deletion of more than 10 base pairs
(C) a base pair substitution
(D) insertion of a transposon
(E) truncation

25. Which of the following processes would be directly affected by a lack of cellular ATP?
(A) Osmosis
(B) Diffusion
(C) Active transport
(D) Facilitated transport
(E) Simple diffusion

26. A typical membrane lipid has the following components EXCEPT
(A) Choline
(B) Phosphate
(c) Glycerol
(D) Hydrocarbon chain
(E) Kink

27. Which of the following will be affected directly if the mitochondria in a cell are not functioning properly?
(A) Absorption of alcohol by the cell
(B) The movement of water into and out of the cell
(C) The movement of oxygen across the cell membrane
(D) The movement of sugar from a low to a high concentration
(E) The movement of lipids within the membrane

28. Play a major role in cell to cell communication:
(A) Membrane
(B) axons

(C) neurons
(D) fibres
(E) platelets

29. Membrane Proteins that bind to glucose, electrolytes, and transfer them to other side of membrane use ATP:
(A) Receptors
(B) Channels
(C) Carriers
(D) Enzymes
(E) Bovin

30. Membrane is a mosaic of except:
(A) Phospholipids
(B) Glycolipids
(C) Sterols
(D) Proteins
(E) Frutolipids

31. A molecule of ATP is used with each "swap of Na/K ions. The reaction is represented by:
(A) ATP $\longrightarrow$ AMP + 2Pi

(B) ATP $\longrightarrow$ ADP + Pi

~~(C) ATP $\longrightarrow$ ADP + Pi~~
C (D) ATP $\longrightarrow$ ANP + Pi

D (E) GTP $\longrightarrow$ GDP + 2Pi

32. In the discovery of introns, a DNA called _____ was formed that had the same nucleotide sequence as the gene that produced the mRNA.
(A) mDNA
(B) rDNA
(C) sDNA
(D) gDNA
(E) cDNA

33. To identify an individual by DNA analysis of their blood, investigators look for
(A) Primers
(B) DNA fingerprints
(C) Probes
(D) Nucleosomes
(E) Transgenic fragments

34. Genetically identical organisms derived from a single genetic source are called

(A) Populations
(B) Siblings species
(C) Clones
(D) Ecotypes
(E) Varieties

35. Transcription is initiated when RNA polymerase binds to
(A) Promoter
(B) Initiator
(C) Transcriptor
(D) Codon
(E) Start codon

36. In eukaryotes, there are _____ codons that specify amino acids
(A) 21
(B) 24
(C) 64
(D) 61
(E) 32

37. If the solute concentration of solution A is greater than solution B, then solution A is said to be
(A) Isotonic to solution B
(B) osmotic to solution B
(C) hypotonic to solution B
(D) hypertonic to solution B
(E) Lucotonic to solution B

38. This organelle contains its own DNA:
(A) ER
(B) Golgi
(C) Mitochondria
(D) Lysosome
(E) Peroxisome

39. The following are some of the problems of antiviral drugs except?
(A) Identification of virus specific targets
(B) Generation of resistant variants
(C) Nucleic acid replication
(D) Suppress virus protein processing
(E) Promote virus maturation

40. The cytoskeleton responds to stress by exhibiting the following properties
(A) elastic, plastic, failure

(B) strength, elastic, toughness
(C) elastic, resilience, plastic
(D) strength, resilience, toughness
(E) None of the above

41. A mutation in a codon leads to the substitution of one amino acid with another. What is the name for this type of mutation?
(A) nonsense mutation
(B) missense mutation
(C) frameshift mutation
(D) promoter mutation
(E) operator mutation

42. X-chromosome inactivation
(A) normally takes place in males but not females
(B) is the cause of the Y chromosome being genetically inactive
(C) takes place in humans so that the same X chromosome is inactive in all of the cells of a female
(D) occurs in fruit flies but not in mammals
(E) results in genetically turning off one of the two X chromosomes in female mammals

43. An enzyme that recognizes a specific (palindromic) sequence and cuts within a DNA molecule is called a(n):
(A) exonuclease
(B) methylase
(C) modification enzyme
(D) restriction endonuclease
(E) helicase

44. What instrument can be used to determine the structure of a protein?
(A) PCR machine
(B) X-ray machine
(C) Mass Spectrometer
(D) Confocal miceroscope
(E) UV/VIS

45. Which is the correct order, from smallest to largest number of base pairs?
(A) plasmid, transposon, chromosomal DNA
(B) chromosomal DNA, transposon, plasmid
(C) transposon, plasmid, chromosomal DNA
(D) plasmid, chromosomal DNA transposon
(E) RNA, DNA, tRNA, plasmid

46. Assume you inoculated 100 cells into 100ml of nutrient broth and 100 cells in 200ml of nutrient broth. After incubation for 24hrs the cultures have entered stationary phase. You should have:
(A) more cells per ml in the 100 ml
(B) more cells per ml in the 200 ml

(C) the same number of cells per ml in each
(D) less cells in the 200 ml
(E) less cells in the 100 ml

47. A drug interacts with a protein. One can use the following machine to know which amino acids in the protein the drugs is touching.
(A) PCR machine
(B) NMR machine
(C) Mass spectrometer
(D) Confocal Microscope
(E) UV/VIS

48. The amount of a specific DNA sequence can be increased more than 10^6 fold by using which of the following chemical reactions?
(A) restriction endonuclease reaction
(B) ligation reaction
(C) polymerase chain reaction
(D) reverse translation
(E) reverse transcriptase reaction

49. The proofreading of newly synthesized DNA, to excise incorrect nucleotides which have been inserted, is done by:
(A) a restriction endonucleases
(B) DNA gyrase
(C) DNA ligase
(D) DNA polymerase III
(E) all of the above may participate

50. If you are interested in protein secondary structure, what instrument will you use?
(A) PCR machine
(B) UV/VIS machine
(C) Circular dichroism machine
(D) Visible machine
(E) Microscope

End of Test