

CHM 2045 Exam 3 Review

1

H

Hydrogen

Nonmetal

Atomic Number

Symbol

Name

Chemical Group Block

3

Li

Lithium

Alkali Metal

4

Be

Beryllium

Alkaline Earth Metal

11

Na

Sodium

Alkali Metal

12

Mg

Magnesium

Alkaline Earth Metal

19

K

Potassium

Alkali Metal

20

Ca

Calcium

Alkaline Earth Metal

21

Sc

Scandium

Transition Metal

22

Ti

Titanium

Transition Metal

23

V

Vanadium

Transition Metal

24

Cr

Chromium

Transition Metal

25

Mn

Manganese

Transition Metal

26

Fe

Iron

Transition Metal

27

Co

Cobalt

Transition Metal

28

Ni

Nickel

Transition Metal

29

Cu

Copper

Transition Metal

30

Zn

Zinc

Transition Metal

37

Rb

Rubidium

Alkali Metal

38

Sr

Strontium

Alkaline Earth Metal

39

Y

Yttrium

Transition Metal

40

Zr

Zirconium

Transition Metal

41

Nb

Niobium

Transition Metal

42

Mo

Molybdenum

Transition Metal

43

Tc

Technetium

Transition Metal

44

Ru

Ruthenium

Transition Metal

45

Rh

Rhodium

Transition Metal

46

Pd

Palladium

Transition Metal

47

Ag

Silver

Transition Metal

48

Cd

Cadmium

Transition Metal

55

Cs

Cesium

Alkali Metal

56

Ba

Barium

Alkaline Earth Metal

57

La

Lanthanum

Lanthanide

58

Ce

Cerium

Lanthanide

59

Pr

Praseodymium

Lanthanide

60

Nd

Neodymium

Lanthanide

61

Pm

Promethium

Lanthanide

62

Sm

Samarium

Lanthanide

63

Eu

Europium

Lanthanide

64

Gd

Gadolinium

Lanthanide

65

Tb

Terbium

Lanthanide

66

Dy

Dysprosium

Lanthanide

67

Ho

Holmium

Lanthanide

68

Er

Erbium

Lanthanide

69

Tm

Thulium

Lanthanide

70

Yb

Ytterbium

Lanthanide

71

Lu

Lutetium

Lanthanide

87

Fr

Francium

Alkali Metal

88

Ra

Radium

Alkaline Earth Metal

89

Ac

Actinium

Actinide

90

Th

Thorium

Actinide

91

Pa

Protactinium

Actinide

92

U

Uranium

Actinide

93

Np

Neptunium

Actinide

94

Pu

Plutonium

Actinide

95

Am

Americium

Actinide

96

Cm

Curium

Actinide

97

Bk

Berkelium

Actinide

98

Cf

Californium

Actinide

99

Es

Einsteinium

Actinide

100

Fm

Fermium

Actinide

101

Md

Mendelevium

Actinide

102

No

Nobelium

Actinide

103

Lr

Lawrencium

Actinide

104

Rf

Rutherfordium

Transition Metal

105

Db

Dubnium

Transition Metal

106

Sg

Seaborgium

Transition Metal

107

Bh

Bohrium

Transition Metal

108

Hs

Hassium

Transition Metal

109

Mt

Meitnerium

Transition Metal

110

Ds

Darmstadtium

Transition Metal

111

Rg

Roentgenium

Transition Metal

112

Cn

Copernicium

Transition Metal

113

Nh

Nihonium

Poor Transition Metal

114

Fl

Flerovium

Poor Transition Metal

115

Mc

Moscovium

Poor Transition Metal

116

Lv

Livermorium

Poor Transition Metal

117

Ts

Tennessine

Poor Transition Metal

118

Og

Oganesson

Noble Gas

5

B

Boron

Metalloid

6

C

Carbon

Nonmetal

7

N

Nitrogen

Nonmetal

8

O

Oxygen

Nonmetal

9

F

Fluorine

Halogen

10

Ne

Neon

Noble Gas

13

Al

Aluminum

Poor Transition Metal

14

Si

Silicon

Metalloid

15

P

Phosphorus

Nonmetal

16

S

Sulfur

Nonmetal

17

Cl

Chlorine

Halogen

18

Ar

Argon

Noble Gas

31

Ga

Gallium

Poor Transition Metal

32

Ge

Germanium

Metalloid

33

As

Arsenic

Metalloid

34

Se

Selenium

Nonmetal

35

Br

Bromine

Halogen

36

Kr

Krypton

Noble Gas

49

In

Indium

Poor Transition Metal

50

Sn

Tin

Poor Transition Metal

51

Sb

Antimony

Metalloid

52

Te

Tellurium

Metalloid

53

I

Iodine

Halogen

54

Xe

Xenon

Noble Gas

81

Tl

Thallium

Poor Transition Metal

82

Pb

Lead

Poor Transition Metal

83

Bi

Bismuth

Poor Transition Metal

84

Po

Polonium

Radioactive

85

At

Astatine

Radioactive

86

Rn

Radon

Noble Gas

Pub

Chem

1. Draw the Lewis Structure(s) for SO_4^{2-}

2. Which of the following are exceptions to the octet rule in the central atom?

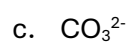
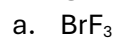
I PCl_5 II. BeCl_2 III. BF_3 IV. NH_3 V. H_2O

- a. I, II, III
- b. I, II, IV
- c. II, IV
- d. I, II, V
- e. II, III, IV

3. Which of the following molecules is polar?

- a. CH_2Cl_2
- b. PCl_5
- c. BF_3
- d. XeF_2

4. Name the electron geometry, molecular geometry, and bond angles for each of the following bonds.



5. Which of the following solutions is matched with its correct intermolecular force between solute and solvent?

- A) CH_2F_2 and CH_2O : dispersion
- B) Cl_2 and PH_3 : dipole-induced dipole
- C) HF and NH_3 : dipole-dipole
- D) PH_3 and H_2O : dispersion

6. Which of the following has sp^2 hybridization?

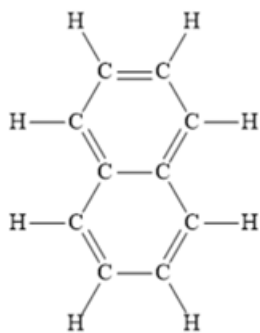
- a. BF_3
- b. I_3^-
- c. CO_2
- d. NH_3

7. According to MO theory, which of the following is paramagnetic? MO order: $\sigma_{2s} < \sigma_{2s}^* < \sigma_{2p_x} < \pi_{2p_y} = \pi_{2p_z} < \pi_{2p_y}^* = \pi_{2p_z}^* < \sigma_{2p_x}^*$

- a. O_2
- b. O_2^+
- c. O_2^-
- d. All of the above

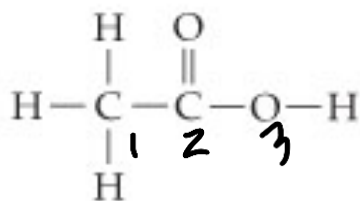
8. 19. According to MO theory, which of the following dicarbon species is expected to have the shortest bond length. Use the following valence MO order: $\sigma_{2s} < \sigma^*_{2s} < \pi_{2py} = \pi_{2pz} < \sigma_{2px} < \pi^*_{2py} = \pi^*_{2pz} < \sigma^*_{2px}$
- C_2^{2+}
 - C_2
 - C_2^{2-}
 - C_2^-
 - They all have the same length

9. How many sigma and pi bonds are in the molecule below?



- 16 sigma, 5 pi
- 19 sigma, 5 pi
- 14 sigma, 10 pi
- 20 sigma, 10 pi

10. What are the hybridizations of the three labeled atoms in the following molecule?



- a. 1 sp^3 2. sp^2 3. sp^3
- b. 1. sp^3 2. sp^2 3. sp^3d
- c. 1. sp^3 2. sp^2 3. sp
- d. 1. sp^3d 2. sp^3 3. sp^3

11. Rank the following in order of increasing boiling point.

I. CH_2Br_2 II. $\text{CH}_3\text{CH}_2\text{OH}$ III. F_2 IV. CH_4

- a. $\text{IV} < \text{III} < \text{II} < \text{I}$
- b. $\text{IV} < \text{III} < \text{I} < \text{II}$
- c. $\text{I} < \text{II} < \text{IV} < \text{III}$
- d. $\text{III} < \text{I} < \text{II} < \text{IV}$

12. Which of the following has the lowest vapor pressure?

- a. CH_4
- b. H_2O
- c. CH_2Cl_2
- d. NH_3

13. Which of the following molecules is predicted to have the highest viscosity?

- a. BF_3
- b. CH_2I_2
- c. NH_3
- d. CH_4

14. Which of the following statements is true?

- a. As temperature increases, viscosity increases.
- b. Vapor pressure increases with increasing intermolecular forces
- c. The stronger intermolecular force, the stronger the surface tension.
- d. Surface tension increases with increasing temperature.

15. Calculate the heat needed to convert 10.0 g of solid bromine from -7.2°C to 70.0°C . Which of the following steps requires the most heat energy: melting the solid bromine, heating the liquid bromine from its melting point to its boiling point, boiling the bromine, or heating the gaseous bromine from its boiling point to 110.0°C ? Melting point for bromine -7.2°C , heat of fusion for bromine = 66.15 J/g ; specific heat of liquid bromine = $0.474 \text{ J/g}^\circ\text{C}$; boiling point for bromine = 58.7°C , heat of vaporization for bromine = 193.21 J/g , specific heat of gaseous bromine = $0.225 \text{ J/g}^\circ\text{C}$.