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PRE-BOARD II [2022-23]
SUBJECT: CHEMISTRY (043)

MM:70 **CLASS: XII** **Time: 3 Hours**

General Instructions: Read the following instructions carefully.

- There are 35 questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- 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.	Which of the following undergoes nucleophilic substitution exclusively by S_N1 mechanism? (a) Benzyl chloride (b) Ethyl chloride (c) Chlorobenzene (d) Isopropyl chloride	1
2.	Which radioactive isotope would have the smaller half-life ^{14}C or ^{13}C? (Given: rate constants for ^{14}C and ^{13}C are $4.26 \times 10^{-3}\ s^{-1}$ and $2.53 \times 10^{-2}\ s^{-1}$ respectively). (a) ^{13}C (b) ^{14}C (c) Both will have same half-life (d)None the above information given is insufficient	1
3.	Although zirconium belongs to 4d-transition series and hafnium to 5d-transition series even then they show similar physical and chemical properties because (a) Both belong to d-block (b) Both have same number of electrons (c) Both have similar atomic radius (d) Both belong to same group of the periodic table	1

4.	For a reaction A +B → C, the experimental rate law is found to be R=k $[A]^1[B]^{1/2}$. Find the rate ofthe reaction when [A] = 0.5 M, [B] = 0.1 M and k=0.03. (a) 4.74×10^{-2} $(L/mol)^{1/2}$ s^{-1} (b) 5.38×10^{-2} $(L/mol)^{1/2}$ s^{-1} (c) 5.748×10^{-2} $(L/mol)^{1/2}$ s^{-1} (d) 4.86×10^{-2} $(L/mol)^{1/2}$ s^{-1}	1
5.	Colourless complex ion in the following is (a) $[Cu(NH_3)_4]^{2+}$ (b)$[Zn(NH_3)_4]^{2+}$ (c)$[Fe(H_2O)_6]^{3+}$ (d)$[Fe(CN)_6]^{3-}$	1

6.	Which one of the following compound will give butanone on oxidation with alkaline $KmnO_4$ solution? a) Butan-1-ol b) Butan-2-ol c) Butene d) But-2-ene	1
7.	Arrange the following in the increasing order of the boiling points A= CH_3NH_2 , B= $(CH_3)_2NH$, C= $(CH_3)_3N$ (a) A < B < C (b) A < C < B (c) C < B < A (d) C < A < B	1
8.	The correct IUPAC name of the following compound is $[Cr(NH_3)_5(NCS)][ZnCl_4]$ (a)Penta amine isothicoyanato chromium (III) tetrachlorozincate (II) (b)Penta amine isothicocyanatezinc chloridechromate (III) (c)Penta amine isothicoyanato chromate (II) (d) isothiocyanatopenta amine chromium (II) zinc chloride (IV)	1
9.	Which of the following alcohols will give the most stable carbocation during dehydration? (a) 2-methyl-1-propanol (b) 2-methyl-2-propanol (c) 1-Butanol (d) 2-Butanol	1
10.	The compound that does not liberate CO2, on treatment with aqueous sodium bicarbonate solution is: a) Benzoic acid b) Salicylic acid c) Carbolic acid d) Benzenesulphonic acid	1
11	The decomposition of dimethyl ether is a fractional order reaction. The rate is given by rate =k $(PCH_3OCH_3)^{3/2}$. If the pressure is measured in bar and time in minutes, then what are theunits of rate and rate constant? (a) bar min^{-1}, bar^2 min^{-1} (b) bar min^{-1}, $bar^{1/2}$ min^{-1} (c) $bar^{1/2}$ min^{-1}, bar^2 min^{-1} (d) bar min^{-1}, $bar^{-1/2}$ min^{-1}	1

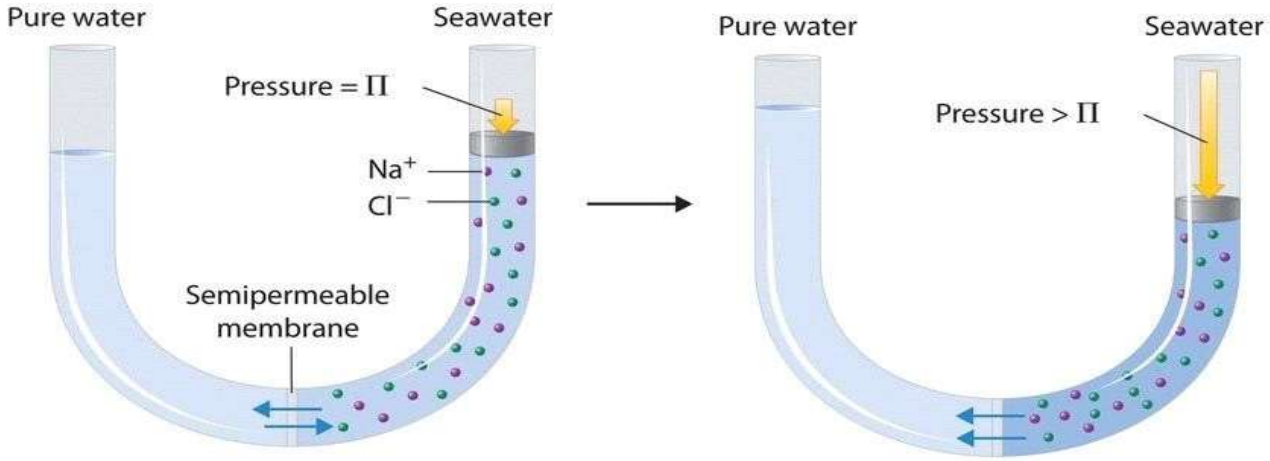
12	Which of the following can be prepared using Gabriel phthalimide synthesis? (a) Primary aromatic amines (b) Secondary amines (c) Primary aliphatic amines (d) Tertiary amines	1
13	Given below are the half –cell reaction: $Mn^{+2} + 2e^-$ Mn ; $E^0 = -1.18V$ $2(Mn^{+3} + e^-$ $Mn^{+2})$; $E^0 = 1.51V$ The E^0 for $3Mn^{+2}$ $2Mn^{+3} + Mn$ will be a) -0.33 V ; the reaction will occur b) -2.69V; the reaction will not occur c) -2.69 V ; the reaction will occur d) -0.33 V ; the reaction will not occur	1
14	Secondary amines can be prepared by (a) reduction of nitro compound (b) oxidation of N-substitution (c) reduction of isonitriles (d) reduction of nitriles	1
15	Given below are two statement labelled as Assertion (A) and Reason (R) **Assertion (A)**: Like bromination of benzene, bromination of phenol is also carried out in presence of Lewis acid. **Reason (R)**: Lewis acid polarises the bromine molecule. Select the most appropriate answer from the options given below: (a) Assertion and reason both are correct statements, and reason is the correct explanation of the Assertion. (b) Assertion and reason both are correct statements, but reason is not the correct explanation of theAssertion. (c) Assertion is correct statement, but Reason is incorrect statement. (d)Assertion is incorrect statement, but Reason is correct statement	1
16	Given below are two statement labelled as Assertion (A) and Reason (R) **Assertion (A)**: Fructose does not contain an aldehyde group but still reduces Tollen's reagent. **Reason (R):** In the presence of a base, fructose undergoes rearrangement to form glucose and mannose. Select the most appropriate answer from the options given below: (a) Assertion and reason both are correct statements, and reason is the correct explanation of theAssertion. (b) Assertion and reason both are correct statements, but reason is not the correct explanation of theAssertion. (c) Assertion is correct statement, but Reason is incorrect statement. (d) Assertion is incorrect statement, but Reason is correct statement	1

17	Given below are two statement labelled as Assertion (A) and Reason (R) **Assertion (A)**: N,N-Diethyl benzene sulphonamide is insoluble in alkali **Reason (R)**: Sulphonyl group attached to nitrogen atom is strong electron withdrawing groupSelect the most appropriate answer from the options given below: (a) Assertion and reason both are correct statements, and reason is the correct explanation of theAssertion. (b) Assertion and reason both are correct statements, but reason is not the correct explanation of theAssertion. (c) Assertion is correct statement, but Reason is incorrect statement. (d) Assertion is incorrect statement, but Reason is correct statement	1
18	Given below are two statement labelled as Assertion (A) and Reason (R) **Assertion (A)**: Lanthanoids show a limited number of oxidation states whereas actinoids show alarge number of oxidation states. **Reason (R)**: Energy gap between 4f, 5d, and 6s orbitals is small whereas that between 5f, 6d and 7sorbitals is large. Select the most appropriate answer from the options given below: (a) Assertion and reason both are correct statements, and reason is the correct explanation of theAssertion. (b) Assertion and reason both are correct statements, but reason is not the correct explanation of theAssertion. (c) Assertion is correct statement, but Reason is incorrect statement. (d) Assertion is incorrect statement, but Reason is correct statement	1
	SECTION B This section contains 7 questions with internal choice in two questions. The following questions arevery short answer type and carry 2 marks each.	
19.	Give reason for the following? a) Denaturation of proteins results in the loss of biological activity of the proteins. b) Vitamins B and C cannot be stored in our body. OR a) Name the deficiency diseases resulting from lack of vitamin A and E in the diet. b) Out of the four bases, name those which are common to both DNA and RNA and why DNA and RNA are called acids?	2
20.	Give reasons for the following a) Name the reaction in which alkyl bromide is converted into alkyl iodide. b) Out of $(CH_3)_3CCl$ and CH_3Cl which one will react faster towards SN2 reaction with -OH and why?	2
21.	The rate constant for a reaction of zero order in A is $0.0030 molL^{-1}s^{-1}$. How long will it take for the initial concentration of A to fall from 0.10M to 0.075M?	2

22.	Write the formula for the complex dichloridobis (ethane-1, 2-diamine) cobalt (III) ion. Draw itsgeometrical and optical isomers. OR The spin only magnetic moment of $[MnBr_4]^{-2}$ is 5.9 BM. Predict the geometry of the complex.	2
23.	An aqueous solution of an unknown salt of palladium is electrolysed by a current of 3.0A passingfor 1 hour. During electrolysis, 2.997 g of palladium ions are reduced at the cathode. What is the charge on the palladium ions in solution? (Molar mass of Pd=106.4gm/mol)	2
24.	The thermal decomposition of HCOOH is a first order reaction with a rate constant of $2.4x10^{-3}$ sec^{-1} at a certain temperature. Calculate how long will it take for $3/4^{th}$ of HCOOH to decompose?(log 4=0.6021, log 3=0.4771, log 0.25= -0.6021)	2
25.	(a) Predict the product when Hex-4-en-1-nitrile is treated with DIBALH at -78^0C with water. (b) Arrange the following acids in the increasing order of acidity : CCl_3COOH, CH_3COOH, $CHCl_2COOH$, $CH_2Cl\,COOH$,	2

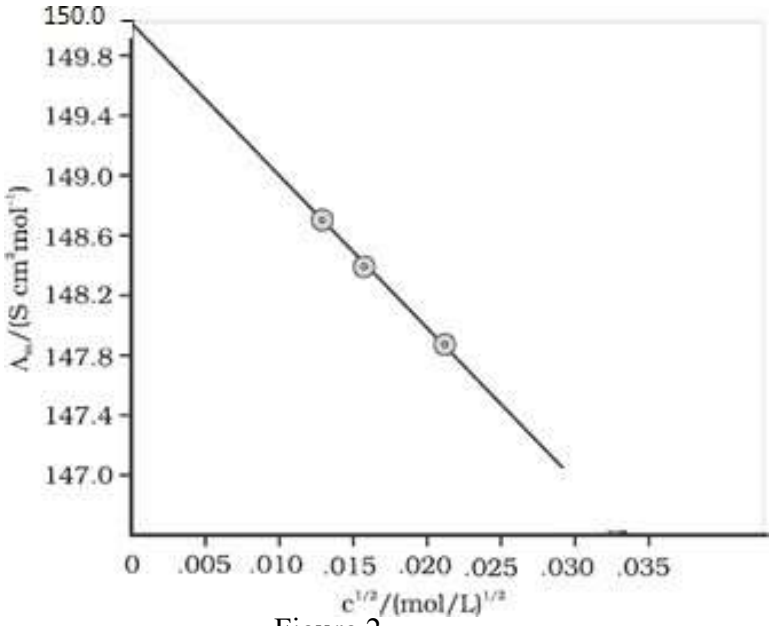
	SECTION C This section contains 5 questions with internal choice in two questions. The following questions areshort answer type and carry 3 marks each.	
26.	What happens when: (a) 2-Methylbut-1-ol is dehydrated with ConcH_2SO_4. (b) Phenol is oxidized with sodium dichromate/H^+. (c) Benzyl ethyl ether reacts with HI at 373 K.	3
27.	(a) A coordination compound with molecular formula $CrCl_3 .4H_2O$ precipitates one mole of AgClwith $AgNO_3$ solution. Its molar conductivity is found to be equivalent to two ions. What is the structural formula? (b) Using valence bond theory explain the geometry of $[Co(NH_3)_6]^{+3}$ ion.	3
28.	(a) Out of 0.1 molal aqueous solution of glucose and 0.1 molal solution of KCl, which one will havehigher boiling point and why? (b) A 5% solution (by mass) of cane sugar in water has freezing point of 271K.Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 K. **OR** Give suitable reason to justify your answer: (a) Gases always tend to be less soluble in liquids as temperature is raised. (b) People at higher altitudes suffer from a disease called anoxia. (c) Pure ethyl alcohol cannot be obtained from rectified spirit (95.6% of alcohol) even by fractional distillation.	3

29.	Give suitable reason any three to justify your answer: (a) Amines are less acidic than alcohols of comparable molecular mass. (b) Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide. (c) Diazonium salts of aromatic amines are more stable than those of aliphatic amines. (d) Tertiary amines do not undergo acylation reaction.	3
30.	Give the IUPAC name of the product formed when: (a) 2-Methyl-1-bromopropane is treated with sodium in the presence of dry ether. (b) 1- Methyl cyclohexene is treated with HBr. (c) tert-Butyl bromide is treated with Ethanolic KOH followed with reaction with HBR in presenceof peroxide. **OR** Write the equation for the following reaction. a) Methyl chloride is treated with $AgNO_2$. b) Bromobenzene is treated with CH_3Cl in the presence of anhydrous $AlCl_3$. c) Ethyl chloride is treated with aqueous KOH.	3
	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.	

31	Read the passage given below and answer the following questions: Trees use osmotic pressure to transport water and other nutrients from the roots to the upper branches. Evaporation of water from the leaves results in a local increase in the salt concentration which generates an osmotic pressure that pulls water up the trunk of the tree to the leaves. Finally, a process called reverse osmosis can be used to produce pure water from seawater. As shown in given Figure applying high pressure to seawater forces water molecules to flow through a semipermeable membrane that separates pure water from the solution, leaving the dissolved salt behind. Large-scale desalinization plants that can produce hundreds of thousands of gallons of freshwater per day are common in the desert lands of the Middle East, where they supply a large proportion of the freshwater needed by the population. Similar facilities are now being used to supply freshwater in southern California. Small, hand-operated reverse osmosis units can produce approximately 5 L of freshwater per hour, enough to keep 25 people alive, and are now standard equipment on US Navy lifeboats.  (a) What happens when the external pressure applied becomes more than the osmotic pressure ofsolution? (b) Are equimolar solutions of sodium chloride and urea isotonic? Why? (c) A solution prepared by dissolving 8.95 mg of a gene fragment in 35ml of water has an osmotic pressure of 0.335 torr at 25^0C.Assuming the gene fragment is a non-electrolyte, determine its molar mass?(Given R= 0.0821atm.L/mol/K) OR (c) The osmotic pressure of blood is 8.21 atm at 37^0C.How much glucose should be used per litre for an intravenous injection that is isotonic with blood? (Given R= 0.0821atm.L/mol/K)	

32	Read the passage given below and answer the following questions: Glucose is a simple sugar with the molecular formula $C_6H_{12}O_6$. Glucose is the most abundant monosaccharide, a subcategory of carbohydrates. Glucose is mainly made by plants and most algae during photosynthesis from water and carbon dioxide, using energy from sunlight, whereit is used to make cellulose in cell walls, the most abundant carbohydrate in the world. In energy metabolism, glucose is the most important source of energy in all organisms. Glucose for metabolism is stored as a polymer, in plants mainly as starch and amylopectin, and in animals as glycogen. Glucose circulates in the blood of animals as blood sugar. The naturally occurring form of glucose is D-glucose, while L-glucose is produced synthetically in comparatively small amounts and is less biologically active. Glucose is a monosaccharide containing six carbon atoms and an aldehyde group, and is therefore an aldohexose. The glucose molecule can exist in an open-chain (acyclic) as well as ring (cyclic) form. Glucose is naturally occurring and is found in its free state in fruits and other parts of plants. In animals, glucose is released from the breakdown of glycogen in a process known as glycogenolysis. (a) Glucose does not give 2, 4-DNP test and Schiff's test. Why? (b) What type of linkage is there is in amylopectin? (c) How do anomers differ from epimers? **OR** (c) Write two function of carbohydrates in plants.	

	SECTION E The following questions are long answer type and carry 5 marks each. Two questions have aninternal choice.	
33	Give reasons for the following: (a) Transition elements act as catalysts (b) Cu^{+} ion is not stable in aqueous solution. (c) Of the d^4 species, Cr^{+2} is strongly reducing while Mn^{+3} is strongly oxidising (d) $Cr_2O_7^{-2}$ ion is orange coloured. (e) Among the Lanthanoids, Ce (III) can easily be oxidised to Ce (IV).	5

34	(a) Can Fe^{+3} oxidise Br^- to Br_2 under standard conditions? $E^0\ Fe^{+3}/Fe^{+2} = 0.77$ V , $E^0\ Br_2/Br^- = 1.08$ V (b) Write Nernst equation and calculate emf of the cell at 298 K: $Pt(s)/Br_2(1)/Br^-(0.010M)//H^+(0.030M)/H_2(g)$ (1bar) ,Pt(s)Given E^0 : Br_2/Br^- = 1.08V , log 1.11=0.0457 OR (i) On the basis of E^o values identify which amongst the following is the strongest oxidising agent $Cl_2(g) + 2\ e^- \rightarrow 2Cl^-\ E^o = +1.36$ V, $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O\ E^o = +1.51$ V $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O\ E^o = +1.33$ V (ii) The following figure 2, represents variation of (Λm) vs $\sqrt{c}$ for an electrolyte. Here Λm is the molar conductivity and c is the concentration of the electrolyte.  Figure 2 (a) Define equivalent conductivity (b) Identify the nature of electrolyte on the basis of the above plot. Justify your answer. (c) The molar conductivity of 0.025 mol L^{-1} methanoic acid is 46.1 S cm^2 mol^{-1}. Calculate its degreeof dissociation and dissociation constant Given $\lambda^\circ(H^+)$=349.6 S cm^2 mol^{-1} and λ°(HCOO-) = 54.6S cm^2 mol^{-1}	5

35	An organic compound with molecular formula C_8H_8O forms an orange red precipitate 2, 4-DNP derivative, and gives yellow precipitate on heating with iodine in presence of NaOH. It neither reduces Tollen's reagents or Fehling's solution, nor does it decolourise bromine water or Baeyer' reagent. It undergoes Aldol condensation. On drastic oxidation with chromic acid, it gives an acid (B) having formula $C_7H_6O_2$. Identify the compounds (A) and (B) and write the reaction involved. **OR** i) Write the reaction of cyclohexanecarbaldehyde with the following reagents: (a) PhMgBr and then H_3O^+ (b) Semi carbazide with weak acid. (ii) How will you carry out the following conversions: (a) Ethanal to But-2-enal (b) Benzaldehyde to α-Hydroxyphenyl acetic acid (c) Benzene to *m*-Nitroacetophenone	5

End