1.Choose all that apply below.



2.

3.



4.



5.

Which of the following acid-base pairs would you use to make a buffer of pH = 7.6?

Which species would be present in higher concentration, the acid or the base?



6.

Below is a plot for the titration of a weak, diprotic acid H2SO3 with NaOH. I

Indicate what chemical entity or entities are present at each of the indicated points (A – E).

Estimate the Ka values for H2SO3 and HSO3-.



7.

The Ka value of HNO2 is 4.5 x 10-4. Draw an alpha plot for the HNO2/NO2- system. Label both axes.

8.

The fully acidic form of the amino acid valine is,



The two acidic H atoms are highlighted. The pKa of the COOH acid group is 2.32; that of the NH3+ group is 9.61.

Which form will the amino acid take at pH = 7?

Which form will the amino acid take at pH = 12?

9. The **Al3+** concentration in a saturated solution of **aluminum hydroxide** is measured and found to be **2.85E-9** M. Use this information to calculate a Ksp value for **aluminum hydroxide**.

OR

The solubility of **Ni(CN)2** is measured and found to be **2.22E-6** g/L. Use this information to calculate a Ksp value for **nickel(II) cyanide**.

10.

Calculate the solubility of **iron(II) hydroxide**, **Fe(OH)2** in units of grams per liter.

Ksp(**Fe(OH)2**) = **7.9E-15**.

11.

a) Is CaCO3 more soluble in pure water, or in a solution of Na2CO3?

b) Calculate the solubility of **CaCO3** (a) in pure water and (b) in a solution in which [**CO32-**] = **0.174** M.

12. Identify the Lewis acid and Lewis base in this reaction:



13. In the presence of excess OH-, the **Zn2+**(aq) ion forms a hydroxide complex ion, **Zn(OH)42-**. Calculate the concentration of free **Zn2+**ion when **1.64E-2** mol **Zn(NO3)2**(s) is added to 1.00 L of solution in which [OH- ] is held constant (buffered at pH **12.40**). For**Zn(OH)42-**, Kf = **4.6E17**.