Roll No: _____   Subject Code-043

Please check that this question paper contains 33 questions and 10 printed pages.

DAV INSTITUTIONS, CHHATTISGARH
Sample Paper: 2023-24
CLASS XII
Chemistry (043)

TIME: 03 HOURS   M.M.: 70

General Instructions:

1. *The question paper comprises five sections A, B, C, D and E. There are 33 questions in this question paper. All questions are compulsory.*

2. *Section–A - consists of 16 multiple choice questions carrying 1 mark each*

3. *Section–B – consists of 5 very short answer questions carrying 2 marks each.*

4. *Section–C –consists of 7 short answer type questions, carrying 3 marks each*

5. *Section–D –consists of 2 case based questions carrying 4 marks each.*

6. *Section E consists of 3 long answer questions carrying 5 marks each.*

7. *There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.*

8. *Use of log tables and calculators are not allowed*

SECTION--A

1. Which of the following has highest molar conductivity

   a)0.01 M KCl   b) 1 M KCl   c) 0.5 M KCl   d) 0.1 M KCl

2. Which of the following is a fibrous protein

   a) albumin   b) keratin   c) insulin   d) globin

3. Formic acid and acetic acid can be distinguished by

   a) reaction with HCl   b) iodoform test   c)   reaction   with   ammonia d) Tollens test

4. Enantiomers differ only in

   a) boiling point   b) rotation of plane polarized light

   c) melting point   d) solubility

5 the heating of phenyl methyl ether with HI produces

a) Iodobenzene   b) phenol   c) benzene   d) ethyl iodide

6. Which of the following is a strong oxidising agent

   a) Mn^{+3} b) Zn^{+2} c) Cr^{+3} d) Sr^{+3}

7. in a chemical reaction $X \rightarrow Y$, it is found that the rate of reaction doubles when the concentration of X is increased four times. the order of the reaction with respect to X is

a) 1   b) 0   c) 2   d) ½

8. arrange the following in the increasing order of their boiling point;

   A: butanamine   B: N,N –dimethylethanamine   C: N-ethyl ethanamine

   a) C<B<A   b) A<B<C   c)A<C<B   d)B<C<A

9. Phenol is more acidic than ethanol because

   a) ethoxide ion is more stable than phenoxide ion

   b) phenoxide ion is more stable than ethoxide ion

   c) phenol undergoes electrophilic substitution reaction

   d) phenol undergoes protonation easily

10. Salicylic acid on heating with acetic anhydride in basic medium gives

   a) Aspirin   b) methyl salicylate

   c) phenyl salicylate   d) acetyl salicylate

11. in presence of a catalyst, the heat evolved or absorbed during the reaction

      a) increase   b) decreases

      c) remains unchanged   d) may increase or decrease

12 Which of the following is most stable in aqueous solution

a)Mn^{+3} b) Cr^{+3} c) V^{+3} d) Ti^{+3}

13. Given below are two statements labelled as assertion(A) and reason(R)

   A: bond angle in ethers is slightly less than the tetrahedral bond angle

   R: there is repulsion between the two bulky alkyl group

     a) BothAand R are true And R is the correct explanation of A

     b) BothAand R are true but R is not the correct explanation of A

     c) A is true but R is false

     d) A is false but R is true

14. Given below are two statements labelled as assertion(A) and reason(R)

   A: sucrose is a non reducing sugar

   R: sucrose has glycosidic linkage

     a) BothAand R are true And R is the correct explanation of A

b) Both A and R are true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

15. Given below are two statements labelled as assertion(A) and reason(R)

A: electrolysis of aqueous solution of NaCl gives chlorine gas at anode instead of oxygen gas

R: formation of oxygen gas at anode requires overpotential

a) Both A and R are true And R is the correct explanation of A

b) Both A and R are true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

16. Given below are two statements labelled as assertion(A) and reason(R)

A: the alpha hydrogen atom in carbonyl compound is less acidic

R: the anion formed after the loss of alpha hydrogen atom is resonance stabilised

a) Both A and R are true And R is the correct explanation of A

b) Both A and R are true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

SECTION ---B

This section contains 5 questions with internal choice in one question.the following questions are very short answer type and carry 2 marks each

17. Time required for a particular reaction to be half completed is 693 seconds. calculate the time required for 90% completion of this reaction

18. a 0.01m aqueous solution of $AlCl_3$ freezes at -0.068^0C calculate the percentage of dissociation(Kf for water is 1.86 K kg/mol)

OR

An electrolyte AB is 50% dissociated in aqueous solution. Calculate the freezing point of imolal aqueous solutions

19. Give simple chemical test to distinguish between the following pairs of compounds

a) Benzaldehyde and benzoic acid

b) Propanal and propanone

20. compound A with molecular formula C_4H_9Br is trated with aq.KOHsolution.the rate of this reaction depends upon the concentration of A only.when another optically

active isomer B of this compound was treated with aqueos KOH solution , the rate of reaction was found to be dependent on concentration of compound and KOH both.

 i) write down the structural formula of both compounds

 ii) out of these two compounds which one will be converted to the product with inverted configuration

21 a) what is the basic structural difference between starch and cellulose

 b) what structural change will occur when a native protein is subjected to change in pH

SECTION ---C

This section contains 7 questions with internal choice in one question .the following questions are short answer type and carry 3marks each

22. a) when a coordination compound $NiCl_2 .6H_2O$ is mixed with $AgNO_3$ solution ,2 moles of AgCl are precipitated per mole of the compound. write the structural formula of the compound and the secondary valency for nickel ion

b) write the IUPAC name of $[Co(NH_3)_5(SO_4)]Cl$

c) is the central metal atom in coordination complex a lewis acid or a lewisbase.explain

23.

 a) can we construct an electrochemical cell with two half cell composed of ZnSO4 solution and Zn electrode.explain your answer

 b) calculate the potential of hydrogen electrode in contact with a solution whose pH is 10

24

 a) phenol doesnot give protonation reaction readily. why

 b) Write the mechanism of acid catalyzed hydration of ethene to give ethanol

25 an organic compound X having molecular formulaC_5H_{10}O can show various properties depending on its structure .draw each of the structure if it

 a) Gives positive iodoform test

 b) Shows cannizaros reaction

 c) Reduces Tollens reagent and has a chiral carbon

26 the rate constant of a reaction at 200K and 500 K are 0.02 $s^{-1}$and 0.2 s^{-1} .calculate the value of activation energy(2.0303R = 1915J/ Kmol

27 give reasons for the following

a) Thepresence of –NO2 group at ortho or para positions increases the reactivity of haloarenes towards nucleophilic substitution reactions

b) P- dichlorobenzene has higher melting point than that of ortho or meta isomer

c) Thionylchloride method is preferred for preparing alkylchloride from alcohols

28 what are vitamins.name any 2 fat soluble vitamins ,their sources and the disease caused due to their deficiency in diet

OR

Write the structure of product when D- glucose reacts with the following

a) HCN

b) Con.HNO_3

c) Bromine water

SECTION --D

29. (The following questions are case based questions. Each question has an internal choice and 4(1+1+2) marks each.Read the passage carefully and answer the questions that follow)

Coordination compounds are widely present in the minerals, plant and animal world and are known to play many important functions in the area of analytical chemistry, metallurgy, biological system and medicine. Alfred Werners theory postulated the use of two types of linkages(primaryand secondary),by a metal atom/ion in a coordination compoundhe predicted the geometrical shape of a large number of coordination entities using the property of isomerism.the VBT explains the formation magnetic behaviour and geometrical shapes of coordination compounds. however it fails to describe the optical properties of these compounds. CFT explains the effect of different crystal fields on the degeneracy of d orbital

i)   Discuss any 2 application of coordination complexes

ii)   Low spin tetrahedral complexes are not known why

iii) $[Cr(NH_3)_6]^{+3}$ is paramagnetic while $[Ni(CN)_4]^{-2}$ is diamagnetic. explain

OR

How does the magnitude of Δo decide the actual configuration of d-orbital in a coordination entity

30. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches,wall clock; mercury cell is used in watches;Ni-Cd ,secondary cell

is used in cordless phones, lithiumbattery is used in laptop, mobile phones and electric vevicles; lead storage battery is used in vehicles and invertor;fuel cell like H_2-O_2 was used in Apollo space programme

i) how many faradays are required to carry out the reduction of 1 mole of PbO_2

ii) give any two advantages of fuel cell

ii)Write the anode reaction and cathode reactions occurring in a lead storage battery during discharging

OR

Mention the reactions occurring at anode and cathode during working of a mercury cell

SECTION—E

The following questions are long answer type questions and carry 5 marks each.all questions have an internal choice

31attempt any 5 of the following

A)the second ionisation enthalpies of chromium and manganese are 1592 and 1509 kJ/mol respectively. explain the lower value of Mn

b) what is the oxidation state of chromium in chromate ion and dichromate ion

c) chromate change their colour when kept in an acidic solution

d) manganese shows higher oxidation state of +4 with fluorine but shows +7 with oxygen

e) whyHCl should not be used for potassium permanganate titrations

f) how is variability in oxidation states of transition from that of non transition elements

g) actinoid contraction is greater from element to element than lanthanoid contraction

32 a) 0.3 g of acetic acid (molarmass= 60g/mol) dissolved in 30 g benzene shows adepression in freezing pointequal to 0.45 ^{0} C .calculate the percentage association of acid if it forms a dimer in the solution (Kf for benzene is 5.12Kkg/mol

b)can we seseparate an azeotropic mixture by distillation

c) defin ecryoscopic constant

OR

a) The vapour pressure of pure water at a certain temperature is 23.8 mm Hg. If 1 mole of non volatile non electrolyte is dissolved in 100 g of water, calculate the resultant vapour pressure of the solution

b) What type of deviation from Raouls law is expected when phenol and aniline are mixed with each other. What change in the net volume is expected

c) For determination of molar mass of polymers and proteins which colligative property is used and why

33

a) Why do bromination of aniline ,even under mild condition give 2,4,6-tribromoaniline.why

b) Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis. why

c) Write chemical equationfor the following conversion i) benzyl chloride to 2-phenylethanamine   ii) aniline to chloro benzene

d)   Aniline does not react with methyl chloride in the presence of anhydrous $AlCl_3$

OR

a) Pkb of aniline is lower than m-nitroaniline. Why

b) What happens when benzene diazonium chloride is being heated with ethanol

c) Write short notes on Gabriel phthalimide synthesis

d) Arrange the following in the increasing order of basicity $C_6H_5 NH_2$, $C_2H_5NH_2$, $(C_2H_5)_3N$, NH_3, $(C_2H_5)_2 NH$

e) N-ethyl ethanamine boils at 329.3 K where as butanamine boils at 350.8 K although both are isomeric in nature. explain

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ANSWER KEY/VALUE POINTS

1 a)0.01 M KCl

2.   *b) keratin*

3.   *d) Tollens test*

4   *b) rotation of plane polarized light*

5   *b) phenol*

6. a) Mn^{+3}

7.   d) ½

8.   d)B<C<A

9b) phenoxide ion is more stable than ethoxide ion

10. d) acetyl salicylate

11. c) remains unchanged

12 b) Cr^{+3}

13.d) A is false but R is true

14..b

15..a

16.d.

17

18

19 a)add NaHCO3 solutionbenzaldehyde will not react whereas benzoic acid will give brisk effervescence

b)Add Tollens reagentpropanal will give silver mirror,propanone will not react

20since rate of reaction depends upon concentration of A only,therefore A should be tertiary halide which follow SN1 mechanism   A is $(CH3)_3Br$

B follows SN2 mechanism and is optically active so there must be a chiral carbon so B is $CH_3CH(Br)CH_2CH_3$

B will be converted to inverted configuration

21cellulose is linear polymer of β-glucose whereas starch is abranched polymer of ɑ-glucose

b)   only the primary structure will be retained. Secondary and tertiary structure gets destroyed

SECTION –C

22 a) $[Ni(H_2O)]Cl_2$ .secondary valency is -6

B) Pentaamminesulpatocobalt(III) chloride

c) lewis acid as the central atom accepts lone pairs of electrons from the ligand

23 a)

b) pH=10   -log[H$^+$] =10

[H$^+$] =10^{-10}

24a) lone pair present on the oxygen atom is delocalised in the benzene ring

c)   correct mechanism with the shifting of electron and name of each step

25. a) CH$_3$CO CH$_2$CH$_2$CH$_3$

b) (CH$_3$)$_3$C-CHO

c) CH$_3$CH$_2$CH(CH$_3$)CHO

26.

27.--NO2 group is an electron withdrawing group hence stabilizes the carbanion formed during the reaction.hence increases reactivity

b) close packing due to symmetrical arrangement

c) bye products SO2 and HCl are gaseous in nature and can beeasily removed to get pure alcohol

28 correct definition and any 2 fat soluble vitamins with their deficiency and sources

OR

Correct structure with name

SECTION –D

29 a) any 2 application

b)orbital splitting energies are not very large, therefore forced pairing doesnot takes place

c)   due to the presence of unpaired electron in Cr ,it is paramagnetic where as in Ni no unpaired electron---explanation with electronic configuration

OR

If Δo<P then t$_2$g^3 eg^1

Δo >P then t$_2$g^4 eg^0

30a) 4F

b) any 2 advantages

c) correct reaction

SECTION –E

A) afterloosing second electron Mn can attain the stable half filled d^5 electronic configuration

b) 6

c) chromate changes to dichromate in an acidic solution which is orange red in colour

d) oxygen can form double bond whereas F can not

e)potassiumpermanganateoxidises hydrochloric acid to chlorine

f) in transition elements oxidation state differ by one whereas in non transition elements it differ by 2

g) due to poor shielding effect of 5f orbital as compared with 4f

32 a) 0.3 g of acetic acid (molarmass= 60g/mol) dissolved in 30 g benzene shows a depression in freezing point equal to 0.45 ^{0} C .calculate the percentage association of acid if it forms a dimer in the solution (Kf for benzene is 5.12Kkg/mol

b) no. composition remains same in both liquid and vapour state

c) correct definition

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

B) negative deviation due to the formation of H-bond. Volume will decrease

c) osmotic pressure.

Measurement can be done at room temp , even for dilute solution high value is obtained

   d) The vapour pressure of pure water at a certain temperature is 23.8 mm Hg. If 1 mole of non volatile non electrolyte is dissolved in 100 g of water, calculate the resultant vapour pressure of the solution

   33

aNH $_2$ group activates the benzezene ring

bAryl halides doesnot undergo nucleophillic substitution reactio

c)Correct equation

   d) Due to salt formation

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

a) Lone pair present on the N atom is delocalized in the benzene ring where as in methyl amine electron density increases due to +I effect of methyl group

b)benzene will be formed

c)correct explanation with equation

d) C_6HNH_2, NH_3, $(C_2H_5)_3N$ $C_2H_5NH_2$, $(C_2H_5)_2$ NH

e) butanamine boils at 350.8 K because of more number of H-bond