以下各題為單選題，共25題。每題答對者得4分，答錯者扣1分。不回答者不得分也不扣分。請將答案寫在答案紙上，不須抄題。

1. If the dissociation constant of NH_4OH is 1.8×10^{-5}, the concentration of OH^- ions, in moles per liter, of a 0.1 molar NH_4OH solution is
   (a) 1.8×10^{-6}
   (b) 1.34×10^{-3}
   (c) 4.2×10^{-3}
   (d) 5.0×10^{-2}
   (e) 1.8×10^{-4}

2. The volume of 0.25 molar H_3PO_4 necessary to neutralize 25 ml of 0.30 molar $Ca(OH)_2$ is
   (a) 8.3 ml
   (b) 20 ml
   (c) 50 ml
   (d) 75 ml
   (e) 40 ml

3. The phosphorescence spectrum of the excited species is due to
   (a) singlet to triplet transitions
   (b) tripet to singlet transitions
   (c) vibration modes
   (d) nuclear spin transitions
   (e) electron spin transitions

4. A saturated solution of CaF_2 is 2×10^{-4} moles per liter; its solubility product constant is
   (a) 2.6×10^{-9}
   (b) $4. \times 10^{-8}$
   (c) 3.2×10^{-11}
   (d) $8. \times 10^{-12}$
   (e) $8. \times 10^{-10}$

5. A 0.2 molar solution of formic acid is ionized 3.2%. Its ionization constant is
   (a) 9.6×10^{-3}
   (b) 2.1×10^{-4}
   (c) 1.25×10^{-6}
   (d) 4.8×10^{-5}
   (e) 2.1×10^{-8}

6. Iodine may be determined quantitatively by titrating with a standard solution of which one of the following?
   (a) Na_2S
   (b) Na_2SO_3
   (c) Na_2SO_4
   (d) $Na_2S_2O_3$
   (e) $NaHSO_4$

7. Which one of the following reagents will separate out one of the following: $PbCl_2$, AgCl, and Hg_2Cl_2?
   (a) HCl
   (b) HNO_3
   (c) H_2SO_4
   (d) hot water
   (e) NaOH.

8. A mixture of benzene, 2,4-hexadiene, hexane, 1-hexanol, and butyl acetate is adsorbed on a column of neutral alumina, and eluted with solvents of increasing polarity. The compound that would be eluted first is
   (a) benzene
   (b) 2,4-hexadiene
   (c) hexane
   (d) 1-hexanol
   (e) butyl acetate

9. What is the normality of a 50% solution of acetic acid whose density is 1.00 g/ml?
   (a) 10.0
   (b) 5.0
   (c) 6.23
   (d) 8.47
   (e) none of the above

10. The most basic species among the following is
   (a) F^-
   (b) OH^-
   (c) NH_2^-
   (d) CH_3^-
   (e) H_2O

11. Of the following, the substance which has the highest boiling point is
   (a) H_2Se
   (b) H_2S
   (c) H_2Te
   (d) H_2O
   (e) H_3N

12. Which of the following equipments is the most appropriate one to separate CO and CO_2?
   (a) gas-solid chromatograph
   (b) thin-layer chromatograph
   (c) gas-liquid chromatograph
   (d) normal phase HPLC
   (e) reverse phase HPLC

13. Which of the following is the strongest acid?
   (a) HCl
   (b) HOCl
   (c) HOClO
   (d) $HOClO_2$
   (e) $HOClO_3$

14. The use of a semi-permeable membrane to separate colloids and crystalloids is known as which one of the following?
   (a) electrophoresis
   (b) dialysis
   (c) precipitation
   (d) filtration
   (e) electrolysis

15. A basic compound Q has a pKa of 8.4. if unionized Q concentration is the same in two solutions with pH 5.4 and 7.4, what is the approximate ratio of total (ionized + unionized) concentration of Q in the two solutions ($C_{5.4}/C_{7.4}$)?
   (a) 0.01
   (b) 1
   (c) 2
   (d) 2.4
   (e) 100

16. Which will precipitate with both HCl and H_2S?
   (a) Pb^{++}, Cd^{++}
   (b) Mn^{++}, Fe^{++}
   (c) Pb^{++}
   (d) Mn^{++}
   (e) Fe^{++}

17. Given that the first ionization constant of a solution at constant temperature approximates 1.7×10^{-5} and that it is 1.3% ionized, what then would its concentration be?
   (a) 0.13 M
   (b) 2.0 M
   (c) 0.1 M
   (d) 1.3 M
   (e) cannot be calculated from the above data.

18. Given that the K_{sp} of Ag_2S, molecular weight 248, is 1.3×10^{-49} moles/liter, what is the approximate extent to which it dissolves in gm/liter?
(a) 8.0×10^{-17}
(b) 8.0×10^{-15}
(c) 3.1×10^{-17}
(d) 3.1×10^{-1}
(e) none of the above

19. The halogen that is most easily reduced is
(a) fluorine
(b) chlorine
(c) bromine
(d) iodine
(e) astarine

20. 500 ml of a 0.1 N solution of $AgNO_3$ are added to 500 ml of a 0.1 N solution of KCl. The concentration of nitrate ion in the resulting mixture is
(a) 0.05N
(b) 0.1 N
(c) 0.2 N
(d) 0.01 N
(e) reduced to nearly zero

21. A reagent used in testing for a carbonate is
(a) H_2S
(b) $CaCl_2$
(c) HCl
(d) NaOH
(e) $MgCl_2$

22. Chlorous acid has the formula
(a) HClO
(b) HCl
(c) $HClO_4$
(d) $HClO_3$
(e) $HClO_2$

23. The normality of a solution of sulfuric acid containing 50 grams of acid in 500 ml of solution is
(a) 0.49
(b) 0.1
(c) 0.98
(d) 0.35
(e) 2.04

24. Which one of the following is a product of the reaction between copper and hot concentrated sulfuric acid?
(a) hydrogen
(b) oxygen
(c) sulfur dioxide
(d) sulfur trioxide
(e) cuprous ions

25. The following solvents are commonly used in reversed-phase HPLC. Select the most nonpolar one from them.
(a) methanol
(b) acetonitrile
(c) water
(d) tetrahydrofuran
(e) ethanol