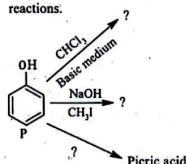


22. a. How will you carry out the following conversions? [2×2]
- Acetylene to Acetic acid
 - Toluene to m-nitrobenzoic acid
- b. An organic compound A (C_6H_6O) is resistant to oxidation but forms compound B (C_6H_5O) on reduction which reacts with HBr to form the bromide (C). C forms a Grignard reagent which reacts with A to give D ($C_{12}H_{10}O$). Give the structures of A, B, C and D and explain the reactions involved. [4]
23. a. An organic compound A (C_6H_6O) forms phenylhydrazone with phenylhydrazine and reduce Fehling's solution. It has negative iodoform test. Identify the organic compound A. [3]
- b. Give reasons: [1.5+1.5]
- Boiling point of ethanol is higher than ethanal having same molecular weight.
 - pH of reaction should be carefully controlled while preparing ammonia derivatives of carbonyl compounds.
- c. How do you obtain benzaldehyde from phenol? [2]
- OR
- a. The list of organic compounds are given as: [5]
- $C_6H_5O_2$, C_6H_5OCl , C_6H_5ON , $C_6H_5NH_2$, C_6H_5O
- Write the sequence of reaction with proper reagent used.
- b. Give one application of each: DNP test and Tollen's test with proper example. [1.5+1.5]

14. A metal 'M' is known as quick silver and it is used in thermometer.
- Write a reaction which is involved in the extraction of metal 'M'. [2]
 - The one of the compound of metal 'M' having valency two, write the name of this compound which is used as electrode. [1]
 - What happens when the above compound of metal 'M' is heated with KI solution? [2]
15. a. Write one example of each bidentate and polydentate ligand. [2]
- b. Draw the structure of square planar and tetrahedral metal complex ion. [1]
- c. What are the main factor that affect d-orbital splitting in energy? [2]
16. An haloalkane having molecular formula C_4H_9Br .
- What happens when the secondary structure of above haloalkane is heated with sodium metal in the presence of dry ether? [1]
 - Convert primary structure to secondary structure of above haloalkane. [2]
 - How can you prepare butanoic acid from the primary structure of above haloalkane? [2]
17. a. Why is it difficult to undergo nucleophilic substitution in haloarene? [2]
- b. What product would you expect when diazonium salt is heated with copper powder in the presence of HCl? [2]
- c. Write the name of reaction in which chlorobenzene is converted into toluene. [1]
18. a. Draw the structural formula of the organic product of the following reactions. [3]



- Convert compound P into benzaldehyde. [2]
19. a. Name the monomer of Nylon-6,6 and what type of polymer is Nylon-6,6? [2]
- b. Write one example of each natural and azo dyes. [1]
- c. What are main challenge to establish the cement factory in Nepal? How

many grades of cement are available in Nepal? [2]

OR

An organic compound having molecular formula C_7H_9N .

- Write primary and secondary structure of above formula. [1]
- How can you separate primary structure from secondary structure by Hoffmann's method? [2]
- How can you test these two class of compound? [2]

Group 'C'

Give long answer to the following equations. [3 × 8 = 24]

20. a. Why is Ostwald's dilution law not applicable to strong electrolyte? [1]
- b. Is an aqueous solution containing hydroxyl ion concentration $3.33 \times 10^{-10} \text{ mol/L}$ acidic, basic or neutral? [2]
- c. What is the pH of the buffer composed of 0.1M solution of HCN in 0.1M KCN? The dissociation constant of HCN is 0.01. [2] (Ans: 1.96)
- d. The solubility product of Ag_2CrO_4 at 25°C is $1.29 \times 10^{-11} \text{ mol lit}^{-1}$. A solution of $K_2C_2O_4$ containing 0.1520 mole in 500 mL water is shaken with excess of Ag_2CO_3 till the following equilibrium is reached:
- $$Ag_2CO_3 + K_2C_2O_4 \rightleftharpoons Ag_2C_2O_4 + K_2CO_3$$
- At equilibrium the solution contains 0.0358 mole of K_2CO_3 . Assuming the degree of dissociation of $K_2C_2O_4$ and K_2CO_3 to be equal, calculate the solubility product of Ag_2CO_3 . [3] (Ans: $3.97 \times 10^{-12} \text{ mol}^2 \text{ lit}^{-1}$)

OR

21. a. The standard electrode potential for the following electrodes are
- $$Mg^{2+} + 2e^- \rightarrow Mg, E^\circ = -2.37 \text{ V}$$
- $$Fe^{3+} + e^- \rightarrow Fe^{2+}, E^\circ = 0.77 \text{ V}$$
- Represent a galvanic cell and point out which one is anode? [1]
 - With 1M solution of ions what will be EMF? [2] (Ans: 3.14V)
 - Will the reaction $Mg^{2+} + 2Fe^{2+} \rightarrow Mg + 2Fe^{3+}$ occur? Give reason. [2] (Ans: reaction not occur)
- b. Calculate the bond energy of HCl. The bond energy of H_2 and Cl_2 are 430 kJ/mol and 242 kJ/mol respectively and standard enthalpy of formation of HCl is -91 kJ/mol. [3] (Ans: 427 kJ/mol)

9. Which element is the end product of natural radioactive series?
- Pb
 - Sn
 - C
 - Bi

10. is for further de-watering by squeezing water from the sheet.
- Draining
 - Drying
 - Pressuring
 - Forming
11. The initial setting time of cement is not less than.....
- 30 sec
 - 300 sec
 - 30 min
 - 300 min

Group 'B'

Give short answer to the following questions. [8 × 5 = 40]

12. a. What is the importance of calculating normality factors of solution during titration? [2]
- b. 5.1g of impure sodium carbonate solution was dissolved in water to make 500 cm³ of solution. 20 cm³ of this solution was titrated against 20.45 cm³ of 0.04M hydrochloric acid. Calculate the percentage purity of the sodium carbonate solid. [3] (Ans: 21.25 %)

OR

Consider the reaction: $SO_2 + O_3 \rightarrow SO_3 + O_2$. A rate study of this reaction was conducted at 298 K. The data that were obtained are shown in the table.

$[SO_2] \text{ mol/L}$	$[O_3] \text{ mol/L}$	Initial Rate mol/L.s
0.25	0.40	0.118
0.25	0.20	0.118
0.75	0.20	1.062

- What is the order with respect to: SO_2 and O_3 ? [2] (Ans: 2,0)
 - Write rate law equation. [1]
 - Determine the value and units of the rate constant, k. [2] (Ans: $k = 2.36 \text{ mol.L}^{-1}\text{s}^{-1}$)
13. a. How would you predict whether a reaction is spontaneous, non-spontaneous and equilibrium in term of free energy change? [2]
- b. Heat of formation of ethyl alcohol, water and carbon dioxide are -64.1 Kcal, -68.5 Kcal and -95 Kcal. Calculate the heat of combustion of ethyl alcohol. [3]

Grade : XII

SET - 4

F.M.: 75

Time : 3 hrs

Chemistry

Candidates are required to give their answers in their own words as far as practicable.

Attempt all questions.

Group A

[11 × 1 = 11]

Circle the best alternative to the following questions.

- The solubility of the sparingly soluble salt CaF_2 is 2.03×10^{-4} mole L^{-1} . The solubility product is
a. 4.12×10^{-8} b. 4.12×10^{-8}
c. 8.20×10^{-8} d. 3.45×10^{-11}
- The rate of reaction between two specific time intervals is called
a. instantaneous rate b. average rate
c. specific rate d. ordinary rate
- Entropy of the universe is always
a. decrease b. zero
c. increasing d. constant
- The emf of the cell: $\text{Ni} / \text{Ni}^{2+} (1.0 \text{ M}) // \text{Au}^{3+} (1.0 \text{ M}) / \text{Au}$ ($E^\circ = -0.25 \text{ V}$ for Ni^{2+}/Ni ; $E^\circ = 1.5 \text{ V}$ for Au^{3+}/Au) is
a. 1.25V b. -1.25V
c. 1.75V d. 2.0V
- Ions which are produced from the ligand are
a. cation b. anion
c. complex ion d. none of above
- An alloy which does not contain copper is
a. Bronze b. Magnalium
c. Brass d. Bell metal
- CHCl_3 reacts with acetone in the presence of KOH to give
a. $\text{CH}_3\text{C}(\text{OH})(\text{CCl}_3)\text{CH}_3$ b. CH_3NO_2
c. CH_3CN d. $\text{CH}_3\text{CH}_2\text{NO}_2$
- $\text{CH}_3\text{-O-C}_2\text{H}_5$ on reaction with HI gives
a. Methyl iodide and methanol b. Methyl iodide and ethanol
c. $\text{CH}_3\text{-I-O-CH}_2\text{-CH}_3$ d. $[\text{CH}_3\text{-OH-C}_2\text{H}_5]^+\text{I}^-$

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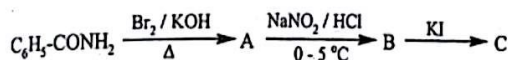
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molecular formula $\text{C}_7\text{H}_8\text{O}$ which on oxidation with CrO_3 gives back compound (A). Compound (C) is the sodium salt of the acid. Compound (C) when heated with soda lime yields an aromatic hydrocarbon (D). Deduce the structures of (A), (B), (C) and (D). Write chemical equations for all reactions taking place. [4]

- Why $-\text{NH}_2$ group of aniline is protected before nitration? [2]
- Write a product which is obtained by the reduction of acetic anhydride. [2]

OR

- Write the structures A, B and C in the following: [4]



- What happens when compound C is heated with sodium metal in the presence of dry ether? [2]
- What product would you get when compound A and B are heated? [2]

OR

- Name the catalyst in the Contact Process for the manufacture of sulphuric acid. [1]
- Draw the structure of: $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{CuCl}_4]^{2-}$ and write the shape of ion. [2]

Group 'C'

Give long answer to the following equations.

[3 × 8 = 24]

- Consider the reaction,
 $2\text{Ag}^+ + \text{Cd} \rightarrow 2\text{Ag} + \text{Cd}^{2+}$
The standard electrode potentials for $\text{Ag}^+ \rightarrow \text{Ag}$ and $\text{Cd}^{2+} \rightarrow \text{Cd}$ couples are 0.80 volt and -0.40 volt, respectively.
i. What is the standard potential E° for this reaction? [2] (Ans: 1.20 V)
ii. For the electrochemical cell in which this reaction takes place which electrode is negative electrode? [2] (Ans: Cd)
- How is single electrode potential originated? [1]
- Heat of combustion of compound are given as: [3]

CH_4	-210 Kcal
C	-94 Kcal
H_2	-68 Kcal

Calculate the heat of formation of CH_4 .

OR

- Equal volumes of 0.02 M AgNO_3 and 0.02 M HCN were mixed. Calculate $[\text{Ag}^+]$ at equilibrium given,
 $K_{\text{sp}}(\text{AgCN}) = 2.2 \times 10^{-16}$ $K_{\text{a}}(\text{HCN}) = 6.2 \times 10^{-10}$. [4]
- A solution contains a mixture of Ag^+ (0.1M) and Hg^{2+} (0.1M) which are to be separated by selective precipitation. Calculate the maximum concentration of iodide ion at which one of them gets precipitated almost completely. What percentage of that metal ion is precipitated? $K_{\text{sp}}(\text{AgI}) = 8.5 \times 10^{-17}$, $K_{\text{sp}}(\text{Hg}_2\text{I}_2) = 2.5 \times 10^{-26}$. [4] (Ans: 99.83%)
- Arrange the compound in the complete reaction sequence with suitable reagent. [4]
Aniline, benzenediazonium chloride, Benzonitrile, Benzamide, Benzoic acid
- Write the name of aldehyde which gives Tolle's test and shows aldol condensation reaction. [2]
- How is 2-hydroxypropanoic acid obtained from ethanal? [2]
- An organic compound (A) which has characteristic odour, on treatment with NaOH forms two compounds (B) and (C). Compound (B) has the

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- A metal 'M' can be extracted from hematite ore. Steel is an alloy of metal 'M'.
a. Write the principle involved in the manufacture of steel by Open-Hearth process. [2]
b. How is metal 'M' rust by exposing in moist air? [2]
c. What is the function of lime stone in the smelting of metal 'M'? [1]
- Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (A) reacted with alcoholic KOH to give compound (B). Compound (B) is reacted with HBr to give (C) which is an isomer of (A). When (A) is reacted with sodium metal it gives compound (D). $\text{C}_4\text{H}_9\text{Br}$ which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (A) and write the equations for all the reactions. [1+1+1+1]

- What product would you expect when compound (B) is treated with hydrogen cyanide? [1]
- Write down the Isomeric alcohols of $\text{C}_3\text{H}_8\text{O}$ and IUPAC name. Explain Victor-Meyer's method to distinguish them. [2+2]
- What happens when the product obtained by dehydrogenation of ethanol is allowed to react with Tollen's reagent? [1]
- An aromatic compound 'P' on treatment with aqueous ammonia and heating forms compound 'Q' which on heating with Br_2 and KOH forms a compound 'R' of molecular formula $\text{C}_6\text{H}_5\text{N}$. Write the structures and IUPAC names of compounds A, B and C. [3]
- How can you prepare p-hydroxazobenzene from compound 'R'? [2]
- Write the name of one drug which relief pain and also draw structure. [2]
- How can you distinguish addition and condensation polymer? [1]
- What the function of CaO in the manufacture of cement? [2]
- A monohydroxyl substituted benzene (A) is prepared from hydrolysis of diazonium salt. Compound (A) is heated with zinc dust gives (B). The compound (B) on Friedel-Craft alkylation with methyl chloride to give (C) which on oxidation with CeO_2 yield compound (D). Write the reaction involved and IUPAC name of A, B, C, D. [3]
- Convert compound A into m-nitrobenzoic acid. [2]

OR

- Transition metals and their compounds are frequently used as catalysts.
- Name the catalyst in the Haber process for the manufacture of ammonia. [1]
 - Name the catalyst used in the hydrogenation of carbon-carbon double bonds. [1]

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9. The specific gravity of cement is.....
 a. 2.5 b. 1.44
 c. 3.15 d. 30
10. Litharge is
 a. PbO_2 b. PbO c. Pb_2O_3 d. Pb_3O_4
11. In nuclear reactor the control rods are made of
 a. graphite rod b. cadmium rod c. Au d. None of these

Group 'B'

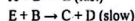
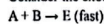
Give short answer to the following questions.

[8 × 5 = 40]

12. 20 cm³ of a solution containing 7g/dm³ of a metal hydroxide, XOH , were exactly neutralized with 25 cm³ of 0.10M hydrochloric acid.
 i. Write a balanced chemical equation for the neutralization of the metal hydroxide, XOH , with hydrochloric acid. [1]
 ii. Calculate the concentration of the metal hydroxide in moles per dm³. [2]
 (Ans: 0.125 M)
 iii. Calculate the molar mass of XOH . [1]
 (Ans: 56 g)
 iv. Identify element X. [1]
 (Ans: K)

OR

Consider the exothermic reaction between reactants A and B?



- a. What is the order with respect to reactants A and B? [1]
 (Ans: 1, 2)
 b. What is the rate law for the reaction? [2]
 c. Sketch a potential energy diagram for this reaction. Identify the activation energy for the overall forward reaction. Identify the location of reactants, intermediate(s), activated complex(es), and products. [2]
 13. This question related to thermodynamics.
 a. How is free energy change of a reaction related to enthalpy change and entropy change? [2]
 b. Calculate the enthalpy of formation of ethane at 298K, if the enthalpies of combustion of C, H and C_2H_6 are - 94.14, - 68.47 and - 373.3 K cal. respectively. [3]

Candidates are required to give their answers in their own words as far as practicable.

Attempt all questions

Group A

[11 × 1 = 11]

Circle the best alternative to the following questions.

1. The pH of 1×10^{-10} M HCl is approximately
 a. 10.0 b. 4.0
 c. 7.0 d. 0.0
2. Which of the following equation is not correct?
 a. $q = E + w$ b. $\Delta G = \Delta H + T\Delta S$
 c. $\Delta H = \Delta E + P\Delta V$ d. $\Delta S = q/\Delta T$
3. 10 mL of 1 M H_2SO_4 is mixed with 25 mL of 0.4 N HCl, the strength of the resulting solution is
 a. 0.35 N b. 0.857 N
 c. 0.28 N d. 0.14 N
4. The reaction, $3ClO^- (aq) \rightarrow ClO_3^- (aq) + 2Cl^- (aq)$ is an example of
 a. Oxidation reaction b. Reduction reaction
 c. Disproportionation reaction d. decomposition reaction
5. Different ions will split up by different compounds to given of
 a. same coloured complex b. different coloured complex
 c. same density complex d. same temperature complex
6. Which of the following are the correct matching of metals with the most commonly employed ores for their extraction?
 a. Fe: Chalcocite; Al: Bauxite b. Fe: Siderite; Al: Clay
 c. Fe: Haematite; Al: corundum d. Fe: Haematite; Al: Bauxite
7. Phenol is acidic in nature because
 a. of the -OH group b. It contains a benzene ring
 c. of resonance d. of sp^2 hybridization
8. Which of the following compounds gives a secondary alcohol upon reaction with methylmagnesium bromide?
 a. Butyl formate b. 3- pentanone
 c. Pentanal d. Methyl butanoate

Group 'C'

Give long answer to the following questions.

[3 × 8 = 24]

22. a. An organic compound 'A' which has characteristic odour, on treatment with NaOH forms two compounds 'B' and 'C'. Compound 'B' has the molecular formula C_6H_5O which on oxidation with CrO_3 gives back compound 'A'. Compound 'C' is the sodium salt of the acid. 'C' when heated with soda lime yields an aromatic hydrocarbon 'D'. Deduce the structures of 'A', 'B', 'C' and 'D'. [4]
 b. Give reasons:
 i. Electrophilic substitution in Benzoic acid takes place at meta position. [2]
 ii. Carboxylic acids do not give characteristic reactions of carbonyl group. [2]
 OR
 a. Arrange the following compounds in an increasing order of basic strengths in their aqueous solutions: NH_3 , CH_3NH_2 , $(CH_3)_2NH$, $(CH_3)_3N$. [1]
 b. Give a chemical test to distinguish between ethylamine and aniline. [2]
 c. How may methyl bromide be preferentially converted to methyl isocyanide? [2]
 d. Complete the following reaction equations: [3]
 (i) $C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow$
 (ii) $C_6H_5NH_2 + Br_2 (aq) \rightarrow$

20. a. Two half-cell reactions of an electrochemical cell are given below:
 $MnO_4^- (aq) + 8H^+ (aq) + 5e^- \rightarrow Mn^{2+} (aq) + 4H_2O (l)$, $E^\circ = + 1.51$ V
 $Sn^{2+} (aq) \rightarrow 4 Sn^{4+} (aq) + 2e^-$, $E^\circ = + 0.15$ V
 i. Construct the redox equation from the two half-cell reactions. [2]
 ii. Predict if this reaction favours formation of reactants or product. [1]
 (Ans: $E^\circ = +1.36$ V, favours formation of product)
 b. How is the free energy change of a reaction related with the enthalpy change and entropy change? [2]
 c. From the following enthalpies of reaction [3]
 $H_2(g) + F_2(g) \rightarrow 2HF(g)$ $\Delta H = -537$ kJ
 $C(s) + 2F_2(g) \rightarrow CF_4(g)$ $\Delta H = -680$ kJ
 $2C(s) + 2H_2(g) \rightarrow C_2H_4(g)$ $\Delta H = -52.3$ kJ
 Calculate the ΔH for the reaction of $C_2H_4(g)$ with $F_2(g)$ to make $CF_4(g)$ and $HF(g)$. Enthalpy of formation of compounds are given below:
 Calculate the enthalpy of combustion of benzene. [3]

OR

- a. What is pH of 1M CH_3COOH solution? To what volume must one litre of this solution be diluted so that the pH of resulting solution will be twice the original value? Given: $K_a = 1.8 \times 10^{-5}$ (Ans: pH = 2.37, V = 2.78×10^4 L) [1+4]
 b. How much AgBr could dissolve in 1.0 L of 0.4 M NH_3 ? Assume that $[Ag(NH_3)_2]^+$ is the only complex formed given, $K_f [Ag(NH_3)_2]^+ = 1.0 \times 10^8$, $K_{sp} (AgBr) = 5.0 \times 10^{-13}$ (Ans: 2.8×10^{-3} M) [3]
 21. a. An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$. Identify the compounds (A) and (B) and explain the reactions involved. [2+2+2]
 b. An organic compound 'Z' is known as oil of mirbane which is prepared by the nitration of benzene.
 i. What product would you expect when 'Z' is reduced in $LiAlH_4$? [2]
 ii. Convert 'Z' into p-hydroazobenzene. [1]

14. A metal 'Z' is good conductor of electricity which has mass number 65 and forms white vitriol with sulphuric acid.
- Write two important ores of 'Z'. [1]
 - How can you obtain Rinnmann's green from 'Z'? Write its one use. [2]
 - Write a proper reaction which is involved in extraction of 'Z'. [2]
15. A secondary haloalkane (X) having molecular mass 78.5 which is obtained by the reaction of PCl_5 with secondary alcohol (Y).
- Which one 'X' or 'Y' gives positive iodoform test? Write its one use. [1]
 - What product would you obtain when 'X' is heated with sodium metal in the presence of dry ether? [2]
 - How can you convert 'X' into 2-methylpropanoic acid? [2]
16. An aromatic compound (A) which gives common insecticide with 2,2,2-trichloroethanol in the presence of conc. H_2SO_4 .
- How can you prepare 'A' with diazonium salt? [1]
 - Reaction of aqueous NaOH on 'A' is more difficult than aliphatic haloalkane. Give reason. [2]
 - Write a product when 'A' is heated with sodium metal in the presence of dry ether. [2]
17. The compound (P) is amino substituted aromatic compound which is prepared from haloarene with ammonia. Complete the reaction sequence. Identify the compound P, Q, R, S, T. [1+1+1+1+1]
18. Copper forms three common complex ions: $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$ and $[\text{CuCl}_4]^{2-}$.
- What is the general name given to groups such as water, ammonia or chloride ions which surround the central metal ion? [2]
 - How are these groups bound to the central metal ion? [2]
 - What colours are the $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$ ions? [1]
19. a. What is the monomer of Teflon and nylon-6,6? [2]
 b. Write the name and structure of antipyretic drug which is used as lowering body temperature. [1]
 c. Write the composition OPC and concrete and which one is best for construction work? [2]

OR

List of some compounds are given below, [1+1+1+1+1]

$\text{C}_2\text{H}_5\text{N}_3\text{Cl}$, $\text{C}_2\text{H}_5\text{Cl}$, $\text{C}_2\text{H}_5\text{CN}$, $\text{C}_2\text{H}_5\text{COOH}$, $(\text{C}_2\text{H}_5\text{CO})_2\text{O}$

From the above list, prepare a sequence of reaction with suitable condition and reagent.

SCIENCE - XII

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8. Benzaldehyde reacts with conc. NaOH, sodium benzoate and benzyl alcohol are formed. The reaction is called
- Perkin reaction
 - Sandmeyer's reaction
 - Reimer-Tiemann reaction
 - Cannizzaro's reaction
9. The grade 43 OPC shall be rejected if it remains in bulk storage in the factory for
- More than 3 months
 - More than 1 months
 - More than 6 months
 - More than 4 months
10. Which of the following has highest penetration action?
- α -ray
 - β -ray
 - γ -ray
 - cathode ray
11. Philosopher's wool is
- ZnO
 - PbO
 - MgO
 - CaO

Group 'B'

Give short answer to the following questions.

[8 × 5 = 40]

12. This question is related to volumetric analysis.

- How do you prepare deci-normal solution of hydrated anhydrous sodium carbonate? Is this solution is primary or secondary standard? Why? [1+1]
- 100 cc of a deci-normal solution of HCl solution required 160 cc of a solution of Na_2CO_3 for complete neutralization. Calculate of strength of Na_2CO_3 in terms of: (i) Normality (ii) Molarity (iii) G/L (iv) % by volume. [3]

OR

A first-order reaction is 38.5% complete in 480 s.

- Calculate the value of the rate constant. [2]
- What is the value of the half-life? [1]
- How long will it take for the reaction to reach 95% completion? [2]

13. Consider the following hypothetical reactions

$\text{A} \rightarrow \text{B}$ $\Delta H = 30 \text{ kJ}$

$\text{B} \rightarrow \text{C}$ $\Delta H = 60 \text{ kJ}$

Use Hess's law to calculate the enthalpy change for the reaction $\text{A} \rightarrow \text{C}$.

- Construct an enthalpy diagram for substances A, B, and C and show how Hess's law applies. [3]
- How many kJ of heat are needed to completely vaporize 50.0g of water at 100°C ? [1]

[Ans: 113. kJ]

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Grade : XII
 Time : 3 hrs
 Candidates are required to give their answers in their own words as far as practicable.

SET - 2

F.M.: 75

Chemistry

Attempt all questions

Group A

Circle the best alternative to the following questions.

[11 × 1 = 11]

- The no. of millimoles of NaOH required to neutralize 10 mL of 0.1 M H_2SO_4 solution is
 a. 2 mL mol b. 2 mmol c. 3 mmol d. 20 mmol
- Ionisation constant of formic acid is 1.8×10^{-4} at 298 K. In 0.1 M HCOOH the percentage ionisation of HCOOH acid is
 a. 0.18 b. 42.4 c. 4.24 d. 2.89
- The half life is independent of initial concentration in which reaction
 a. zero order b. first order c. second order d. third order
- The standard emf is for hydrogen-oxygen fuel cells.
 a. 3.96 V b. 1.23V c. 0.58V d. 2.54V
- Ligand which can form two coordinate bonds from each ion or molecule to the transition metal ion known as
 a. ligand ion b. dentate ligand
 c. monodentate ligand d. bidentate ligand
- The method of zone refining of metals is based upon the principle of.....
 a. greater solubility of the impurity in molten state than in solid
 b. greater mobility of pure metal than impurity
 c. higher melting point of impurity than that of pure metal
 d. greater noble character of solid metal than that of the impurity
- The IUPAC name of the compound



- 4-fluoro-1-methyl-3-nitrobenzene
- 1-fluoro-4-methyl-2-nitrobenzene
- 2-fluoro-5-methyl-1-nitrobenzene
- 4-methyl-1-fluoro-2-nitrobenzene

SCIENCE - XII

HISSAN Practice Book-2079

CS CamScanner

- (B) on treatment with alc. KOH to yield (C). The compound (C) on ozonolysis gives a mixture of ethanal and 2-methylpropan-2-ol. What happens when compound (A) is heated with excess of ammonia? Write the IUPAC name of A, B, C. [3]
- What product would you expect when benzaldehyde is heated with NaOH solution? [2]
 - Write one example of coupling reaction. [1]
 - How can you test 1° amine from 2° amine? Write a reaction only. [2]
- OR
- What happens when propanone is treated with PCl_5 ? [1]
 - What is major product when benzaldehyde is heated with NaOH? Write the name of reaction. [2]
 - Complete the following reaction. [2]
- $$\text{CH}_3\text{CHO} \xrightarrow{\text{HCN}} \text{A} \xrightarrow{\text{H}_2\text{O}/\text{H}^+} \text{B}$$
- Formic acid gives positive Tollen's test but acetic acid does not, why? Give reason with suitable reaction. [2]
 - What is the major product when acetic acid heated with P_2O_5 ? [1]
22. An organic compound (X) which is used as preservative of biological specimen and also used as urinary antiseptic.
- Write the name and formula of compound (X). [2]
 - What product would you expect when the compound (X) is heated with concentrated NaOH solution? [2]
 - A polymer is obtained by heating (X) with phenol in acidic medium, write the structure of polymer. [2]
 - What happens when compound (X) is treated with Grignard reagent followed by hydrolysis? [2]

CS CamScanner

- oxide 'Y'. This metal oxide belongs to Group II of basic radical in salt analysis. The metal ore 'X' on roasting gives metal 'M' with the evolution of a gas. The gas when passed through acidified solution of $K_2Cr_2O_7$, turns green.
- Identify the metal ore. [1]
 - Write a reaction involving in the calcination of ore. [1]
 - Write the action of gas on acidified solution of $K_2Cr_2O_7$. [1]
 - Convert metal 'M' into its vitriol. [2]
- How is molality differed from molarity? [1]
 - Write two differences between acid-base titration and redox titration. [2]
 - 1.43 gram of $Na_2CO_3 \cdot xH_2O$ required 40 mL of semimolar HCl solution for complete reaction. Find the value of x. [2]
 - How does surface area and concentration of reactants affect the rate of chemical reaction? [2]
 - The experimental data for the reaction $2A + B_2 \rightarrow 2AB$ are as below.

Exp.	[A] mol L ⁻¹	[B] mol L ⁻¹	Rate mol L ⁻¹ s ⁻¹
1	0.50	0.50	1.6×10^{-4}
2	0.50	1.00	3.2×10^{-4}
3	1.00	1.00	3.2×10^{-4}

- Find the overall reaction and rate constant. [1]
- Calculate the rate of formation of AB when the initial concentration of A and B are 2 mol L⁻¹ and 4 mol L⁻¹ respectively. [2]

Group 'C'

Give long answer to the following questions. [3 × 8 = 24]

- For a cell:
 $Mg(s)/Mg^{2+}(1M)/Cu^{2+}(1M)/Cu(s)$
 $E^\circ_{Mg^{2+}/Mg} = -2.37V$ and $E^\circ_{Cu^{2+}/Cu} = +0.34V$
 - Indicate anode and cathode. [1]
 - Write the reaction taking place at electrode [1]
 - Calculate the EMF at 1M solution of its ion. [1]
 - State Ostwald's dilution law and mention its limitation. [2]
 - What mass of KOH should be dissolved in 2 L of solution to prepare a solution having pH 6 at 25°C? [3]
- OR
- What will be the resultant pH when 100 mL of aqueous solution of HCl (pH=2) is mixed with 150 mL of an aqueous solution of NaOH (pH=12) [4]
 - State Ostwald dilution law. [1]
 - An aliphatic compound (A) reacts with PCl_5 to give (B). The compound

SCIENCE - XII

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SET - 1

F.M.: 75

Grade : XII

Time : 3 hrs

Candidates are required to give their answers in their own words as far as practicable.

Attempt all questions

Chemistry

Group A

11 x 1 = 11

[11 x 1 = 11]

Circle the best alternative to the following questions.

- 100 mL of 0.5 M H_2SO_4 solution and 0.1 litre of the 1 M HCl were mixed. The normality of resulting solution is
 - 0.80 N
 - 0.40 N
 - 1.0 N
 - 0.60 N
- What will be the pH of 10⁻¹² M HCl?
 - 12.0
 - 7.0
 - 4.0
 - 12
- The rate of a gaseous reaction is given by $k[A][B]$. If the volume of vessel containing these gases is reduced to 1/4th of initial volume, the rate of reaction relative to the original rate would be
 - 16
 - 116
 - 4
 - 8
- A catalyst increase the rate of a chemical reaction by
 - decreasing free energy
 - decreasing the heat of reaction
 - decreasing the activation energy
 - increasing the average speed of the reacting molecules.
- What happens when lead storage battery is discharged?
 - SO_2 is evolved
 - $PbSO_4$ is consumed
 - Lead is formed
 - H_2SO_4 is consumed
- Which product is formed when nitrobenzene is reduced with zinc dust and ammonium chloride?
 - Azobenzene
 - Azoxybenzene
 - Hydrazobenzene
 - Phenyl hydroxylamine
- Which grade of cement is generally used for construction work?
 - 33 grade
 - 53 grade
 - 22 grade
 - 73 grade
- PVC is a
 - Condensation polymer
 - Co-polymer
 - Addition polymer
 - Dyes

SCIENCE - XII

HISSAN Practice Book-2079

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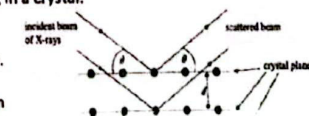
- Wire P and Q have the same resistance at ordinary room temperature. When heated at a ordinary room temperature, resistance of P increases and that of Q decreases. We conclude that
 - P is N-type semiconductor and Q is P-type semiconductor
 - Q is P-type semiconductor and P is N-type semiconductor
 - P is semiconductor and Q is conductor
 - Q is semiconductor and P is conductor
- Which of the following is also called love-particle?
 - electron
 - meson
 - proton
 - Higgs boson

Group 'B'

[8×5=40]

Attempt all questions:

- The graph shows the variation with time 't' of the output voltage 'V' of an ac generator of negligible internal resistance. A resistor of resistance 25 Ω is connected across the output of the generator. Calculate
 - the rms value of the current in the resistor. [2]
 - the average power dissipated in the resistor. [1]
 - the power dissipated in the resistor at 0.40 ms. [2]
- Does a transformer work for d.c current explain. [2]
 - A closely wound rectangular coil of 200 turns and size 0.3m x 0.1m is rotating in a uniform magnetic field of strength 0.05 Weber/m² with a frequency of 1100 rpm about an axis passing through the centre and normal to the field. Calculate the maximum value of induced emf. [3]
- The diagram shows X-rays scattering in a crystal.
 - For certain scattering angle 'θ' a very intense scattered beam is detected. Explain this observation. [2]
 - X-rays of wavelength 4.00×10^{-11} m produce the first maximum with a scattering angle of 26.4°. Calculate the spacing of the crystal planes 'd'. [2]
 - State the law on which formula used in previous question (question b) based on. [1]



- In figure, a fixed mass of an ideal gas undergoes the three thermodynamic processes AB, BC and CA, represented in the P-V graph.
 - The temperature of the gas at A is 300K. Calculate the temperature of the gas at B. [1]
 - Calculate work done by the gas from the state A to B. [2]
 - The increase in internal energy of the gas during process AB is 450J. Determine the heat transferred to the gas from the surroundings during the process AB. [1]
 - Define angular momentum and torque. [1]
 - Obtain a relation between torque and angular momentum. [2]
 - State and explain the law of conservation of angular momentum in terms of torque. [2]
- Find the expression for total energy of particle executing SHM. [1]
 - If the length of a second pendulum is decreased by 5%, find gain or loss in time per day. [1]
 - Derive relation between surface tension and surface energy. [2]
 - State Bernoulli's principle and use this principle to find maximum weight of an aircraft flying horizontally and having wing area 50 m² if velocity of air on upper surface and lower surface of wing are 150 m/s and 140 m/s respectively. (density of air = 1.25 kg/m³) [3]
 - State one success and one limitation of the Bohr's model of the hydrogen atom. [1]
 - Determine the deuterium energy of atomic hydrogen. The Rydberg constant is 1.1×10^7 m⁻¹. [2]
 - Specific charge of a particle is 4.4×10^8 C kg⁻¹. It is moving in a circular orbit with velocity 3.5×10^6 m/s in a magnetic flux density 0.4 T. Find the radius of its orbit. [2]

- State Hagen's principle. [1]
 - Verify lines of refraction of light using wave theory. [3]
 - A normally incident wave front does not deviate when it travels from one medium to another medium, why? [1]
- OR
- What are the differences between interference and diffraction of light? [1]
 - On the basis of Young's double slit experiment, show that dark and bright fringes are equally spaced in interference. [3]
 - Diffraction grating is better than double slit for measuring the wavelength of a monochromatic light. Explain. [1]
- Group 'C'
- [3×8=24]
- What is Newton's formula for velocity of sound in air? How Laplace corrected it? Explain. [3]
 - Find velocity of sound in Helium ($\gamma = 1.67$) at normal temperature and pressure. $R = 8.31 J mol^{-1} K^{-1}$. [2]
 - A policeman sounds a whistle of frequency 300 Hz. Find the frequency of the whistle heard by the driver of the car moving with 5 m/s away from policeman. [2]
 - State Ampere's circuital law and mention its limitations. [2]
 - Find magnetic field on the axis of a long current carrying solenoid. [1]
 - The magnetic field at a point 3 cm from a long current carrying wire is 10^{-4} T. Find the field induced at 12 cm from the wire. [1]
 - What is potentiometer and why it is called ideal voltmeter? [2]
 - Explain with detailed circuit diagram, how potentiometer can be used to measure internal resistance of a cell. [3]
 - State Kirchhoff's laws and use them to find balanced condition for Wheatstone bridge. [1]
 - What properties of inductor and capacitor enable us to design filter circuit? Explain construction and working of a filter. [1+2]
 - Explain with clear circuit diagram the working of a full wave rectifier. [2]
 - What is reverse breakdown voltage? Explain the working of a Zener diode as a voltage regulator. [1]

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Class: XII 'Science'
Subject: Physics

SET-A

F.M: 75
P.M: 30

Candidates are required to give their answer in their own words as far as practicable.
The figure in the margin indicated full marks:
Group A

Multiple Choice Questions:

[11x1=11]

- A glass containing water has a block of ice floating in it. As the ice melts completely, the level of water
 - goes up
 - goes down
 - remains unchanged
 - depends on initial volume of water
- When pressure is increased by 1%, what is percentage decrease in the volume of gas, if Boyle's law is obeyed?
 - 1/100%
 - 10/100%
 - 100/101%
 - 101/10%
- The coefficient of performance of a refrigerator working between the ice point (0°C) and room temperature 27°C is nearly equal to
 - 10
 - 15
 - 20
 - 25
- The neutral temperature of a thermo-couple is 300°C. What is the inversion temperature if the temperature of cold junction is 16°C?
 - 610°C
 - 590°C
 - 310°C
 - 290°C
- Two heater coils separately take 10 minutes and 5 minutes to boil certain amount of water. If both the coils are connected in series, the time taken will be
 - 15 min
 - 7.5 min
 - 5 min
 - 2.5 min
- If an ac mains supply is given to be $E = 220 \sin \omega t$ volts. What would be the average emf during the positive half cycle?
 - 140 V
 - 156 V
 - 220 V
 - 345 V
- The susceptibility of a diamagnetic substance
 - does not vary with temperature
 - increases with the rise in temperature
 - decreases with the rise in temperature
 - first decreases and then increases with the rise of temperature.
- The angle of incidence at which the polarization of reflected light from the surface of a glass is 58°, then refractive index of glass is
 - 1.3
 - 1.6
 - 1.4
 - 1.8
- The sound level of two waves of same frequency in a given medium is 100 dB and 20 dB respectively. How many times is the intensity I_1 greater than I_2 ?
 - 8
 - 10^6
 - 10^5
 - 5

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- Find the work done required to break up a drop of water of radius 5×10^{-3} m into eight drops of water, assuming isothermal condition. [Surface tension of water = 72×10^{-3} N/m] [3]

OR

- Why choke coil is preferable to a resistor in an ac circuit? [2]
- Derive the expression for impedance and current in LCR series circuit. Also find the resonant frequency. [3]
- An ac source of 220V, 50Hz is connected to series circuit containing a resistor R and inductor L and capacitor C. If $R = 100 \Omega$, $L = 0.2$ H and $C = 8 \mu F$, (a) calculate the current in the circuit, (b) the phase angle, and (c) the power consumed in the circuit. [3]
- State Newton's formula for the velocity of sound in gases. [2]
- What correction was done by Laplace on it? [2]
- A man standing at one end of a closed corridor 57 m long blow a short blast on a whistle. He found that the time from the blast to the sixth echo was 2 seconds. If the temperature was 17°C, what was the velocity of sound at 0°C? [3]
- Describe with necessary theory of Millikan oil drop experiment to determine the value of the charge associated with an electron. [3]
- What is the importance of Millikan's oil drop experiment? [2]
- In a Millikan-type apparatus the horizontal plates are 1.5 cm apart. With the electric field switched off an oil drop is observed to fall with the steady velocity 2.5×10^{-2} cms⁻¹ when the field is switched on the upper plate being positive, the drop just remains stationary when the potential difference between the plates is 1500V. Calculate the radius of the drop and the number of electronic charges. (Given - density of oil = 900 kg m⁻³ and viscosity of air = 1.8×10^{-4} NSm⁻¹, Neglect air density) [3]

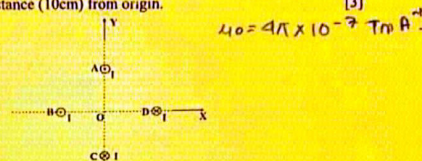
OR

- State Bohr's postulates. [2]
- Derive expression for the radius of n^{th} orbit of hydrogen atom. [3]
- Calculate the wavelength of the first line of the Balmer series. If the wavelength of the second line of this series is 4.86×10^{-7} m. [3]

*** Good Luck ***

CamScanner

- State second law of thermodynamics. [2]
- A petrol engine consumes 10 kg of petrol in one hour. The calorific value of petrol is 11.4×10^3 cal/gm. The power of the engine is 20 Kwatts. Calculate the efficiency of the engine. [3]
- Explain why the magnetic field at the centre of the coil disappears when the circular coil is made infinitely large. [2]
- What will be the resultant magnetic field at origin due to four infinite current carrying wires A, B, C, & D. Each wire carries current ($I = 2$ A) and is equidistant (10cm) from origin. [3]



- If the number of turns of a solenoid is doubled, keeping the other factors constant, how does the self-inductance of the solenoid change? [2]
- When a wheel with metal spokes 1.2m long is rotated in magnetic field of flux density 5×10^{-3} T normal to the plane of wheel, an emf of 10^{-2} V is induced between the rim and axle. Find the rate of rotation of the wheel. [3]
- What happens to the kinetic energy of photoelectrons when the intensity of incident light is doubled? Justify your answer. [2]
- A UV light of 400 nm strikes a cesium surface of work function 1.9 eV. Find the velocity of electron emitted from the cesium surface $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ m/s $h = 6.62 \times 10^{-34}$ J.s. [3]
- Define half life and decay constant of a radioactive substance. [2]
- Establish a relation between half life and decay constant of a radioactive substance. [3]

OR

- What do you understand by Zener diode? [1]
- How can this be used as voltage regulator? [3]
- Give truth table for an OR gate. [1]

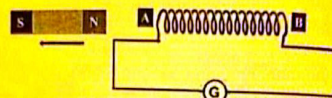
Group C

- Long Answer Questions. [3x8 = 24]
- Why is soap solution a better cleaning agent than ordinary water? [1]
 - Why the antiseptics used for cuts and wounds in human flesh have low surface tension? [1]
 - Derive an expression for the rise or fall of liquid in a capillary tube. [3]

Sp gravity = 917

CamScanner

- The instrument for the accurate measurement of the emf of a cell is
 - ammeter
 - voltmeter
 - potentiometer
 - ohm-meter
- When a current carrying conductor is placed in a magnetic field, the maximum force will act on the conductor when the conductor is at an angle of _____ to the magnetic field.
 - 45°
 - 60°
 - 30°
 - 90°
- The magnet is moving away from the coil as shown in figure. In the coil, the current
 - will be zero
 - will flow from B to A
 - will flow from A to B
 - may flow in any direction



- will be zero
- will flow from B to A
- will flow from A to B
- may flow in any direction

- One Rutherford is equal to
 - 3.7×10^{10} dis/s
 - 10×10^6 dis/s
 - 1 dis/s
 - 10^6 dis/s

Group B

- Short Questions. [8x5 = 40]
- How does the K.E, P.E. and total energy of a simple harmonic oscillator vary with position? [2]
 - The displacement y of a mass vibrating with simple harmonic motion is given by $y = 20 \sin 10\pi t$, where y is in millimeter and t is in second. What is: (i) amplitude (ii) the period (iii) the velocity at $t = 0$. [3]
 - If the ice on the polar caps of the earth melts, how will it affect the duration of the day? Explain. [2]
 - Speed of a body spinning about an axis increases from rest to 100 rev. min⁻¹ in 5 sec., if a constant torque of 20 Nm is applied. The external torque is then removed and the body comes to rest in 100 sec. due to friction. Calculate the frictional torque. [3]

OR

- An ice cube floats in a glass of water. When the ice melts, will the water level in the glass rise, fall or remain unchanged? Explain. [1]
- Distinguish between density and specific gravity. [1]
- A 25 cm thick block of ice floating on fresh water can support an 80 kg man standing on it, what is the smallest area of the ice block? [3]
- What do you understand by coherent sources? [1]
- Can two independent sources of light produce interference? [1]
- In young's double slit experiment, the slits are 0.03cm apart and the screen is placed 1.5m away. The distance between the central bright fringe and fourth bright fringe is 1cm. Calculate the wave length of light used. [3]

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Pre-Board Exam 2078

Physics

Grade: XII
Time: 3 Hours

F.M.: 75
P.M.: 30

Set - A

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.
Attempt all the questions.

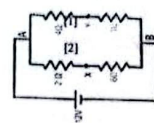
Group A

Multiple Choice Questions:

[11×1 = 11]

- You are given a circular disc, a hollow sphere, a solid sphere and a circular ring of equal radius. They start falling from the top of an inclined plane in the same time. Which one will reach bottom at first?
(a) Circular ring (b) Solid sphere (c) Hollow sphere (d) Circular disc
- Two equal drops are falling through air with a steady velocity of 5 cm/sec. If the drops coalesce, the new terminal velocity will be
(a) 5×2 cm/sec (b) $5 \times \sqrt{2}$ cm/sec
(c) $5 \times (4)^{1/3}$ cm/sec (d) $5 / \sqrt{2}$ cm/sec
- A block of wood floats in the water with two-third of its volume submerged. The density of the wood (in gm/cm^3) will be,
(a) 0.33 (b) 0.66 (c) 0.56 (d) 1
- An inflated tire of a bicycle bursts. Which of the following relation between pressure P and temperature T holds well if γ is the ratio of the specific heats of air?
(a) $p^{1-\gamma} T^\gamma$ (b) $p^{1-\gamma} T^{1-\gamma}$
(c) $p^\gamma T^{1-\gamma}$ (d) $p^\gamma T^\gamma$
- A Carnot engine takes 300 calories of heat from a source at 500 K and rejects 150 calories of heat to the sink. The temperature of the sink is
(a) 400 K (b) 250 K (c) 150 K (d) 100 K
- In the propagation of light waves, the angle between the plane of vibration and plane of polarization is
(a) 0° (b) 90° (c) 45° (d) 180°
- The maximum wave length of a transverse wave that can be set up in a string of length l is
(a) l (b) 2l (c) $\frac{l}{2}$ (d) 4l

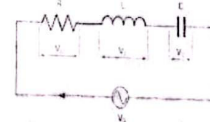
- Draw an arrow on axis of solenoid to show direction of magnetic field inside solenoid. [1]
- Explain the direction of magnetic field due to the induced current in the small coil. [2]
- The small coil has cross sectional area $1.0 \times 10^{-4} \text{ m}^2$ and contains 75 turns of wire. A constant current in the solenoid produces a uniform magnetic field of flux density 1.4mT through the coil. Calculate the average emf induced in the small coil. [2]
- State principle of potentiometer. [2]
- Describe the use of potentiometer to determine the internal resistance of a cell. [2]
- In this resistor network, the emf of the supply is 12 V and it has negligible internal resistance. What is the reading on a voltmeter connected between points X and Y? [2]
- You set out to reproduce Thomson's e/m exp't. with an accelerating potential of 150 V and a deflecting electric field of magnitude $6.0 \times 10^5 \text{ N/C}$.
(a) At what fraction of the speed of light do the electrons move? [2]
(b) What magnitude of magnetic field will you need so that path of the electron remains the same? [1]
(c) Can you use water instead of clock oil in Millikan's oil drop experiment? Justify your answer. [1]
- What is the rest mass of photon? [2]
(b) Describe Millikan's experiment to determine Planck's constant. [1]
(c) Alkali metals are suitable for photoelectric effect, why? [1]



Long answer Short Answer Questions

Answer the following questions.

- Distinguish between wave front and wavelets. Prove Snell's law applying the concept of wave theory of light. [1+2]
 - A diffraction grating has 600 lines per mm and is illuminated by a monochromatic light of wavelength 700nm. Find the diffracting angle for the first order spectrum. [2]
 - Describe polarization by reflection and deduce the relation, $\mu = \tan \theta_p$, where symbols have their usual meanings. [3]
 - Explain Hall Effect. [1]
 - In Hall Effect, derive an expression for Hall Voltage, $V_H = \frac{IB}{net}$ where t is thickness. [3]
 - A hall probe consists of a copper strip, $n = 8.5 \times 10^{24} \text{ electrons/m}^3$ which is 2.0 cm wide and 0.10 cm thick. Calculate the magnetic field when $I = 50 \text{ A}$ at Hall potential is $6.0 \mu\text{V}$. [2]
 - Discuss domain theory of ferromagnetism. [2]
- OR
- In the given figure, an inductor of inductance L, a capacitor of capacitance C and a resistor of resistance R are connected in series and the combination is then connected to an alternating source of emf.
(i) Draw a phasor diagram for the circuit. [1]
(ii) Calculate the impedance of the circuit. [2]
(iii) If $L = 0.5 \text{ H}$ and $C = 20 \mu\text{F}$, find the resonant frequency of the circuit. [2]
 - Define wattless current. Why is 220V ac more dangerous than 220V dc? Explain. [1+2]
 - What is radioactivity? [1]
 - State decay law and obtain the relationship between decay constant and half-life of a radioactive substance. [3]



HISSAN CENTRAL EXAMINATION - 2079 (2022)

Class: XII

PHYSICS (1021)

F.M : 75

(11 Marks Obj + 64 Marks Sub)

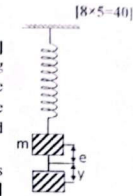
Time: 3hrs

GROUP B

Attempt all questions.

Short Answers Question:

- (i) What is simple harmonic motion? How is it different than linear motion? [2]
(ii) Figure shows the mass spring system of spring constant k, e is the extension produced due to the load and y is the displacement produced in the system due to external force. Find the time period of the system. [2]
(iii) What happens to the time period if mass is doubled? [1]
 - (i) State Bernoulli's Theorem. How this principle is used in the lifting of airplane. [2]
(ii) Water flows horizontally through a pipe of varying cross-section. If the pressure of water is 20Pa at a point where the velocity is 0.35 ms^{-1} . What is the pressure at a point where the velocity is 0.25 m s^{-1} ? (Density of water = 1000 Kg/m^3) [3]
- OR
- (i) State and prove principle of conservation of angular momentum [2]
(ii) A ballet dancer spins with 2.4rev/s with her arms outstretched, when the M.I. about the axis of rotation is I. With her arms folded, the M.I. about the same axis becomes 0.6I, calculate the new rate of spin. [3]
 - (i) Discuss the assumption made by Laplace for the velocity of sound in gaseous medium. [2]
(ii) A source of sound of frequency 512 Hz emits waves of wavelength 670mm in air at 20° C . What is the velocity of sound in air at this temperature? What would be the wavelength of sound from the source in air at 0° C ? [3]
 - (i) What are the limitations of first law of thermodynamics? [2]
(ii) Draw the block diagram of heat engine. [1]
(iii) Discuss the essential part of heat engine and find the efficiency of heat engine. [2]



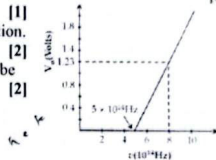
- Measurements on a certain isotope show that the decay rate decreases from 8318decays/min. to 3091decays/min. in 4 days. What is the half-life of this isotope? [1]
 - What is the SI unit of radioactivity? [1]
- OR
- Write the symbol of two inputs NAND gate with Boolean algebra and truth table. [2]
 - Describe forward characteristic of a semiconductor diode. [2]
 - The energy levels of a hypothetical atom are shown in the adjacent figure having energy levels at 0.00 eV (the ground level), 1.00 eV, and 3.00 eV.
(i) What are the frequencies of the spectral lines this atom can emit when excited? [2]
(ii) What wavelengths can this atom absorb if it is in its ground level? [2]

... Best of Luck ...

5. (i) State and explain Biot and Savart law. [2]
 (ii) Discuss the magnetic field produced due to straight current carrying conductor. [2]
 (iii) Which law gives the direction of magnetic field due to straight conductor? [1]

6. (i) What is magnetic flux? [1]
 (ii) State the law which is used to design AC generator in a hydropower. [2]
 (iii) If magnetic flux linked with the coil is $\Phi = 5t^3 + 4t^2 + 3t$. Find the induced emf in time 2 second. [2]

7. (i) What is work function of metal? [1]
 (ii) Discuss Einstein photoelectric equation. [2]
 (iii) How the value of Planck's constant be determined from the graph given. [2]



8. (i) Describe Millikan's oil drop experiment. In which principle it works? [2]
 (ii) How can one estimate charge of electron using result of Millikan's oil drop experiment? [1]
 (iii) What is the function of X-ray in the experiment? Can we use γ -ray instead of X-ray? [2]

OR

- (i) What is forward and reverse biasing of a junction diode? [2]
 (ii) Draw i - v graph of junction diode in forward biasing and hence find forward resistance of junction diode using graph [2]
 (iii) Give two applications of junction diode [1]

GROUP C

Long Answer Questions: [3×8=24]

9. (i) A student wants to study interference pattern using two identical candle light. Explain why he can't produce interference pattern using identical candle. [2]
 (ii) How can he produce sustainable interference pattern? Give two conditions of it. [2]
 (iv) Discuss the Young's double slit experiment for the determination of fringe width. [3]

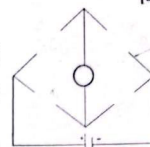
- (v) Can you use white light in Young's experiment? [1]

10. (i) A student wants to design Wheatstone bridge in physics laboratory. What are the minimum requirement to design Wheatstone bridge circuit? [2]

- (ii) Complete a circuit diagram of Wheatstone bridge using resistances 10Ω , 8Ω , 5Ω and 16Ω for the balance condition. [1]

- (iii) How can you increase the sensitivity of Wheatstone bridge? [2]

- (iv) Using the concept of Wheatstone bridge, construct a meter bridge and discuss how it is used to measure unknown resistance. [3]



OR

- (i) When alternating current is passed through a circuit voltage leads the current by phase angle $\pi/2$.
 a. Is the circuit inductive or capacitive? [2]
 b. What is the power consumed in such circuit? [1]
 (ii) What are inductive and capacitive reactances? Discuss their value at high frequency. [2]
 (iii) A 50 V, 50 Hz a.c supply is connected to a resistor of resistance 40Ω in series with a solenoid whose inductance is $0.2H$. The p.d. between the ends of the resistor is found to be 20 V. What is the resistance of the wire of the solenoid? [3]

11. (i) What are X-rays? Give their properties. [2] $15^4 - 10^{-3}$
 (ii) A student wants to use Aluminum target in Coolidge tube for the production of X-ray. What suggestion do you want to give him? [1]
 (iii) A X-ray tube works at dc potential difference of 50kV and current through the tube is 0.5mA.
 a. Find the numbers of electron hitting the target per second. [1]
 b. Energy falling on the target per second. [2]

OR

- (i) A physics professor explains about the formation of nitrogen $^{14}_7N$ from radioactive carbon $^{14}_6C$. Is it possible? Give the suitable nuclear reaction. [2]
 (ii) How can we estimate the age of archeological sample using carbon dating? Give concept only. [1] 12
 (iii) Radioactive carbon disintegrates according to certain laws of radioactive disintegration. What are the laws of radioactive disintegration? [2]

HISSAN CENTRAL EXAMINATION - 2079 (2022)

Class: XII

PHYSICS (1021)

F.M : 75

(11 Marks Obj+ 64 Marks Sub)

Time: 3hrs

Attempt all questions.

GROUP B

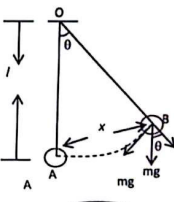
Short Answers Question:

[8×5=40]

1. (i) What is simple pendulum? [1]

- (ii) Figure shows a massive body suspended by a weightless string of length l . When the mass is displaced through the displacement of x and released, it will oscillate freely.

- a. Which force is responsible for the vibration? [1]
 b. Derive its time period? [2]
 c. If we perform this experiment inside water, what will happen to the motion? [1]



2. (i) What is Stokes law? [1]
 (ii) In given figure a spherical steel ball is dropped in a viscous liquid. Is it in equilibrium? What happens to the terminal velocity of steel ball if we use liquid of large coefficient of viscosity? [1]
 (iii) How can you determine coefficient of viscosity of given liquid? [2]



OR

- (i) What is angular momentum? Give its relation with moment of inertia. [2]
 (ii) A constant torque 150Nm turns a wheel about its center. The moment of inertia about its axis is 75 kgm^2 . Find the kinetic energy gained after 20 revolutions. [3]

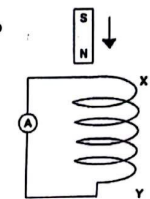
3. (i) Define end correction in an organ pipe? [1]
 (ii) Give two application of the organ pipe. [2]

- (iii) Discuss the possible modes of vibration of a column of air in open organ pipe. [2]

4. (i) State First law of thermodynamics. How does it deal with conservation of heat energy? [2]
 (ii) Explain the result obtained when first law of thermodynamics is applied in isothermal process. [1]
 (iii) In adiabatic process no heat can be applied to the system, explain how work is done in adiabatic process. [2]

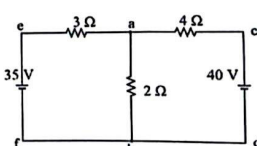
5. A bar magnet is dropped in a circular solenoid as shown in figure.

- (i) Why the motion of bar magnet is slower in the solenoid? [2]
 (ii) What happens to the direction of induced current if the bar magnet is dropped in reverse way? Explain. [2]
 (iii) Does this violate law of conservation of energy? [1]



6. (i) State Kirchhoff's laws. [2]

- (ii) In the given circuit find current through each resistance. [3]

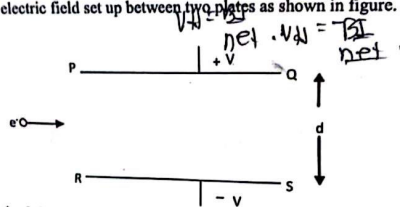


7. (i) Describe quantum nature of radiation. [1]
 (ii) Which phenomenon justify the particle nature of light? [1]
 (iii) Light of frequency $5 \times 10^{14} \text{ Hz}$ liberates electrons with energy $2.3 \times 10^{-19} \text{ J}$ from a metal surface. What is the wave length of UV- light which liberates electrons of energy $8.93 \times 10^{-19} \text{ J}$ from the same metal surface? ($h = 6.6 \times 10^{-34} \text{ Js}$, $c = 3 \times 10^8 \text{ m/s}$) [3]

of free charge carriers per unit volume, assuming they have a charge of $1.6 \times 10^{-19} \text{C}$. [3]

OR

- Define rms value of alternating current. [1]
 - Alternating current is passed through a series circuit of resistance, inductor and a capacitor. Find the impedance of the circuit. [2]
 - If the impedance of LCR circuit is $Z = R$, what can be predicted? [2]
 - In a series LRC circuit $R = 25 \Omega$, $L = 30 \text{mH}$, $C = 10 \mu\text{F}$ and these elements are connected to 240 ac (rms) 50Hz source. Calculate the current in the circuit and voltmeter reading across a capacitor. [3]
11. A beam of electron accelerated by a potential is moving with velocity v enters the electric field set up between two plates as shown in figure. [3]



- Draw a path of electron in the electric field. [1]
- Find the equation of path of electron. [2]
- If a magnetic field is also applied, give the condition that the beam of electron is undeflected. [2]
- Two plane metal plates 4 cm long held horizontally 3 cm apart in vacuum one being vertically above the other. The upper plate is at a potential of 300 volt and the lower is earthed. Electrons having a velocity of $1 \times 10^7 \text{ ms}^{-1}$ are injected horizontally mid-way between the plates and in a direction parallel to the plates. Calculate vertical deflection of the electron beam as it emerges from the plates ($e/m = 1.8 \times 10^{11} \text{ C kg}^{-1}$). [3]

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- What are Bohr's postulates of an atomic model? [2]
 - Calculate an expression for radius of n^{th} orbit of the Hydrogen atom. [2]
 - Define the term excitation energy. [1]
- OR
- What do you mean by p-n junction diode? [1]
 - Discuss the formation of depletion layer and barrier potential in the diode. [2]
 - How can one use junction diodes as full wave rectifier? Discuss its working. [3]

GROUP C

Long Answer Questions: [3×8=24]

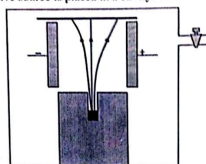
- Seismic wave vibrates bodies in earth. When a body is subjected to compression, a restoring force develops inside it. This restoring force is given by an equation $F = -ky$ where y is displacement and k is a constant.
 - Prove that this force will make the rock vibrate with simple harmonic motion. [2]
 - Prove that the acceleration of a body undergoing simple harmonic motion is given by the expression $a = -\omega^2 y$ where the symbols carry standard meanings. [2]
- Calculate the maximum speed of a building shaken by S-waves of 20Hz and amplitude 0.04m. [2]
- If the time period of tall building is equal to time period of seismic wave, (the possibility of damage will be more why?) [2]
- Define Hall effect. [1]
- Derive an expression of Hall voltage if a copper strip carrying current is placed inside a magnetic field 'B' where 't' is thickness. [2]
- If the copper strip is replaced by a silicon strip is the Hall voltage same? Explain. [2]
- A semiconductor strip is 2mm thick and carries a current of 140mA. A magnetic field of flux density 0.6T correctly applied produces a maximum Hall voltage of 9mV between the edges of the slices. Calculate the number [2]

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OR

- What is radioactivity? Discuss its various unit. [2]
- In the given diagram a radioactive source is placed in a cavity. Which element do you prefer to use as cavity? [1]
- Name and label the three radiations and particles emitted by radioactive source. Explain why the deflection is in different directions. [2]
- At a certain instant, a piece of radioactive materials contains 10^{12} atoms. The half-life of material is 15 days. Calculate the rate of disintegration. [3]



THE END

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V.S. NIKETAN SECONDARY SCHOOL

(Under the management of V.S. Education Foundation)
Minbhawan, Kathmandu, Nepal

PRE BOARD EXAMINATION - 2022

Grade :- Science - XII

Subject: Physics

Time:- 3 hours

FM:- 75

PM:- 30

Attempt all questions:

Group 'A'

(11×1=11)

Multiple choice questions

- If simple harmonic motion is represented by $y = A \cos(\omega t + \phi)$, then ω is ---
a) displacement b) amplitude c) angular frequency d) phase constant
- The spokes are used in bicycle wheel to
a) Increase frictional force b) Decreases frictional force
c) Increase moment of inertia d) Increase angular momentum
- An airplane gets its upward lift due to the phenomenon described by the
a) Archimedes' principle b) Bernoulli's principle
c) Buoyancy principle d) Pascal Law
- PV-diagram for a gas under three different processes are shown in figure. The plot 1, 2 and 3 should correspond respectively to
a) Isobaric, Isothermal and adiabatic processes
b) Isobaric, adiabatic and Isothermal processes
c) Adiabatic, Isothermal and Isobaric processes
d) Isothermal, Isobaric and adiabatic Processes
- Which of the following is true?
a) Compression ratio of Petrol engine is greater than that of Diesel engine.
b) Compression ratio of Diesel engine is greater than that of Petrol engine.
c) Both Petrol and Diesel engine have same compression ratio.
d) Some engine compression of petrol engine is greater while some other compression of diesel is greater.
- The graph shows how the vertical height of a travelling sound wave varies with distance along the path of the wave. The speed of the wave is 20 cm s^{-1} . What is the period of the wave?
a) 0.1 s
b) 0.2 s
c) 5.0 s
d) 10.0 s
- The neutral temperature of a thermocouple depends on --
a) Nature of thermocouple b) temperature of cold junction
c) temperature of hot junction d) nature of heating source
- When a charge moves in a direction perpendicular to magnetic field, then
a) K.E. is constant and momentum changes. b) Momentum is constant and K.E. Changes.
c) Both K.E. and Momentum change. d) Both velocity and momentum are constant.
- A conducting rod of length 0.4 m is moving perpendicular to magnetic flux density 0.9 Wb/m^2 , with speed of 7 m/sec . The e.m.f. induced in the rod is :
a) 25.4 V b) 2.52 V c) 5.62 V d) 1.36 V
- Laminated cores are used in a transformer in order to
a) Reduce eddy current b) Increase eddy current
c) Increase electric flux d) Use the transformer as a rectifier
- When β -particles are emitted from identical nuclei in a substance, which of the following remain constant?
a) Proton number of the nuclei b) Nucleon number of the nuclei
c) Neutron number of the nuclei d) Energy of the β -particles

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Short Answer Questions

Group B

(8 × 5 = 40)

Attempt all the questions

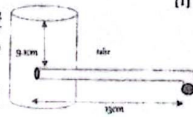
1. a) What is responsible for surface tension of a liquid? [1]
 b) Obtain the relationship between surface tension and surface energy of a liquid. [2]
 c) Calculate the minimum pressure required to force the blood from the heart to the top of the head (vertical distance of 25 cm). Assume the density of blood to be 1.04 g/cm^3 . [2]
2. a) State principle of conservation of angular momentum. [1]
 b) Deduce the relation between angular momentum and moment of inertia in a rotating body. [2]
 c) A body of mass 0.2 kg is executing simple harmonic motion with an amplitude of 20 mm . The maximum force which acts upon it is 0.064 N . Calculate (a) its maximum velocity, and (b) its period of oscillation. [2]

OR

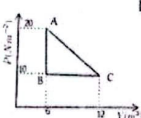
- a) State what provides the upthrust on an object when it is immersed in a fluid. [1]

- b) The volume flow rate V of a viscous liquid undergoing steady flow through a tube of length L and radius r is $V = \frac{\pi r^4 \Delta P}{8 \eta L}$ where η is the viscosity of liquid, P is pressure difference between the ends of the tube.

Water of density 1000 kg/m^3 flows out of a container through a tube of length 13 cm and internal diameter 1.8 mm as shown in figure. When the axis of the tube is at a depth of 9.1 cm below the water surface, water runs out of the tube at a rate of $1.5 \times 10^{-6} \text{ m}^3 \text{ s}^{-1}$.



- i) Calculate the pressure difference between ends of tube. [2]
 ii) Determine the viscosity of the water. [2]
3. a) PV diagram for a cyclic process is shown in the adjacent figure
 i) Explaination in which process AB, BC, or CA the amount of work done is zero. [1]
 ii) Calculate the total amount of work done in the complete cycle ABCA. [2]
- b) A Carnot engine whose high-temperature reservoir is at 620 K takes in 550 J of heat at this temperature in each cycle and gives up 335 J to the low-temperature reservoir. (i) How much mechanical work does the engine perform during each cycle? (ii) What is the temperature of the low-temperature reservoir? (iii) What is the thermal efficiency of the cycle?



4. a) Define stationary waves. A stationary wave equation is given by the relation $y = A \sin \omega t$, where $A = 2a \cos kx$. Using this relation, prove that the distance between any two consecutive antinodes is $\lambda/2$. [2]
 b) A tuning fork of frequency 512 Hz emits waves of wavelength 65 cm in air at 20°C , what would be the velocity of sound at 0°C ? [1+2]

OR

- a) What are harmonics in an organ pipe? Describe the various modes of vibrations in a stretched string. [1+2]
- b) A radio wave of frequency $3 \times 10^9 \text{ Hz}$ is sent towards an approaching airplane. The frequency of radio echo has a frequency is 990 Hz more than the original frequency. Calculate the speed of airplane (velocity of sound is 340 m/s)
5. A solenoid is connected in series with a battery and switch as in figure given. A small coil connected to a sensitive ammeter is placed near one end of the solenoid. As the current in the solenoid is switched on, there is current induced in the small coil. This induced current gives rise to a magnetic field in the small coil.

