CUET (UG)

Chemistry Sample Paper - 4

Solved

Time Allowed: 45 minutes **Maximum Marks: 200**

General Instructions:

1. The test is of 45 Minutes duration.
2. The test contains 50 questions out of which 40 questions need to be attempted.
3. Marking Scheme of the test:

a. Correct answer or the most appropriate answer: Five marks (+5).
b. Any incorrectly marked option will be given minus one mark (-1).
c. Unanswered/Marked for Review will be given zero mark (0).

Attempt any 40 questions

1. Point defect is also known as **[5]**

a) Zero dimensional defect
b) Two dimensional defect
c) Single dimensional defect
d) None of these

2. Which of the following defects is also known as dislocation defect? **[5]**

a) Simple interstitial defect
b) Non-stoichiometric defect
c) Frenkel defect
d) Schottky defect

3. Ionic solids containing large differences in sizes of ions show **[5]**

a) Interstitials defect
b) Schottky defect
c) Frenkel defect
d) F - centers

4. The total number of tetrahedral voids in the face-centred unit cell is: **[5]**

a) 12
b) 10
c) 8
d) 6

5. Solution of hydrogen in palladium is an example of **[5]**

a) Gas in gas
b) Solid in solid
c) Liquid in gas
d) Gas in solid

6. A cucumber placed in brine solution _____. **[5]**

a) swells as it loses water due to reverse osmosis

b) shrivels as it loses water due to osmosis

c) shrivels as it absorbs water due to reverse osmosis

d) swells as it absorbs water due to osmosis

7. The temperature at which the vapour pressure of a liquid equals external pressure is called: **[5]**

a) m.p

b) fp

c) critical temperature

d) b.p

8. The colligative property used for the determination of molar mass of polymers and proteins is: **[5]**

a) Elevation is boiling point

b) Depression in freezing point

c) Osmotic pressure

d) Relative lowering in vapour pressure

9. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is _____. **[5]**

a) 2F

b) 3F

c) 1F

d) 6F

10. ΔG and E°_{cell} for a spontaneous reaction will be: **[5]**

a) negative, positive

b) positive, positive

c) positive, negative

d) negative, negative

11. Consider the following standard electrode potential values: **[5]**
$Fe^{3+}{}_{(aq)} + e^- \rightarrow Fe^{2+}{}_{(aq)} E^\circ = +0.77\ V$
$MnO_4^-{}_{(aq)} + 8H^+ + 5e^- \rightarrow Mn^{2+}{}_{(aq)} + 4H_2O_{(l)} E^\circ = +1.51\ V$
What is the cell potential for the redox reaction?

a) -2.28 V

b) +2.28 V

c) +0.74 V

d) -0.74 V

12. Consider the Arrhenius equation given below and mark the correct option. **[5]**
$K = Ae^{-E_a/RT}$

a) Rate constant increases exponentially with decreasing activation energy and decreasing temperature.

b) Rate constant increases exponentially with decreasing activation energy and increasing temperature.

c) Rate constant increases exponentially with increasing activation energy and decreasing temperature.

d) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.

13. If the reaction 2 A + 3 D $\rightarrow$ product is first order in A and second order in D, then the rate law will have the form: rate = **[5]**

a) $k[A][D]^2$

b) K [A] [D]

c) $K[A]^2[D]^2$

d) $K[A]^2[D]$

14. The unit of the rate of reaction is the same as that of the rate constant for a: **[5]**

a) it cannot be same

b) first order reaction

c) zero order reaction

d) second order reaction

15. In shaving cream, the dispersion medium is _____ and the dispersed phase is _____. **[5]**

a) liquid, solid

b) solid, gas

c) liquid, gas

d) gas, liquid

16. Liquid – liquid solutions are known as **[5]**

a) Foam

b) Aerosols

c) Gel

d) Emulsions

17. Ammonia is adsorbed by **[5]**

a) Silica

b) Charcoal

c) Water

d) Alcohol

18. Which type of property is the Brownian movement of the colloidal solution? **[5]**

a) Electrochemical

b) Optical

c) Mechanical

d) Electrical

19. Blister copper is about **[5]**

a) 30% Cu

b) 90% Cu

c) 60% Cu

d) 98% Cu

20. Which among the following act as froth stabilizer? **[5]**

a) Sodium ethyl xanthate

b) Pine oil

c) Coal tar

d) Aniline

21. Leaching of gold is done by **[5]**

a) Metal cyanide

b) Metal silicate

c) Metal sulphide

d) Metal hydroxide

22. Zone refining is based on the principle that _____ **[5]**

a) different components of a mixture are differently adsorbed on an adsorbent.

b) impurities of low boiling metals can be separated distillation

c) vapour of volatile compound can be decomposed in pure metal.

d) impurities are more soluble in molten metal than in solid metal

23. Which of the following acids forms three series of salts? **[5]**

a) H_3BO_3

b) H_3PO_3

c) H_3PO_4

d) H_3PO_2

24. Which of the following reactions will be the fastest under identical conditions? **[5]**

a) $C_2H_5OH + HCl \longrightarrow C_2H_5Cl + H_2O$

b) $C_2H_5OH + HF \longrightarrow C_2H_5F + H_2O$

c) $C_2H_5OH + HBr \longrightarrow C_2H_5Br + H_2O$

d) $C_2H_5OH + HI \longrightarrow C_2H_5I + H_2O$

25. Which of the following oxides reacts with both HCl and NaOH? **[5]**

a) ZnO

b) N_2O_5

c) CaO

d) CO_2

26. Which of the following is called chromic acid? **[5]**

a) CrO

b) H_2CrO_4

c) Cr_3O_4

d) Cr_2O_3

27. How many electrons are involved in the reduction of $KMnO_4$ in the basic medium? **[5]**

a) 3

b) 1

c) 2

d) 4

28. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment. **[5]**

a) $3d^2$

b) $3d^5$

c) $3d^7$

d) $3d^8$

29. Which of the following ligands form a **chelate** complex with metal ion? **[5]**

a) CN^-

b) $C_2O_4^{2-}$

c) H_2O

d) Cl^-

30. Which of the following complex species involves d^2sp^3 hybridization? **[5]**

a) $[Cr(NH_3)_6]^{3+}$

b) $[Fe(CN)_6]^{3-}$

c) $[Co(N\{H_3)_6]^{3+}$

d) $[CoF_6]^{3-}$

31. Which type of isomerism is exhibited by the given complex? **[5]**
$[Pt(NH_3)_2Cl_2]$

a) Coordination isomerism

b) Geometrical isomerism

c) Ionisation isomerism

d) Optical isomerism

32. To prepare alkanes containing odd number of carbon atoms, Wurtz reaction is not preferred because: **[5]**

a) a lot of reaction mixture goes wasted.

b) a mixture of three different alkyl halides has to be used.

c) a mixture of four different alkyl halides has to be used.

d) a mixture of two different alkyl halides has to be used.

33. Which one of the following is employed as antityphoid drug? **[5]**

a) Diphenyl hydramine

b) Chloramphenicol

c) Omeprazole

d) Chloroquine

34. Chloroform is stored in closed dark coloured bottles completely filled because it: **[5]**

a) gets slowly oxidized by air in the presence of light and form a poisonous gas.

b) forms an extremely poisonous gas in the presence of light.

c) can change its colour in the presence of light and get spoilt by the action of light.

d) gets slowly oxidized by air in the presence of light.

35. CH_3CONH_2 on reaction with NaOH and Br_2 in alcoholic medium gives: **[5]**

a) CH_3NH_2

b) $CH_3CH_2NH_2$

c) CH_3COONa

d) CH_3CH_2Br

36. For the conversion of propene into 1-propanol, which of the following reagents and conditions should be used? **[5]**

a) Salicylic acid

b) Phenol

c) Acetyl salicylic acid

d) Salicylaldehyde

37. Which of the following compounds will give butanone on oxidation with alkaline $KMnO_4$ solution? **[5]**

a) Butan-2-ol

b) Both Butan-2-ol and Butan-1-ol

c) Butan-1-ol

d) None of these

38. Pentan-2-one and Pentan-3-one can be distinguished by: **[5]**

a) Sodium bicarbonate test

b) Fehling's test

c) Tollens' test

d) Iodoform test

39. Gabriel synthesis is used for the preparation of: **[5]**

a) Quaternary salt

b) Primary amines

c) Tertiary amine

d) Secondary amine

40. The source of nitrogen in Gabriel synthesis of amines is _____. **[5]**

a) Sodium nitrite, $NaNO_2$

b) Potassium cyanide, KCN

c) Potassium phthalimide, $C_6H_4(CO)_2N^-K^+$

d) Sodium azide, NaN_3

41. Arrange the following in order of increasing basicity: aniline, p – nitroaniline, p – toluidine, and p – methoxyaniline. **[5]**

a) p – nitroaniline < aniline< p – methoxyaniline < p – toluidine

b) p – methoxyaniline p – nitroaniline < aniline < p – toluidine

c) p – nitroaniline < aniline < p – toluidine < p – methoxyaniline

d) aniline < p – methoxyaniline p – nitroaniline < p – toluidine

42. A vitamin which plays a vital role in the clotting of blood is: **[5]**

a) Vitamin K

b) Vitamin D

c) Vitamin B

d) Vitamin A

43. RNA guides the biosynthesis of **[5]**

a) Cellulose

b) Fats

c) Starch

d) Proteins

44. Glucose is: **[5]**

a) Aldopentose

b) Ketopentose

c) Aldohexose

d) Ketohexose

45. $F_2C = CF_2$ is a monomer of : **[5]**

a) Teflon

b) Buna-S

c) Glyptal

d) Nylon - 6

46. Polystyrene is used **[5]**

a) to make rain coats
b) as an insulator
c) to make handles of utensils
d) in paints

47. Natural rubber is **[5]**

a) polyfluoroethylene
b) polyvinyl chloride
c) polychloroprene
d) polyisoprene

48. Sulphonamides act as: **[5]**

a) Hypnotics
b) Antidepressants
c) Antimicrobials
d) Antiseptics

49. A sample of water was found to contain Ca^{2+} ions. Which of these will be preferred for washing clothes? **[5]**

a) Detergents
b) Liquid soaps
c) Bleach
d) Soaps

50. Different receptors in our body show selectivity for one chemical messenger over the other because **[5]**

a) different amino acid composition of the binding site
b) All of these
c) different structure of binding sites
d) different shape of binding site

Solutions

1. **(a)** Zero dimensional defect
   Explanation: Point defect is zero dimensional defect. Point defects are the irregularities or deviations from ideal arrangement around a point or an atom in a crystalline substance.
2. **(c)** Frenkel defect
   Explanation: Frenkel defect is one in which an atom is displaced from its lattice point to the interstitial site, creating a vacancy at the lattice point. Here, since dislocation of atom lattice point happens. So, it is also called a dislocation defect.
3. **(c)** Frenkel defect
   Explanation: Smaller atoms can easily occupy interstitial position showing Frenkel Defect.
4. **(c)** 8
   Explanation: In face-centered cubic unit cell (FCC), tetrahedral voids are present on body diagonals. There are two tetrahedral voids on each body diagonal at $\left(\frac{1}{4}\right)^{\text{th}}$ of the distance from each corner. So, the total number of tetrahedral voids= (no. of tetrahedral voids per body diagonal) $\times$ (no. of body diagonals) = $2 \times 4 = 8$
5. **(d)** Gas in solid
   Explanation: Hydrogen (solute, gas) and solvent is palladium (solid).
6. **(b)** shrivels as it loses water due to osmosis
   Explanation: The concentrated salt solution will have higher osmotic pressure as compared to the fluid inside the cells of the cucumber. Hence, the cucumber shrivels when placed in a concentrated salt solution as it loses water due to osmosis.
7. **(d)** b.p
   Explanation: liquid starts to boil.
8. **(c)** Osmotic pressure
   Explanation: Osmotic pressure method is especially suitable for the determination of molecular masses of macromolecules such as protein & polymer because for these substances the value of other colligative properties
9. **(b)** 3F
   Explanation: $Al_2O_3 \rightarrow 2Al^{3+} + 3O^{2-}$
   $Al^{3-} + 3e^- \rightarrow Al$ (For 1 mole)

3F charge is required to obtain 1 mole Al from Al_2O_3. Hence to neutralize Al^{3+} ion 3F is required.

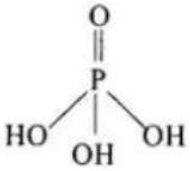
10. **(a)** negative, positive
    Explanation: ΔG and E°cell for spontaneous reaction will be negative, positive.
11. **(d)** -0.74 V
    Explanation: Cell potential for the redox reaction -0.74 V
12. **(b)** Rate constant increases exponentially with decreasing activation energy and increasing temperature.
    Explanation: $K = Ae^{-E_a/RT}$ from the equation it is clear that the value of rate constant k increases exponentially with a decrease in activation energy E_a and increase in temperature.
    As E_a decreases $\frac{-E_a}{RT}$ increases and k (rate constant) increases.
    As T increases, $\frac{-E_a}{RT}$ decreases and $\frac{-E_a}{RT}$ increases and k (rate constant) increases.
13. **(a)** $k[A][D]^2$
    Explanation: Rate of reaction is first-order w.r.t A reactant and 2nd-order w.r.t D reactant, therefore:
    $rate = k[A][D]^2$
14. **(c)** zero order reaction
    Explanation: Therefore, for a zero order reaction the units of rate of reaction and rate constants are same.
15. **(c)** liquid, gas
    Explanation: liquid, gas
16. **(d)** Emulsions
    Explanation: Dispersed phase and dispersion medium both are liquids.
17. **(b)** Charcoal
    Explanation: Charcoal acts as an adsorbent.
18. **(c)** Mechanical
    Explanation: Movement is always a mechanical property.
19. **(d)** 98% Cu
    Explanation: Blister copper contains is 98% Cu and very small percentage of other impurities.
20. **(d)** Aniline

Explanation: During froth flotation, substances are used to stabilize the froth so that it can be easily skimmed off and purified. Aniline and cresols are froth stabilizers.

21. **(a)** Metal cyanide
Explanation: Cyanide forms soluble complex with the gold from which metal is obtained by replacement.

22.
(d) impurities are more soluble in molten metal than in solid metal
Explanation: Zone refining is based on the principle that the impurities are more soluble in the molten state than in solid-state of the metal. A circular mobile heater fixed at one end of the impure metal rod. The molten zone moves along with the heater is moved forward. As the heater moves forward, the pure metal crystallises out of the melt and the impurities pass on into adjacent molten zone. The process is repeated several time and the heater is moved in the same direction. At one end, impurities get concentrated. This end is cut off E.g., germanium, silicon, gallium etc., are refined by this method.

23.
(c) H_3PO_4
Explanation: Structure of H_3PO_4 is:



Phosphoric acid H_3PO_4 has 3-OH groups i.e., has three ionizable H-atoms and hence forms three series of salts. These three possible series of salts of H_3PO_4 are as follows. NaH_2PO_4, $NaHPO_4$, and Na_3PO_4.

24.
(b) $C_2H_5OH + HF \longrightarrow C_2H_5F + H_2O$
Explanation: $C_2H_5OH + HF \longrightarrow C_2H_5F + H_2O$

25. **(a)** ZnO
Explanation: ZnO is an amphoteric oxide. it reacts with both acid and base. With HCl, it forms zinc chloride and water and with NaOH, it forms sodium zincate and water.
$ZnO(s) + 2HCl(l) \rightarrow ZnCl_2(s) + H_2O(l)$
$ZnO(s) + 2NaOH(l) \rightarrow Na_2ZnO_2(s) + H_2O$

26.
(b) H_2CrO_4
Explanation: H_2CrO_4 is chromic acid. It is actually formed by mixing concentrated sulphuric acid to a dichromate like sodium dichromate which may contain a variety of compounds, including solid chromium trioxide.

27.
(b) 1
Explanation: In the basic medium, the following reduction reaction takes place for permanganate ion.

$MnO_4^- + e^- \rightarrow MnO_4^{2-}$

Thus 1 e^- is involved.

28.

(b) $3d^5$

Explanation: The greater the number of the unpaired electrons, the higher will be its value of the magnetic moment. Since $3d^5$ has 5 unpaired electrons hence highest magnetic moment as compared to others.

$\mu = \sqrt{5(5+2)}$

$= \sqrt{35}$

= 5.95 BM

29.

(b) $C_2O_4^{2-}$

Explanation: $C_2O_4^{2-}$

30.

(b) $[Fe(CN)_6]^{3-}$

Explanation: In this complex there are 6 CN^- ligands means a total of -6 charge on ligands. There is a charge of -3 on the complex so oxidation state of Fe is +3. Atomic number of Fe is 26. So the electronic configuration of Fe^{+3} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$.Coordination number of the metal is 6 so the complex has octahedral geometry and since CN^- is a strong field ligand so it causes pairing and hence inner orbital complex is formed. So the hybridization is $d^2 sp^3$.

31.

(b) Geometrical isomerism

Explanation: Geometrical isomerism

32.

(d) a mixture of two different alkyl halides has to be used.

Explanation: Alkyl halides on treatment with sodium metal in dry ethereal (free from moisture) solution give higher alkanes. This reaction is known as the Wurtz reaction and is used for the preparation of higher alkanes containing even a number of carbon atoms. Many side products are formed when two different alkyl halides are used. So this method is not preferred to prepare alkanes having an odd number of C atoms.

33.

(b) Chloramphenicol

Explanation: Chlorine containing antibiotics, chloramphenicol, produced by soil microorganisms is very effective for the treatment of typhoid fever. Chloramphenicol is an antityphoid drug.

34. **(a)** gets slowly oxidized by air in the presence of light and form a poisonous gas.

Explanation: In the presence of light chloroform slowly oxidizes in air to form phosgene (carbonyl chloride $COCl_2$), which is a poisonous gas. It is therefore stored in closed dark

coloured bottles completely filled so that air is kept out.
$2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

35. **(a)** CH_3NH_2
Explanation: Product formed is CH_3NH_2

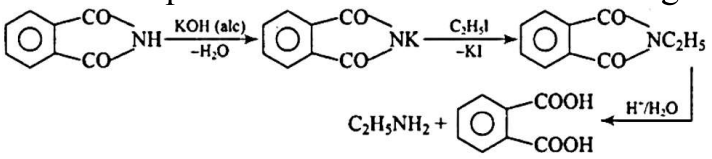
36. **(a)** Salicylic acid
Explanation: Salicylic acid

37. **(a)** Butan-2-ol
Explanation: $\underset{Bu\tan -2-ol}{CH_3CH_2\underset{OH}{\underset{|}{C}}HCH_3} \xrightarrow[KMnO_4]{alk} \underset{Bu\tan one}{CH_3CH_2COCH_3}$ Butan-2-ol converted to butanone

38. **(d)** Iodoform test
Explanation: Iodoform test

39. **(b)** Primary amines
Explanation: In Gabriel Phthalimide reaction, the sodium or potassium salt of phthalimide is N-alkylated with a primary alkyl halide to give the corresponding *N*-alkylphthalimideis for producing primary amines. This is because of the reaction of sodium or potassium salt of phthalimide with alkyl halide impure SN_2 reaction.

40. **(c)** Potassium phthalimide, $C_6H_4(CO)_2N^-K^+$
Explanation:
Potassium phthalimide is the source of nitrogen in Gabriel's phthalimide synthesis.



41. **(c)** p – nitroaniline < aniline < p – toluidine < p – methoxyaniline
Explanation: -OMe group at a para position will increase the basicity of more than-CH_3 group at the para position. While the presence of $–NO_2$ at a para position will decrease the basicity.

42. **(a)** Vitamin K
Explanation: Vitamin K helps to make various proteins that are needed for blood clotting and the building of bones. Prothrombin is a vitamin K-dependent protein directly involved with blood clotting.

43. **(d)** Proteins
Explanation: Various RNA (ribonucleic acid) molecules in the cell guide synthesise the proteins.

44. **(c)** Aldohexose

Explanation: Glucose is an aldohexose. It has an aldehyde group. It is a six membered sugar so the term hexose.

45. **(a)** Teflon
Explanation: Teflon is manufactured by heating tetrafluoroethene (CF_2=CF_2) with a free radical or persulphate catalyst at high pressures

46. **(b)** as an insulator
Explanation: Polystyrene is a thermoplastic polymers which are the linear or slightly branched long chain molecules capable of repeatedly softening on heating and hardening on cooling. It is used as an insulator.

47. **(d)** polyisoprene
Explanation: Natural rubber maybe considered as a linear polymer of isoprene (2-methyl-1, 3-butadiene) and is also called as cis - 1, 4 polyisoprene.

48. **(c)** Antimicrobials
Explanation: Antimicrobials

49. **(a)** Detergents
Explanation: Ca^{2+} ions present makes the water hard by forming insoluble calcium soaps when sodium or potassium soaps are dissolved in hard water. Synthetic detergents are cleansing agents which have all the properties of soaps, but which actually do not contain any soap. These can be used both in soft and hard water as they give foam even in hard water.

50. **(b)** All of these
Explanation: There are a large number of different receptors in the body that interact with different chemical messengers. These receptors show selectivity for one chemical messenger over the other because their binding sites have different shape, structure and amino acid composition.