KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.E./B.Sc./B.Tech.
Year : I
Course : CHEM 101
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 20
Registration No.:
Date 28 :NOV 2023

SECTION "A"
[20 Q. × 1 = 20 marks]

Choose and mark [X] in the most appropriate option.

1. Which one of the followings is **NOT** a state function?
   [ ] Enthalpy [ ] Absolute entropy
   [ ] Heat capacity [ ] Gibbs free energy

2. Which one of the following relation is **CORRECT**?
   [ ] $\ln k_1/k_2 = Ea/R\,[1/T_2 - 1/T_1]$ [ ] $\ln k_2/k_1 = -Ea/R\,[1/T_2 - 1/T_1]$
   [ ] $\ln k_1/k_2 = -Ea/R\,[1/T_1 - 1/T_2]$ [ ] $\ln k_2/k_1 = \Delta H°/R\,[1/T_2 - 1/T_1]$

3. If the standard entropies of CO_2 (g), C(s) and O_2 (g) are 213.6, 5.740, and 205.0 JK^{-1} respectively, then the standard entropy of formation, $\Delta S°_f$, of CO_2 (g) is given by
   [ ] 8.78 JK^{-1} [ ] 4.65 JK^{-1} [ ] 1.46 JK^{-1} [ ] 2.86 JK^{-1}

4. For which of the following equilibrium reaction, the forward reaction is favored by increasing the pressure?
   [ ] $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ [ ] $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
   [ ] $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ [ ] $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

5. The vapor pressure lowering caused by addition of 120 gm of sucrose (M.W. = 342) to 1000 gm of water is:
   [ ] 23.8 mm [ ] 20.48 mm [ ] 14.38 mm [ ] 9.88 mm

6. If the half reaction is multiplied by a positive number, its electrode potential
   [ ] Becomes half of its initial [ ] Increases by four times
   [ ] Increases by two times [ ] Remains unchanged

7. For the ice water transition, ΔH =1440 Cal at 273K and ΔS for it is
   [ ] 144 Cal/deg [ ] 373 Cal/deg [ ] 5.28 Cal/deg [ ] 42.8 Cal/deg

8. For a reaction, NH_4HS (s) $\rightleftharpoons$ NH_3 (g) + H_2S(g), Kp = 0.11. If ammonium hydrosulfide is placed in a flask containing 0.50 atm of NH_3 then partial pressure of H_2S at equilibrium is given by
   [ ] 0.28 atm [ ] 0.67 atm [ ] 0.49 atm [ ] 0.17 atm

9. If the solubility product of $Fe(OH)_3$ in pure water at 18°C is 1.0×10^{-36} M, then its solubility in 0.05 M NaOH is
[ ] 8.0×10^{-33} M [ ] 4.38×10^{-10} M [ ] 2.0×10^{-22} M [ ] 7.2×10^{-16} M

10. The standard reduction potentials of Cu^{2+} and Ag^{+} in volts are +0.34 and +0.80 respectively. Then the value of $\Delta\mathcal{E}$ in volts for the following cell at 25°C Cu | Cu^{2+} (1.00 M) || Ag^{+} (0.0010 M) | Ag is given by
[ ] 0.37 V [ ] +0.55 V [ ] –0.28 V [ ] +0.28 V

Fill in the blanks with most appropriate value or word.

11. The .....of reaction in the elementary process can be predicted from stoichiometric coefficients.

12. The intersection of the vapor pressure curve of the solution with vapor pressure curve of pure solid solvent is called ....of the solution.

13. For a reaction, A + B → C, the rate law is $\frac{d[C]}{dt} = K[A]^2[B]^2$
On doubling the concentration of A and B, the rate of reaction increases by a factor of.....

14. A suitable indicator for a given titration may be defined as one which has a narrow ..... as possible that lies entirely on the upright part of the titration curve.

15. The concentration cell is a galvanic cell obtained by using ....of electrodes dipped in same type of electrolytic solution having ..... concentration. e.g., silver ion concentration cell.

16. The standard enthalpy of formation of all pure elements is considered to be .....

17. The maximum boiling azeotropic mixture of HCl in the composition of 20.3 % by its mass with water is due to .....deviation from the Raoult's law.

18. The amount of heat (q_v) required for the change of temperature of n mole of substance from T_1 to T_2 at constant volume is given by the equation.....

19. If 1.5 gm of $BaBr_2$ is completely converted to 1.05 gm of barium chloride ($BaCl_2$) on heating in a stream of chloride gas, then the atomic weight of barium is given by..... (Br = 79.904, Cl = 35.453).

20. The value of Kp at 25°C for the reaction, $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ is 1.9×10^{3} atm^{-1}. Then, the value of Kc at the same temperature is.....