NEET Chemistry Sample Paper 03

A) Subject: Chemistry
B) Total Questions: 45 Questions (All Compulsory)
C) Marking Scheme & Rules:

- Correct Answer: +4 marks
- Incorrect Answer: -1 mark (Negative marking)
- Unattempted Question: 0 marks
- Multiple Answers: Treated as incorrect, attracting -1 mark

Q1. The rate constant for a first-order reaction is 4.6×10^{-3} s^{-1}. The time required to reduce 2.0 g of the reactant to 0.2 g is:
A. 200 s
B. 500 s
C. 1000 s
D. 100 s

Q2. The root mean square velocity of an ideal gas at constant pressure varies with density (d) as:
A. d^2
B. d
C. $\sqrt{d}$
D. $1/\sqrt{d}$

Q3. In which of the following, the solubility of AgCl will be minimum?
A. 0.1 M $AgNO_3$
B. 0.1 M HCl
C. 0.1 M NaCl
D. Pure Water

Q4. The standard reduction potentials of four elements A, B, C, and D are -3.05, -1.66, -0.40, and $+0.80$ V. The highest chemical reactivity will be exhibited by:
A. A
B. B
C. C
D. D

Q5. For the reaction $2A + B \rightarrow 3C$, the rate of appearance of C is:
A. Same as rate of disappearance of B
B. Triple the rate of disappearance of B
C. Double the rate of disappearance of A
D. Half the rate of disappearance of A

Q6. Which of the following is an intensive property?
A. Internal energy
B. Enthalpy

C. Density
D. Volume

Q7. 10 g of glucose is dissolved in 150 g of water. The mass percentage of glucose is:
A. 6.25%
B. 6.66%
C. 10%
D. 15%

Q8. The number of tetrahedral and octahedral voids in a CCP unit cell are respectively:
A. 4, 8
B. 8, 4
C. 12, 6
D. 6, 12

Q9. For a reaction $\Delta H = 30$ kJ/mol and $\Delta S = 100$ J/mol K. The reaction will be spontaneous at:
A. T ¿ 300 K
B. T ¡ 300 K
C. T ¿ 30 K
D. All temperatures

Q10. The osmotic pressure of 5%(w/v) solution of cane sugar (mol. wt. 342) at 150°C is:
A. 2.45 atm
B. 5.07 atm
C. 3.42 atm
D. 4.00 atm

Q11. The pH of 0.01 M NaOH solution is:
A. 2
B. 12
C. 10
D. 7

Q12. The unit of molar conductivity is:
A. S cm^2 mol^{-1}
B. S cm mol^{-1}
C. S^{-1} cm^2 mol^{-1}
D. S cm^2 mol

Q13. Which of the following is not a colligative property?
A. Osmotic pressure
B. Elevation in B.P.
C. Vapour pressure
D. Depression in F.P.

Q14. What is the oxidation number of sulfur in H_2SO_5 (Caro's acid)?
A. +8
B. +6

C. +5
D. +4

Q15. A process carried out at constant volume is called:
A. Isothermal
B. Isobaric
C. Isochoric
D. Adiabatic

Q16. Which of the following has the smallest size?
A. Na^+
B. Mg^{2+}
C. Al^{3+}
D. F^-

Q17. The shape of PCl_5 in the gaseous state is:
A. Square pyramidal
B. Trigonal bipyramidal
C. Octahedral
D. Tetrahedral

Q18. Which of the following is a neutral oxide?
A. CO
B. SnO_2
C. ZnO
D. SiO_2

Q19. In the extraction of Copper, the role of silica is:
A. Oxidising agent
B. Reducing agent
C. Flux
D. Gangue

Q20. The most stable hydride of group 15 elements is:
A. NH_3
B. PH_3
C. AsH_3
D. BiH_3

Q21. Coordination number of Fe in $[Fe(C_2O_4)_3]^{3-}$ is:
A. 3
B. 4
C. 5
D. 6

Q22. Which d-block element does not show variable oxidation states?
A. Sc
B. Cu
C. Fe
D. Cr

Q23. The hybridization of S in SF_4 is:
A. sp^3
B. sp^3d
C. sp^3d^2
D. sp^2

Q24. Calamine is an ore of:
A. Iron
B. Copper
C. Zinc
D. Aluminium

Q25. Which of the following is used as a moderator in nuclear reactors?
A. H_2O
B. D_2O
C. H_2O_2
D. T_2O

Q26. The electronic configuration of Gd (Z=64) is:
A. $[Xe]4f^75d^16s^2$
B. $[Xe]4f^86s^2$
C. $[Xe]4f^85d^16s^1$
D. $[Xe]4f^75d^26s^1$

Q27. Which ion has the highest ionic mobility in aqueous solution?
A. Li^+
B. Na^+
C. K^+
D. Rb^+

Q28. The number of P-O-P bonds in P_4O_{10} is:
A. 4
B. 6
C. 5
D. 8

Q29. Which of the following acts as a strong reducing agent in the 4f series?
A. Ce^{4+}
B. Eu^{2+}
C. Lu^{3+}
D. Yb^{2+}

Q30. VSEPR theory predicts that H_2O has a bond angle of:
A. $109°28'$
B. $107°$
C. $104.5°$
D. $120°$

Q31. The test used to distinguish between Methyl alcohol and Ethyl alcohol is:
A. Lucas test

B. Iodoform test
C. Tollen's test
D. Fehling's test

Q32. The major product of nitration of Benzene is:
A. Nitrobenzene
B. 1,3-dinitrobenzene
C. Chlorobenzene
D. Benzene sulfonic acid

Q33. Which of the following is most reactive towards S_N1 reaction?
A. CH_3Br
B. C_2H_5Br
C. $(CH_3)_2CHBr$
D. $(CH_3)_3CBr$

Q34. Reduction of ketones using Zn-Hg/HCl is known as:
A. Wolff-Kishner reduction
B. Clemmensen reduction
C. Rosenmund reduction
D. Stephen's reduction

Q35. Nylon-6,6 is a polymer of:
A. Adipic acid and Hexamethylene diamine
B. Caprolactam
C. Ethylene glycol and Phthalic acid
D. Styrene

Q36. Which of the following is not a functional derivative of carboxylic acid?
A. Amide
B. Ester
C. Anhydride
D. Ether

Q37. The reaction $C_6H_5N_2Cl \xrightarrow{CuCl/HCl} C_6H_5Cl$ is:
A. Sandmeyer reaction
B. Gattermann reaction
C. Wurtz reaction
D. Fittig reaction

Q38. Glucose and Fructose are:
A. Chain isomers
B. Position isomers
C. Functional isomers
D. Optical isomers

Q39. Which of the following is a natural polymer?
A. Buna-S
B. PVC
C. Cellulose

D. Polyethene

Q40. Phenol reacts with Br_2 in CS_2 at low temperature to give:
A. 2,4,6-tribromophenol
B. p-bromophenol
C. m-bromophenol
D. o-bromophenol

Q41. The functional group present in an ester is:
A. $-CHO$
B. $-COOR$
C. $-COOH$
D. $-OH$

Q42. Which reagent is used for the conversion of Alcohol to Aldehyde?
A. $KMnO_4$
B. $K_2Cr_2O_7$
C. PCC
D. $LiAlH_4$

Q43. The deficiency of Vitamin C causes:
A. Beri-beri
B. Scurvy
C. Rickets
D. Night blindness

Q44. Gabriel Phthalimide synthesis is used for the preparation of:
A. Primary aliphatic amines
B. Primary aromatic amines
C. Secondary amines
D. Tertiary amines

Q45. Which of the following is a detergent?
A. Sodium stearate
B. Sodium palmitate
C. Sodium lauryl sulphate
D. Sodium oleate

Solutions & Explanations

1. **(B)** $t = (2.303/k)\log([A]_0/[A])$. $t = (2.303/4.6 \times 10^{-3})\log(2/0.2) = 500 \times 1 = 500$ s.

2. **(D)** $V_{rms} = \sqrt{3P/d}$. Hence, $V_{rms} \propto 1/\sqrt{d}$.

3. **(A)** Due to the common ion effect of Ag^+ from $AgNO_3$, the solubility of AgCl is suppressed the most.

4. **(A)** The more negative the reduction potential, the more reactive the metal (stronger reducing agent).
5. **(B)** Rate $= -1/2\Delta[A]/\Delta t = -\Delta[B]/\Delta t = +1/3\Delta[C]/\Delta t$. Thus, Rate appearance of C $= 3 \times$ Rate disappearance of B.
6. **(C)** Density is mass/volume; it is independent of the quantity of matter.
7. **(A)** Mass % $= (10/(10+150)) \times 100 = (10/160) \times 100 = 6.25\%$.
8. **(B)** In CCP (or FCC), Z=4. Tetrahedral voids $= 2Z = 8$. Octahedral voids $= Z = 4$.
9. **(A)** $\Delta G = \Delta H - T\Delta S < 0$. $30,000 - T(100) < 0 \implies T > 300$ K.
10. **(B)** $\Pi = iCRT = (1) \times (50/342) \times (0.0821) \times 423 \approx 5.07$ atm.
11. **(B)** $[OH^-] = 10^{-2} \implies pOH = 2$. $pH = 14 - 2 = 12$.
12. **(A)** $\Lambda_m = \kappa/C$. Units: S cm^{-1}/mol cm^{-3} = S cm^2 mol^{-1}.
13. **(C)** Vapour pressure is not a colligative property; relative lowering of vapour pressure is.
14. **(B)** Sulfur has 1 peroxy bond $(-O-O-)$. $2(+1) + x + 3(-2) + 2(-1) = 0 \implies x = +6$.
15. **(C)** Isothermal (Temp), Isobaric (Pressure), Isochoric (Volume), Adiabatic (Heat).
16. **(C)** Isoelectronic species. Higher positive charge leads to a smaller radius (Al^{3+} has highest pull).
17. **(B)** 5 bond pairs, 0 lone pairs (sp^3d) lead to trigonal bipyramidal geometry.
18. **(A)** CO, NO, and N_2O are neutral. ZnO is amphoteric; SnO_2 is amphoteric; SiO_2 is acidic.
19. **(C)** Silica (SiO_2) acts as an acidic flux to remove FeO impurities as $FeSiO_3$ (slag).
20. **(A)** Stability decreases down group as bond length increases and bond energy decreases.
21. **(D)** Oxalate is a bidentate ligand. 3 ligands $\times$ 2 bonds each = 6.
22. **(A)** Scandium has a stable +3 state only (d^0 configuration).
23. **(B)** 4 bond pairs and 1 lone pair (sp^3d).
24. **(C)** Calamine is $ZnCO_3$.
25. **(B)** Heavy water (D_2O) slows down neutrons in nuclear reactors.
26. **(A)** Gd ($Z = 64$) has half-filled f^7 stability: $[Xe]4f^7 5d^1 6s^2$.
27. **(D)** Smaller ions (Li^+) are more heavily hydrated, increasing effective size and decreasing mobility.

28. **(B)** Each P is bonded to others via O bridges. Structure contains 6 P-O-P bonds.
29. **(B)** Eu^{2+} loses an electron to reach the stable $4f^7$ state, making it a strong reducer.
30. **(C)** Lone pair-lone pair repulsion reduces the tetrahedral angle from 109.5° to 104.5°.
31. **(B)** Ethyl alcohol has the $CH_3CH(OH)-$ group and gives the yellow precipitate of CHI_3.
32. **(A)** In nitrating mixture (H_2SO_4/HNO_3), benzene forms nitrobenzene.
33. **(D)** S_N1 rate depends on carbocation stability. Tertiary (3°) is the most stable.
34. **(B)** Clemmensen reduction uses Zn-Hg and HCl to reduce C=O to CH_2.
35. **(A)** Condensation polymer from Adipic acid (C_6) and Hexamethylene diamine (C_6).
36. **(D)** Ethers are R-O-R; acid derivatives include halides, amides, esters, and anhydrides.
37. **(A)** Sandmeyer reaction uses Copper(I) salts to replace the diazonium group.
38. **(C)** Formula $C_6H_{12}O_6$ but different functional groups (Aldehyde vs Ketone).
39. **(C)** Cellulose is a natural polysaccharide found in plants.
40. **(B)** In non-polar solvents at low temp, monobromination occurs (p-product major).
41. **(B)** Esters are characterized by the $-COOR$ linkage.
42. **(C)** PCC is a mild oxidant that stops at the aldehyde stage.
43. **(B)** Vitamin C (Ascorbic acid) deficiency leads to Scurvy.
44. **(A)** Used to prepare pure primary aliphatic amines; cannot prepare aromatic amines.
45. **(C)** Detergents like sodium lauryl sulphate are synthetic surfactants.