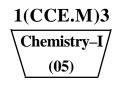
- (d) A certain system absorbs 3×10^{18} Quanta of light per second. On irradiation for 20 minutes, 0.003 moles of the reactant was found to have reacted. Calculate the Quantum yield for the process. (Avagadro's number = 6.02×10^{23}). 10 (a) How are lanthanides separated by ion exchange method ? 7. 10 (b) Explain the factors which favour the formation of ionic compounds. 10 (c) What is lanthanide contraction ? Explain the consequences of lanthanide contraction. 15 (d) Explain the main features of crystal field theory. Discuss the crystal field splitting in octahedral complexes. 15 (a) Discuss the properties of d-block elements with respect to : 8. Variable oxidation states (i) (ii) Complex formation (iii) Catalytic property. 15 (b) Discuss the bonding in olefin complexes. 15 (c) Calculate CFSE and spin only magnetic moment of $[Co(CN)_{\epsilon}]^{-3}$ and $[Co F_{\epsilon}]^{-3}$ on the basis of CFT. 10 (d) Explain: (i) Neutralisation reaction and (ii) Precipitation reactions in liquid NH₃ as solvent with suitable example. 10 (a) Explain crystal field splitting in tetrahedral complexes and 9. calculate CFSE for d³ system. 10 (b) Discuss the applications of emf measurements of fuel cells. 15 (c) State and explain the IIIrd law of thermodynamics. 15
 - (d) The rate constant of a first order reaction increases from $2 \times 10^{-5} \text{ S}^{-1}$ to $2 \times 10^{-4} \text{ S}^{-1}$ when temperature is increased from 27°C to 47°C. Calculate the activation energy of the reaction. 10

Roll No.



Time : Three Hours]

[Maximum Marks : 300

INSTRUCTIONS

- (i) Answers must be written in English.
- (ii) The number of marks carried by each question is indicated at the end of the question.
- (iii) The answer to each question or part thereof should begin on a fresh page.
- (iv) Your answer should be precise and coherent.
- (v) The part/parts of the same question must be answered together and should not be interposed between answers to other questions.
- (vi) Candidates should attempt question no. **1** which is compulsory and any **four** more out of the remaining questions.
- (vii) If you encounter any typographical error, please read it as it appears in the text-book.
- (viii) Candidates are in their own interest advised to go through the General Instructions on the back side of the title page of the Answer Script for strict adherence.
- (ix) No continuation sheets shall be provided to any candidate under any circumstances.
- (x) Candidates shall put a cross (x) on blank pages of Answer Script.
- (xi) No blank page be left in between answer to various questions.

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- (xii) No programmable Calculator is allowed.
- (xiii) No stencil (with different markings) is allowed.

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4

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1.	(a) What are Quantum numbers ? Explain and give their significan		ificance.	
			10	
	(b)	Explain the concept of resonance and resonance ener		
		suitable example.	10	
	(c)	Derive the relation between C_p and C_v for n moles of	an ideal 10	
	(d)	gas. Discuss Schottky defect and Frenkel defect with rea		
	(d)	-	10 spect	
	(a)	crystalline solids.		
	(e)	Discuss the kinetics of polymerisation with a suitable e	-	
	(\mathbf{f})	Eurlain briefly banding in motal carbonyle	10 10	
	(f)	Explain briefly bonding in metal carbonyls.		
	(g)	Write a note on Photoelectric Cells.	10	
	(h)	Explain the properties of lanthanides with respect to	:	
		(i) Colour and	10	
		(ii) Magnetic Property.	10	
	(i)	Explain :		
		(i) Acid-base reactions and		
		(ii) Solvolytic reactions in liquid SO_2 with suitable ex		
			10	
	(j)	Explain Fajan's rule of Polarisation.	10	
2.	(a)	Derive the expression for energy of the particle in on		
		dimensional box from Schrodinger's wave equation.	15	
	(b)	Discuss the molecular orbital theory of chemical bondin	g. Write	
		the M.O. diagram for CO and NO molecule. Calculate t	the bond	
		order.	15	
	(c)	Construct Born-Haber cycle for 1 : 1 ionic compounds.	Explain	
		the steps involved.	10	
	(d)	What is covalent bond ? Explain the factors which far	vour the	
		formation of covalent bond.	10	
3.	(a)	State and explain the laws of thermochemistry.	15	
	(b)	Derive Gibbs Helmholtz equation.	15	
	(c)	Derive the Bragg's law of X-ray diffraction.	10	
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(d)	The heat of combustion of ethyl alcohol (C_2 H ₅ OH) is - 1380.7 kJ/mol. If the heats of formation of CO ₂ and H ₂ O are - 394.5 kJ/mol and - 286.6 kJ/mol respectively, calculate the
4. (a)	heat of formation of ethyl alcohol.10Explain the collision theory of reaction rates of bimolecular reactions.10
(b)	What are liquid crystals ? Explain their types with examples. 10
(c)	Discuss the effect of temperature and catalysts on the reaction rates. 10
(d)	Derive the rate equation for second order reaction when $a = b$. 10
(e)	A first order reaction is 40% complete in 50 minutes. Calculate the rate constant for the reaction. In what time will the reaction be 80% complete ? 10
5. (a)	
(b)	State and explain the laws of crystallography. 13
(c)	Discuss the Debye-Huckel theory of strong electrolytes. 15
(d)	10 moles of an ideal gas at the initial pressure of one atmosphere
(u)	at 0°C were expanded reversibly under isothermal conditions
	to a final pressure of 0.1 atmosphere. Calculate the work done
	by the gas, the change in internal energy and the heat absorbed
	by the system. (D = 8.214 Wel share model) 10
6. (a)	$(\mathbf{R} = 8.314 \text{ JK}^{-1} \text{ deg}^{-1} \text{ mol}^{-1}). $ 10 The Quantum yield for
0. (u)	$H_2(g) + Cl_{2(g)} \xrightarrow{hv} 2 HCl_{(g)}$ is high but for
	$H_{2(g)} + Br_{2(g)} \xrightarrow{h\nu} 2 H Br_{(g)}$ is low.
	Discuss this with respect to the mechanism of these reactions. 15
(b)	State and explain Lambert-Beer's law. 15
(c)	What are the limitations of Arrhenius theory of dissociation ? 10
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