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CORRECT ANSWERS ARE LOCATED IN THE 2ND HALF OF THIS DOC.

MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.

1) The hypothesis that simple chemicals may have naturally become complex macromolecules by natural physical forces was first proposed by
   A) Stanley Miller.
   B) Graham Cairns Smith.
   C) Alexander Oparin and J. B. S. Haldane.
   D) Sidney Fox.

2) A solution that has a pH of 5 has
   A) a concentration of H^+ 20 times higher than water.
   B) a concentration of H^+ 100 times higher than water.
   C) a concentration of H^+ the same as water.
   D) a concentration of H^+ 20 times lower than water.
   E) a concentration of H^+ 100 times lower than water.

3) A dissolved substance that has the ability to either remove or add H^+ and OH^- ions to resist pH changes is
   A) a solution.
   B) pure water.
   C) a buffer.
   D) a solvent.

4) Most organic molecules are associated with living organisms. Which of the following statements is NOT related to the general distinctions between these types of molecules?
   A) Carbon dioxide (CO_2) lacks hydrogen atoms found in most organic molecules and therefore is usually not considered to be "organic."
   B) Formaldehyde (CH_2O) is a small molecule compared to most organic molecules but does have carbon and hydrogen covalently bonded together and therefore is considered to be "organic."
   C) Salt (Na^+Cl) is not an organic molecule but is important to the life of many organisms.
   D) Organic carbon atoms are more diverse than inorganic carbon molecules that form the molecular structure of soot or a diamond from pure carbon.
   E) All of the choices are correct.

5) Carbohydrates are categorized into
   A) organic and inorganic carbohydrates.
   B) saturated and unsaturated carbohydrates.
   C) monosaccharides, disaccharides, and polysaccharides.
   D) primary, secondary, tertiary, and quaternary carbohydrates.
   E) monomer and polymer carbohydrates.

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6) Which of the following is a "structural" carbohydrate molecule?
   A) sucrose
   B) glycogen
   C) cellulose
   D) glucose

7) Which of the carbohydrates given below is a major component of the cuticle of arthropods (e.g., insects, crayfish, etc.)?
   A) starch
   B) chitin
   C) cellulose
   D) glycogen

8) Which of the following carbohydrates is used in animal muscle and liver cells for energy storage?
   A) starch
   B) chitin
   C) cellulose
   D) glycogen

9) What are the monomers that make up the structure of polysaccharides?
   A) simple sugars
   B) amino acids
   C) nucleotides
   D) alternating sugar and phosphate groups
   E) fatty acids and glycerol

10) The three principal groups of lipids are triglycerides, phospholipids, and
   A) glycogen.
   B) steroids.
   C) amino acids.
   D) fatty acids.

11) A dehydration synthesis reaction is also
   A) a condensation reaction.
   B) a hydrolysis reaction.
   C) an isomeric reaction.
   D) a reaction that does not require enzymes.

12) Which of the lipid groups below is structurally unlike the others?
   A) steroids
   B) unsaturated fats
   C) triglycerides
   D) phospholipids

13) Which of the following lipids forms a bilayer between two fluid regions, such as in the plasma membrane of a cell?
   A) Steroids
   B) Waxes
   C) Phospholipids
   D) Lipoproteins

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14) Which of the following is NOT a steroid?
   A) vitamin D
   B) adrenocortical hormones
   C) sex hormones
   D) cholesterol
   E) All of the choices are steroids.

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15) If an animal needs to store high-energy compounds for long-term use with the least amount of extra body weight, which would be the best molecule for storage?
   A) fructose and glucose in the form of honey
   B) high-calorie fat molecules
   C) starch
   D) glycogen with extensive side branches of glucose

16) From what type of monomers is a protein composed?
   A) glucose or modified glucose molecules
   B) amino acids
   C) nucleotides
   D) fatty acids and glycerol

17) Which class of biological molecules has peptide bonds?
   A) carbohydrates
   B) lipids
   C) proteins
   D) simple sugars

18) A chain consisting of a number of amino acids is a
   A) quaternary structure.
   B) dipeptide.
   C) polypeptide.
   D) None of the choices is correct.

19) In a protein, the folding of a polypeptide into a three-dimensional structure, usually stabilized by covalent bonds between the side groups of the amino acids, is the
   A) primary structure.
   B) secondary structure.
   C) tertiary structure.
   D) quaternary structure.

20) At which level of protein organization is the alpha helix found?
   A) primary structure
   B) secondary structure
   C) tertiary structure
   D) quaternary structure

21) The splitting of one compound into two by the addition of water is called
   A) covalent.
   B) ionic formation.
   C) hydrolysis.
   D) condensation.

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22) You eat eggs for breakfast and return in the evening to dirty dishes with "dried on" yellow streaks. After soaking awhile, the egg yolk protein molecules easily "wash off." What happened?
A) Heating denatured the egg protein molecules, hydrolysis reactions then formed bonds in the dried egg yolk, and soaking in water eventually resulted in condensation reactions where water broke these bonds.
B) Heating denatured the egg protein molecules, unorganized condensation reactions formed bonds in the drying egg, and soaking in water resulted in hydrolysis reactions where water broke these bonds.
C) Egg monomers were fused to become one polymer, which was easily dissolved by water back into monomers.
D) Addition of water converted organic molecules into inorganic molecules.

23) At the molecular level, a cell's ability to vary in its operational tolerance to temperature and other factors is most closely related to
A) enzyme activity and protein denaturation.
B) ATP efficiency.
C) replication of nucleic acids.
D) extent of saturation of fatty acids.

24) DNA and RNA are polymers composed of repeated units called
A) nucleotides.
B) bases.
C) sugars.
D) None of the choices is correct.

25) Nucleic acids are important because they
A) act as buffers.
B) are the basic units of neutral fats.
C) direct the synthesis of proteins.
D) None of the choices is correct.

26) Which of these statements is true about DNA?
A) It is the genetic material of the cell.
B) It forms a protein.
C) It is pure amino acid.
D) It contains no sugar.

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27) Fish sperm is mostly made of male DNA. A chemical test would find high amounts of
A) nitrogenous bases, sugar, and phosphate groups.
B) phospholipids and steroids.
C) amino acids and unsaturated fats.
D) triglycerides and ATP.
E) globular proteins and stored fats.

28) Prions are infectious
A) carbohydrates.
B) proteins.
C) lipids.
D) Prions are not actually infectious.

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29) Which of the following forms of energy is NOT one of those thought to have been involved in the production of large organic molecules in the primitive reducing atmosphere?
A) radioactivity
B) electrical energy
C) radiation from the sun
D) sound

30) The term "reducing atmosphere" for the early earth means that the atmosphere
A) was much thinner around the surface of the earth than now.
B) contained only two or three kinds of gases.
C) contained little or no free oxygen.
D) contained little or no free nitrogen.

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31) Who first performed an experiment that proved that amino acids could be produced in the laboratory from a reducing atmosphere and electrical sparks?
A) Stanley Miller and Harold Urey
B) Graham Cairns Smith
C) Thomas Cech
D) Alexander Oparin and J. B. S. Haldane

32) Which molecule is thought to have been absent from the primitive reducing atmosphere?
A) water vapor (H_2O)
B) carbon dioxide (CO_2)
C) oxygen (O_2)
D) nitrogen (N_2)

33) What explains the key role of water in living systems?
A) Water has a high specific heat capacity.
B) Water has high surface tension.
C) Water is an excellent solvent.
D) All of the choices are correct.

34) A molecule of RNA that has enzymatic or catalytic properties is called a
A) deoxyribose.
B) nucleotide.
C) ribonucleic acid.
D) ribozyme.

35) The fact that nucleic acids are very complicated molecules suggests that
A) the RNA-first hypothesis is impossible.
B) the protein-first hypothesis is therefore the only plausible hypothesis.
C) no natural system could ever generate them.
D) None of the choices is correct.

36) The ancestral protocells
A) may have contained RNA or DNA as their genetic material.
B) may have evolved before the development of a true cell.
C) may have had a lipid and protein membrane surrounding them, forming a proteinoid microsphere.
D) may have contained a biochemical pathway for energy metabolism.
E) All of the choices are correct.

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37) Heating dry mixtures of amino acids and then mixing them with water forms small
A) strands of DNA.
B) living cells.
C) proteinoid microspheres.
D) plasma membranes.

38) If the hypothesis that protocells were based on an "RNA world" is correct, what would be necessary to shift to a "DNA world"?
A) an enzyme or reaction capable of removing one oxygen from ribose in nucleotides
B) enzymes for reverse transcription of RNA into DNA
C) new enzymes to replicate the DNA
D) new enzymes for transcribing DNA back to RNA
E) All are necessary to switch to a "DNA world."

39) Scientists once assumed that the earliest protocells would have been autotrophs. This concept appears to be
A) correct, since heterotrophs would depend upon eating autotrophs.
B) correct, since glycolysis and fermentation only occur after oxygen is present from photosynthesis.
C) incorrect, since the primordial soup likely contained many preformed food molecules suitable for heterotrophic metabolism.
D) incorrect, since glycolysis and fermentation require complex enzymes for catalytic reactions.

40) Prokaryotic cells are represented by fossils that are dated back as far as _____ billion years ago.
A) 1.5
B) 2.8
C) 3.8
D) 4.8

41) The first eukaryotic cells probably arose about _____ billion years ago.
A) 1.5
B) 2.5
C) 3.5
D) 4.5

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42) Which pairing of occurrence and date is correct?
   A) Beginning of Cambrian—600 million years ago
   B) Origin of life—3.8 billion years ago
   C) Origin of eukaryotic cells—1.5 billion years ago
   D) All of the choices are correct.

43) Our current understanding of the origin of eukaryotic organelles such as mitochondria is that they
   A) were copies of a cell nucleus that failed to be separated by cytokinesis.
   B) were prokaryotes that were taken into a cell and now live there symbiotically.
   C) were variations of the plasma membrane.
   D) were new forms of life that arose inside other cells.

FILL IN THE BLANK. Write the word or phrase that best completes each statement or answers the question.

44) The term _____ refers broadly to compounds that contain carbon.

45) The most important of the energy-storing carbohydrate monomers is the molecule _____.

46) The molecule _____ is an important form for storing sugar in animals and is found mainly in the liver and muscle cells of animals.

47) A(n) _____ fatty acid has two or more carbon atoms joined by double bonds.

48) When hemoglobin takes up or releases oxygen, it undergoes a change in its _____ structure.

49) Submarine hot springs where seawater seeps through cracks in the bottom and comes close to the hot magma are called _____ vents.

50) Most biological polymerizations are _____ dehydration reactions in which monomers are linked together by removal of water.

51) Sidney Fox studied the synthesis of polypeptides into polymers which in water formed small spherical bodies called _____ microspheres.

52) A critical answer to the chicken-or-the-egg problem formed by the nucleic-acid-or-enzyme-first dilemma is potentially solved by the discovery of catalytic RNAs called _____.

53) The earliest source of reduced compounds for oxidative metabolism was probably _____ _____.

54) Bacteria contain a single, large molecule of DNA in the _____ region.

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55) The _____ theory proposes that pre-eukaryotes are the result of anaerobic bacteria ingesting aerobic bacteria and subsequently a symbiotic relationship was formed.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

56) Describe the first evidence for chemical evolution that came from Stanley Miller's experiment.

57) This chapter began with Pasteur disproving spontaneous generation, the theory that life could arise from non-living material. Then Miller and Urey test the Oparin-Haldane hypothesis and suggest that the organic compounds required for life could be formed from the simpler molecules present in the prebiotic environment. Are these experiments contradictory? Explain how the science community recognize both as valid.

58) The Miller-Urey experiments demonstrated the formation of larger molecules from simple molecules. Why is there still a need for concentration in order to make formation of a protocell more likely?

59) Assumptions that the earliest life forms had to make their own food have been replaced with the belief that the earliest microorganisms were definitely primary heterotrophs. How could these earliest cells have lived if they did not make their own food, and why do we feel certain that they were not photosynthetic?

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60) What evidence do scientists have that the earth's primeval atmosphere was a reducing atmosphere?

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61) Why can't we set up an experiment that would again duplicate the conditions that were present at the early origin of protocells?

62) Describe the chicken-or-the-egg dilemma with enzymes and hereditary molecules, and detail how the "RNA world" proposal offers a solution.

63) What are the essential properties of a "protocell"?

64) Describe the endosymbiotic theory for the origin of eukaryotes.

65) What may have been the "reason" for the "Cambrian explosion"?

66) What evidence leads researchers to believe that there was a diversity of animal life before the Cambrian if we cannot find extensive fossils of earlier animals?

67) Compare and contrast the prokaryotic and eukaryotic cellular structures.

68) If eukaryotes are more complex than prokaryotes, then why are there prokaryotes living today?

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69) Does the recognition of prokaryotes as two major lineages, Archaebacteria and Eubacteria, result in any major changes to the internal taxonomic arrangement of the fungi, protozoan, plant, or animal groups?

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Answer Key

Test name: CH-02

1) C
2) B
3) C
4) E
5) C
6) C
7) B
8) D
9) A
10) B
11) A
12) A
13) C
14) E
15) B
16) B
17) C
18) C
19) C
20) B
21) C
22) B
23) A
24) A
25) C
26) A
27) A
28) B
29) D
30) C
31) A
32) C
33) D
34) D
35) D
36) E
37) C
38) E
39) C
40) C
41) A
42) D
43) B
44) organic
45) glucose
46) glycogen
47) unsaturated
48) quaternary
49) hydrothermal
50) condensation
51) proteinoid
52) ribozymes
53) hydrogen sulfide
54) nucleoid
55) endosymbiotic
56) Essay
Answers will vary.

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57) Essay
Answers will vary.

58) Essay
Answers will vary.

59) Essay
Answers will vary.

60) Essay
Answers will vary.

61) Essay
Answers will vary.

62) Essay
Answers will vary.

63) Essay

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Answers will vary.

64) Essay
Answers will vary.

65) Essay
Answers will vary.

66) Essay
Answers will vary.

67) Essay
Answers will vary.

68) Essay
Answers will vary.

69) Essay
Answers will vary.

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