Name: _____ Class: _____ Date: _____ ID: A

sec 3.3 - 3.5

SCH3U Ch3 Review

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is a characteristic of ionic bonds?
a. form between atoms
b. result in individual molecules
c. result in large crystal lattices
d. are created by sharing of pairs of valence electrons between atoms

____ 2. Which of the following is a molecule in which the uneven distribution of electrons results in a positive charge at one end and a negative charge at the other end?
a. petrochemical
b. polar molecule
c. ionic compound
d. non-polar molecule

____ 3. Which of the following is a molecule in which the electrons are equally distributed among the atoms, resulting in no localized charges?
a. ionic compound
b. polar molecule
c. non-polar molecule
d. petrochemical

____ 4. Which of the following are examples of van der Waals forces?
a. dipole–dipole and ionic bonds
b. dipole–dipole and hydrogen bonds
c. London dispersion and hydrogen bonds
d. dipole–dipole and London dispersion

____ 5. Which of the following is a particularly strong dipole–dipole force that occurs between two molecules consisting of a hydrogen atom covalently bonded to a highly electronegative atom of nitrogen, oxygen, or fluorine?
a. hydrogen bond
b. London dispersion
c. ionic bond
d. van der Waals

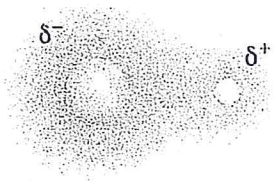
____ 6. Which of the following is an unusual physical property of water?
a. low surface tension
b. high density when solid
c. low melting and boiling points
d. high specific heat capacity

____ 7. Which term describes a weak attractive force acting between all entities, including non-polar molecules and unbonded atoms, caused by the temporary imbalance of electrons within entities?
a. dipole–dipole force
b. polar covalent bond
c. London dispersion force
d. hydrogen bond

____ 8. Which of the following is a characteristic of covalent bonds?
a. are created by transfer of valence electrons between atoms to form ions
b. form between ions
c. form between atoms
d. result in large crystal lattices

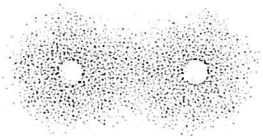
____ 9. Which of the following is an example of a polar molecule?
a. HCl
b. CO_2
c. CH_4
d. N_2

____ 10. Examine the bonds shown here and their electronegativity values. Which figure shows the most polar covalent bond?
a. N-H:



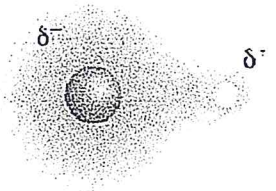
$\Delta EN = 0.9$

b. H-H:



$\Delta EN = 0.0$

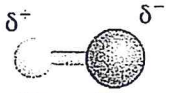
c. O-H:

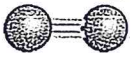
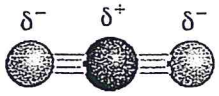


$\Delta EN = 1.4$

d. none of the above

___ 11. Which of the following have the strongest attraction?
a. London dispersion force in hydrogen gas
b. dipole–dipole force in hydrogen fluoride
c. hydrogen bond in DNA molecule
d. ionic bond in sodium chloride

___ 12. Which of the following shows a polar molecule?
a. 

b. 
c. 

d. none of the above

___ 13. Which of the following non-polar substances will likely have the strongest London forces?
a. bromine with 70 electrons per molecule
b. argon with 18 electrons per molecule
c. helium with 2 electrons per molecule
d. sulfur with 128 electrons per molecule

___ 14. London dispersion forces exist between which of the following entities?
a. polar molecules
b. unbonded atoms
c. non-polar molecules
d. all of the above

___ 15. If you take a misstep off the high dive at the swimming pool, which of the following causes you pain as you splash into the water?
a. upcycling
b. surface tension
c. petrochemicals
d. London dispersion forces

___ 16. Which of the following help to make snowflakes form in a variety of intricate arrangements?
a. covalent bonds
b. London dispersion forces
c. hydrogen bonds
d. ionic bonds

Modified True/False
Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

___ 17. Most compounds in our world today are *molecular*. _____

___ 18. A molecule that has its charges equally distributed is classified as a *polar molecule*. _____

____ 19. Ionic compounds are always *liquids* at room temperature. _____

____ 20. As the intermolecular forces between molecules increase, the melting point of the compound *decreases*. _____

____ 21. London dispersion forces are very *strong*. _____

____ 22. A *hydrogen bond* is a particularly strong dipole-dipole force that occurs between two molecules. _____

____ 23. *Surface tension* is a phenomenon, caused by forces of attraction between molecules, that leads to the formation of a skin-like film on the surface of a liquid. _____

Completion
Complete each statement.

24. Atoms with significantly different electronegativities form _____ covalent bonds.

25. A molecule is classified as a(n) _____ if it has a positively charged end and a negatively charged end.

26. A(n) _____ is an attraction between molecules.

27. The forces of attraction between molecules, including dipole–dipole forces and London dispersion forces, are classified as _____ forces.

Matching

Match each characteristic to the corresponding chemical bond type. Answer choices may be used more than once.
a. ionic bonds
b. covalent bonds

____ 28. result in individual molecules

____ 29. are created by transfer of valence electrons between atoms to form ions

____ 30. result in large crystal lattices

____ 31. are created by sharing of pairs of valence electrons between atoms

Short Answer

32. Describe the steps you could follow to determine whether a molecule is polar or non-polar.

33. Contrast polar molecules and non-polar molecules.

34. What physical properties of molecular compounds are determined by the strength of intermolecular forces?

35. Determine whether Cl_2 is polar or non-polar. Which rule did you use to determine the polarity of this molecule?

SCH3U Ch3 Review
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1 REF: K/U
   OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
   MSC: Knowledge
2. ANS: B PTS: 1 REF: K/U
   OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B2.1
   MSC: Knowledge
3. ANS: C PTS: 1 REF: K/U
   OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B2.1
   MSC: Knowledge
4. ANS: D PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
   LOC: B2.1 MSC: Knowledge
5. ANS: A PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
   LOC: B2.1 MSC: Knowledge
6. ANS: D PTS: 1 REF: K/U OBJ: 3.5 Hydrogen Bonding and Water
   LOC: B1.1 MSC: Understanding
7. ANS: C PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
   LOC: B2.1 MSC: Knowledge
8. ANS: C PTS: 1 REF: K/U
   OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
   MSC: Knowledge
9. ANS: A PTS: 1 REF: A
   OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B2.1
   MSC: Knowledge
10. ANS: C PTS: 1 REF: C
    OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B2.5
    MSC: Understanding
11. ANS: D PTS: 1 REF: T/I OBJ: 3.4 Intermolecular Forces
    LOC: B2.1 MSC: Analysis and Application
12. ANS: A PTS: 1 REF: C
    OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B2.5
    MSC: Understanding
13. ANS: D PTS: 1 REF: T/I OBJ: 3.4 Intermolecular Forces
    LOC: B2.1 MSC: Analysis and Application
14. ANS: D PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
    LOC: B2.1 MSC: Understanding
15. ANS: B PTS: 1 REF: A OBJ: 3.5 Hydrogen Bonding and Water
    LOC: B2.1 MSC: Understanding
16. ANS: C PTS: 1 REF: A OBJ: 3.5 Hydrogen Bonding and Water
    LOC: B1.1 MSC: Analysis and Application

MODIFIED TRUE/FALSE

17. ANS: T PTS: 1 REF: K/U
OBJ: Chapter 3 Introduction LOC: B1.1 MSC: Understanding
18. ANS: F, non-polar

PTS: 1 REF: K/U OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Knowledge
19. ANS: F, solids

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B3.4 MSC: Knowledge
20. ANS: F, increases

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B3.4 MSC: Knowledge
21. ANS: F, weak

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B2.1 MSC: Knowledge
22. ANS: T PTS: 1 REF: K/U
OBJ: 3.4 Intermolecular Forces LOC: B2.1 MSC: Knowledge
23. ANS: T PTS: 1 REF: K/U
OBJ: 3.5 Hydrogen Bonding and Water LOC: B2.1 MSC: Knowledge

COMPLETION

24. ANS: polar

PTS: 1 REF: K/U OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Knowledge
25. ANS: polar molecule

PTS: 1 REF: K/U OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Knowledge
26. ANS: intermolecular force

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B2.1 MSC: Knowledge
27. ANS: van der Waals

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B2.1 MSC: Knowledge

MATCHING

28. ANS: B PTS: 1 REF: A
OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
MSC: Understanding
29. ANS: A PTS: 1 REF: A
OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
MSC: Understanding
30. ANS: A PTS: 1 REF: A
OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
MSC: Understanding
31. ANS: B PTS: 1 REF: A
OBJ: 3.3 Polar Bonds and Polar Molecules LOC: B3.4
MSC: Understanding

SHORT ANSWER

32. ANS:
To determine whether a molecule is polar or non-polar, you first should determine how many atoms of which elements make up a molecule. Then, draw the Lewis structure for the molecule. Next, determine the number of covalent bonds in the molecule and the electronegativity difference for each covalent bond in the molecule. Then, indicate whether each bond is polar or non-polar. If there are polar covalent bonds in the molecule, indicate the partial charges. Finally, interpret your diagram. If the molecule only has one polar covalent bond, the molecule is polar. If the molecule has more than one polar covalent bond, the molecule may or may not be polar. Examine the shape of the molecule to determine if it is symmetrical or asymmetrical. If symmetrical, the molecule is non-polar. If asymmetrical, the molecule is polar.

PTS: 1 REF: K/U OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Understanding

33. ANS:
Covalent bonds in a molecule may be polar or non-polar. Polar bonds may cause the whole molecule to be polar. Polar molecules are molecules in which the uneven distribution of electrons results in a positive charge at one end and a negative charge at the other end. Non-polar molecules are molecules in which the electrons are equally distributed among the atoms, resulting in no localized charges.

PTS: 1 REF: T/I OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Evaluation

34. ANS:
Physical state of a compound at a specific temperature and pressure, melting point, boiling point, surface tension, hardness, texture, and solubility are physical properties of molecular compounds determined by the strength of intermolecular forces.

PTS: 1 REF: K/U OBJ: 3.4 Intermolecular Forces
LOC: B1.1 MSC: Understanding

35. ANS:
Cl_2 is non-polar. I used the rule that diatomic molecules with two identical atoms are non-polar.

PTS: 1 REF: T/I OBJ: 3.3 Polar Bonds and Polar Molecules
LOC: B2.1 MSC: Analysis and Application