Please check that this question paper contains 33 questions and 7 printed pages.

SET 1

DAV INSTITUTIONS CG ZONE

CLASS- XII SESSION 2023-24

TIME: 3 HRS **SUBJECT: CHEMISTRY** **MM: 70**

General Instructions:

Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.

(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 7 short answer questions carrying 3 marks each.

(e) SECTION D consists of 2 case- based questions carrying 4 marks each.

(f) SECTION E consists of 3 long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

SECTION- A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Heating phenyl methyl ether with HI produces
   (a) Iodobenzene
   (b) Phenol
   (c) Benzene
   (d) Ethyl benzene
2. Which one of the following halide contains C sp^2 – X bond ?
   a) Allyl halide
   b) Alkyl halide
   c) Benzyl halide
   d) Vinyl halide
3. Generally, transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?
   a) $Ag_2 SO_4$
   b) CuF_2
   c) ZnF_2
   d) Cu_2Cl_2

4. An electrochemical cell can behave like an electrolytic cell when ……..
   (a) $E_{cell} = 0$
   (b) $E_{cell} > E_{ext}$
   (c) $E_{ext} > E_{cell}$
   (d) $E_{cell} = E_{ext}$
5. Among the ligands NH_3, en, CN^- and CO, the correct order of field strength is
   (a) $NH_3 < en < CN^- < CO$
   (b) $CN^- < NH_3 < CO < en$
   (c) $en < CN^- < NH_3 < CO$
   (d) $CO < NH_3 < en < CN^-$
6. The graph below show the variation in concentration of reactants Vs time for two different reactions. What are order of reactions respectively ?

   (a) 0 ,1
   (b) 1 ,0
   (c) 1 , 1
   (d) 0 , 2
7. The number of ions formed on dissolving one molecule of K_2SO_4. $Al_2(SO_4)_3$. $24H_20$ in water is
   (a) 3
   (b) 5
   (c) 8
   (d) 10
8. The half-life period of first order reaction is 1386 seconds. The rate constant of the reaction is
   (a) $0.5 \times 10^{-2}\ s^{-1}$
   (b) $0.5 \times 10^{-3}\ s^{-1}$
   (c) $5.0 \times 10^{-2}\ s^{-1}$
   (d) $5.0 \times 10^{-3}\ s^{-1}$
9. The correct IUPAC name for $CH_2 = CHCH_2\ NHCH_3$ is
   (a) Allyl methylamine
   (b) 2-amino-4-pentene
   (c) 4-aminopent-1-ene
   (d) N-methylprop-2-en-1-amine
10. Which of the following is optically inactive?

(a) (+) Butan-2-ol

(b) (-) Butan-2-ol

(c) (±) Butan-2-ol

(d) (+) -2- Bromobutane

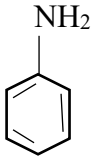
11. The minimum potential difference needed to reduce Al_2O_3 at 773 K, the ΔG° for the decomposition reaction $\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2$ is 960 KJ

(a) +2.48 V

(b) - 2.48 V

(c) +1.24 V

(d) -1.24 V

12.  $\xrightarrow{conc.\ H2SO4,\ \ 453\ K}$ 'X' is

(a) Sulphanilic acid

(b) o- amino benzene sulphonic acid

(c) p- amino benzene sulphonic acid

(d) All of these

In the following questions (Q.No. 13-16), a statement of assertion followed by statement of a reason is given. Choose the correct answer out of the following choices.

(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

13. **Assertion (A)**: Haemoglobin has tertiary structure.

Reason (R): Insulin has sequence of 51 amino acids.

14. **Assertion (A)**: The correct order of oxidising power is $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$.

Reason (R): The oxidation state of Mn is +7 in MnO_4^-.

15. **Assertion (A)**: In gaseous state 3° > 2° > 1° is order of basic character of methylamines

Reason (R): In aqueous solution 2°> 1°>3° is order of basic character of methylamines.

16. **Assertion (A)**: Phenol is more acidic than cyclohexanol.

Reason (R): Phenol causes irritation when comes in contact with skin.

SECTION -B

17. Give reasons:

(a) The presence of alkyl group (-R) at o/p positions decreases the reactivity of haloarenes towards nucleophilic substitution reactions.

(b) n-Butyl bromide has higher boiling point than tertiary-butyl bromide.

18. (a) Using crystal field theory, write the electronic configuration of d^5 ion, if $\Delta_o > P$.

    (b) State any one difference between an ambidentate ligand and a chelating ligand.

19. (a) For a reaction R→P, $t_{1/2}$ is independent of initial concentration of reactants, what is order of reaction.

    (b) Write one difference between order and molecularity of reaction.

20. Write chemical reactions to show that open chain structure of D-glucose contains the following:

    (a) Straight chain

    (b) Five alcohol groups

21. State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu?

    or

    Calculate $\Delta_r G^o$ for the reaction:

    $Mg_{(s)} + Cu^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Cu\ (s)$

    Given $E^0_{cell} = +2.71$ V, $1F = 96500$ C mol^{-1}

SECTION -C

22. What happens when:

    (a) Salicylic acid is treated with $(CH_3CO)_2O/H^+$?

    (b) Phenol is oxidised with $Na_2Cr_20_7/H^+$?

    (c) Anisole is treated with CH_3Cl in presence of anhydrous $AlCI_3$?

23. Write equations of the following reactions:

    (a) acetylation of aniline

    (b) coupling reaction

    (c) Carbyl amine reaction

24. An organic compound A, having the formula, C_3H_8O, on treating with copper at 573 K, gives B. B does not reduce Fehling solution but gives a yellow precipitate of the compound C with I_2 / NaOH. Deduce the structure of A, B and C.

25. A 10% solution of (by mass) of sucrose in water has a freezing point of 269.15 K. Calculate the freezing point of glucose in water if the freezing point of pure water is 273.15 K.

    (Given : Molar mass of sucrose = 342 g mol^{-1}, Molar mass of glucose = 180 g mol^{-1}

    Or

    On mixing liquid X and liquid Y, the volume of the resulting solution increases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y ?

26. For the complex $[NiCI_4]^{2-}$,write

    (a) The IUPAC name

(b) The hybridization type

(c) The shape of complex

27. For a reaction

$2\ H_2O_2 \xrightarrow{I-,\ alkline\ medium} 2H_2O + O_2$

The proposed mechanism is as given below:

(i) $H_20_2 + I^- \rightarrow H_20 + IO^-$ (slow)

(ii) $H_20_2 + I0^- \rightarrow H_20 + I^- + O_2$ (fast)

(a) Write rate law for the reaction.

(b) Write the overall order of reaction.

(c) Out of steps (i) and (ii), which one is rate determining step ?

28. Give reasons for the following:

(a) Why does inversion occur in S_N2 mechanism in chiral alkyl halide?

(b) Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.

(c) CH_3Cl has higher dipole moment than CH_3F.

SECTION-D

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

29. Cut carbohydrates, increase protein to check diabetes: Study

[Source: Times of India, November 15, 2022

An average Indian derives 61-64% of energy from consumption of food rich in carbohydrates. A study published in this journal Diabetes care has recommended reducing this to 49-56% for remission or prevention of type 2 diabetes, one of the leading cause of death worldwide.

Along with reducing carbohydrates intake, the study suggests that one should also increase protein intake (14-20%) of the total energy consumption. Fat should contribute not more than 21-27% of the total energy consumption. In simple words, 50% of plate should Consist of fruits and green vegetables, 25% carbohydrates of choice. 25% contain food rich in protein.

Physically inactive, obese and older individuals as well as residing in urban locations may require greater reduction in carbohydrate intake. The Keto diet, very low-calorie diet is best. Type 1 diabetes is due to deficiency of insulin. Camel milk caused reduction in doses of insulin for Type I diabetes patients. Camel milk works well in regulation of blood sugar and improvement of carbohydrate metabolism.

(a) Why do elderly people reduce more intake of carbohydrates than younger people?

(b) Which carbohydrates are healthier out of polysaccharides, monosaccharides and disaccharides? Give reason.

(c) (i) Which hormone controls blood sugar in our body?

(ii) Why should diabetic patients do mild exercise like walking every day?

Or

(c) (i) Why should protein be increased in diet especially for growing children? Which part of egg contains protein?

(ii) Why should our plate have 50% fruits and vegetables?

30. Solution play a very important role in our daily life. Alloys, homogeneous mixture of metal are solution of solid in solid. 1 ppm (parts per million) of fluoride ions prevent tooth decay. All intravenous injections must be isotonic with our body fluids, i.e. should have same concentration as blood plasma. Diabetic patients are more likely to have heart attack and high blood pressure due to higher glucose level in blood. Common salt increases blood pressure because Na mixes up with blood. Aquatic species are more comfortable in cold water than warm water.

(a) Why 0.1 M glucose solution is not isotonic with 0.1 M KCI solution?

(b) What will happen when blood cells are placed in saline water?

(c) If mole fraction of ethanol in H_2O is 0.20, what will be molality of solution?

or

(c) Calculate degree of dissociation of NaCl at 300 K if 0.1 M solution has osmotic pressure 4.1 atm. [R=0.082 L atm K^{-1} mol^{-1}]

SECTION-E

31. Attempt any five out of following:

(a) There is a greater horizontal similarity in the properties of the transition elements than of the main group elements. Why?

(b) Mn(II) ion shows maximum paramagnetic character amongst the bivalent ions of first transition series. Why?

(c) Scandium (At. no. 21) salt are white. Why?

(d) Transition metals act as catalyst, why?

(e) How does Fe(III) catalyses the reaction between I^- and $S_2O_8^{2-}$ (persulphate ions) ?

(f) Why are interstitial compounds of transition metals harder than pure metals?

(g) Which element in 3d series has lowest melting point? Give reason.

32. (a) What are products of electrolysis of aq. NaCl ? Write reactions at cathode as well as anode.

(b) If current of 0.5 A flows through a metallic wire for two hours, calculate charge passed.

(c) $Cr_2O_7^{2-} + 14\ H^+ + 6\ e^- \rightarrow 2\ Cr^{3+} + 7\ H_2O$, what is quantity of electricity in coulombs needed to reduce dichromate ion.

Or

(a) Calculate the emf for the given cell at 25° C.

(b) Calculate the strength of the current required to deposited 1.2 g of magnesium from molten $MgCl_2$ in 1 hour.

[1 F = 96500 C mol^{-1} ; Atomic mass = 24.0]

33. (a) Give IUPAC name of CH_3-CH = CH- CHO.

(b) How can you distinguish between ethanal and ethanol?

(c) How will you convert the following :

(i) Toluene to benzoic acid

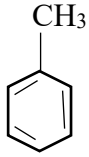
(ii) Ethanol to propan-2-ol

(iii) Propanal to 2-hydroxy propanoic acid

Or

(a) Write the structures of main compounds 'A' and 'B' in each of the following reactions:

(i) $CH_3CH_2CN \xrightarrow{CH3MgBr/H3O\ +} A \xrightarrow{LiAlH4} B$

(ii) 

$\xrightarrow[(ii)\ H_3O^+ / \Delta]{(i)\ CrO_3 / (CH_3CO)_2O}$ A $\xrightarrow{H_2N\text{-}NH_2}$ B

(iii) $CH_3CH_2COOH \xrightarrow{P_4 /Cl_2} A \xrightarrow{KOH\ (aq)} B$

(b) Arrange the following compounds increasing order as per given properties

(i) Ethanal, Propanal, Propanone, Butanone. (reactivity towards HCN)

(ii) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (in acid strength)
