

[This question paper contains 4 printed pages.]

12

01/12/17

Your Roll No.....

Sr. No. of Question Paper : 5005 H  
Unique Paper Code : 234191  
Name of the Paper : Computational Skills  
Name of the Course : B.Sc. Math. Sc. / B.Sc. (Prog.) / B.Sc. (Hons.)  
Semester : I  
Duration : 3 Hours Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is Compulsory.
3. Answer any five questions out of the remaining questions (Q2-Q7).

1. (a) Identify the generation that saw the development and introduction of minicomputers. What was the prominent technology used in this generation? (2)

(b) Expand the following abbreviations :-

VLSI, GIGO. (2)

(c) Expand the terms Bit and IC. (2)

P.T.O.

- (d) Who is considered father of modern digital computers?  
Name the machine that he designed to create reliable tables. (2)
- (e) Name the commonly used device used for
- Reading the codes on products, in a supermarket store
  - Reading the cards in ATMs (2)
- (f) Find the two's complement of  $(101101)_2$ . (2)
- (g) Identify the different image formats in which a file can be saved. (2)
- (h) Name any two devices commonly used to connect two or more networks to form a single network. (2)
- (i) Distinguish between a byte and a nibble. (2)
- (j) What does the term 32-bit register imply in computer terminology? (2)
- (k) What is the maximum number that can be represented when word size of memory is N bits? (2)
- (l) Differentiate between Primary and Secondary Storage. (2)
- (m) What are the various uses of Internet? (1)
2. (a) Draw a fully labelled block diagram to illustrate the basic organization of a computer system. Explain each unit in brief. (5)

- (b) Identify the following registers and their respective functionalities
- PC
  - MAR
  - AC
  - IR
  - MBR (5)
3. (a) Perform the following conversions
- $(2BD)_{16} == (\dots\dots)_2$
  - $(1101101)_2 = (\dots\dots)_{10}$
  - $(2537)_8 = (\dots\dots)_{10}$  (3×2=6)
- (b) Perform the following binary operations
- $(1010110)_2 + (1011010)_2$
  - $(010010)_2 - (100011)_2$  (2×2=4)
4. (a) What is an algorithm? Identify the characteristics of an algorithm. (5)
- (b) Write an algorithm to accept the names and cumulative grades of 20 students and print the names of those students only who have got a grade "A". (5)

5. (a) What is MAN? Identify its main objective. Mention any two communicative links commonly used for MAN. (5)
- (b) Classify the following into unimedia and multimedia devices
- (i) Home theatre
  - (ii) Newspaper
  - (iii) A smart phone
  - (iv) Radio
  - (v) A botany text book with diagram (5)
6. (a) State and explain any five applications of Multimedia. (5)
- (b) Differentiate between Gateway and Router. (5)
7. Write short notes on any two of the following :
- (a) Network Topology
  - (b) Generations of Computer
  - (c) Client Server Architecture (5×2=10)

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[This question paper contains 5 printed pages.]

Your Roll No. 19117

Sr. No. of Question Paper : 5007 H  
Unique Paper Code : 235166  
Name of the Paper : Maths-I Calculus and Matrices  
(MAPT-101)  
Name of the Course : B.Sc. (Hons.) Computer Science/  
B.Sc. (Mathematical Sciences)/  
B.Sc. (Physical Sciences)  
Semester : I  
Duration : 3 Hours Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **two** questions from each section.

**SECTION I**

1. (a) Show that the set  $\{(5, 0), (1, 1)\}$  is a basis for  $\mathbb{R}^2$ .  
(b) Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be defined by  $T([x, b]) = [x, 0]$

Show that  $T$  is a linear transformation.

P.T.O.

- (c) Find the characteristic equation, eigen values and eigen vector corresponding to anyone eigen value for the matrix

$$\begin{pmatrix} 3 & 1 & 2 \\ 0 & 1 & -1 \\ 2 & 4 & 6 \end{pmatrix} \quad (4,4,4)$$

2. (a) Examine which of the following is a subspace of  $\mathbb{R}^2$ . Also justify

$$U = \{(a, 0); a \in \mathbb{R}\}$$

$$V = \{(1, y); y \in \mathbb{R}\}.$$

- (b) Find the inverse of the matrix using E-row operations

$$\begin{pmatrix} 1 & -1 & 1 \\ 4 & 1 & 0 \\ 8 & 1 & 1 \end{pmatrix}$$

- (c) Let  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be defined by  $T(x, y) = (-y, -x)$

Show that T is a Linear Transformation. (4,4,4)

3. (a) Find the rank of the matrix using E-row operations

$$\begin{pmatrix} 1 & 3 & 0 \\ 1 & 1 & 2 \\ 1 & -2 & -3 \end{pmatrix}$$

- (b) Show that the only real value of  $\lambda$  for which the following equations haven on-zero solution.

$$x + 2y + 3z = \lambda x$$

$$3x + y + 2z = \lambda y$$

$$2x + 3y + z = \lambda z.$$

- (c) Define subspace of a vector space. Give one example. (4,4,4)

## SECTION II

4. (a) Use definition, to show that the sequence  $\left(\frac{1}{n^2+1}\right)$  converges to 0.

- (b) Find the nth derivative of  $y = \cos^4 x$ .

- (c) Sketch the graph of  $y = |x + 2| - 1$ . Mention the transformation used at each step. (6,6,6)

5. (a) Show that

$$f(x, y) = e^{-y} \cos x$$

satisfies Laplace's equation.

(b) Radium is known to decay at a rate proportional to the amount present. If half-life of radium is 1600 years, what percentage of radium will remain in a given sample after 800 years?

(c) If  $v = \log(x^2 + y^2 + z^2)$ , show that

$$x \frac{\partial^2 v}{\partial y \partial z} = y \frac{\partial^2 v}{\partial x \partial z} = z \frac{\partial^2 v}{\partial x \partial y} \quad (6,6,6)$$

6. (a) Draw the level curves of

$$f(x, y) = \sqrt{4 - x^2 - y^2}$$

of height 1, 2 and 5.

(b) If  $y = (\sin^{-1}x)^2$ , show that

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0.$$

(c) Find the Maclaurin's series expansion for  $f(x) = \cos \frac{x}{2}$ ,

$$\text{assuming that } \lim_{n \rightarrow \infty} R_n(x) = 0. \quad (6,6,6)$$

### SECTION III

7. (a) Find the radius and centre of the circle whose equation is :

$$z\bar{z} - (2 + 3i)z - (2 - 3i)\bar{z} + 9 = 0.$$

(b) Show that

$$(1 + \cos\theta + i \sin\theta)^n + (1 + \cos\theta - i \sin\theta)^n = 2^{n+1} \cos^n \frac{\theta}{2} \cos n \frac{\theta}{2}.$$

(4,3.5)

8. (a) Solve the equation .

$$z^4 + 1 = 0$$

(b) Show that the points  $1 + 6i$ ,  $3 + 10i$  and  $4 + 12i$  are collinear. (4,3.5)

9. (a) Form an equation in the lowest degree with rational coefficients having  $2 + \sqrt{3}$  and  $\sqrt{5} - 2$  as two of its roots.

(b) Write down all the values of  $(\sqrt{3} + i)^{1/3}$ . (4,3.5)

(14)

01/12/17

This question paper contains 4 printed pages.

Your Roll No. ....

Sl. No. of Ques. Paper: 5009

H

Unique Paper Code : 203191

Name of Paper : Technical Writing and  
Communication in English

Name of Course : B.Sc. (Hons.) / B.Sc. (Prog.) /  
Math. Sc.

Semester : I

Duration : 3 hours

Maximum Marks : 75

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

All questions are compulsory.

1. Write short notes in about 75 words on any *three* of the following:

(a) Advantages of oral communication

(b) Non-verbal communication

(c) Advantages of grapevine

(d) Process of communication

(e) Formal patterns of communication.

3×5=15

2. Answer *either* (a) or (b):

(a) Using the thesis statement given, write an essay of 3 paragraphs in about 200 words:

P. T. O.

Canteens in educational institutions should mandatorily serve only healthy foods. 20

Or

- (b) (i) Using the topic sentence given, write a paragraph of about 100 words:

Joint families have their own advantages. 10

- (ii) Write the introductory and the concluding paragraph, in about 50 words each, to the passage given below:

Social networking technologies also allow one to share a thought or two. They help people at one end of the world to connect and exchange ideas with people at the other end of the world. Young people may also socialise and make friends: They can learn new things by interacting with each other and sharing knowledge. 10

3. (a) On behalf of the Principal, ABC College write a memorandum to the Accounts Officer to submit accounts details of the cultural festival of the college within a scheduled time.

Or

- (b) As Secretary of the Residents Welfare Association (RWA) of your colony, write the minutes of a meeting of the Association on holding a Diwali Mela in the colony. 10

4. (a) Prepare a report of a National Seminar organised by your Department in the college, which has to be submitted to the Teacher-in-Charge of the Department.

Or

- (b) Write the sample manual of the latest product purchased by you, by covering all the steps and leaving out long details. 10

5. Rewrite as directed: 1×10=10

- (a) Change the voice:

- (i) All the garments arranged for the tour were kept back carefully in the cupboard.  
(ii) I was told the harsh but true facts.

- (b) Change the following sentences from direct to indirect speech or *vice-versa*:

- (i) I told my friends, "I have no idea when I am going."  
(ii) The music teacher warned the children against getting carried away.

- (c) Change the following sentences:

- (i) The woman in yellow saree was the Principal of the college. (To interrogative)  
(ii) What a lovely morning! (To negative)

- (d) Provide one-word substitute:

A doctor who specialises in the diseases of eyes.

(e) Choose the right word to fill in the blank.

(i) — my warning, they went ahead with their plan. (Despite / Besides)

(ii) The passenger lost his briefcase — sleeping in the train. (when/while)

(f) Punctuate:

he taught her how to fish I gasped

6. The following passage has 10 errors. Identify the errors and correct them.

A passengers were waiting at the station when five policemen rushing into difference compartments of a train. After sometimes one of them comes out with two young men and, soon the other policemen joined her. The men which had been arrested was been caught for a theft. A young woman had reported off a big theft at her home when her family were away. 10

(15)

[This question paper contains 6 printed pages.]

Your Roll No. 13/12/17

Sr. No. of Question Paper : 5011

H

Unique Paper Code : 217153/217181

Name of the Paper : CHEMISTRY, CHCT-101 (Credit Course-I)

Name of the Course : B.Sc. Mathematical Sciences / B.Sc. (Hons.) / B.Sc. (Hons.) Math.

Semester : I/III

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt 3 questions from **Section A** and 3 questions from **Section B**.
3. Indicate the section you are attempting by putting a heading and do not intermix the sections.
4. The questions should be numbered in accordance to the number in the question paper.
5. Calculators and log tables may be used.

P.T.O.

## SECTION A

(Attempt three questions in all.)

1. (a) Calculate the lattice energy of NaCl(s) from the following data by the use of Born-Haber cycle :

Sublimation energy of Na(s)  $\Delta H_{\text{sub}} = 108.7 \text{ KJ/mol}$

Bond dissociation energy of  $\text{Cl}_2(\text{g})$   $\Delta H_{\text{BE}} = 225.9 \text{ KJ/mol}$

1<sup>st</sup> ionization energy of Na(g),  $\Delta H_{\text{IEI}} = 489.5 \text{ KJ/mol}$

Electron affinity of Cl(g),  $\Delta H_{\text{EA}} = -351.4 \text{ KJ/mol}$

Heat of formation of NaCl,  $\Delta H_{\text{f}} = -414.2 \text{ KJ/mol}$

(4)

- (b) State Bent's rule. Predict the stability of  $\text{PCl}_3\text{F}_2$  as compared to  $\text{PF}_3\text{Cl}_2$  on the basis of Bent's rule. (4)

- (c) What is trans-effect? In the light of trans effect, discuss the method for preparation of *cis*- and *trans*- $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ . (4.5)

## OR

Discuss the outer sphere and inner sphere mechanism for electron transfer reaction of complexes with suitable examples. (4.5)

2. (a) Predict the shapes of  $\text{ICl}_2^-$ ,  $\text{PCl}_4^+$ ,  $\text{OF}_2$ . (3)

- (b) Discuss the effect of inter- and intra-molecular hydrogen bonding on solubility and melting point of the compounds with suitable examples. (4)

- (c) Sketch molecular orbital energy level diagram for oxygen molecule ( $\text{O}_2$ ). Write its electronic configuration and comment on its magnetic properties. Also compute the bond order of  $\text{O}_2^+$ . (5.5)

3. (a) Write the Born-Landé equation for ionic compounds. Describe the importance of 'A' (Madelung constant) in the equation using suitable example. (4)

- (b) Calculate the limiting radius ratio of cation to that of anion (in which the cation is in contact with anions) when co-ordination number of the cation is four. (3)

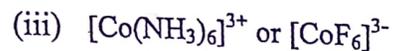
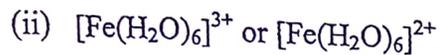
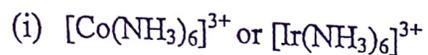
- (c) Give the hybridization of the central atom in  $\text{SO}_2$ ,  $\text{IO}_3^-$ ,  $\text{PCl}_5$ . (3)

- (d) Differentiate between inert and labile complexes with suitable examples. (2.5)

4. (a) Explain why  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  is soluble in water whereas  $\text{BaSO}_4$  is insoluble? (2)

- (b) Draw the crystal field splitting (CFT) diagram of  $[\text{CoF}_6]^{3-}$ . How will you account for its paramagnetic character on the basis of CFT? (3)

(c) Which of the complex has higher magnitude of  $\Delta_0$  in each of the following sets and why?



(4.5)

(d) In square-planar complex, the crystal field splitting energy of the d-orbitals of the central ion decreases in the sequence  $dx^2 - y^2 > dxy > dz > dxz, dyz$ . Explain.

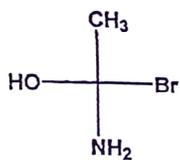
(3)

### SECTION B

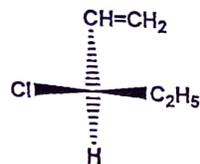
(Attempt three questions in all.)

1. (a) Using sequence rules, assign R/S configuration to the chiral carbon(s) in the following molecules describing the steps involved :

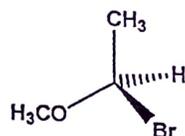
(8)



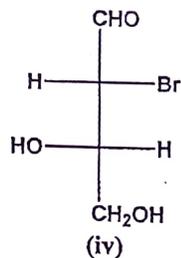
(i)



(ii)



(iii)

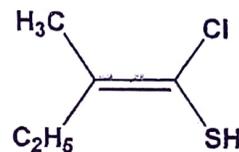


(iv)

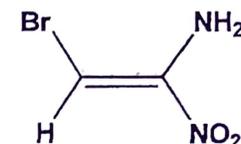
(b) Write all possible Newman projection formulae for the various conformational stereoisomers of *n*-butane and name them all.

(4.5)

2. (a) Using sequence rules assign E/Z notations to the following geometrical isomers :



(i)



(ii)

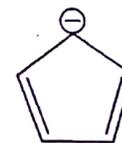
(3)

(b) Write and draw two different conformations of cyclohexane and give their relative stability. (3)

(c) With the help of Huckel's rule, indicate whether the following cyclic compounds are aromatic or not. (4)



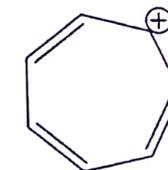
(i)



(ii)



(iii)



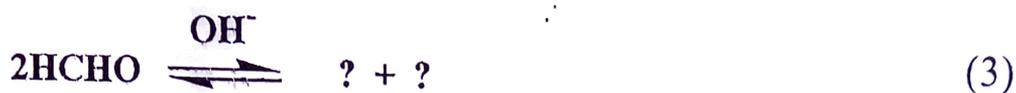
(iv)

(d) Explain why *N*-methyl aniline is more basic than aniline. (2.5)

3. (a) Why the chlorination of nitrobenzene gives *m*-chloro nitrobenzene while that of bromobenzene gives *o*- and *p*-chloro bromobenzene? (2.5)

(b) Give, with reasons, the order of acidity of  $\text{CH}_3\text{COOH}$ ,  $\text{CH}_3\text{OH}$  and  $\text{HCOOH}$ . (3)

(c) Give products with mechanism of the following reaction :



(d) Differentiate between the following : (2+2)

(i) Natural and synthetic rubber.

(ii) Addition and condensation polymerization (with suitable example(s)).

4. (a) Discuss and give mechanism of the following name reactions :

(i) Aldol condensation

(ii) Claisen condensation (8)

(b) Explain the formation of different products when 3,3 - dimethyl- 1-butene is treated with :

(i) Hydrobromic acid (HBr)

(ii) Hydrobromic acid in the presence of benzoyl peroxide in a non-polar solvent (2+2.5)

[This question paper contains 6 printed pages.]

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5/12/17  
Your Roll No.....

Sr. No. of Question Paper : 5043

H

Unique Paper Code : 217161

Name of the Paper : CHPT-101 : CHEMISTRY – I

Name of the Course : B.Sc. (Prog.) Physical Sci. / Life  
Sci. / Applied Sci.

Semester : I

Duration : 3 Hours

Maximum Marks : 75

### Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Three** questions from **Section-A** and **Section-B** respectively.

### SECTION – A

1. (a) Write the Schrodinger's wave equation. Explain the terms involved in it.  
(b) Plot the radial distribution curves for 3p, 3d orbitals.  
(c) Why half-filled and fully filled orbital systems are more stable?

P.T.O.

- (d) Write the values of three quantum number's (n, m, l) for electron in 4f and 3d orbitals.
- (e) Draw the shape of d orbitals. Indicating the sign of wave function. (2,2,2½,3,3)
2. (a)  $\text{BeCl}_2$  has zero dipole moment while  $\text{H}_2\text{S}$  has some value.
- (b) Write Born Lande's equation for calculating lattice energy. Explain all the terms in it.
- (c) Calculate the % ionic character of Si-H bond in  $\text{SiH}_4$ . Pauling electronegativity of Si and H are 1.4 and 2.1, respectively.
- (d) Discuss the lattice energy.
- (e) Which cation will exert a greater polarizing power in the following cases? Explain.
- (i)  $\text{Na}^+$  or  $\text{Mg}^{2+}$  (ii)  $\text{Cu}^{2+}$  or  $\text{Ca}^{2+}$  (2½,2½,2½,2,3)
3. (a) Discuss the hybridization of the central atom and geometry of the following molecules/ions.
- $\text{XeF}_4$ ,  $\text{SO}_4^{2-}$ ,  $\text{NH}_3$ ,  $\text{I}_3^-$
- (b) Draw the resonance structure of  $\text{CO}_3^{2-}$ .

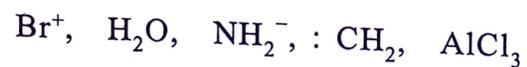
- (c) State the fundamental rules of VSEPR theory.
- (d) Explain the diamagnetic behaviour of  $\text{N}_2$  molecule with the help of M.O. diagram. (4,2½,3,3)
4. (a) Explain the Born Haber Cycle with suitable example. (3½)
- (b) Write short notes on any **three** of the following :
- (i) Hybridization
- (ii) Fajan's Rule
- (iii) Dipole moment
- (iv) Solvation energy (3,3,3)

**SECTION - B**

5. (a) Explain the following :
- (i) Benzyl free radical is more stable than methyl free radical.
- (ii) Boat conformation of cyclohexane is less stable than chair conformation of cyclohexane.

(iii) Ethylamine is more basic than aniline.

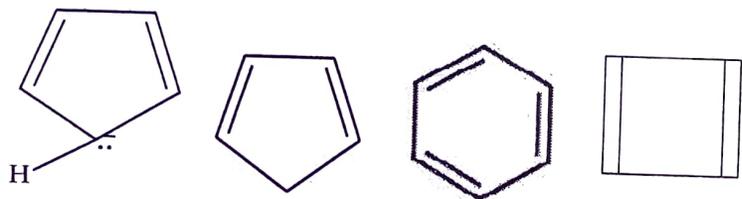
(b) Classify the following as electrophiles and nucleophile:



(c) How many stereoisomers are possible for 2, 3 - dibromobutane? Write their structures and give their relationship with each other. (6, 2½, 4)

6. (a) Give a chemical test to distinguish between but-1-yne and but-2-yne.

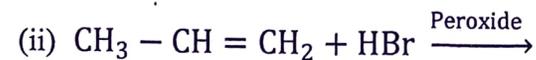
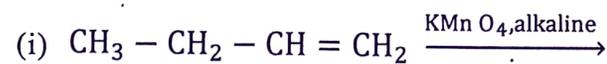
(b) Explain which of the following are aromatic in nature :



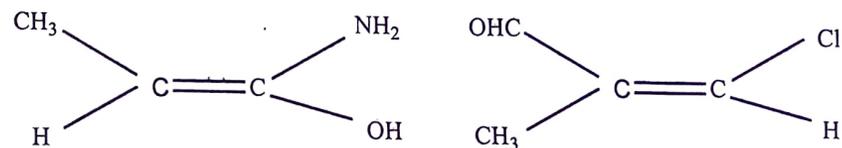
(c) Draw Newmann projection for different conformations of n-butane. Which of the conformation is most stable and why? (1½, 6, 5)

7. (a) Methane and chlorine react in presence of light to give chloromethane. Give mechanism for this reaction.

(b) Complete the following reactions :

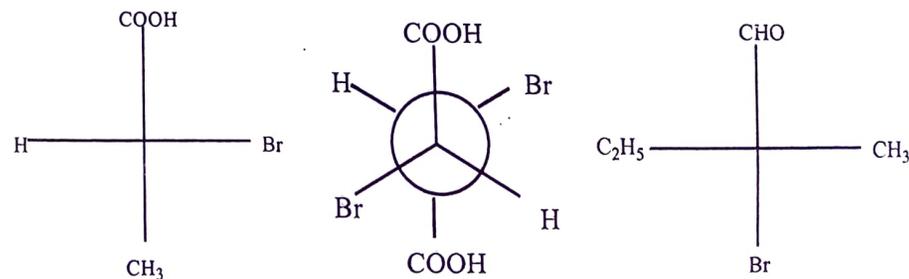


(c) Giving priority, assign E-/ Z- to the following :



(2½, 6, 4)

8. (a) Assign R-/S- configuration to each of the following :



(b) Write short notes on any **two** of the following :

(i) Wurtz reaction

(ii) Ozonolysis of alkenes

(iii) Geometrical isomerism

(c) Differentiate between meso compound and racemic mixture.

(6,5,1½)

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[This question paper contains 3 printed pages.]

Your Roll No.....1112117

Sr. No. of Question Paper : 5048

H

Unique Paper Code : 217163

Name of the Paper : ICPT-101-Industrial Chemistry-I

Name of the Course : B.Sc. (Prog.) Applied Physical  
Science (Industrial Chemistry)

Semester : I

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt Six questions in all including Question No. 1 which is compulsory.

1. Write informative note on of the following: (any three)

(a) Ozone depletion : Causes and consequences

(b) Van-Arkel method for the purification of metals

(c) Greenhouse Gases

P.T.O.

- (d) Ion exchange method for the water purification
- (e) Solvent extraction (5×3)
2. (a) Describe the method of manufacture of sulphuric acid by contact process. (8)
- (b) Write four applications each of bleaching powder and sodium thiosulphate. (4)
3. (a) Differentiate the following with suitable example.
- (i) Minerals and Ores
- (ii) Gangue, Flux and Slag (6)
- (b) Discuss the uses and hazards of chlorine and sulphur dioxide. (6)
4. (a) Describe the air pollution caused by oxides of Nitrogen. Discuss their source and control procedure. (8)
- (b) State Nernst Distribution law. What are its limitations? (4)
5. (a) Characterise different water pollutants and discuss the biochemical effects of some important water pollutants. (8)

- (b) Distinguish between absorption and adsorption with suitable example. (4)
6. (a) Write a short note on incineration method of waste disposal. How is it advantageous over other methods? (7)
- (b) Discuss the sources of particulates and their effects on environment. (5)
7. (a) Briefly illustrate water treatment by aerobic and anaerobic sludge process. (7)
- (b) What is the principle of Reverse Osmosis? How it helps in desalination/purification of water. (5)
8. (a) What is photochemical smog? How is it forms in atmosphere? Discuss its major consequences. (8)
- (b) Discuss BOD and DO as water quality parameter. How they are related to each other? (4)

[This question paper contains 4 printed pages.]

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Your Roll No.....

15/12/17

Sr. No. of Question Paper : 5049

H

Unique Paper Code : 216/223/151

Name of the Paper : Introduction to Biology (Biology-I)

Name of the Course : B.Sc. (Hons.) / B.Sc. (Prog.)

Semester : I / III

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Five** questions in all, including Question No. 1 which is compulsory.

1. (a) Define the following terms :

- (i) Acid precipitation
- (ii) Chaperonin
- (iii) Protobionts
- (iv) Enantiomers
- (v) Gene

(5)

P.T.O.

(b) Differentiate between the following :

(i) Starch & cellulose

(ii) Microevolution & macroevolution

(iii) Nucleotide & nucleoside

(iv) Polar & nonpolar covalent bonds

(v) Prokaryotes & eukaryotes (5)

(c) State whether the following statements are true or false :

(i) Cellulose is indigestible in human digestive tract.

(ii) RNA is chemically more stable than DNA.

(iii) Halophiles live in extreme temperature conditions.

(iv) Wings of bats and flippers of whales are homologous structures.

(v) Casein is a transport protein. (5)

2. (a) What are the four emergent properties of water that contribute to earth's suitability for life? (6)

(b) Explain the various evidences supporting evolution. (9)

3. (a) Describe the distinctive characteristics of the three domains of living organisms. (9)

(b) Compare the process of discovery science with hypothesis-based science. (6)

4. (a) Describe the flow of genetic information from DNA to RNA to protein, with suitable illustrations. (10)

(b) Explain the origin of eukaryotes through endosymbiosis. (5)

5. (a) Describe the various types of polysaccharides and their functions. (9)

(b) Describe how carbon can form large, complex and diverse organic molecules. (6)

6. (a) What are the different levels of protein structure? Explain. (9)

(b) Explain the biological species concept. What are its limitations? (6)

7. Write short notes on any **three** of the following :

(a) Archaea

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4

(b) Mass extinction

(c) Phospholipids

(d) Artificial selection

(e) Ecosystem

(5,5,5)

(5,

[This question paper contains 4 printed pages.]

Your Roll No. ....

Sr. No. of Question Paper : 5050

H

Unique Paper Code : 222161

Name of the Paper : PHYSICS – I : Mechanics (PHPT-101)

Name of the Course : B.Sc. Physical Science / Applied Physical Sciences

Semester : I

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. 1 is compulsory.
4. Attempt **four** questions from the rest of the paper.

1. Attempt any **five** of the following : (5×3=15)

(a) Show that if  $\frac{d|\vec{A}|}{dt} = 0$  then  $\vec{A}$  is perpendicular to  $\frac{d\vec{A}}{dt}$ .

- (b) Differentiate between conservative and non conservative forces.
- (c) What was the motivation behind Michelson- Morley experiment?
- (d) Explain the advantage of centre of mass system.
- (e) Define torque and angular momentum and give their units.
- (f) The speed of planet revolving around the Sun in an elliptical orbit increases, when moving closer to the Sun. Explain why?
- (g) Show that for low velocities Lorentz transformations reduce to Galilean transformation.
2. (a) State and prove law of conservation of mechanical energy. (7)
- (b) Prove that a conservative force is equal to negative gradient of potential energy. (5)
- (c) A disc and a ring of same mass  $M$  and radius  $R$  are rolling down an inclined plane, both starting from rest. Which one will have more kinetic energy. Explain. (3)

3. (a) Derive an expression of torsional rigidity for (i) solid cylinder and (ii) hollow cylinder. (10)
- (b) Define Poisson's ratio and derive mathematically its limiting values. (5)
4. (a) Determine the moment of inertia of a solid sphere of mass  $M$  and radius  $R$  about (i) its diameter and (ii) its tangent. (10)
- (b) Calculate the angular momentum and kinetic energy of a uniform circular disc of mass 100 g and diameter 10 cm, making 100 revolutions / minute about its axis. (5)
5. (a) Derive an expression for length contraction for a body of length  $L$  moving with a velocity  $v$  in a direction making an angle of  $30^\circ$  with its length. (5)
- (b) Two electrons move towards each other with a speed of  $0.9c$  in a Galilean frame of reference. What is their relative speed? (5)
- (c) Explain recessional red shift on the basis of special theory of relativity. (5)
6. (a) State and prove Gauss divergence theorem of vector analysis. (8)

(b) Show that  $\iint \vec{F} \cdot \vec{dS} = 6\bar{V}$  where  $S$  is a closed surface enclosing a volume  $\bar{V}$  and  $\vec{F} = x\hat{i} + 2y\hat{j} + 3z\hat{k}$ . (7)

7. (a) State and prove theorems of parallel and perpendicular axes of moment of inertia. (10)

(b) If the centre of mass of three particles of masses 1, 2 and 3 kg be at the point (3, 3, 3). Where should a fourth mass of 4 kg be placed so that the centre of mass of four particles be at the point (1, 1, 1). (5)

8. (a) Find the work done in joules in stretching a wire of cross section 1.5 sq mm and length 4 m through 0.1 mm if young's modulus for the material of wire is  $2 \times 10^{12}$  dynes/cm<sup>2</sup>. (5)

(b) Calculate the value of Young's modulus for a wire if the modulus of rigidity and Poisson's ratio for the wire are  $1.5 \times 10^{10}$  N/m<sup>2</sup> and 0.25 respectively. (5)

(c) Define central force and prove that it is conservative in nature. (5)

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[This question paper contains 6 printed pages.]

Your Roll No..... 20/12/17

Sr. No. of Question Paper : 5261

H

Unique Paper Code : ES-2014

Name of the Paper : Environmental Studies

Name of the Course : Undergraduate Courses  
[Compulsory & Qualifying]

Semester : I

Duration : 3 hours

Maximum Marks : 75

### Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. **All** questions carry equal marks.
4. Answers may be written either in English or Hindi; but the same medium should be used throughout the paper.

### छात्रों के लिए निर्देश

1. इस प्रश्न-पत्र के मिलते ही ऊपर दिए गए निर्धारित स्थान पर अपना अनुक्रमांक लिखिए ।
2. कोई पाँच प्रश्न कीजिए ।
3. सभी प्रश्नों के अंक समान हैं ।
4. इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिंदी किसी एक भाषा में दीजिए, लेकिन सभी उत्तरों का माध्यम एक ही होना चाहिए ।

P.T.O.

1. (a) Fill in the blanks : (5×1=5)
- (i) Chernobyl disaster is associated with \_\_\_\_\_ radiation.
- (ii) Due to ozone depletion, human beings get more exposed to \_\_\_\_\_ rays.
- (iii) Solid waste material that can be degraded by microorganisms are called \_\_\_\_\_ waste.
- (iv) \_\_\_\_\_ is a biodiversity hotspot in India.
- (v) The Satluj-Yamuna Link canal dispute is between \_\_\_\_\_ and \_\_\_\_\_ states.

(b) Define the following (any five) : (5×2=10)

- (i) Organic waste
- (ii) Pesticide
- (iii) Fossil fuels
- (iv) Poaching
- (v) Biofuels
- (vi) Mangrove forests
- (vii) Coral reefs

(क) रिक्त स्थान भरिए :

- (i) चेरनोबिल आपदा \_\_\_\_\_ विकिरण से जुड़ा हुआ है।
- (ii) ओज़ोन हास के कारण, मनुष्य \_\_\_\_\_ किरणों के संपर्क में ज्यादा आते हैं।

- (iii) ठोस अपशिष्ट पदार्थ जिसे सूक्ष्मजीवों द्वारा अवक्रमित किया जा सकता है से \_\_\_\_\_ कचरा कहा जाता है।
- (iv) \_\_\_\_\_ भारत में एक "जैव-विविधता मुख्यस्थल" है।
- (v) सतलुज-यमुना संपर्क नहर का \_\_\_\_\_ और \_\_\_\_\_ राज्यों के बीच का विवाद है।

(ख) निम्न में से किन्हीं पाँच की परिभाषा दीजिए :

- (i) जैविक अपशिष्ट
- (ii) कीटनाशक
- (iii) जीवाश्म ईंधन
- (iv) अवैध शिकार
- (v) जैव ईंधन
- (vi) मैग्रोव वन
- (vii) मूंगों की चट्टानें

2. Write short notes (any three) : (3×5=15)

- (i) Ganga Action Plan
- (ii) Water crisis in Delhi
- (iii) Scope of Environmental Studies
- (iv) Renewable energy resources in India
- (v) Silent valley movement

किन्हीं तीन पर संक्षिप्त टिप्पणी लिखिए :

- (i) गंगा कार्य योजना
- (ii) दिल्ली में जल संकट
- (iii) पर्यावरण अध्ययनों का दायरा
- (iv) भारत में नवीकरणीय ऊर्जा संसाधन
- (v) स्वामोश घाटी आंदोलन

3. (a) Discuss the major limitations towards successful implementation of environmental legislation in India? (7)

(b) What do you mean by solid waste management? Explain the measures needed for effective management and disposal of Municipal Solid Waste. (8)

(क) भारत में पर्यावरण कानून के सफल कार्यान्वयन की दिशा में प्रमुख सीमाओं पर चर्चा करें।

(ख) ठोस अपशिष्ट प्रबंधन का क्या मतलब है ? नगरपालिका ठोस अपशिष्ट के प्रभावी प्रबंधन और निपटान के लिए आवश्यक उपायों की व्याख्या करें।

4. (a) Explain the role of media in bringing about a pro-environment attitude among citizens a country. (8)

(b) What are the major sources of soil pollution? How does soil pollution affect soil productivity? Briefly explain measures that can be taken to prevent soil pollution? (7)

(क) नागरिकों के बीच पर्यावरण समर्थन के प्रति दृष्टिकोण को लाने के लिए मीडिया की भूमिका को समझाओ।

(ख) मृदा प्रदूषण के प्रमुख स्रोत क्या हैं ? मृदा प्रदूषण मिट्टी उत्पादकता को कैसे प्रभावित करता है। मृदा प्रदूषण को रोकने के लिए जो उपाय किए जा सकते हैं, संक्षेप में बताएं।

5. (a) What are the major causes of man-wildlife conflicts? Discuss the remedial steps that can curb this conflict? (8)

(b) Explain why India is considered as a Megadiversity nation in terms of its biodiversity. (7)

(क) मानव वन्यजीव संघर्षों के प्रमुख कारण क्या हैं ? संघर्षों को नियंत्रित करने के लिए उपचारात्मक कदमों पर चर्चा करें।

(ख) जैव विविधता के संदर्भ में भारत को "विराट विविधता राष्ट्र" के रूप में क्यों जाना जाता है ? व्याख्या करें।

6. (a) Discuss some measures that can be taken at the individual level to reduce air pollution. (8)

(b) With the help of a case study, discuss the ecological and social impacts of dam construction over major rivers in India. (7)

- (क) वायु प्रदूषण को कम करने के लिए व्यक्तिगत स्तर पर कुछ उपायों पर विचार करें।
- (ख) भारत में प्रमुख नदियों पर बांध निर्माण के पारिस्थितिक और सामाजिक प्रभावों पर केस अध्ययन की सहायता से चर्चा करें।

7. (a) Discuss the merits and demerits of wind energy for power production? (6)

(b) Discuss the benefits of Forest ecosystem to humans. Briefly explain the major threats faced by Forest resource in India. (9)

(क) बिजली उत्पादन के लिए पवन ऊर्जा के गुण और दोषों पर चर्चा करें।

(ख) मनुष्य के लिए वन पारिस्थितिकी तंत्र के लाभों पर चर्चा करें भारत में वन संसाधनों के सामने आने वाले प्रमुख खतरों को संक्षेप में बताएं।

8. Discuss the reasons for increasing incidences of natural disasters in India. Also discuss the importance of protecting the ecosystem in order to reduce the impacts of various natural disasters. (15)

भारत में प्राकृतिक आपदाओं की घटनाओं में वृद्धि के कारणों पर चर्चा करें। विभिन्न प्राकृतिक आपदाओं के प्रभावों को कम करने के लिए पारिस्थितिकी तंत्र की रक्षा करने के महत्व पर भी चर्चा करें।