

KEY

Name _____

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

1) Which of the following is a molecular compound? 1) _____
A) LiOH B) P₄O₁₀ C) ZnS D) NaCN E) SrI₂

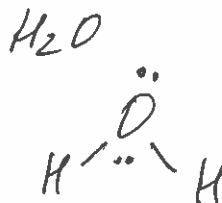
2) Determine the name for N₂O₅. 2) _____
A) nitrogen (IV) oxide
B) nitrogen (II) oxide
C) nitrogen tetraoxide
D) dinitrogen pentaoxide
E) nitrogen oxide

3) Determine the empirical formula for a compound that is 36.86% N and 63.14% O by mass. 3) _____
A) NO₂ B) N₂O₃ C) NO₃ D) N₂O E) NO

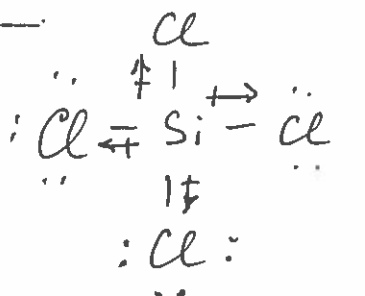
4) Choose the bond below that is most polar. 4) _____
A) H-Cl B) H-I C) H-F D) H-Br E) C-H

5) Choose the best Lewis structure for OCl₂. 5) _____
A) :Cl=O=Cl:
B) :Cl-O=Cl:
C) :Cl=O=Cl:
D) :Cl=O-Cl:
E) :Cl-O-Cl:

6) The water molecule has a _____ geometry because its central atom has _____ bonds and _____ lone pairs of electrons. 6) _____
A) tetrahedral; four; zero
B) pyramidal; three; one
C) bent; two; two
D) linear; two; two
E) trigonal; three; one



7) Consider the molecule SiCl₄. The electronegativity values for Si and Cl are 1.8 and 3.0, respectively. Based on these values and on consideration of molecular geometry, the Si-Cl bond is _____ and the molecule is _____. 7) _____
A) non-polar; polar
B) polar; polar
C) non-polar; non-polar
D) polar; non-polar
E) none of the above



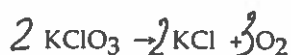
polar bonds
cancellation
↓
The molecule is not polar

1 Tetrahedral molecule with 4 identical bonds.

8) A chemical bond formed when two atoms share two pairs of electrons is a _____ bond; it is best described as _____.

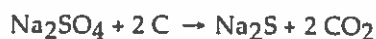
- A) single; covalent
B) double; ionic
C) triple; covalent
D) double; covalent
E) single; ionic

9) When the reaction shown is correctly balanced, the coefficients are 9)



- A) 2, 2, 3 B) 2, 2, 2 C) 4, 4, 6 D) 2, 2, 1 E) 1, 1, 1

10) How many grams of C will be consumed when 5.00 grams of Na_2SO_4 react according to the balanced reaction shown? 10) _____



- A) 1.69 g B) 0.211 g C) 0.844 g D) 17.1 g E) 0.038 g

11) The reaction $2 \text{AgNO}_3(\text{aq}) + \text{K}_2\text{SO}_4(\text{aq}) \rightarrow 2 \text{KNO}_3(\text{aq}) + \text{Ag}_2\text{SO}_4(\text{s})$ is an example of a(an) _____ reaction. 11) _____

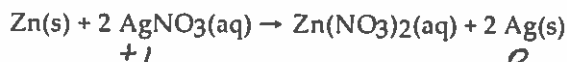
- A) combustion
B) precipitation
C) acid-base
D) oxidation-reduction
E) none of the above

12) How many of the following compounds are **soluble** in water? 12)



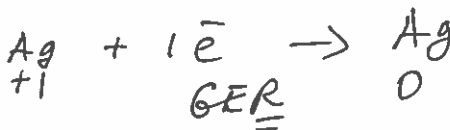
- A) 4 B) 1 C) 2 D) 0 **E) 3**

13) What element is undergoing reduction (if any) in the following reaction? 13)



- A) N
B) Zn
C) Ag
D) O

E) This is not an oxidation-reduction reaction.



14) Determine the oxidation state of P in PO_3^{3-} . 14)

- A) -3 B) +2 C) 0 D) +3 E) +6

$$\begin{array}{rcl} x + 3 \cdot (-2) & = & -3 \\ x & = & +3 \end{array}$$

15) Chose the reaction that represents the combustion of $C_6H_{12}O_2$.

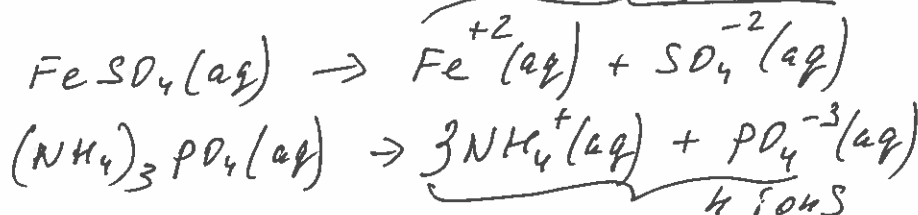
15) _____

- A) $C_6H_{12}O_2(l) + 8 O_2(g) \rightarrow 6 CO_2(g) + 6 H_2O(g)$
- B) $C_6H_{12}O_2(l) \rightarrow 6 C(s) + 6 H_2(g) + O_2(g)$
- C) $Mg(s) + C_6H_{12}O_2(l) \rightarrow MgC_6H_{12}O_2(aq)$
- D) $6 C(s) + 6 H_2(g) + O_2(g) \rightarrow C_6H_{12}O_2(l)$
- E) None of the above represent the combustion of $C_6H_{12}O_2$.

16) Considering 1 M solutions of each substance, which contains the smallest concentration of ions?

16) _____

- A) K_2CO_3
- B) $Ca(NO_3)_2$
- C) $FeSO_4$
- D) $(NH_4)_3PO_4$
- E) Na_2SO_4



17) What is the molarity of a solution prepared by dissolving 48.0 g of NaOH in enough water to make 1.50 L of solution?

17) _____

- A) 0.556 M
- B) 32.0 M
- C) 1.28 M
- D) 0.0313 M
- E) 0.800 M

18) How many mL of water should be added to 50.0 mL of a 15.0 M H_2SO_4 solution to give a final concentration of 0.300 M?

18) _____

- A) 950 mL
- B) 2550 mL
- C) 1000 mL
- D) 2500 mL
- E) 2450 mL

19) Which reaction is an example of an acid-base reaction?

19) _____

- A) $FeCl_3(aq) + 3 KOH(aq) \rightarrow Fe(OH)_3(s) + 3 KCl(aq)$
- B) $2 Hg(l) + O_2(g) \rightarrow 2 HgO(s)$
- C) $H_2CO_3(aq) \rightarrow H_2O(l) + CO_2(g)$
- D) $6 HCl(aq) + 2 Al(s) \rightarrow 2 AlCl_3(aq) + 3 H_2(g)$
- E) $H_2SO_4(aq) + Ca(OH)_2(aq) \rightarrow CaSO_4(aq) + 2 H_2O(l)$
acid base

20) Which representation of a hydrogen molecule is not correct?

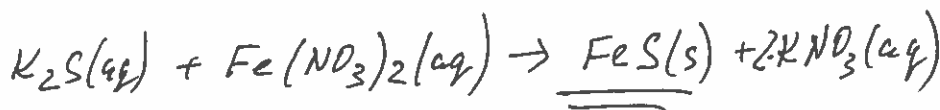
20) _____

- A) H_2
- B) $H=H$
- C) $H-H$
- D) $H:H$
- E) none of the above

21) Give the net ionic equation for the reaction (if any) that occurs when aqueous solutions of K_2S and $Fe(NO_3)_2$ are mixed.

21) _____

- A) $Fe^{2+}(aq) + S^{2-}(aq) + 2 K^+(aq) + 2 NO_3^-(aq) \rightarrow Fe^{2+}(aq) + S^{2-}(aq) + 2 KNO_3(s)$
- B) $K^+(aq) + NO_3^-(aq) \rightarrow KNO_3(s)$
- C) $Fe^{2+}(aq) + S^{2-}(aq) + 2 K^+(aq) + 2 NO_3^-(aq) \rightarrow FeS(s) + 2 K^+(aq) + 2 NO_3^-(aq)$
- D) $Fe^{2+}(aq) + S^{2-}(aq) \rightarrow FeS(s)$
- E) No reaction occurs.



$$MM_{NO_2} = 14.01 + 2 \cdot 16.00 = 46.0 \frac{g}{mol}$$

22) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO₂. 22) _____

A) N₂O₄

B) N₂O₃

C) NO₂

D) N₂O₅

E) N₃O₆

23) 105 g of MgCl₂ contains _____ mol MgCl₂.

A) 1.10

B) 1.76

C) 1.06 × 10²⁴

D) 105

E) 6.62 × 10²³

$$\frac{92.0g}{46.0} = 2 \quad 23) \text{ _____}$$

molec. formula:

$$N_{1 \times 2} O_{2 \times 2} = \boxed{N_2 O_4}$$

24) Which of the following represent the Lewis structure for N? 24) _____

A) $\cdot \ddot{N} \cdot$

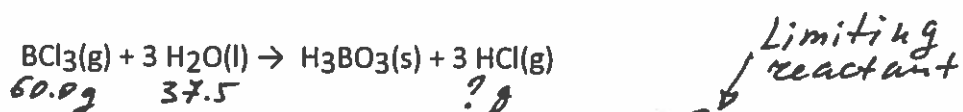
B) $\cdot \ddot{N} \cdot$

C) N⁺

D) $\cdot \ddot{N} \cdot$

E) $\cdot \ddot{N} \cdot$

25&26. According to the following balanced reaction:



- a) Determine the theoretical yield of HCl (in g) if 60.0 g of BCl_3 and 37.5 g of H_2O are reacted. A possibly useful molar mass is $\text{BCl}_3 = 117.16 \text{ g/mol}$

(This is a limiting reagent problem).

$$60.0 \text{ g BCl}_3 \times \frac{1 \text{ mol BCl}_3}{117.16 \text{ g}} \times \frac{3 \text{ mol HCl}}{1 \text{ mol BCl}_3} \times \frac{36.46 \text{ g HCl}}{1 \text{ mol HCl}} = \boxed{56.0 \text{ g HCl}}$$

$$37.5 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{3 \text{ mol HCl}}{3 \text{ mol H}_2\text{O}} \times \frac{36.46 \text{ g HCl}}{1 \text{ mol HCl}} = 75.9 \text{ g HCl}$$

- b) If 22.86 g HCl were collected, what is the % yield of the reaction?

$$\frac{22.86 \text{ g}}{56.0 \text{ g}} \times 100\% = \boxed{40.8\%}$$