

[This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 5959 I

Unique Paper Code : 2172521201

Name of the Paper : DSC : Chemical Bonding
and Elements in
Biological System

Name of the Course : B.Sc.(P) Life Sciences

Semester : II

Time : 2 Hours Maximum Marks : 60

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **FOUR** questions.
- (c) **All** questions carry equal marks.

1. (a) Define lattice energy and solvation energy. What is the role of these terms in deciding the solubility of ionic solids ?

(b) Based on the Molecular Orbital Theory, explain the paramagnetic and diamagnetic behaviour of B_2 and C_2 .

P.T.O.

कालिन्दी महाविद्यालय पुस्तकालय
KALINDI COLLEGE LIBRARY

(c) Explain the hybridization and give shapes of the following molecules : SF_6 , NH_3 and PF_6^- .
5,5,5=15

2. (a) Explain, why the bond angles of H_2O , H_2S and H_2Se are different in the order $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se}$ despite having same geometry ?

(b) Draw the molecular orbital diagram of O_2 molecules and arrange the following in order to their increasing bond order, O_2 , O_2^- , O_2^{2-} , O_2^+ , and O_2^{2+} .

(c) Based on the Molecular Orbital Theory, explain, why He_2 molecule does not exist ?
5,5,5=15

4. (a) Using suitable examples, classify the essential and non - essential elements in an animal cell ?

(b) Elaborate on the mechanism and working of sodium - potassium pump. Discuss it's importance in regulating a cell.

(c) Draw the MO diagram of CO molecule. Discuss the bond strength of CO and CO^+ .
5,5,5=15

4. (a) Explain the decreasing bond angle in the order $\text{NO}_2^+ > \text{NO}_2 > \text{NO}_2^-$ on the basis of VSEPR.
- (b) Describe how Born - Haber Cycle is used for calculating lattice energy of NaCl.
- (c) How calcium help in the process of blood clotting ? 5,5,5=15
5. (a) Explain Fajan's rules and on the basis of this rule compare the covalent character in the following compounds :
- (i) NaCl and CuCl
- (ii) AgCl and AgI
- (b) (i) Explain, why the melting point of NaCl is higher than that of AlCl_3 .
- (ii) Why CuCl is insoluble while NaCl is soluble in water.
- (c) Predict the type of hybridization and shape of the following species using Valence Bond Theory :
- (i) CO_3^{2-}
- (ii) XeF_2
- (iii) ClF_3
- (iv) H_2O
- (v) IF_5 5, 5, 5 = 15

6. (a) The experimental lattice energy of SnO_2 is $-11596 \text{ KJmol}^{-1}$. Calculate ΔH_f of SnO_2 . Given $S_{(\text{sn})} = 292 \text{ KJ/mol}$, $D_{(\text{O}_2)} = 454 \text{ KJ/mol}$, $I_{(\text{Sn}^{4+})} = 890 \text{ KJ/mol}$ and $E_{(\text{O}^{2-})} = 636 \text{ KJ/mol}$.
- (b) The dipole moment of H-X molecule is 1.92 D and bond distance is $1.20 \text{ \AA}$. Calculate the ionic character of H-X.
- (c) Discuss the toxicity of Lead. Give reasons of its toxicity. How can it be treated ?

5, 5, 5

14

This question paper contains 3 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 5973

Unique Paper Code : 2232521201

Name of the Paper : Cell and Development Biology of Animals

Name of the Course : B.Sc. (P) Life Sciences

Semester : II

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Draw well labelled diagrams wherever required.

Attempt four questions in all, including

Question No. 1 which is compulsory.

All parts of a question to be attempted together.

1. (a) Define the following terms (any four) :

4

(i) Capacitation

(ii) Tight junctions

(iii) Gastrulation

(iv) Fate maps

(v) Epigenesis.

कालिन्दी महाविद्यालय पुस्तकालय
KALINDI COLLEGE LIBRARY

P.T.O.

(b) Differentiate between (any three) :

- (i) Meiosis and Mitosis
- (ii) Spermatist and Ovist
- (iii) Gastrula and Neurula
- (iv) Autocrine and Paracrine signaling.

(c) Name the germ layers from which the following are derived : 5

- (i) Lung
- (ii) Brain
- (iii) Pancreas
- (iv) Liver
- (v) Kidney.

2. (a) Describe the process of spermatogenesis in mammals with the help of well labelled diagrams. 10

(b) Add a note on morphogenetic movements. 5

3. (a) Describe the major morphological and physiological changes during metamorphosis in amphibians. Give a detailed account of hormonal regulation of metamorphosis in amphibian. 10

(b) Briefly describe cortical reaction and its role in blocking polyspermy. 5

4. (a) What is the importance of checkpoints in cell cycle ? Give an account of the role of various Cdk-Cyclins during cell cycle regulation. 10
- (b) Explain how Prophase I is different from Prophase II. What do you understand by reductional division ? 5
5. (a) Describe Gastrulation in chick. What is the importance of primitive streak and Hensen's node ? 10
- (b) Describe the different types of tissues and their roles in the body. 5
6. Write short notes on any *three* of the following : 5,5,5
- (a) Planes and pattern of cleavage
- (b) Extra embryonic membrane in birds
- (c) Types of Egg
- (d) Von-Baer Laws.

15
[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5871

J

Unique Paper Code : 2162512401

Name of the Paper : Ecology and Evolution

Name of the Course : **B.Sc. Life Science**

Semester : IV

Duration : 3 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt four questions in all, including question number 1, which is compulsory.
3. All questions carry equal marks.
4. All parts of a question must be answered together.
5. Draw diagrams wherever required.

कालिन्दी महाविद्यालय पुस्तकालय
KALINDI COLLEGE LIBRARY

P.T.O.

1. (a) Define the following (any five): (1x5=5)

- (i) Ecotone
- (ii) Biome
- (iii) Homology
- (iv) Climax community
- (v) Soil texture
- (vi) Phylogeny

(b) State True/ False for the following statements (any five). (1x5=5)

- (i) The diversification of life on Earth over long periods of time is an example of microevolution.
- (ii) Sister taxa along with their common ancestor forms a clade in the phylogenetic tree.
- (iii) The zone of eluviation is the part of a soil profile where materials like clay particles, humus and salts accumulate from other layers.
- (iv) Competition and predation influence population growth irrespective of population density.

(v) Regeneration of forest after land slide is an example of secondary succession.

(c) Match the following: (1x5=5)

- | | |
|--------------------|-----------------|
| (i) Ginkgo biloba | A. Fossil |
| (ii) Orchids | B. Symbiosis |
| (iii) Lichens | C. Phylloclade |
| (iv) Stromatolites | D. Paleoendemic |
| (v) Opuntia | E. Commensal |

2. With the help of well labelled diagrams, explain any three of the following: (5x3=15)

- (i) Soil Profile
- (ii) Survivorship curves
- (iii) Hydrosere
- (iv) Nitrogen cycle

3. Differentiate between the following (any three): (5x3=15)

- (i) Biological species concept and Phylogenetic species concept

- (ii) Paleoendemics and Neoendemics
 - (iii) Sciophytes and Heliophytes
 - (iv) Natural selection and artificial selection
4. (a) Describe the various types of ecological pyramids? (5)
- (b) Explain the Y-shaped energy flow model in an ecosystem. (5)
- (c) Discuss the history of life on earth briefly with appropriate examples. (5)
5. (a) Define the term Phytogeography. Name the different botanical provinces of India. Give elaborate accounts of any two. (8)
- (b) What is speciation? Explain the different modes through which speciation occurs. (7)

This question paper contains 3 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 5918

Unique Paper Code : 2232522401

Name of the Paper : DSC : Fundamentals of Human Physiology

Name of the Course : B.Sc. (Prog.) Life Sciences

Semester : IV (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any four questions in all, including

Question No. 1 which is compulsory.

All questions carry equal marks.

Draw well labelled diagram wherever necessary.

1. (a) Define the following (any three) : 3

(i) Summation

(iii) Peristalsis

(iii) Chloride Shift

(iv) Spermiation

(b) Differentiate between the following (any three) : 6

(i) Voltage gated and Ligand gated ion channels

(ii) External respiration and Internal respiration

P.T.O.

(iii) Action Potential and Graded potential

(iv) Electrical and Chemical Synapse

(c) Give the location and function of the following (any three) : 3

(i) G cells

(ii) Juxtaglomerular apparatus

(iii) Nissls granules

(iv) Myomesin

(d) Expand the following abbreviations (any three) : 3

(i) IGF

(ii) ACE

(iii) FEV^e

(iv) EPSP

2. (a) Explain the process of origin and propagation of cardiac action potentials. 8

(b) Diagrammatically explain the sliding filament mechanism of muscle contraction. 7

3. (a) Discuss the roles of enzymes involved in the digestion of carbohydrates in the alimentary canal. Also add a note on absorption of carbohydrates. 10

(b) Explain the role of bile salts in the emulsification of fats. 5

4. (a) Describe the oxygen-hemoglobin dissociation curve. How do various factors affect it ? 8
- (b) Write a short note on the structure and function of Adrenal gland. 7
5. (a) Explain the process of formation of diluted urine. 8
- (b) Elaborate on the Menstrual cycle and discuss its hormonal control. 7
6. Write short notes on any *three* : 3×5=15
- (a) Spermatogenesis
- (b) Structure and function of pituitary gland
- (c) Resting membrane potential
- (d) Pulmonary ventilation.

17
[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5854

J

Unique Paper Code : 2172523601

Name of the Paper : DSE – Conductance,
Electrochemistry and
Chemical Kinetics

Name of the Course : B.Sc. Life Science

Semester : VI

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all, question No. 1 is compulsory.
3. The answers should be numbered in accordance to the number in the question paper.
4. Use of Scientific Calculator is permitted.

कालिन्दी महाविद्यालय पुस्तकालय
KALINDI COLLEGE LIBRARY

P.T.O.

$$(R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} \quad k = 1.38 \times 10^{-23} \text{ J K}^{-1} \quad N_A = 6.023 \times 10^{23})$$

1. Answer any Five

(3×5)

(a) Differentiate between order and molecularity of a reaction giving examples.

(b) The molar conductance of an electrolyte solution increases, whereas its specific conductance decreases with dilution. Explain.

(c) Why it is not possible to determine the equivalent conductance of a weak electrolyte at infinite dilution by direct measurement using conductivity meter?

(d) A finely powdered substance is more effective catalyst. Why?

(e) Why a first order reaction never reaches completion?

(f) Draw labelled energy profile diagrams for endothermic and exothermic reaction using a catalyst.

2. (a) State Kohlrausch's law of independent migration of ions. How does it help in determination of equivalent conductance at infinite dilution of weak electrolytes? (5)

(b) If the molar conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126, 420, and $91 \text{ S cm}^2 \text{ mol}^{-1}$ respectively, calculate molar conductance of acetic acid at infinite dilution. (5)

(c) Calculate the transference numbers of H^+ and Cl^- ions from the following data obtained from the moving boundary method using cadmium chloride as indicator electrolyte, Given:

Atomic mass of Ag = 108 g mol^{-1}

Concentration of HCl solution = 0.1 N

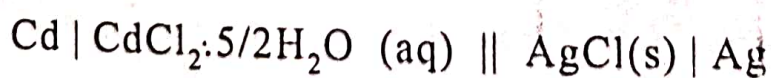
Mass of Ag deposited in the coulometer = 0.1209 g

Movement of boundary = 8.5 cm

Cross-section of the tube = 1.1 cm^2 . (5)

3. (a) What is meant by transference number? Describe the Hittorfs method to determine experimentally the transference number of ions. (5)

(b) For the electrochemical cell :



18
This question paper contains 3 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 5868

Unique Paper Code : 2232523601

Name of the Paper : Basics of Immunology

Name of the Course : B.Sc. Life Sciences (NEP)

Semester : VI

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt four questions including

Question No. 1 which is compulsory.

Draw well-labelled diagrams wherever necessary.

1. (a) Define the following (any four) :

4×1=4

(i) Granuloma

(ii) Hapten

(iii) Passive immunity

(iv) Anaphylaxis

(v) Autoimmunity

(vi) Opsonin.

P.T.O.

कालिन्दी महाविद्यालय पुस्तकालय
KALINDI COLLEGE LIBRARY

(b) Differentiate between the following (any *two*) :

(i) Cell-mediated and humoral immunity

(ii) T and B cell epitopes

(iii) T helper and T cytotoxic cell.

(c) Give the immunological significance of the following (any *three*) : $3 \times 1 = 3$

(i) Interferons

(ii) Calnexin

(iii) Lysozyme

(iv) NK cells.

(d) Justify the following :

4×1=4

(i) The secondary immune response is faster and stronger than the primary immune response.

(ii) IgM antibody is considered to be effective in agglutination and complement activation.

(iii) All antigens are not immunogens.

(iv) T cells are said to be self-MHC restricted.

2. (a) Define Immunogenicity. Discuss the various factors that influence the degree of immunogenicity. 7

(b) Discuss the general structure and biological function of antibody molecules. 8

3. (a) Describe the various types of barriers involved in innate immune responses. 7
- (b) Briefly discuss the attributes of adaptive immunity. Differentiate between primary and secondary immune response. 8
4. (a) Differentiate between structure and function of Class I and Class II MHC molecules. 7
- (b) What is antigen processing and presentation. Illustrate the processing and presentation of exogenous antigens. 8
5. (a) Discuss the properties and functions of cytokines. 7
- (b) Describe types of hypersensitivities on the basis of Gell and Coomb's classification. 8
6. Write short notes on (any *three*) : 3×5=15
- (a) Clonal selection theory
- (b) Vaccines
- (c) Immunodeficiency with suitable examples
- (d) Alternate pathway of complement activation.