Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Multiple Choice: Choose any 25 questions /25**

1.         Which of the following oxides will form the most acidic solution?

            **A.        SO2 non metal oxide= acid**

            B.        MgO O+ forms a base. Metal oxide= base

            C.        Na2O Metal oxide= base

            D.        Al2O3 Al3+ will hydrolyse to make acid but not the salt

2.         Which one of the following salts will produce an acidic solution?

            A.        KBr. No hydrolysis

            B.        LiCN No hydrolysis

            **C.        NH4Cl** NH4 hydrolysis

            D.        NaCH3COO No hydrolysis

3.         The balanced equation for the reaction between sodium oxide and water is

            **A.        Na2O + H2O → 2NaOH -> 2Na+ + 2OH-**

            B.        Na2O + H2O → 2NaH  +  O2

            C.        Na2O + H2O → 2Na +  H2O2

D.        Na2O + H2O → 2Na + H2+O2

4.         Normal rainwater is slightly acidic due to the presence of dissolved Hebden / video

            A.        methane

            **B.        carbon dioxide**

            C.        sulphur dioxide

            D.        nitrogen dioxide

5.         Which of the following oxides would hydrolyze to produce hydroxide ions? Flow chart

            A.        NO

            B.        SO2

            C.        Cl2O

            **D.        Na2O**

6.         The approximate pH of “normal” rainwater is Hebden / video

            A.        0

            **B.        6**

            C.        7

            D.        8

7.         Which of the following oxides would hydrolyze to produce hydronium ions? Flow chart

A.       CaO

            **B.        SO2**

            C.        MgO

            D.        Na2O

8.         Which of the following gasses results in the formation of acid rain? Hebden / video

            A.        H2

            B.        O3

**C.        SO2**

            D.        NH3

9.         Consider the following acid /base solution

                        HSO3- + HF ⇄ H2SO3 + F-

            The order of Bronsted-Lowry conjugate acids and bases in this equation is

            A.        acid + base ⇄ acid + base

            B.        acid + base ⇄ base + acid

            C.        base + acid ⇄ base + acid

            **D.        base + acid ⇄ acid + base** Ka HF > Ka HSO3-

10.       The conjugate acid of OH- is one H+ apart

            A.        H+

            B.        O2-

**C.        H2O**

            D.        H3O+

11.       Which of the following 0.10 M solutions will have the greatest electrical conductivity

            A.        HF

            B.        NH3

**C.        NaOH** (strongest base/acid)

            D.        C6H5COOH

12.       The amphiprotic ion HSeO3- can undergo hydrolysis according to the following equations

|  |  |
| --- | --- |
| HSeO3- + H2O ⇄ H2SeO3 + OH- | Kb |
| HSeO3- + H2O ⇄ SeO32-+ H3O+ | Ka |

An aqueous solution of HSeO3- is found to be acidic. This observation indicates that when it is added to water, HSeO3- behaves mainly as a

**A.        proton donor, and Kb is less than Ka** B-L definition of an acid

            B.        proton donor, and Kb is greater than Ka

C.        proton acceptor, and Kb is less than Ka

            D.        proton acceptor, and Kb is greater than Ka

13.       The Kbexpression for HPO42-is look on the right side of the Ka equations, eliminate H+, add OH-to the left

            A. [PO43-][H3O+]                     B. [HPO42-][ OH - ]

                     [HPO42-]                                 [H2PO4-]

            **C. [H2PO4-][ OH - ]**            D. [HPO42-][ H3O+]

**[HPO42-]**                                     [PO43-]

14.       Given the equilibrium:            H2BO3-  +   H2PO4-  ⇌   H3BO3  +  HPO42- table

            Which is the strongest acid?

            A.        HPO42-

            B.        H3BO3

            **C.        H2PO4-**

            D.        H2BO3-

15.       Which species is not amphiprotic? Appears twice on Table or memorize

            A.        H2O

            **B.        H3BO3**

            C.        H2PO4-

            D.        H2C6H5O7-

16.       What is produced when CH3NH2 acts as a base in water? Proton acceptor

            A.        CH3NH-

            **B.        CH3NH3+**

            C.        CH3NH2+

            D.        CH2NH2-

17.       What species will form when H+ ions are in the presence of H2O molecules? Proton acceptor

            A.        HO+

            B.        H2O+

            **C.        H3O+**

            D.        H2O2+

18.       What is the conjugate acid of the base HAsO42-? Base is a Proton acceptor and CP are one proton apart

            A.        AsO43-

            **B.        H2AsO4-**

            C.        H4AsO4+

            D.        H3AsO4

19.       Which solution will have the greatest electrical conductivity?

            A.        0.50 M HCl = H+ + Cl- = 2 moles

            B.        0.10 M RbOH

            **C.        0.50 M K3PO4= 3K+ + PO4-3 = 4 moles**

            D.        2.0 M C6H12O6

20.       The following equilibrium favours the formation of products: table

            NH2OH   +   CH3NH2   ⇌     CH3NH-   +   NH3OH+

            Which species is the strongest acid?

            A.        NH3OH+

            B.        NH2OH

            **C.        CH3NH2**

            D.        CH3NH-

21.       Which of the following solutions would have the greatest [OH-]? Greatest Kb or lowest Ka

            A.        0.1 M HCO3-

            B.        0.1 M HPO42-

            C.        0.1 M H2PO4-

            **D.        0.1 M CO32-**

22.       Which of the following amphiprotic ions will act predominantly as a base in

            solution? Greatest Kb or lowest Ka

            A.        HSO3-

            B.        HSO4-

            C.        H2PO4-

            **D.        HPO42-**

23.       Which is the strongest base? Greatest Kb or lowest Ka

            A.        Cl-

            B.        NO2-

            **C.        HPO42-**

            D.        CH3COO-

24.       Water has the greatest tendency to act as an acid with which of the following? Greatest Kb or lowest Ka

            A.        Cl-

            B.        NO2-

            **C.        HPO42-**

            D.        CH3COO-

25.       Water has the greatest tendency to act as a base with which of the following? Greatest Ka or lowest Kb

            A.        HF

            B.        H2CO3

            **C.        H3PO4**

            D.        CH3COOH

26.       Which of the following will have the smallest Ka value? table

            A.        HF

            **B.        H2CO3**

            C.        H3PO4

            D.        CH3COOH

27.       Which of the following will have the smallest Kb value? Greatest Ka or calculate Kw=Ka\*Kb

            **A.        IO3-**

            B.        NH3

            C.        CN-

            D.        HPO42-

28.       What volume of 0.500 M NaOH is required to neutralize 25.0 mL 0.250 M HBr ? Titration caculation 1:1

            A.        5.00 mL

            **B.        12.5 mL** 0.250 mole x 1L x 25.0 ml = 6.25 x10-3 mole HBr & NaOH

            C.        20.0 mL 1L 1000ml

            D.        25.0 mL

29.       Which of the following Ka values represents the acid that is strongest? Highest Ka

            A.        Ka  =  2.8  x  10-18

            **B.        Ka  =  8.2  x  10-18**

            C.        Ka  =  4.4  x  10-22

            D.        Ka  =  6.4  x  10-22

30.       Which of the following Ka values represents the acid with the strongest conjugate lowest Ka

            base?

            A.        Ka  =  2.8  x  10-18

            B.        Ka  =  8.2  x  10-18

            **C.        Ka  =  4.4  x  10-22**

            D.        Ka  =  6.4  x  10-22