Campbell Essential Biology, 5e **(Simon/Yeh)**
Chapter 2 Essential Chemistry for Biology

Multiple-Choice Questions

1) _____ is an example of an element.
A) Water
B) Carbon
C) Glucose
D) Salt
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

2) The four most common elements found in living things are
A) nitrogen, oxygen, phosphorus, and carbon.
B) carbon, oxygen, nitrogen, and hydrogen.
C) carbon, oxygen, potassium, and calcium.
D) oxygen, calcium, hydrogen, and carbon.
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

3) Which of the following elements, essential to life, is a trace element?
A) phosphorus
B) carbon
C) iodine
D) calcium
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

4) An atom with a positive charge has _____.
A) more protons than electrons
B) more electrons than protons
C) more neutrons than protons
D) more protons than neutrons
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

5) All atoms of an element have the same number of _____.
A) protons plus neutrons
B) protons
C) electrons
D) neutrons
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

6) An atom's _____ are found in its nucleus.
A) neutrons and protons
B) protons only
C) neutrons and electrons
D) electrons, protons, and neutrons
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

7) Beryllium's atomic mass is 9 and its atomic number is 4. How many neutrons are found in a beryllium atom?
A) 9
B) 13
C) 4
D) 5
Answer: D
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

8) An uncharged atom of gold has an atomic number of 79 and an atomic mass of 197. This atom has _____ protons, _____ neutrons, and _____ electrons.
A) 79... 118... 79
B) 118... 79... 118
C) 118... 276... 118
D) 79... 34... 79
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

9) The way Earth moves about the sun is most like _____.
A) a neutron and electron moving around a proton
B) an electron moving around the nucleus of an atom
C) a proton moving about an electron
D) a neutron moving about a proton
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

10) Isotopes of an element have the same number of _____ and different numbers of _____.
A) protons... neutrons
B) protons... electrons
C) neutrons... protons
D) electrons... protons
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

11) How do radioactive isotopes differ from isotopes?
A) Radioactive isotopes have more neutrons than do isotopes.
B) Radioactive isotopes are stable; isotopes are unstable.
C) Radioactive isotopes have fewer neutrons than do isotopes.
D) Radioactive isotopes are unstable; isotopes are stable.
Answer: D
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

12) The second electron shell of an atom can hold a maximum of _____ electron(s).
A) 1
B) 2
C) 6
D) 8
Answer: D
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

13) Nitrogen has an atomic number of 7; therefore, it has _____ electrons in its outermost electron shell.
A) 10
B) 18
C) 5
D) 2
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

14) An atom with an electrical charge is a(n) _____.
A) isotope
B) molecule
C) ion
D) compound
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

15) The bond between oppositely charged ions is a(n) _____ bond.
A) ionic
B) polar
C) hydrogen
D) covalent
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

16) In the following reaction, what type of bond is holding the two atoms together?
$K + Cl \rightarrow K^+ + Cl^- \rightarrow KCl$
A) hydrophilic
B) ionic
C) hydrophobic
D) covalent
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

17) What name is given to bonds that involve the sharing of electrons?
A) covalent
B) hydrogen
C) ionic
D) polar
Answer: A
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

18) Sulfur has an atomic number of 16. How many covalent bonds can sulfur form?
A) 1
B) 2
C) 4
D) 0
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

19) The hydrogens and oxygen of a water molecule are held together by _____ bonds.
A) electron
B) hydrogen
C) covalent
D) osmotic
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

20) Why is water considered a polar molecule?
A) The oxygen is found between the two hydrogens.
B) The oxygen atom attracts the hydrogen atoms.
C) The oxygen end of the molecule has a slight negative charge, and the hydrogen end has a slight positive charge.
D) Both hydrogens are at one end of the molecule, and oxygen is at the other end.
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

21) Adjacent water molecules are joined by _____ bonds.
A) covalent only
B) ionic
C) polar and covalent
D) hydrogen
Answer: D
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

22) Adjacent water molecules are connected by the _____.
A) sharing of electrons between the hydrogen of one water molecule and the oxygen of another water molecule
B) electrical attraction between the hydrogen of one water molecule and the oxygen of another water molecule
C) sharing of electrons between adjacent oxygen molecules
D) electrical attraction between the hydrogens of adjacent water molecules
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

23) How many oxygen atoms are in the products of the following reaction?
$C_6H_{12}O_6 + 6\ H_2O + 6\ O_2 \rightarrow 6\ CO_2 + 12\ H_2O$
A) 18
B) 6
C) 12
D) 24
Answer: D
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

24) What are the reactant(s) in the following chemical reaction?
$C_6H_{12}O_6 + 6\ H_2O + 6\ O_2 \rightarrow 6\ CO_2 + 12\ H_2O$
A) CO_2 and H_2O
B) $C_6H_{12}O_6$, H_2O, and O_2
C) O_2 only
D) $C_6H_{12}O_6$, H_2O, O_2, CO_2, and H_2O
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Application/Analysis

25) Human body cells are approximately _____ water.
A) 95—99%
B) 25—35%
C) 50—55%
D) 70—95%
Answer: D
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

26) The tendency of molecules of the same kind to stick together is called _____.
A) bonding
B) cohesion
C) polarity
D) adhesion
Answer: B
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

27) Why (if you are careful) are you able to float a needle on the surface of water?
A) Water has adhesive properties.
B) The surface tension that is a result of water's cohesive properties makes this possible.
C) The covalent bonds that hold a water molecule together are responsible for this ability.
D) A single needle is less dense than water.
Answer: B
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

28) Sweating cools your body by _____.
A) cohesion
B) radiation
C) evaporative cooling
D) hydrogen bonding
Answer: C
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

29) As water freezes, _____.
A) its molecules move farther apart
B) it cools the surrounding environment
C) its hydrogen bonds break apart
D) it loses its polarity
Answer: A
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

30) Sugar dissolves when stirred into water. The sugar is the _____, the water is the _____, and the sweetened water is the _____.
A) solution... solvent... solute
B) solute... solvent... solution
C) solvent... solute... solution
D) solution... solute... solvent
Answer: B
Topic: 2.2 Water and Life
Skill: Application/Analysis

31) Which of the following is an acid?
A) NaOH
B) NaCl
C) HCl
D) CH_4
Answer: C
Topic: 2.2 Water and Life
Skill: Application/Analysis

32) A base _____.
A) removes H_2O molecules from a solution
B) decreases the pH of a solution
C) removes OH^- ions from a solution
D) removes H^+ ions from a solution
Answer: D
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

33) The lower the pH of a solution, the _____.
A) greater the number of oxygen atoms
B) more acidic the solution
C) less toxic the solution
D) higher the OH^- concentration
Answer: B
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

34) Relative to a pH of 6, a pH of 4 has a _____.
A) 200 times higher H^+ concentration
B) 100 times higher H^+ concentration
C) 20 times higher H^+ concentration
D) 100 times lower H^+ concentration
Answer: B
Topic: 2.2 Water and Life
Skill: Application/Analysis

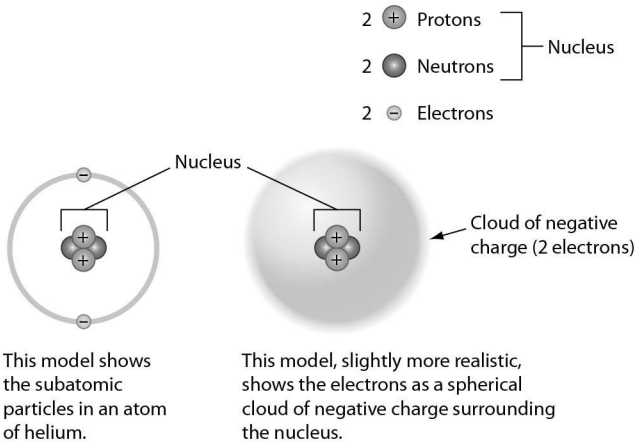
35) What name is given to substances that resist changes in pH?
A) buffers
B) sugars
C) salts
D) bases
Answer: A
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

36) When a base is added to a buffered solution, the buffer will _____.
A) donate OH^- ions
B) accept water molecules
C) donate H^+ ions
D) form covalent bonds with the base
Answer: C
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

37) People have long speculated about whether life exists on Mars. Scientists have evidence that on Mars, _____.
A) microbial life exists
B) liquid water has existed in the past
C) the only water present has always been frozen in the polar ice caps
D) water is found only in the form of water vapor
Answer: B
Topic: 2.2 Water and Life
Skill: Knowledge/Comprehension

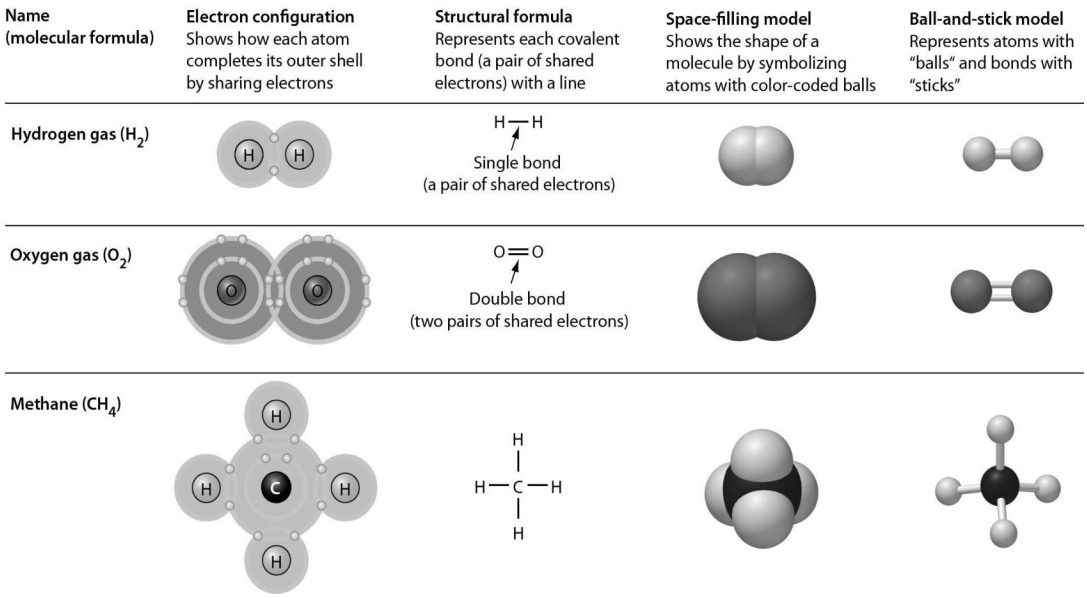
Art Questions

1) Examine the drawing of an atom below. The art is technically incorrect in that _____.



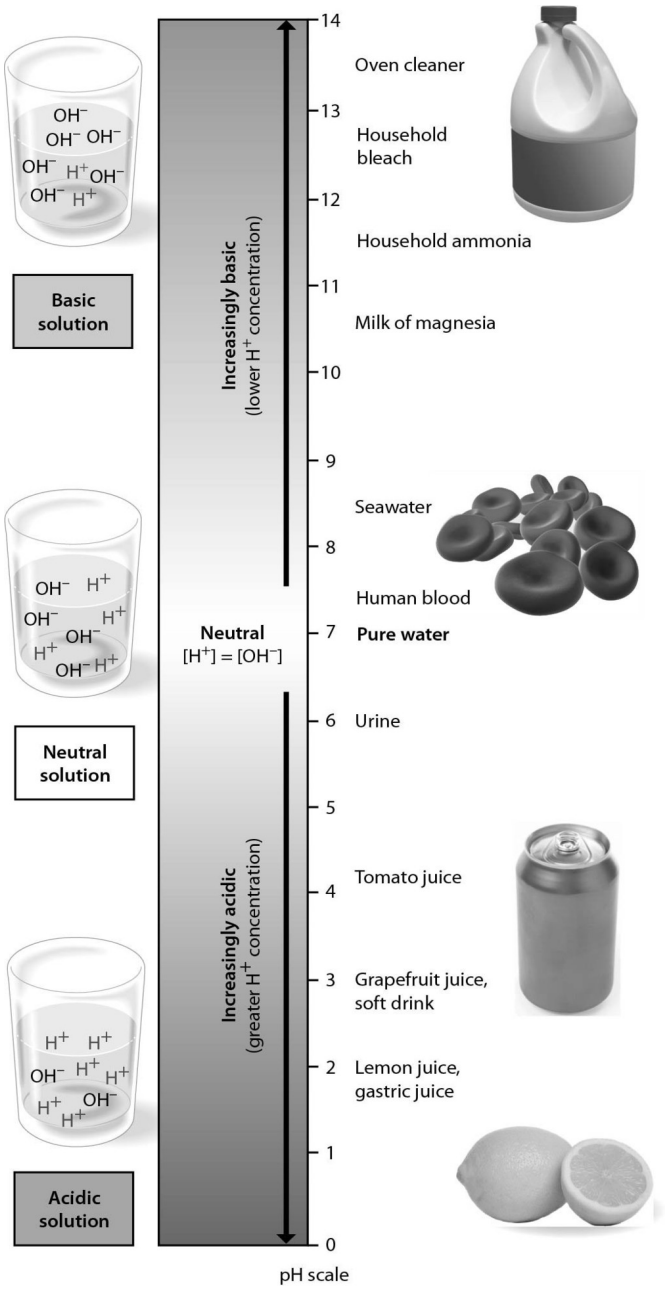
A) neutrons are not located in the nucleus
B) the electrons should be much farther away from the nucleus
C) electrons do not orbit the nucleus
D) electrons do not have a negative charge
Answer: B
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

2) Examine the following figure. Which of the representations of molecules does *not* reveal double bonds?



A) electron configuration
B) structural formula
C) space-filling model
D) All of the representations of molecules reveal double bonds.
Answer: C
Topic: 2.1 Some Basic Chemistry
Skill: Knowledge/Comprehension

3) Examine the pH scale below. How does household bleach compare to household ammonia?



A) Household bleach is more acidic than household ammonia.

B) Household bleach has 10 times higher H^+ concentration than household ammonia.

C) Household bleach has 100 times higher H^+ concentration than household ammonia.

D) Household ammonia has 10 times higher H^+ concentration.

Answer: D

Topic: 2.2 Water and Life

Skill: Application/Analysis

Scenario Questions

Please read the following scenario to answer the following question(s).

The last few miles of the marathon are the most difficult for Heather. Her hair is plastered to her head, sweat clings to her arms, and her legs feel as if they had nothing left. Heather grabs a cup of ice water. The ice cubes smash against her nose as she gulps some cool refreshment and keeps on running. Then a breeze kicks up and she finally feels some coolness against her skin. Drops of sweat, once clinging to her forehead, now spill down, and Heather feels a stinging as the sweat flows into her eyes.

1) Sweat on Heather's forehead and arms formed drops because of the _____.
A) high salt content of sweat
B) cohesive nature of water
C) ability of water to moderate heat
D) high evaporative cooling effect of water
Answer: B
Topic: 2.2 Water and Life
Skill: Application/Analysis

2) Which of the following is the most likely reason why the ice struck Heather's nose when she took a drink?
A) Water can store large amounts of heat.
B) Water can moderate temperatures through evaporative cooling.
C) The density of water decreases when it freezes.
D) Water has a cohesive nature.
Answer: C
Topic: 2.2 Water and Life
Skill: Application/Analysis