共二十題，每題五分.
請儘量依序作答並標明題號，但不必抄題，
計算題必須寫出計算過程，否則不予計分.

1. The average mass of a carbon atom is 12.011.　Assuming you were able to pick up only one carbon unit, the chances that you would randomly get one with a mass of 12.011 is

   a. 0%.　　　b. 0.011%.　　　c. about 12%.　　　d. 12.011%.　　　e. greater than 50%.

2. You heat 3.970 g of a mixture of Fe_3O_4 and FeO to form 4.195 g Fe_2O_3.　What was the mass percent of FeO originally in the mixture?

3. What volume of 0.25 M HNO_3 is necessary to react exactly with 7.4 g of $Ca(OH)_2$?

4. A sample of oxygen gas has a volume of 4.50 L at 27 ℃ and 800.0 torr.　How many oxygen molecules does it contain?

5. What is the specific heat capacity of gold if it requires 48.8 J to raise the temperature of 15 grams of gold 25 ℃?

6. When an electron in a 2p orbital of a lithium atom makes a transition to the 2s orbital, a photon of wavelength 670.8 nm is emitted. What is the energy difference between these 2p and 2s orbitals?

7. Calculate the lattice energy for LiF(s) given the following:
sublimation energy for Li(s)	+161 kJ/mol
ΔH_f for F(g)	+77 kJ/mol
first ionization energy of Li(g)	+520. kJ/mol
electron affinity of F(g)	-328 kJ/mol
enthalpy of formation of LiF(s)	-617 kJ/mol

8. What is the hybridization of I in IF_4^-?

9. The vapor pressure of water at 25 ℃ is 23.8 torr, and the heat of vaporization of water at 25 ℃ is 43.9 KJ/mol. Calculate the vapor pressure of water at 50 ℃.

10. Concentrated nitric acid is a solution that is 70% HNO_3, by mass. The density of this acid is 1.42 g/cm³. What is the molarity of this acid?

11. The average rate of disappearance of ozone in the reaction $2O_3(g) \rightarrow 3O_2(g)$ is found to be 9.0×10^{-5} atm over a certain interval of time. What is the rate of appearance of O_2 during this interval?

12. Find the value of the equilibrium constant (K) (at 500 K) for
    $$N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$$
    The value for Kp at 500 K is 1.5×10^{-5}/atm^2.

13. For nitrous acid, HNO_2, Ka = 4.0×10^{-4}. Calculate the pH of 0.25 M HNO_2.

14. If 25 mL of 0.75 M HCl are added to 100 mL of 0.25 M NaOH, what is the final pH?

15. The standard free energy of formation of AgCl(s) is -110 kJ/mol. What is ΔG° for the reaction $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$?

16. Copper is electroplated from $CuSO_4$ solution. A constant current of 4.00 amp is applied by an external power supply. How long will it take to deposit 1.00×10^3 g of Cu? The atomic mass of copper is 63.546.

17. A coordination compound of Cu^{2+} can be described as $Cu(NH_3)_xSO_4$ and is known to contain 29.9% NH_3. What is the value of x ?

18. The half-life of ^{90}Sr is 28 years. How long will it take for a given sample of ^{90}Sr to be 90% decomposed ?

19. How many isomers of C_4H_3 are there ?

20. How many possible sequences can be made for a polypeptide with five different amino acids?

   Fe : 55.85,　O : 16.00,　N : 14.01,　Ca : 40.08,　S : 32.07
   R = 0.8206 Latm/Kmol = 8.3145 J/Kmol
   h = 6.626×10^{-34} J $\cdot$ s