S No	Unit	VSA (1 marks)	SA-1 (2marks)	SA –II (3marks)	VBQ (4 marks)	LA (5 marks)	Total
1	**Solid state**	1		1			4
2	**Solutions**		1	1			5
3	**Electrochemistry**		1	1			5
4	**Chemical Kinetics**		1	1			5
5	**Surface Chemistry**				1		4
6	**General Principles and Processes of Isolation of Elements**			1			3
7	**p-Block Elements**			1		1	8
8	**d and f Block Elements**					1	5
9	**Coordination Compounds**			1			3
10	**Haloalkanes and Haloarenes**	1		1			4
11	**Alcohols, Phenols and Ethers**	1		1			4
12	**Aldehydes, Ketones and Carboxylic Acids**	1				1	6
13	**Organic compounds containing Nitrogen**		2				4
14	**Biomolecules**	1		1			4
15	**Polymers**			1			3
16	**Chemistry in everyday life**			1			3
17	**Total**	5	5	12	1	3	70(26)

MODEL TEST PAPER-2014-15

Subject: Chemistry   **Marks:70**
Class : XII   **Time: 3hrs.**

General Instructions:
1.   All questions are compulsory
2.   Marks of each question are indicated against it.
3.   Question numbers 1 to 5 are very short questions, each of 1 mark. Answer these in one word or about one sentence each.
4.   Question numbers 6 to 10 are short answer questions of 2 marks each. Answer this in about 30 words each.
5.   Question numbers 11 to 22 are short answer questions of 3 marks each. Answer these in about 40 words each.
6.   Question number 23 is Value based question of 4 marks.
7.   Question numbers 24 to 26 are long answer questions of 5 marks each. Answer these in about 70 words.
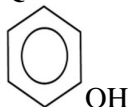8.   Use log tables if necessary. Calculators are not permitted.

Q.1. What is Total no. of atoms per unit cell in fcc crystal structure**.**

Q.2. Arrange the following in increasing order of boiling point:
   (i) $CH_3CH_2CH_2CH_2Br$
   (ii) $(CH_3)_3C.Br$
   (iii) $(CH_3)_2.CH.CH_2.Br$

Q.3. Explain the Rosenmund reaction with chemical equation ?
Q.4 Write the IUPAC names of;   CHO

OH
Q.5 Write the reaction when glucose is heated in excess of HI.
Q.6 A reaction is second order with respect to a reactant. How is the rate of the
reaction affected if the concentration of the reactant is:-
i) Doubled
ii) Reduced to $\frac{1}{2}$.
OR,
A first order reaction is 15% complete in 20 minutes. How long it take to
     be 60% complete.
Q.7.(a) What is the relationship between standard free energy change and equilibrium constant.
(b) The standard emf of the cell
Zn(s) + Cu^{2+} (aq) ------Zn^{2+}(aq) + Cu (s) is 1.10v.
Calculate the standard free energy change.
Q.8. How would you account for the following?
    (a) Aniline is a weaker base than cyclohexylamine.
    (b) Methylamine in aqueous medium gives reddish- brown precipitate with $FeCl_3$.
Q.9. Why do gases nearly always tend to be less soluble in liquid as the temperature is raised?
Q10.How would you account for the following?

(a) Electrophilic substitution in case of aromatic amines takes place more readily then benzene.

(b) Ethanamide is a weaker base than ethanamine.

Q.11 Write balanced chemical equations for the following reactions.

(i) XeF6 undergoes hydrolysis.

(ii) Phosphorus is treated with concentrated nitric acid.

(iii) Orthophosphorous acid is heated.

Q12. (a) What are intrinsic semi-conductors? Give an example.

(b) What is the distance between Na^+ and Cl^- ions in NaCl crystal if its density is $2.165 gcm^{-3}$? [Atomic Mass of Na =23u, Cl=35.5u; Avogadro's number = 6.023×10^{23}]

Q.13(i) Give reason of the followings

(a) Phenyl methyl ether (or anisole) reacts with HI to give phenol and methyl iodide and

not iodobenzene and methyl alcohol.

(b) Phenols are more acidic than alcohols.

(ii) Name the reagent used in the oxidation of primary alcohol to aldehyde.

Q.14

(i) Give one structural difference between amylose and amylopectin

(ii) Name the protein and its shape present in oxygen carrier in humanbody.

(iii) Name two fat storing tissues in human body.

Q.15 Define the following by giving one example of each:

(i) Antiseptics

(ii) Antioxidants

(iii) Narcotic analgesics

Q.16

(a) Write the names of the monomers of polymer used for making unbreakable crockery. .

(b) write the reaction of preparation of neoprene.

(c) Arrange the following polymers in decreasing order of intermolecularforces.

PVC, Nylon 66, Natural rubber

Q.17(a) What is the role of NaCN in theconsentration of sulphide ore.

(b) The value of $\Delta_f G^0$ for formation of Cr_2O_3 is $- 540$ kJmol^{-1}and that of Al_2O_3 is $- 827$ kJmol^{-1}. Is the reduction of Cr_2O_3 possible with Al?

Q18. (a)How many coulombs are required to reduce 1 mole $Cr_2O_7^{2-}$ to Cr^{3+}?

(b)The conductivity of 0.001M acetic is 4×10^{-5}S/m. Calculate the dissociation constant of acetic acid if Λ^0_m for acetic acid is 390 Scm^{2}mol^{-1}

Q19. In general it is observed that the rate of a chemical reaction doubles with every 10 degree rise in temperature. If the generalization holds good for the reaction in the temperature range 295 K to 305 K, what would be the value of activation energy for this reaction ? [R=8.314 mol^{-1}K^{-1}]

Q.20. Account for the following:

(a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

(b) Alkyl halides, though polar, are immiscible with water.

(c) Grignard's reagents should be prepared under anhydrous conditions.

Q.21 a) Write the IUPAC name for [Co(en)$_3$]$_2$(SO$_4$)$_3$

(b) How many geometrical isomers are possible in the coordination entity   [Co(NH$_3$)$_3$(NO$_3$)$_3$]?

(c) Give the number of unpaired electrons in [Ni(CN)$_4$]$^{-2}$. (Atomic no of Ni = 27)

Q.22 If N_2 gas is bubbled through water at 293 K, how many millimoles of N2 gas would dissolve in

1 litter of water? Assume that N_2 exert a partial pressure of 0.987 bar. Given that Henry's law constant for N_2 at 293 K is 76.48.

<div align="center">**OR**</div>

    The partial pressure of ethane over a saturated solution containing 6.56×10^{-2} g of ethane is 1 bar. if the solution contains 5.0×10^{-2} g of ethane, then what will be the partial pressure of the gas?

Q.23 A house wife while working in the kitchen got a cut on the finger . It started bleeding and became panicy. She immediately called her neighbor. She had kept ferric chloride in her house .She immediately applied it on affected area and the bleeding stooped.

(i) What is the chemical formula of ferric chloride ?

(ii) Why did bleeding stop on applying it on the affected finger?

(iii) what is the name of the phenomenon?

(iv) What is the value associated with this from the point of view of chemist?

Q.24. Account for the following:

    (i) Chlorine water loses its yellow colour on standing.

    (ii) $BrCl_2$ is more stable then $BrCl_5$.

    (iii) Fluorine does not form oxoacids.

    (iv) PCl_5 acts as an oxidizing agent.

    (v) SO_2 is an air pollutant.

<div align="center">**OR**</div>

(a) With help of chemical equations the principle of contact process in brief for the manufacture of sulphuric acid. (No diagram)

(b) Account for the following:

    (i) Bond dissociation energy of F_2 is less than that of Cl_2.

    (ii) Nitric oxide (NO) becomes brown when released in air.

Q.25. (a) Give chemical tests to distinguish between the following pairs of compounds:

    (i) Benzene amide and 4-aminobenzoic acid

    (ii) Methyl acetate and Ethyl acetate

  (b) An organic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNPderivative and reduces Tollen's reagent and undergoes Cannizzaro's reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound and write chemical equations for the reactions.

<div align="center">**OR**</div>

(a) Give chemical tests to distinguish between the following pairs of compounds:

 (i) Benzoic acid and Phenol

(ii) Benzaldehyde and Acetophenone

  (c) An organic compound with molecular formula $C_5H_{10}O$ does not reduces Tollen's reagent but forms an addition compound with sodium hydrogen sulphate and gives a positive idoform test.. On vigorous oxidation, it gives ethanoic acid and propanoic acid. Identify the compound and write all chemical equations for the reactions

Q.26.(a) Describe the preparation of potassium dichromate from chromite ore. What is the effect of change of pH on dichromate ion?

(b) How is the variability in oxidation state of transition elements of different from that of non-transition elements? Illustrate with examples.

<div align="center">**OR**</div>

  (a) Describe the preparation of potassium permanganate from pyrolusite ore . What happens when acidified potassium permanganate solution reacts with ferrous sulphate solution? Write balanced chemical equations.

(b) Account for the following:

 (i) Mn^{2+} compounds are more stable than Fe^{2+} compounds towards oxidation to their +3 state.

 (ii) Cr^{2+} is reducing and Mn^{3+} oxidizing when both have d^4 configuration.

S.NO	VALUE POINT	MARKS
1	There are 4 atoms per unit cell in fcc crystal structure.	1
2	$(CH_3)_3CBr > (CH_3)_2CHCH_2Br > CH_3CH_2CH_2CH_2Br$	1
3	C_6H_5COCl ------- C_6H_5CHO	1
4	3-hydroxybenzaldehyde	1
5	$CHO\text{-}(CHOH)_4CH_2OH + HI \ (excess) \longrightarrow n\text{-}hexane \ (C_6H_{14})$	1
6	Rate = K [A]2 (i) When concentration of reactant is doubled the rate becomes 4 times. (ii) When concentration of reactant is reduced to ½ the rate becomes ¼ times . OR **Ist Case** : 2.303 [ ] log [ ] Ao K t A 2.303 100 log 20 85 □ = 8.13 ×10-3min-1 **IInd Case** 2.303 [ ] log [ ] Ao t k A 3 2.303 [100] log 8.13 10 [40] = 112.7 min	1 1 1 1
7	(a) G^0 = -2.303RT log Kc (b) G^0 = -nFE0 Cell = -212300 J	1 1
8	(a) It is because in aniline the –NH$_2$ group is attached directly to the benzene ring . It results in the unshared electron pair on nitrogen atom to be in conjugation with the benzene ring and thus making it less available for protonation. (Or any other suitable reason) (b) Methyl amine in water gives OH- ions which react with FeCl$_3$ to give precipitate of ferric hydroxide	1 1
9	As the temperature rises the value of Henry's law constant.K$_H$ increases Solubility of gasin liquids decreases with increase in K$_H$.	1+1
10	(a) Because –NH$_2$ is a very strong activating group due to the presence of lone pair of electrons on nitrogen/ or due to resonance in aromatic ammines. (b) Because NH$_2$ of ethanamide involves in resonance with carbonyl group (-CO-) which leads to positive charge on N and less basic.	1 1
11	(i) XeF6 + 3 H2O XeO3+ 6HF (ii) P4 + 20 HNO3 4 H3PO4 + 20 NO2 + 4H2O (iii) 4 H3PO3 3H3PO4 + PH3	1 1 1
12	(a) The pure substances in which electrical conductivity is due to the thermal promotion of valence electrons to the conduction band are called intrinsic semi-	1

	conductors. Eg Si / Ge (any one correct example) (b) $d = \dfrac{z \times M}{a^3 \times N_A}$ For fcc lattice z=4 $2.165 \text{ g cm}^{-3} = \dfrac{4 \times 58.5 \text{g mol}^{-1}}{a^3 \times 6.023 \times 10^{23} \text{mol}^{-1}}$ $a^3 = \dfrac{4 \times 58.5 \text{ g mol}^{-1}}{2.165 \text{ g cm}^{-3} \times 6.023 \times 10^{23} \text{Mol}^{-1}}$ $a = 5.64 \times 10^{-8}$ cm or 564pm Therefore the distance between Na^+ and Cl^- ions is 564/2=282pm	2
13	13 (i) (a) The bond between O–CH3 is weaker than the bond between O–C6H5 because the carbon of phenyl group is *sp2* hybridised and there is a partial double bond character. (b) Phenoxide ion has more resonance stability than phenol so more H^+ ions are formed while no resonance stabilization in alcohols. (ii)PCC (PyridinumChloro chromate)	1 1 1
14	*(i)* Amylose is a long unbranched chain polymer α -D(+) glucose. Amylopectin is a branched chain polymer of α -D glucose. **(ii)** Globular protein and its shape is spherical. **(iii)** Liver and adipose tissue.	0.5 0.5 1 1
15	**(i)** Antiseptics are the chemicals applied to the living tissues either to kill or prevent the growth of microorganisms .e.gdettol. **(ii)** Antioxidants are the compounds which retard the action of oxygen on food and reduces its rate of decomposition by oxidation.e.g BHA **(iii)** Narcotic analgesics are the chemicals used for the relief of post operativepain.e.g morphine.	0.5 0.5 1 ½ + ½ 1
16	**(i)** Monomers of the polymer are melamine and formaldehyde. **(ii)** n CH₂=C-CH=CH₂ [>CH₂-C=CH-CH₂]ₙ ⎯ ⎯ Cl Cl **(iii)** Nylon66 > Natural rubber > PVC	1 1 1

17	(i) To decrease the melting point and to make it better conductor
	   ii) Yes as ΔG^0 for net reaction will come –ve as
	       $Cr_2O_3 + Al \longrightarrow Cr + Al_2O_3$
	$\Delta G_{net} = -827 + 540 = -287$Kj/mol
		1
		
		1
		1

18	. (a) 6F -= 6 × 96500 C = 5.76×10^5C	1

	(b) $\Lambda m = K/c$ $= 4 \times 10^{-7}$ cm^{-1} × 1000 cm^3 L^{-1} $$\underline{\phantom{0.001\ molL^{-1}}}$$ 0.001 molL^{-1} $= 0.4$ Scm^2 mol^{-1}	0.5
	$\alpha = \dfrac{\Lambda m}{\Lambda m^0}$ $= \dfrac{0.4\ Scm^2 mol^{-1}}{390\ Scm^2\ mol^{-1}} = 0.00103$	0.5
	$K = \dfrac{C\alpha^2}{C(1-\alpha)} = C\alpha^2 = 0.001 \times (0.00103)^2 = 1.06 \times 10^{-9}$	1
19	$\dfrac{\log\ k_2}{k_1} = \dfrac{Ea}{2.303\ R} \dfrac{T_2-T_1}{T_1.T_2}$	0.5
		0.5
	$\log 2 = \dfrac{Ea}{2.303 \times 8.314\ jk^{-1}\ mol^{-1}} \dfrac{305 - 295}{305 \times 295}\ K^{-1}$	
		1
	$0.30010 = \dfrac{Ea10K^{-1}}{2.303 \times 8.314\ jk^{-1}\ mol^{-1}} \dfrac{}{305 \times 295}$	
	$Ea = 51855.2$ j mol^{-1} or 51.86 k j mol^{-1}	1
20	(a)Due to –I and effect of Cl group , the net dipolereduces to a large extent in chlorobenzene (or diagrammatic explanation)	1
	(b) Because alkyl halides cannot form hydrogen bond with water.	1
	(c) Because in the presence of moisture it change to alkanes (or chemical reaction)	1
21	(i) Tris(ethylenediamine)cobalt(III) sulphate	1
	(ii) 2 (fac and mer)	1
	(iii)dsp^2 – square planar	1
22	. x(Nitrogen) = $\dfrac{p\ (nitrogen)}{K\,H} = \dfrac{0.987 bar}{76,480\ bar} = 1.29 \times 10^{-5}$	1
	As 1 litre of water contains 55.5 mol of it, therefore if n represents Number of moles of N$_2$ in solution, x (Nitrogen) =$\dfrac{nmol}{nmol +55.5\ mol} = \dfrac{n}{55.5} = 1.29 \times 10^{-5}$ (n in denominator is neglected as it is $\ll 55.5$) Thus $n = 1.29 \times 10^{-5} \times 55.5$ mol $= 7.16 \times 10^{-4}$ mol10^{-4}	1
	$= \dfrac{7.16 \times 10^{-4} mol \times 1000\ mol}{1\ mol} = 0.716$ m mol	1
	OR	
	Applying henrys' law m = K$_H$ x p, 6.56×10^{-2} g = K$_H$ x 1 bar K$_H$ = 6.56×10^{-2} g bar^{-1}	1
	Put the value of K$_H$ in the second case 5×10^{-2} = 6.56×10^{-2} g bar^{-1} x p P = $\dfrac{5 \times 10^{-2}\ g}{6.56 \times 10^{-2}\ g\ bar^{-1}}$ = 0.765 bar	1
23	**(i) Chemical formula ; FeCl$_3$**	1
	(ii) Blood consists of RBCs which are negatively charged .Fe^{3+} ions of FeCl$_3$ neutralise the charge on thease.This leads to coagulation of blood .Bleeding	1

	therefore, stopped **(iii) Coagulation or flocculation** **(iv) All house wives must keep small bag or kit in their kitchen. It must have ferric chloride kept in small bottle or potash alum, burn aid and bandages etc. Minor accidents are very common in the kitchen.**	1 1

24	(i) Because of the formation of HOCl / or due to its oxidation.
	    (ii) Because of inert pair effect.
	    (iii) Because of high electronegativity of fluorine.
	    (iv) Because +3 oxidation state of P is more stable than +5.
	    (v) Because in air SO_2 gets oxidized to H_2SO_4 which is very corrosive and poisonous
	
	CONTACT PROCESS
	i) Burning of sulphur or sulphide ores in air to generate SO_2.
	
	(ii) Conversion of SO_2 to SO_3 by the reaction with oxygen in the presence of a catalyst (V_2O_5), and
	
	(iii) Absorption of SO_3 in H_2SO_4 to give *Oleum*($H_2S_2O_7$).
	A flow diagram for the manufacture of sulphuric acid is shown in
	The SO_2 produced is purified by removing dust and other impurities such as arsenic compounds.
	
	The key step in the manufacture of H_2SO_4 is the catalytic oxidation of SO_2 with O_2 to give SO_3 in the presence of V_2O_5 (catalyst).
	
	$$2SO_2 g + O_2 g \xrightarrow{V_2O_5} 2SO_3 g \quad \Delta_r H^0 = -196.6 \text{ kJmol}^{-1}$$
	
	The reaction is exothermic, reversible and the forward reaction leads to a decrease in volume. Therefore, low temperature and high pressure are the favourable conditions for maximum yield. But the temperature should not be very low otherwise rate of reaction will become slow.
	(b) (i) Because of large electron –electron pair repulsion among the lone pair in F_2 molecule.
	(ii) Because of the formation of NO_2 gas.
		1
		1
		1
		1
		1
		
		1
		
		1
		
		1
		
		1
		
		1

25	(a) (i) Add $NaHCO_3$ to both the compounds, 4- aminobenzoic acid will give brisk effervescence whereas Benzene amide will not give this test. (or any other correct suitable test) (ii) Warm both the esters with NaOH and then heat them with I2 and NaOH. Ethyl acetate gives yellow ppt of Idoform. (Or any other correct suitable test) (b o-ethyl benzaldehyde2.4DNP (o~~CH₂CH₃~~ (o-CH_2CH_3)-C_6H_4-CH=N-NH-C_6H_4(p-NO_2) (c) o-ethyl benzaldehyde $KMnO_4$,KOH Benzene 1,2-dicarboxylic acid (a) (i) **Phenol and Benzoic** neutral $FeCl^3$ to both of them .phenol gives violet colour. (Other relevant test can be accepted) (b) As the compound does not reduce Tollen's reagent but forms an addition compound with $NaHSO_3$ there for compound gives positive contains a ketone	1 1 1+1 1

	group. Since compound gives positive idoform test therefore compound contains CH_3CO group.	1
	On vigorous oxidation compound gives ethanoic acid and propanoic acid which shows the compound $C_5H_{10}O$ is $CH_3CH_2CH_2COCH_3$ (pentan–2-one)	1
	$CH_3CH_2CH_2COCH_3 \xrightarrow{\text{Oxidation}} CH_3CH_2COOH + CH_3COOH$	2
	(or the given reaction ca e equation)	
		1
26	(a) It is prepared from one called chromate or Ferrochrome iron, $FeOCr_2O_3$. The various steps involved are	1
	(i) Preparation of sodium chromate	1
	$\qquad 4FeO.Cr_2O_3 + O_2 \longrightarrow Fe_2O_3 + 4Cr_2O_3$	
	$\qquad 4Na_2CO_3 + 2Cr_2O_3 + 3O_2 \longrightarrow 4Na_2CrO_4 + 4CO_2$	
	(ii) Conversion of sodium chromate in to sodium dichromate.	1
	$\qquad 2NaCrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$	
	(iii) Conversion of sodium dichromate in to potassium dichromate	
	$\qquad Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$	
	Dichromate ion ($Cr_2O_7^{2-}$) converts to chromate ion (CrO_4^{2-}) in the presence of alkali (i.e. pH> 7) or ionic equation.	
	(b) In transition elements oxidation state differ from each other by unity e.g. V^{2+}, V^{3+}, V^{4+}, V^{5+}	1+1
	Whereas in non- transition elements oxidation state normally differ by a unit of two e.g. Cl^-, Cl^+, Cl^{3+}, Cl^{5+} (or any one correct example)	
	OR	
	(a) $2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$	
	$2MnO_4^{2-} + Cl_2 \longrightarrow 2MnO_4^- + 2Cl^-$	
		1+1+1
	b) Mn^{2+}-stable half filled d-orbitals	
	Fe^{2+} -unstable (6 electron in d-orbitals)	1
	(ii) CU^{2+} - d^4 –t2g stable	
	$\quad Mn^{3+}$ -- d^4 -t2g unstable	
	******	1