O.P.JINDAL SCHOOL,SAVITRINAGAR

HALF YEARLY EXAMINATION-(2026-27)

CLASS-XII **M.M-50**

SUBJECT-CHEMISTRY **TIME-2HOURS**

General Instruction:-

(i)All questions are compulsory .There are 24 questions in all.
(ii)SECTION –A: Question numbers 1 to 12 are MCQs carrying one mark each.
(iii) SECTION –B:Question numbers 13 to 16 are short answer type-I questions , carrying 2 marks each.
(iv) SECTION –C: Question numbers 17 to 20 are short answer type-II questions , carrying 3 marks each.
(v) SECTION –D:Question numbers 21 and 22 are case-based questions carrying 4 marks each.
(v) SECTION –E:Question numbers 23 and 24 are al long answer type questions and carrying 5 marks each.
(vi)There is no overall choice. However,an internal choice has been provided in some questions.
(vii)Use of calculator is not permitted. However, you may use log tables, if necessary.

SECTION-A

1.Which of the following halides contains sp^2 –X bond ?
(a)Alkyl halide (b)Allyl halide
(c)Benzyl halide (d)Vinyl halide

2. Which alkyl halide from the given options will undergo S_N1 reaction faster ?
(a)$(CH_3)_3C$-Br (b) $(CH_3)_2CH$-Br
(c)$CH_3 – CH_2 – Br$ (d)$(CH_3)_3C – CH_2 –Br$

3.The oxidation state of iron in $[FeCO)_5]$ is :
(a)+2 (b)0
(c)+3 (d)+5

4.The half life period of a first order reaction is 4 minutes, the time after which 99.9% reaction gets completed is:
(a)16 min (b)8 min
(c)32 min (d)40min

5. The rate of reaction increases sixteen times when the concentration is increased by four times.What is the order of reaction?
(a)2.5 (b)2.0
(c)1.5 (d)0.5

6.van't Hoff factor for $Na_2SO_4.10H_2O$solution,assuming completing complete ionization is
(a)1 (b)3
(c)13 (d)2

7.If the molality of a dilute solution is doubled,the value of the molal elevation constant (K_b) will be :
(a)halved (b)doubled
(c)tripled (d)unchanged

8. Phenol reacts with bromine water in CS_2 at low temperature will give :
(a)o-Bromophenol (b)o- and p-Bromophenol
(c)p-Bromophenol (d)2,4,6-Tribromophenol

Questions 9-12 are Assertion and Reason questions:
In these questions(15-18) a statement of assertion followed by a statement of reason is given.
Choose the correct answer out of the following choices:
(a)Assertion and reason both are correct statements and reason is the correct explanation for assertion.

(b) Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement .
(d) Assertion is wrong statement but reason is correct statement .

9.Assertion: The molecularity of the reaction: $H_2 + Br_2 \rightarrow 2HBr$ is 2.
Reason: Order of the reaction is 3/2.

10. Assertion: Henry's law constant decreases with the increase in temperature.
Reason: As the temperature increases,solubility of gases in liquids decreases.

11. Assertion: Boiling point of p-nitrophenol is more than o-nitrophenol.
Reason: p-nitrophenol is steam volatile due to intermolecular hydrogen bonding .

12. Assertion: $[Ni(CN)_4]^-$ is square planar and diamagnetic.
Reason: It has no unpaired electrons due to the strong field lingand.

SECTION-B

13. Explain why
(i) Alkyl halides though polar ,are immiscible with water.
(ii) Grignard reagents should be prepared under anhydrous conditions.

14.A reaction is of second order with respect to a reactant. How will the rate of reaction be affected if the concentration of this reactant is: (i)tripled (ii)reduced to half.

OR

If time taken for half of the first order reaction to complete is t_1 ,whereas that for $3/4^{th}$ of the reaction to complete is t_2 .How are t_1 and t_2 related to each other.

15.(i) Using VBT ,predict the hybridization and magnetic character of following , $[FeF_6]^{3-}$.
(ii) Write the IUPAC name of the following complex ; $[CoBr_2(en)_2]^+$.

16. How are the following conversions carried out ?
(i) Propene $\rightarrow$Propan-2-ol **(ii)**Methanal $\rightarrow$Propan-1-ol

SECTION-C

17. Calculate the boiling point elevation for a solution prepared by adding 10g of $CaCl_2$ to 200g of water.(K_b for Water = 0.0512K $kgmol^{-1}$, molar mass of $CaCl_2$ = 111 g mol^{-1})

OR

45 g of ethylene glycol($C_2H_6O_2$) is mixed with 600 g of water.Calculate;(i)the freezing point depression and (ii)the freezing point of the solution.(Given K_f of water = 1.86 K kg mol^{-1})

18. Although chlorine is an electron withdrawing group,yet it is ortho-,para- directing in electrophilic aromatic substitution reactions .Why?

19. Write the mechanism of conversion of ethene to ethanol.

20. A first order reaction takes 20 minutes for 25% decomposition . In what time will the reaction be 75% completed. (log 2=0.3010 , log 3= 0.4771 , log 4=0.6020)

SECTION-D

21. The spontaneous flow of the solvent through a semi permiable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis.The phenomenon of osmosis can be demonstrated by taking two eggs of the same size.In an egg,the membrane below the shell and arround the egg material is semipermiable.The outer hard shell can be removed by putting the egg in dilute hydrochloric acid.

After removing the hard shell,one egg is placed in distilled water and other in saturated salt solution. After some time,the egg placed in distilled water swells-up while egg placed in salt solution shrinks.The external pressure applied to stop the osmosis is termed as osmotic pressure(a colligative property).Reverse osmosis takes place when the applied external pressure becomes larger than the osmotic pressure.

Based on the information provided above,answer the following questions.

(i)Name one SPM which can be used in the process of reverse osmosis.

(ii)Why osmotic pressure is a colligative property?

(iii)What do you expect to happen when RBC's are placed in 0.5 % NaCl solution?

OR

(iii)Which one of the following will have higher osmotic in 1M KCl or !M Urea solution.Justify your answer.

22. Elimination and substitution reactions can occur simultaneously .When alkyl halide reacts with nucleophile ,it may undergo either substitution via S_N1 and S_N2 or elimination reaction.It depends upon the nature of alkyl halide,strength and size of nucleophile,conditions of the reaction. Primary alkyl halide will prefer S_N2 reaction. Secondary alkyl halide can undergo substitution or elimination depending upon the strength of the nucleophile. Stronger the nucleophile like $^-OC_2H_5$ will bring out elimination where as nucleophiles like ^-OH will bring out substitution. Tertiary alkyl halide will under go substitution or elimination depending upon the stability of carbocation or the more substituted alkene.

(i) Why racemization occurs in S_N1 ?

(ii) Out of $CH_3 - CH_2$ - I and CH_3-CH_2-Cl which one undergoes S_N2 reaction faster?

(iii) Predict the order of reactivity of the following compounds in S_N1 reactions:

$C_6H_5CH(C_6H_5)Br$, $C_6H_5CH_2Br$, $C_6H_5CH(CH_3)Br$, $C_6H_5C(CH_3)(C_6H_5)Br$

OR

(iii) The p-isomer of dichlorobenzene has higher melting point than o- and m-isomers.Why?

SECTION-E

23.(i) Accounts for the following:

(a)Phenol is stronger acid than alcohol.

(b)Propanol has higher boiling point than butane.

(ii) How would you convert the following:

(a)C_6H_5-OH $\rightarrow C_6H_6$

(b)C_6H_5 –$CH(CH_3)_2$ $\rightarrow C_6H_5$-OH

(c)Phenol$\rightarrow$Picric acid

OR

(i) Accounts for the following:

(a)o-Nitrophenol is more acidic than o-Methoxyphenol.

(b)The boiling point of alcohols decrease with the increase in branching of alkyl chain.

(ii) Write the mechanism for the conversion of ethanol to ethoxy ethane.

24. (i) What is meant by negative deviation from Raoult's law? Draw a diagram to illustrate the relationship between vapour pressure and mole fraction of components in a solution to represent negative deviation.

(ii) How does Raoult's law become a special case of Henry's law?Explain

OR

(i)0.3 g of acetic acid (molar mass=60 g mol^{-1}) dissolved in 30 g of benzene shows a depression in freezing point equal to 0.45 ^{0}C.Calculate the percentage of association of acid if it forms a dimer in the solution.(Given K_f for benzene =5.12 K kg mol^{-1}).

(ii) State Henry's law.Why are aquatic species more comfortable in cold water as compared to hot water?
