Chapter (3): The chemistry of water

1) The specific heat of water is:

A. High
B. Low
C. Moderate
D. None of the above

2) Each water molecule can form hydrogen bond with other ---------- molecules.

A. 4
B. 3
C. 2
D. 1
E. None of the above

3) Some evaporation can occur at ----------:

A. High temperature
B. Low temperature
C. Any temperature
D. At 100C
E. None of the above

4) The following figure shows:

A. Adhesion
B. Cohesion
C. Surface tension
D. Evaporative cooling
E. None of the above

5) The specific heat of water is:

A. 5 Cal per g per C
B. 2 Cal per g per C
C. 3 Cal per g per C
D. 1 Cal per g per C
E. 4 Cal per g per C

6) In aqueous solution, the solvent is ----------:

A. Water
B. Chloroform
C. Ether
D. All of the above
E. None of the above

7) When water vaporizes, which of the following bonds must be broken?

A. Ionic
B. Polar covalent
C. Hydrogen
D. Hydrophobic
E. None of the above

8) Which of the following classified as hydrophilic molecules but cannot dissolve in water?

A. Cellulose
B. Cotton
C. Salt
D. Oils
E. Both A and B correct

9) Hydration shell can be form around:

A. Ion
B. Sugar
C. Oil
D. Glucose
E. All of them except (c)

10) What is specific heat:

A. The temperature it takes to raise 1g of a substance by 1 degree C
B. The temperature it takes to raise 1g of a substance by 1 degree F
C. The temperature in Celsius to boil 1g of a substance at boiling point
D. The temperature in Fahrenheit to boil 1g of a substance at boiling point

11) Describe water's heat of vaporization:

A. High
B. Low
C. Moderate
D. It has none
E. All of the above

12) Which of the following is not property of liquid water?

A. Ice has a lower density than liquid water
B. Liquid water has high surface tension
C. Can form hydrogen bond with other water molecules
D. Has a low specific heat
E. None of the above

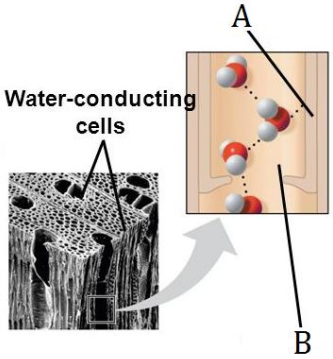
13) The sphere of water molecule around an ions is known as:

A. Hydration shell
B. Cohesion
C. Adhesion
D. Surface tension
E. None of the above

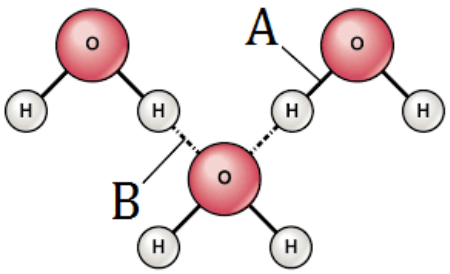
14) The property that can make water resistant to changing in its temperature:

A. High surface tension
B. High specific heat
C. High heat of evaporation
D. Its V shape
E. Covalent bond between water molecules

15) According to the figure, which letters represent adhesion and which of them represent cohesion?



16) According to the figure A represents ---------- bond while B represent ---------- bond:



17) Which of the following is true about electronegativity of oxygen and hydrogen?

A. Hydrogen is more electronegative than oxygen
B. Oxygen is more electronegative than hydrogen
C. Oxygen and hydrogen have the same electronegativity
D. Oxygen and water don't have significant electronegativity in water

18) Ice floats above liquid water because:

A. Ice is less dense than water
B. Liquid water is less dense than water
C. Both of liquid water and ice have the same density
D. A and C
E. None of the above

19) Most important reason for unusual properties of water is:

A. the covalent bonding pattern in water molecule
B. The bond angle between two hydrogen atoms in the molecule
C. Hydrogen bonding between water molecules
D. None of the above
E. All of the above

20) The oxygen atom in a water molecule due to its high electronegativity bears:

A. one negative charge
B. Two negative charges
C. One positive charge
D. Two positive charges
E. None of the above

21) Transformation of a material from liquid to gaseous state is known as:

A. Evaporation
B. Vaporization
C. Boiling
D. Condensation
E. A and B are correct

22) Which of the following helps in the transporting of water against gravity?

A. Cohesion
B. Adhesion
C. Evaporation
D. Condensation
E. All of them except D

23) **The tendency of water molecules to stay close to each other as a result of hydrogen bonding ----------:**

A) Provides the surface tension that allows leaves to float on water
B) Is called cohesion
C) Acts to moderate temperature
D) Keeps water moving through the vessels in a tree trunk
E) All of the listed responses are correct.

24) **The partial charges on a water molecule occur because of --------:**

A) The high electronegativity of hydrogen

B) The achievement of a stable configuration by one atom of a bond but not by the other partner

C) Widespread ionization

D) Covalent bonding

E) The unequal sharing of electrons between the hydrogen and the oxygen atoms of a water molecule

25) "Hydrogen bond" is:

- Attraction between hydrogen and electronegative atom

26) Which of the following is a hydrophobic material?

A) Paper

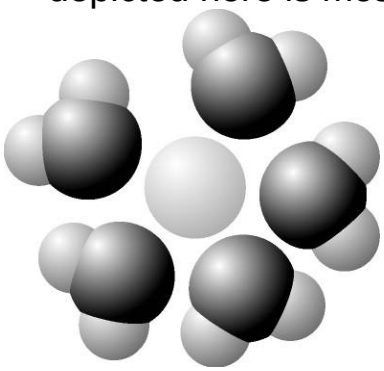
B) Table salt

C) Wax

D) Sugar

E) Pasta

27) Based on your knowledge of the polarity of water molecules, the solute molecule depicted here is most likely



A) Positively charged.

B) Negatively charged.

C) Without charge.

D) Hydrophobic.

E) Nonpolar.

Answers

1. (A) High
2. (A) 4
3. (C) At any temperature
4. (C) Surface tension
5. (D) 1 cal per g per C
6. (A) water
7. (D) hydrogen bond
8. (E) Both a and b are correct
9. (E) All of them except C
10. (A) The temperature it takes to raise 1 gram of a substance by 1 degree C
11. (A) high
12. (D) has a low specific heat
13. (A) Hydration shell
14. (B) high specific heat
15. A. Adhesion B.Cohesion
16. A. polar covalent bond B. Hydrogen bond
17. (B) Oxygen is more electronegative than hydrogen
18. (A) Ice is less dense than water
19. (C) Hydrogen bonding between water molecules
20. (B) Two negative charges
21. (E) Both A and B are correct
22. (E) All of them except (D)
23. (E) All of the listed responses are correct
24. (E) Unequal sharing of electrons between hydrogen and oxygen of a water
25. Answered
26. (C) Wax
27. (A) positively charged

Chapter (3): The chemistry of water – Summary

- Concept 3.1 Polar covalent bonds in water molecules result in hydrogen bonding
- Water is a **polar molecule**. A hydrogen bond forms when a partially negatively charged region on the oxygen of one water molecule is attracted to the partially positively charged hydrogen of a nearby water molecule.
- Hydrogen bonding between water molecules is the basis for water's properties.

- Concept 3.2 Four emergent properties of water contribute to Earth's suitability for life
- Hydrogen bonding keeps water molecules close to each other, giving water **cohesion**.
- Hydrogen bonding is also responsible for water's **surface tension**.
- Water has a high **specific heat**: Heat is absorbed when hydrogen bonds break and is released when hydrogen bonds form. This helps keep **temperatures** relatively steady, within limits that permit life.
- **Evaporative cooling** is based on water's high **heat of vaporization**. The evaporative loss of the most energetic water molecules cools a surface.

- Ice floats because it is less dense than liquid water. This property allows life to exist under the frozen surfaces of lakes and polar seas.
- Water is an unusually versatile **solvent** because its polar molecules are attracted to ions and polar substances that can form hydrogen bonds.
- **Hydrophilic** substances have an affinity for water; **hydrophobic** substances do not.
- **Molarity**, the number of moles of **solute** per liter of **solution**, is used as a measure of solute concentration in solutions.
- A **mole** is a certain number of molecules of a substance.
- The mass of a mole of a substance in grams is the same as the **molecular mass** in daltons.
- The emergent properties of water support life on Earth and may contribute to the potential for life to have evolved on other planets.

Chapter (5): Biological macromolecules

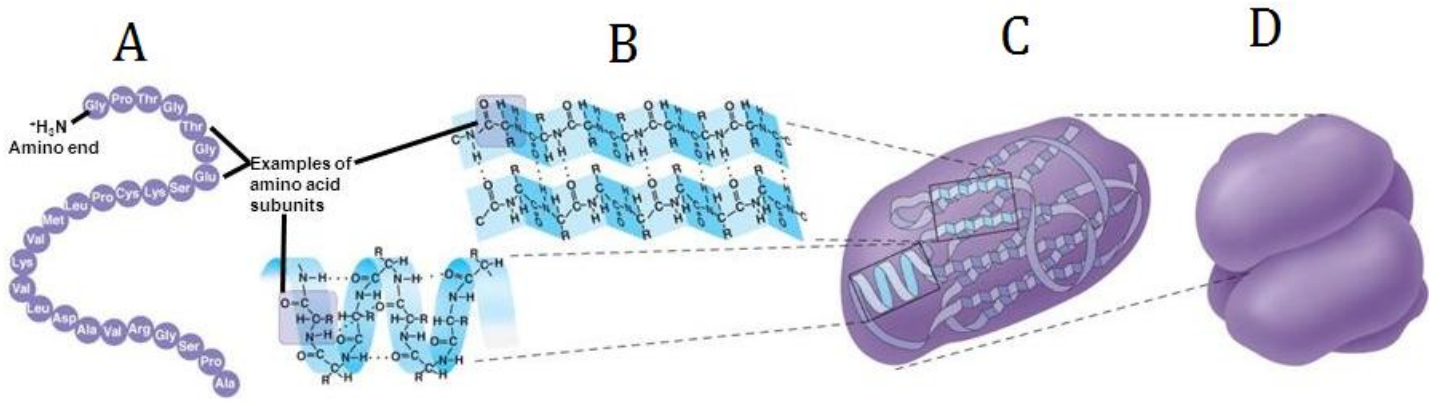
1) Aldose sugars and ketose sugars differ in:

A. Position of carbonyl group
B. Number of carbonyl groups
C. Position of carboxyl group
D. Number of carboxyl groups
E. None of the above

2) Cholesterol is a:

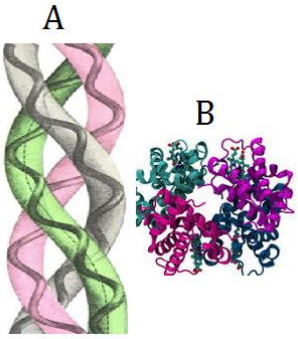
A. Triglyceride
B. Phospholipid
C. Steroid
D. Protein
E. All of the above

3) According to this figure:



- Which of them stabilized by Disulfide Bridge?
- Which of them least affected by disruption of hydrogen bond?
- Which of them formed by hydrogen bonding between backbones?
- Which of them consists of two or more polypeptides?

4) The figure shows two examples of quaternary protein structure , A is --------- and found as ---------- while b is ---------- and found as ---------- :



A. Hemoglobin , Fibrous protein
B. Hemoglobin , Globular protein
C. Collagen , Fibrous protein
D. Collagen , Globular protein
E. C and B

5) Sulfur can be found in:

A. Proteins
B. Starch
C. DNA
D. Cholesterol
E. Fats

6) "Insoluble fibers" is:

A. Carbohydrate
B. Cellulose
C. Starch
D. Glycogen
E. A and B

7) Disulfide bridge can stabilize ---------- structure of protein:

A. Primary
B. Secondary
C. Tertiary
D. Quaternary
E. All of the above

8) Secondary structure of protein form by hydrogen bonding between ----------:

A. Backbone
B. Side chain
C. R group
D. Amino groups
E. None of the above

9) Which of the following is “Storage carbohydrate in plant”?

A. Starch
B. Cellulose
C. Glycogen
D. Chitin
E. Insulin

10) Which of the following does not contain amino acids?

A. Hemoglobin
B. Collagen
C. Enzymes
D. RNA
E. Insulin

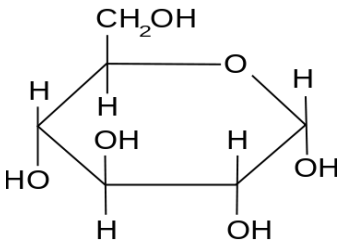
11) How many water molecules needed to hydrolyze a polymer made of 4 monomers?

A. 4
B. 3
C. 2
D. 1
E. None of the above

12) Which of the following is mismatched?

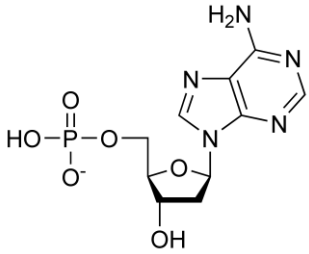
A. Polypeptide = peptide bond
B. Fats = ester bond
C. Carbohydrate = Glycosidic linkage
D. Nucleic acids = Phosphodiester bond
E. All of them are true

13) Which of the following is true about this figure?



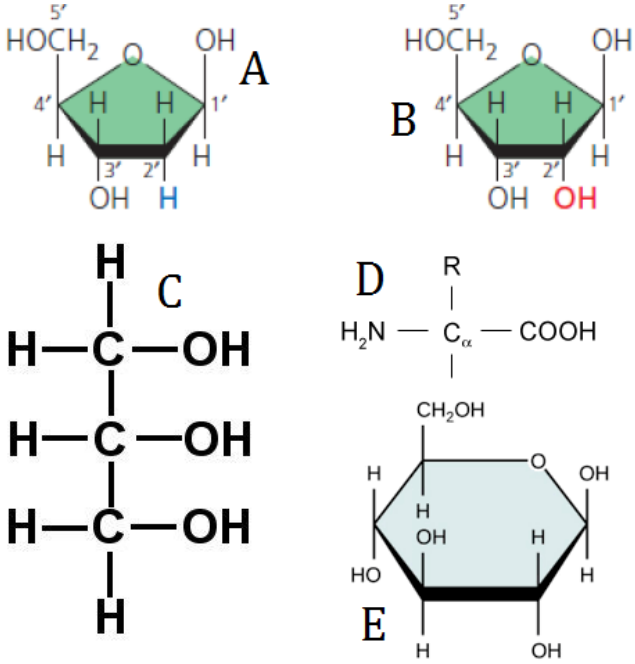
A. It represents alpha glucose
B. Can be found in starch and glycogen
C. Can be found in cellulose
D. Presented in linear form
E. Both A and B are correct

14) The figure represents:



A. Nucleotide
B. Nucleoside monophosphate
C. Nucleoside diphosphate
D. Nucleoside triphosphate
E. Both A and B can be correct

15) According to the figure:

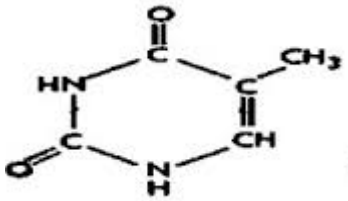


- Which of them found only in DNA?
- Which of them found only in RNA?
- Which of them can found in collagen?
- Which of them is involved in the synthesis of ester bond?
- Which of them can be found in cellulose?

16) Which of the following is true about DNA?

A. It's 5' end contains OH group
B. It's 3' end contains phosphate group
C. It's contains ionic bonds between nitrogenous bases
D. It is found as a double helix molecule
E. It contains ribose sugar in its nucleotide

17) The figure represents:



A. Purine
B. Pyrimidine
C. Sugar
D. Protein
E. Fat

18) Which of the following is hydrophobic?

A. Cellulose
B. Starch
C. Animal fats
D. Oils
E. C and D are correct

19) Which of the following is true about saturated fats?

A. It contains unsaturated fatty acids with double bonds
B. It contains saturated fatty acids with no kinks
C. Animal fats is an example for saturated fats
D. It is solid at room temperature
E. All of them are true except of A

20) In order to synthesize one fat molecule, the dehydration reaction needs to remove --------- water molecules:

A. 3
B. 4
C. 5
D. 6

21) Which of the following does not contain true polymer?

A. Proteins
B. Carbohydrate
C. Lipids
D. DNA
E. RNA

22) Lipids are a group of molecules that ---------- :

A. Contain peptide bonds
B. Mix poorly with water
C. Contain polar parts
D. All of the above
E. A and B

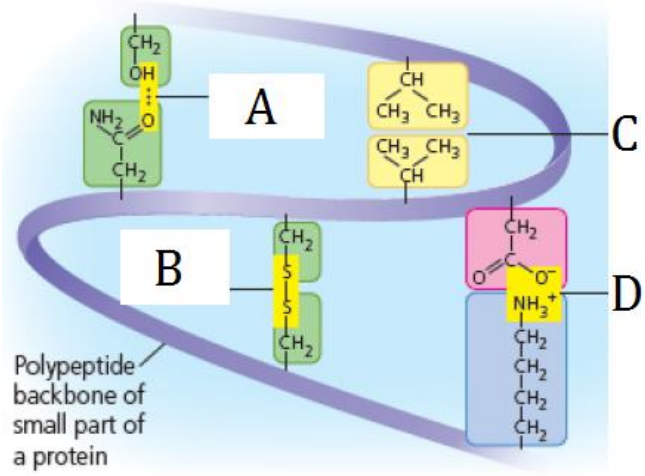
23) Enzymes are usually ----------:

A. Carbohydrate
B. Fats
C. Nucleic acids
D. Monosaccharides
E. Proteins

24) Animals store glucose in the form of which macromolecule?

A. Amylose
B. Glycogen
C. Glycerol
D. Cellulose
E. Amylopectin

25) Name A,B,C,D which represent the types of bonds involved in tertiary structure:



26) Using this terms, fill in the blank:

(Primary structure, Secondary structure, Tertiary structure, Quaternary structure)

A. Represent association between two or more polypeptides ----------
B. Represent linear amino acid sequence of the protein ----------
C. Represent 3D shape of protein that stabilized by interaction between side chains ----------
D. Represent regions stabilized by hydrogen bonds between the atoms of backbone ----------

27) Which of the following is true about globular proteins?

A. It's hydrophilic amino acids can be found at the surface
B. It's hydrophilic amino acids can be found in the core
C. It's hydrophobic amino acids can be found at the surface
D. It's hydrophobic amino acids can be found in the core
E. Both A and D are correct

28) The minimum number of carbons in monosaccharide is:

A. 4
B. 5
C. 3
D. 2
E. 1

29) In the formation of a macromolecule, what type of reaction would join two subunits together?

A. Hydrophobic reaction
B. Hydrolysis reaction
C. Dehydration reaction
D. Denaturation reaction

30) Assuming that all of the below given compound had the same number of carbon atoms, which of the following has the most C-H bonds?

A. Unsaturated fat
B. Poly-saturated fat
C. Polysaccharide
D. Saturated fat

31) Which of the following is not a disaccharide?

A. Sucrose
B. Maltose
C. Lactose
D. Amylose

32) What type of macromolecule carries out catalysis in biological systems?

A. Proteins called enzymes
B. Carbohydrates called starches
C. Lipids called steroids
D. Nucleic acids called DNA

33) What are the most diverse macromolecules in the cell?

A. Lipids
B. Mineral salts
C. Proteins
D. Carbohydrates

34) All of the following considered as lipids except of:

A. Fats
B. Phospholipids
C. Some waxes and pigments
D. Cholesterol
E. All of them are lipids

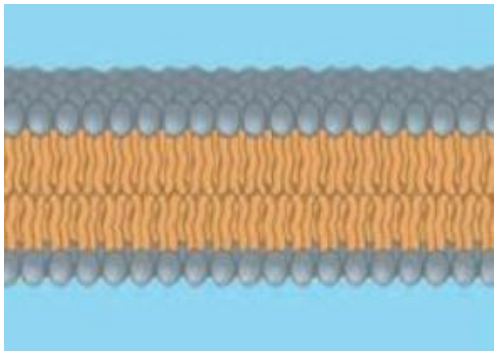
35) The figure shows:

A. DNA double helix
B. RNA 3D shape
C. Collagen
D. Cellulose
E. None of the above

36) The sugar that have nitrogen containing appendage in their monomer is:

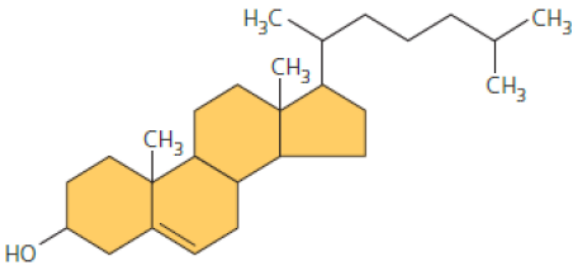
A. Cellulose
B. Starch
C. Glycogen
D. Chitin
E. Amylose only

37) The figure shows:



A. Phospholipid bilayer
B. The structure of cell membrane
C. Unsaturated fats
D. Cholesterol
E. A and B are correct

38) Which of the following is true about the figure:



A. It is a steroid
B. It is found in the cell membrane of animal cells
C. It is a globular protein
D. It is a hydrophilic molecule
E. Both A and B are correct

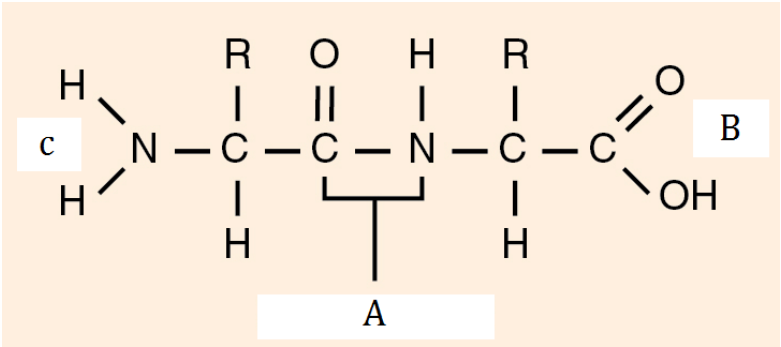
39) Human sex hormone can be classified as:

A. Protein
B. Lipid
C. Steroid
D. Both B and C
E. Both A and B

40) The simplest amino acid is:

A. Glycine
B. Serine
C. Lysine
D. Valine
E. Glutamine

41) According to the figure:



- A represents ---------- bond.
- C represents ----------
- B represents ----------

42) Oils are liquid at room temperature because they:

A. Are small molecules
B. Are non-polar
C. Are hydrophilic
D. Contains unsaturated fatty acids
E. Contains saturated fatty acids

43) Which of the following nitrogenous bases is Purine?

A. C and G
B. A and G
C. Adenine only
D. U and T
E. Thymine only

44) In a sucrose molecule, the linkage between glucose and fructose is:

A. 1-4 glycosidic
B. 1-2 glycosidic
C. 1-6 glycosidic
D. Peptide
E. Ester

45) Which of the following found only in RNA?

A. Ribose sugar and adenine
B. Deoxyribose sugar and uracil
C. Ribose sugar and uracil
D. Ribose sugar and guanine
E. Any of the above

46) RNA molecules can found as a 3D shape due to:

A. Hydrogen bonds between complementary base pairing

47) When protein losing its native shape it called:

A. Denaturation
B. Renaturation
C. Destruction
D. Deformation
E. None of the above

48) Phospholipids contain:

A. Glycerol
B. 2 hydrocarbon tails
C. Phosphate group
D. Amino group
E. All of them except of (D)

49) Which of the following is false about cellulose?

A. It made of B-glucose
B. It is the main component of plant cell wall
C. Can form hydrogen bond with other parallel cellulose molecules
D. It cannot be digested by human enzymes
E. All of them are true

50) Which of the following is true?

A. Amylose is branched molecule
B. Amylopectin is unbranched molecule
C. Starch contains alpha glucose in its monomer
D. Human can digest starch
E. Both C and D are correct

51) Misfolded proteins involved in:

A. Mad cow disease
B. Parkinson's disease
C. Cystic fibrosis
D. Alzheimer's
E. All of the above

52) Which of the following is true about sickle cell anemia?

A. It is caused by pint mutation that lead to substitution of one amino acid
B. It is involved abnormal alpha subunits
C. Hemoglobin molecules aggregate in a long fiber
D. Reduced capacity for oxygen transport
E. All of them are true except of (B)

53) Which of the following categories includes all others in the list?

A. Disaccharide
B. Polysaccharide
C. Starch
D. Carbohydrate

54) Molecules with which functional groups may form polymers via dehydration reactions?

A) Hydroxyl groups
B) Carbonyl groups
C) Carboxyl groups
D) Either carbonyl or carboxyl groups
E) Either hydroxyl or carboxyl groups

55) Which of these molecules is not formed by dehydration reactions?

A) Fatty acids
B) Disaccharides
C) DNA
D) Protein
E) Amylose

56) Which of these classes of biological molecules consist of both small molecules and macromolecular polymers?

A) Lipids
B) Carbohydrates
C) Proteins
D) Nucleic acids
E) Lipids, carbohydrates, proteins, and nucleic acids all consist of only macromolecular polymers

57) Which of the following is not a polymer?

A) Glucose
B) Starch
C) Cellulose
D) Chitin
E) DNA

58) **What is the chemical reaction mechanism by which cells make polymers from monomers?**

A) Phosphodiester linkages
B) Hydrolysis
C) Dehydration reactions
D) Ionic bonding of monomers
E) The formation of disulfide bridges between monomers

59) How many molecules of water are needed to completely hydrolyze a polymer that is 11 monomers long?

A) 12
B) 11
C) 10
D) 9
E) 8

60) Which of the following best summarizes the relationship between dehydration reactions and hydrolysis?

A) Dehydration reactions assemble polymers, and hydrolysis reactions break down polymers.
B) Dehydration reactions eliminate water from lipid membranes, and hydrolysis makes lipid membranes water permeable.
C) Dehydration reactions can occur only after hydrolysis.
D) Hydrolysis creates monomers, and dehydration reactions break down polymers.
E) Dehydration reactions ionize water molecules and add hydroxyl groups to polymers; hydrolysis reactions release hydroxyl groups from polymers.

61) Which of the following polymers contain nitrogen?

A) Starch
B) Glycogen
C) Cellulose
D) Chitin
E) Amylopectin

62) A molecule with the chemical formula $C_6H_{12}O_6$ is probably a

A) Carbohydrate.
B) Lipid.
C) Monosaccharide
D) Carbohydrate and lipid only.
E) Carbohydrate and monosaccharide only.

63) Lactose, a sugar in milk, is composed of one glucose molecule joined by a glycosidic linkage to one galactose molecule. How is lactose classified?
A) As a pentose
B) As a hexose
C) As a monosaccharide
D) As a disaccharide
E) As a polysaccharide

64) Which of the following is true of both starch and cellulose?
A) They are both polymers of glucose.
B) They are *cis-trans* isomers of each other.
C) They can both be digested by humans.
D) They are both used for energy storage in plants.
E) They are both structural components of the plant cell wall.

65) Which of the following statements is true for the class of biological molecules known as lipids?
A) They are insoluble in water.
B) They are made from glycerol, fatty acids, and phosphate.
C) They contain less energy than proteins and carbohydrates.
D) They are made by dehydration reactions.
E) They contain nitrogen.

66) Large organic molecules are usually assembled by polymerization of a few kinds of simple subunits. Which of the following is an exception to this statement?
A) A steroid
B) Cellulose
C) DNA
D) An enzyme
E) A contractile protein

67) The bonding of two amino acid molecules to form a larger molecule requires
A) The release of a water molecule.
B) The release of a carbon dioxide molecule.
C) The addition of a nitrogen atom.
D) The addition of a water molecule.
E) The release of a nitrous oxide molecule.

68) There are 20 different amino acids. What makes one amino acid different from another?

A) Different side chains (R groups) attached to a carboxyl carbon
B) Different side chains (R groups) attached to the amino groups
C) Different side chains (R groups) attached to an α carbon
D) Different structural and optical isomers
E) Different asymmetric carbons

69) Upon chemical analysis, a particular polypeptide was found to contain 100 amino acids. How many peptide bonds are present in this protein?

A) 101
B) 100
C) 99
D) 98
E) 97

70) The tertiary structure of a protein is the

A) Bonding together of several polypeptide chains by weak bonds.
B) Order in which amino acids are joined in a polypeptide chain.
C) Unique three-dimensional shape of the fully folded polypeptide.
D) Organization of a polypeptide chain into an α helix or β pleated sheet.
E) Overall protein structure resulting from the aggregation of two or more polypeptide subunits

71) DNAase is an enzyme that catalyzes the hydrolysis of the covalent bonds that join nucleotides together. What would first happen to DNA molecules treated with DNAase?

A) The two strands of the double helix would separate.
B) The phosphodiester bonds between deoxyribose sugars would be broken.
C) The purines would be separated from the deoxyribose sugars.
D) The pyrimidines would be separated from the deoxyribose sugars.
E) All bases would be separated from the deoxyribose sugars.

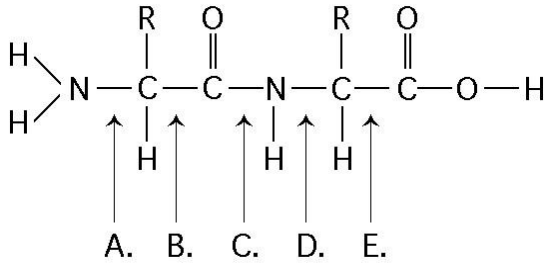
72) If a DNA sample were composed of 10% thymine, what would be the percentage of guanine?

A) 10
B) 20
C) 40
D) 80
E) Impossible to tell from the information given

73) Which of the following statements best summarizes the differences between DNA and RNA?

A) DNA encodes hereditary information, whereas RNA does not.
B) The bases in DNA form base-paired duplexes, whereas the bases in RNA do not.
C) DNA nucleotides contain a different sugar than RNA nucleotides.
D) DNA contains the base uracil, whereas RNA contains the base thymine.
E) DNA encodes hereditary information, whereas RNA does not; the bases in DNA form base-paired duplexes, whereas the bases in RNA do not; and DNA nucleotides contain a different sugar than RNA nucleotides.

74) According to the figure:



- Which bond is a peptide bond?

A) A
B) B
C) C
D) D
E) E

- Which bond is closest to the amino terminus of the molecule?

A) A
B) B
C) C
D) D
E) E

- At which bond would water need to be added to achieve hydrolysis of the peptide, back to its component amino acid?

A) A
B) B
C) C
D) D
E) E

75) The molecular formula for glucose is $C_6H_{12}O_6$. What would be the molecular formula for a polymer made by linking ten glucose molecules together by dehydration reactions?

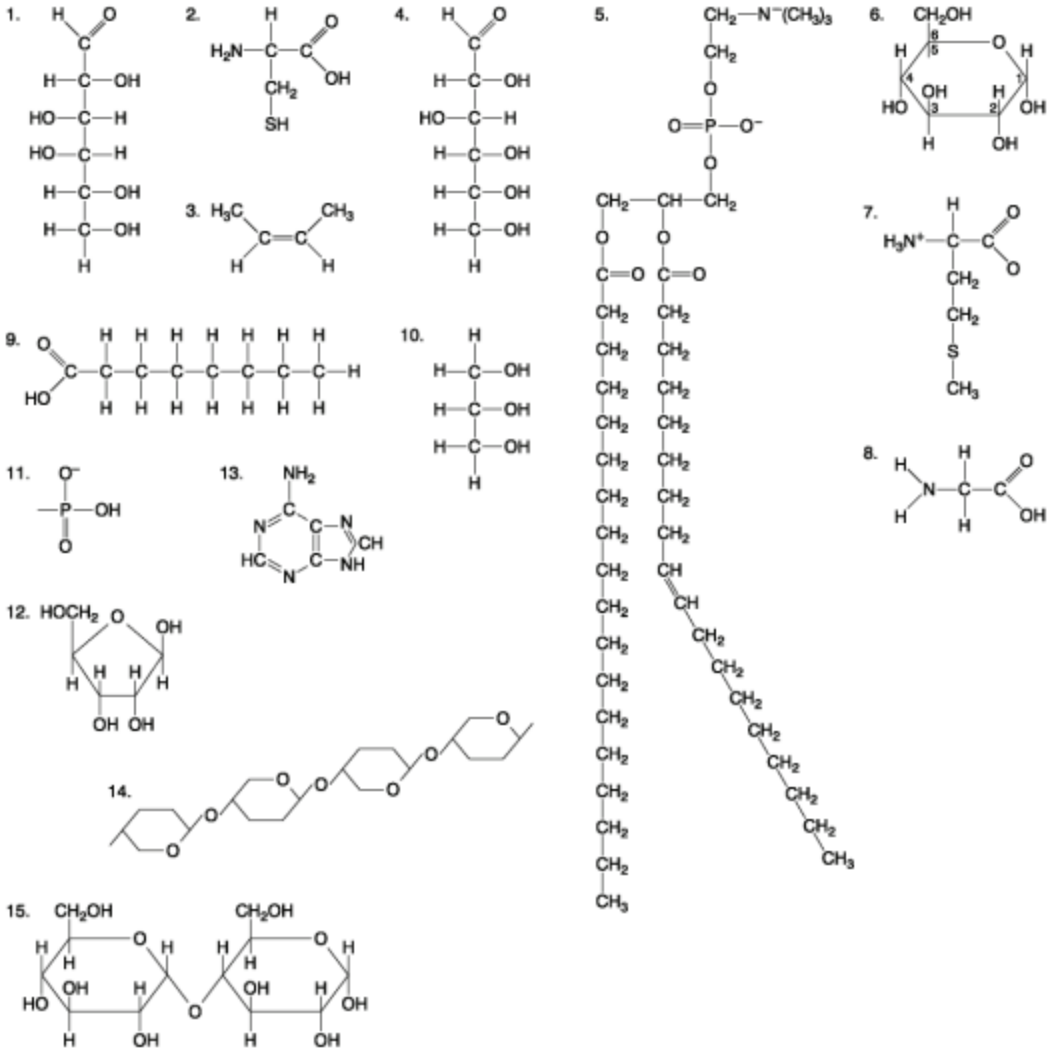
A) $C_{60}H_{120}O_{60}$
B) $C_6H_{12}O_6$
C) $C_{60}H_{102}O_{51}$
D) $C_{60}H_{100}O_{50}$
E) $C_{60}H_{111}O_{51}$

- مساعدة : نقوم بضرب صيغة سكر الغلوكوز ب(١٠) ثم نطرح من الصيغة ٩ جزيئات ماء بسبب الحاجة لتسعة روابط لربط هذه المونومرات.

76) Which of the following pairs of base sequences could form a short stretch of a normal double helix of DNA?

A) 5'-purine-pyrimidine-purine-pyrimidine-3' with 3'-purine-pyrimidine-purine-pyrimidine-5'
B) 5'-AGCT-3' with 5'-TCGA-3'
C) 5'-GCGC-3' with 5'-TATA-3'
D) 5'-ATGC-3' with 5'-GCAT-3'
E) All of these pairs are correct.

77) According to the figure:



A. Which molecule has hydrophilic and hydrophobic properties and would be found in plasma membranes?
B. Which of them could be linked together to form a nucleotide?
C. Which of the following molecules contain(s) an aldehyde type of carbonyl functional group
D. Which molecule is glycerol?
E. Which molecule is a saturated fatty acid?
F. Which of the following molecules is a purine type of nitrogenous base?
G. Which of the following molecules act as building blocks (monomers) of polypeptides?
H. Which of the following molecules is an amino acid with a hydrophobic R group or side

I. Which of the following molecules could be joined together by a peptide bond as a result of a dehydration reaction?
J. A fat (or triacylglycerol) would be formed as a result of a dehydration reaction between

Answers

1. (A) Position of carbonyl group
2. (C) Steroid
3. - C - A - B - D
4. (E) Both c and b respectively
5. (A) proteins
6. (B) Cellulose
7. (C) Tertiary
8. (A) Backbone
9. (A) Starch
10. (D) DNA
11. (B) 3
12. (E) All of them are true
13. (E) Both A and B correct
14. (E) Both A and B are correct
15. – A - B - D - C - E
16. (D) It is found as a double helix molecule
17. (B) pyrimidine
18. (E) both c and d are correct
19. (E) all of them true except of (A)
20. (A) 3
21. (C) Lipids
22. (B) Mix poorly with water
23. (E) protein
24. (B) glycogen
25. A. Hydrogen bond B. Disulfide bridge C. Hydrophobic interaction D. Ionic bond
26. A. Quaternary B. Primary C. Tertiary D. Secondary
27. (E) Both A and D are correct
28. (C) 3
29. (C) Dehydration reaction
30. (D) Saturated fatty acids
31. (D) Amylose

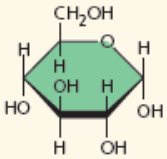
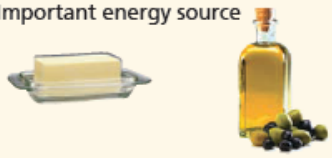
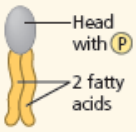
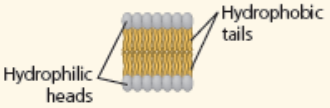
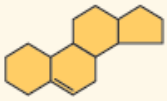
32. (A) proteins called enzymes
33. (C) proteins
34. (E) All of them
35. (C) Collagen
36. (D) Chitin
37. (E) both a and b are correct
38. (E) both a and b are correct
39. (E) b and c are correct
40. (A) Glycine
41. – peptide bond - N terminus - C terminus
42. (D) contain unsaturated fatty acids
43. (b) A and G
44. (B) 1,2-glycosidic linkage
45. (C) Ribose sugar and uracil
46. Answered
47. (A) Denaturation
48. (E) All of them except of D
49. (E) All of them are true
50. (E) both c and d are correct
51. (E) all of them
52. (E) all of them except b
53. (D) Carbohydrate
54. (E) either hydroxyl or carboxyl group
55. (A) Fatty acids
56. (B) Carbohydrate
57. (A) glucose
58. (C) dehydration reaction
59. (C) 10
60. (A) dehydration reaction assemble polymers and hydrolysis reaction breaks down polymers
61. (D) Chitin
62. (E) Carbohydrate and monosaccharide only
63. (D) as a disaccharide
64. (A) They are both a polymer of glucose

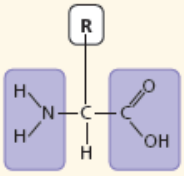
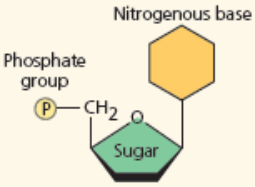
65. (A) They are insoluble in water
66. (A) a steroid
67. (A) The release of water molecule
68. (C) different side chains (R groups) attached to alpha carbon
69. (C) 99
70. (C) unique three-dimensional shape of the fully folded polypeptide
71. (B) The phosphodiester bonds between deoxyribose sugars would be broken
72. (C) 40
73. (C) DNA nucleotide contains different sugar than RNA nucleotide
74. – C - A - C
75. (C) $C_{60}H_{102}O_{51}$
76. (B) 5’-AGCT-3’ with 5’-TCGA-3’
77.

A. 5
B. 11,12,13
C. 1 and 4
D. 10
E. 9
F. 13
G. 2,7,8
H. 7
I. 7 and 8
J. Three molecules of 9 and one molecule of 10

Chapter (5): Biological macromolecules – Summary

- Concept 5.1 Macromolecules are polymers, built from monomers
- Large carbohydrates (polysaccharides), proteins, and nucleic acids are **polymers**, which are chains of **monomers**. The components of lipids vary.
- Monomers form larger molecules by **dehydration reactions**, in which water molecules are released.
- Polymers can disassemble by the reverse process, **hydrolysis**. An immense variety of polymers can be built from a small set of monomers.

Large Biological Molecules	Components	Examples	Functions
CONCEPT 5.2 **Carbohydrates serve as fuel and building material**	 Monosaccharide monomer	**Monosaccharides:** glucose, fructose **Disaccharides:** lactose, sucrose	Fuel; carbon sources that can be converted to other molecules or combined into polymers
		Polysaccharides: ▪ Cellulose (plants) ▪ Starch (plants) ▪ Glycogen (animals) ▪ Chitin (animals and fungi)	▪ Strengthens plant cell walls ▪ Stores glucose for energy ▪ Stores glucose for energy ▪ Strengthens exoskeletons and fungal cell walls
CONCEPT 5.3 **Lipids are a diverse group of hydrophobic molecules**		**Triacylglycerols** (fats or oils): glycerol + three fatty acids	Important energy source 
		**Phospholipids:** glycerol + phosphate group + two fatty acids	Lipid bilayers of membranes 
	 Steroid backbone	**Steroids:** four fused rings with attached chemical groups	▪ Component of cell membranes (cholesterol) ▪ Signaling molecules that travel through the body (hormones)

CONCEPT 5.4 **Proteins include a diversity of structures, resulting in a wide range of functions**	 Amino acid monomer (20 types)	▪ Enzymes ▪ Defensive proteins ▪ Storage proteins ▪ Transport proteins ▪ Hormones ▪ Receptor proteins ▪ Motor proteins ▪ Structural proteins	▪ Catalyze chemical reactions ▪ Protect against disease ▪ Store amino acids ▪ Transport substances ▪ Coordinate organismal responses ▪ Receive signals from outside cell ▪ Function in cell movement ▪ Provide structural support
CONCEPT 5.5 **Nucleic acids store, transmit, and help express hereditary information** *(pp. 132–134)*	 Nucleotide (monomer of a polynucleotide)	**DNA:**  ▪ Sugar = deoxyribose ▪ Nitrogenous bases = C, G, A, T ▪ Usually double-stranded	Stores hereditary information
		RNA:  ▪ Sugar = ribose ▪ Nitrogenous bases = C, G, A, U ▪ Usually single-stranded	Various functions in gene expression, including carrying instructions from DNA to ribosomes

Chapter (7): Cell structure and function

1) Which of the following maintains the shape of nucleus?

A. Chromatin
B. Chromosome
C. Nuclear envelope
D. Nucleolus
E. Nuclear lamina

2) Which of the following organelles can convert energy from type to another?

A. Golgi apparatus and Rough ER
B. Ribosomes
C. Mitochondria and chloroplasts
D. Smoot
E. ER and lysosome

3) What is the function of (Contractile vacuole)?

- Answer: Remove excess water “fluid” from the cell

4) What is the function of “Rough endoplasmic reticulum”?

- Synthesis of secretory proteins

5) Which of the following is not a part of extracellular matrix?

A. Collagen
B. Proteoglycan
C. Fibronectin
D. Integrins
E. Cellulose

6) Photosynthesis occur in ----------:

A. Mitochondria
B. Lysosomes
C. Golgi
D. Nucleus
E. Chloroplasts

7) Resolution is measure of ----------:

A. Magnification
B. Clarity
C. Brightness
D. All of the above
E. A and B are correct

8) “Cisternae” can be found in :

A. Rough ER
B. Smooth ER
C. Golgi apparatus
D. Lysosomes
E. All except “D”

9) Which of the following is involved in the formation of hydrogen peroxide?

A. Lysosome
B. Peroxisomes
C. Nucleus
D. Mitochondria
E. Golgi
F. All of the above

10) Which of the following is not part of endomembrane system?

A. Smooth ER
B. Rough ER
C. Golgi apparatus
D. Peroxisomes
E. Vacuoles

11) Intermediate filament involved in:

A. Cytoplasmic streaming
B. Anchor of nucleus
C. Formation of nuclear lamina
D. Maintain of cell shape
E. All except of (A)

12) Which of the following known as (Actin filament)?

A. Microfilament
B. Microtubule
C. Intermediate filament
D. All of the above
E. None of the above

13) The correct order of cytoskeleton elements according to their diameter:

A. Microfilament > Microtubule > Intermediate filament
B. Microtubule > Microfilament > Intermediate filament
C. Microtubule > Intermediate filament > Microfilament
D. All of them have the same diameter
E. Any of the above

14) Which of the following is mismatched?

A. Nucleolus – Ribosomes synthesis
B. Mitochondria – Energy conversion
C. Intermediate filament – Cytoplasmic streaming
D. Golgi apparatus – Modification of products
E. Lysosomes – Digestion

15) Which of the following can be seen with light microscope?

A. Cytoskeleton elements
B. Ribosomes
C. Lysosomes
D. Nucleus
E. None of the above

16) Which of the following statements is correct?

A. Larger organisms have larger cells
B. Larger organisms have more cells
C. Surface area to volume ratio is large in small cells
D. Surface area to volume ratio is small in small cells
E. Both of B and C are correct

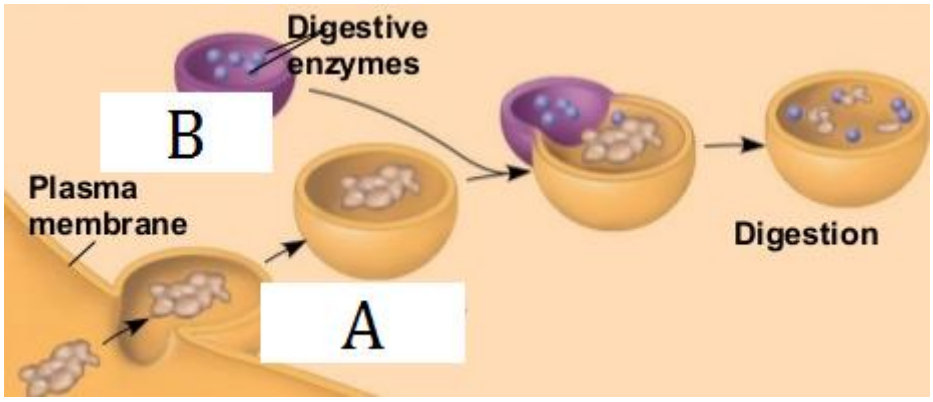
17) Which type of junctions establishes a barrier that prevents leakage of extracellular fluid across a layer of epithelial cells?

A. Tight junction
B. Gap junction
C. Desmosomes
D. Plasmodesmata
E. None of the above

18) The type of junction that can be seen between heart (Cardiac muscle) is:

A. Tight junction
B. Gap junction
C. Desmosomes
D. Plasmodesmata
E. None of the above

19) According to the figure , (A) represent:



A. Lysosome
B. Food vacuole
C. Contractile vacuole
D. Peroxisomes
E. None of the above

20)Which of the following is FALSE about lysosomes:

A. Can digest food and damaged organelles
B. They are membranous
C. Contain hydrolytic enzymes
D. Has basic environment
E. All of the above is true

21)Which of the following is FALSE about ribosomes:

A. Their function involved in protein synthesis
B. They bounded by single membrane
C. They can be either free or bounded
D. They made of two subunits of protein and tRNA
E. B and D

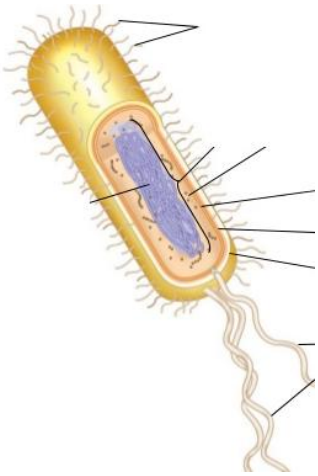
22) Chloroplasts and mitochondria have in common a :

A. Both of them bounded by double membrane
B. Both of them contain DNA
C. Both of them involved in energy conversion
D. Both of them involved in digestion of food
E. All of them true except of (D)

23)Cell well can be found :

A. Plant cells only
B. Animal cells only
C. In both animal and plant cells
D. In plant cells and some prokaryote
E. Any of the above

24) The figure represent:



A. Prokaryote
B. Eukaryote
C. Animal cell
D. Plant cell
E. Protists

25) Which of the following is function of smooth ER?

A. Detoxification of drugs
B. Storage of calcium ions
C. Synthesis of lipids
D. Synthesis of Glycoproteins and secretory proteins
E. All of them except (D)

26) The correct pathway of secretory proteins:

A. Rough ER --- Lysosome --- Golgi --- Plasma membrane
B. Smooth ER --- Golgi --- Transport vesicles --- Plasma membrane
C. Rough ER --- Golgi --- Transport vesicle --- Plasma membrane
D. Golgi --- Lysosome --- Plasma membrane
E. None of the above

27) Microtubules not involved in?

A. Cilia
B. Flagella
C. Movement of organelles
D. Cell division
E. Amoeboid movement

28) Materials from one animal cell can enter adjacent cell by :

A. Tight junction
B. Gap junction
C. Desmosome
D. Microfilament
E. Intermediate filament

29) The organelle that can carry out (Autophagy process) is:

A. Golgi
B. ER
C. Nucleus
D. Mitochondria
E. Lysosomes

30) The plant cell's central vacuole:

A. Play a major role in growth
B. Store nutrient
C. Reservoir of inorganic ions
D. Occupied large space of the cell
E. All of the above

31) The nuclear envelope is directly connect to:

A. Endoplasmic reticulum
B. Golgi apparatus
C. Lysosomes
D. Peroxisomes
E. Food vacuole

32) Which of the following found in both bacteria and plant cells:

A. Chloroplasts
B. Cell wall
C. Nucleus
D. Mitochondria
E. None of the above

33) All of the following found in prokaryotic cells except:

A. DNA
B. Chromosomes
C. Ribosomes
D. Cytosol
E. Nuclear envelope

34) Which of the following organelles responsible of protein synthesis?

A. Ribosomes
B. Lysosomes
C. Mitochondria
D. Microtubule
E. Nucleus

35) Large number of ribosomes can be found in cells that produce:

A. Proteins
B. Carbohydrate
C. Lipids
D. DNA
E. RNA

36) Grana and thylakoid can be found in:

A. Mitochondria
B. Chloroplasts
C. Golgi
D. Rough ER
E. Peroxisomes

37) Ribosomes can be seen by:

A. Light microscope
B. Electron microscope
C. Unaided eye
D. None of the above
E. All of the above

38) ---------- is a framework of protein fibers extending throughout the nuclear interior.

A. Nuclear lamina
B. Nuclear matrix
C. Middle lamella
D. Pore complex
E. None of the above

39)The main function of cell fractionation?

- Separation of major organelles and subcellular components

40) Which of the following is not a function of cytoskeleton?

A. Transporting of molecules into the cell
B. Transporting of molecules within the cell
C. Providing structure and shape
D. Anchoring the cell
E. Cell movement

41) For studying Phagocytosis (Lysosome function) , the best cells sued to study it:

A. Liver cells
B. Red blood cells
C. Macrophages
D. Skin cell
E. None of the above

42)Which of the following organelles is absent in plant cells?

A. Plasma membrane
B. Cell wall
C. Chloroplast
D. Central vacuole
E. Centrosome

43) Which of the following is function of cell wall?

A. Prevent excessive uptake of water
B. Protection
C. Maintain the cell shape
D. Holding plant against gravity
E. All of the above

44) Which of the following is true about free ribosomes?

A. It is attached to the nuclear envelope
B. It is attached to the ER
C. It produced the proteins that must be secreted out the cell
D. Producing cytoplasmic proteins
E. None of the above

45) Under which of the following conditions would you expect to find a cell with a predominance of free ribosomes?

A) A cell that is secreting proteins
B) A cell that is producing cytoplasmic enzymes
C) A cell that is constructing its cell wall or extracellular matrix
D) A cell that is digesting food particles
E) A cell that is enlarging its vacuole

46) Which type of organelle is primarily involved in the synthesis of oils, phospholipids, and steroids?

A) Ribosome
B) Lysosome
C) Smooth endoplasmic reticulum
D) Mitochondrion
E) Contractile vacuole

47) Tay-Sachs disease is a human genetic abnormality that results in cells accumulating and becoming clogged with very large and complex lipids. Which cellular organelle must be involved in this condition?

A) The endoplasmic reticulum
B) The Golgi apparatus
C) The lysosome
D) Mitochondria
E) membrane-bound ribosomes

48) The liver is involved in detoxification of many poisons and drugs. Which of the following structures is primarily involved in this process and therefore abundant in liver cells?

A) Rough ER
B) Smooth ER
C) Golgi apparatus
D) Nuclear envelope
E) Transport vesicles

49) Which of the following produces and modifies polysaccharides that will be secreted?

A) Lysosome
B) Vacuole
C) Mitochondrion
D) Golgi apparatus
E) Peroxisomes

50) Which of the following contains hydrolytic enzymes?

A) Lysosome
B) Vacuole
C) Mitochondrion
D) Golgi apparatus
E) Peroxisomes

51) Which of the following is a compartment that often takes up much of the volume of a plant cell?

A) Lysosome
B) Vacuole
C) Mitochondrion
D) Golgi apparatus
E) Peroxisomes

52) Which is one of the main energy transformers of cells?

A) Lysosome
B) Vacuole
C) Mitochondrion
D) Golgi apparatus
E) Peroxisomes

53) Which of the following contains its own DNA and ribosomes?

A) Lysosome
B) Vacuole
C) Mitochondrion
D) Golgi apparatus
E) Peroxisomes

54) Which of the following are capable of converting light energy to chemical energy?

A) Chloroplasts
B) Mitochondria
C) Leucoplasts
D) Peroxisomes
E) Golgi bodies

55) A cell has the following molecules and structures: enzymes, DNA, ribosomes, plasma membrane, and mitochondria. It could be a cell from

A) A bacterium.
B) An animal, but not a plant.
C) A plant, but not an animal.
D) A plant or an animal.
E) Any kind of organism.

56) Which of the following contain the 9 + 2 arrangement of microtubules?

A) Cilia
B) Centrioles
C) Flagella
D) A and C only
E) A, B, and C

57) Which of the following possesses a microtubular structure similar to a basal body?

A) Centriole
B) Lysosome
C) Nucleolus
D) Peroxisomes
E) Ribosome

58) Which statement correctly characterizes bound ribosomes?

A) Bound ribosomes are enclosed in their own membrane.
B) Bound and free ribosomes are structurally different.
C) Bound ribosomes generally synthesize membrane proteins and secretory proteins.
D) The most common location for bound ribosomes is the cytoplasmic surface of the plasma membrane.
E) All of the above.

59) Cyanide binds with at least one molecule involved in producing ATP. If a cell is exposed to cyanide, most of the cyanide would be found within the

A) Mitochondria.
B) Ribosomes.
C) Peroxisomes.
D) Lysosomes.
E) Endoplasmic reticulum.

- ملاحظات :
- يجب التركيز جيداً على أجزاء الخلايا النباتية والحيوانية مع القدرة على ربط شكل العضي مع وظيفته وموقعه في الخلية.
- التركيز على المفاهيم الأساسية في جزء الدراسة الذاتية (الميكروسكوب)

Answers

1. (E) Nuclear lamina
2. (C) Mitochondria and chloroplast
3. Answered
4. Answered
5. (E) cellulose
6. (E) Chloroplasts
7. (B) Clarity
8. (E) All of them except of d
9. (B) peroxisomes
10. (D) Peroxisomes
11. (E) All except of a
12. (A) microfilament
13. (C) Microtubule > intermediate filament > Microfilament
14. (C) intermediate filament = cytoplasmic streaming
15. (D) Nucleus
16. (E) Both B and C are correct
17. (A) Tight junction
18. (B) Gap junction
19. (B) Food vacuole
20. (D) Has a basic environment
21. (E) B and D
22. (E) All of them except of d
23. (D) in plant cell and some prokaryote
24. (A) Prokaryote
25. (E) All of them except of d
26. (C) Rough ER --- Golgi --- Transport vesicle --- Plasma membrane
27. (E) Amoeboid movement
28. (B) Gap junction
29. (E) Lysosome
30. (E) All of the above

31. (A) ER
32. (B) Cell wall
33. (E) Nuclear envelope
34. (A) ribosome
35. (A) proteins
36. (B) chloroplast
37. (B) electron microscope
38. (B) Nuclear matrix
39. Answered
40. (A) Transporting of molecules into the cell
41. (C) Macrophages
42. (E) centriole
43. (E) all of the above
44. (D) producing cytoplasmic proteins
45. (B) a cell that producing cytoplasmic enzymes
46. (C) Smooth ER
47. (C) lysosomes
48. (B) Smooth ER
49. (D) Golgi
50. (A) Lysosome
51. (B) Vacuole
52. (C) Mitochondrion
53. (C) Mitochondria
54. (A) Chloroplast
55. (D) A plant or an animal
56. (D) A and C only
57. (A) Centriole
58. (C) Bound ribosomes generally synthesized membrane proteins and secretory proteins
59. (A) mitochondria

Chapter (7): Cell structure and function – Summary

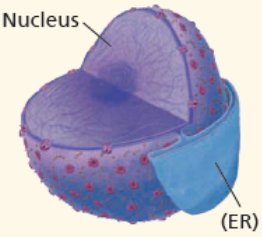
- Concept 7.1 Biologists use microscopes and biochemistry to study cells
- Improvements in microscopy that affect the parameters of magnification, resolution, and contrast have catalyzed progress in the study of cell structure.
- **Light microscopy** (LM) and **electron microscopy** (EM), as well as other types, remain important tools.
- Cell biologists can obtain pellets enriched in particular cellular components by centrifuging disrupted cells at sequential speeds, a process known as **cell fractionation**.

- Concept 7.2 Eukaryotic cells have internal membranes that compartmentalize their functions
- All cells are bounded by a **plasma membrane**.
- **Prokaryotic cells** lack nuclei and other membrane-enclosed **organelles**, while **eukaryotic cells** have internal membranes that compartmentalize cellular functions.
- The surface-to-volume ratio is an important parameter affecting cell size and shape.
- Plant and animal cells have most of the same organelles: a nucleus, endoplasmic reticulum, Golgi apparatus, and mitochondria. Chloroplasts are present only in cells of photosynthetic eukaryotes.

CONCEPT 7.3

The eukaryotic cell's genetic instructions are housed in the nucleus and carried out by the ribosomes *(pp. 172–174)*

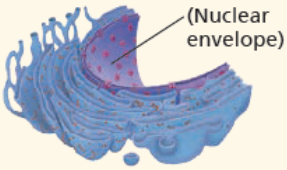
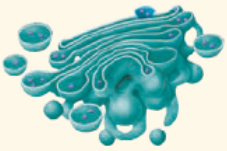
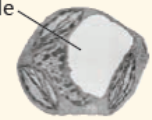
? *Describe the relationship between the nucleus and ribosomes.*

Nucleus 	Surrounded by nuclear envelope (double membrane) perforated by nuclear pores; nuclear envelope continuous with endoplasmic reticulum (ER)	Houses chromosomes, which are made of chromatin (DNA and proteins); contains nucleoli, where ribosomal subunits are made; pores regulate entry and exit of materials
Ribosome 	Two subunits made of ribosomal RNAs and proteins; can be free in cytosol or bound to ER	Protein synthesis

CONCEPT 7.4

The endomembrane system regulates protein traffic and performs metabolic functions *(pp. 174–178)*

? *Describe the key role played by transport vesicles in the endomembrane system.*

Endoplasmic reticulum (ER) 	Extensive network of membrane-bounded tubules and sacs; membrane separates lumen from cytosol; continuous with nuclear envelope	Smooth ER: synthesis of lipids, metabolism of carbohydrates, Ca^{2+} storage, detoxification of drugs and poisons Rough ER: aids in synthesis of secretory and other proteins on bound ribosomes; adds carbohydrates to proteins to make glycoproteins; produces new membrane
Golgi apparatus 	Stacks of flattened membranous sacs; has polarity (*cis* and *trans* faces)	Modification of proteins, carbohydrates on proteins, and phospholipids; synthesis of many polysaccharides; sorting of Golgi products, which are then released in vesicles
Lysosome 	Membranous sac of hydrolytic enzymes (in animal cells)	Breakdown of ingested substances, cell macromolecules, and damaged organelles for recycling
Vacuole 	Large membrane-bounded vesicle	Digestion, storage, waste disposal, water balance, cell growth, and protection

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- Concept 7.6 the cytoskeleton is a network of fibers that organizes structures and activities in the cell
- The **cytoskeleton** functions in structural support for the cell and in motility and signal transmission.
- **Microtubules** shape the cell, guide organelle movement, and separate chromosomes in dividing cells. **Cilia** and **flagella** are motile appendages containing microtubules. Primary cilia also play sensory and signaling roles.
- **Microfilaments** are thin rods that function in muscle contraction, amoeboid movement, **cytoplasmic streaming**, and support of microvilli. **Intermediate filaments** support cell shape and fix organelles in place.

- Concept 7.7 Extracellular components and connections between cells help coordinate cellular activities
- Plant **cell walls** are made of cellulose fibers embedded in other polysaccharides and proteins.
- Animal cells secrete glycoproteins and proteoglycans that form the **extracellular matrix (ECM)**, which functions in support, adhesion, movement, and regulation.
- Cell junctions connect neighboring cells.
- Plants have **plasmodesmata** that pass through adjoining cell walls. Animal cells have **tight junctions, desmosomes**, and **gap junctions**.

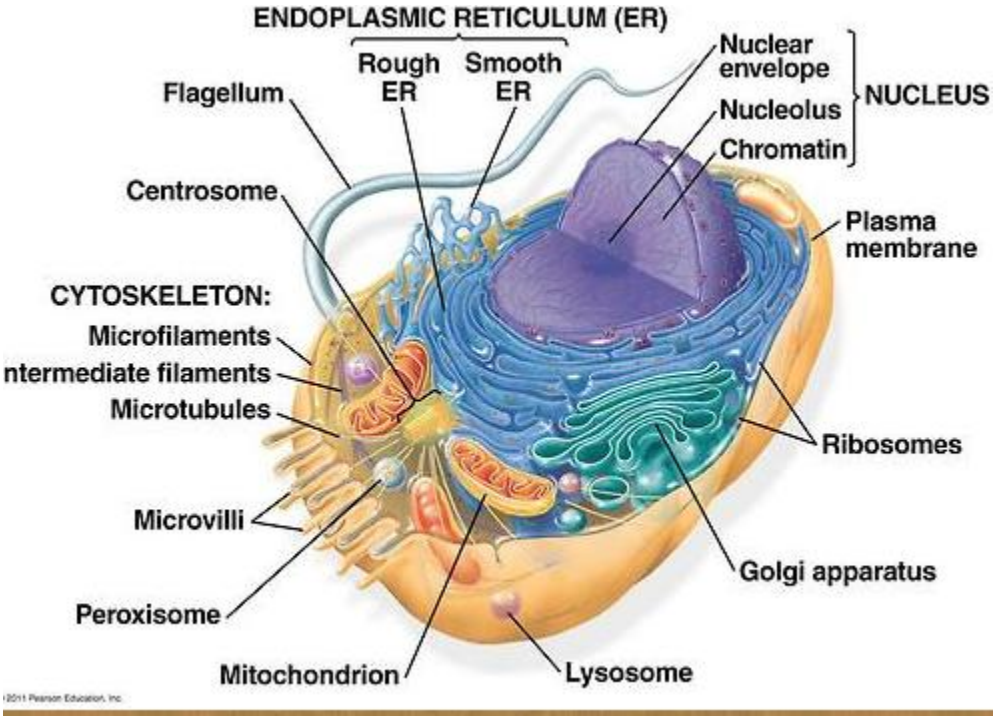
ENDOPLASMIC RETICULUM (ER)
Rough ER
Smooth ER
Flagellum
Centrosome
CYTOSKELETON:
Microfilaments
ntermediate filaments
Microtubules
Microvilli
Peroxisome
Mitochondrion
Lysosome
Golgi apparatus
Ribosomes
Plasma membrane
Nuclear envelope
Nucleolus
Chromatin
NUCLEUS
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Figure 6.8c

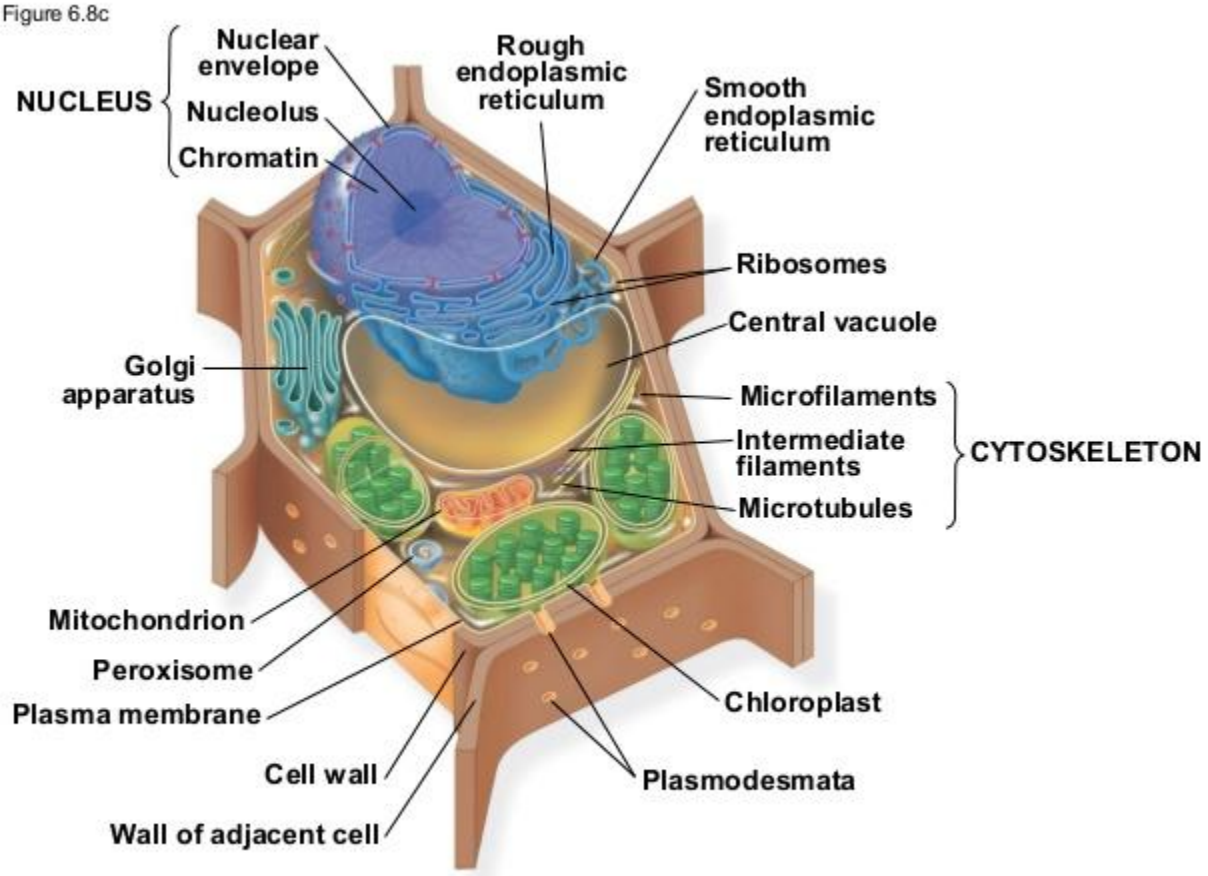

Fig. 6-32