

Chemistry 30 Unit 1 PRACTICE Exam /68

Materials Science

Multiple Choice: (20 marks)

Things to Study for the missing questions:

- Particles in the atom and their discovery
- Scientists (including periodic table)
- Valence electrons & octet rule
- Intermolecular forces and their relative strengths
- Properties of ionic, covalent and metallic bonds

- When calcium has a full valence shell, it usually has a charge of:
a. 0
b. -1
c. +1
d. -2
e. +2
- Group 17 elements have what charge when in an ionic bond?
a. 17
b. -1
c. 7
d. +3
e. -3
f. +1
- Which of the following elements has 1 valence electron?
a. Lithium
b. Magnesium
c. Titanium
d. Aluminum
- Which combination of elements is most likely to form ionic bonds?
a. Sodium and calcium
b. carbon and hydrogen
c. hydrogen and oxygen
d. calcium and fluorine
- Which is a covalent compound?
a. NH_4^+
b. $NaCl$
c. PO_4^{3-}
d. H_2S
- Which of the following is a Nitrogen ion?
a. NO_3^-
b. N_2
c. N^{3-}
d. Na_3N
- If a molecule has a central atom with 2 pairs of *unbonded* electrons and 4 pairs of *bonded* electrons around it, the *molecular* geometry is
- Which of the following substances has covalent bonds that are the most polar?
- Which of the following is **false**?
a. If a compound has atoms bonded with an electronegativity difference less than 0.4, then the compound is non-polar.
b. If a compound has an electronegativity difference greater than 1.7, it must be ionic.
c. In a polar covalent molecule, the atom with the higher electronegativity value has a slightly negative charge.
d. Water has van der waals, polar covalent bonds, H-bonds, dipole forces AND dispersion forces.
- Which of the following is **true**?
a. The weakest intermolecular force (of those we learned about) is the dipole force.
b. Ionic compounds can form polar bonds.
c. All covalent compounds have dispersion forces.
d. Dipole forces only last for an instant in time.

11. Which of the following does hydrogen not form an H-bond with?

Short Answer: (40 marks)

1. A question about the atom similar to one in your first assignment
2. History of the Atom: For the following Scientists, match the appropriate description of their model or discovery (the scientists are not listed in chronological order). (3 marks) – 6 scientists
3. In the blank beside the following statement, write “I” if the statement applies to ionic bonds and “C” if the statement applies to covalent bonds and “M” if the statement applies to metallic bonds. (2 marks)- 4 statements
4. Draw the Lewis formulas for the following atoms and ions: (4 marks)

a. Nitrogen

c. Mg

b. Li^+

d. S^{2-}

5. Draw the Lewis symbols to show the formation of bonds within the following **ionic** compounds (2 steps). (4 marks)

a. Calcium chloride, MgF_2

b. Lithium Sulfide

6. Draw the Lewis symbols to show the formation of bonds within the following **covalent** compounds (2 marks). (4 marks)

a. Oxygen molecule

b. Sulfur difluoride

7. Element A has 7 valence electrons. Element B has 6 valence electrons. (5 marks)

(a) Classify each of these elements as a metal or a non-metal assuming neither is an element with an exception to the octet rule.

(b) Use Lewis symbols to show how A and B would form a compound.

- (c) What type of compound is formed (ie. which intramolecular force)?
(d) Write the chemical formula for this compound.

8. Element A has 1 valence electrons. Element B has 6 valence electrons. (5 marks)

(a) Classify each of these elements as a metal or a non-metal assuming neither is an element with an exception to the octet rule.

(b) Use Lewis symbols to show how A and B would form a compound.

(c) What type of compound is formed (ie. which intramolecular force)?

(d) Write the chemical formula for this compound.

9. Determine the molecular geometry, electron pair geometry and draw the 3D diagram for each of the molecules below: (6 marks)

a. H_2O

b. BrF_5

10. Determine whether the following compounds would be ionic, polar covalent or non polar covalent and explain how you know. If the molecule is polar covalent, add the dipole moment. (7 marks)

a) SBr_2

d) carbon tetrafluoride

b) Aluminum oxide

e) nitrogen trichloride

c) Hydrogen sulfide

11. Determine whether the following molecules will have polar bonds, H-bonds, dipole forces or dispersion forces. Be sure to include all forces (i.e. there may be more than one that applies). (3 marks)

a. NF_3

b. H_2O

c. N_2

12. Determine if the following compounds are metallic solids, ionic solids, network atomic solids, or molecular solids based on their properties. These are all actual chemical compounds. (2 marks)

a. This material forms crumbly crystals and has a melting point of 16.6° Celsius. It has a low density in solid form.
_____ (acetic acid)

b. This material forms very hard colorless crystals. It does not dissolve in water and burns at high temperatures.
_____ (diamond, C-C bond)

13. During a lab, a student filled in the following table regarding three unknown substances that could be ionic, molecular or metallic. Determine the type of bond based on the data: (3 marks)- boxes will be filled in with information

Unknown	Appearance at room temperature	Solubility in water	Conductivity of aqueous solution	Conductivity of solid	Melting point (high or low)	Type of Bond
A						
B						
C						

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