

## **Blue print-- chemistry**

<b>UnitNo.</b>	<b>Title</b>	<b>Marks</b>
UnitI	SolidState	23
UnitII	Solutions	
UnitIII	Electrochemistry	
UnitIV	Chemical Kinetics	
UnitV	SurfaceChemistry	
UnitVI	GeneralPrinciplesandProcessesofIsolationofElements	19
UnitVII	p-BlockElements	
UnitVIII	d-andf -BlockElements	
UnitIX	CoordinationCompounds	
UnitX	HaloalkanesandHaloarenes	28
UnitXI	Alcohols,Phenolsand Ethers	
UnitXII	Aldehydes,KetonesandCarboxylic Acids	
UnitXIII	OrganicCompoundscontainingNitrogen	
UnitXIV	Biomolecules	
UnitXV	Polymers	
UnitXVI	Chemistryin EverydayLife	
	<b>Total</b>	<b>70</b>

### **QUESTIONWISEBREAKUP**

<b>TypeofQuestion</b>	<b>MarkperQuestion</b>	<b>TotalNo.ofQuestions</b>	<b>TotalMarks</b>
VSA	1	5	05
SA-I	2	5	10
SA-II	3	12	36
VBQ	4	1	04
LA	5	3	15
<b>Total</b>		<b>26</b>	<b>70</b>

1.  

**InternalChoice:** There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage.
2. *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different forms of questions and typology of questions same.*

## CHEMISTRY WORKSHOP AT KV HIRANAGAR

# GROUP: P C RAY

Class- XII

## Sub-Chemistry

Time- 3 Hours MM:70

General Instructions:

1. All questions are compulsory.
  2. Question numbers 1 to 5 are very short answer questions of one mark each. Answer these in one word or about one sentence each.
  3. Question numbers 6 to 10 are short answer question of two marks each. Answer these in about 30 words each.
  4. Question numbers 11 to 22 are short answer question of three marks each. Answer these in about 40 words each. Question no. 23 is of 4 marks .
  5. Question numbers 24 to 26 are long answer question of five marks each. Answer these in about 70 words each.
  6. Use log tables, if necessary.
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1	A group 14 element is to be converted into p-type semiconductor by doping. To which group should this impurity belong?	1
2	Why a finely divided substance is more effective as an adsorbent?	1
3	Why Dipole moment of chloro-benzene is lower than of cyclohexyl chloride?	1
4	Write IUPAC name of the following compound: $\text{CH}_3\text{—CO—CH}(\text{NO}_2)\text{—CH}_2\text{—OH}$	1
5	Although $-\text{NH}_2$ gp is an ortho and para directing gp, nitration of aniline gives along with ortho and para, meta derivatives also.	1
6	Calculate the vapour pressure lowering of water when 5.67g of glucose( $\text{C}_6\text{H}_{12}\text{O}_6$ ) is dissolved in 25.23 g of water at 25°C. The vapour pressure of water at 25°C is 23.8 mmHg. What is the vapour pressure of	2

the solution?

- 7 Which of the two is more acidic and why? p-nitrophenol or p-methoxyphenol. 2

OR

What happens when:

- (i) Phenol reacts with  $\text{Br}_2$  in  $\text{CS}_2$  at 273K  
(ii) Phenol reacts with conc.  $\text{HNO}_3$

- 8 Account for the following: 2  
(i) Zn is not considered as a transition element.  
(ii) Transition metals form a large number of complexes

- 9 Give IUPAC name of following compounds. 2  
(i)  $\text{CH}_3\text{CH}=\text{CH CH}_2\text{CH(OH)CH}_3$   
(ii)  $\begin{array}{ccccccc} \text{CH}_3\text{CH} & \text{CH}_2 & \text{CH} & \text{CH}_3 \\ | & | & | & | \\ \text{OCH}_3 & \text{OCH}_3 & & & \end{array}$

- 10 Differentiate between molecularity and order of a reaction . 2

- 11 A) Complete the following equations: 3  
(I)  $\text{PCl}_3 + \text{H}_2\text{O} \rightarrow$  (ii)  $\text{Al}_2\text{O}_3 + \text{NaOH} + \text{H}_2\text{O} \rightarrow$

B) Why  $\text{N}_2$  exist as gas while  $\text{P}_4$  exist as solid?

- 12 The reaction,  $2\text{A} + \text{B} \rightarrow \text{A}_2\text{B}$ , Rate =  $k [\text{A}] [\text{B}]^2$  with  $k = 2 \times 10^{-6} \text{ mol}^{-2}\text{litre}^2\text{s}^{-1}$ . Calculate the initial rate of the reaction when  $[\text{A}] = 0.1 \text{ mole L}^{-1}$ ,  $[\text{B}] = 0.2 \text{ mol L}^{-1}$ . 3

- 13 Write short note on (i) froth flotation process (ii) leaching (iii) smelting 3

- 14 (i) Explain the variation of chemical adsorption with temperature at constant pressure.  
(ii) difference between macromolecular and micro-molecular colloids.  
(iii) Hardy Schulze's rule. 3

- 15 (i) What is Van't Hoff factor for  $\text{K}_3[\text{Fe}(\text{CN})_6]$ ?  
(ii) Calculate the degree of dissociation for  $\text{MgSO}_4$  if aqueous solution of 1 m concentration represents boiling point  $100.832^\circ\text{C}$ . Molal elevation constant for water is  $0.52 \text{ K Kg Mol}^{-1}$ . 3

- 16 Explain with reason (i)  $\text{Ni}^{2+}$  is formed but not  $\text{Ni}^{4+}$ .  
(ii)  $\text{Cu}^+$  is not stable in aqueous solution.  
(iii)  $\text{Ce}^{4+}$  is stable while lanthanides have stable +3 oxidation states. 3

17	Calculate the density of NaCl crystal where the distance between the $\text{Na}^+$ & $\text{Cl}^-$ is 281 pm. It is found that $1.5 \times 10^{23}$ constituents are present in 14.62 g of the crystal.	3
18	What are  i) food preservatives?. ii) antipyretics iii) analgesics(non-narcotic) Gives one example each	3
19	(a) Explain the difference between Buna-N & Buna-S. (b) Arrange the following polymers in increasing order of their molecular forces: (i) Nylon-6 6, Buna-S, Polythene (ii) Nylon-6, Neoprene, Polyvinyl Chloride	3
20	Arrange the compounds of each set in order of reactivity towards $\text{SN}^2$ reactions:  (i) 2-bromo-2-methylbutane, 1-bromopentane, 2-bromopentane (ii) 1-bromo-3-methylbutane, 2-bromo-2-methylbutane, 3-bromo-2-methylbutane	3
21	An organic compound A ( $\text{C}_3\text{H}_5\text{N}$ ) on boiling with alkali gives ammonia and sodiumsalt of an acid B ( $\text{C}_3\text{H}_6\text{O}_2$ ). Upon reduction, A gives C ( $\text{C}_3\text{H}_9\text{N}$ ) which on treatment with nitrous acid gives D ( $\text{C}_3\text{H}_8\text{O}$ ). Identify A, B, C and D. give all equations involved.  Or  An organic compound A Having formula $\text{C}_5\text{H}_{10}\text{O}$ , on treatment with 2,4 DNP form orange red ppt. Of compound B. On treatment with NaOH and Iodine compound A form yellow ppt. Of compound C. Compound A does not react with fehling reagent or Tollen's reagent. Identify Compound A,B,C and write the chemical reaction involved	3
22	(i) Explain the geometry of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ on the basis of VB theory. (ii) Give one example of ambi-dentate ligand.	3
23	Pradeep had very high fever. He was given strong antibiotics. But after recovering from fever he was not able to digest food and was feeling too weak.The grandmother who lived in his neighborhood suggested him to take lots off fruits and vegetables. a. Why? (2) b. What is the remedy for this? (1) c. What was the value that Pradeep had by taking fruits and vegetables?	4

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(1)

24

5

- (a).Explain the following: (i) Cannizzaro's Reaction  
(ii) Wolf Kishner's Reaction  
Condensation  
(b) Give chemical test to distinguish between  
(i)  $\text{CH}_3\text{CHO}$  and  $\text{C}_6\text{H}_5\text{CHO}$  (ii)  $\text{CH}_3\text{COCH}_3$ &  $\text{CH}_3\text{CHOHCH}_3$

OR

- (a) Ethanol reacts with acetic acid in the presence of conc.  $\text{H}_2\text{SO}_4$  to give a sweet smelling substance. Give the equation involved in the reaction.  
(b) Write a note on  
(i) Rosenmund's reduction  
(ii) Hell VolhardZelinsky reaction

25

5

- (a) How are  $\text{XeO}_3$ &  $\text{XeOF}_4$  prepared?  
(b) Explain (i)  $\text{PCl}_3$  act as a oxidizing agent as well as reducing agent.  
(ii) Di-oxygen is gas but sulphur is a solid.  
(iii)  $\text{R}_3\text{P}=\text{O}$  exist but  $\text{R}_3\text{N}=\text{O}$  does not.

OR

- (a) Write balance equation for the following:  
(i) Sodium chloride is heated with sulphuric acid in the presence of manganese dioxide.  
(ii) Chlorine gas is passed into a solution of sodium iodide in water  
(b) Explain with reason (i) why is He used in diving apparatus?  
(ii) All the 5 bonds in  $\text{PCl}_5$  are not equivalent. (iii) F exhibit only -1 O.N. whereas other halogens exhibit +1, +3, +5 & +7 O.N.

26

5

- (a) Explain the construction & working of Pb storage cell.  
(b) Explain Kohlrausch's law.  
(c) Calculate amount of Ni deposited when a constant current of 5 ampereflown through the electrolytic solution of  $\text{Ni}(\text{NO}_3)_2$  for 40 minute.

OR

- (a) In a cell reaction, the equilibrium constant  $K$  is less than one. Is  $E^\circ$  for the

**cell positive or negative ?**

**(b) What will be the value of K of  $E^\circ_{\text{cell}} = 0$  ?**

**(c) What would happen if the protective tin coating over an iron bucket is broken in some places ?**

**Marking scheme**

**1 GP 13 1**

**2 CORRECT REASON 1**

**3 CORRECT EXPLANATION**

**1**

**4 CORRECT IUPAC NAME 1**

**5 while  $-N^+H_3gp$  in anilinium ion is m-directing and deactivating hence a mixture of all three—ortho, para and meta derivatives is formed. 1 mark**

**6  $W_A = 25.23 \text{ g}$**

$$M_B = 180 \text{ g mol}^{-1}$$

$$M_A = 18 \text{ g mol}^{-1}$$

$$n_B = \frac{5.67}{180} = 0.0315 \text{ mol}$$

$$n_A = \frac{25.23}{18} = 1.40 \text{ mol}$$

$$\begin{aligned}\text{Mole fraction of glucose} &= x_B = \frac{n_B}{n_A + n_B} \\ &= \frac{0.0315}{0.0315 + 1.4} \\ &= 0.022\end{aligned}$$

$$p^0_A = 23.8 \text{ mmHg at } 25^\circ\text{C}$$

We know that

Relative lowering of vapour pressure

$$\frac{p_A^0 - p_A}{p_A^0} = x_B$$

$$\begin{aligned}\text{Vapour pressure lowering} &= p_A^0 - p_A = x_B \cdot p_A^0 \\ &= 0.022 \times 23.8 \\ &= 0.524 \text{ mmHg}\end{aligned}$$

1/2

Also,

$$\frac{23.8 - p_A}{23.8} = 0.022$$

$\frac{23.8}{23.8}$

$$23.8 - p_A = 0.022 \times 23.8 = 0.524$$

$$p_A = 23.8 - 0.524$$

$$= 23.3 \text{ mmHg}$$

7

p-Nitrophenol is more acidic than p-methoxyphenol.

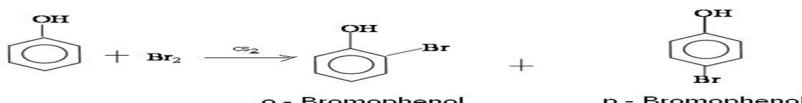
(1)

This is because p-nitrophenoxide ion is stabilized due to electron withdrawing inductive effect of  $-NO_2$  group present on the para position. On the other hand,  $-OCH_3$  group has electron releasing inductive effect which destabilizes p-methoxyphenoxide ion.

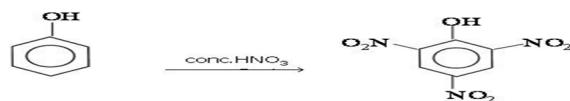
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OR

(i) When phenol reacts with  $Br_2$  in  $CS_2$  at 273K, a mixture of o- and p- bromophenol is formed in which p- bromophenol is the major product



(ii) When phenol reacts with conc.  $HNO_3$ , 2, 4, 6-trinitrophenol is formed.



8

(i) Zinc is not considered a transition element because it does not have partly filled(or incomplete) d-subshell. It has 3d-subshell full filled.

(ii) The transition elements form complexes because of the following reasons.  
Comparatively smaller size of their metal ions.

- Their high ionic charges.
- Availability of vacant d-orbitals so that these orbitals can accept lone pairs of electrons donated by the ligands

9 i) Hex-4-en-2-ol

(ii) 2, 4-Dimethoxypentane

10 Four differences , each of  $\frac{1}{2}$  mark

11 Correct reaction 2  
Correct reason 1

12

$$\text{Rate} = k [A][B]^2 = 2 \times 10^{-6} \times 0.1 \times (0.2)^2 = 8 \times 10^{-9} \text{ mol L}^{-1} \text{ sec}^{-1}$$

13 Correct definition with example.  $1\frac{1}{2} \times 2 = 3$

14 The chemical adsorption first increases with rise in temperature and then decreases with further rise.  
Macromolecular colloid is obtained by breaking bigger particles while micrmolecular colloid is obtained by the association of smaller ones.

The coagulating power of effective ion is directly proportional to the fourth power its valency.  $3 \times 1 = 3$

15  $K_3[Fe(CN)_6] \rightarrow 3 K^+ + [Fe(CN)_6]^{4-}$ . n = 4 and i = 4.  $\Delta T_b = i \times k_b$   
x m. i = 1.6 and  $\alpha = 60\%$ .

16 Correct reasons  $1 \times 3 = 3$

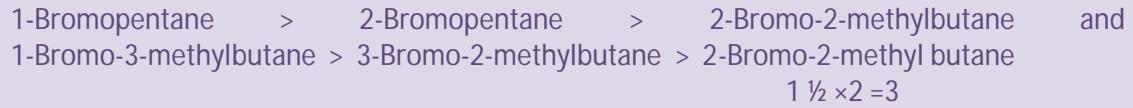
17

On substituting the value in  $d = Z \times M / a^3 \times N_A$ ,  $d = 2.165 \text{ g/cm}^3$ .  $1 \times 3 = 3$

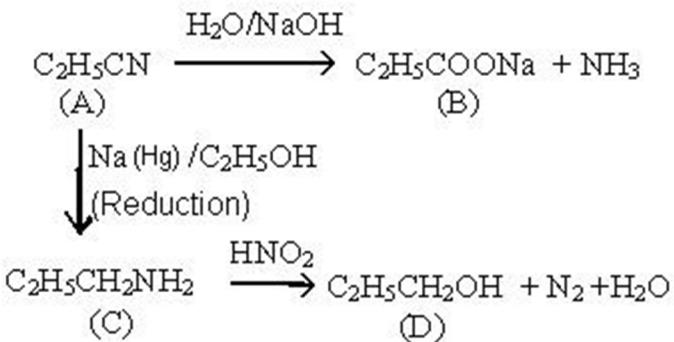
18 Definition and suitable examples.  $3 \times 1 = 3$

19 In Buna-N, one monomer is  $CH_2 = CH - CH = CH_2$  and other is  $CH_2 = CH - CN$  while in Buna-S, one monomer is  $CH_2 = CH - CH = CH_2$  and other is  $CH_2 = CH - C_6H_5$ .  $1 + 2 = 3$

20



21



1 + 2=3

Or

A = Pentan-2-one ½ mark

B= Pentan-2-one 2,4-DNP Hydrazone ½ mark

C = CHI<sub>3</sub> ½ mark

Chemical reaction ½ mark each

22	Explanation based Example of ambidentate ligand is CN <sup>-</sup> and NC <sup>-</sup> .	on	VBT.
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- 23 ANS a. Rise in temperature denatures the proteins in our body. The enzymes which are also proteins get denatured. The body has to regenerate these enzymes. Till then Pradeep will continue to feel weak as the enzymes to digest food and for respiration are destroyed due to high temperature and change in pH. Even after the enzymes are regenerated, vitamins which act as prosthetic groups in enzyme action are to be taken from an external source.  
b. By taking fruits and vegetables Pradeep is actually taking in vitamins.  
**c. He obeyed an elderly person's advice. 2+1+1=4**

24

Carbonyl compound without  $\alpha$  H in the presence of base gives salt of carboxylic acid and alcohol.  
Carbonyl compound + NH<sub>2</sub>NH<sub>2</sub> / base gives hydrocarbon.

Two different carbonyl compound, one having  $\alpha$  H in the presence of base gives  $\beta$ -hydroxy carbonyl compounds as product.

Iodoform test and Brady's reagent respectively.

Or

1)CORRECT REACTION 2

2) CORRECT REACTION 1.5 X 2=3

- 25 XeF<sub>6</sub> + 3 H<sub>2</sub>O  $\rightarrow$  XeO<sub>3</sub> + 6 HF and XeF<sub>6</sub> + H<sub>2</sub>O  $\rightarrow$  XeOF<sub>4</sub> + 2 HF. The oxidation number of P is in between -3 and +5 in PCl<sub>3</sub>. Due to small size, O can form pπ-pπ bonds and it exist as a discrete small molecule and hence gas. S being large in size, cannot form Pπ-Pπ bonds, exist as a network solid. Due to absence of d-orbital, N cannot form R<sub>3</sub>N = O but P has d-orbitals, it can show pentacovalency. OR  
4 NaCl + MnO<sub>2</sub> + 4 H<sub>2</sub>SO<sub>4</sub>  $\rightarrow$  MnCl<sub>2</sub> + 4 NaHSO<sub>4</sub> + 2 H<sub>2</sub>O + Cl<sub>2</sub>. Cl<sub>2</sub> (g) + 2 NaI (aq)  $\rightarrow$  2 NaCl (aq) + I<sub>2</sub> (s). Very low solubility of He in blood. The three equatorial bonds repels

two axial bonds to greater extent.  
no d-orbitals.

$F_2$  is strongest oxidizing agent as well as it has

- 26 Explanation about lead storage battery. 2

Statement of law. 1

$$W = \text{atomic weight of Ni} \times 5 \times 40 \times 60 / 2 \times 96500 = 3.65 \text{ g}$$

or

$$\text{For a cell } E^\circ = \frac{0.0591}{n} \log K$$

$$K < 0 \Rightarrow \log K < 0$$

i.e.  $\log K$  is - ve.

Then  $E^\circ_{\text{cell}}$  will be negative. 2

(b) If  $E^\circ_{\text{cell}} = 0$  then  $0 = \frac{0.0591}{n} \log K$

$$\log K = 0 \Rightarrow K = 1 \quad 1$$

- c) Iron will corrode faster as the oxidation potential of Fe is higher than that of tin. 2