70d)Ionic conductance at infinite dilution of Al^{3+} and SO^{2-}_4 are 189 ohm^{-1} cm^2 gm. equiv.$^{-1}$ and 160 ohm^{-1} cm^2 gm. equiv.$^{-1}$. Calculate equivalent and molar conductance of the electrolytes at infinite dilution.

Solution

Electrolyte $= Al_2(SO_4)_3$

$\lambda_\infty Al_2(SO_4)_3 = ?$

$\mu_\infty Al_2(SO_4)_3 = ?$

$\lambda_\infty Al_2(SO_4)_3 =$

$$= \frac{189}{3} + \frac{160}{2}$$

$$= 63 + 80$$

$\lambda_\infty Al_2(SO_4)_3 = 143$ mho.cm^2.(g.equiv)$^{-1}$

$\mu_\infty Al_2(SO_4)_3 = 2 \times \mu_\infty Al^{3+} + 3 \times \mu_\infty SO_4^{2-}$

$= (2 \times 189) + (3 \times 160)$

$= 378 + 480$

$\mu_\infty Al_2(SO_4)_3 = 858$ mho.cm^2.mole^{-1}

March 2017 / +2 Chemistry/ Answer Key (Tentative)

		Question Type A			Question type B
1.	c	CH_3 NHOH	1.	c	6.93×10^{-2} min^{-1}
2.	b	$CH_2 = CH_2$	2.	c	Scattering of light
3.	d	Acetic acid	3.	a	O-nitrophenol
4.	d	$[Cu(NH_3)_4]$ Cl_2	4.	d	$K_2SO_4.Al_2(SO_4)_3.24H_2O$
5.	c	2-(N,N-dimethylamino butane)	5.	c	High pressure and low temperature
6.	c	Scattering of light	6.	c	2-(N,N-dimethylamino butane)
7.	a	Crystallization of sucrose from solution	7.	d	Cu
8.	d	$Cu_2(CN)_2 + (CN)_2$	8.	b	$K_p > K_c$
9.	b	3 neutrons	9.	c	gelatin
10.	d	Z* = Z – S	10.	c	$CH_3CH(OH)$ COOH
11.	b	$K_p > K_c$	11.	c	Ortho and para nitro anisole
12.	d	Cu	12.	a	6
13.	a	Peptisation	13.	d	$Cu_2(CN)_2 + (CN)_2$
14.	b	α-amino acid	14.	b	α-amino acid
15.	c	6.93×10^{-2} min^{-1}	15.	b	metamerism
16.	b	Actinides	16.	a	paraformaldehyde
17.	c	$CH_3CH(OH)$ COOH	17.	c	Lone pair of electrons on nitrogen atoms
18.	b	metamerism	18.	d	Z* = Z – S
19.	d	$K_2SO_4.Al_2(SO_4)_3.24H_2O$	19.	a	Peptisation
20.	a	paraformaldehyde	20	b	3 neutrons
21.	d	Methyl orange	21	c	CH_3 NHOH
22.	b	30% mish metal and 1% Zr	22	b	Three monosaccharides
23.	c	High pressure and low temperature	23	d	$[Cu(NH_3)_4]$ Cl_2
24.	b	Three monosaccharides	24.	d	Acetic acid
25.	a	O-nitrophenol	25.	b	SO_4^{2-}
26.	a	6	26	a	Crystallization of sucrose from solution
27.	c	Ortho and para nitro anisole	27	b	30% mish metal and 1% Zr
28.	b	SO_4^{2-}	28	b	Actinides
29.	c	Lone pair of electrons on nitrogen atoms	29	d	Methyl orange
30.	c	gelatin	30	b	$CH_2 = CH_2$

(* Note: Utmost c are is taken to prepare this answer key. If any mistake or correction, compare with Government answer key)

PART - II

31. State Heisenberg's uncertainty principle?

It is impossible to measure simultaneously both the position and velocity of a microscopic particle with absolute accuracy or certainty.

$$\Delta x.\ \Delta p \geq \frac{h}{4\pi}$$

Δx = uncertainity in the position of the particle

Δp = uncertainity in the momentum of the particle.

32. Ionisation energy of Carbon is more than that of Boron. Why?

Carbon - (Z = 6)

Boron - (Z = 5) $1s^2\ 2s^2\ 2p_x^1\ 2p_y^0\ 2p_z^0$

Carbon has more nuclear charge than Boron.

So, ionisation energy of carbon is greater than Boron.

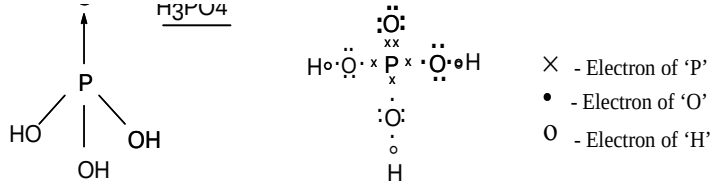
33. Write a note on plumbo solvancy?

Lead reacts with water containing dissolved air has a solvent action.

Lead hydroxide is a poisonous substance.

$2Pb + O_2 + 2H_2O \rightarrow 2Pb(OH)_2$

34. Draw the electron dot formula of $H_4P_2O_7$.



35. Why do transition metals form alloys?

Transition metals have almost similar size and the atoms of one metal can easily take up positions in the crystal lattice of the other.

(Eg.) Cr-Ni, Cr-Ni-Fe or any relevant example.

36. Write short note on chrome plating.

1.	Anode	:	A plate of lead
2.	Cathode	:	The articles to be plated
3.	Electroyte	:	Chromic acid + Sulphuric acid

(A) + Diazomethane $\xrightarrow{\text{Alkaline medium}}$ (D) (Ether)

(ii) $C_6H_5OH + CH_2N_2 \xrightarrow{OH^-} C_6H_5OCH_3 + N_2$

(A) (D)

70b)Compound (A) is an orange red crystal and also a powerful oxidising agent. Compound (A) when treated with potassium chloride and concentrated sulphuric acid evolves coloured gas (B). When KOH reacts with (A) an yellow solution of (C) is obtained. Identify (A), (B) and (C). Explain the reactions.

(i) (A) (Red Orange Crystals) + (Chloride salt) + conc.H_2SO_4 ⟶ (Reddish orange vapours of chromyl chloride) (B)

$$\underset{(A)}{K_2Cr_2O_7} + 4KCl + 6H_2SO_4 \longrightarrow \underset{(B)}{2CrO_2Cl_2} + 6KHSO_4 + 3H_2O$$

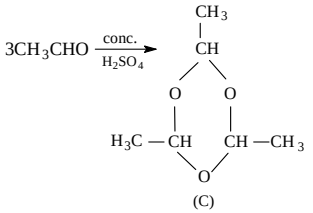
(ii) (A) + KOH ⟶ (C) Yellow colour compound

70c)An organic compound (A) of molecular formula C_2H_4O is prepared by the reduction of compound (B) of molecular formula C_2H_3N dissolved in ether, with $SnCl_2$ and HCl. Compund (A) reduces Tollen's reagent. When a drop of conc. H_2SO_4 is added to compound (A), it polymerises to give a cyclic compund (C). Identify (A), (B) and (C). Explain the reactions.

(i) $\underset{(B)}{C_2H_3N} \xrightarrow[\text{reduction}]{SnCl_2/HCl} \underset{(A)}{C_2H_4O}$ (reduces Tollen's reagent)

$$\underset{(B)}{CH_3-CN} \xrightarrow{SnCl_2/HCl} CH_3CH=NH.HCl \xrightarrow{H_2O} \underset{(A)}{CH_3CHO} + NH_3$$

(ii) (A) $\xrightarrow{\text{Polymerisation}}$ (C) Cyclic compound



(4) Glucose + acetic anhydride $\xrightarrow{\text{pyridine}}$ penta acetate

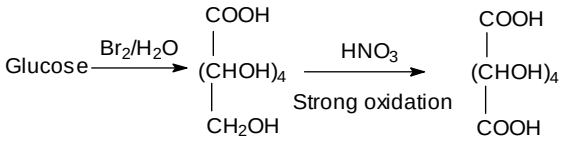
Indicates presence of five hydroxyl groups.

(5) Glucose + Hydroxylamine → monoxime

Indicates the presence of either aldehye or Ketone group

(6) Mild oxidation of glucose with bromine water gives gluconic acid. This indicates presence of aldehyde group.

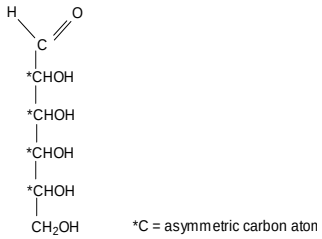
(7) Further oxidation of gluconic acid with nitric acid gives saccharic acid. This indicates the presence of a primary alcoholic group



gluconic acid Saccharic acid

(8) Glucose reduces Tollen's reagent and Fehling's solution. This confirms the presence of a aldehyde group.

(9) From the above evidences, structure of glucose is

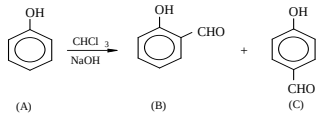


Glucose(2,3,4,5,6 penta hydroxy hexanal)

70a) An organic compound (A) of molecular formula C_6H_6O, gives violet colour with neutral ferric chloride. Compound (A) when refluxed with $CHCl_3$ and NaOH gives two isomers (B) and (C). Compound (A) when added to diazomethane in alkaline medium gives an ether (D). Identify (A), (B), (C) and (D). Explain the reactions.

(i) C_6H_6O (gives violet colour with neutral $FeCl_3$ solution) $\xrightarrow[NaOH]{CHCl_3}$ $C_7H_6O_2 + C_7H_6O_2$

(A) (B) (C)



(A) (B) (C)

4. First plated with : Nickel

During electrolysis chromium deposits on the article.

37. Calculate Q value of the following Nuclear Reaction?

$_{13}Al^{27} + {}_2He^4 \longrightarrow {}_{14}Si^{30} + {}_1H^1 + Q$

$_{13}Al^{27}$ = 26.9815 amu **$_{14}Si^{30}$ = 29.9738 amu**

$_2He^4$ = 4.0026 amu **$_1H^1$ = 1.0078 amu**

$\Delta E = (29.9738 + 1.0078) - (26.9815 + 4.0026)$

$= -0.0025$ amu

$Q = 0.0025 \times 931$

$Q = 2.329$ Mev.

38. Write any three applications of super conductors.

1. Super conducting generators are smaller in size and weight when we compare with conventional generators. These generators consume very low energy and so we can save more energy.
2. High efficiency ore separating machines may be built using superconducting magnets.
3. Superconducting solenoids are used in Nuclear Magnetic Resonance Imaging equipment which is a whole body scan equipment.

39. What is entropy? Write the units?

Entropy is a measure of randomness or disorder of molecules of a system. It is a state function.

cgs Unit : eu (or) Calories. K^{-1} ***SI Unit:*** EU (or) JK^{-1}

40. State Le Chateliers principle?

If a system at equilibrium is subjected to a disturbance or stress, then the equilibrium shifts in the direction that tends to nullify the effect of disturbance.

41. What is pseudo first order reaction? Give e.g?

In a second order reaction, when one of the reactants concentration is in excess, then the reaction follows a first – order kinetics and such a reaction is called pseudo first order reaction.

$CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$

42. Write the Arrhenius equation and explain the terms?

$$k = Ae^{-Ea/RT}$$

k = Rate constant A = Frequency factor

E_a = Activation energy R = Gas constant

T = Temperature (in Kelvin)

43. What is peptisation? Give an example.

The dispersion of a precipitated material into a colloidal solution by the action of an electrolyte is termed as peptisation. The electrolyte used is called peptising agent. (e.g.) Ferric hydroxide yields a sol by adding ferric chloride. or Any other suitable eg..

44. Write three significances of Henderson equation.

1. The pH of a buffer solution can be calculated from the initial concentration of weak acid and salt, provided Ka is given.

2. The dissociation constant of a weak acid or weak base can be determined by measuring pH of buffer solution containing equimolar concentrations of the acid or base and the salt.

3. A buffer solution of desired pH can be prepared by adjusting the concentration of the salt and the acid.

45. Write any three differences between enantiomers and diastereomers.

	Enantiomers	Diasteromers
1.	Optical isomers having the same magnitude but different sign of optical rotation.	Differ in the magnitude of rotation.
2.	They have configuration with non-super imposable object mirror image relationship.	They are never mirror images
3.	They are identical in all properties except the sign of optical rotation.	They differ in all physical properties

46. Why alcohols cannot be used as solvent for Grignard reagent?

Strongly basic substances like grignard reagents are decomposed by alcohol.

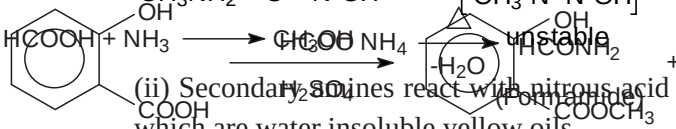
(ii) Salicyclic acid $\rightarrow$ methyl salicylate

(iii) Formic acid $\rightarrow$ formamide

69a) How do primary, secondary and tertiary amines react with nitrous acid?

(i) Primary amines react with nitrous acid to form alcohols and nitrogen

$$CH_3NH_2 + O = N\text{-}OH \longrightarrow [CH_3\text{-}N=N\text{-}OH] \longrightarrow CH_3OH + N_2$$



Salicyclic acid

(ii) Secondary amines react with nitrous acid to form N-nitroso amines which are water insoluble yellow oils

$$(CH_3)_2NH + HO\text{-}N=O \xrightarrow{\text{methyl salicylate}} (CH_3)_2\text{-}N\text{-}N=O$$

(iii) Tertiary amines react with nitrous acid to form tri alkyl ammonium nitrite salts which are soluble in water

$$(CH_3)_3N + HONO \longrightarrow (CH_3)_3NH^+NO_2^-$$

69b) Elucidate the structure of glucose.

(1) Elemental analysis and molecular weight determination shows formula of Glucose is $C_6H_{12}O_6$

(2) Glucose $\xrightarrow[\text{Reduction}]{HI/p}$ n-hexane

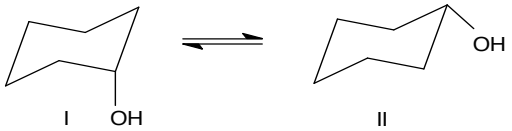
Indicates 6-carbon atoms are consecutive unbranched chain

(3) Glucose + water $\rightarrow$ neutral solution

Indicates absence of – COOH group

68a) Describe the conformations of cyclohexanol. Comment on their stability.

These two forms are interconvertible and exist in equilibrium.



i) In I-form -OH group axially oriented

In II-form -OH group equatorially oriented

ii) The energy of the axial conformer is little higher than that of equiatorial conformer

iii) The axial substituent experiences steric interaction with the axial H-atoms present at third carbon atoms. This decreases the stability of axial conformer. This is called 1:3 diaxial interaction.

iv) This interaction is absent in equatorial conformer. Hence equatorial conformer present to the extent of 90% and axial conformer present only to 10%.

68b) How are the following conversions carried out?

(i) Salicycli acid $\rightarrow$ aspirin

(ii) Salicyclic acid methyl salicylate

(iii) Formic acid formamide

(i) Salicycli acid aspirin

$$R - OH + CH_3MgBr \rightarrow R - O - MgBr + CH_4$$

Hence alcohols cannot be used as a solvent for grignard reagent.

47. How will you prepare benzyl alcohol from toluene?

$$C_6H_5CH_3 \xrightarrow[-HCl]{Cl_2} C_6H_5CH_2Cl \xrightarrow{NaOH} C_6H_5CH_2OH + NaCl$$

Toluene Benzyl Chloride Benzyl alcohol

48. Write note about Rosenmund's Reduction?

Acetyl chloride are reduced to aldehydes in presence of Pd / $BaSO_4$

$$CH_3COCl + H_2 \xrightarrow[BaSO_4]{Pd} CH_3CHO$$

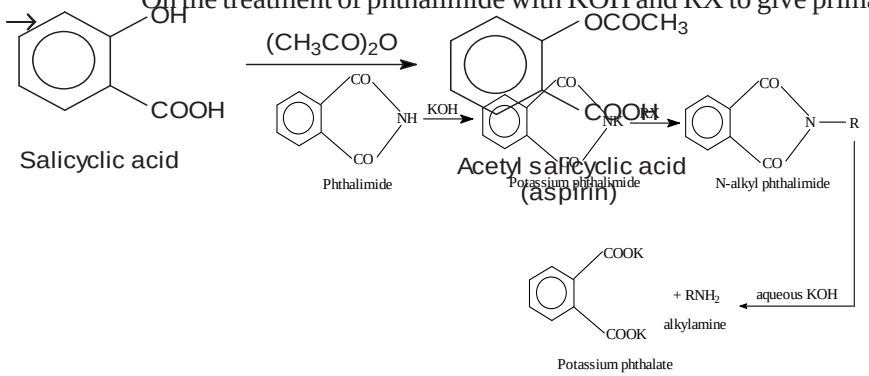
$BaSO_4$ is used as a catalytic poison, to stop the reduction at the stage of aldehyde.

49. How is methyl cyanide obtained from acetamide?

$$CH_3CONH_2 \xrightarrow[-H_2O]{P_2O_5} CH_3CN$$

50. What is Gabriel phthalimide synthesis?

On the treatment of phthalimide with KOH and RX to give primary amine.



51. Give any three characteristics of Dye?

1. A dye should have suitable colour
2. It should be able to fix itself or be capable of being fixed to the fabric.
3. It should be resistant to the action of water, dilute acids and alkalies.
4. It should be fast to light.