Total No. of Questions : 4]

SEAT No. :

P499

[Total No. of Pages : 2

[5215]-319

T.Y.B.Sc.

CHEMISTRY

CH- 331: Physical Chemistry

(2013 Pattern) (Paper-V) (Semester-III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator and logarithmic table is allowed.***
5) ***Actual calculations must be shown while solving problems.***

Q1) Answer the following: **[10]**

a) Give the unit of rate constant 'K' for third order reaction.

b) Define the term "Energy of activation".

c) Explain the term transport number of an ion.

d) What do you mean by infinite dilution solution.

e) Define polarizability of molecule.

f) If the observed dipole moment of HCl is 1.067 D and calculated dipole moment is 6.124 D. Estimate % ionic charactor.

g) What are stokes and antistokes lines in Raman Spectra.

h) State any two applications of Microwave spectra.

i) Estimate number of components in the following system

$$MgCO_{3(S)} \rightleftharpoons MgO_{(S)} + CO_{2(g)}$$

j) What do you mean by "Eutectic point".

Q2) a) Attempt ANY TWO of the following: **[6]**

i) Derive exponential form of Arrhenius equation.

ii) Explain how specific conductance and equivalent conductance varies with concentration.

iii) What is dipole moment? How dipole moment is measured by vapour temperature method.

P.T.O.

b) Solve ANY ONE of the following: **[4]**

i) If bond length of $^{1}H^{79}_{Br}$ molecule is 1.42Å. calculate the reduced mass and moment of inertia of HBr molecule. (Given: $N = 6.023 \times 10^{23}$)

ii) For a gaseous reaction $2HI \rightarrow H_2 + I_2$, the half life periods are 40 hrs and 10 hrs. When initial concentration of hydrogen iodide are 5 mole/lit and 20 mole/lit respectively. Calculate order of reaction.

Q3) Attempt ANY TWO of the following: **[10]**

a) Describe Hittorf's method for determination of transport number of ion.

b) Derive the equation for rate constant of third order reaction for equal initial concentration of reactants.

c) Discuss the phase diagram of sulphur system.

Q4) a) Derive the expression for the energy of transition from $J \rightarrow J+1$ level in the rotational spectrum of simple diatomic molecule. **[6]**

OR

Attempt the following: **[6]**

i) Explain any two applications of Kohlrausch's law of independent migration of ions.

ii) Explain the following terms:

1) Component

2) Phase

3) Degree of freedom

b) Solve the following (Any one): **[4]**

i) Fundamental band in Infrared region for HF appears at 2907 cm^{-1}. Calculate force constant. (Given: H=1, F=19, $N=6.023 \times 10^{23}$)

ii) A cell constant of conductivity cell is 0.86 cm^{-1}. If it is filled with 0.06 M NaCl solution gave resistance of 365 ohm. Calculate equivalent conductance of NaCl solution.

Total No. of Questions : 4]

SEAT No. :

P500

[Total No. of Pages : 2

[5215]-320
T.Y. B.Sc.
CHEMISTRY
CH - 332 : Inorganic Chemistry
(2013 Pattern) (Paper - VI) (Semester - III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Marks are reserved for neat diagrams.***
4) ***Use of log tables and calculators are allowed.***
5) ***Atomic numbers : B-5, C-6, N-7, O-8, Ne-10, Mn-25, Fe-26, Co-27***

Q1) Answer the following: **[10]**

a) Give oxidation state of Cr in $[Cr(NH_3)_6]SO_4$.

b) What are possible geometries for coordination number 7?

c) What type of isomerism is shown by

$[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2\text{-}H_2O$.

d) Calculate EAN of $[FeCl_6]^{3-}$.

e) Give molecular orbital electronic configuration of B_2 molecule.

f) What type of hybridization is shown by $K_3[Co(CN)_6]$?

g) How many unpaired electrons are present in weak field octahedral d^6 system?

h) What is the magnetic nature of O_2^+ ion?

i) Give the symmetry symbol for dxy, dyz and dxz orbitals.

j) What is the effect of size of d-orbitals on 10 Dq value?

P.T.O.

Q2) A) Answer <u>any two</u> of the following: **[6]**

a) Explain the non-existance of Ne_2 molecule.

b) Write note on 'multiple bonding'.

c) Write the formulae of following complexes/ions.

i) Dicyanoargentate (I) ion.

ii) Calcium dioxalatodiamminecobaltate (II)

iii) Tetraaquo copper (II) Sulphate.

B) Answer <u>any two</u> of the following: **[4]**

a) Distinguish between sigma and pi molecular orbitals.

b) Write note on 'Nephelauxetic effect'.

c) Give merits and demerits of Sidgwick model.

Q3) Answer <u>any two</u> of the following: **[10]**

a) Discuss the formation of NO_2 molecule on the basis of MOT.

b) Explain the formation of $[Co(CN)_6]^{3-}$ ion without π-bonding on the basis of MOT.

c) Discuss the application of CFT to tetrahedral complexes.

Q4) a) Compare the formation of N_2 and CO molecule on the basis of MOT. **[6]**

OR

a) Answer the following: **[6]**

i) Discuss the factors affecting the stability of complexes.

ii) For $[Mn(NH_3)_6]^{3+}$ complex ion, electron pairing energy is 28000 cm^{-1}. The value of 10Dq is 38500 cm^{-1}. Calculate the CFSE.

b) Answer <u>any one</u> of the following: **[4]**

i) What do you mean by primary and secondary valency? Explain the concept with the help of suitable example.

ii) Explain ligand and linkage isomerism with suitable examples.

Total No. of Questions :4]

SEAT No. :

P501

[Total No. of Pages :3

[5215] - 321

T.Y.B.Sc.

CHEMISTRY

CH-333: Organic Chemistry (Paper-III)

(2013 Pattern) (Semester - III)

Time : 2 Hours] *[Max. Marks :40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw the structure and neat diagrams if necessary.***

Q1) Answer the following: **[10]**

a) Define acid catalysis.

b) Cis - 1, 4 - dimethyl cyclohexane is optically inactive?

c) Which is a good nucleophile amongst $Rs^{\ominus}$ and $Ro^{\ominus}$

d) State Hofmann elimination.

e) As crowding increase, the rate of S_N^2 reaction decrease. Why?

f) What is benzyne intermediate?

g) SO_3 is effective electrophile for sulphonation of benzene. Explain.

h) Write the products of ozonolysis of 2 - methyl-1-propene.

i) Write the cannizaro's reaction of benzaldehyde and formaldehyde.

j) Write the reaction of 2 - butyne with H_2 in presence of Lindlar catalyst.

P.T.O.

Q2) a) Answer any two of the following: **[6]**

i) Explain intramolecular Hydrogen bonding in determination of strengths of acid.

ii) Discuss Reformatsky reaction with suitable example.

iii) Discuss the mechanism of hydroxylation of cis - 2- butene. With $KMnO_4$

b) Answer any two of the following: **[4]**

i) 2, 4, 6 - trinitro phenol is strongly acidic. Explain.

ii) Propyne on hydration gives acetone. Explain.

iii) Explain Markovnikoff rule with suitable example.

Q3) Attempt any two of the following. **[10]**

a) Draw chair conformations of trans -1, 2 - dimethyl cyclohexane. comment on their stability and optical activity.

b) What is E1 elimination? Give the evidences of E1 elimination.

c) What is S_N1 reaction? Discuss the stereochemistry of S_N1 reaction.

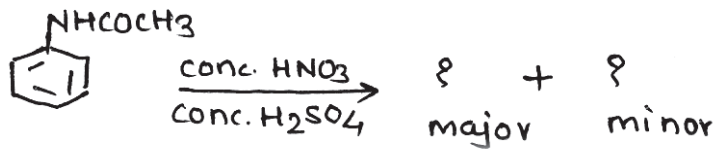
Q4) a) Attempt any two of the following **[6]**

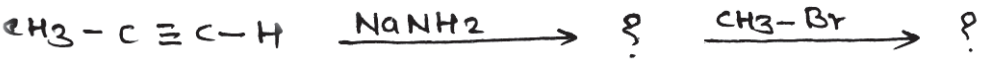
i) Explain addition - elimination reaction of benzaldehyde with hydroxylamine and phenylhyrazine.

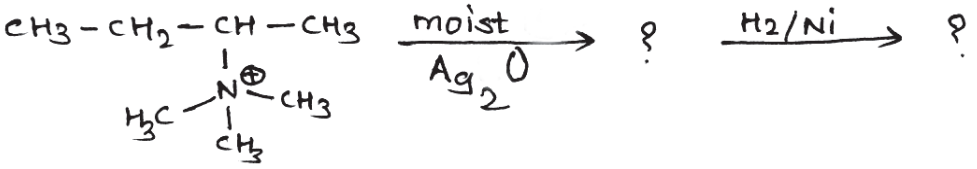
ii) What is Friedel - craft acylation? Give its advantages.

iii) Discuss the mechanism of hydroboration - oxidation of 1 - propene.

b) Predict the products with mechanism. (any two) **[4]**

i) 

ii) 

iii) 

Total No. of Questions : 4]

SEAT No. :

P502

[Total No. of Pages : 2

[5215]-322
T.Y. B.Sc.
CHEMISTRY
CH - 334 :Analytical Chemistry
(2013 Pattern) (Semester - III) (Paper - IV)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log table and calculator is allowed.***

Q1) Answer the following. **[10]**

a) What is effect on degree of dissociation of acetic acid when sodium acetate is added to it?

b) Define a term post-precipitation.

c) Draw a label ideal polarogram.

d) Define a term absorbance.

e) What is the role of N_2 gas in polarographic analysis.

f) Define a term interference in AAS.

g) Give the solubility product equation for $Mg(OH)_2$

h) Which reference material is used in differential T.A?

i) Which elements can be determined by FES?

j) Calculate the transmittance of a solution which absorbs 80% of the incident radiation.

Q2) a) Answer any two of the following. **[6]**

i) State Faradays first Law of electrolysis. Give the mathematical equation and significance of each term.

ii) Draw and explain the pyrolysis curve for calcium oxalate.

iii) Write short note on phototube.

P.T.O.

b) Answer Any Two of the following. **[4]**

i) Draw Schematic diagram of thermobalance and explain various components used in it.

ii) When a current of 3 Amp B passed through $AgNO_3$ solution for 20 min. during electrolysis. Calculate the weight of Ag (Silver) deposited (ECE for Ag = 1.118×10^{-3})

iii) Calculate the molar absorptivity of 1.8×10^{-5} M solution having 0.35 absorbance when placed in a cell of 1.5cm path length.

Q3) Answer Any Two of the following. **[10]**

a) Draw a schematic diagram of dropping Mercury Electrode. Give the advantages and disadvantages of DME.

b) Explain the advantages of AAS over FES.

c) What is co-precipitation? What precautions can be taken to minimise co-precipitation.

Q4) a) What is Spectrophotometric titration? Describe various types of spectrophotometric titration curve with suitable example. **[6]**

OR

i) Sketch ideal polarographic wave. Explain the term residual current and limiting current. **[3]**

ii) Give principle of AAS. Explain the construction and working of hollow cathode lamp in AAS. **[3]**

b) The solution of Cd^{2+} ions having concentration 5 millimoles /L. If drop rate is 6 seconds and rate of falling mercury is 4 Mg/s. What is the diffussion current flowing through the cell if diffussion coefficient of Cd^{++} ion is 7.0×10^{-6} $cm^2\ s^{-1}$. **[4]**

OR

The solubility product of PbI_2 is 2.5×10^{-8}. What is the minimum concentration of iodide ion that must be added to a solution contain 1×10^{-3} moles per liter of Pb^{+P} ion so as to precipitate lead iodide. **[4]**

★ ★ ★

Total No. of Questions : 4]

SEAT No. : ____

P503

[Total No. of Pages : 2

[5215]-323

T.Y.B.Sc.

CHEMISTRY

CH-335 : Industrial Chemistry

(2013 Pattern) (Semester - III) (Paper-V)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram and flowsheet wherever necessary.***

Q1) Answer the following: **[10]**

a) Define the term selectivity.

b) Give two important uses of ammonia.

c) What is pickling?

d) Define the term fire point.

e) Which reagents are used for concentration of nitric acid.

f) Define the term clinker.

g) What are food additives?

h) Define the term unit process.

i) What is setting of cement?

j) What are herbicides?

Q2) a) Answer any two of the following. **[6]**

i) Explain the terms, quality control and process control.

ii) Write a note on purifying unit in contact process for manufacture of sulphuric acid.

iii) Give uses of Neem oil.

P.T.O.

b) Answer any two of the following. **[4]**

i) Explain the term trade mark.

ii) What is reinforced concrete?

iii) What are safety precautions that should be taken in chemical industry.

Q3) Answer any two of the following: **[10]**

a) What are fuels? How are they classified? Give the applications of petrochemicals.

b) Discuss food deterioration factors.

c) Discuss various types of raw materials for manufacture of cement. Explain importance of proportioning of raw materials.

Q4) a) What are pesticides? Give synthesis and applications of DDT and Endosulphan. **[6]**

OR

a) Explain with flow sheet the manufacture of ammonia by Bosch-Haber process.

b) Give advantages and disadvantages of gaseous fuels. **[4]**

OR

b) Explain different methods of food preservations.

Total No. of Questions : 4]

SEAT No. :

P504

[Total No. of Pages : 10

[5215]-324
T.Y. B.Sc.
CHEMISTRY
CH - 336(A) : Nuclear Chemistry
(2013 Pattern) (Semester - III) (913A3) (Elective - I) (Paper - VI)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams whenever necessary.***
4) ***Use of logtables and calculator is allowed.***

Q1) Answer the following: **[10]**

a) Which of the following nuclei is move stable?

i) $^{16}_{8}O$ ii) $^{3}_{1}H$

iii) $^{238}_{92}U$ iv) $^{2}_{1}H$

b) Which are the different types of quarks?

c) What are the limitations of liquid drop model?

d) State the Magic numbers in Shell Model.

e) State general characteristics of radioactive decay.

f) What is the range of α particle in air?

g) State the unit of radioactivity.

h) Complete the following nuclear reaction

$^{14}_{7}N + ^{1}_{0}n \rightarrow ..... + ^{1}_{1}H$.

i) What are photonuclear reactions?

j) State Bethe's notations.

Q2) a) Answer any two of the following: **[6]**

i) What is reaction cross section? State it's unit.

ii) What is the value of N/Z ratio for stability? Discuss stability on the basis of their N/Z ratio.

iii) Write short notes on Geiger-Nuttal's law.

P.T.O.

b) Answer any two of the following: **[4]**

i) Calculate the binding energy of $^{4}_{2}He$ atom

Given: mass of proton : 1.007825 amu

mass of neutron : 1.008665 amu

mass of $^{4}_{2}He$: 4.0026 amu

ii) Define:

1) Half life

2) Decay constant

iii) Show that Half life = $\frac{0.693}{\lambda}$

Q3) Answer any two of the following: **[10]**

a) Explain different types of radioactive decay processes with examples.

b) State and explain semi-empirical mass equation. What are the applications of semi-empirical mass equation?

c) Explain conservation of proton, neutron and momentum in nuclear reactions with examples.

Q4) a) Explain periodicity in nuclear properties in shell model. What are the limitations of shell model? **[6]**

OR

State the different types of nuclear reactions.

b) Write short notes on nuclear isomerism and isomeric transition. **[4]**

OR

A sample of radioactive iodine gave with geiger counter 3791 counts per minutes at certain time interval and 816 counts per minutes exactly after 60 minutes, Calculate half life of iodine.

Total No. of Questions : 4]

P504

[5215]-324
T.Y. B.Sc.
CHEMISTRY
CH - 336(B) : Polymer Chemistry
(2013 Pattern) (Semester - III) (Paper - VI)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***

Q1) Answer the following: **[10]**

a) Define the term : Polymer.

b) Explain the term : Colourants.

c) Calculate the molecular weight of polyvinyl chloride (PVC) whose D_P is 2080.

d) Write an important linkage of polyamide polymer.

e) Draw the correct structures of following polymers.

i) Polypropylene.

ii) Polyvinyl alcohol.

f) Give two important applications of nylon.

g) 'Sand is the best example of organic polymer'. State whether the statement is true or false.

h) Convert the IUPAC name poly -(1-nitrile-ethylene) into correct structure.

i) The vulcanisation of rubber had invented by _____.

j) Name any two commonly used UV stabilizers.

Q2) a) Attempt any two of the following: **[6]**

i) 'Fillers are often added for making polymer articles'. Explain.

ii) 'Polymers are the gift for us in day to day life'. Explain.

iii) Write a note on - Silicone polymers.

b) How will you distinguish between the following (Any two). **[4]**

i) Organic polymers and Inorganic polymers.

ii) Linear polymers and Cross-linked polymers.

iii) Homopolymers and Co-polymers.

Q3) Attempt any <u>two</u> of the following: **[10]**

a) What is meant by step polymerisation reactions? Give the detailed account for polycondensation reactions.

b) Explain the meaning of chain polymerisation. Give full account on co-ordination polymerisation-Zeiglar Natta catalyst.

c) Explain in detail the emulsion polymerisation technique.

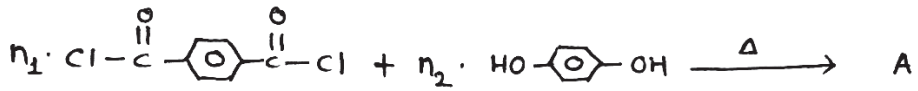
Q4) a) Attempt <u>any two</u> of the following: **[6]**

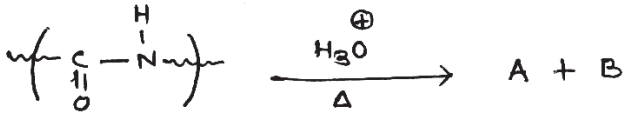
i) Write a short note on - Bulk polymerisation.

ii) Give brief account of hydrogenation reaction of polymers.

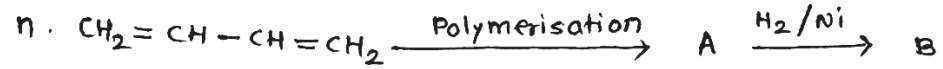
iii) Calculate the molecular weight $\left(\overline{M_n}\right)$ of polymer when 1.175 gm of polymer sample requires 27.9ml of 0.0255N alcoholic KOH for complete neutralisation whose functionality is 3.

b) Complete the following polymeric reactions: **[4]**

i) 

ii) 

iii) 

iv) 

Total No. of Questions : 4]

P504

[5215]-324
T.Y. B.Sc.
CHEMISTRY
CH - 336(C) : Introduction to Biochemistry & Molecular Biology
(2013 Pattern) (Paper - VI) (Semester - III) (New Syllabus)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw structures and neat diagrams if necessary.***

Q1) Answer the following: **[10 × 1 = 10]**

a) Name one structural protein.

b) Define Acid number.

c) Write MM equation.

d) Give one significance of mitochondria.

e) Name one hormone of Adrenal medulla.

f) Give one example of oxidoreductase.

g) What are fat soluble vitamins? Give one example.

h) Write the Zwitter ion form of alanine.

i) List out any two unsaturated fatty acid.

j) Give one example of a non reducing sugar.

Q2) a) Answer any two of the following: **[2 × 3 = 6]**

i) What are amphipathic lipids? Give examples.

ii) Give reaction of amino acid with ninhydrin and its significance.

iii) Differentiate between apo and Holoenzyme.

b) Give the structures of any two of the following: **[2 × 2 = 4]**

i) One Aromatic amino acid.

ii) Lactose.

iii) Cholesterol.

Q3) Attempt any two of the following: **[2 × 5 = 10]**

a) Explain principle, procedure for desalting of proteins by gel filtration.

b) Differentiate between prokaryotes and eukaryotes.

c) Discuss the types and features of lipoproteins.

Q4) a) Classify proteins based on functions with examples. **[6]**

OR

Describe the structural organisation and functions of cell membrane.

b) List out the B complex vitamins and their coenzymes. **[4]**

OR

Write short notes on enzyme specificity.

☛ ☛ ☛

Total No. of Questions : 4]

P504

[5215]-324
T.Y. B.Sc.
CHEMISTRY
CH - 336(D) : Environmental & Green Chemistry
(New Course) (2013 Pattern) (Paper - VI) (Semester - III)
(Elective - I) (913D3)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer the following: **[10]**

a) Define the term 'Threshold Limit Value (TLV).

b) Give the name of any two major component of atmosphere.

c) Define Oxidising Smog.

d) What are humic substances.

e) Define Pathogens.

f) Name any two biotic components.

g) Define Lithosphere.

h) Draw the structure of M-hydroxy benzaldehyde.

i) Define contaminant.

j) Arrange following in order of greater health risk

Diethyl sulphoxide, Benzene, CCl_4.

Q2) a) Attempt any two of the following in details. **[6]**

i) Explain stratosphere.

ii) Explain Organophosphate and Carbamate pesticides.

iii) Explain Environmental Chemistry.

b) Solve any two of the following: **[4]**

i) Organic particulate matter.

ii) Composition of water resources.

iii) Give green chemistry of Adepic acid using Non-hazardous D-glucose & a biocatalyst Modified E-coli.

Q3) Attempt any two of the following in details: **[10]**

a) Explain mechanism of Ozone depletion.

b) Define chemical oxygen demand & Explain the Methods for C.O.D. analysis.

c) Describe basic principle of Green Chemistry.

Q4) a) What is sources & sink of carbon monoxide (CO)? Explain chemical processes and concentration profile of Carbon Monoxide (CO). **[6]**

OR

Explain in detail scientific areas for practical application of Green Chemistry.

b) Write note on any one: **[4]**

i) Biosphere.

ii) Green catalyst.

Total No. of Questions : 4]

P504

[5215]-324
T.Y. B.Sc.
CHEMISTRY
CH - 336(E) : Agriculture Chemistry
(2013 Pattern) (Paper - VI) (Semester - III) (Elective - I) (New Course)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw the diagrams wherever necessary.***

Q1) Answer the following: **[10]**

a) What is pryanishnikov triangle?

b) Define particle density.

c) What is calcarious soil?

d) What is TDS? How is it measured?

e) Define Aminization.

f) Define the term 'Biofertilizers'.

g) Define insecticides.

h) Define macronutrients.

i) What are attractants?

j) What is ESP?

Q2) a) Attempt any TWO of the following: **[6]**

i) Explain about acidic soil.

ii) Give classification of fungicides.

iii) What is the role of nitrogen in the plants?

b) Attempt any TWO: **[4]**

i) Explain 'reclamation of soil'.

ii) Explain the role of sulphur in the plants.

iii) Explain the role of Mixed fertilizers.

Q3) Attempt any two: **[10]**

a) Discuss about soil structure.

b) Describe Farm Yard Manure (FYM) in detail.

c) Discuss 'Sources of Water'.

Q4) a) Attempt any two: **[6]**

i) Discuss deficiency symptoms of potassium.

ii) Draw vermiculture box. Discuss about vermiculture.

iii) Discuss about 'Soil Water'.

b) Attempt any two: **[4]**

i) Explain 'Soil temperature'.

ii) Discuss surface soil and subsoil.

iii) Explain 'microorganisms in the soil.