CHM 1143 Exam 1

1-4 30 points each
Multiple choice 10 points each
with 3 free misses

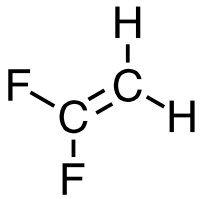
TUD Department of Chemistry
Fall 2017

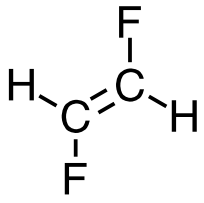
1. a) A piece of metal alloy with a mass of 5.0 g is heated to 95^{0}C and then dumped into 45 g of water(CH_2O=4.184 J/g^{0}C. The water temperature increases from 21^{0}C to 26^{0}C. What is the specific heat of the metal?

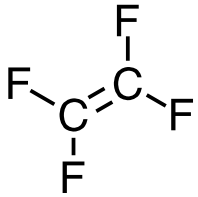
b) How many Joules of heat would be required to increase the temperature of a human body by 1.0 ^{0}C? (That's to go from about 98.6 ^{0}F to a fever of 100.4 ^{0}F). Assume the specific heat of the body is 3.5 J/g^{0}C and an FAA standard man- 70 Kg or 70,000 g.

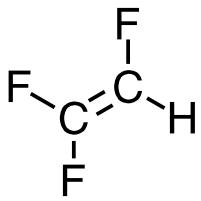
2. a) Draw the Lewis structure for phosphite, PO_3^{3-} and for methyl formate, $C_2H_4O_2$. (Hint: The skeletal structure for methyl formate is on the board.). Show the formal charges on all atoms. (Hint: Skeletal structure for formic acid is on the board)

b) Circle the polar molecules (Hint: the geometry is accurately portrayed in the drawings):









3. a) A gas at 255 K occupies 4.0 L at a pressure of 1.1 atm. What volume does it occupy if the pressures is changed (T constant) to 0.050 atm?

b) A gas at 273 K and 1.0 atm occupies 7.0 L . What is its pressure if the temperature is changed to 373 K and the volume is decreased to 1.0 L?

c) What is the density of CO_2 at 315 K and 750 Torr?

4) a) Circle the strong acids

$HClO_4$ KCl HNO_2 HNO_3 H_2SO_3 H_3PO_4

b) Circle the water soluble compounds

NaCl $AgC_2H_3O_2$ KBr $(NH_4)_3PO_4$ Li_2SO_4 $CsCO_3$ $HgCl_2$

c) A 25.00 mL sample of aqueous HBr was titrated with 0.1500 M NaOH. 45.55 mL of the base was required to reach the equivalence point. What was the molar concentration of the acid?

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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) ΔH for an endothermic process is _____ while ΔH for an exothermic process is _____. 1) _____
A) zero, positive
B) positive, negative
C) negative, positive
D) positive, zero
E) zero, negative

2) The reaction 2) _____

$$4Al\,(s) + 3O_2\,(g) \rightarrow 2Al_2O_3\,(s) \qquad \Delta H^\circ = -3351\ kJ$$

is _____, and therefore heat is _____ by the reaction.
A) endothermic, absorbed
B) endothermic, released
C) exothermic, absorbed
D) exothermic, released
E) thermoneutral, neither released nor absorbed

3) In which of the molecules below is the carbon–carbon distance the shortest? 3) _____
A) $H_3C–CH_2–CH_3$
B) $H_2C=CH_2$
C) $H_2C=C=CH_2$
D) $H_3C–CH_3$
E) H–C≡C–H

4) Of the atoms below, _____ is the most electronegative. 4) _____
A) Si B) Cl C) S D) Rb E) Ca

5) A valid Lewis structure of _____ cannot be drawn without violating the octet rule. 5) _____
A) SO_2 B) SiF_4 C) NI_3 D) ICl_5 E) CO_2

6) The basis of the VSEPR model of molecular bonding is _____. 6) _____
A) electron domains in the valence shell of an atom will arrange themselves so as to minimize repulsions
B) atomic orbitals of the bonding atoms must overlap for a bond to form
C) hybrid orbitals will form as necessary to, as closely as possible, achieve spherical symmetry
D) regions of electron density on an atom will organize themselves so as to maximize s–character
E) regions of electron density in the valence shell of an atom will arrange themselves so as to maximize overlap

7) The net ionic equation for the reaction between aqueous nitric acid and aqueous sodium hydroxide is _____. 7) _____

A) $HNO_3\,(aq) + OH^-\,(aq) \rightarrow NO_3^-\,(aq) + H_2O\,(l)$

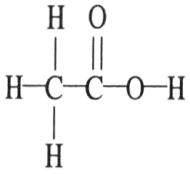
B) $H^+\,(aq) + Na^+\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l) + Na^+\,(aq)$

C) $H^+\,(aq) + HNO_3\,(aq) + 2OH^-\,(aq) \rightarrow 2H_2O\,(l) + NO_3^-\,(aq)$

D) $H^+\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l)$

E) $HNO_3\,(aq) + NaOH\,(aq) \rightarrow NaNO_3\,(aq) + H_2O\,(l)$

8) The molecular geometry of the right–most carbon in the molecule below is _____. 8) _____



A) tetrahedral
B) trigonal bipyramidal
C) T–shaped
D) trigonal planar
E) octahedral

9) Of the molecules below, only _____ is nonpolar. 9) _____

A) NH_3 B) $TeCl_2$ C) H_2O D) CO_2 E) HCl

10) Molecular compounds of low molecular weight tend to be gases at room temperature. Which of the following is most likely not a gas at room temperature? 10) _____

A) CH_4 B) Cl_2 C) HCl D) LiCl E) H_2

11) A 0.100 M solution of _____ will contain the highest concentration of potassium ions. 11) _____

A) potassium oxide
B) potassium phosphate
C) potassium hydrogen carbonate
D) potassium iodide
E) potassium hypochlorite