

Name:

Written Exam for post of Junior Technician,
Department of Biology
26th September 2016, Duration: 1h

INSTRUCTIONS: All Questions are 1 mark each = Total 40 marks

Please mark (circle/tick) the correct answer. There is only one correct option for every question. Total pages: 5

1. Nucleic acids are chains of 5-carbon sugars linked by ____ bonds with an organic base protruding from each sugar?
 - a. amino
 - b. phosphodiester
 - c. carboxyl
 - d. phosphate
2. Which of the following is not a lipid?
 - a. Terpenes
 - b. Steroids
 - c. Prostaglandins
 - d. Chitin
3. Glucose is a
 - a. Protein
 - b. Disaccharide
 - c. nucleic acid
 - d. monosaccharide
 - e. starch
4. In the formation of a macromolecule, what type of bond would join two amino acid subunits?
 - a. Ionic bond
 - b. Phosphodiester bond
 - c. Hydrogen bond
 - d. Peptide bond
5. Which of the following is not a disaccharide?
 - a. Sucrose
 - b. Amylose
 - c. Lactose
 - d. Maltose
6. In nucleic acids, the purine nitrogenous bases are
 - a. Adenine and Guanine
 - b. Thymine and Cytosine
 - c. Uracil and thymine
 - d. Guanine and thymine
7. At what level(s) of protein structure would you expect to find disulfide bridges?
 - a. Primary
 - b. Secondary
 - c. Tertiary
 - d. Quaternary
 - e. Only b and c
8. Molecular chaperones
 - a. are found in the nucleus and aid in folding of DNA
 - b. degrade proteins that have folded incorrectly
 - c. help new proteins fold correctly and repair incorrectly folded proteins

- d. are only present in cells that are exposed to high temperatures
e. work through hydrophobic interactions
9. Most cells are very small. A typical eukaryotic cell, both plant and animal, will occur in which of the following size ranges?
- 1 mm to 100 μm
 - 100 μm to 10 μm
 - 10 μm to 1 μm
 - 1 μm to 100nm
 - 100nm to 10nm
10. Assuming all other factors to be the same, electron microscopes have greater resolving power than light microscopes because.
- the wavelength of electrons is much longer than the wavelength of visible light
 - electron microscopes have more lenses
 - because the beams in electron microscopes overlap creating a clearer picture
 - because electron microscopes are compound microscopes
 - because the wavelengths in visible light are longer than with electrons
11. If a zygote has 4 chromosomes, the somatic cells formed from it have _____ chromosomes.
- 4
 - 8
 - 2
 - 1
 - 16
12. The p53 gene is responsible for
- DNA Damage
 - Over riding G1 checkpoint
 - Initiating transcription of p21 which binds to cyclins
 - Triggering cells to grow uncontrollably
13. The assembly of transcription factors on a promoter begins some 25 nucleotides upstream where it binds to a start _____ sequence.
- ATAT
 - AATT
 - TTAA
 - TATA
 - TAAT
14. When tryptophan is present in the environment of E. coli, the tryptophan binds to the
- Trp operator
 - Trp repressor
 - Trp operon
 - Trp promoter
15. In the zinc fingers motif, the spacing of the helical segments is performed by
- Beta sheets
 - Helical clusters
 - Zinc atoms
 - Alpha helix
16. Which of the following is the correct expression of the Henderson-Hasselbalch equation.
- $\text{pH} = \text{pK} + \log ([\text{HA}] / [\text{A}^-])$
 - $\text{pH} = \text{pK} - \log ([\text{A}^-] / [\text{HA}])$
 - $\text{pK} = \text{pH} + \log ([\text{A}^-] / [\text{HA}])$
 - none of the above

17. Gases such as oxygen and carbon dioxide cross the plasma membrane by:
- Secondary active transport
 - Passive Diffusion
 - Specific gas transport protein
 - Primary active transport
18. Hemoglobin gives up oxygen when the environment is _____
- Acidic
 - Alkaline
 - Icy
 - Open
19. Arranged in order of ions/s transported across the membrane, which is the correct sequence
- ATP Powered Pumps < Ion Channels < Transporters
 - Ion Channels < ATP Powered Pumps < Transporters
 - Transporters < Ion Channels < ATP Powered Pumps
 - ATP Powered Pumps < Transporters < Ion Channels
 -
20. What is the pH of a solution containing 0.02 M HA and 0.01 M A⁻? pKa of HA = 5.0.

Based on the equation: $HA \rightleftharpoons H^+ + A^-$

- 5.3
 - 4.7
 - 1.69
 - 2.0
21. Calculate the E_{Ca} for a cell that has [Ca²⁺] outside of 1000mM and internal [Ca²⁺] of 10mM. Assume the universal gas constant is 8 Joules. K⁻¹.mol⁻¹ (Joules per Kelvin per mole), temperature is 300K, Faraday's constant is 96500 Coulombs/mole
- 57mV
 - 114mV
 - 23mV
 - 46mV
22. Some diseases are caused by defects in neuronal insulation. Which structure would likely NOT be functioning properly in such a disease?
- Axon
 - Myelin sheath
 - Cell body
 - Synapse
23. GFP was originally isolated from
- Arabidopsis thaliana
 - Aequoria victoria
 - C elegans
 - Drosophila melanogaster
24. How many bases are there in the human genome
- 3000
 - 30,000
 - 3 million
 - 3 billion
25. What percent of your DNA is similar to any other person in the world?
- 99.9%
 - 1%
 - 98%
 - 90%

26. The first transgenic plant to be produced was
- Maize
 - Corn
 - Rice
 - Cotton
27. Golden rice has the following improved trait
- Increased Protein
 - Increased Vitamin A
 - Better insect resistance
 - High fat content
28. Which of these enzymes is used to convert mRNA to cDNA
- Taq polymerase
 - Reverse transcriptase
 - Nuclease
 - Alkaline phosphatase
29. The structure of a newly discovered hormone shows that it is a large peptide it is likely to:
- Bind to DNA and affect gene transcription
 - Bind to adenylate cyclase and stimulate protein kinase C
 - Bind to a cell surface receptor
 - None of the above
30. Excess growth hormone after puberty leads to
- Gigantism
 - Acromegaly
 - Dwarfism
 - Hypotension
31. What is the Molarity of a 2N H_2SO_4 solution?
- 2
 - 1
 - 4
32. Southern hybridization is used to identify a specific
- DNA
 - RNA
 - Protein
 - Protein-DNA complex
33. Different organisms have different frequency of occurrence of codons for the same amino acid this phenomenon is called _____
- Codon bias
 - Triplet codon
 - tRNA switch
 - Reading frame
34. What is T_m ?
- T_m is the mixing temperature for a microarray
 - T_m is the transient state of a mitochondrial DNA
 - T_m is the temperature at which half the bases in dsDNA are denatured
 - T_m is the reaction time of a primer pair to DNA
35. For a message encoded by DNA, how many reading frames are possible?
- 1
 - 3
 - 6
 - 9

36. Which is the best method to determine the concentration of bacteriophages in a sample?
- Plaque assay
 - Spectrophotometry
 - Light microscopy
 - None of the above
37. An enzyme used to cut DNA at a specific sequence
- Restriction enzyme
 - Polymerase
 - Ligase
 - None of the above
38. The inheritance of traits transmitted by mechanisms not directly involving the nucleotide sequence is called
-
- Mendel's laws
 - Morgan's laws
 - Epigenetic inheritance
 - None of the above
39. Which of these statements is FALSE
- Genes within tightly packaged heterochromatin are usually expressed
 - Genes within tightly packaged heterochromatin are usually NOT expressed
 - Histone acetylation loosens chromatin structure
 - Histone methylation condenses (packs) chromatin structure
40. If extracellular potassium is removed, what will happen to the activity of the sodium/potassium ATPase?
- It will stop working
 - It will slow down
 - It will continue pumping but will pump only Na ions

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Solutions

1. B
2. d
3. d
4. d
5. b
6. a
7. e
8. c
9. b
10. e
11. b
12. b
13. e
14. b
15. a
16. d
17. b
18. a
19. a
20. b

21. a
22. b
23. b
24. d
25. a
26. c
27. b
28. b
29. c
30. b
31. b
32. a
33. a
34. c
35. c
36. a
37. a
38. c
39. a
40. A