CUET (UG)

Chemistry Sample Paper - 3

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. End centred unit cell is present in _____ crystal systems. **[5]**

   a) orthorhombic and monoclinic
   b) hexagonal and cubic
   c) cubic and triclinic
   d) tetragonal and rhombohedral

2. Iodine molecules are held in the crystals lattice by: **[5]**

   a) coulombic forces
   b) covalent bonds
   c) London forces
   d) dipole-dipole interactions

3. An atom located at the body center of a cubic unit cell is shared by **[5]**

   a) 8 unit cells
   b) 4 unit cells
   c) 1 unit cell
   d) 2 unit cells

4. Brass is an example of **[5]**

   a) covalent crystal
   b) molecular crystal
   c) ionic crystal
   d) metallic crystal

5. Solubility of gas in liquid decreases with increase in **[5]**

   a) shows a negative deviation from Raoult's law
   b) is saturated
   c) forms an ideal solution
   d) shows a positive deviation from Raoult's law

6. A colligative property is: **[5]**

a) boiling point
b) vapour pressure
c) electrical conductivity
d) osmotic pressure

7. Isotonic solutions have same _____. **[5]**

a) vapour pressure
b) boiling temperature
c) osmotic pressure
d) freezing temperature

8. Which among the following is soluble in water? **[5]**

a) Phenol
b) Formic acid
c) Benzene
d) Chloroform

9. The standard reduction potential for Zn is -0.76 V. Which of the following statements is correct when Zn is placed in dilute acid solution? **[5]**

a) Zn is readily oxidized.
b) Zn cannot liberate hydrogen from acids.
c) Zn^{2+} is readily reduced.
d) Zn remains as it is.

10. A galvanic cell can behave as an electrolytic cell when: **[5]**

a) $E_{cell} > E_{ext}$
b) $E_{cell} = E_{ext}$
c) $E_{ext} > E_{cell}$
d) $E_{cell} = 0$

11. The cell constant of a conductivity cell _____. **[5]**

a) changes with temperature of electrolyte
b) changes with change of electrolyte
c) remains constant for a cell
d) changes with change of concentration of electrolyte

12. Why is the minimum energy needed for an effective collision? **[5]**

a) Enough energy is needed to give off heat in a reaction.
b) Energy is needed to break bonds.

c) A minimum energy is needed, so that the particles will collide many times per second.

d) Energy is needed to orient the particles correctly.

13. A first order reaction takes 30 minutes for 50% completion. The value of rate constant k would be: **[5]**

a) 2.31×10^{-3} min^{-1}

b) 1.25×10^{-3} min^{-1}

c) 2.75×10^{-4} min^{-1}

d) 2.5×10^{-3} min^{-1}

14. Name the order of reaction which proceeds with a uniform rate throughout. **[5]**

a) Third order

b) Second order

c) First order

d) Zero order

15. Which is not an example of coagulation? **[5]**

a) Purification of water by alum

b) Formation of delta at the river banks

c) Creaming of milk

d) Rubber plating and chrome tanning

16. The average molecular mass of colloidal can be determined by **[5]**

a) Tyndall effect

b) Flocculation value

c) Brownian movement

d) Osmotic pressure measurement

17. The temperature above which the formation of micelles takes place is called _____. **[5]**

a) critical temperature

b) Boyle's temperature

c) inversion temperature

d) Kraft temperature

18. Which of the following processes does not occur at the interface of phases? **[5]**

a) Heterogeneous catalysis

b) Corrosion

c) Homogeneous catalysis

d) Crystallisation

19. Which of the following reactions is an example of auto reduction? **[5]**

a) $Fe_3O_4 + 4CO \rightarrow 3Fe + 4CO_2$

b) $Cu_2O + C \rightarrow 2Cu + CO$

c) Cu^{2+} (aq) + Fe (s) $\rightarrow$ Cu (s) + Fe^{2+} (aq)

d) $Cu_2O + \frac{1}{2} Cu_2 S \rightarrow 3Cu + 3Cu + \frac{1}{2} SO_2$

20. Electrolytic refining is used to purify which of the following metals? **[5]**

a) Zn and Hg

b) Cu and Zn

c) Zr and Ti

d) Ge and Si

21. Self reduction of Cu_2S to Cu can be carried out in: **[5]**

a) Bessemer converter

b) Down's Process

c) Both Bessemer converter and Pierce - Smith converter

d) Pierce - Smith converter

22. In blister copper, the blisters are formed due to passing out of **[5]**

a) CO_2 gas

b) N_2 gas

c) CO gas

d) SO_2 gas

23. Pure N_2 is prepared in the laboratory by heating a mixture of : **[5]**

a) NH_4Cl and $NaNO_2$

b) NH_4Cl and NaOH

c) NH_4OH and NaCl

d) NH_4Cl and $NaNO_3$

24. In XeO_3 and XeF_6 the oxidation state of Xe is **[5]**

a) +6

b) +4

c) +3

d) +1

25. Iodine is liberated from KI solution when treated with: **[5]**

a) $FeSO_4$

b) $CuSO_4$

c) $NiSO_4$

d) $ZnSO_4$

26. The most stable ion is **[5]**

a) Fe^{2+}

b) Mn^{2+}

c) Cr^{2+}

d) All are equally stable

27. Which of the following transition metals does **not** show variable oxidation state? **[5]**

a) Cr
b) Sc
c) Cu
d) Ti

28. Lanthanoid contraction is due to increase in: **[5]**

a) shielding by 4f electrons
b) effective nuclear charge
c) atomic number
d) atomic radius

29. Mohr's salt is a better volumetric agent then ferrous sulphate because: **[5]**

a) Its reaction are less violent
b) It is less readily oxidized in the solid state
c) All the chemical reactions given by ferrous sulphate are given by Mohr's salt
d) It does not effloresce like ferrous sulphate

30. Which of the following coordination compounds exhibits linkage isomerism? **[5]**

a) $[Co(en)_3]Cl_3$
b) $[Co(NH_3)_5NO_2](NO_3)_2$
c) $[Co(NH_3)_3Cl_3]$
d) $[Co(NH_3)_5(CO_3)]Cl$

31. How many ions are produced from the complex $[Co(NH_3)_6]\ Cl_2$ in solution? **[5]**

a) 2
b) 3
c) 4
d) 6

32. What would be the major product of the given reaction? **[5]**

a) Ethanol
b) Ethanal
c) Propanol
d) Propanal

33. The synthesis of 3 – octyne is achieved by adding a bromoalkane into a mixture of sodium amide and an alkyne. The bromoalkane and alkyne respectively are **[5]**

a) $BrCH_2CH_2CH_3$ and $CH_3CH_2CH_2C \equiv CH$
b) $BrCH_2CH_2CH_2CH_3$ and $CH_3C \equiv CH$

c) $BrCH_2CH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

d) $BrCH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

34. Benzylic halides contains: **[5]**

a) sp^3-hybridized carbon atom, next to an aromatic ring bonded to a halogen.

b) sp^2-hybridized carbon atom next to an aromatic ring.

c) sp^3-hybridized carbon atom next to carbon-carbon double bond.

d) a halogen atom bonded to an alkyl group.

35. Which of the following is most acidic? **[5]**

a) Cyclohexanol

b) Phenol

c) m – Chlorophenol

d) Benzyl alcohol

36. Alcoholic compounds react: **[5]**

a) only as nucleophiles.

b) both as nucleophiles and electrophiles.

c) only as electrophiles.

d) None of these

37. Benzaldehyde and acetone can be best distinguished by using: **[5]**

a) Hydrazine

b) Tollen's reagent

c) 2, 4 – DNP reagent

d) Sodium hydroxide solution

38. The reagent which does not react with both acetone and benzaldehyde. **[5]**

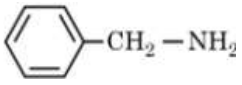
a) Sodium hydrogensulphite

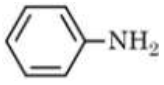
b) Phenyl hydrazine

c) Fehling's solution

d) Grignard reagent

39. Benzene diazonium chloride on hydrolysis gives: **[5]**

a) 

b) 

c) 

d) 

40. Which of the following amines can be resolved into enantiomers? **[5]**

a) 4 – (dimethylamino) pyridine
b) 2 – pentanamine
c) 3 – pentanamine
d) Trimethylamine

41. Sec – Butylamine is the common name of which compound? **[5]**

a) N – ethylethanamine
b) 2 – butanamine
c) N – methyl – 1 – propanamine
d) 1 – butanamine

42. The most appropriate base pair in a double helix of DNA is **[5]**

a) A – T
b) A – C
c) C – T
d) T – G

43. _____ are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of the pentose sugar. **[5]**

a) Nucleosides
b) Nucleic acids
c) Proteins
d) Nucleotides

44. Which of the following acids is a vitamin? **[5]**

a) Adipic acid
b) Aspartic acid
c) Saccharic acid
d) Ascorbic acid

45. Which of the following polymers have tetrafluoroethene monomer units? **[5]**

a) Teflon
b) Nylon
c) Acrilan
d) Polystyrene

46. Painting material among the following is **[5]**

a) Polyvinyl chloride
b) Glyptal
c) Polystyrene
d) Polypropene

47. Melamine formaldehyde polymer is: **[5]**

a) Copolymer
b) Elastomers
c) Condensation polymer
d) Both condensation polymer and copolymer

48. The purpose of adding bithional to medicated soaps is **[5]**

a) To impart antiseptic properties
b) To make it look attractive
c) To give a good smell
d) To prevent soap from drying

49. Amoxycillin is synthetic modification of **[5]**

a) Streptomycin
b) Tetracycline
c) Penicillin
d) Chloramphenicol

50. Tranquilizers act as antidepressant by **[5]**

a) Decreasing the degradation of noradrenaline
b) Binding itself to noradrenaline
c) Performing the function of neurotransmitters
d) Increasing the degradation of noradrenaline

Solutions

1. **(a)** orthorhombic and monoclinic
   Explanation: orthorhombic and monoclinic
2. **(c)** London forces
   Explanation: The London dispersion force is the weakest intermolecular force. The London dispersion force is a temporary attractive force that results when the electrons in two adjacent atoms occupy positions that make the atoms form temporary dipoles. This force is sometimes called an induced dipole-induced dipole attraction.
   Iodine molecules are a class of non- polar molecular solid in which constitute molecules are held together by London or dispersion forces. These solids are soft and non-conductor of electricity.
3. **(c)** 1 unit cell
   Explanation: In body centered cubic cell, an atom at the body-centre is shared by 1 unit cell.
   Thus, this atom contributes one atom to the unit cell.
4. **(d)** metallic crystal
   Explanation: Brass shows all the characteristics of Metallic Crystal.
5. **(d)** shows a positive deviation from Raoult's law
   Explanation: If the azeotropic solution has a lower boiling point than either of its two liquids then it shows positive deviation from Raoult's law.
6. **(d)** osmotic pressure
   Explanation: osmotic pressure, as it depends upon number of particles(moles).
7. **(c)** osmotic pressure
   Explanation: An isotonic solution refers to two solutions having the same osmotic pressure across a semipermeable membrane. This state allows for the free movement of water across the membrane without changing the concentration of solutes on either side.
8. **(b)** Formic acid
   Explanation: Formic acid (HCOOH) has the polar group -OH and can form H-bond with water. Thus, formic acid is highly soluble in water.
9. **(a)** Zn is readily oxidized.
   Explanation: Since $E^{o}_{Zn^{2+}/Zn}$ is negative, Zn has greater tendency to be oxidized than hydrogen.
10. **(c)** $E_{ext} > E_{cell}$

Explanation: $E_{ext} > E_{cell}$

11. **(c)** remains constant for a cell
Explanation: The cell constant of a conductivity (k) cell remains constant for a battery cell.

12. **(b)** Energy is needed to break bonds.
Explanation: Energy is needed to break bonds. This energy, used to initiate the reaction, is called the activation energy.

13. **(a)** 2.31×10^{-3} min^{-1}
Explanation: K=0.693
$t_{1/2}$=0.693/30 = 2.31×10^{-3} min^{-1}

14. **(d)** Zero order
Explanation: Zero order reaction proceeds with a uniform rate throughout.
rate =k$[A]^0$=k= constant.
The rate of the reaction is independent of the reactant concentration.

15. **(c)** Creaming of milk
Explanation: Creaming of milk

16. **(d)** Osmotic pressure measurement
Explanation: Average molecular mass of colloidal solution is determined by Osmotic Pressure measurement.

17. **(d)** Kraft temperature
Explanation: Kraft temperature

18. **(c)** Homogeneous catalysis
Explanation: Homogeneous catalysis

19. **(d)** $Cu_2O + \frac{1}{2}\ Cu_2\ S \rightarrow 3Cu + 3Cu + \frac{1}{2}\ SO_2$
Explanation: $Cu_2O + \frac{1}{2}\ Cu_2\ S \rightarrow 3Cu + 3Cu + \frac{1}{2}\ SO_2$
This chemical reaction includes the reduction of copper (I) oxide by copper (I) sulphide. In this process, copper is reduced by itself hence this process is known as an auto reduction and the solidified copper so, obtained is known as blister copper.

20. **(b)** Cu and Zn
Explanation: Copper and zinc are two metals that are generally purified by using electrolyte refining. In this process, impure metal is used as an anode, and a strap of the same metal in pure form is used as a cathode. Impurities from the blister copper or impure zinc deposit as anode mud.

21.

(c) Both Bessemer converter and Pierce - Smith converter

Explanation: Both Bessemer converter and Pierce - Smith converter can be used for the self reduction of CuS to get metal

22.

(d) SO_2 gas

Explanation: The blisters are formed due to passing out of SO_2.

$2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$

$FeO + SiO_2 \rightarrow FeSiO_3$

$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$

23. **(a)** NH_4Cl and $NaNO_2$

Explanation: Nitrogen gas can be prepared in the laboratory by heating a mixture of ammonium cholride and sodium nitrite in a test tube over a Bunsen burner

$NH_4Cl + NaNO_2$ ---> heat $N_2 + 2H_2O + NaCl$

24. **(a)** +6

Explanation: The oxidation state of Xe is +6. XeO_3 , the oxidation of Xe is calculated as x+3(-2)= 0 gives x= +6.

Similarly, for XeF_6 , x + 6(-1) = 0 which is x = +6.

25.

(b) $CuSO_4$

Explanation: Cu^{2+} will reduce to Cu^{+} and I^- will oxidize to I_2.

Molecular equation:

$2CuSO_4 + KI \rightarrow CuI + I_2 + K_2SO_4$

Ionic equation:

$2Cu^{2+} + I^- \rightarrow 2CuI + I_2\uparrow$

26.

(b) Mn^{2+}

Explanation: For Manganese, +2 is the most stable oxidation state because of d^5 configuration.

27.

(b) Sc

Explanation: In case of scandium the number of electrons in the 3d and 4s orbital is 1 and 2 respectively. By removing three electrons from its d and s orbital it forms a very stable inert gas configuration. Therefore, after that electron removal there is no such oxidation state is possible.

28.

(b) effective nuclear charge

Explanation: Lanthanide contraction increase due to effective nuclear charge.

29.

(b) It is less readily oxidized in the solid state

Explanation: Mohr's salt is a better volumetric agent than ferrous sulphate because it is less readily oxidized in the solid state. Also, Mohr's salt is more stable than $FeSO_4$.

30.

(b) $[Co(NH_3)_5NO_2](NO_3)_2$

Explanation: $[Co(NH_3)_5NO_2](NO_3)_2$ will exhibit linkage isomerism as it contains nitrite ligand which have the same composition differing with the connectivity of the metal to a ligand.It can bind from N as well as from O side.

31.

(b) 3

Explanation: The given compound will dissociate to give $[Co(NH_3)_6]^{2+}$ and 2 Cl^- ions in solution i.e. a total of 3 ions. The two Cl^- ions satisfy the primary ionisable valence of Co $^{2+}$ whereas the 6 NH_3 molecules satisfy the non ionisable secondary valence of Co^{2+}.

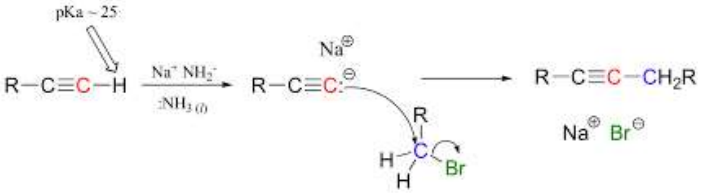
32. **(a)** Ethanol

Explanation: Ethanol

33.

(d) $BrCH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

Explanation:



$CH_3CH_2C{\equiv}BrCH_2CH_2CH_2CH3+NaNH2{\rightarrow}CH3CH_2CH_2CH_2CH_2CH_2C{\equiv}CH+NH_3+NaBr$

$NaNH_2$ is a very strong base it will abstract H from alkyne (But-1-yne in this case) and then nucleophilic substitution reaction will occur as shown where the resulting compound will be Oct-1-yne as here the reactants contain a total of 8 C.

34. **(a)** sp^3-hybridized carbon atom, next to an aromatic ring bonded to a halogen.

Explanation: Benzylic halides are the compounds in which the halogen atom is bonded to an sp^3-hybridized carbon atom next to an aromatic ring. For example $C_6H_5CH_2Cl$.

35.

(c) m – Chlorophenol

Explanation: In cases of halogen derivatives of phenols or aniline or benzoic acid etc, it is very helpful to understand that all halogens, when attached to benzene ring, exerts -I as well as +R effect.

In case of Cl, Br and I, the +R effect has almost no effect on reactivity, acidic character or basic character of the benzene ring. It is due to very less effective overlapping involving 2p of carbon and 3p or 4p or 5p of halogen.

Hence, only -I effect becomes the deciding factor, which is most dominant from ortho-position and least effective from para-position. So m chlorophenol is most acidic.

36.

(b) both as nucleophiles and electrophiles.

Explanation: Alcohols as nucleophile: The bond between O−H is broken when alcohol react as nucleophiles.

Alcohols as electrophile : The bond between C−O is broken when alcohol reacts as electrophiles

37.

(b) Tollen's reagent

Explanation: Tollen's Test is used to distinguish between aldehyde and ketone. It uses the fact that aldehydes are easily oxidised to their corresponding acids while ketones are not. Tollen's reagent is aqueous ammonical silver nitrate solution which reacts with aldehydes as shown.

$RCHO + 2Ag^{+} + 2OH^{-} \rightarrow RCOO^{-} + Ag + H_2O.$

$RCOR + 2Ag^{+} + 2OH \rightarrow$ No reaction

If this test is carried in a glass tube, the Ag formed forms a mirror on the sides of the test tube so the test is also known as the silver mirror test.

Aldehydes show Tollen's test while acetone which is a ketone does not give Tollen's test.

38.

(c) Fehling's solution

Explanation: Fehling's solution oxidises aliphatic aldehydes very easily but does not react with acetone and aromatic aldehyde; benzaldehyde.

39.

(d) 

Explanation:  has highest value of pk_b

40.

(b) 2 – pentanamine

Explanation: 2-pentamine will have a chiral centre, therefore it can be resolved into enantiomers.

$CH_3CH_2CH_2C^*HCH_3NH_2$

The C* in 2-pentan amine is the chiral center.

41.

(b) 2 – butanamine

Explanation: Sec – Butylamine is the common name of 2-butanamine ($CH_3CH_2CHNH_2CH_3$).

42. **(a)** A – T

Explanation: Two nucleic acid chains are wound about each other and held together by hydrogen bonds between pairs of bases. The two strands are complementary to each other because the hydrogen bonds are formed between specific pairs of bases. Adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bonds with guanine. So base pair in a double helix of DNA is A-T.

43.
(d) Nucleotides
Explanation: When nucleoside is linked to phosphoric acid at 5′-position of sugar moiety, we get a nucleotide and nucleotides are joined by a phosphodiester bond between 5′ and 3′ carbon atoms of the pentose sugar.

44.
(d) Ascorbic acid
Explanation: Ascorbic acid is vitamin C. Aspartic acid is an amino acid. Adipic acid and saccharic acid are dicarboxylic acids.

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

46.
(b) Glyptal
Explanation: Gyptal is a polyester formed from condensation of ethylene glycol and phthalic acid. It is used in paints and lacquers.

47.
(d) Both condensation polymer and copolymer
Explanation: Melamine formaldehyde polymer is formed by the condensation polymerisation of melamine and formaldehyde. It is a copolymer of these two different monomers.

48. **(a)** To impart antiseptic properties
Explanation: Biithionol (also called bithional) is added to soaps to impart antiseptic properties.

49.
(c) Penicillin
Explanation: Ampicillin and Amoxycillin are synthetic modifications of penicillins. These have broad spectrum whereas Penicillin G has a narrow spectrum.

50. **(a)** Decreasing the degradation of noradrenaline
Explanation: Transquilizers function by different mechanisms. For example, the antidepressant drugs inhibit the enzymes which catalyse the degradation of the neurotransmittor noradrenaline. If the enzyme is inhibited, this important neurotransmitter is slowly metabolised and can activate its receptor for longer periods of time, thus counteracting the effect of depression.