Class- XII
Subject: Chemistry
Blue Print

S No	Unit	VSA (1 mark)	SA-1 (2 mark)	SA –II (3 marks)	LA (5 marks)	Total
1	**Solid state**		2			4
2	**Solutions**	2		1		5
3	**Electrochemistry**				1	5
4	**Chemical Kinetics**	1	2			5
5	**Surface Chemistry**	1		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	1		5
9	**Coordination Compounds**			1		3
10	**Haloalkanes and Haloarenes**		2			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**	2	1			4
15	**Polymers**			1		3
16	**Chemistry in everyday life**			1		3

MODEL TEST PAPER

Subject: Chemistry   **Marks:70**

**Grade: XII**   **Time: 3 hrs.**

General Instructions:
1.   All questions are compulsory
2.   Marks of each question are indicated against it.
3.   Question numbers 1 to 8 are very short questions, each of 1 mark. Answer these in one word or about one sentence each.
4.   Question numbers 9 to 18 are short answer questions of 2 marks each. Answer this in about 30 words each.
5.   Question numbers 19 to 27 are short answer questions of 3 marks each. Answer these in about 40 words each.
6.   Question numbers 28 to 30 are long answer questions of 5 marks each. Answer these in about 70 words.
7.   Use log tables if necessary. Calculators are not permitted.

1.   Write IUPAC name of the following compound
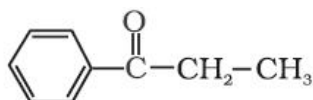
2.   Lower alcohols are soluble in water but higher alcohols are not. Why?

3.   Which one have higher coagulating power K^+ OR $Fe3^{+.}$. Why?

4.   Can we separate a mixture of 5% water and 95% ethanol by simple distillation? Justify your answer.

5.   State Raoult,s Law.

6.   Write a reaction which confirms the presence of aldehyde group in Glucose.

7.   What is peptide bond?

8.   State any one condition under which a bimolecular reaction may be kinetically of the first order.

9.   Give four structural differences between DNA and RNA.

10. Aluminium crystallizes in a cubic close packed structure. Its metallic radius is 125pm.

   (a) What is the length of the side of the unit cell?

   (b) How many unit cells are there in $1.00cm^3$ of Aluminium?

11. Explain the following with suitable example a) paramagnetism b) ferromagnetism

12. A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2.}$
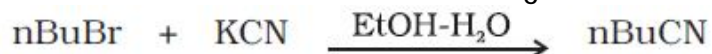
13. The decomposition of hydrocarbon follows the equation
$k = (4.5 \times 1011s^{-1}) e^{-28000K/T}$
Calculate energy of activation (E_a).

14. Chlorobenzene on nitration gives ortho &para nitro chloro benzene.explain ?

15. Write the mechanism of the following reaction:

nBuBr + KCN $\xrightarrow{\text{EtOH-H}_2\text{O}}$ nBuCN

16. Write short notes on
(i) rosenmund reduction
(ii) Clemensen reduction

17. Give a chemical test to distinguish between the following
(a) Ethyl amine and benzenamine

(b) Acetaldehyde and Benzaldehyde

18. (a) Calculate the magnetic moment of a divalent ion in aqueous solution if its atomic number is 25.
(b)Compare the chemistry of the actinoids with that of lanthanoids with reference to: (i) electronic configuration (ii) oxidation states and

Or

What is Lanthanoid contraction? Write its cause and consequences?

19. (i) Give reason of the followings

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

20. A 5% solution (by mass) of cane sugar in water has freezing point of 271K. Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 K.

21. Explain the following terms:
(i)   coagulation
(ii)   Peptization
(iii)   Shape selective catalysis?

22. Give reason for the following observation
(i) Cu^{2+} ion is more stable than Cu^+ in aqueous solution
(ii) Cr has maximum melting point in 3d series.
(iii) Transition metals forms alloy.

Or

(i)   Indicate the steps for the preparation of $K_2Cr_2O_7$ from chromite ore.

(ii)   Write the ionic equations when potassium dichromate reacts with Fe^2+in acidic medium.

23. (a) What is the role of NaCN in theconsentration of sulphide ore.
   (b) The value of Δ_fG^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?

24. Give reasons:

   (i)   Hypo phosphorous acid is good reducing agent.

   (ii) $PH_3$is less basic than NH_3. Why?

   (iii)   Chlorine water acts as a bleaching agent.

25.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)

26. (a) Why do soaps not work in hard water?
   (b) What are the main constituents of dettol?

   (c) Name the sweetening agent used in the preparation of sweets for a diabetic patient.

27.a) Name the monomers of biodegradable polymer PHBV.
   (b) Why the numbers 66 and 6 put in the name of nylon -66 and nylon -6?
   (c) How vulcanization changes the properties of natural rubber?

28. (a) How will you bring about the following conversions

   (1) Propanone to 2- methyl propane -2 -ol

   (2) Benzoic acid to meta nitro benzoic acid

   (3) Ethanal to 3-Hydroxybutanal

   (c) Complete the following reactions:-
   (i)

   (ii)
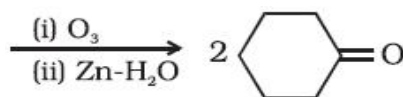
Or

(a) An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound and give the chemical reactions involved.

(b) Predict the products formed when cyclohexanecarbaldehyde reacts with following reagents.

    (i) PhMgBr and then H_3O^+

    (ii) Zinc amalgam and dilute hydrochloric acid

29. (i) Account for the following:

  (a) Nitrogen gas is inert at room temp.

  (b) F_2 is better oxidizing agent than Cl_2. Why?

  (c) In aqueous solution HI is stronger acid than HCl.

  (d) Noble gases have low boiling point.

  (ii) Draw the structure of BrF_3

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

(a) Write balanced equations for the following:

    (i) White phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2.

    (ii) The reaction of Cl_2 with hot and concentrated NaOH.

    (iii) The reaction of platinum with aqua-regia

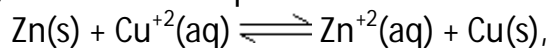(b) Write the chemical equations involved in Brown ring test for nitrate ion.

30. (a) Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution. The conductivity of 0.1 mol L^{-1} KCl solution is 1.29 S/m.

(b) Write the cathodic and anodic reactions for the charging of lead storage battery.

<div align="center">Or</div>

(a) Write the equations involved at anode and cathode in rusting of Iron.

(b) Calculate the equilibrium constant for the reaction:
$Zn(s) + Cu^{+2}(aq) \rightleftharpoons Zn^{+2}(aq) + Cu(s)$,
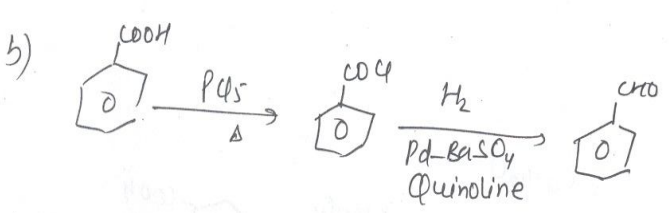Given: $E^o{}_{Zn}{}^{+2}{}_{/Zn} = -0.76V$ and $E^o Cu^{+2}/Cu = +0.34V$.

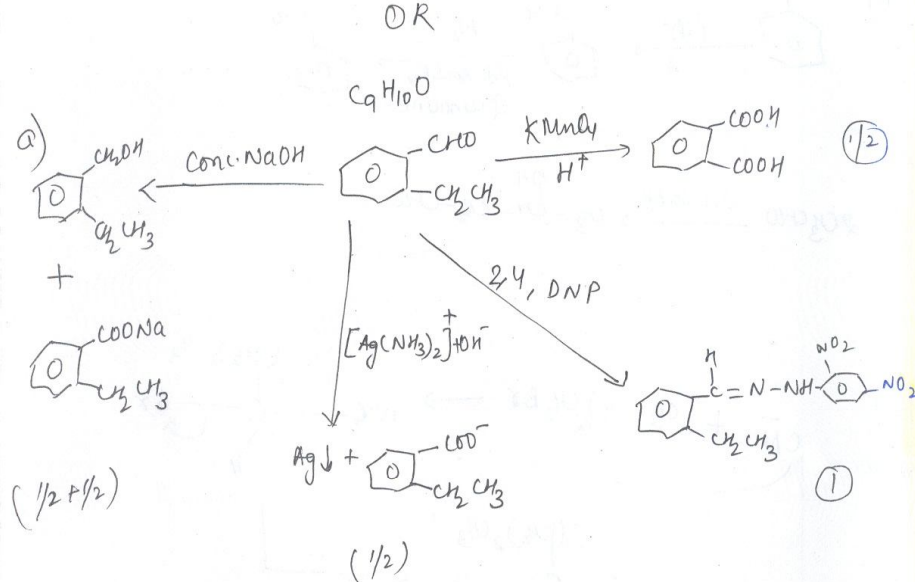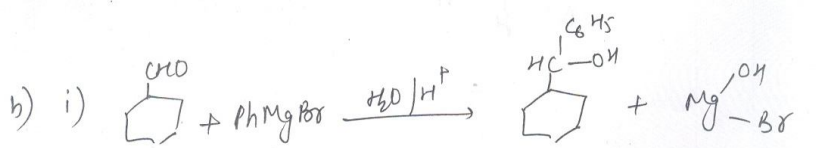(c) How much electricity in terms of Faraday is required to produce 20.0 g of Ca from molten $CaCl_2$?
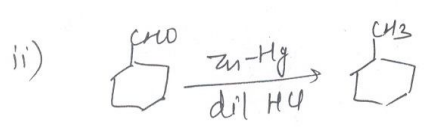
<div align="center">MARKING SCHEME</div>
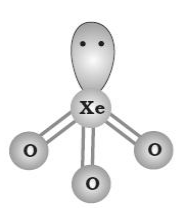
Q No.	Value Points	Point wise mark	Total mark
1	1-phenyl propan-1-one		1
2	Propanol has higher boiling point than butane because propanol molecules are associated to each other through intermolecular hydrogen bonding while there is no H-bonding in Butane.		1
3	Due to greater force of attraction between dispersed phase and dispersion medium in lyophillic colloids and lyophobic colloids.	½ ½	1
4	No at this composition solution will act as azeotrope	½ ½	1
5	The solubility of a gas in a liquid is directly proportional to the pressure of the gas.		1
6			1
7	The bond between carboxyl group and amino group of amino acids	1	1
8	When one of the reactant will be in excess (pseudo first order)	1	1
9	<table><tr><td>s.no</td><td>D.N.A</td><td>R.N.A</td></tr><tr><td>1</td><td>It contains β-2-deoxyribose sugar</td><td>It contains ribose sugar</td></tr><tr><td>2</td><td>It is double stranded nucleic acid</td><td>It is single stranded nucleic acid</td></tr><tr><td>3</td><td>It contains adenine , guanine, thymine & cytosine nitrogen bases</td><td>It contains adenine , guanine, uracil& cytosine nitrogen bases</td></tr><tr><td>4</td><td>It is responsible for genetic information.</td><td>It is involved in protein synthesis.</td></tr></table>	1 1	2

10	a) For fcc unit cell, r = a/ 2√
	      a = 2 x 1.414 x 125
	      = 353.5 pm
	 b) Volume of unit cell = a^3 = $(353.5 \times 10^{-10})^3$
	      = 442×10^{-25} cm^3
	 No. of unit cells = $1/442 \times 10^{-25}$ = 2.26×10^{22}
		1
		
		 1
			2

11	(i) When a 14 group element is doped with an electron rich 15 group element then excess of electron increases the conductivity, which forms n-type semiconductor. (ii) Anionic site occupied by the unpaired electrons in nonstoichiometric crystals.	1 1	2
12	k = (2.303/t) log [R_0]/[R] k = (2.303/ 40) log [100]/[70] = 0.00892 min^{-1} $t_{1/2}$ = 0.693 / k = 0.693 / 0.00892 = 77.7 min	½ 1 ½	2

13	$k = A\, e^{-Ea/RT}$	½	2
	on comparision Ea / (RT) = 28000/T		
	Ea = 28000 x 8.314 = 232792 J mol^{-1}	1 ½	
14	Aryl halides are extremely less reactive towards nucleophilic substitution reactions due to the following reasons:	1	2
	(i) Resonance effect :In haloarenes, C—Clbond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, they are less reactive towards nucleophilic substitution reaction.	1	
	(ii) Due to difference in hybridization state of aryl carbon(sp^2) and alkyl cabon (sp^3)		
15	SN$_2$ mechanism 		2
16 (i)	$R-\overset{\overset{\displaystyle O}{\|\|}}{C}-NH_2 \;+\; Br_2 \;+\; 4NaOH \longrightarrow R-NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$	1	2
	(ii)2HCHO $\xrightarrow{\text{Conc. NaOH}}$ HCOONa + CH$_3$OH	1	
17	(i) Ethyl amine gives foul smelling isocyanide with chloroform and KOH but di ethyl amine does not give carbyl amine test	1	2
	C$_2$H$_5$NH$_2$ + CHCl$_3$ + KOH(alc) $\longrightarrow$ C$_2$H$_5$NC + KCl + H Offensive smell+ H$_2$O		
	These can be distinguished by Iodoform test	1	
	CH3CHO + NaOH/I$_2$ $\longrightarrow$ CHI$_3$ + HCOONa + NaI Yellow ppt		
18	With atomic number 25, the divalent ion in aqueous solution will have d^5 configuration (five unpaired electrons). The magnetic moment, μ is μ = 5(5 + 2) = 5.92BM	1	2
	difference in Electronic configuration	½	
	difference in Oxidation number	½	
	Or		
	Lanthanoid Contraction: It is a gradual decrease in the atomic and ionic radii of lanthanoids.	½	
	Cause: Due to very poor shielding effect and diffused shape of f-orbitals.	1	
	Consequence: Separation of lanthanoid elements become difficult.	½	
19	(i) (a) The bond between O–CH3 is weaker than the bond between O–	1	3

	C6H5 because the carbon of phenyl group is *sp2* hybridised and there is a partial double bond character.	1	
	(b) Phenoxide ion has more resonance stability than phenol so more H$^+$ ions are formed while no resonance stabilization in alcohols.	1	
	(ii) PCC (Pyridinum Chloro chromate)		
20	(i) $\Delta T_f = K_f m$	½	
	Molecular mass of cane sugar = 342 g	2	
	Molecular mass of glucose = 180 g	½	
	2.15 = Kf x 5 x 1000/(342 x 95)		
	K_f = 13.97		
	(ii) $\Delta T_f = K_f m$		
	ΔT_f = 13.97 x x 5 x 1000/(180 x 95)		
	= 4.085 K		
	Depression in Freezing Point = 4.085		
	Freezing point of 5% glucose in water = 269.07K		
21	(i) Electrophoresis: The movement of charged colloidal particles towards the oppositely charged electrodes on passing electric current through the colloid.	1 x3	3
	(ii) The **process of converting a precipitate into colloidal sol** by shaking it with dispersion medium in the presence of a small amount of electrolyte. E.g zeolite		
	(iii) The catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules is called **shape-selective catalysis.** Zeolites are good shape-selective catalysts because of their honeycomb-like structures.		
22	(1) Due to more hydration energy of Cu^{2+}	1 x 3	3
	(2) Maximum unpaired electrons, more interatomic attraction due to d-d overlapping		
	(3) Transition elements can show variable oxidation state, and they can adsorb the reactant on the surface and decreases the activation energy.		
	Or		
	(i)		
	$$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$$ $$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$$		
	(ii)		
	$$5C_2O_4^{2-} + 2MnO_4^- + 16H^+ \longrightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$		
23	(i) To decrease the melting point and to make it better conductor	1	3

	(ii) Yes as ΔG^0 for net reaction will come –ve as $Cr_2O_3 + Al \longrightarrow Cr + Al_2O_3$ ΔG_{net} = -827 + 540 = -287Kj/mol	2	
24	(i) Due to the presence of 2 P-H bonds (ii) Less bond dissociation enthalpy of H_2Te due to bigger size of Te $Cl_2 + H_2O \longrightarrow 2HCl + [O]$ (iii) Due to the liberation of nascent Oxygen.	1 1 1	3
25	(i) Tris(ethylenediamine)cobalt(III) sulphate (ii) 2 (fac and mer) (iii) dsp^2 – square planar	1 1 1	3
26	(a) Form scum with calcium and Mg ions (b) dettol is a mixture of **chloroxylenol** and **terpineol**. (c) Ortho-sulphobenzimide, also called saccharin	1 1 1	3
27	 Each monomers have 6 c-atoms Sulphur gets cross link between the chain	1 1 1	3
28		1 x 5 1 + 2 1 x2	5s

OR

29 | (a) Nitrogen can form triple bond due to smaller size and high electronegativity. | 1 x 5 | 5
(b) Due to lone pair-lone pair repulsion in F atoms as F has smaller size.	1x3
(c) Bond dissociation enthalpy of HI is smaller than HCl	
(d) Due to weak Vanderwaal force of attraction in noble gases.	2

Or

(a)

(i) $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

(ii) $Cl_2 + NaOH$ (hot & conc.) $\rightarrow NaCl + NaClO_3 + H_2O$

(iii) $3Pt + 16H^+ + 4NO_3^- + 18Cl^- \rightarrow 3PtCl_6^{2-} + 4NO + 8H_2O$

(b)

	$NO_3^- + 3Fe^{2+} + 4H^+ \rightarrow NO + 3Fe^{3+} + 2H_2O$ $[Fe(H_2O)_6]^{2+} + NO \rightarrow [Fe(H_2O)_5(NO)]^{2+} + H_2O$ (brown) 2 mark		
30	The cell constant is given by the equation: Cell constant = $G^* = $ conductivity × resistance = 1.29 S/m × 100 Ω = 129 m^{-1} = 1.29 cm^{-1} Conductivity of 0.02 mol L^{-1} KCl solution = cell constant / resistance $= \dfrac{G^*}{R} = \dfrac{129\ m^{-1}}{520\ \Omega} = 0.248\ S\ m^{-1}$ Concentration = 0.02 mol L^{-1} = 1000 × 0.02 mol m^{-3} = 20 mol m^{-3} Molar conductivity = $\Lambda_m = \dfrac{\kappa}{c}$ $= \dfrac{248 \times 10^{-3}\ S\ m^{-1}}{20\ mol\ m^{-3}}$ (a) $= 124 \times 10^{-4}\ S\ m^2 mol^{-1}$ Anode: $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$ (b) Cathode: $PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O(l)$ **OR** (a) Oxidation: $Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$ Reduction: $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$ Atomospheric oxidation : $2Fe^{2+}(aq) + 2H_2O(l) + \tfrac{1}{2}O_2(g) \rightarrow Fe_2O_3(s) + 4H^+(aq)$ (b) $E^o_{cell} = E^o_c - E^o_a = 0.34 - (-0.76) = 1.10\ V$ $E^{\ominus}_{(cell)} = \dfrac{0.059\ V}{2}\ \log K_C$ E^0 Cell = 1.1 V, log Kc= 37.288 Kc = 1.94 x 10^{37} (a) $Ca^{2+} + 2e^- \rightarrow Ca$ 40 g require 2 Faraday 20 g require = 2 x 20/ 40 = 1 Faraday	1 ½ ½ ½ ½ 1 1 2 2 1	5