BLUE PRINT

CLASS- XII

CHEMISTRY MODEL Q.P.

S.NO.	UNIT	VSA (1 MARK	SA I (2 MARKS)	SAII (3 MARKS)	VBQ (4 MARKS)	LA II (5 MARKS)	TOTAL	
1	Solid state	1		1			4	23
2	Solutions		1	1			5	
3	Electrochemistry		1	1			5	
4	Chemical kinetics					1	5	
5	Surface chemistry	1		1			4	
6	General principles & processes of isolation of Elements	1		1			4	19
7	p-block elements		1			1	7	
8	d-& f- block elements	1		1			4	
9	Coordination compounds	1		1			4	
10	Haloalkanes & Haloarenes		1	1			5	28
11	Alcohol, Phenols& ethers				1		4	
12	Aldeydes,Ketones & Carboxylic acids					1	5	
13	Amines			1			3	
14	Biomolecules		1	1			5	
15	Polymers			1			3	
16	Chemistry in everyday life			1			3	
	TOTAL	5(1)	5(2)	12(3)	1(4)	3(5)	70	70

Model Q.P.

Subject - Chemistry

Class - XII

Time – 3 hrs **MM –70**

General Instructions:

(i) All questions are compulsory.
(ii) Question numbers 1 to 5 are very short answer questions & carry 1 mark each.
(iii) Question numbers 6 to 10 are short answer questions & carry 2 marks each.
(iv) Question numbers 11 to 22 are short answer questions & carry 3 marks each.
(v) Question numbers 23 Value Based question & carry 4 marks.
(vi) Question numbers 24 to 26 are Long answer questions & carry 5 marks each.
(vii) Use log table if necessary.

1. Why are zeolites called shape selective catalysts?
2. Name the point defect which lowers the density of a crystal.
3. Why Zn Cd & Hg are not considered as transition elements?
4. Which method is generally used for refining Zr and Ti?
5. Give IUPAC name of $[Cr(NH_3)_5Cl](NO_3)_2$.
6. p-dichlorobenzene has higher melting point and lower solubility than o- and m-isomer. Explain?
7. Give Optimum conditions for manufacturing of Ammonia by Haber's Process.
8. What deficiency diseases are caused due to lack of vitamins B1, B6, C and K in human diet.
9. When 3 ampere of electricity is passed for 45 minutes 2.0 g of metal is deposited. Find equivalent weight of metal.

   OR

   Write the Anode and Cathode reactions of recharging the lead storage battery.
10. 16gm of methanol and 23gm of ethanol are mixed together. What is the total V.P. of the solution? (Given VP of pure methanol and pure ethanol are 88.7mm Hg and 44.5mmHg respectively.
11. Define the following terms:
    a. Peptization
    b. Electrophoresis

c. Emulsions

12. Haloalkanes undergo nucleophilic substitutions whereas haloarenes undergo electrophilic substitutions. Why?
13. Identify the type of drug-
    (i) Ofloxacin (ii) Aspirin (iii) Cimetidine
14. Account for the following:
    Propanol has higher boiling point than butane
    O-nitrophenol is more acidic than o- methoxyphenol
    Phenol does not give protonation reaction readily.
15. Give example and suggest reasons for the following features of the transitional metal chemistry.
    1. The lowest oxide of transition metal is basic, the highest is acidic.
    2. The transition metal exhibits higher oxidation states in oxides and fluorides.
16. State and Explain Raoult's Law for solutions of volatile liquid components. taking suitable examples explain the meaning of positive and negative deviations from Raoult's Law.

    OR

    Define the term Osmotic pressure. Describe how the molecular mass of a substance can be determined on the basis of osmotic pressure measurement.
17. Write the polymerization reaction of Nylon 66, Buna S and Buna N.
18. The density of an atom is 7.2g cm^{-3}. It has bcc structure. The edge length is 288 pm. How many atoms of element does 208g of element has?
19. $[NiCl_4]^{2-}$ is paramagnetic where as $[Ni(CO)_4]$is diamagnetic though both are tetrahedral why?.
20. Name the principal ore of aluminium and describe how Al is extracted from its ore.
21. Find the *emf* of following cell -

    $Zn/Zn^{2+}_{(0.1M)} \,||\, Pb^{2+}_{(1M)}/Pb$

    $E^0_{Zn/Zn^{2+}} = -0.76V$ and $E^0_{Pb^{2+}/Zn} = 0.12V$
22. Define the following as related to proteins
    (i) Peptide linkage (ii) Primary structure (iii) Denaturation.
23. Mohan heard a lot of noise and weeping in nearby jhuggis. He took courage and went to inquire what had happened. He found that some people has taken spurious alcohol containing methanol and were crying with pain and were complaining of loss of eyesight. He immediately hired an auto risk saw and packed it with 4 persons who has consumed spurious alcohol.

a. How does methanol in drinking alcohol cause problem?
b. What treatment might the doctors have undertaken to save the patients
c. What message would you give to the person who consumed spurious alcohol?
d. Write the values associated with his decision.

24. Give reasons for the following observations:

a) HF is least volatile where as HCl is most volatile among the hydrogen halides.
b) Boron forms electron deficient compounds.
c) Silanes get hydrolysed by water.
d) H_3PO_3 is a diprotic acid.
e) Pentavalent bismuth is a strong oxidizing agent.

OR

a) NF_3 is an exothermic compound but NCl_3 is an endothermic compound.
b) CCl_4 is not hydrolysed with water but $SiCl_4$ is easily hydrolysed.
c) Nitrogen does not form penta chloride but phosphorous can.
d) SF_6 is well known but SH_6 is not known.
e) HI in an aqueous solution is stronger acid than HCl

25. (a) Illustrate the following name reactions giving a chemical equation in each case:-

i. Clemmensen reaction.
ii. Cannizaro's reaction.

(b) Describe how the following conversions can be brought about:

i. Cylohexanol to cyclohexan-1-one
ii. Ethylbenzene to benzoic acid
iii. Bromobenzene to benzoic acid

OR

(a) Illustrate the following name reactions:-

i. Hell-Volhard - Zelinsky reaction
ii. Wolff-Kishner reduction reaction

Account for the following

1. Benzoic acid does not undego Friedel-Craft reaction.

2. pKa value of chloroacetic acid is lower than pKa value of acetic acid.

26. (a) The rate of the chemical reaction doubles for an increase of 10 K in absolute temperature from 298 K. Calculate Ea.

(b) Define the following terms

i) Order of reaction

ii) Molecularity of reaction

OR

a. A reaction is of 2^{nd} order with respect to a reactant. How is the rate of recation affected if the concentration of this reactant is

i. Doubled

ii. Reduced to half

2) Sucrose decomposes in acid solution into glucose and fructose according to the first order rate law, with $t1/2 = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours?

Marking Scheme

1. Because there reaction depends upon Pore size, tunnels and cavities in it.
2. Schottky defect.
3. Fully filled d-subshell.
4. Van-Arkel method
5. pentaamminechloridochromium(III)nitrate
6. symmetry in para isomer leads to greater Vander Waals forces.
7. 700 K temp. 20 MPa pressure Fe catalyst.
8.

Vitamins	Deficiency Disease
B1	Beri beri (loss of appetite)
B6	Convulsions
K	Increased blood clotting time
C	Scurvy

9. Q =I X t

= 3 X 45 X 60= 8100 C

8100 C of electricity deposits 2.0 g of metal

∴ 96500 C of electricity deposits = (2.0/8100) X 96500
= 23.82 g of metal

∴ Eq. Wt. of metal is 23.82 g.

OR

Anode: $PbSO_4(s) \; 2e^- \rightarrow SO_4^{2-}(aq)$ □ $Pb(s)$

Cathode: $PbSO_4(s) + 2H_2O(l) \rightarrow PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^-$

10. Moles of methanol = 16/32 = 0.5
Moles of ethanol = 23/46 = o.5
x_{CH_3OH} = 0.5/0.5+0.5 = 0.5
$X_{C_2H_5OH}$ = 1-0.5 = 0.5
Partial V.P. of methanol = 0.5 x 88.7 =44.35
Partial V.P. of ethanol = 0.5 x 44.5 = 22.25
Vapour pressure of solution = 44.35 +22.25 = 66.60mm Hg
11. Correct definition 1 mark each.
12. 1. Haloarenes are electron rich 2. Resonance stabilization.3. Hybridization of carbon.
13. (i) Antibiotic (ii) Analgesics & Antipyretics (iii) Antihistamines & antacid.
14. (a) both are of comparable masses but because of intermolecular H-bonding in propanol which is not present in butane due to absence of –OH group. There are only weak VanDer Waals forces in butane and hence has lower boiling point.
(a) -NO_2 group is an electron withdrawing group and tend to decrease the electron density on –OH thereby increasing its tendency to lose H+ ions ,consequently increasing the acidic nature .but in o-methoxyphenol, -OCH_3 group has +I effect and hence less is acidic .
(b) C-OH in phenol is stabilized due to resonance and electron pair at oxygen atom in phenol is not readily available to proton ,thus protonation not occurs readily
15. 1. Transition metal in lower oxidation state can afford to lose few electrons but in higher oxidation state it prefer to gain electron.

2. because of high electro negativity of F and O.

16. for a solution of volatile liquids, the partial vapour pressure of each component in the solution is directly proportional to its mole fraction.

Thus, for component 1
$p1 \square\square x1$
and $p1 = 0$
$1\ p\ x1$
where 0
1 *p* is the vapour pressure of pure component 1 at the same temperature.
Similarly, for component 2
$p2 = p2$
$0\ x2$
where $p20$
represents the vapour pressure of the pure component 2.
Positive deviation: ehanol and acetone
Mixtures of ethanol and acetone
behave in this manner. In pure ethanol, molecules are hydrogen bonded. On adding acetone, its molecules get in between the host molecules and break some of the hydrogen bonds between them. Due to weakening of interactions, the solution shows positive deviation from Raoult's law
Negative deviation: Chloroform and acetone
a mixture of chloroform and acetone forms a
solution with negative deviation from Raoult's law. This is because chloroform molecule is able to form hydrogen bond with acetone molecule.

OR

The pressure that just stops the flow of solvent is called *osmotic pressure* of the solution.
osmotic pressure is
proportional to the molarity, *C* of the
solution at a given temperature *T*. Thus:
$ð = C\ R\ T$ (2.39)
Here ð is the osmotic pressure and R is the gas constant.

ð = (*n*2 /*V*) *R T* (2.40)

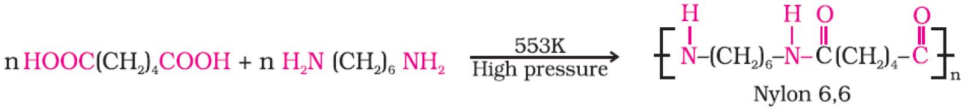
Here *V* is volume of a solution in litres containing n2 moles of solute.

If *w*2 grams of solute, of molar mass, *M*2 is present in the solution, then

$$ð\ V = \frac{w_2\ R\ T}{M_2}$$

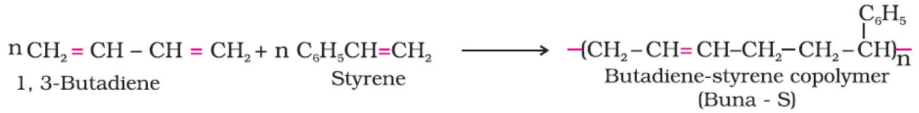
$$\text{or}\quad M_2 = \frac{w_2\ R\ T}{\pi\ V}$$

17. *Nylon 6,6:* It is prepared by the condensation polymerisation of hexamethylenediamine with adipic acid under high pressure and at high temperature.



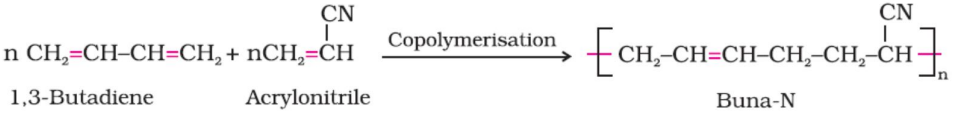
Nylon 6, 6 is used in making sheets, bristles for brushes and in textile industry.

The polymers made by addition polymerisation from two different monomers are termed as copolymers, *e.g.*, Buna-S



Buna – N

You have already studied about Buna-S, in Section 15.1.3. Buna –N is obtained by the copolymerisation of 1, 3 – butadiene and acrylonitrile in the presence of a peroxide catalyst.



18. Volume of the unit cell = (288 pm)3
= (288×10-12 m) = (288×10-10 cm)3
= 2.39×10-23 cm3

Volume of 208 g of the element

$$= \frac{mass}{density} = \frac{208g}{7.2\,g\,cm^{-3}} = 28.88\,cm^3$$

Number of unit cells in this volume

$$= \frac{28.88cm^3}{2.39\times10^{-23}cm^3\,/\,unit\ cell} = 12.08\times10^{23}\ \text{unit cells}$$

Since each *bcc* cubic unit cell contains 2 atoms, therefore, the total number of atoms in 208 g = 2 (atoms/unit cell) × 12.08 × 10^{23} unit cells

$= 24.16\times10^{23}$ atoms

19. $[NiCl_4]^{2-}$ is paramagnetic where as $[Ni(CO)_4]$is diamagnetic
$[NiCl_4]^{2-}$ weak field ligands, low CFSE, High spin Complex and vice versa.

20. Important ores -(i) Bauxite Al2O3.xH20 (ii) Corrundum Al2O3. Bauxite is commercially important ore of Al.
Extraction from Bauxite ore involves the following two stages:-
(i) Purification of bauxite to get pure alumina (Al2O3)
(ii) Electrolysis of pure alumina in molten cryolite
Step:-1 Bauxite is treated with NaOH .Following reaction takes place:-
Al2O3 +2NaOH + 3H2O→ 2 Na [Al(OH)4] and impurities of Fe2O3,TiO2 &SiO2 are removed . Na [Al(OH)4] ,then reacts with CO2 then pure Alumina is obtained.
Na [Al(OH)4] + 2CO2 → Al2O3.xH2O + 2NaHCO3
Step:-2 Electrolytic reduction of pure alumina takes place in iron box (cathode) with cryolite (Na3AlF6) & fluorspar CaF2.Graphide rods act as anode. Following reactions take place:-
At cathode:- Al3+ + 3e- → Al, At Anode:- 2O2- →O2 + 4e-
By this process 98.8% pure Aluminum is obtained.

21. From the cell representation it is clear that zinc is anode and Pb is cathode

$$E^{\circ}_{cell} = E^{\circ}_{C} - E^{\circ}_{A}$$

$$= \ -0.12 \ - \ (-0.76)$$

$$= \ -0.12 \ + \ 0.76$$

$$= + 0.64 \text{ V}$$

$$\text{Given} \left[Zn^{2+}\right] = 0.1\text{M}, \ \left[Pb^{2+}\right] = 1.0\text{V}, \ n = 2$$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{n} \log \left[\frac{Zn^{2+}}{Pb^{2+}}\right]$$

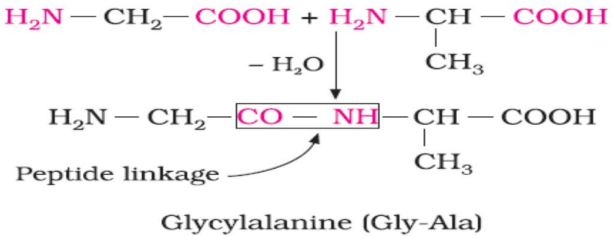
$$E_{cell} = 0.64 - \frac{0.0591}{2} \log \left[\frac{0.1}{1.0}\right]$$

$$= 0.64 - 0.02955 \times 1$$

$$= 0.64 + 0.02955$$

$$= 0.669 \text{ V}$$

22. peptide linkage is an amide formed between –COOH group and –NH2 group.



Glycylalanine (Gly-Ala)

Primary structure of proteins: Proteins may have one or more polypeptide chains. Each polypeptide in a protein has amino acids linked with each other in a specific sequence and it is this sequence of amino acids that is said to be the primary structure of that protein. Any change in this primary structure i.e., the sequence of amino acids creates a different protein.

When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of proteins.

23. (a) methyl alcohol is easily oxidized to formaldehyde and then to formic acid. Which may cause blindness and death

(b) doctors given an intra venous infusion of diluted ethanol. the enzyme responsible for oxidation of HCHO to acid is swamped allowing time for kidneys to excrete methanol

(c) people should be educated not to drink cheap alcohol from unauthorized sources. It is not worth saving money when the life get endangered. It at all one has to drink, the stuff must be purchased from an authorized source.

24. a. H-bonding
b. presence of one vacant p-orbital.
c. due to presence of d-subshell.
d. two ionisable P-OH bonds.
e. lower oxidation state becomes more stable down the group.

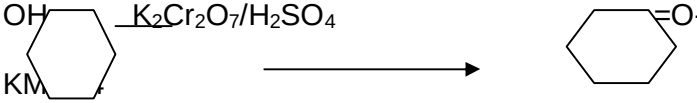
OR

a. high electronegativity of F.
b. absence of d-subshell in CCl_4.
c. absence of d-subshell
d. high electronegativity of F.
e. low bond dissociation of HI.

25. a 1 CH_3COCH_3+ 4{H} $\rightarrow$ $CH_3CH_2CH_3+H_2O$---1

2 HCHO+NaOH $\xrightarrow{\text{Conc NaOH}}$ $CH_3OH+HCONa$ -----1

b.



2 $C_6H_5CH_2CH_3$ $\xrightarrow{\text{Mg/dry ether}}$ C_6H_5COOK $\xrightarrow{H_3O+}$ C_6H_5COOH

1. 2 C_6H_5Br $\xrightarrow{\text{Mg/dry ether}}$ C_6H_5MgBr $\xrightarrow{CO_2}$ $C_6H_5COOMgBr$ $\xrightarrow{H_3O+}$ C_6H_5COOH

OR

CL_2,P

A 1..CH_3COOH $\rightarrow$ Cl_3COOH----1

NH_2NH_2 KOH/GLYCOL

2 RCHO $\rightarrow$ $RCH=NN\ H_2$ $\rightarrow$ $RCH_3 + N_2$ ---1

B 1 COOH group is deactivating and combines with AlCl3----1
2 due to –I effect of chlorine atoms---1
26.i. It is given that $T1 = 298$ K
$\therefore T2 = (298 + 10)$ K
= 308 K
We also know that the rate of the reaction doubles when temperature is increased by 10°.
Therefore, let us take the value of $k1 = k$ and that of $k2 = 2k$
Also, $R = 8.314$ J K−1 mol−1
Now, substituting these values in the equation:

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303\ R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$$

We get:

$$\log \frac{2k}{k} = \frac{E_a}{2.303 \times 8.314}\left[\frac{10}{298 \times 308}\right]$$

$$\Rightarrow \log 2 = \frac{E_a}{2.303 \times 8.314}\left[\frac{10}{298 \times 308}\right]$$

$$\Rightarrow E_a = \frac{2.303 \times 8.314 \times 298 \times 308 \times \log 2}{10}$$

= 52897.78 J mol−1
= 52.9 kJ mol−1
ii. a. the sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.
b. The number of reacting species (atoms, ions or molecules) taking part in an elementary reaction, which must collide simultaneously in order to bring about a chemical reaction is called molecularity of a reaction.

OR

a. i. Let the concentration of the reactant be [A] = *a*

Rate of reaction, R = *k* [A]2
= *ka*2
(i)If the concentration of the reactant is doubled, i.e. [A] = 2*a*, then the rate of the reaction would be
= 4*ka*2
= 4 R
Therefore, the rate of the reaction would increase by 4 times.
ii. If the concentration of the reactant is reduced to half, then the rate of the reaction would be

$$R'' = k\left(\frac{1}{2}a\right)^2$$

$$= \frac{1}{4}ka$$

$$= \frac{1}{4}R$$

Therefore, the rate of the reaction would be reduced to1/4.
b.

For a first order reaction,

$$k = \frac{2.303}{t}\log\frac{[R]_0}{[R]}$$

It is given that, $t_{1/2}$ = 3.00 hours

Therefore,

$$k = \frac{0.693}{t_{1/2}}$$

$$= \frac{0.693}{3}\ h^{-1}$$

$$= 0.231\ h^{-1}$$

Then, $0.231\ h^{-1} = \frac{2.303}{8\ h}\log\frac{[R]_0}{[R]}$

$$\Rightarrow \log\frac{[R]_0}{[R]} = \frac{0.231\ h^{-1} \times 8\ h}{2.303}$$

$$\Rightarrow \frac{[R]_0}{[R]} = \text{antilog}(0.8024)$$

$$\Rightarrow \frac{[R]_0}{[R]} = 6.3445$$

$$\Rightarrow \frac{[R]}{[R]_0} = 0.1576\ (\text{approx})$$

$$= 0.158$$

Hence, the fraction of sample of sucrose that remains after 8 hours is 0.158.