UG 2nd - Semester Examination - 2025 (Under NCCF)
Award: B.Sc.
Discipline : CHEMISTRY
Course Type : MJC-2 (Major)
Course Code : BSCCEMMJ201
Course Name : General Chemistry-I

Full Marks - 35 **Time - 2 hrs**

1. Answer any *five* questions: **1×5=5**

a) What is a HARD Acid? Give an example.
b) What is the oxidation number of oxygen in H_2O_2?
c) Define Viscosity coefficient.
d) What is Newtonian fluid?
e) What is Latimer diagram?
f) What are the units of van der Waal's constant?
g) Can order of a reaction be fractional? Explain your answer.
h) Which one is a stronger acid between $[Mn(H_2O)_6]^{2+}$ and $[Sc(H_2O)_6]^{2+}$.

2. Answer any *five* questions: **2×5=10**

a) What is a buffer solution? Give an example of each of different types of it.
b) Balance the following equation by ion electron method:
$P_4(s) + OH^-(aq) \rightarrow PH_3(g) + H_2PO_2^-(aq)$
c) A sample of pure water is found to have pH < 7. Does it mean that it is acidic? Explain.
d) In the reaction $A+2B \rightarrow 3C+2D$, the rate of disappearance of B is 1.0×10^{-2} mol $L^{-1}s^{-1}$. What will be the rate of the reaction and rate of change in concentration of A and C?
e) Explain the difference between standard potential and formal potential?
f) Can you determine relative viscosity of a liquid by using burette instead of Ostwald viscometer? Explain your answer.
g) Oil spreads over the surface of water whereas the reverse does not happen– explain.
h) Which one of NH_2^- and PH_2^- is a better base towards proton and why?

3. Answer any *two* questions for 2022 Batch : **5×2=10**

a) i) Derive Henderson-Hasselblach equation.
ii) What will be the ratio of $[HCO_3^-]$ to $[H_2CO_3]$ in our blood? Given K_1 of $H_2CO_3 = 4.5\times10^{-7}$. 3+2
b) i) Calculate the oxidation number of sulphur in H_2SO_5 and chromium in CrO_5. Count for the fallacy.

ii) Explain the role of Zimmermann-Reinhardt solution in the estimation of Fe^{2+} using permanganometry. 2+3

c) i) At what temperature surface tension will be zero?– Explain.

ii) How high will water rise in a capillary of radius 3×10^{-4}m at 25ºC. Given $\gamma_{H_2O} = 72.75$ N/m. 2+3

d) What is most probable velocity? Find its expression using Maxwell distribution function of velocities. Locate it on a suitable plot. 1+4

4. Answer any *one* question: 10×1=10

a) i) Can you determine the rate constant numerically without knowing the initial concentration of the reactant for a 1st order reaction? Explain how. Whose concentration variation is needed to be monitored in this case?

ii) 1.0 ml of ethyl acetate was added to 25 ml of *N*/2 *HCl*. 2.0 ml of the mixture was titrated against standard *NaOH* solution each time. The amount of *NaOH* required in ml was 20.24, 21.73, 25.20, 27.60, 30.22 and 43.95 at various time interval (in min) of 0, 20, 75, 110, 183 and ∞ (infinity) respectively. The value at infinite time was obtained by completing the hydrolysis by boiling. Show that the reaction is of 1st order and calculate the everage value of rate constant.

iii) The activation energy of a reaction is 75.2 kJ mol^{-1} in the absence of a catalyst and 50.14 kJ mol^{-1} I the presence of catalyst. How many times will the reaction grow in the presence of catalyst if the reaction proceeds at 25ºC? 3+4+3

b) i) Write a short note on Calomel electrode and its use.

ii) The Hg^{2+}/Hg_2^{2+} couple ($E^0 = 0.92$v) is more oxidising than the Fe^{3+}/Fe^{2+} couple ($E^0 = 0.77$v). Yet Hg_2^{2+} reduces Fe^{3+} to Fe^{2+} in presence of thiocyanate ion– Comment.

iii) Write a short note on Frost diagram.

iv) CF_3COOH is a very strong acid and $(CF_3)_3N$ has no basic property– Justify. 3+3+2+2

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