

Marks scored:

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
June, 2018

Level : B.E. /B.Sc. /B. Pharm. /B. Tech.

Course : CHEM 101

Year : I

Semester: I

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No.:

Date JUN 19 2018

SECTION "A"

[20 Q. × 1 = 20 marks]

Select the most appropriate answer:

- For the reaction:  $\text{NO}(\text{g}) + \text{O}_3(\text{g}) = \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ ;  $\Delta G^\circ = -47.3 \text{ kcal}$ ; the equilibrium constant at 298 K is given by:  
  $4.28 \times 10^{36}$         $5.00 \times 10^{34}$         $3.90 \times 10^{40}$         $5.10 \times 10^{43}$
- Which one of the followings is not a state function?  
 Enthalpy       Absolute entropy  
 Heat capacity       Gibbs free energy
- For which of the following equilibrium reaction, the forward reaction is favored by increasing the pressure?  
  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$         $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$   
  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$         $2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$
- For the reaction,  $\text{C}_2\text{H}_5\text{I} + \text{OH}^- \longrightarrow \text{C}_2\text{H}_5\text{OH} + \text{I}^-$ ; rate constants ( $k_1$ ) at 289°K and  $k_2$  at 333°K are  $5.03 \times 10^{-2} \text{ M}^{-1} \cdot \text{sec}^{-1}$  and  $6.71 \text{ M}^{-1} \cdot \text{sec}^{-1}$ . Then, activation energy ( $E_a$ ) of the reaction is given by;  
 21.2 kcal       24.3 kcal       19.5 kcal       26.1 kcal
- If the reaction is :  $2\text{MnO}_4^- + 5\text{C}_2\text{O}_4^{2-} + 16\text{H}^+ = 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$ , then milliliters of 0.10M  $\text{KMnO}_4$  required to react completely with 0.05 mole of oxalate ion is:  
 40 ml       100 ml       200 ml       150 ml
- Which one of the following is conjugate base of the  $\text{HCO}_3^-$ ?  
  $\text{HCO}_3^{2-}$         $\text{H}_2\text{CO}_3$         $\text{CO}_2$         $\text{CO}_3^{2-}$
- If the solubility product of  $\text{Fe}(\text{OH})_3$  in pure water at 18°C is  $1.0 \times 10^{-36} \text{ M}$ , then its solubility in 0.05 M NaOH is :  
  $8.0 \times 10^{-33} \text{ M}$         $4.38 \times 10^{-10} \text{ M}$         $2.0 \times 10^{-22} \text{ M}$         $7.2 \times 10^{-16} \text{ M}$
- Which of the following has pH above seven?  
  $\text{NH}_4\text{Cl}$  solution       NaCl solution  
  $\text{CuSO}_4$  solution        $\text{CH}_3\text{COONa}$  solution

9. Consider the following reactions with their equilibrium constant:  
 $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{H}_2\text{O}(\text{g}); \quad K_c = 1.7 \times 10^{27}$   
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}); \quad K_c = 1.5 \times 10^2$   
 Then, the value of  $K_c$  for  $4\text{NH}_3(\text{g}) + 3\text{O}_2(\text{g}) \rightleftharpoons 2\text{N}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$  is:  
  $2.18 \times 10^{77}$       $5.18 \times 10^{40}$       $3.18 \times 10^{-20}$       $1.18 \times 10^{50}$
10. The standard reduction potential of two half cells are:  
 $\text{Zn}^{++} + 2\text{e}^- = \text{Zn}; \quad E^\circ = -0.76\text{V}$  and  $\text{Fe}^{++} + 2\text{e}^- = \text{Fe}; \quad E^\circ = -0.44\text{V}$   
 Which substance is the strongest oxidizing agent?  
  $\text{Zn}^{++}$       $\text{Fe}^{++}$       $\text{Zn}$       $\text{Fe}$

Fill in the blanks with most appropriate value or word.

11. For a reaction,  $\text{A} + \text{B} \rightarrow \text{C}$ , the rate law is;

$$\frac{d[\text{C}]}{dt} = K[\text{A}]^2[\text{B}]^3$$

On doubling the concentration of A and B, the rate of reaction increases by a factor of ....

12. For any reaction which has a negative  $\Delta H$ , an increase in temperature will result ..... in the concentration of products in the favour of the reactant concentration.
13. ....process in the series of successive sequence of complex reaction is considered as the rate determining step.
14. The pH of a buffer solution which contains 0.6 M  $\text{NH}_4\text{OH}$  and 2 M  $\text{NH}_4\text{Cl}$  is..... (Given,  $K_b$  for  $\text{NH}_3 = 1.8 \times 10^{-5}$ )
15. The  $\Delta E^\circ$  for the reaction;  $\text{Fe} + \text{Zn}^{++} = \text{Zn} + \text{Fe}^{++}$  is -0.32 V. If a piece of iron is placed in a 1M  $\text{Zn}^{++}$  solution reaching the reaction equilibrium, then the equilibrium concentration of  $\text{Fe}^{++}$  is given by .....
16. A 0.21 gm of a compound containing only hydrogen and carbon was burned to give 0.660 gm of  $\text{CO}_2$ . Then, the empirical formula of the compound is .....
17. Molarity of 5.0 m ethanol solution (Density of solution = 0.95 g/mL) is.....
18. The entropy change for reversible isothermal expansion of ideal gas from  $V_1$  to  $V_2$  is obtained by.....
19. The amount of heat ( $q_p$ ) needed to change the temperature of 'n' moles of any material from  $T_1$  to  $T_2$  at constant pressure is given by.....
20. Consider the reaction,  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g}); \quad K = 55.3$  at  $699^\circ\text{K}$ . If the mixture consists of 0.70 atm. of HI and 0.02 atm. each of  $\text{H}_2$  and  $\text{I}_2$  at the same temperature, then reaction will proceed .....