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Chemistry Half Yearly Sample Paper for 12th

Physical + Inorganic Chemistry

Max. Marks = 70 | Time = 180 min.

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Super Easy Chemistry

By

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(Director of Anjit)

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12th/NEET/JEE

Chapters Included :

- ✓ 01. Solution
- ✓ 02. Electrochemistry
- ✓ 03. Chemical Kinetics
- ✓ 04. d & f Block Elements
- ✓ 05. Complex Compound

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Unit No.	Unit Name
Unit I	Solutions
Unit II	Electrochemistry
Unit III	Chemical Kinetics
Unit IV	d & f - Blocks
Unit V	Coordination Compounds
Unit VI	Catalyst part of surface Chemistry

General Instructions:

- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 5 very short answer questions carrying 2 marks each.
- SECTION C consists of 7 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.
- The use of log tables and calculators is not allowed

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Section ' A ' — 1 marks

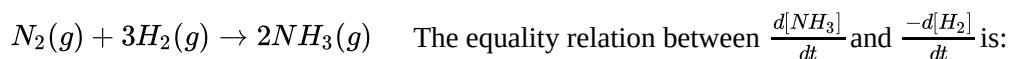
- The rate law for a particular reaction is given as $\text{rate} = k[A][B]^2$.
How is the rate of reaction affected if we double the concentration of B?
 a) becomes half ($\frac{1}{2}$)
 b) four times
 c) three times
 d) two times

- Match the types of solutions given Column I to the examples given in Column II.

Column I	Column II
(a) Solution of gas in gas	(i) Brass
(b) Solution of solid in solid	(ii) Air
(c) Solution of liquid in gas	(iii) Zinc amalgam
(d) Solution of liquid in solid	(iv) Chloroform in Nitrogen

- a) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i) b) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
- c) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii) d) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

- Consider the reaction



- a) $\frac{d[NH_3]}{dt} = -\frac{3}{2} \frac{d[H_2]}{dt}$ b) $\frac{d[NH_3]}{dt} = -\frac{1}{3} \frac{d[H_2]}{dt}$
- c) $\frac{d[NH_3]}{dt} = -\frac{2}{3} \frac{d[H_2]}{dt}$ d) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

4. Match the item given in Column I with expression given in Column II.

Column I	Column II
(a) Osmotic Pressure	(i) $p = K_H \cdot \chi_B$
(b) Relative lowering of vapour pressure	(ii) $\frac{\Delta P}{P_A^0} = \chi_B$
(c) Henry Law	(iii) $\Delta T_b = K_b \cdot m$
(d) Elevation in boiling point	(iv) $p = iCRT$

a) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i). b) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv).

c) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i). d) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii).

5. On addition of small amount of KMnO_4 to concentrated H_2SO_4 , a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following. [1]

a) MnO_2 b) Mn_2O_7
c) Mn_2O_3 d) MnSO_4

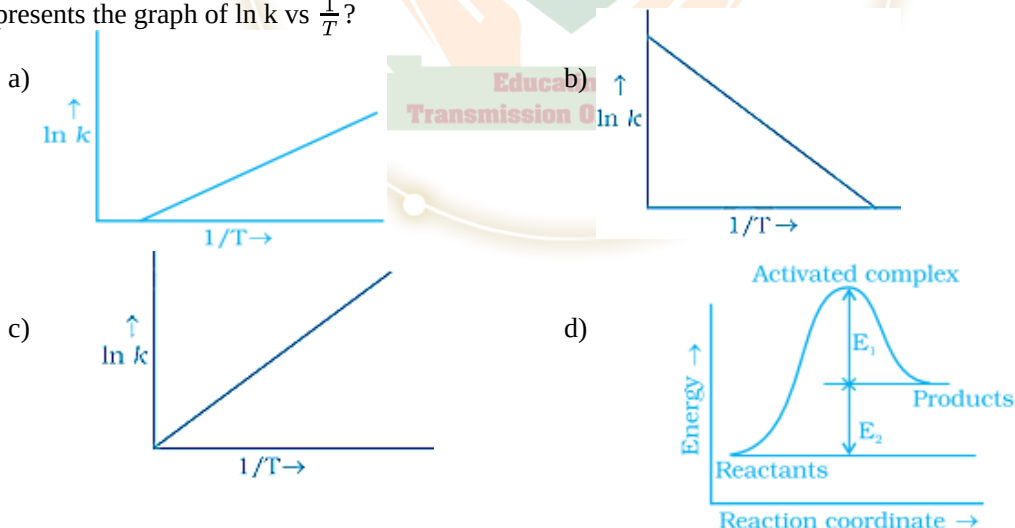
6. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment. [1]

a) $3d^7$ b) $3d^8$
c) $3d^2$ d) $3d^5$

7. The half-life periods of a reaction at initial concentration of 0.1 mol/L and 0.5 mol/L are 200 s and 40 s respectively. The order of the reaction is [1]

a) 0 b) 1
c) 2 d) $\frac{1}{2}$

8. According to the Arrhenius equation rate constant k is equal to $Ae^{-E_a/RT}$. Which of the following options represents the graph of $\ln k$ vs $\frac{1}{T}$? [1]

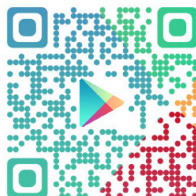
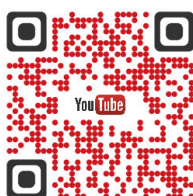


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9. The expression which gives $3/4^{\text{th}}$ life of the first-order reaction is: [1]
 a) $\frac{k}{2.303} \log 4/3$ b) $\frac{2.303}{k} \log 4$
 c) $\frac{2.303}{k} \log 3$ d) $\frac{k}{2.303} \log 3/4$
10. Which of the following is used as a catalyst in the contact process? [1]
 a) V_2O_5 b) Fe_2O_3
 c) Ag_2O d) SO_3
11. The number of unpaired electrons in gaseous species of Mn^{3+} , Cr^{3+} and V^{3+} respectively are: [1]
 a) 4, 4 and 2 b) 3, 3 and 2
 c) 4, 3 and 2 d) 3, 3 and 3
12. In $\text{Fe}(\text{CO})_5$, the Fe-C bond possesses: [1]
 a) ionic character b) sigma character only
 c) pi character d) both sigma and pi characters
13. Which of the following statements concerning transuranium elements is incorrect? [1]
 a) Atomic number > 92 b) Example is Thorium
 c) Decay radioactively as they are unstable d) Elements after Uranium
14. The relationship between osmotic pressure at 273K when 10g glucose (P1), 10g urea (P2) and 10g sucrose (P3) are dissolved in 250ml of water is [1]
 a) $P_1 > P_2 > P_3$ b) $P_3 > P_1 > P_2$
 c) $P_2 > P_1 > P_3$ d) $P_2 > P_3 > P_1$
15. The volume of 0.025M H_3PO_4 required to neutralise 25ml of 0.03M $\text{Ca}(\text{OH})_2$ is [1]
 a) 20ml b) 25ml
 c) 40ml d) 50ml
16. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds? [1]
 a) $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$ b) $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 c) $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$ d) $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$

Section ' B ' __ 2 marks

17. Answer the following: [2]
 (a) a. In a reaction, if the concentration of reactant X is tripled, the rate of reaction becomes twenty-seven times. What is the order of the reaction? [1]
 b. State a condition under which a bimolecular reaction is kinetically a first-order reaction. Give an example of such a reaction.
 (b) For which type of reactions, order and molecularity have the same value? [1]
18. Consider the reaction: [2]
 $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
 What is the quantity of electricity in coulombs needed to reduce 1 mol of $\text{Cr}_2\text{O}_7^{2-}$?
19. a. On the basis of crystal field theory write the electronic configuration for d^5 ion with a strong field ligand for which $\Delta_0 > P$. [2]
 b. $[\text{Ni}(\text{CO})_4]$ has tetrahedral geometry while $[\text{Ni}(\text{CN})_4]^{2-}$ has square planar yet both exhibit diamagnetism. Explain.
20. A solution of $\text{Ni}(\text{NO}_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. [2]
 What mass of Ni is deposited at the cathode?
21. Write the formulas for the following coordination compounds: [2]
 a. Tetraammineaquachloridocobalt(III) chloride b. Dichloridobis(ethane-1, 2-diamine)cobalt(III)

Section ' C ' __ 3 marks

22. In the button cell widely used in watches and other devices the following reaction takes place: [3]

$$\text{Zn}(s) + \text{Ag}_2\text{O}(s) + \text{H}_2\text{O}(l) \rightarrow \text{Zn}^{2+}(aq) + 2\text{Ag}(s) + 2\text{OH}^-(aq)$$

 Determine $\Delta_r G^{(-)}$ and $E^{(-)}$ for the reaction
 Given $\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^-$, $E^0 = 0.76\text{V}$
 Given $\text{Ag} \rightarrow \text{Ag}^+ + 2e^-$, $E^0 = 0.344\text{V}$
23. A reaction is first order in A and second order in B. [3]
 a. Write the differential rate equation.
 b. How is the rate affected on increasing the concentration of B three times?
 c. How is the rate affected when the concentrations of both A and B are doubled?
24. $[\text{NiCl}_4]^{2-}$ is paramagnetic while $[\text{Ni}(\text{CO})_4]$ is diamagnetic though both are tetrahedral. Why? [3]
25. Answer the following: [3]
 (a) Write the slope value obtained in the plot of $\log \frac{[R_o]}{[R]}$ Vs. time for a first-order reaction.
 (b) For the homogeneous decomposition of N_2O_5 into NO_2 and O_2 ; $2\text{N}_2\text{O}_5(g) \rightarrow 4\text{NO}_2(g) + \text{O}_2(g)$
 Rate = $k [\text{N}_2\text{O}_5]$ Find out the order of reaction with respect to N_2O_5 .
 (c) Why is osmotic pressure of 1 M KCl higher than that of 1 M urea solution?
26. (a) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid [2]
 weighing 0.5 g when added to 39.0 g of benzene (molar mass 78 g mol^{-1}). Vapour pressure of the solution, then,
 is 0.845 bar. What is the molar mass of the solid substance?
 (b) Distinguish between homoleptic and hetroleptic ligands. [1]
27. (a) Write the chemical equation for all the steps involved in the rusting of iron. Give any one method to prevent [3]
 rusting of iron.
 (b) Indicate the types of isomerism exhibited by the following complexes and draw the structures for these isomers:
28. Give reasons for the following: [3]
 a. The only oxidation state shown by Scandium is +3.
 b. $[\text{Ti}(\text{H}_2\text{O})_6]^{4+}$ is colourless.
 c. MnO is basic while Mn_2O_7 is acidic.
 d. Molality is Temp. dependent or independent

Section ' D ' __ 4 marks

29. Read the following text carefully and answer the questions that follow: [4]
 The colligative properties of electrolytes require a slightly different approach than the one used for the colligative properties of non-electrolytes. The electrolytes dissociate into ions in solution. It is the number of solute particles that determines the colligative properties of a solution. The electron solutions, therefore, show abnormal colligative properties. To account for this effect we define a quantity called the van't Hoff factor, given by

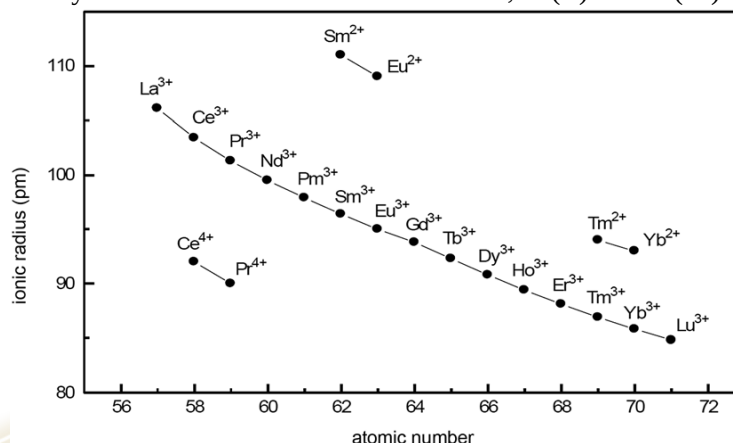
$$i = \frac{\text{Actual number of particles in solution after dissociation}}{\text{Number of formula units initially dissolved in solution}}$$

 $i = 1$ (for non-electrolytes);
 $i > 1$ (for electrolytes, undergoing dissociation)
 $i < 1$ (for solutes, undergoing association).
- i. 0.1M $\text{K}_4[\text{Fe}(\text{CN})_6]$ is 60% ionized. What will be its van't Hoff factor? (1)
 ii. When a solution of benzoic acid dissolved in benzene such that it undergoes in molecular association and its molar mass approaches 244. In which form Benzoic molecules will exist? (1)
 iii. How does van't Hoff factor i and degree of association a are related if benzoic acid undergoes dimerisation in benzene solution? ($i = 1 - \frac{a}{2}$ or $i = 1 + a$) (1)
 iv. What do you mean by colligative properties of solutions? (1)

30. Read the text carefully and answer the questions:

[4]

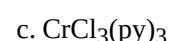
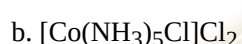
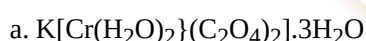
The f-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium). Because lanthanum closely resembles the lanthanoids. The chemistry of the actinoids is much more complicated. The complication arises partly owing to the occurrence of a wide range of oxidation states in these elements and partly because their radioactivity creates special problems in their study. The overall decrease in atomic and ionic radii from lanthanum to lutetium (the lanthanoid contraction) is a unique feature in the chemistry of the lanthanoids. In the lanthanoids, La(II) and Ln(III) compounds are predominant species.



- Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequently and why?
- The transition metals (with the exception of Zn, Cd and Hg) are hard and have high melting and boiling points. Give reason.
- Both O_2 and F_2 stabilize high oxidation states of transition metals but the ability of oxygen to do so exceeds that of fluorine. Give reason.
- The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series. Give reason.

Section 'E' ___ 5 marks

31. A .Write down the IUPAC name for each of the following complexes and indicate the oxidation state, electronic configuration, and coordination number. Also, give stereochemistry and magnetic moment of the complex: [3]



- B . i. What type of isomerism is shown by the complex $[Cr(H_2O)_6]Cl_3$? [2]

ii. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o > P$.

iii. Write the hybridization and shape of $[CoF_6]^{3-}$. (Atomic number of Co = 27)

32. A . Calculate the emf of the cell $Mg(s) \parallel Mg^{2+}(0.1 M) \parallel Cu^{2+}(1 \times 10^{-3} M) \mid Cu(s)$ [3]

Given : $E^0(Cu^{2+}/Cu) = +0.34V$ $E^0(Mg^{2+}/Mg) = -2.37V$

- B . What is an electrochemical series? How does it help in calculating the e.m.f of a standard cell? [2]

33. Answer the following:

- The half-life of a first order reaction is 60 minutes. How long will it take to consume 90% of the reactant? [Given : $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 10 = 1$] [3]
- Write units of rate constant k for zero, first, second and n^{th} order reactions. [2]

