For 1 – 4:
a. HBr(aq)
b. NH_3(aq)
c. H_2O(l)
d. HF(aq)
e. H_2CO_3(aq)

1. A strip of litmus paper will appear blue in

2. At 25 °C, it has a pH > 7

3. It is essentially a non-electrolyte

4. Its aqueous ionization goes virtually to completion

For 5 – 8:
a. a Bronsted acid
b. a Bronsted base
c. a strong acid
d. a weak base
e. a buffer

5. It's a solution made by the combination of a weak acid and the salt of its conjugate base

6. It always dissociates completely in aqueous solution

7. It has a very high K_a

8. It accepts a proton

For 9 – 12:
a. a strong acid
b. a strong base
c. a weak acid
d. a weak base
e. a salt (made from an acid and a base)

9. NH_3 is

10. Cl^- is

11. $NaHCO_3$ is

12. NaOH is

For 13 – 18:
a. an acid
b. a base
c. an acidic salt
d. a basic salt
e. an amphoteric substance

13. Amino acids are an example of

14. Ammonia is an example of a

15. Ammonium sulfate is an example of

16. Aluminum chloride is an example of

17. The product of a group IA element and water is an example of a

18. Bicarbonate ion is an example of a

Q	Statement I	Because	Statement II
19.	The reaction of zinc with hydrochloric acid goes to completion in an open container	Because	Hydrogen gas is evolved from the reaction of zinc and hydrochloric acid.
20.	A 0.2 M solution of carbonic acid is a weaker conductor of electricity than a 0.2 M solution of HBr	Because	In solutions with the same concentration of solute molecules, H_2CO_3 is less dissociated than HBr
21.	An aqueous solution of HI is considered to be a Bronsted-Lowry base.	Because	HI(aq) can accept an H^+ ion from another species.
22.	If an acid is added to pure water, it increases the water's pH.	Because	Adding an acid to water raises the hydrogen ion concentration in the water.
23.	Hydrofluoric acid etches glass.	Because	It is a strong acid.
24.	Acetic acid is a strong acid.	Because	Acetic acid ionizes completely in solution.
25.	NH_3 is a Lewis base.	Because	Ammonia can accept a proton.
26.	A 1 N ("normal") solution of H_2SO_4 is the same as a 1M ("molar") solution of H_2SO_4.	Because	Molarity refers to the moles of solute per liter of solution, whereas *normality* refers to the molarity of hydrogen ions.
27.	The pH of 0.01 M HCl(aq) is 2.	Because	HCl is essentially an ionic species, completely dissociating so that $[H^+] = [HCl]$.
28.	A solution with a pH of 12 has a higher concentration of hydroxide ions than a solution with a pH of 10	Because	At 25 °C, pH + pOH = 14.
29.	A basic solution has more hydrogen ions than an acidic solution.	Because	At 25 °C, the product of $[H^+] \times [OH^-] = 10^{-14}$.
30.	Water makes a good buffer	Because	A good buffer will resist changes in pH
31.	When volumes of 1.0 M HCl and 1.0 M NaOH are mixed, the product mixture is theoretically safe to drink.	Because	The acid and the base form a neutral salt
32.	If an acid is added to water with original pH of 7, the concentration of hydroxide ions will increase.	Because	The product of hydroxide ions and hydrogen ions is equal to 1.0×10^{-14} in all aqueous solutions at 25 °C.

33. In $HNO_3(aq) + OH^-(aq) \rightleftharpoons H_2O(l) + NO_3^-(aq)$, which species is the conjugate acid?
a. HNO_3(aq)
b. OH^-(aq)
c. H_2O(l)
d. NO_3^-(aq)
e. There is no conjugate acid

34. Which is true regarding an aqueous solution of H_3PO_4 at 25 °C?
a. It has a very large acid ionization constant
b. It has a bitter taste
c. The concentration of $[OH^-] > 1.0 \times 10^{-7}$ M
d. It is a weak electrolyte
e. It can be formed by the reaction of a metal oxide and water

35. In $NH_3(aq) + H_2CO_3(aq) \rightleftharpoons NH_4^+(aq) + HCO_3^-(aq)$, NH_4^+(aq) acts as a(n)
a. indicator
b. hydrate
c. acid
d. base
e. salt

36. Which of the following are true regarding the aqueous dissociation of HCN, $K_a = 4.9 \times 10^{-10}$ at 25 °C?
i. At equilibrium, $[H^+] = [CN^-]$
ii. At equilibrium, $[H^+] = [HCN]$
iii. HCN is a strong acid
a. i only
b. ii only
c. i and ii only
d. ii and iii only
e. i, ii and iii

37. The reaction of zinc metal and HCl produces which of the following?
i. H_2(g)
ii. Cl_2(g)
iii. $ZnCl_2$(aq)
a. ii only
b. iii only
c. i and ii only
d. i and iii only
e. i, ii and iii

38. Which characteristic is associated with Lewis bases?
a. React with metal to produce hydrogen gas
b. Donate an unshared electron pair
c. Always contain the hydroxide ion in its structure
d. Taste sour
e. Formed by the reaction of a nonmetal oxide and water

39. Which of the following is a poor electrolyte?
a. A hydrochloric acid solution
b. A sodium hydroxide solution
c. A vinegar solution
d. A sodium chloride solution
e. Molten sodium chloride

40. A compound that dissolves in water which barely conducts electrical current can probably be
a. A strong electrolyte
b. An ionic salt
c. A strong acid
d. A strong base
e. None of the above

41. Which of the following acids is capable of dissolving gold?
a. Hydrochloric
b. Nitric
c. Sulfuric
d. A combination of A and B
e. A combination of A and C

42. A stock solution of 10 M NaOH was used to prepare 2 L of 0.5 M NaOH. How many milliliters of sodium hydroxide stock solution were used?
a. 10 mL
b. 100 mL
c. 1000 mL
d. 200 mL
e. 2000 mL

43. What is the hydroxide ion concentration in a solution with a pH of 5?
a. 10^{-3}
b. 10^{-5}
c. 10^{-7}
d. 10^{-9}
e. 10^{-11}

44. What is the H_3O^+ concentration of a 0.100 M acetic acid solution (K_a = 1.8×10^{-5})?
a. 1.8×10^{-5}
b. 1.8×10^{-4}
c. 1.3×10^{-2}
d. 1.3×10^{-3}
e. 0.9×10^{-3}

45. What is the pH of a solution with a hydroxide ion concentration of 0.00001 M?
a. -5
b. -1
c. 5
d. 9
e. 14

46. A titration experiment is conducted in which 15 mL of a 0.015 M $Ba(OH)_2$ solution is added to 30 mL of an HCl solution of unknown concentration and titration is complete. What is the approximate concentration of the HCl solution?
a. 0.015 M
b. 0.03 M
c. 1.5 M
d. 2.5 M
e. 3.0 M

47. An aqueous solution with pH 5 at 25 ^{o}C has a hydroxide ion concentration of
a. 1×10^{-11} M
b. 1×10^{-9} M
c. 1×10^{-7} M
d. 1×10^{-5} M
e. 1×10^{-3} M

48. What is the pOH of a solution with $[H^+]$ = 0.001 M
a. -3
b. 1
c. 3
d. 11
e. 14

49. Which of the following can be used to prepare hydrogen gas in the laboratory?
a. Mercuric oxide
b. Acid plus zinc
c. Potassium chlorate
d. Carbon disulfide
e. Benzene

<u>ANSWERS:</u>

1. B
2. B
3. C
4. A
5. E
6. C
7. C
8. B
9. D
10. D
11. E
12. B
13. E
14. B
15. C
16. C
17. B
18. E
19. T T CE
20. T T CE
21. F F
22. F T
23. T F
24. F F
25. T T
26. F T
27. T T CE
28. T T
29. F T
30. F T
31. T T CE
32. F T
33. C
34. D
35. C
36. A
37. D
38. B
39. C
40. E
41. D (mixture is called “aqua regia”)
42. B
43. D
44. D
45. D
46. A
47. B
48. D
49. B