

(4)

ebUee nDee heoLeEdhej eceivesSkeá DeLelee [eFceivesSkeá DeLelee
Heáj eceivesSkeá nD?

- (b) The permanent dipole moment of a given substance is 1.2 D and nuclear distance is 1.5×10^{-8} cm. Find whether the given substance is ionic or non-ionic.

Given : $q = 4.8 \times 10^{-10}$ e.s.u. 3

Skeá ebUesnD heoLeEkeáe mLeeF&E leCe& 1.2 D Deej Fmekeáe
veeYekáede ojer 1.5×10^{-8} cm. nD ebUee heoLeEdDeeUedreá

DeLelee DeveDeeUedreá nD keáe ieCevee keáepes~

ebUee nD: $q = 4.8 \times 10^{-10}$ e.s.u.

3. Explain the following in brief : 4+2+2+3

- (i) Heat capacity of solids
- (ii) de-Broglie's hypothesis
- (iii) Heisenberg's uncertainty principle.
- (iv) Photo electric effect

efrecveeUeeKele keáes mDhe cellmecePeeFS :

- (i) "enreelMkeáe T<ce Oeej lee
- (ii) [er.yeáeuer keáe heej keáuhevee
- (iii) neFpeseveie& keáe DeetremUeUe efmeáevle
- (iv) DekeáeMe efteÁeje Deveeje

A

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B.Sc. (Part-III) Examination, 2015

CHEMISTRY

Third Paper

(Physical)

Time Allowed : Three Hours] [Maximum Marks : 75

- Note :
- (i) Answer five questions in all.
 - (ii) Question No.1 is compulsory.
 - (iii) Answer one question from each unit.
 - (iv) All parts of every question must be attempted at one place.
 - (v) Log table will be provided on demand.
- (i) keáue heeBe DeMveelVkeá Góej oeepeS~
- (ii) DeMve meB1 DeetreeUe&nD
- (iii) DeUekeá FkeáeF&mes Skeá DeMve keáe Góej oeepeS~
- (iv) DeUekeá DeMve keá meYeerYeeie Skeá nermLeeve hej keáepes~
- (v) ceáBeves hej uelejeCekeá meej Ceer oer peeSiceer

1. Explain in brief the following: 10×3,+1
efrecve keáes mDhe cellmecePeeFS :

- (a) Black body radiation and Stefan's law. 3
keáeKekeáe eftekeájCe (yuekeá yee[er jst[DeMve) leLee mSetheáve
keáe efrellece~

(2)

- (b) In the formation of H-Cl, H-Br and H-I, which has the highest quantum field and why? 3
 H-Cl, H-Br and H-I kea yeeveshej ekeame Deefeeceale kear keacee ueyDelee DeDekealece neieer Deeyj kebleeP
- (c) What do you mean by Van't Hoff's factor? Arrange the following with their increasing order of Van't Hoff's factor : 3
 $K_4Fe(CN)_6$, $K_3Fe(CN)_6$, KNO_3 and $C_6H_{12}O_6$.
 JecŠneka iegceka mes Deehkeae keblee leelheue&riP efec>edkeale keas Gveka JecŠneka iegceka kea yek l'es >eace celJDeJemLele keapeS :
- $K_4Fe(CN)_6$, $K_3Fe(CN)_6$, KNO_3 and $C_6H_{12}O_6$
- (d) Franck-Condon principle. 3
 nelka-kol[ve keae emeae vle-
- (e) Which out of NO, NO⁺ and NO⁻ is paramagnetic and why? 3
 NO, NO⁺ and NO⁻ cellmeskeame hej eceivestška nDeeyj kebleeP
- (f) Which of the following will give dipole moment and why? 3
- HCl,

(3)

- Gheef dUeeKele Ueeñkeael/cellkeame mes Ueeñkeae eÉOeje DeeleCel oñes Deeyj kebleeP
- (g) Raoult's law and its utility. 3
 jeGuŠ keae eflejece SJeGmekear GheJeešlele-
- (h) Chemiluminescence 3
 jemeleefveka Dekeame hepe
- (i) Bohr's model of Hydrogen atom and its spectra. 3
 neF [epeve hej ceceeg kear yeej Éeje DeelMele mej Devee SJeGmekeae mhekešé-
- (j) Derive (Describe) Hamiltonian operator for hydrogen molecular ion (H₂⁺) and write Schrödinger wave equation of this ion. 4
 neF [epeve ceuekeguej Deelve (H₂⁺) kea nufeešestvele Deehjšj keae JecKe keapeS Deeyj Fme Deelve kea Beest[ypej lejhe mecekeaj Ce keas dUeeKedes-
- Unit-I / FkeaeF-I
2. (a) What is dipole moment? How is it experimentally determined? How will you predict whether a substance is paramagnetic or dimagnetic or ferromagnetic. 1+4+3
 eÉOeje DeeleCelkeblee netee nP DeJeeñkeae efedDe Éeje Fme ekeame Dekeaj mes efkeaeueles nP Deche keimes Fblele keaj ñes eka

(8)

03kádMe- j emedUedreka DeelVedcaUee 3600 Å hej A → B, cel
 1.0×10^{-5} ceesime B kaá 7.0 Joules MeeseCe kaáj
 yeveles nθ kealešice ueefOe kaár ieCevce kaáej S-
 ebUee nw: $N = 6.02 \times 10^{23}$, $h = 6.0 \times 10^{-34}$ JS,
 $C = 3 \times 10^8$ ms⁻¹ .

9. (a) Define boiling point of a liquid. Why does it increase on adding a solute in the liquid? Derive thermodynamically the relationship of elevation in boiling point of solution and molecular weight of the solute in the solvent. 7

ōJe kaá kealeveeKa kaár heej Yee-ee oeppeS- ōJe cel legule
 heoLe& efueeves hej kealeveeKa keleeWyeK peelee nW T<ee
 iell ekaá Éej e GŪUe kealeveeKa telLee legule heoLe&ka DeCeyeej
 kaá ceOŪe mecyēDe kaás JŪeJheVe kaáeppeS-

(b) 10g of substance was dissolved in 300 ml of water. The osmotic pressure was found to be 600 m.m. of Hg at 27° C. Find the M.W. of the substance. 4

Given : $R = 0.0821$ Atm lit k⁻¹ mol⁻¹.
 10g heoLe& 300 ml heeveer celWlegree Lee- 27° C hej
 efueeUeve kaá Jee-he oeye 600 m.m. of Hg heeUee
 iell ee- heoLe& kaá DeCeyeej kaár ieCevce kaáeppeS-
 ebUee nw: $R = 0.0821$ Atm. lit. k⁻¹ mol⁻¹.

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Unit-II / FkacF-II

4. (a) Apply Schrödinger wave equation to calculate the energy of a particle moving in one dimensional box and explain that :

(i) Energy is quantized 8+3

(ii) Existence of zero point energy

Skaá efceceUe yeekāne kaá Devoj Skaá Yeēce kaáj jnskaáCe kaár
 Tpee& kaár ieCevce Beesf [pej lej he meceekāej Ce kaáe GheUeeie
 kaáj kaáeppeS Deej mecePeefS ekaá :

(i) Tpee& kealešiceFp [nw

(ii) MetUe efjevot hej Tpee& neeer nw

(b) What will happen if the walls of one dimensional box are suddenly removed? kelee neee Ueeb Skaá efceceUe yeekāne kaár oelēj ellkaásDeUeeveka nše ebUee peeS?

5. (a) What is difference between valence bond and molecular orbital theory of formation of a molecule? Describe the valence bond theory of formation of H₂ molecule. Jewellme yeef Deej ceueekegej Deej efyešue efnezevle celMkelee Devlej nW H₂ DeCeg kaá yeveles kaá yewehne yeef efnezevle (V.B.T.) kaá JeCete kaáeppeS- 8

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- (b) Draw M.O. energy diagram of CO molecule and calculate its bond order. 3

OR

Calculate the coefficient of atomic orbitals used in SP hybridisation.

CO molecule ke M.O. diagram ke calculate karke bond order nikalke. 3

OR

SP hybridisation ke coefficient of atomic orbitals ke calculate karke. 3

Unit-III / Part-III

6. (a) Describe in brief the Infrared spectroscopy and its applications. 6

I.R. spectroscopy ke brief me description aur applications likhke. 6

- (b) What is force constant? How is it related with frequency of vibration? 3

Force constant ke definition aur frequency of vibration ke relation likhke. 3

- (c) Which of the following will have greater value of force constant? 2

C - C, C = C and C ≡ C

Which of the following will have greater value of force constant? 2

C - C, C = C and C ≡ C

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(7)

7. What is Raman spectrum? Name different types of lines present in pure rotational and rotational-vibrational, spectra of diatomic molecules. What are its advantages over I.R. spectra? 7,4

Raman spectrum ke definition aur rotational aur rotational-vibrational spectra ke lines ke naam likhke. I.R. spectra ke advantages bhi likhke. 7,4

Unit-IV / Part-IV

8. (a) What is law of photo-chemical equivalence? How quantum yield is determined experimentally? 5

Law of photo-chemical equivalence aur quantum yield ke determination ke methods likhke. 5

- (b) Explain with suitable examples photosensitization. 3

Photosensitization ke definition aur suitable examples ke saath explain karke. 3

- (c) For the photo-chemical reaction $A \rightarrow B$, 1.0×10^{-5} moles of B were formed on absorption of 7.0 Joules at 3600 Å. Calculate the quantum efficiency of the reaction. 3

Given : $N = 6.02 \times 10^{23}$,

$h = 6.0 \times 10^{-34} \text{ JS}$, $c = 3 \times 10^8 \text{ ms}^{-1}$.

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P.T.O.