

Total No. of Printed Pages:2

**B.Sc. Course (CBCS) Ordinance Sem-V
EXAMINATION OCTOBER 2019
Chemistry - Essential in Pharmaceutical Chemistry**

Duration : Two Hours]

[Total Marks :60]

Please check whether you have got the right question paper.

Instructions:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q.1 Answer Any four of the following: (4x3=12)

- i) Define the following terms:
Pharmacodynamics, toxicology & Biological assay.
- ii) List out all physicochemical properties of drugs responsible for pharmacological action. Give one conjugation reaction of drug metabolism.
- iii) Describe the procedure followed in drug design.
- iv) Give synthesis of clotrimazole
- v) Define diagnostic agents. Give structure of ethacrynic acid & uses of metformin
- vi) Give classification of various anti-inflammatory drugs.

Q.2 A) i) Explain with examples importance chemistry in pharmacy. 3

ii) List out all factors on which drug metabolism depends giving short details about 1 factor. 3

OR

iii) Explain the effect of Amino group on the chemical activity of drugs. 3

iv) Define pro drug & soft drug. Give structure of 9-mercaptapurine. 3

B) i) Define drug metabolism. Give at least three oxidation reactions taking place in drug metabolism. 4

ii) Give different routes of drug administration. Give disadvantages of Enemal route of drug administration. 2

Q.3 A) i) What are enzyme inhibitors? What are their classes? Explain with one example each. 4

ii) What do you mean by the term 'synonyms'? Give one example. 2

OR

A) iii) Give synthesis of metronidazole 4

iv) Define sulphonamides. Give uses of theophylline 2

B) i) Explain with examples effect of halogens on chemical activity of drugs. 3

ii) Define analgesics & give their classes. Give structure of chloroamphenicol 3

Q.4 A) i) Outline synthesis of methyl dopa. Name the drugs used for parkinsonism and antilepidemics. 4

ii) Give uses of mercurochrome & structure of DDT. 2

OR

A) iii) Define Antihistaminics. Give structure of histamine & list out functions carried out by histamine in the body. 4

iv) Give structure of sulfacetamide & uses of amino hippuric acid. 2

B) i) Outline synthesis of Thiotepa & give uses of saccharin. 3

ii) Give different steps involved in synthesis of phenytoin. 3

Q.5

A) i) Give synthesis of propranolol. 4

ii) Define the terms. Antipyretics & antiinflammatory drugs. 2

OR

A) iii) Explain the terms i) systolic & ii) diastolic blood pressure. Name one antianginal drug & anticoagulant. Give structure of Nicotinic acid. 4

iv) What is the source of Adrenergic agents? Give name of one adrenergic agent & structure of Bethanechol. 2

B) i) Define the terms a) Hypnotics b) CNS stimulants c) psychotherapeutic agents. 3

ii) Give uses of Niclosamide & structure of ethambutol. 3

Total No. of Printed Pages:02

B.Sc. Course (CBCS) Ordinance (Semester-V)
EXAMINATION OCTOBER 2019
Chemistry : Green Methods & Safety Aspects in Chemistry

[Duration : Two Hours]

[Max. Marks: 80]

Instructions:

- 1) All questions are compulsory.
- 2) Answers to the two sections to be written in separate answer books.
- 3) Figures to the right indicate full marks.

SECTION –A

(40 marks)

Q.1 Answer **any four** of the following. **(4×4=16 marks)**

- Explain the concepts on which principles of Green Chemistry are based.
- State any four ways by which one can save energy during any chemical synthesis.
- Comment on Supercritical Fluids.
- Give the principles and advantages of Ultrasound Techniques.
- Discuss the benefits of Environmentally Safe marine Antifoulant.
- Give the Synthesis of Polylactic Acid from Corn.

Q.2 A] i) Explain the concept of % atom economy with suitable examples. **(3 marks)**
ii) Explain the term Ecofriendly Pesticides. **(3 marks)**

OR

A] iii) Give the Principles and illustrations of Accidents Prevention. **(3 marks)**
iv) What is surfactant? Draw the micelle structure of surfactant. **(3 marks)**

B] i) Distinguish between Ionic liquids and Deep Eutectic Solvents. **(3 marks)**
ii) Give the advantages of Catalysis. **(3 marks)**

Q.3 A] i) Draw the schematic view of motion of the ball and powder mixture and explain the working of Ball milling Technique. **(4 marks)**
ii) Name the Sources of Vitamin – C. **(2 marks)**

OR

A] iii) What is Phase Transfer Catalysis? Give the mechanism of PTC. **(4 marks)**
iv) Give the uses of Acetic Acid. **(2 marks)**

B] i) Discuss the benefits of using Right Fit™ pigment. **(4 marks)**
ii) Name any four Green Chemistry institutions. **(2 marks)**

SECTION- B**(40 marks)**Q.4 Answer **any four** of the following.**(4×4=16 marks)**

- Define the following:
 - PPE
 - Chemical Hazard
 - Risk
 - Eye shower
- What is the full form of MSDS and SDS? Give three points of comparison between them.
- Name the heating devices used in a laboratory? What precautions need to taken while handling such devices?
- What is risk assessment and give the various steps involved in it?
- What is a fire extinguisher and how does it work?
- Briefly explain the consequences of mixing incompatible wastes.

- Q.5 A] i) List the proper attire and its purpose for working in a chemical laboratory. **(4 marks)**
 ii) What precautions need to be taken while working with stirring and mixing devices in a laboratory? **(2 marks)**

OR

- A] iii) Describe the various adverse health effects of chemical hazards. **(4 marks)**
 iv) What precautions need to be taken while working with sand bath? **(2 marks)**

- B] i) Explain various types of flammable hazards in a laboratory. **(4 marks)**
 ii) List the various exposure routes to hazardous chemicals in a laboratory. **(2 marks)**

- Q.6 A] i) What is flammability? Explain any two of its characteristics. **(4 marks)**
 ii) What precautions need to be taken while working with high pressure vacuum pump? **(2 marks)**

OR

- A] iii) a) Define Explosives? Give types of chemical explosives. **(4 marks)**
 b) Identify the hazard symbols for the following (flammable, oxidizing, explosive, toxic, corrosive, harmful)



- iv) How can one minimize hazardous waste in a laboratory? **(2 marks)**
- B] i) What are the hazards involved and precautions need to be taken while working with laboratory equipment's which are water dependent. **(4 marks)**
 ii) How can one identify chemical hazards associated with specific chemicals? **2 marks)**

Total No. of Printed Pages:03

B.Sc. Course (CBCS) Ordinance (Semester-V)
EXAMINATION OCTOBER 2019
Chemistry: Inorganic Chemistry

[Duration : Two Hours]

[Max. Marks :80]

Instructions:

- 1) All questions are **compulsory**, however **internal** choice is available.
- 2) Briefly answer sub-questions in question 1 and question 4.
- 3) Figures to the **right** indicate maximum marks to the question/sub-question
- 4) Answers to the **two** Sections should be written in separate answer books.
- 5) Use of non programable calculator is **allowed**.

SECTION A

- Q.1 Answer ANY FOUR of the following. (40 Marks)
(4 × 4 = 16)
- i) Define a) Covalent radius b) Vanderwaals radius. Give the trend of Covalent radius and Vanderwaals radius in a group and period of the periodic table.
 - ii) Comment on the radius of a cation with its corresponding parent atom. Explain with the help of an example.
 - iii) Give any four general characteristics of interhalogens.
 - iv) Discuss the geometry and hybridisation of $[\text{ICl}_2]^-$.
 - v) Explain structure and bonding in XeF_2
 - vi) What is a Schottky defect? Give any three consequences of a Schottky defect.
- Q.2 A) Answer the following questions.
- i) Define Ionization energy and explain why "Larger the atomic size, smaller is the Ionization Energy". 3
 - ii) With the help of energy band diagram explain the conductivity in alkali metals. 3
- OR
- A) Answer the following questions.
- iii) Define electron affinity and comment on the trend of electron affinity in the halogen family. 3
 - iv) Explain with the help of band gap diagram the conductivity of a p-type of a semiconductor. 3
- B) Answer the following questions.
- i) Define electro negativity according to Pauling. Explain with an example how does the charge on the atom affect the electro negativity of the atom. 4

- Q.3
- ii) What are clathrates? Give examples of noble gases which form clathrates. 2
- A) Answer the following questions.
- i) Define Pseudohalogens and give names and molecular formulae of any four. 3
- ii) What are extended defects? Explain with an example. 3
- OR
- A) Answer the following questions.
- iii) Discuss the geometry and hybridisation of IF_7 . 3
- iv) Describe different metal excess type non-stoichiometric defects. 3
- B) i) Answer the following questions 4
- a) Discuss the acid strengths of oxyacids of chlorine.
- b) Give any two uses of Helium gas.
- iii) Using Slaters rules show why a 4s orbital is filled earlier than a 3d orbital in potassium atom ($Z=19$). 2

SECTION- B

(40 MARKS)

4. Answer **any four** of the following:- (4 × 4 = 16)
- i) Define: a) Standard electrode potential
b) Electrochemical Series.
- ii) Explain the term: 'Thermodynamic stability' of a complex.
- iii) Give reason: $[Co(SCN)_4]^{2-}$ complex turns pink when it is diluted with water.
- iv) Explain precipitation method for verification of Werner's $CoCl_3 \cdot xNH_3$ complexes.
- v) Discuss properties and applications of carbon nanotubes.
- vi) Write a note on: Importance of model systems in bioinorganic chemistry.
5. A) i) Draw a neat labelled molecular orbital diagram of $[FeF_6]^{3-}$ complex ion and explain its magnetic property. (6)
- OR
- ii) Give the Frost diagram for nitrogen under standard conditions, and discuss stability of various nitrogen species. (6)
- B) i) Differentiate between roasting and calcination process in metallurgy. (3)
- ii) What is 'Chelate effect'? How does it affect stability of a complex? (3)
6. A) i) Discuss π -bonding in metal complexes involving different types of ligands, giving suitable diagrams. (3)
- ii) Briefly explain important features of nanoparticles. (3)
- OR
- iii) What is a Latimer diagram? Describe Latimer diagram of Chlorine in acidic solution. (3)

- iv) Explain the functions of a metalloenzyme giving a suitable example. (3)
- B) i) Write a short note on: applications of nanomaterials. (3)
ii) Discuss the role of haemoglobin and myoglobin in biological systems. (3)

Total No. of Printed Pages: 7

B.Sc. Course (CBCS) Ordinance (Semester-V)
EXAMINATION OCTOBER 2019
Chemistry: Organic Chemistry

[Duration : Two Hours]

[Max. Marks : 80]

Instructions :

1. All questions are compulsory.
2. Answers to the two sections should be written on **separate** answer books.
3. Tables of spectral values are attached at the end of the question paper.

SECTION - A**(40 Marks)****Q.1** Answer any four of the following.**(4X4=16)**

- i) When oxidized with hot concentrated permanganate, papaverine gives 6,7-dimethoxyisoquinoline-1-carboxylic acid as one of the products. Give analytical evidence for the structure of this compound.
- ii) A compound C_7H_9N shows the following NMR spectra. δ 2.16, s, 3H; δ 3.41, s, 2H; δ 6.47, d, 2H; and δ 6.86, d, 2H. Find the structure of the compound and assign the peaks to the protons.
- iii) Discuss the mechanism of halogenations of benzene.
- iv) Describe the different decoupling experiments done in ^{13}C MR spectroscopy.
- v) State and discuss Huckel's rule with a suitable example.
- vi) How can Infra-red spectroscopy be used to study progress of reactions? Explain with a suitable reaction series.

Q.2**A)**

- i) A compound $C_5H_{11}Cl$ shows in its ^{13}C MR spectra three peaks at δ 27.3; δ 33.1 and δ 57.3. Find the structure of the compound and assign the peaks to the carbon atoms in the molecule. **04**
- ii) How will you prepare p-phenylene diamine from nitrobenzene? **02**

OR**A)**

- iii) A compound $C_8H_8O_2$ shows in its NMR spectra, peaks at δ 3.58, s, 3H; δ 7.2, m, 5H. Find the structure of the compound and assign peaks to the protons. **04**
- iv) Explain the $4n$ rule of antiaromaticity. **02**

B)

- i) Give analytical evidence for the presence of pyrrolidine nucleus in nicotine. **04**
- ii) With reference to NMR spectroscopy explain shielding and deshielding. **02**

Q.3

- A)
- How will you distinguish propionic acid and 2-oxopropane-1-ol by NMR spectroscopy? 04
 - When subjected to dry distillation, hygrinic acid gives N-methylpyrrolidine. What does this prove about the structure of hygrinic acid? Give structures to support your answer. 02

OR

- A)
- Three isomeric dimethyl cyclopropanes show 2, 3 and 4 signals in their NMR spectra. Write their structures and match them with the number of signals. 04
 - Discuss the use of Herzig-Meyer method and Zeisel's method in the structure elucidation of alkaloids. 02
- B)
- What is the effect of conjugation and change in ring size on the IR absorption of ketones? 04
 - What is meant by chemical shift in NMR spectroscopy? 02

SECTION - II

(40 Marks)

Q.4

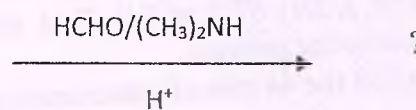
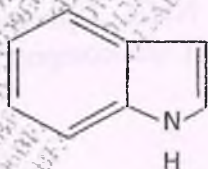
Answer any four of the following:

(4X4=16)

- Give analytical evidence to prove the presence of a diphenyl ether linkage in thyroxine.
- Write the preparation of quinoline by Skraup synthesis.
- Define Azo dyes. Give one example with structure.
- Does electrophilic aromatic substitution in indole occur at C-2 or C-3? Explain giving all resonance contributing structures.
- Explain colour in β -carotene and graphite using conjugation effect. Give structures.
- Write a note on the relative reactivity of the following heterocycles towards electrophilic aromatic substitution. Arrange them in order of decreasing reactivity.
Furan; Pyrrole; Thiophene

Q.5

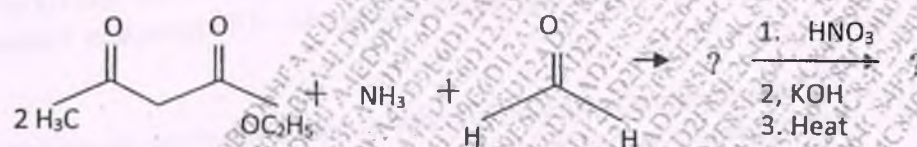
- A)
- Complete the following equations: 04



b)



c)



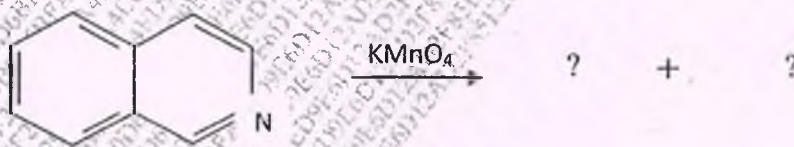
ii) Outline a synthesis for Crystal Violet. 02

OR

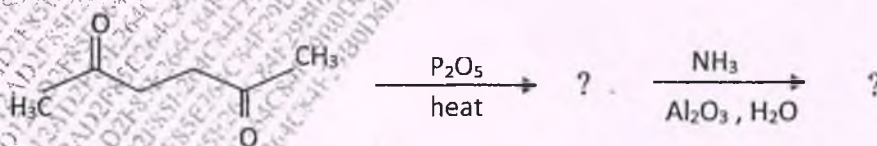
A)

iii) Complete the following equations: 04

a)



b)



iv) Give the structure of Congo Red in acidic medium. What is the reason for the change in colour? 02

B)

i) Outline a synthesis for Vitamin A from β -Ionone. 04

ii) Write the resonance structures of pyrrole. 02

Q.6

- A)
- i) Where does nucleophilic aromatic substitution occur in pyridine? Explain giving all resonance contributing structures. 04
 - ii) How will you prove the position of the side chain in adrenaline? 02

OR

- A)
- iii) Does electrophilic aromatic substitution in isoquinoline occurs at C-5/C-8 or at C-6/C-7? Explain giving all resonance contributing structures. 04
 - iv) How will you prove the presence of enolic -OH groups in Vitamin C? 02
- B)
- i) Where does nucleophilic aromatic substitution occur in quinoline? Explain giving all resonance contributing structures. 04
 - ii) Give a method of synthesis for furan. 02

TABLE - 1
Characteristic Infrared Absorption of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
I. Alkyl C - H (stretching)	2853-2962	
II. Alkenyl C - H (stretching)	3010 - 3095	
C = C (stretching)	1620 - 1680	
R - CH = CH ₂	985 - 1000 and 905 - 920	
R ₂ C = CH ₂	880 - 900	
cis R CH = CHR	675 - 730	
trans RCH = CHR	960 - 975	
C. Alkynyl C - H (stretching)	3300	
C = C (stretching)	2100 - 2260	
D. Aromatic Ar - H (stretching)	3030	
Aromatic substitution type (C - H out of plane bendings)		
Monosubstituted	690 - 710 and 730 - 770	
o - disubstituted	735 - 770	
m - disubstituted	680 - 725 and 750 - 810	
p - disubstituted	800 - 840	
E. Alcohols, Phenols, Carboxylic acids OH (alcohols, phenols, dilute solutions)	3590 - 3650	
OH (alcohols, phenols, hydrogen bonded)	3200 - 3550	
OH (carboxylic acids, hydrogen bonded)	2500 - 3000	
F. Aldehydes, Ketones, Esters and Carboxylic acids C = O stretch		
Aldehydes	1720 - 1740	
Ketones	1715	
Esters	1735 - 1750	
Carboxylic acids	1650 - 1760	
Amides	1650 - 1700	
Ether C-O stretch	1000 - 1200	
G. Amines N - H stretch	3300 - 3500	
H. Nitriles C \equiv N stretch	2220 - 2260	

TABLE - 2

U.V. Absorption Rules for Diene Chromophores

Base value for heteroannular and acyclic dienes	214 nm
Base value for homoannular dienes	253 nm
Increments for:	
Double bond extending conjugation	+30 nm
Alkyl substituents or ring residues	+5 nm
Exocyclic double bonds	+5 nm

TABLE - 3

U.V. Absorption Rules for α,β - unsaturated carbonyl chromophores

Base Values:	
Acyclic or six membered α,β -unsaturated ketones	215 nm
Five membered α,β -unsaturated ketones	202 nm
α,β -unsaturated Aldehydes	210 nm
α,β -unsaturated acids and esters	195 nm
Increments for:	
Double bond extending conjugation	+30 nm
Exocyclic double bond	+5 nm
Homoannular diene component	+39 nm
Alkyl group or ring residues	
α - position	+10 nm
β - position	+12 nm
γ - position and higher	+18 nm

TABLE - 4
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT (δ) PPM
Cyclopropane	0.2 - 0.8
Methyl CH_3	0.8 - 1.0
Methylene CH_2	1.2 - 1.4
Methine CH	1.4 - 1.7
Allylic $=\text{C}-\text{CH}_2$	1.6 - 1.9
Ketone RCOCH_3	2.1 - 2.6
Benzylic $\text{Ar}-\text{CH}_2$	2.2 - 2.5
Acetylenic $=\text{C}-\text{H}$	2.5 - 3.1
Ether $\text{O}-\text{CH}_3$	3.3 - 3.9
Alcohol RCH_2OH	3.3 - 4.0
Ester $\text{RCOO}-\text{CH}_2-\text{R}$	4.0 - 4.5
Vinyl $\text{R}_2\text{C}=\text{CH}_2$	4.6 - 5.0
Vinyl $\text{R}_2\text{C}=\text{CHR}$	5.2 - 5.7
Aromatic $\text{Ar}-\text{H}$	6.0 - 9.0
Aldehyde $\text{R}-\text{CHO}$	9.5 - 9.8

TABLE - 5
Typical ^{13}C NMR Chemical Shifts (δ)

Saturated carbon atoms	1 - 60
$\text{C}-\text{O}$ and $\text{C}-\text{N}$	30 - 80
$\text{C}=\text{C}$	70 - 95
$\text{C}=\text{C}$	100 - 150
Aromatic carbons	110 - 135
$\text{C}=\text{O}$ in acids, esters and amides	150 - 180
$\text{C}=\text{O}$ in Aldehydes and ketones	195 - 250

Total No. of Printed Pages:3

B.Sc. Course (CBCS) Ordinance (Semester-V)
EXAMINATION OCTOBER 2019
Chemistry: Physical Chemistry

[Duration : Two Hours]

[Max. Marks:80]

Instructions :

- 1) Answers to the **two** sections should be written on separate answer books.
- 2) Figures to the **right** indicate full marks
- 3) **Use** of non- programmable calculator is **allowed**.
- 4) **All** questions are **compulsory** however **internal choice** is available.

Physical Constants: $h = 6.625 \times 10^{-34}$ Joule.sec.

$$c = 3 \times 10^8 \text{ meter/sec}$$

$$N = 6.023 \times 10^{23} \text{ molecules /mole}$$

$$\frac{2.303RT}{F} \text{ at } 25^\circ\text{C} = 0.0591$$

$$1\text{MeV} = 1.6 \times 10^{-6} \text{ ergs}$$

$$1 \text{ amu} = 931.5 \text{ Mev}$$

$$= 1.66 \times 10^{-24} \text{ g}$$

At. Wts: C = 12, H = 1, Li = 3, O = 16, N = 14, Cl = 35.5

SECTION A**(40 Marks)**Q.1 Answer any **four** of the following questions.**4X4=16**

- i) Explain the composition of nucleus based on proton-neutron hypothesis.
- ii) Write the characteristics of nuclear binding forces.
- iii) Define decomposition potential. How is it determined experimentally?
- iv) Give the construction and working of $H_2 - O_2$ fuel cell.
- v) State the applications of electrochemical sensors.
- vi) With suitable examples, explain different type of fixed- site membranes of ion selective electrodes.

Q.2A)

- i) State the principle of scintillation counter. 2
- ii) Calculate mass defect, binding energy and binding energy per nucleon of ${}^4_2\text{He}$ having atomic mass 4.0026 amu. The masses of proton and neutron being 1.0078 and 1.0086 amu respectively. 4

OR

- Q.2A) iii) State two characteristics of an ideal Geiger Muller counter. 2
 iv) Half – life period of ${}_{92}\text{U}^{238}$ is 4.5×10^9 years. Calculate the weight of uranium equivalent to one millicurie. 4
- Q.2B) i) State three applications of ion selective electrodes. 3
 ii) Derive a relation between average life period and decay constant of a radio element. 3
- Q.3A) i) Explain the working principle of electrochemical sensors. 4
 ii) What is metal over voltage? 2
- OR
- Q.3A) iii) With a neat labeled diagram, describe solid oxide fuel cell. 4
 iv) State two advantages of glass electrode. 2
- Q.3B) i) Write the anode and cathode reactions for molten carbonate fuel cell. 2
 ii) Describe the experimental determination of over voltage. 4

SECTION B
(40 marks)

- Q.4 Answer any four of the following. 4X4=16
- 1) State Heisenberg uncertainty principle and give the corresponding equation. Calculate the uncertainty in position of a base ball of mass 6.626 kg if the velocity is 80ms^{-1} .
 - 2) What is the isotopic effect? Discuss the separation of lines due to the presence of isotopes.
 - 3) What is an operator? If \hat{x} and \hat{p}_x are two operators in quantum mechanics, check if they commute with each other .
 - 4) Explain the various modes of vibration in IR spectroscopy.
 - 5) What are the boundary conditions for a wave function of particle in 1D box? Write the expression of $\psi(x)$ for 1D box . If $\psi(x) = x(x - a)$, does this function satisfy the boundary condition?
 - 6) Write the time – independent Schrodinger equation in spherical polar coordinates. Define probability density function and write the mathematical equation for it and state its significance.
- Q.5A) i) For a particle in 3D box, write down the energy expression and define the terms involved .explain the ‘degeneracy’ for this system using suitable example. 4
 ii) Write the relation between Cartesian coordinates (x,y, z) and spherical polar coordinates (r , θ , ϕ). 2
- OR
- Q.5A) iii) Define ‘average value’ of operator \hat{A} in quantum mechanics. Write down the Hamiltonian operator in 1D and explain the terms what is the average value of Hamiltonian operator? 4
 iv) Sketch the graph of $\psi_n(x)$ and $|\psi_n(x)|^2$ for particle in 1D box when $n=2$ and $n=4$ 2

Q.5B) Explain P, Q and R branches in vibrational – rotational spectroscopy . 6

Q.6A) i) Calculate the force constant of HI, if its fundamental vibrational frequency is 2236 cm^{-1} . The atomic masses of H and I are $1.0 \times 10^{-3}\text{kg}$ and $127 \times 10^{-3}\text{kg}$. 4

ii) What is Raman shift? 2

OR

Q.6A) iii) Give the differences between Raman spectrum and Infra red spectrum. 4

iv) What are hot bands? 2

Q.6C) i) Derive the expression for energy of a particle in 1D box 4

ii) What is the normalization constant for the wave function of particle in 3D box? Why the wave function needs to be normalized? 2