

BINGHAM UNIVERSITY  
FACULTY OF SCIENCE & TECHNOLOGY  
DEPARTMENT OF CHEMISTRY

CHM 101: General Chemistry

93/100  
20/10

INTROCTIONS: Answer all questions by filling in the blank spaces.

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Time: 1: 45 Hours

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Calculate the percent Sulphur in the compound  $\text{Al}_2(\text{SO}_4)_3$  is 28.67% % [Al = 27, S = 32, O = 16]

The solubility of alcohol in water is due to Electrovalent bonding, while the reaction between calcium and fluorine is due to Covalent Bond bonding.

3. In the Haber process for the production of ammonia gas from nitrogen and hydrogen gas if the heat of the reaction is 22.0 Kcal as shown by the equation:  $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$   $\Delta H = -22.0 \text{ Kcal}$ . Calculate the  $K_p$

for the reaction if the partial pressure for  $\text{N}_2 = 0.65 \text{ atm}$ ,  $\text{H}_2 = 0.65 \text{ atm}$  and  $\text{NH}_3 = 4.6 \text{ atm}$ . 118.543

4. Calculate the  $K_c$  for the reaction above at  $500^\circ\text{C}$ . [R = 0.0821 L. atm/mol. K]  $2.943 \times 10^{-2}$

5. What is the IUPAC name for  $\text{K}_2\text{Cr}_2\text{O}_7$  potassium heptaoxodichromate (VI)

If lead (II) iodide,  $\text{PbI}_2$  has a  $K_{sp}$  of  $1.4 \times 10^{-8}$ . The molar solubility is  $1.52 \times 10^{-3} \text{ mol/dm}^3$  and the solubility in g/L

$7.9 \times 10^{-2} \text{ g/L}$  [Pb = 207, I = 127]

The types of hybridization found in methane,  $\text{CH}_4$  is sp<sup>3</sup>, while that of ethyne,  $\text{C}_2\text{H}_2$  is sp

At  $50^\circ\text{C}$ , the equilibrium constant for the reaction:  $2\text{NO}_2 + \text{Br}_2 \rightleftharpoons 2\text{NOBr}$ , is found in the experiments with different initial concentrations of NO and  $\text{Br}_2$ . the result are as follows:

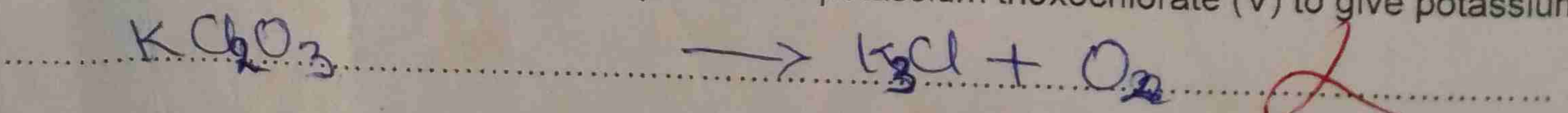
Experiments	[NO] mol/dm <sup>3</sup>	[Br] mol/dm <sup>3</sup>	Initial rate mol/dm <sup>3</sup>
1	0.10	0.10	0.040
2	0.10	0.20	0.080
3	0.20	0.20	0.320

8. What is the order of the reaction with respect to NO and with respect to  $\text{Br}_2$ ? 3rd order reaction

9. Calculate the rate constant using the result of experiment (1) 40

10. What is the rate of the equation for the reaction?  $R = k[\text{NO}]^2[\text{Br}_2]$

11. Write a balance equation for the decomposition of potassium trioxochlorate (V) to give potassium chloride and oxygen





If 22.9 g of iron (II) sulphide react with excess hydrochloric acid by the equation:  $\text{FeS}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow \text{H}_2\text{S}_{(g)} + \text{FeCl}_{2(aq)}$

12. Calculate the volume of hydrogen sulphide in  $\text{dm}^3$  formed at S.T.P. ~~8.65 dm<sup>3</sup>~~ [Fe = 56, S = 32, H = 1.008, Cl = 35.5, M. V. = 22.4  $\text{dm}^3$  at S.T.P.]

13. Calculate the mass of  $\text{FeCl}_2$  formed in the above reaction is ~~31.75 g~~ (1)

14. If 20.0  $\text{cm}^3$  of carbon(II) oxide are burnt in excess oxygen to give carbon(IV)oxide according to the reaction  $2\text{CO}_{(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{CO}_{2(g)}$ , the volume of oxygen in  $\text{cm}^3$  used up at the same temperature and pressure will be: ~~4.2 cm<sup>3</sup>~~ and the total residual gas is: ~~5.8 cm<sup>3</sup>~~ (2)

15. Write the equilibrium constant for this reaction system  $\text{N}_2\text{O}_{4(g)} \rightleftharpoons 2\text{NO}_{2(g)}$   $\Delta H = -Ve$ :  $K_c = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$  and predict what the effect of increasing in temperature on the equilibrium position will cause: The backwards reaction will be favoured because the reaction was already emitting heat so an addition of temperature will favour the opposite reaction. (2)

16. Calculate the  $\Delta S$  for the reaction:  $\text{Al}_2\text{O}_{3(s)} + 3\text{H}_{2(g)} \rightarrow 2\text{Al}_{(s)} + \text{H}_2\text{O}_{(g)}$  given that  $[\text{Al}_2\text{O}_3 = 51.00, \text{Al} = 28.32, \text{H}_2 = 130.6, \text{H}_2\text{O} = 188.7 \text{ J/K}]$  ~~-197.46 JK~~  $\Rightarrow 0.197 \text{ KJ/K}$  (1)

17. In the reaction shown by the equation:  $\text{CaF}_{2(g)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow 2\text{HF}_{(g)} + \text{CaSO}_{4(s)}$  if 9.8 g of  $\text{CaF}_2$  reacts with 10.5 g of  $\text{H}_2\text{SO}_4$ . The reagent that is in excess is  ~~$\text{H}_2\text{SO}_4$~~  while the amount in which it is in excess is ~~0.01 g~~ (1/2)

18. Define all the terms in the equation given by:  $\Delta G = \Delta H - T\Delta S$ .  $\Delta G = \text{Free energy change}$   
 $\Delta H = \text{Enthalpy change (Heat content)}$ ,  $\Delta S = \text{entropy of disorder}$   
 $T = \text{temperature of the system}$

19. The formula formed between  $\text{Cu}^{2+}$  and  $\text{PO}_4^{3-}$  is  ~~$\text{Cu}_3(\text{PO}_4)_2$~~  (1/2) and the IUPAC name is ~~copper(II) tetraoxophosphate~~ (1)

20. Calculate the temperature given that  $\Delta S = 240 \text{ J mol}^{-1} \text{ K}^{-1} = \Delta H = 33.18 \text{ kJ mol}^{-1}$ ,  $\Delta G = 51.30 \text{ kJ mol}^{-1}$  ~~75.5 K~~

Good Luc