WKS
Brønsted Acids/Bases

Name _____
Period _____ Date_____

1) Compare and contrast the general properties of acids and bases.

2) Refresher: in Unit 8 we learned how to convert between the names and formulas of acids. Determine the formulas or names of the following acids.

a) sulfurous acid

b) perbromic acid

c) hydrofluoric acid

d) HI

e) HNO_2

f) HIO_3

3) Write the conjugate base for each of the following acids. [Remember, the an acid *loses one* H^+]

a) HNO_3

b) HS^-

c) HPO_4^{2-}

d) $HC_3H_5O_2$

e) H_2SO_3

f) C_6H_5COOH

4) Write the conjugate acid for each of the following bases. [Remember, the a base *gains one* H^+]

a) HPO_4^{2-}

b) NO_2^-

c) CH_3NH_2

d) HS^-

e) S^{2-}

f) C_5H_4N

5) For each reaction listed, identify the acid, base, conjugate acid and conjugate base.

a) $CH_3COOH\ (aq) + H_2O \rightleftharpoons H_3O^+\ (aq) + CH_3COO^-\ (aq)$

b) $HCO_3^-\ (aq) + H_2O\ (l) \rightleftharpoons H_2CO_3\ (aq) + OH^-\ (aq)$

c) $HNO_3(l) + SO_4^{2-}\ (aq) \rightarrow HSO_4^-\ (aq) + NO_3^-\ (aq)$

d) $NH_3\ (aq) + H_2PO_4^-\ (aq) \rightleftharpoons NH_4^+\ (aq) + HPO_4^{2-}\ (aq)$

6) In each of the following acid-base reactions, show an arrow for the H^+ transfer, determine the products and label products as either the conjugate acid or conjugate base.

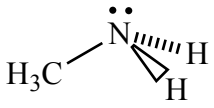
a) NH_2^- (aq) + H_2O ⇌
base *acid*

b) H_2S (aq) + NH_3 (aq) ⇌
acid *base*

c) HSO_4^- (aq) + OH^- (aq) ⇌
acid *base*

d) CO_3^{2-} (aq) + NH_4^+ (aq) ⇌
base *acid*

7) Methylamine (CH_3NH_2, Lewis structure below) forms hydroxide in water the same way that ammonia, NH_3, does. Draw the transfer of H^+ from water (H–OH) and explain why methylamine is a Brønsted-Lowry base but not an Arrhenius base. [Hint: in the products, the N is tetrahedral with one additional H and a + charge, like NH_3 becoming NH_4^+.]



8) a) What is meant by the term amphoteric?

b) Give two examples of an amphoteric species (other than the ones below)

9) HPO_4^{2-} is amphoteric.
a) Write a balanced equation of showing how HPO_4^{2-} can act as an acid in water:

b) Write balanced equation showing how HPO_4^{2-} can act as a base in water.

10) What are diprotic and triprotic acids? Give one example of each (other than the one below).

11) Polyprotic acids ionize in water one proton at a time. Write the step-by-step complete ionization of arsenous acid, H_3AsO_3.