

DECEMBER 2015

P/ID 40129/PCHJ

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Time : Three hours

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is called an overlap integral?
2. What is the term symbol corresponding to an  $nd^{10}$  electron configuration?
3. What is called a hartree?
4. For a  $Mg_3(PO_4)_2$  how is the mean activity coefficient is related to the activity coefficients of the individual ions?
5. Calculate the ionic strength of 0.1M KCl.
6. What is known as the Zeta potential?
7. What do you mean by rigid rotor?
8. What is called Rayleigh radiation?
9. State the Karplus equation.
10. What do you mean by polarisation mechanism?

PART B — (4 × 20 = 80 marks)

Answer ALL questions.

11. (a) (i) Discuss RS coupling. (10)  
(ii) Give a detailed account of Huckel theory for conjugated molecules. (10)

Or

- (b) (i) State the Born-Oppenheimer approximation and explain. (10)  
(ii) Explain how Hartree-Fock equations are solved by the self-consistent field method. (10)
12. (a) (i) Discuss the essentials postulates of Debye Huckel theory. (10)  
(ii) What is meant by degree of dissociation? Explain the significance. (10)

Or

- (b) (i) Define flux and discuss the Fick's first law of diffusion. (10)  
(ii) Give a detailed account of Stern model of electrical double layer. (10)

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13. (a) (i) What are called Stokes and Antistokes lines? Explain. (10)  
(ii) Write notes on Fermi resonance. (10)

Or

- (b) (i) Discuss the Einstein's theory of transition probability. (10)  
(ii) Derive an energy expression for fundamental absorption and overtones. (10)

14. (a) (i) Explain Zeeman effect. (10)  
(ii) Write notes on :  
Nuclear g-factor, chemical shift and proton decoupling of  $^{13}\text{C}$ -NMR. (3 + 3 + 4)

Or

- (b) (i) How do you calculate the coupling constant? (10)  
(ii) What do you mean by spin relaxation? Discuss. (10)