Solved Sample Paper

Section II of CUET (UG) is Domain specific. In this section of Chemistry 40 questions to be attempted out of 50.

Time : 45 minutes

1. How much portion of an atom located at corner and body centre of a cubic unit cell is part of its neighbouring unit cell respectively?
(a) $1, \frac{1}{2}$ (b) $\frac{1}{2}, 1$ (c) $\frac{1}{8}, 0$ (d) $\frac{1}{8}, \frac{1}{2}$

2. 6 g of urea was dissolved in 500 g of water. The percentage (by mass) of urea in the solution is
(a) 0.86% (b) 1.186%
(c) 11.86% (d) 0.08%

3. For which case Λ values *vs* c shows a straight line?
(a) KCl (b) HCOOH
(c) CH_3NH_2 (d) CH_3COOH

4. For a general chemical change,

$2A + 3B \longrightarrow$ Products, the rate of decomposition of A is r_1 and that of B is r_2. The rates r_1 and r_2 are related as
(a) $3r_1 = 2r_2$ (b) $r_1 = r_2$
(c) $2r_1 = 3r_2$ (d) $r_1^2 = 3r_2$

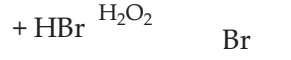
5. Zinc is extracted by_____.
(a) the carbon reduction of ZnO
(b) the carbon monoxide reduction of ZnO
(c) the hydrogen reduction of ZnO
(d) the copper reduction of ZnO.

6. The electronic configuration of antimony is
(a) $[Ar]3d^{10}4s^24p^3$ (b) $[Xe]4f^{14}5d^{10}6s^26p^3$
(c) $[Kr]4d^{10}5s^25p^3$ (d) $[Kr]4d^{14}5s^25p^3$

7. Mn^{7+} involves 2 and 5 electrons of
(a) 3*d*, 4*s* (b) 4*s*, 3*d*
(c) 4*f*, 3*d* (d) 3*d*, 4*f*.

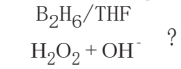
8. How many hydrate isomers are possible with the formula $CrCl_3 \cdot 6H_2O$?
(a) Six (b) Four (c) Three (d) Two

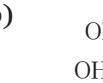
9. In the following reaction stable reaction intermediate is



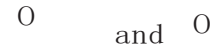
(a) (b) 
(c) (d)

10. Product of the following reaction is



(a)  (b) 
(c)  (d) 

11. Following compounds are



(a) functional isomers (b) metamers
(c) chain isomers (d) position isomers.

12. The IUPAC name of $(CH_3)_2C(OH)CH_2COCH_3$ is
(a) 4-hydroxy-4-methylpentan-2-one
(b) 4-hydroxy-2-methylpentan-4-one
(c) diacetone alcohol
(d) 4-hydroxy-4-methyl-2-oxopentane.

13. Antipyretics are used to
(a) relieve pain
(b) bring down body temperature
(c) kill micro-organisms
(d) relieve from anxiety.

14. Sodium metal crystallises in *bcc* structure with the edge length of unit cell 4.29×10^{-8} cm. The radius of sodium atom is
(a) 1.70×10^{-8} cm (b) 1.86×10^{-8} cm
(c) 1.90×10^{-6} cm (d) 2.30×10^{-5} cm.

15. According to the Raoult's law, the relative lowering of vapour pressure is equal to the
(a) mole fraction of solvent
(b) mole fraction of solute
(c) independent of mole fraction of solute
(d) molality of solution.

16. During electrolysis of fused NaCl which of the following reaction takes place at cathode?
(a) $Na^+ + e^- \longrightarrow Na$ (b) $Na \longrightarrow Na^+ + e^-$
(c) $Cl + e^- \longrightarrow Cl^-$ (d) $Cl^- \longrightarrow Cl + e^-$

17. What is the overall order of the following reaction?
$CHCl_{3(g)} + Cl_{2(g)} \longrightarrow CCl_{4(g)} + HCl_{(g)}$
Rate = $k\,[CHCl_3]\,[Cl_2]^{1/2}$
(a) 3/2 (b) 1/2
(c) 5 (d) 2

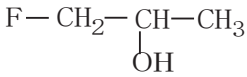
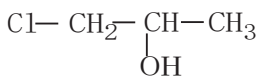
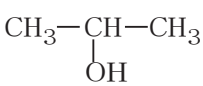
18. Coke is used in metallurgical process as
(a) slag (b) flux
(c) reducing agent (d) oxidising agent.

19. What happens when white phosphorus is heated with concentrated NaOH solution?
(a) PH_3 is formed (b) PO_4^{2-} is formed
(c) H_3PO_4 is formed (d) None of these

20. Which of the following compounds is expected to be coloured?
(a) $AgNO_3$ (b) $CuSO_4$
(c) $ZnCl_2$ (d) CuCl

21. A complex involving dsp^2 hybridisation has
(a) a square planar complex
(b) a tetrahedral geometry
(c) an octahedral geometry
(d) a trigonal planar geometry.

22. Which of the following halides is capable of exhibiting enantiomerism?
(a) Ethyl chloride (b) Isopropyl bromide
(c) *sec*-Butyl iodide (d) *tert*-Butyl chloride

23. The reactivity order of following alcohols in breaking of C—O bond is
1. 
2. 
3. 
4. $C_6H_5—CH_2—OH$

(a) 1 > 2 > 3 > 4 (b) 4 > 3 > 2 > 1
(c) 3 > 4 > 2 > 1 (d) 4 > 2 > 3 > 1

24. Reaction of phenol with chloroform/sodium hydroxide to give *o*-hydroxybenzaldehyde involves the formation of
(a) dichlorocarbene
(b) trichlorocarbene
(c) chlorine atoms
(d) chlorine molecules.

25. In a given cubic unit cell
(a) number of tetrahedral holes is equal to the number of octahedral holes
(b) number of tetrahedral holes is twice the number of octahedral holes
(c) number of octahedral holes is twice the number of tetrahedral holes
(d) number of tetrahedral holes is equal to the half of the octahedral holes.

26. Boiling point of water is 373.11 K. What is K_b of water, if 0.15 molal aqueous solution of a substance boils at 373.20 K?
(a) 0.09 K kg mol^{-1} (b) 0.6 K kg mol^{-1}
(c) 6.0 K kg mol^{-1} (d) 60 K kg mol^{-1}

27. For reducing 1 mole of ferrous ions to iron, the number of faradays of electricity required will be
(a) 1 (b) 2
(c) 3 (d) 1.5

28. If the rate constant of a first order reaction is 1.3×10^{-2} min^{-1}, then its half-period in seconds is
(a) 53.3 (b) 3200
(c) 1.247 (d) 0.888

29. Metal which cannot be extracted by smelting process is
(a) Pb (b) Fe
(c) Zn (d) Al

30. Which oxidation state is not exhibited by oxygen?
(a) –2 (b) –1 (c) +6 (d) +2

31. For a transition metal ion having seven electrons in its *d*-orbital the effective magnetic moment will be
(a) 7.98 B.M. (b) 4.90 B.M.
(c) 3.87 B.M. (d) 2.83 B.M.

32. Which of the following will exhibit maximum ionic conductivity?
(a) $CoCl_3 \cdot 3NH_3$ (b) $CoCl_3 \cdot 4NH_3$
(c) $CoCl_3 \cdot 5NH_3$ (d) $CoCl_3 \cdot 6NH_3$

33. Introduction of alkyl group in chlorobenzene by reacting it with methyl chloride in presence of anhydrous aluminium chloride is known as
(a) Sandmeyer's reaction
(b) Wurtz–Fittig reaction
(c) Williamson synthesis
(d) Friedel–Crafts reaction.

34. The reaction of *R*CN with *R*Mg*X* followed by hydrolysis gives
(a) an aldehyde (b) a ketone
(c) a 2° alcohol (d) a 3° alcohol.

35. Match list I with list II and select the correct answer using the codes given below :

List I		List II
A.	Coagulation	1. Scattering
B.	Dialysis	2. Washing of precipitates
C.	Peptization	3. Mixing of colloids
D.	Tyndall effect	4. Electrolyte

(a) A-4; B-3; C-2; D-1
(b) A-2; B-1; C-3; D-4
(c) A-3; B-1; C-2; D-4
(d) A-4; B-3; C-1; D-2

36. Regarding addition of HBr to but-2-ene, which of the following is true?
(a) Markovnikov's rule is not obeyed.
(b) Anti-Markovnikov's rule is obeyed.
(c) Both Markovnikov's and anti-Markovnikov's rule are obeyed to give isomers.
(d) In any case, the product is the same.

37. Consider the reaction,

$CH_3CH_2C \equiv N \xrightarrow{R} CH_3CH_2CH_2NH_2$

The reagent *R* is
(a) Ni/H_2 (b) $LiAlH_4$
(c) $(Na + C_2H_5OH)$ (d) all of these.

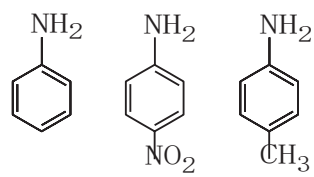
38. Which one of the following is not an aldose?
(a) Glucose (b) Ribose
(c) Fructose (d) Erythrose

39. Which of the following represents soap?
(a) $C_{17}H_{35}COOH$ (b) $C_{17}H_{35}COOK$
(c) $C_{15}H_{31}COOH$ (d) $(C_{17}H_{35}COO)_2Ca$

40. Low density polyethylene is
(a) cross-linked polymer
(b) branched polymer
(c) linear polymer
(d) condensation polymer.

41. Oxidation of which compound is not possible?
(a) $CH_3{-}COOH$ (b) $CH_3{-}CO{-}CH_3$
(c) $CH_3{-}CHO$ (d) $CH_3{-}CH_2{-}OH$

42. The correct increasing order of basic strength for the following compounds is



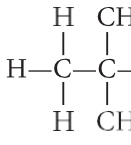
I II III

(a) II < III < I (b) III < I < II
(c) III < II < I (d) II < I < III

43. A biological catalyst is essentially
(a) an amino acid (b) an enzyme
(c) a nitrogen molecule (d) a carbohydrate.

44. On which of the following properties does the coagulating power of an ion depend?
(a) The magnitude of the charge on the ion alone
(b) Size of the ion alone
(c) Both magnitude and sign of the charge on the ion
(d) The sign of charge on the ion alone

45. The compound



IUPAC name as
(a) 1-chloro-1, 1-dimethylethane
(b) 2-chloro-2-methylpropane
(c) *tert*-butyl chloride
(d) 2-methyl-2-propyl chloride.

46. Which of the following has maximum reactivity towards HCN?
(a) HCHO (b) CH_3CHO
(c) CH_3COCH_3 (d) $CH_3COC_2H_5$

47. Consider the following sequence of reactions and identify the final product (*Y*).

$CH_3CH_2CH_2Br \xrightarrow[\text{dry ether}]{Mg} X \xrightarrow[\text{dry ether}]{CO_2/H_3O^+} Y$

(a) CH_3CH_2COOH (b) $(CH_3)_2CHCOOH$
(c) $CH_3CH_2CH_2CH_2COOH$
(d) $CH_3CH_2CH_2COOH$

48. The correct decreasing order of their boiling points is
(a) *n*-propylamine > ethylmethylamine > trimethylamine
(b) trimethylamine > ethylmethylamine > *n*-propylamine
(c) *n*-propylamine > trimethylamine > ethylmethylamine
(d) ethylmethylamine > *n*-propylamine > trimethylamine.

49. Which of the following is a monomer of natural rubber?
(a) Chloroprene (b) Caprolactum
(c) Urea (d) None of these.

50. The two monosaccharides of sucrose are held together by a glycosidic linkage between
(a) C_2 of α-glucose and C_1 of β fructose
(b) C_3 of α-glucose and C_2 of β fructose
(c) C_1 of α-glucose and C_2 of β fructose
(d) C_1 of α-glucose and C_5 of β fructose.

ANSWER KEYS

1.	(c)	**2.**	(b)	**3.**	(a)	**4.**	(a)	**5.**	(a)	**6.**	(c)	**7.**	(b)	**8.**	(c)	**9.**	(a)	**10.**	(c)
11.	(b)	**12.**	(a)	**13.**	(b)	**14.**	(b)	**15.**	(b)	**16.**	(a)	**17.**	(a)	**18.**	(c)	**19.**	(a)	**20.**	(b)
21.	(a)	**22.**	(c)	**23.**	(b)	**24.**	(a)	**25.**	(b)	**26.**	(b)	**27.**	(b)	**28.**	(b)	**29.**	(d)	**30.**	(c)
31.	(c)	**32.**	(d)	**33.**	(d)	**34.**	(b)	**35.**	(a)	**36.**	(d)	**37.**	(d)	**38.**	(c)	**39.**	(b)	**40.**	(b)
41.	(a)	**42.**	(d)	**43.**	(b)	**44.**	(c)	**45.**	(b)	**46.**	(a)	**47.**	(d)	**48.**	(a)	**49.**	(d)	**50.**	(c)

Hints &

1. (c) : (i) A point lying at the corner of a unit cell is shared equally by eight unit cells and therefore, only one-eighth $\left(\frac{1}{8}\right)$ of each such point belongs to the given unit cell.

(ii) A body centred point belongs entirely to one unit cell since it is not shared by any other unit cell.

2. (b) : Mass percentage of urea (*w*/*W*)

$$= \frac{\text{mass of urea}}{\text{mass of urea} + \text{mass of water}} \times 100$$

$$= \frac{6\text{ g}}{6\text{ g} + 500\text{ g}} \times 100 = \frac{600}{506} = 1.186\% \text{ by mass}$$

3. (a) : For strong electrolytes, Λ *vs* $\sqrt{c}$ plots are straight lines.

4. (a) : For the reaction $2A + 3B \longrightarrow$ Products;

$$-\frac{1}{2}\cdot\frac{d[A]}{dt} = -\frac{1}{3}\cdot\frac{d[B]}{dt}$$

Given : $\frac{-d[A]}{dt} = r_1$; $\frac{-d[B]}{dt} = r_2$

or $\frac{1}{2}r_1 = \frac{1}{3}r_2$ or $3r_1 = 2r_2$

5. (a) : $ZnO + C \longrightarrow Zn + CO$,

mixture of ZnO + C to form briquettes.

6. (c)

7. (b) : Manganese (Mn) : $25 \longrightarrow [Ar]3d^5 4s^2$

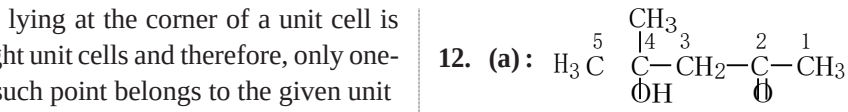
8. (c) : $[Cr(H_2O)_6]Cl_3$, $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ and $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$

9. (a)

10. (c) : Hydroboration -oxidation reaction takes place according to anti-markovnikov's rule, where the negative part goes to the carbon containing maximum number of hydrogen atoms.

11. (b)

12. (a) :



4-Hydroxy-4-methylpentan-2-one

13. (b)

14. (b) : For *bcc* lattice, edge length, $a = \frac{4r}{\sqrt{3}}$

Hence, $4.29 \times 10^{-8} = \frac{4r}{\sqrt{3}}$

i.e., $r = \frac{4.29 \times 10^{-8} \times \sqrt{3}}{4} = 1.86 \times 10^{-8}$ cm

Hence, radius of sodium atom is 1.86×10^{-8} cm.

15. (b) **16. (a)**

17. (a) : $CHCl_{3(g)} + Cl_{2(g)} \longrightarrow CCl_{4(g)} + HCl_{(g)}$

The rate law for the reaction is

rate = $k\,[CHCl_3]\,[Cl_2]^{1/2}$

The rate law shows that the reaction is first order w.r.t. $CHCl_3$ and 1/2 order w.r.t. Cl_2. Hence, overall order of reaction is 1 + 1/2 = 3/2.

18. (c) : During metallurgical process coke is used as reducing agent.

e.g.; $Fe_2O_3 + 3C \longrightarrow 2Fe + 3CO$

19. (a) : White phosphorus when heated with concentrated NaOH forms phosphine, PH_3 and sodium hypophosphite, NaH_2PO_2.

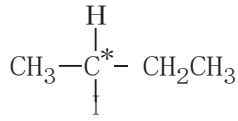
$$P_4 + 3NaOH + 3H_2O \xrightarrow{\text{Heat}} PH_3 + 3NaH_2PO_2$$

20. (b) : Cu in +2 state has $3d^9$ electronic configuration, presence of one unpaired electron causes *d*-*d*-transition. Hence, it is coloured.

21. (a)

22. (c) : Enantiomers are those compounds which are mirror images of each other. *sec*-Butyl iodide is capable of exhibiting enantiomerism.

Any molecule which contains an asymmetric carbon atom will exist as a pair of isomers, which are non-superimposable mirror images of each other.



sec-Butyl iodide

23. (b)

24. (a) : This is Reimer-Tiemann reaction where the electrophile is dichlorocarbene ($:CCl_2$) generated from chloroform by the action of a base.

$$OH^- + CHCl_3 \rightleftharpoons HOH + :CCl_3^- \rightarrow Cl^- + :CCl_2$$

25. (b)

26. (b): $\Delta T_b = T_b - T_b^\circ = 373.20 - 373.11 = 0.09$ K

$$\Delta T_b = K_b \cdot m \Rightarrow K_b = \frac{\Delta T_b}{m} = \frac{0.09}{0.15} = 0.6 \text{ K kg mol}^{-1}$$

27. (b): $Fe^{2+} + 2e^- \longrightarrow Fe$

$\therefore$ 2 mol of electrons requires 2 faradays of electricity.

28. (b): $t_{1/2} = \frac{0.693}{k} = \frac{0.693}{1.3 \times 10^{-2}}$

= 53.30 minutes = 3198.46 s $\approx$ 3200 s

29. (d) : Pb, Fe and Zn are extracted by smelting *i.e.*, heating the roasted and calcined ores with coke in the presence of a flux. But Al cannot be extracted.

30. (c) : Due to absence of vacant *d*-orbitals, oxygen can not show +6 oxidation state.

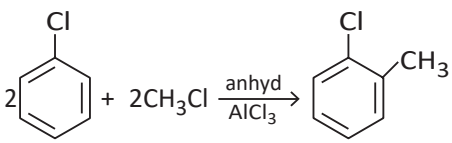
31. (c) : If *d*-orbital contains 7-electrons, it has 3 unpaired electrons.

$$\therefore \quad \mu = \sqrt{n(n+2)} = \sqrt{3(3+2)} = \sqrt{3 \times 5} = \sqrt{15}$$

= 3.87 B.M.

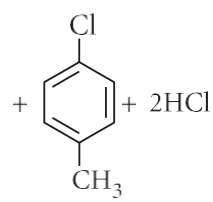
32. (d)

33. (d):



(Minor)

1-Chloro-2-methylbenzene



(Major)

1-Chloro-4-methylbenzene

34. (b): $RCN + RMgX \xrightarrow[H_3O^+]{\text{Dry ether}} RCOR + NH_3 + MgXOH$

35. (a) : Coagulation : Electrolyte
Dialysis : Purification of colloids
Peptization : Mixing of precipitates
Tyndall effect : Scattering

36. (d): As but-2-ene is a symmetrical alkene, the product is always the same, be it in presence or absence of peroxide.

37. (d)

38. (c) : Fructose is a ketose.

39. (b) : Soaps are the sodium or potassium salts of higher fatty acids. *e.g.* $C_{17}H_{35}COOK$(potassium stearate). These are obtained by alkaline hydrolysis of oils and fats.

40. (b)

41. (a) : Oxidation of CH_3COOH is not possible.

42. (d): Presence of electron releasing groups like $—CH_3$, $—OCH_3$, solvation increase the electron density over N of $—NH_2$ group, and hence, makes it more basic. On the other hand electron withdrawing groups like $—NO_2$ reduces the basicity of aniline by decreasing electron density over N-atom. Thus, the correct order of basic strength is II < I < III.

43. (b)

44. (c) : According to Hardy–Schulze rule, the coagulating power of an electrolyte depends on both magnitude and sign of the charge of the effective ion or electrolyte.

45. (b)

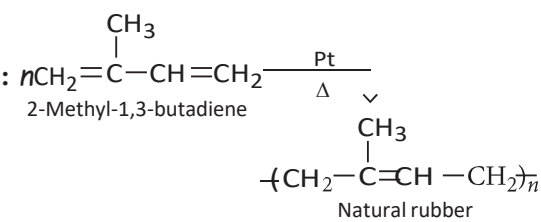
46. (a) : Positive charge on carbonyl carbon is maximum in case of HCHO. It is because no alkyl group (+*I* effect) is attached with it and therefore, positive charge is not dispersed. Hence, formaldehyde is more reactive than other aldehydes.

47. (d): $CH_3CH_2CH_2Br \xrightarrow[\text{dry ether}]{Mg} CH_3CH_2CH_2MgBr$

$$CH_3CH_2CH_2COOH \xleftarrow[\text{dry ether}]{CO_2/H_3O^+} CH_3CH_2CH_2MgBr$$

48. (a)

49. (d):



2-Methyl-1,3-butadiene

Natural rubber

50. (c) : Sucrose is formed by condensation of α-*D*-glucopyranose ($C_1 - \alpha$) unit and β-*D*-fructofuranose ($C_2 - \beta$) unit. These units are joined by α-β-glycosidic linkage between C_1 at the glucose unit and C_2 at the fructose unit.

☺☺☺