

# PANJAB UNIVERSITY CHANDIGARH



(Established under the Panjab University Act VII of 1947-  
Enacted by the Government of India)

## PROSPECTUS

### PU – CET-2014 (U.G.)

For Admission to  
B. Pharmacy (Credit Based Semester System) and  
B.Sc. (Hons. School)

**Date of Test: 24<sup>th</sup> May 2014**

**Last date for the submission of Online Application  
Form: 29-04-2014 (Tuesday)**

#### CET FEE:

General Category   Rs. 1600/-  
SC/ST   Category    Rs. 800/-

## PANJAB UNIVERSITY ANTHEM

तमसो मा ज्योतिर्गमयः  
तमसो मा ज्योतिर्गमयः  
तमसो मा ज्योतिर्गमयः  
तमसो मा ज्योतिर्गमयः  
पंजाब विश्वविद्यालय  
तेरी शान-ओ-शौकत सदा रहे  
मन में तेरा आदर मान  
और मोहब्बत सदा रहे  
पंजाब विश्वविद्यालय  
तेरी शान-ओ-शौकत सदा रहे  
तू है अपना भविष्य विधाता  
पंख बिना परवाज़ सिखाता  
जीवन पुस्तक रोज़ पढ़ा कर  
सही गलत की समझ बढ़ाता  
जीवन पुस्तक रोज़ पढ़ा कर  
सही गलत की समझ बढ़ाता  
तेरी जय का शंख बजायें  
रौशन तारे बन जायें  
वखरी तेरी शोहरत  
तेरी शोहरत सदा सदा रहे  
पंजाब विश्वविद्यालय  
तेरी शान-ओ-शौकत सदा रहे  
पंजाब विश्वविद्यालय  
तेरी शान-ओ-शौकत सदा रहे  
तमसो मा ज्योतिर्गमयः  
तमसो मा ज्योतिर्गमयः

Tamso ma jyotirgamaya:  
Tamso ma jyotirgamaya:  
Tamso ma jyotirgamaya:  
Tamso ma jyotirgamaya:  
Panjab vishaw vidyalaya  
Teri shaan-o-shauqat sada rahe  
Mann mein tera aadar maan  
Aur mohabbat sada rahe  
Panjab vishaw vidyalaya  
Teri shaan-o-shauqat sada rahe  
Tu hai apna bhavishya vidhata  
Pankh bina parwaaz sikhata  
Jeevan pustak roz padha kar  
Sahi galat ki samajh badhata  
Jeevan pustak roz padha kar  
Sahi galat ki samajh badhata  
Teri jai ka shankh bajayein  
Roshan tare ban jaayein  
Vakhari teri shohrat  
Teri shohrat sada sada rahe  
Panjab vishaw vidyalaya  
Teri shaan-o-shauqat sada rahe  
Panjab vishaw vidyalaya  
Teri shaan-o-shauqat sada rahe  
Tamso ma jyotirgamaya:  
Tamso ma jyotirgamaya:

# CONTENTS

	<b>Page</b>
1. Important Information	4
2. Information about Test and Admission	5
3. Part A: Eligibility Conditions	6
5. Part B: General Rules	9
6. Appendix I-V	14-50
7. Dates/Information for PU - CET (U.G.)-2014/Enquiries regarding admission	51-53
8. Procedure and steps for filling Online application form	54-56
<ul style="list-style-type: none"><li>• <b>Admission Form for B. Pharm. (credit based Semester System) and B.Sc. (Hons. School) shall be available online on Panjab University website (<a href="http://cetug.puchd.ac.in">http://cetug.puchd.ac.in</a>) after declaration of result of PU - CET (U.G.) Entrance Test.</b></li> <li>• <b>Result card can be downloaded from the Panjab University website. No separate Result Cards will be issued.</b></li></ul>	

## IMPORTANT INFORMATION

1. The candidates having compartment in 10+2 examination held in March-2014 will not be eligible for admission in the course. The candidates who do not appear in PU - CET (U.G.) Entrance Test or who do not qualify PU - CET (U.G.) Entrance Test shall not be considered for admission.
2. **The candidates who are applying under the Sports Category should follow the website <http://cetug.puchd.ac.in> for procedures and guidelines.**
3. Candidates who wish to claim weightages on the basis of NCC, NSS, ADULT EDUCATION, YOUTH FESTIVAL and other activities should follow the guidelines displayed on the Panjab University website.
4. **The maximum qualifications of a writer for a blind candidate for the entrance test is Matric. The writer should not have passed the mentioned qualifications one year prior to the examination. The candidate should contact the Assistant Registrar, CET Cell ten days before the commencement of the entrance test for the arrangement of writer and other formalities.**
5. **The result of the entrance test will be available on the University website. No separate Result Cards will be issued. Only the eligible candidates can apply for the admission.**
6. **UNDER ANY CIRCUMSTANCES NO APPLICATION WILL BE CONSIDERED AFTER THE CLOSING OF THE LAST DATE i.e. 29.4.2014.**

**PANJAB UNIVERSITY, CHANDIGARH**  
**INFORMATION ABOUT TEST AND ADMISSION**

The Panjab University will hold PU - CET (U.G.) Entrance Test on **May 24, 2014 (Saturday)** in Chandigarh for admission to the following courses:

Sr. No.	Courses	Institution(s)/Department(s) offering the Course
1.	B. Pharm. (credit based Semester System)	University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh
2.	B.Sc. (Hons. School Semester System) in the subjects of: 1. Anthropology    7. Geology 2. Bio-Chemistry    8. Microbiology 3. Bio-Physics    9. Mathematics 4. Biotechnology    10. Mathematics & Computing 5. Botany    11. Physics 6. Chemistry    12. Physics & Electronics 13. Zoology	Respective Science Departments of Panjab University, Chandigarh

**Notes:**

- (i) I.N.M.O. (Indian National Mathematical Olympiad) Awardees can join B.Sc. (Hons. School) Department of Mathematics, without appearing in the PU - CET (U.G.) Entrance Test.
- (ii) **All the desirous candidates seeking admission for Courses at Sr. 1, 2, above, should follow the website <http://cetug.puchd.ac.in> for procedures and guidelines for admissions. No letter will be issued for the purpose. The information will be made available on website on or before the date of declaration of result.**

## Part A: ELIGIBILITY CONDITIONS

### For appearing in test

All those candidates who have passed/appeared (up to the Academic Session 2013-2014) in the 10+2 Examination of the Central Board of Secondary Education, New Delhi or its equivalent Examination conducted by a recognized Board/University/Council shall be eligible to appear in the PU - CET (U.G.) Entrance Test - 2014. The admission of candidates for the PU - CET (U.G.) Entrance Test shall be provisional. It shall stand cancelled, if they fail to satisfy the requisite eligibility conditions as required by the concerned institution(s)/University by the date fixed for the purpose.

### SPECIAL NOTE

The candidates who have passed/appeared in 10+2 Examinations of Mahila Gram Vidyapith, Allahabad are ineligible to appear in the PU - CET (U.G.) Entrance Test, as this institution has been derecognised by Panjab University, Chandigarh. The examination conducted by the Board of Higher Secondary Education, Delhi, included in the booklet of recognised exams, have also been deleted from the Booklet.

Courses in Panjab University Teaching Departments and Institutions. Merit will be prepared as under:

(i)	Weightages for admission to B. Pharm. (credit based Semester System) and B.Sc. (Hons School):	Qualifying Examination (+2):	25%
		PU - CET (U.G.) Entrance Test	75%

---

**B. Sc. (Hons. School Semester System) in various teaching Departments**

---

Botany Zoology	Should have passed 10+2 examination with at least 50% marks (45% marks in case of SC/ST/BC) with Physics, Chemistry, Biology and English
Anthropology Chemistry Geology Physics Physics & Electronics	Should have passed 10+2 examination with at least 50% marks (45% marks in case of SC/ST/ BC) with English, Physics, Chemistry, Mathematics / Biology
Biochemistry Microbiology	Should have passed 10+2 examination with at least 50% marks (45% marks in case of SC/ST/ BC) with English, Physics, Chemistry, Mathematics/ Biology/ Biotechnology
Biotechnology Biophysics	Should have passed 10+2 examination with at least 50% marks (45% marks in case of SC/ST/ BC) with English, Physics, Chemistry, Mathematics / Biology / Biotechnology / Computer Science
Mathematics Mathematics & Computing	Should have passed 10+2 examination with at least 50% marks (45% marks in case of SC/ST/ BC) with Mathematics as one of the subjects
B. Pharm. (credit based Semester System)	50% Marks in 10+2 (45% marks in case of SC/ST/BC candidates) with English, Physics, Chemistry and one of the following subject: Biology/Biotechnology/Mathematics.

---

## Seats available\*

Name of Course	Open	Foreign Nationals / PIO / NRI
B. Pharm. (Credit based Semester System)	46	06
B.Sc. (Hons. School) Anthropology	30	04
B.Sc. (Hons. School) Biochemistry	30	04
B.Sc. (Hons. School) Biophysics	30	04
B.Sc. (Hons. School) Biotechnology	15	02
B.Sc. (Hons. School) Botany	20	03
B.Sc. (Hons. School) Chemistry	58	08
B.Sc. (Hons. School) Geology	30	04
B.Sc. (Hons. School) Mathematics	25	04
B.Sc. (Hons. School) Mathematics & Computing	15	02
B.Sc. (Hons. School) Microbiology	29	04
B.Sc. (Hons. School) Physics	40	06
B.Sc. (Hons. School) Physics & Electronics	20	03
B.Sc. (Hons. School) Zoology	25	04

**These seats are subject to approval of the Syndicate.**

***Candidates desirous of seeking admission under the category of Foreign Nationals / Persons of Indian Origin (PIO) / NRI seats to B. Pharm. (credit based Semester System) and B.Sc. (Honours School) courses, who are present in India at the time of test, will compete amongst themselves by appearing in the PU - CET (U.G.) Entrance Test-2014. Foreign Nationals / Persons of Indian Origin (PIO) / NRI candidates, those living abroad at the time of entrance test will be exempted from the entrance test.***



## Part B: GENERAL RULES FOR THE TEST

1. THE RESULT OF THE ENTRANCE TEST SHALL, *IPSO FACTO*, NOT ENTITLE A CANDIDATE TO GET ADMISSION IN AN INSTITUTION/DEPARTMENT CONCERNED WHERE HE/SHE INTENDS TO SEEK ADMISSION. IT WILL BE THE TOTAL RESPONSIBILITY OF THE CANDIDATE TO MAKE SURE ABOUT HIS/HER ELIGIBILITY AND FULFILMENT OF SUCH OTHER CONDITIONS AS MAY BE PRESCRIBED FOR ADMISSION IN THE RULES AND REGULATIONS OF UNIVERSITY/INSTITUTION CONCERNED. MERELY BECAUSE A CANDIDATE IS ALLOWED TO APPEAR IN THE ENTRANCE TEST DOES NOT MEAN THAT HE/SHE IS ELIGIBLE AND HIS/ HER APPEARANCE THEREIN WILL NOT ESTOP OR DEBAR THE UNIVERSITY/ INSTITUTION CONCERNED FROM SATISFYING ITSELF ABOUT HIS/HER ELIGIBILITY AT ANY SUBSEQUENT STAGE (SEE RULE 28).
2. The PU - CET (U.G.) Entrance Test will be held at **CHANDIGARH ONLY** on **Saturday May 24, 2014**.
3. IN NO CASE, THE FEE FOR THE ENTRANCE TEST ONCE PAID, SHALL BE REFUNDED.
4. As per the minutes of the meeting of the Committee dated 21<sup>st</sup> January 2014 (duly approved by the Vice-Chancellor), no application form will be received under any circumstances after the closing of the last date.
5. The test will be conducted in the subjects of, (i) Physics, (ii) Chemistry (iii) Biology (iv) Mathematics (v) Biotechnology and (vi) Computer Science as per date sheet. The scheme of the PU - CET (U.G.) Entrance Test is given below:

**For every wrong answer, 25% i.e. ¼ mark allotted to the question will be deducted.**

Name of the Subject	Number of Questions	Marks allotted to each Question	Total Marks for the paper	Duration of the Paper
Paper-I Physics	60	2	120	70 minutes
Paper-II Chemistry	60	2	120	70 minutes
Paper-III Biology	60	2	120	70 minutes
Paper-IV Mathematics	60	2	120	70 minutes
Paper-V Biotechnology	60	2	120	70 minutes
Paper-VI Computer Science	60	2	120	70 minutes

The syllabi are given in *Appendix I*.

The candidate will be required to choose a suitable combination of subjects depending on his/her choice of the course(s) and subjects he/she has studied in 10 +2. Possible combinations are given in Appendix II.

6. The medium of examination shall be **ENGLISH** only.
7. The candidates shall be required to answer questions on the **OMR Answer-sheet** provided for the purpose only, strictly following all the rules/ norms as stated on the Question Booklet and the Answer-sheet and in *Appendix III*.
8. The candidates shall be required to hand-over both the Question booklet and OMR Answer-sheet to the Centre Superintendent when the time allotted to each paper is over. No candidate shall be allowed to leave the examination hall/room before the

- expiry of the time allotted for the examination.
9. The candidates shall be required to hand over their OMR answer-sheets and the question booklet to the Centre Superintendent even if they have not attempted any question. No page/part of the Question paper/OMR Answer-sheet is to be removed/torn/taken out of the Examination Centre under any circumstances, failing which the candidates shall be straight away disqualified for the entire entrance test.
  10. The use of calculator is not allowed in any subject/paper.
  11. The University will provide logarithmic table. Borrowing or carrying of log table or other material is not allowed.
  12. Rough work, if any, is to be done only in the space provided in the question booklet and nowhere else. No rough work shall be done on the OMR Answer-sheet under any circumstances, failing which the same shall be cancelled.
  13. ANY CANDIDATE WHO CARRIES ANY TELECOMMUNICATION EQUIPMENT SUCH AS PAGER, CELLULAR/CORDLESS PHONE, WIRELESS SET ETC. INSIDE THE EXAMINATION HALL SHALL BE EXPELLED FROM THE EXAMINATION HALL & DISQUALIFIED FOR THE ENTIRE ENTRANCE TEST. ("Expulsion" for this purpose would mean cancellation of his/her Entire PU - CET (U.G.) Entrance Test)
  14. THE CANDIDATE MUST ENSURE THAT THE ANSWERS TO THE QUESTIONS ARE ATTEMPTED ON THE SPECIFICALLY PRESCRIBED **OMR ANSWER-SHEET** ONLY. NO ANSWER ATTEMPTED ON THE QUESTION BOOKLET OR ON A SEPARATE PIECE OF PAPER WILL BE CONSIDERED FOR EVALUATION. ONLY THOSE QUESTIONS ANSWERED ON THE OMR SHEET ITSELF SHALL BE TAKEN INTO ACCOUNT.
  15. THERE SHALL BE NEGATIVE MARKING i.e. 25% MARKS WILL BE DEDUCTED FOR WRONG ANSWERS. THE TOTAL MARKS TO BE AWARDED TO A CANDIDATE IN A PAPER CONTAINING MULTIPLE CHOICE OBJECTIVE TYPE QUESTIONS, AFTER IMPOSING THE PRESCRIBED PENALTY, WILL BE CALCULATED BY THE FOLLOWING FORMULA.

**For example,**

*If for each correct answer to a question, 2 marks is to be awarded; for a wrong answer 1/2 mark will be deducted.*

*The total marks scored by the candidate will be computed as under: -*

*Let P - Number of correct answers.*

*Let Q - Number of wrong answers. (A wrong answer means an incorrect answer or filling of the wrong bubbles or filling more than one bubble for the same question or incomplete or partial filling of bubbles, as indicated in the instructions).*

*R - Number of unattempted questions. (An unattempted question means all bubbles left blank).*

*Then the final score will be  $2P - \frac{1}{2} Q$  calculated to the second place of decimal only.*

16. The result of the PU - CET (U.G.)-2014 will be made available on the University website: <http://www.results.puchd.ac.in> as well as in the Enquiry Office of the University.
17. **There shall be no re-evaluation/re-checking/re-assessment of Answer-Sheets under any circumstances. Request for seeing the Question booklet/Answer-Sheets/Answer-books by the candidates shall not be**

**entertained at all. The evaluation once done by the university shall be absolutely the final.**

**18. MERIT LISTS**

(a) The University will publish PU - CET (U.G.) merit lists of the candidates for the following combinations of subjects:

1. Physics, Chemistry and Biology.
2. Physics, Chemistry and Mathematics
3. Physics, Chemistry and Biotechnology
4. Physics, Chemistry and Computer Sciences
5. Mathematics only.

(b) A candidate shall be included in a particular merit list on the basis of attainment of a minimum of 15% (cut off) aggregate of maximum marks in the test taken as a whole. Only in the case of candidates belonging to Scheduled Castes/Scheduled Tribes/Backward Class, this requirement will be a minimum attainment of 10% (cut off) aggregate of maximum marks in PU - CET (U.G.) test, taken as a whole.

(c) Candidates scoring equal marks will be bracketed together. Their inter-se merit will be determined at the time of interview/counselling by the concerned authority, as explained in the admission procedure.

(d) Admissions to various courses shall be made on the basis of merit lists prepared by the Panjab University.

19. The admission to **B. Pharm (credit based Semester System) and B.Sc. (Hons. School) courses** will be on the relative merit of the candidate on the basis of 75% weightages of PU - CET (U.G.) Entrance Test Score and 25% weightages for the marks obtained in 10 + 2 (12<sup>th</sup> class) examination, subject to such reservations and weightages as are prescribed in the rules of admission by the Govt./University Department/College/Institution concerned.

20. Any candidate who creates disturbance of any kind during examination or otherwise misbehaves in or around the examination hall or refuses to obey the Superintendent/Deputy Superintendent/Assistant Superintendent /any other official on examination duty or changes his/her seat with any other candidate or occupies any seat, other than the one allotted to him/her shall be expelled from the examination hall.

(“Expulsion” for this purpose would mean cancellation /disqualification for the Entire Test of the candidate)

21. Any candidate having in his possession or accessible to him/her paper/books or notes which may possibly be of any assistance to him or is found giving or receiving assistance, or copying from any paper/book or note or from anywhere else or allowing any other candidate to copy from his/her answer book or found writing on any other paper, questions set in the question paper, during examination or using or attempting to use any other unfair means or indulging in any kind of misconduct shall be expelled from the examination hall.

(“Expulsion” for this purpose would mean cancellation /disqualification for the Entire Test of the candidate)

22. The Centre Superintendent/Observer/any other authorised University Officer/Official shall be competent to expel a candidate from the examination centre.

23. If any Answer-sheet of a candidate, subsequently at any stage, shows or it is otherwise established that he/she has received or attempted to receive help from

- any source in any manner or has given help or attempted to give help to any other candidate in any manner, the relevant answer-sheet shall be cancelled. The cancellation of the answer-sheet shall mean cancellation of his/her all answer-sheets of the PU - CET (U.G.) Entrance Test-2014. The decision of the Controller of Examinations, Panjab University, Chandigarh in this regard shall be final.
24. If a candidate writes his/her name or puts any kind of identification mark or discloses his/her identity by any method whatsoever on the cover or anywhere else in the Question Booklet/Answer Sheet, the same shall be treated as cancelled. The cancellation of the answer-sheet shall mean cancellation of all his/her answer-sheets of the PU - CET (U.G.) Entrance Test 2014. The decision of the Controller of Examinations, Panjab University, Chandigarh in this regard shall be final.
  25. Any person who impersonates a candidate shall be disqualified from appearing in any University examination for a period of five years including this examination, if that person is a student on the rolls of a recognised School or College or University. But if the person is not on the rolls of a recognised School or College or University, he/she shall be declared as a person not fit and proper to be admitted to any examination of the University for a period of 5 years and the case, if necessary, shall also be reported to the police for any further action in the matter. The candidate who is being impersonated shall also be disqualified for a period of Five Years from appearing in any examination of this University, apart from any other action which the University may take against him, as deemed fit.
  26. If it is found that a candidate has knowingly or wilfully concealed or suppressed or misrepresented any information/fact which renders him/her ineligible to take the Entrance Test, his/her result of the Test as also admission to a College/Institution/Department of the University, if granted, shall stand cancelled and he/she shall have no claim whatsoever against the College/ University/ Institution concerned and the case, if necessary shall also be reported to the police.
  27. If a dispute or controversy of any kind arises before, during or after the conduct of Entrance Test, the decision of the Controller of Examinations, Panjab University, in all such cases, shall be absolutely final.
  28. If any candidate who fills two application forms for the same Course his/her candidature shall be cancelled.
  29. THE CANDIDATES SHALL BE ADMITTED TO THE TEST ONLY ON THE PRODUCTION OF THE ADMIT CARD AT THE TEST CENTRE. NO CANDIDATE SHALL BE ALLOWED TO TAKE THE TEST WITHOUT THE PRODUCTION OF THE ADMIT CARD UNDER ANY CIRCUMSTANCES. THE CANDIDATES MUST RETAIN THE ADMIT CARD WITH THEM TILL THE ADMISSION PROCESS IS OVER.
  30. ADMIT CARDS WILL BE ISSUED TO THE CANDIDATES ONLY PROVISIONALLY, AT THEIR SOLE RISK AND RESPONSIBILITY, SUBJECT TO THE FINAL CONFIRMATION OF THEIR ELIGIBILITY AT THE TIME OF ADMISSION. IT IS FURTHER CLARIFIED THAT THE CANDIDATES SHALL BE TAKING THE TEST AT THEIR OWN RISK AND RESPONSIBILITY AS FAR AS THEIR ELIGIBILITY IS CONCERNED AND THE UNIVERSITY SHALL, IN NO WAY, BE RESPONSIBLE, IF THEY ARE FOUND TO BE INELIGIBLE, LATER, LEADING TO CANCELLATION OF THEIR RESULT OR ANY OTHER CONSEQUENCE (S) EMANATING FROM THE SAME.
  31. Online Application form once submitted the candidate shall not be allowed to make any change in it by way any addition/deletion/alteration/amendment/changes of any other particular etc. Under any circumstances i.e., they shall have no access to the Application at all.
  32. Notwithstanding anything contained in this prospectus, the eligibility conditions for admission to any particular course, shall be governed by the respective rules/regulations as enshrined in the P.U. Calendar, Volumes I, II and III (latest editions) and / or the General Guidelines for Admissions/ Hand Book of

Information issued by the University and / or decisions of the University Senate/ Syndicate/Vice-Chancellor. In case of any conflict or inconsistency between the prospectus on the one hand and the aforesaid Panjab University Rules and Regulations/ Guidelines / Hand Book of information / decisions of Senate/ conflict decisions of Senate/ Syndicate/Vice-Chancellor, on the other, the latter shall prevail.

33. **4-5 days after the test, the question paper and its key will be put on the University website. The candidates can file their objections regarding discrepancies and accuracy of the key, in writing, within 48 hours of this announcement. The valid concerns thus expressed will be given due consideration while evaluation. If a candidate wishes to verify his/her result, he/she will be provided a photocopy of his/her answer sheet on payment of Rs.10,000/- within 10 days after the declaration of the entrance test result and the office should process the whole procedure within three working days. In case, a discrepancy is found in the result of the candidate, the result would accordingly be revised and the fee deposited will be refunded.**
34. **No separate Result Card will be issued. Only the eligible candidates can apply online for the admission.**
35. **Ragging in any form is banned in Educational Institutions. If a student is found to have indulged in Ragging, strict action will be taken against that student, which include expulsion from the Institution.**
36. **No change in category once marked will be allowed at any stage.**
37. **The following functionaries may be contacted for extremely urgent enquiry, if any, only on working hours i.e. from Monday to Friday.**

1. Assistant Registrar (C.E.T.)	0172 – 2534829
2. Controller of Examinations	0172 – 2534811
3. Coordinator PU - CET (U.G.)	0172 – 2534213
4. Enquiry Office	0172 – 2534818, 2534819, 2534866

**Syllabus**  
**MATHEMATICS**

**UNIT-I**

**I SETS AND FUNCTIONS**

**1. Sets:**

Sets and their representations, Empty set. Finite & Infinite sets, Equal sets. Subsets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams, Union and Intersection of sets. Difference of sets. Complement of a set. Properties of complement sets.

**2. Relations and Functions:**

Ordered pairs, Cartesian product of sets, Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (upto  $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$ ). Definition of relation, pictorial diagrams, domain. Codomain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain & range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

**3. Trigonometric Functions:**

Positive and negative angles. Measuring angles in radians & in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity  $\sin^2 x + \cos^2 x = 1$ , for all  $x$ . Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing  $\sin(x+y)$  and  $\cos(x+y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  &  $\cos y$ . Deducing the identities like following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x},$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ . General solution of trigonometric equations of the type  $\sin \theta = \sin \alpha$ ,  $\cos \theta = \cos \alpha$  and  $\tan \theta = \tan \alpha$ . Proof and simple applications of sine and cosine formulae.

## II ALGEBRA

### 1. Principle of Mathematical Induction:

Processes of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

### 2. Complex Numbers and Quadratic Equations:

Need for complex numbers, especially  $\sqrt{-1}$ , to be motivated by inability to solve some of the quadratic equations. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.

### 3. Linear Inequalities:

Linear inequalities . Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables graphical. Solution of system of linear inequalities in two variables.

### 4. Permutations and Combinations:

Fundamental principle of counting, Factorial  $n$ . ( $n!$ ) Permutation and combinations, derivation of formulae and their connections, simple applications.

### 5. Binomial Theorem:

History, statement and proof of the binomial theorem for positive integral indices, Pascal's triangle, general and middle term in binomial expansion, simple applications.

### 6. Sequences and Series:

Sequence and Series. Arithmetic progression (A.P.). arithmetic mean (A.M.) Geometric progression G.P., general term of a G.P., sum of  $n$  terms of a G.P., Arithmetic and Geometric series infinite G.P. and its sum, geometric mean (G.M.), relation between

A.M. and G.M. Sum to  $n$  terms of the special series  $\sum_{k=1}^n k$ ,  $\sum_{k=1}^n k^2$  and  $\sum_{k=1}^n k^3$  .

## III COORDINATE GEOMETRY

### 1. Straight Lines:

Brief recall of two dimensional geometry from earlier classes. Shifting of origin. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

### 2. Conic Sections:

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

### 3. Introduction to Three – dimensional Geometry:

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

## IV CALCULUS

### 1. Limits and Derivatives:

Limit of functional intuitive idea of derivative introduced as rate of change of distance

function and its geometric meaning  $\lim_{x \rightarrow 0} \frac{\log_e(1+x)}{x} \lim_{x \rightarrow 0} \frac{e^x + 1}{x}$  Definition of derivative,

relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

## V. MATHEMATICAL REASONING

### 1. Mathematical Reasoning:

Mathematically acceptable statements. Connecting words/phrases . consolidating the understanding of %if and only if (necessary and sufficient) condition+, %implies+, %and/or+, %implied by+, %and+, %or+, %there exists+and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words-difference between contradiction, converse and contapositive.

## VI. STATISTICS & PROBABILITY

### 1. Statistics:

Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

### 2. Probability:

Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, ~~not~~ and ~~or~~ events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of ~~not~~ and ~~or~~ events.

## UNIT-II

## MATHEMATICS

### I RELATIONS AND FUNCTIONS

#### 1. Relations and Functions:

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

#### 2. Inverse Trigonometric Functions:

Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

### II ALGEBRA

#### 1. Matrices:

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operation. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).



## 2. Determinants:

Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

## III CALCULUS

### 1. Continuity and Differentiability:

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions, derivative of implicit functions. Concept of exponential and logarithmic functions. Derivatives Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

### 2. Applications of Derivatives:

Application of derivatives: rate of change, increasing/decreasing functions, tangents & normals, use of derivatives in approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

### 3. Integrals:

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$
$$\int \frac{(px + q)}{ax^2 + bx + c} dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx$$
$$\sqrt{ax^2 + bx + c} dx, (px+q)\sqrt{ax^2 + bx + c} dx$$

to be evaluated.

Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

### 4. Applications of the Integrals:

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

### 5. Differential Equations:

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$\frac{dy}{dx} + py = q$ , where  $p$  and  $q$  are functions of  $x$  or constants  
 $+px = Q$ , where  $p$  and  $q$  are functions of  $y$  or constants.

## IV VECTORS AND THREE-DIMENSIONAL GEOMETRY

### 1. Vectors:

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

### 2. Three – dimensional Geometry: $\frac{dx}{dy}$

Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes. (iii) a line and a plane. Distance of a point from a plane.

## V LINEAR PROGRAMMING

### 1. Linear Programming:

Introduction, definition of related terminology such as constraints, objective function, optimisation, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

## VI PROBABILITY

### 1. Probability:

Multiplication theorem on probability. Conditional probability, independent events, total probability, Bayes's theorem, Random variable and its probability distribution, mean and variance of random variable. Repeated independent (Bernoulli) trials and Binomial distribution.

# PHYSICS

## UNIT- I

### 1. Physical World and Measurement

Physics-scope and excitement; nature of physical laws; Physics, technology and society. Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.

Dimensions of physical quantities, dimensional analysis and its applications.

### 2. Kinematics

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity.

Elementary concepts of differentiation and integration for describing motion. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time position-time graphs.

Relations for uniformly accelerated motion (graphical treatment).

Scalar and vector quantities, Position and displacement vectors, general vectors and their notation; Equality of vectors, multiplication of vectors by a real number; Addition and subtraction of vectors. Relative velocity.

Unit vector; Resolution of a vector in a plane . rectangular components. Scalar and Vector product of vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

### 3. Laws of Motion

Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction lubrication.

Dynamics of uniform circular motion; Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road)

### 4. Work, Energy and Power

Work done by a constant force and a variable force; Kinetic energy, work energy theorem, power.

Notion of Potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (Kinetic and potential energies), Non-conservative forces; Motion in vertical circle elastic and inelastic collisions in one and two dimensions.

### 5. Motion of System of Particles and Rigid Body

Centre of mass of a two-particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod.

Moment of a force, torque, angular momentum, laws of conservation of angular momentum and its applications.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; Moment of inertia, radius of gyration.

Values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

## 6. Gravitation

Kepler's Laws of planetary motion. The universal law of gravitation.

Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy and gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

## 7. Properties of Bulk Matter

Elastic behaviour, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, shear, modulus of rigidity.

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, Reynolds number, streamline and turbulent flow, critical velocity. Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water, specific heat capacity;  $C_p$ ,  $C_v$ . calorimetry; change of state. latent heat capacity.

Heat transfer . conduction, convection and radiation, thermal conductivity, Newton's law of cooling. Qualitative ideas of Blackbody radiation, Wien's displacement Law, Stefan's law Green house effect.

## 8. Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics), Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes.

Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators.

## 9. Behaviour of Perfect Gases and Kinetic Theory of Gases

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases . assumptions, concept of pressure. Kinetic interpretation of and temperature rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heats of gases; concept of mean free path, Avogadro's number

## 10. Oscillations and Waves

Periodic motion . time period, frequency, displacement as a function of time. Periodic function. Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a spring- restoring force and force constant; energy in S.H.M.- Kinetic and potential energies; simple pendulum . derivation of expression for its time period; free, forced and damped oscillations (qualitative ideas only), resonance.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

**1. Electrostatics**

Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field, electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole torque on a dipole in uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor. Van de Graaff generator.

**2. Current Electricity**

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear) electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combination of resistors; temperature dependence of resistance.

Internal resistance of a cell, Potential difference and emf of a cell, combination of cells in series and in parallel.

Kirchoff's laws and simple applications. wheatstone bridge, metre bridge.

Potentiometer . principle and its applications to measure potential difference and for comparing emf of two cells; measurement of internal resistance of a cell.

**3. Magnetic Effects of Current and Magnetism**

Concept of Magnetic field, Oersted's experiment.

Bio . Savart law and its applications to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia-and ferro . magnetic substances, with examples.

Electromagnets and factors affecting their strengths. Permanent magnets.

#### **4. Electromagnetic Induction and Alternating currents**

Electromagnetic induction; Faraday's laws, induced emf and current; Lenz's Law, Eddy currents. Self and mutual induction.

Alternating currents, peak and rms value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattless current.

AC generator and transformer.

#### **5. Electromagnetic waves**

Displacement Current, Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

#### **6. Optics**

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact, combination of a lens and a mirror. Refraction and dispersion of light through a prism.

Scattering of light. Blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia, Hypermetropia) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Wave optics; wave front and Huygens's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygens's principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

#### **7. Dual Nature of Matter and Radiation**

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light.

Matter waves-wave nature of particles, de Broglie relation. Davisson-Germer experiment.

#### **8. Atoms & Nuclei**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr Model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

#### **9. Electronic Devices**

Energy bands in solids (Qualitative ideas only) conductor, insulator and Semiconductors; semiconductor diode. I-V characteristics in forward and reverse bias,

diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

#### **10. Communication Systems**

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave.

## CHEMISTRY

### UNIT- I

#### 1. Some Basic Concepts of Chemistry

General Introduction: Importance and scope of Chemistry.

Nature of matter, laws of chemical combination. Dalton's atomic theory: concept of elements, atoms and molecules.

Atomic and molecular masses. Mole concept and molar mass: percentage composition, empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

#### 2. Structure of Atom

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thomson's model and its limitations, Rutherford's model and its limitations. Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, De Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p, and d orbitals, rules for filling electrons in orbitals. Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

#### 3. Classification of Elements and Periodicity in Properties

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements. atomic radii, ionic radii. Ionization enthalpy, electron gain enthalpy, electro negativity, valency. Nomenclature of elements with atomic number greater than 100.

#### 4. Chemical Bonding and Molecular Structure

Valence electrons, ionic bond, covalent bond: bond parameters. Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridisation, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital; theory of homo nuclear diatomic molecules (qualitative idea only), hydrogen bond.

#### 5. States of Matter: gases and liquids

Three states of matter. Intermolecular interactions, type of bonding, melting and boiling points. Role of gas laws in elucidating the concept of the molecule, Boyle's law. Charles law, Gay Lussac's Law, Avogadro's Law. Ideal behaviour, empirical derivation of gas equation, Avogadro's number. Ideal gas equation. Derivation from ideal behaviour, liquefaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea).

Liquid State. Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

#### 6. Chemical Thermodynamics

Concepts Of System, types of systems, surroundings. Work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics. internal energy and enthalpy, heat capacity and specific heat, measurement of  $\Delta U$  and  $\Delta H$ , Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation. Phase transformation, ionization, and solution.



Introduction of entropy as a state function, free energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Third law of thermodynamics (brief introduction)

### **7. Equilibrium**

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium . Le Chatelier's principle; ionic equilibrium . ionisation of acids and bases, strong and weak electrolytes, degree of ionisation, concept of pH. Hydrolysis of salts (elementary idea). Buffer solutions, solubility product, common ion effect (with illustrative examples).

### **8. Redox Reactions**

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

### **9. Hydrogen**

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides . ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, properties and structure; hydrogen as a fuel.

### **10 s-Block Elements (Alkali and Alkaline earth metals) Group 1 and Group 2 elements:**

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionisation enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.

#### **Preparation and properties of some important compounds:**

Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium.

Calcium oxide and Calcium carbonate and their industrial uses, biological importance of Magnesium and Calcium.

### **11. Some p-Block Elements**

#### **General Introduction to p-Block Elements**

**Group 13 elements:** General introduction, electronic configuration, occurrence. Variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron-physical and chemical properties, some important compounds: borax, boric acids, boron hydrides. Aluminium: uses, reactions with acids and alkalis uses.

**Group 14 elements:** General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element, Carbon . catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides  
Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites their uses.

### **12. Organic Chemistry – Some Basic Principles and Techniques**

General introduction, method of purification, qualitative and quantitative analysis,

classification and IUPAC nomenclature of organic compounds.

Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions.

### **13. Hydrocarbons**

#### **Classification of Hydrocarbons**

##### **Aliphatic Hydrocarbons**

Alkanes . Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including, free radical mechanism or halogenation, combustion and pyrolysis.

Alkenes . Nomenclature, structure of double bond (ethene) geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes . Nomenclature, structure of triple bond (ethyne), physical properties. Methods of preparation, chemical reactions; acidic character of alkynes, addition reaction of . hydrogen, halogens, hydrogen halides and water.

Aromatic hydrocarbons: Introduction, IUPAC nomenclature; Benzene: resonance aromaticity; chemical properties: mechanism of electrophilic substitution. . nitration sulphonation, halogenation, Friedel Crafts alkylation and acylation: directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

##### **14. Environmental Chemistry**

Environmental pollution . air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming . pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental Pollution.

## UNIT-II

### CHEMISTRY

#### 1. Solid State

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties. Band theory of metals, conductors, semiconductors and insulators and n & p type semiconductors.

#### 2. Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties . relative lowering of vapour pressure Raoult's law , elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, van't Hoff factor.

#### 3. Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell . electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and emf of a cell, fuel cells, corrosion.

#### 4. Chemical Kinetics

Rate of a reaction (average and instantaneous), factors affecting rates of reaction; concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenius equation.

#### 5. Surface Chemistry

Adsorption . physisorption and chemisorption; factor affecting adsorption of gases on solids; catalysis : homogenous and heterogeneous, activity and selectivity: enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophilic, lyophobic, multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsion . types of emulsions.

#### 6. General Principles and Processes of Isolation of Elements

Principles and methods of extraction . concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and Iron.

#### 7. p-Block Elements

**Group 15 elements:** General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen . preparation, properties and uses; compounds of nitrogen: preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous-allotropic forms; compounds of phosphorous: preparation and properties of phosphine, halides ( $\text{PCl}_3$ ,  $\text{PCl}_5$ ) and oxoacids (elementary idea only).

**Group 16 elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen: preparation, properties and uses; simple oxides; Ozone. Sulphur . allotropic forms; compounds of sulphur: preparation, properties and uses of sulphur dioxide; sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

**Group 17 elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens: preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only)

**Group 18 elements:** General introduction, electronic configuration. Occurrence, trends in physical and chemical properties, uses.

## 8. d and f Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals . metallic character, ionisation enthalpy, oxidation states, ionic radii, colour catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$ .

**Lanthanoids** . electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction.

**Actinoids** – Electronic configuration, oxidation states and comparison with lanthanoids.

## 9. Coordination Compounds

Coordination compounds . Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding; isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

## 10. Haloalkanes and Haloarenes

### Haloalkanes:

Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

### Haloarenes:

Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only)

Uses and environmental effects of . dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

## 11. Alcohols, Phenols and Ethers

**Alcohols:** Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses of methanol and ethanol.

**Phenols:** Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

**Ethers:** Nomenclature, methods of preparation, physical and chemical properties, uses.

## 12. Aldehydes, Ketones and Carboxylic Acids

**Aldehydes and Ketones:** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

**Carboxylic Acids:** Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

### 13. Organic compounds containing Nitrogen

**Amines:** Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

**Cyanides and Isocyanides** –will be mentioned at relevant places in context.

**Diazonium salts:** Preparation, chemical reactions and importance in synthetic organic chemistry.

### 14. Biomolecules

**Carbohydrates** – Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); importance of carbohydrates.

**Proteins** - Elementary idea of  $\alpha$  - amino acids, peptide bond, polypeptides proteins, structure of amines-primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones . Elementary idea excluding structure. Biodegradable and non-biodegradable polymers.

**Vitamins** – Classification and functions.

**Nucleic Acids:** DNA & RNA.

### 15. Polymers

Classification . natural and synthetics, methods of polymerisation (addition and condensation), copolymerisation. Some important polymers: natural and synthetic like polythene, nylon, polyesters, bakelite, rubber.

### 16. Chemistry in everyday life:

1. **Chemicals in medicine – analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.**
2. **Chemicals in food – preservatives, artificial sweetening agents.**
3. **Cleansing agents – soaps and detergents, cleansing action.**

# **BIOLOGY**

## **UNIT – I**

### **1. Diversity in Living Organism**

What is living? biodiversity; need for classification; three domains of life; taxonomy & systematics; concept of species and taxonomical hierarchy; binomial nomenclature; tools for study of taxonomy - museums, zoological parks, herbaria, botanical gardens.

Five kingdom classification; salient features and classification of Monera, Protista and Fungi into major groups: Lichens, Viruses and Viroids.

Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiospermae (three to five salient and distinguishing features and at least two examples of each category); Angiosperms - classification up to class, characteristic features and examples.

Salient features and classification of animals non chordates up to phyla level and chordates up to classes level (three to five salient features and at least two examples)

### **2. Structural Organization in Animals and Plants**

Morphology and modifications; tissues; anatomy and functions of different parts of flowering plants: root, stem, leaf, inflorescence; cymose and racemose, flower, fruit and seed (to be dealt along with the relevant practical of the Practical Syllabus).

Animal tissues; morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (a brief account only)

### **3. Cell Structure and Function (40 Periods)**

Cell theory and cell as the basic unit of life; structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles . structure and function; endomembrane system, endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus, nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids, enzymes, types, properties, enzyme action.

Cell division : cell cycle, mitosis, meiosis and their significance.

### **4. Plant Physiology**

Transport in plants; movement of water, gases and nutrients; cell to cell transport, Diffusion, facilitated diffusion, active transport; plant-water relations, Imbibition, water potential, osmosis, plasmolysis; long distance transport of water - Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; transpiration, opening and closing of stomata; Uptake and translocation of mineral nutrients - Transport of food, phloem transport, mass flow hypothesis; diffusion of gases. Mineral nutrition: Essential minerals, macro and micronutrients and their role; deficiency symptoms; mineral toxicity; elementary idea of hydroponics as a method to study mineral nutrition; nitrogen metabolism, nitrogen cycle, biological nitrogen fixation.

Photosynthesis: photosynthesis as a means of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C<sub>3</sub> and C<sub>4</sub> pathways; factors affecting photosynthesis. Respiration: exchange of gases; cellular respiration - glycolysis,

fermentation (anaerobic),

TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

Plant growth and development: seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, differentiation and redifferentiation; sequence of developmental processes in a plant cell; growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA; seed dormancy; vernalisation; photoperiodism.

## **5. Human Physiology**

Digestion and absorption: alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; calorific values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; mechanism of breathing and its regulation in humans - exchange of gases, transport of gases and regulation of respiration, respiratory volume; disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

Body fluids and circulation: composition of blood, blood groups, coagulation of blood; composition of lymph and its function; human circulatory system - Structure of human heart and blood vessels; cardiac cycle, cardiac output, ECG; double circulation; regulation of cardiac activity; disorders of circulatory system - hypertension, coronary artery disease, angina pectoris, heart failure.

Excretory products and their elimination: modes of excretion - ammonotelism, ureotelism, uricotelism; human excretory system - structure and function; urine formation, osmoregulation; regulation of kidney function - renin - angiotensin, atrial natriuretic factor, ADH and diabetes insipidus; role of other organs in excretion; disorders - uraemia, renal failure, renal calculi, nephritis; dialysis and artificial kidney.

Locomotion and movement: types of movement - ciliary, flagellar, muscular; skeletal muscle - contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal system - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

Neural control and coordination: neuron and nerves; Nervous system in humans . central nervous system; peripheral nervous system and visceral nervous system; generation and conduction of nerve impulse; reflex action; sensory perception; sense organs; elementary structure and function of eye and ear.

Chemical coordination and regulation: endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (elementary Idea); role of hormones as messengers and regulators, hypo - and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goit, exophthalmic goiter, diabetes, Addison's disease.

Note: Diseases related to all the human physiology systems (to be taught in brief).

**1. Reproduction**

Reproduction in organisms: reproduction, a characteristic feature of all organisms for continuation of species; asexual reproduction modes of reproduction - asexual and sexual reproduction; modes - binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants. Sexual reproduction in flowering plant: flower structure; development of male and female gametophytes; pollination - types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation. Human Reproduction: male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis; menstrual cycle; fertilisation embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea). Reproductive health: need for reproductive health and prevention of sexually transmitted diseases (STD); birth control . need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies . IVF, ZIFT, GIFT (elementary idea for general awareness).

**2. Genetics and Evolution**

Heredity and variation: Mendelian inheritance; deviations from Mendelism . incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorder in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes. Molecular basis of inheritance: search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; transcription, genetic code, translation; gene expression and regulation - Lac Operon; Genome and human genome project; DNA fingerprinting. Evolution: origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

**3. Biology and Human Welfare**

Health and disease: pathogens; parasites causing human diseases (malaria, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology -vaccines; cancer, HIV and AIDs; Adolescence, drug and alcohol abuse. Improvement in food production : Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry. Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

**4. Biotechnology and Its Applications**

Principles and process of biotechnology: genetic engineering (recombinant DNA technology). application of biotechnology in health and agriculture: human insulin and



vaccine production, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues-biopiracy and patents.

### **5. Ecology and Environment 35 Periods**

Organisms and environment: habitat and niche, population and ecological adaptations; population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution. Ecosystems: patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecological services - carbon fixation, pollination, oxygen release. Biodiversity and its conservation: concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks and sanctuaries. Environmental issues: Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; greenhouse effect and global warming; ozone depletion; deforestation; any three case studies as success stories addressing environmental issues.

# BIOTECHNOLOGY

## UNIT-I

### 1. Introduction to Biotechnology

- Historical Perspectives
- Production Strategies in Biotechnology
- Quality Control
- Product Safety
- Good Manufacturing Practices
- Good Laboratory Practices
- Intellectual Property
- Global market
- Public Perception
- Biotechnology in India and Global Trends

### 2. Biomolecules

- I. Building Blocks of Biomolecules - Structure and Dynamics
  - Building Blocks of Carbohydrates - Sugars and Their Derivatives
  - Building Blocks of Proteins - Amino Acids
  - Building Blocks of Lipids - Simple Fatty Acids, Sphingosine, Glycerol and Cholesterol
  - Building Blocks of Nucleic Acids - Nucleotides
- Biochemical Transformations

II : Structure and Function of Macromolecules 7 Marks (20 Periods)

- Carbohydrates - The Energy Givers
- Proteins - The Performers
- Enzymes - The Catalysts
- Lipids and Biomembranes - The Barriers
- Nucleic Acids - The Managers

III : Biochemical Techniques 5 Marks (10 Periods)

- Techniques Based on Molecular Weight or Size
- Techniques Based on Polarity or Charge
- Techniques Based on Spectroscopy
- Techniques Based on Solubility

### 3. Cell and Development

- I : The Basic Unit of Life
  - Cell Structure and Components
  - Tissues and Organs
  - Stem cells
  - Biodiversity
  - Organization of Life
- II : Cell Growth and Development
  - Cell Division
  - Cell Cycle
  - Cell Communication
  - Movement
  - Nutrition
  - Gaseous Exchanges
  - Internal Transport

Maintaining the Internal Environment  
Reproduction  
In Vitro Fertilization  
Animal and Plant Development  
Immune Response in Animals  
Programmed Cell Death  
Defense Mechanisms in Plants

III : Cellular Techniques  
Microscopy  
Cell Sorting  
Cell Fractionation  
Cell Growth Determination

#### **4. Genetics and Molecular Biology**

I : Principles of Genetics  
Historical Perspective  
Multiple Alleles  
Linkage and Crossing Over  
Genetic Mapping  
Gene Interaction  
Sex-Linked Inheritance  
Extranuclear Inheritance  
Quantitative Inheritance  
Genes at Population Level  
Discovery of DNA as Genetic Material  
Mutations  
DNA Repair  
Genetic Disorders

II : Genome Function  
Genome Organization  
DNA Replication  
Fine Structure of Genes  
From Gene to Protein  
Transcription - The Basic Process  
Genetic Code  
Translation  
Regulation of Gene Expression

III : Genetical Techniques  
Chromosomal Techniques  
Mutagenic Techniques  
Recombination in Bacteria  
Breeding Methods in Plants  
Pedigree Analysis in Humans

## UNIT-II

### 1. Protein and Gene Manipulation Marks 40 (100 Periods)

I: Recombinant DNA Technology 15 Marks (40 Periods)

Introduction

Tool of rDNA Technology

Making rDNA

Introduction of Recombinant DNA into Host Cells

Identification of Recombinants

Polymerase Chain Reaction (PCR)

Hybridization Techniques

DNA Library

DNA Sequencing

Site-directed Mutagenesis

II: Protein Structure and Engineering 15 Marks (35 Periods)

Introduction to the World of Proteins

3-D Shape of Proteins

Structure-Function Relationship in Proteins

Purification of Proteins

Characterization of Proteins

Protein Based Products

Designing Proteins(Protein Engineering)

III: Genomics and Bioinformatics 10 Marks (25 Periods)

Introduction

Genome Sequencing Projects

Gene Prediction and Counting

Genome Similarity, SNPs and Comparative Genomics

Functional Genomics

Proteomics

History of Bioinformatics

Sequences and Nomenclature

Information Sources

Analysis using Bioinformatics Tools

### 2: Cell Culture and Genetic Manipulation 30 Marks (80 Periods)

I: Microbial Culture and Applications 10 Marks (26 Periods)

Introduction

Microbial Culture Techniques

Measurement and Kinetics of Microbial Growth

Scale up of Microbial Process

Isolation of Microbial Products

Strain isolation and Improvement

Applications of Microbial Culture Technology

Biosafety Issues in Microbial Technology

II: Plant Cell Culture and Applications 10 Marks (27 Periods)

Introduction

Cell and Tissue Culture Techniques

Applications of Cell and Tissue Culture

Gene Transfer Methods in Plants

Transgenic Plants with Beneficial Traits

Biosafety in Plant Genetic Engineering

III: Animal Cell Culture and Applications 10 Marks (27 Periods)

Introduction

Animal Cell Culture Techniques

Characterisation of Cell Lines

Methods of Gene Delivery into Cells

Scale-up of Animal Culture Process

Applications of Animal Cell Culture

Stem Cell Technology

Tissue Engineering

## COMPUTER SCIENCE

### UNIT- I

#### 1: COMPUTER FUNDAMENTALS

Evolution of computers; Basics of computer system and its operation: Functional Components and their interconnections, concept of Booting.

##### **Software Concepts:**

Types of Software - System Software, Utility Software and Application Software;

**System Software:** Operating System, Compiler, Interpreter and Assembler;

Operating System: Need for operating system, Functions of Operating System (Processor Management, Memory Management, File Management and Device Management), Types of operating system -Class XI (Theory) Interactive (GUI based), Real Time and Distributed; Commonly used operating systems: UNIX, LINUX, Windows, Solaris, BOSS (Bharat Operating System Solutions); Mobile OS - Android, Symbian. Illustration and practice of the following tasks using any one of the above Operating Systems:

- ~ Opening/Closing Windows
- ~ Creating/Moving/Deleting Files/Folders
- ~ Renaming Files/Folders
- ~ Switching between Tasks

**Utility Software:** Anti Virus, File Management tools, Compression tools and Disk Management tools (Disk Cleanup, Disk Defragmenter, Backup)

**Application software:** Office Tools - Word Processor, Presentation Tool, Spreadsheet Package, Database Management System; Domain specific tools - School Management System, Inventory Management System, Payroll System, Financial Accounting, Hotel Management, Reservation System and Weather Forecasting System.

**Number System:** Binary, Octal, Decimal, Hexadecimal and conversion amongst these number systems.

**Internal Storage encoding of Characters:** ASCII, ISCII (Indian scripts Standard Code for Information Interchange), and UNICODE (for multilingual computing)

**Microprocessor:** Basic concepts, Clock speed (MHz, GHz), 16 bit, 32 bit, 64 bit processors, 128 bit processors; Types - CISC Processores (Complex Instruction set computing), RISC Processors (Reduced Instruction set computing), and EPIC (Explicitly parallel Instruction computing).

**Memory Concepts:** Units: Byte, Kilo Byte, Mega Byte, Giga Byte, Tera Byte, Peta Byte, Exa Byte, Zetta Byte, Yotta Byte.

**Primary Memory:** Cache, RAM, ROM

**Secondary Memory:** Fixed and Removable Storage - Hard Disk Drive, CD/DVD Drive, Pen Drive, Blue Ray Disk

**Input Output Ports/Connections:** Serial, Parallel and Universal Serial Bus, PS-2 port, Infrared port, Bluetooth, Firewire.

Note : Exploring inside computer system in the computer lab class.

## 2: INTRODUCTION TO C++

### Getting Started:

C++ character set, C++ Tokens (Identifiers, Keywords, Constants, Operators), Structure of a C++ Program (include files, main function); Header files . iostream.h, iomanip.h; **cout**, **cin**; Use of I/O operators (<< and >>), Use of endl and setw(), Cascading of I/O operators, Error Messages; Use of editor, basic commands of editor, compilation, linking and execution;

### Data Types, Variables and Constants:

Concept of Data types; Built-in Data types: **char**, **int**, **float** and **double**; Constants: Integer Constants, Character Constants (Backslash character constants - \n, \t ), Floating Point Constants, String Constants; Access modifier: **const**; Variables of built-in data types, Declaration/ Initialisation of variables, Assignment statement; Type modifier: signed, unsigned, long;

### Operators and Expressions:

Operators: Arithmetic operators (-,+,\*./,%), Unary operator (-), Increment (++) and Decrement (--) Operators, Relation operator (>,>=,<,<=,=,!=), Logical operators (!, &&,||), Conditional operator: <condition>? <if true>:<if false>; Precedence of Operators; Automatic type conversion in expressions, Type casting; C++ shorthands (+=, -=, \*=, /=, %=)

## 3: PROGRAMMING METHODOLOGY

General Concepts; Modular approach; Clarity and Simplicity of Expressions, Use of proper Names for identifiers, Comments, Indentation; Documentation and Program Maintenance; Running and Debugging programs, Syntax Errors, Run-Time Errors, Logical Errors

**Problem Solving Methodologies:** Understanding of the problem, Identifying minimum number of inputs required for output, Writing code to optimizing execution time and memory storage, step by step solution for the problem, breaking down solution into simple steps, Identification of arithmetic and logical operations required for solution, Control Structure: Conditional control and looping (finite and infinite)

## 4: PROGRAMMING IN C++

### Flow of control:

Conditional statements: **if-else**, Nested **if**, **switch..case..default**, use of conditional operator, Nested **switch..case**, **break** statement (to be used in **switch..case only**); Loops: **while**, **do - while** , **for** and Nested loops

## Inbuilt Functions

Header file Categorization	Header	Function
Standard input/output functions	File stdio.h	gets (), puts ()
Character Functions	ctype.h	isalnum (), isalpha (), isdigit (), islower (), isupper (), tolower (), toupper ()
String Functions	string.h	strcpy (), strcat (), strlen (), strcmp (), strcmpi (), strrev (), strlen (),strupr (), strlwr ()
Mathematical Functions	math.h	fabs (), pow (), sgrt (), sin (), cos (), abs ()
Other Functions	stdlib.h	randomize (), random (), itoa (), atoi ()
<b>User Defined Functions:</b>		

### Introduction to user-defined function and its requirements.

Defining a function; function prototype, Invoking/calling a function, passing arguments to function, specifying argument data types, default argument, constant argument, call by value, call by reference, returning values from a function, calling functions with arrays, scope rules of functions and variables local and global variables. Relating the Parameters and return type concepts in built-in functions.

### Structured Data Type:

**Arrays:** Introductory to Array and its advantages.

One Dimensional Array : Declaration/initialisation of One-dimensional array, Inputting array elements, Accessing array elements, Manipulation of Array elements (sum of elements, product of elements, average of elements, linear search, finding maximum/minimum value)

Declaration/Initialization of a String, string manipulations (counting vowels/consonants/digits/special characters, case conversion, reversing a string, reversing each word of a string)

### Two-dimensional Array

Declaration/initialisation of a two-dimensional array, inputting array elements Accessing array elements, Manipulation of Array elements (sum of row element, column elements, diagonal elements, finding maximum/minimum values)

### User-defined Data Types:

Introduction to user defined data types.

### Structure

Defining a Structure (Keyword Structure), Declaring structure variables, Accessing structure elements, Passing structure to Functions as value and reference argument/parameter, Function returning structure, Array of structures, passing an array of structure as an argument/ a parameter to a function Defining a symbol name using typedef keyword and defining a macro using #define directive.



**1. PROGRAMMING IN C++****Object Oriented Programming:**

Concept of Object Oriented Programming . Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading as an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies,

**Implementation of Object Oriented Programming concepts in C++:**

Definition of a class, Members of a class - Data Members and Member Functions (methods), Using Private and Public visibility modes, default visibility mode (private); Member function definition: inside class definition and outside class definition using scope resolution operator (::); Declaration of objects as instances of a class; accessing members from object(s), Objects as function arguments - pass by value and pass by reference;

**Constructor and Destructor:**

Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor;

**Inheritance (Extending Classes):**

Concept of Inheritance, Base Class, Derived Class, Defining derived classes, protected visibility mode; Single level inheritance, Multilevel inheritance and Multiple inheritance, Privately derived, Publicly derived and Protectedly derived class, accessibility of members from objects and within derived class(es);

**Data File Handling:**

Need for a data file, Types of data files . Text file and Binary file;

**Text File: Basic file operations on text file:** Creating/Writing text into file, Reading and manipulation of text from an already existing text File (accessing sequentially);

**Binary File:** Creation of file, Writing data into file, Searching for required data from file, Appending data to a file, Insertion of data in sorted file, Deletion of data from file, Modification of data in a file;

Implementation of above mentioned data file handling in C++;

Components of C++ to be used with file handling:

Header file: fstream.h; ifstream, ofstream, fstream classes;

Opening a text file in in, out, and app modes;

Using cascading operators for writing text to the file and reading text from the file; **open()**, **get()**, **put()**, **getline()** and **close()** functions; Detecting end-of-file (with or without using **eof()** function);

Opening a binary file using **in**, **out**, and **app** modes;

**open(), read(), write() and close()** functions; Detecting end-of-file (with or without using **eof()** function); **tellg(), tellp(), seekg(), seekp()** functions

**Pointers:**

Declaration and Initialization of Pointers; Dynamic memory allocation/deallocation operators: **new, delete**; Pointers and Arrays: Array of Pointers, Pointer to an array (1 dimensional array), Function returning a pointer, Reference variables and use of alias; Function call by reference. Pointer to structures: Deference operator: \*, ->; self referencial structures;

**2: DATA STRUCTURES**

Introduction to data structure, primitive and non-primitive data structure, linear and non-linear structure, static and dynamic data structure.

**Arrays:**

One and two Dimensional arrays: Sequential allocation and address calculation;

One dimensional array: Traversal, Searching (Linear, Binary Search), Insertion of an element in an array, deletion of an element from an array, Sorting (Insertion, Selection)

Two-dimensional arrays: Traversal, Finding sum/difference of two NxM arrays containing numeric values, Interchanging Row and Column elements in a two dimensional array;

**Stack (Array and Linked implementation of Stack):**

Introduction to stock (LIFO \_ Last in First Out Operations)

Operations on Stack (PUSH and POP) and its Implementation in C++, Converting expressions from INFIX to POSTFIX notation and evaluation of Postfix expression;

**Queue: (Circular Array and Linked Implementation):**

Introduction to Queue (FIFO - First in First out operations)

Operations on Queue (Insert and Delete) and its Implementation in C++.

**3: DATABASES MANAGEMENT SYSTEM AND SQL**

**Database Concepts:** Introduction to data base concepts and its need.

**Relational data model:** Concept of domain, tuple, relation, key, primary key, alternate key, candidate key;

**Relational algebra:** Selection, Projection, Union and Cartesian product;

**Structured Query Language:**

**General Concepts:** Advantages of using SQL, Data Definition Language and Data Manipulation Language;

**Data types:** NUMBER/DECIMAL, CHARACTER/VARCHAR/VARCHAR2, DATE;

**SQL commands:**

CREATE TABLE, DROP TABLE, ALTER TABLE, UPDATE...SET..., INSERT, DELETE; SELECT, DISTINCT, FROM, WHERE, IN, BETWEEN, GROUP BY, HAVING, ORDER BY; SQL functions: SUM, AVG, COUNT, MAX and MIN; Obtaining results (SELECT query) from 2 tables using equi-join, Cartesian Product and Union

Note: Implementation of the above mentioned commands could be done on any SQL supported software on one or two tables.

#### **4: BOOLEAN ALGEBRA**

Role of Logical Operations in Computing.

Binary-valued Quantities, Logical Variable, Logical Constant and Logical Operators: AND, OR, NOT; Truth Tables; Closure Property, Commutative Law, Associative Law, Identity law, Inverse law, Principle of Duality, Idem potent Law, Distributive Law, Absorption Law, Involution law, DeMorgan's Law and their applications;

Obtaining Sum of Product (SOP) and Product of Sum (POS) form from the Truth Table, Reducing Boolean Expression (SOP and POS) to its minimal form, Use of Karnaugh Map for minimization of Boolean expressions (up to 4 variables);

#### **Application of Computing Logic:**

Building up logic circuits using basic Logic Gates (NOT, AND, OR, NAND, NOT)

Use of Boolean operators (NOT, AND, OR) in SQL SELECT statements

Use of Boolean operators (AND, OR) in search engine queries.

#### **5: NETWORKING AND OPEN SOURCE SOFTWARE**

##### **COMMUNICATION TECHNOLOGIES**

Evolution of Networking: ARPANET, www, Internet, Interspace

Different ways of sending data across the network with reference to switching techniques (Circuit, Message and Packet switching)

**Data Communication terminologies:** Concept of Channel and Data transfer rate (bps, kbps, Mbps, Gbps, Tbps)

**Transmission media:** Twisted pair cable, coaxial cable, optical fiber, infrared, radio link, microwave link and satellite link

**Network devices:** Modem RJ11 and RJ45 connectors, Ethernet Card, Hub, Switch, Gateway

**Network Topologies and types:** Bus, Star, Tree; PAN, LAN, WAN, MAN

**Network Protocol:** TCP/IP, File Transfer Protocol (FTP), PPP, Remote Login (Telnet), Internet

Wireless/Mobile Communication protocol such as GSM, CDMA, GPRS, WLL,

Mobile Telecommunication Technologies : 1G, 2G, 3G and 4G

Electronic mail protocols such as SMTP, POP3

Protocols for Chat and Video Conferencing VOIP

Wireless protocols such as Wi-Fi and WiMax

#### **Network Security Concepts:**

Threats and prevention from Viruses, Worms, Trojan horse, Spams

Use of Cookies, Protection using Firewall;

India IT Act, Cyber Law, Cyber Crimes, IPR issues, Hacking.

**WebServices:**

WWW, Hyper Text Markup Language (HTML), eXtensible Markup Language (XML); Hyper Text Transfer Protocol (HTTP); Domain Names; URL; Protocol Address; Website, Web browser, Web Servers; Web Hosting, Web Scripting - Client side (VB Script, Java Script, PHP) and Server side (ASP, JSP, PHP), Web 2.0 (for social networking)

**Open Standards**

Introduction to open standards and its advantage in development of inter-operable environment.

**Open Source Concepts**

Proprietary and Open Source Software, Freeware, Shareware, FLOSS/FOSS, GNU,FSF, OSI, W3C

**Cloud Computing**

Characteristics, layers-client, Application, platform and infrastructure, Deployment models-Private cloud, Public cloud, Community cloud and hybrid cloud, Issues-Privacy, Compliance, Security, Sustainability and abuse.

**APPENDIX II****Combinations of subjects in PU - CET (U.G.) for Admission to various courses**

<b>Name of Course</b>	<b>Combination of subject(s)*</b>
B. Sc (Hons School) Biotechnology B.Sc. (Hons. School) Biophysics	i) Physics, Chemistry, Biology <b>OR</b> ii) Physics, Chemistry, Mathematics <b>OR</b> iii) Physics, Chemistry, Biotechnology <b>OR</b> iv) Physics, Chemistry, Computer Science
B.Sc. (Hons. School) in Anthropology/ Chemistry/ Geology/Physics/ Physics and Electronics	i) Physics, Chemistry, Mathematics <b>OR</b> ii) Physics, Chemistry, Biology
B. Sc. (Hons. School) Biochemistry/ Microbiology	i) Physics, Chemistry, Biology <b>OR</b> ii) Physics, Chemistry, Mathematics <b>OR</b> iii) Physics, Chemistry, Biotechnology
B.Sc. (Hons. School) in Mathematics / Mathematics & Computing	Mathematics
B. Pharm. (credit based Semester System)	i) Physics, Chemistry, Biology <b>OR</b> ii) Physics, Chemistry, Mathematics <b>OR</b> iii) Physics, Chemistry, Biotechnology

**\*Note:**

1. If a candidate appears in 4 subjects his/her name will be included in the entire merit list wherever possible. For example if a candidate appears in Biology, Chemistry, Mathematics and Physics, his/her name will be included in all the Merit lists where ever he/she qualifies.
2. Candidates who have preference for B. Sc. (Honours School) Mathematics and B.Sc. (Honours School) Mathematics & Computing only may appear in Mathematics only.

**GENERAL INSTRUCTIONS FOR GIVING ANSWERS  
ON OMR ANSWER SHEET**

1. All questions are to be attempted on the Answer-sheet as per instructions printed on the question booklet and OMR answer sheet.
2. **The Answer-sheet is designed for computer evaluation. Please follow the instructions given on the Answer-sheet strictly otherwise it may make evaluation by the computer difficult. Any resultant loss to the candidate on the above account i.e., not following the instructions completely, shall be of candidate only.**
3. Each question is followed by four answer choices labelled A, B, C and D. Select the answer you think is the best response and darken the bubble bearing the correct response label against the serial number of the question. For example if you think answer to question number 2 is D then mark as follows:

Q. 2                      (A) (B) (C) (D)

The Answer marked as under shall be considered as wrong:

(A) (B) (C) (D)      (A) (B) (C) (D)      (A) (B) (C) (D)      (A) (B) (C) (D)      (A) (B) (C) (D)      (A) (B) (C) (D)

4. For marking answers use **Black Ball/Gel Pen only**.
5. If you do not want to answer any question, leave all the bubbles corresponding to that question blank.
6. Be very careful in filling in the bubble in the first instance since erasing or changing it will spoil the response and go to the disadvantage of the candidate.
7. In order to open the Question Booklet remove the paper band gently.
8. **Write your Roll Number on the answer-sheet as also on the Question Booklet only in the space provided for the purpose and at no other place in the question Booklet and Answer Sheet.**
9. For calculations, the use of log tables is permitted. Use of Calculator is not allowed.
10. For rough work, the sheets marked ROUGH WORK at the end of the Question Booklet be used. No rough work shall be done on the Answer-sheet under any circumstances.
11. Penalty for wrong answers (Negative marking)

Negative marking will be adopted for evaluation i.e. marks will be deducted for wrong answers. The total marks to be awarded to a candidate in a paper after imposing the penalty will be calculated by the following formula (Assuming that each question carries 2 mark):

For each correct answer to a question, 2 marks will be awarded. However, if the answer is wrong 1/2 mark will be deducted. For example, these marks will be calculated as under:

P = Number of correct answers.

Q = Number of wrong answers

R = Number of unattempted questions

(An unattempted question means, the bubbles corresponding to that question is left blank).

Then the final score will be  $2P - 1/2Q$ , calculated to second place of decimal.

It will also be checked that  $P + Q + R = \text{Total No. of questions in the Paper.}$

**APPENDIX IV****Distribution of seats in various Science Departments and Institutes of the Panjab University Chandigarh**

Course	Total No. of Seats	Kashmiri Migrant**	Foreign Nationals/ PIO/NRI	Any other
B. Pharm. (credit based Semester System)	46	01	06	01***
<b>B.Sc. (Hons. School) Courses</b>				
1. Anthropology	30	01	04	-
2. Biochemistry	30	01	04	-
3. Biophysics	30	01	04	-
4. Biotechnology	15	01	02	-
5. Botany	20	01	03	-
6. Chemistry	58	01	08	-
7. Geology	30	01	04	-
8. Maths	25	01	04	-
9. Maths & Computing	15	01	02	-
10. Microbiology	29	01	04	-
11. Physics	40	01	06	-
12. Physics & Electronics	20	-	03	-
13. Zoology	25	01	04	-

These seats are subject to approval of the Syndicate. Distribution of these seats will be made at the time of admission if approved.

\*\*Seat for Kashmiri migrants are subject to approval of the Syndicate, Panjab University Chandigarh.

\*\*\*out of 46 seats, one seat is reserved for the nominee of the Government of India from amongst the foreign students and the students from the States and Union Territories lacking facilities in this field and repatriates from Myanmar (Burma), Sri Lanka etc. of the remaining seats, general University reservation criteria would be applied.

**Note: 1. The above tabulation for various categories reflects approximate figures and is subject to correction in accordance with the General Guidelines for Admission of Panjab University and any other Government notification prior to the time of interview.**

**2. Any other statutory reservation as prescribed by the Syndicate P.U./Govt. of India, if any.**

**3. Additional Seat for One Girl Child out of the only two Girl Children and Cancer, Aids Patient, Kargil war :**

**Two additional seats for those girl children who are either a single girl child of her parents or one amongst the only two girl children with no male child. The additional seat will be available to only one of the two girl children of a couple.**

**For Cancer and Aids Patient:**

The students will submit a certificate with proof from the National Medical Institute like PGI, AIIMS.

**For Kargil War:**

Wards of Kargil war as per syndicate decision dated 29.07.2008

4. The concession to the wards of Kashmiri Displaced persons and additional seats for Single Girl Child and Cancer, Aids Patients, Kargil War is not applicable to the students falling under regulatory agencies such as BCI, MCI, DCI and NCTE.

***Illustration:*** In a course which has 25 seats, the distribution of seats among the various categories will be as under:-

Open Category	SC	ST	BC	Sports	Defence Personnel	Phy. Handicapped	Riot Victim	Freedom Fighter	Total
55.5%	15%	7.5%	5%	5%	5%	3%	2%	2%	
14	4	2	1	1	1	1	1	1	26

**IMPORTANT NOTE: Candidates will fill the above categories in the Admission Form after the declaration of Entrance Test result.**



**APPENDIX V**

**APPROXIMATE AMOUNT TO BE PAID AT THE TIME OF ADMISSION**

Course Institute/Deptt	Indian Nationals		Foreign Nationals/ PIO/NRI			
	Ist installment at the time of Admission	IInd Installment in the month of November	Tuition fee + Development Fund (U.S. Dollar)	Total U.S. Dollar (P.A.)	Other charges (Rs.)	Registratio n fee (U.S. Dollar)
<b>B.Sc. (Hons. School) courses</b>						
Anthropology Botany, Chemistry, Geology, Physics and Zoology	Rs. 5267/-	Rs. 2535/-	1060+115	1175	3862	650
Mathematics	Rs. 4697/-	Rs. 1965/-	1060+115	1175	3292	650
Math & Computing	Rs. 19347/-	Rs. 1725/-	1060+115	1175	17942	650
Microbiology, Biophysics, Biochemistry	Rs. 5267/-	Rs. 2535/-	1590+175	1765	3862	650
Biotechnology	Rs.12912/-	Rs. 1725/-	2120+230	2350	11507	650
B. Pharm. (credit based Semester System)	Rs. 7167/-	Rs. 3675/-	2950+580	3530	3682	650
Physics & Electronics	Rs. 28827/-	Rs. 16095/-	1890+210	2100	13052	650

All admitted students will be required to pay full fee at the time of admission. In case of shifting / left the courses/ Deptt. the fee will be refunded/adjusted later on for the students selected for this benefit as per P.U. rules mentioned in the Hand Book of Information & Rules for admissions.

**IMPORTANT NOTE:**

1. Registration fee (or equivalent Indian Rupees) payable by Foreign Nationals students are US \$ 440 but PIO/NRI who are being registered for the first time in the University are required to pay US \$ 650 as per university rules.
2. (i) Selected Candidates will be asked to make the payments on the spot. No extra time will be given. Payments for the above mentioned fees will be accepted through Bank Draft (in favour of the **Registrar, Panjab University, Chandigarh** payable at **State Bank of India, Sector -14, Chandigarh**).
- (ii) During the counselling, the fee would be collected only by way of drafts issued by any bank in favour of the Registrar/ Chairperson/ Coordinator as the case may be. The student shall prepare separate drafts for counselling fee, admission fee and department funds, if required. For this purpose, Department wise/ Class wise fee structure alongwith proper instruction for preparation of draft shall be incorporated / available in the University

website.

- (iii) The State Bank of India, Sector 14, Chandigarh shall held special drives to popularize the scheme of “**I Collect**” within University, Departments and also put special counters for opening the Zero Balance Accounts of student. The State Bank of India, Sector 14, Chandigarh shall also ensure that during rush hours more counters/ windows shall be opened to avoid any hassle or unwanted circumstances to arise (subject to final approval of the Syndicate).
3. The Candidates will have to pay the exact amount as per P.U. Fee structure prevailing at the time of admission. The amount mentioned above are approximate. The University is likely to increase the fee @ 10% / 20% of the existing fee structure. Therefore, the candidates are advised to bring sufficient money to cover the increase. The amount over and above the fee structure, if any, will also be accepted in the shape of draft. For that, if required, S.B.I. Sector 14, Chandigarh will open more counter / windows for the purpose.
  4. Hostel accommodation both for Boys and Girls is available. The seats as per quota would be allocated to the Department for further allotment to the students on merit basis. Candidates, interested to avail hostel facility, are advised to bring with them an extra amount of Rs. 9050/- (approx) for admission in the hostels.
  5. In case of Foreign Nationals/ PIO/NRI candidates: If the amount is paid in Indian Currency, a Bank Certificate must be attached confirming that the rate of US \$ on that date and the draft is issued from the NRI account.

## IMPORTANT DATES

**Date & Day of Test** : **24.5.2014 (Saturday)**

### DATE-SHEET

<b>Paper and Subject</b>	<b>Time of Examination</b>
Paper ó I Physics	9.00-10.10 a.m.
Paper ó II Chemistry	10.30-11.40 a.m.
Paper ó III Biology	12.00-1.10 p.m.
Paper ó IV Mathematics	2.10-3.20 p.m.
Paper ó V Biotechnology	3.40-4.50 p.m.
Paper ó VI Computer Science	5.10-6.20 p.m.

## For enquiries regarding admission to

**B. Pharm. (Credit Based Semester System) and B. Sc. (H. S.)** In Teaching Departments/Institutions of Panjab University Chandigarh, please contact:

<b>Enquiry about admission to:</b>	<b>Person to be contacted</b>	<b>Phone</b>
B. Pharm. (credit based Semester System)	Chairperson, University, Institute of Pharm. Sciences, P.U. Chd.	0172-2534110 0172-2354101
B. Sc. (Hons School)	Chairperson of the Departments	
Anthropology	-do-	0172 . 2534223
Biochemistry	-do-	0172 . 2534131
Biophysics	-do-	0172 . 2534119
Biotechnology	-do-	0172 . 2534085
Botany	-do-	0172 . 2534023
Chemistry	-do-	0172 . 2534404
Geology	-do-	0172 . 2534235
Mathematics	-do-	0172 . 2534501
Mathematics & Computing	-do-	0172 . 2534501
Microbiology	-do-	0172 . 2534140
Physics	-do-	0172 . 2534466
Physics & Electronics	-do-	0172-2534466
Zoology	-do-	0172 . 2534201
<b>For dates of trials of Sports Category, the candidate should contact the Sports Department.</b>		
Sports	Director Sports Panjab University Chandigarh	0172 . 2534033 0172 . 2544081

## PU - CET (U.G.)-2014 Schedule

Date of Advertisement regarding test & other information relevant thereto	19.03.2014 (Wednesday)
Date of Availability of PU - CET (U.G.) Prospectus and Application Form on the website of Panjab University	19.03.2014 (Wednesday)
Last date for submission of information on the website to generate the Bank Challan	29.04.2014 (Tuesday)
Last date for deposit of fee in any branch of State Bank of India using website generated challan	01.05.2014 (Thursday) upto 4.00 p.m.
Last date for submission of fee details (journal no.; branch code and date of deposit given by Bank) and uploading of photograph, signature with rest of the information on the website	03-05-2014 (Saturday)
No correction will be entertained / made regarding photograph, signature and any other information after <b>09-05-2014, 5:00 p.m.</b>	<b>09-05-2014 (Friday) upto 5.00 p.m.</b>
<b><u>Final date by which Roll No. will be available online</u></b> Roll no and Centre of Examination will be generated and Roll No. slip required to be downloaded from the website by the candidate using their own Login and Password (provided while generating Bank Challan). <b><u>There will be no physical communication for this purpose.</u></b>	17-05-2014 (Saturday)
Date of Holding Entrance Test	24.05.2014 (Saturday)
Tentative date during which the result may be declared by the University	04.06.2014 to 06.06.2014 (Wednesday to Friday)
Centre for the Entrance test	Chandigarh only
PU - CET (U.G.) Fee: General Category: SC/ST Category: (50 % concession for P. U. regular employees under B&C class Senate dated 14.7.2007 vide para xxxiii)	Rs. 1600/- Rs. 800/-

**Admission Form:**

**To be submitted only by the PU - CET (U.G.)-2014 qualified candidates online latest by July 02, 2014 (Wednesday) upto 5.00 pm as per the guidelines displayed on the Panjab University Website.**

### For Enquiries about Test contact

Assistant Registrar (C.E.T.)	0172 . 2534829
Controller of Examinations	0172 . 2534811
Coordinator PU - CET (U.G.)	0172 . 2534141

## THE PROCEDURE AND STEPS FOR FILLING ONLINE APPLICATION FORM

### STEPS TO FOLLOW:

- Register Online.
- Note down your Login Id and Password.
- Download SBI Slip and pay fee in any SBI branch of India.
- Login and upload scanned photograph, signature, fill other important information and Save and Confirm.
- Download your admit card after May 17, 2014 (Saturday).

## Registration Form PU-CET (U.G.)

**Read Instructions and Eligibility Criteria carefully before registration.**


*# Do not prefix the title such as Shri / Smt. / Mr. / Mrs. / Dr. etc. along with names.*

Name #

Father's Name #

Mother's Name #

Date of Birth

  (dd/mm/yyyy)

E-mail

Class 10<sup>th</sup> Roll No.

Class 10<sup>th</sup> Board

Class 10<sup>th</sup> Passing Year

Category

**Categories other than General**

**Scheduled Caste**

**Scheduled Tribe**

**Backward Class**

*Only for the purpose of Entrance Test*

Are you or either of your Parents Class B or Class C Employee of P.U.?<sup>#</sup>

Yes  No

Submit

---

After you submit the above information you will be provided with loginid and password. Deposit required fee and login to update information using following form.

---

## Update Candidate Information

Stream in Class  +2\*

**Subjects**

Passed/  
Appeared in  
Class +2 (for  
Science  
Students only)

Physics\*  Chemistry\*  
 Mathematics  Biology  
 Biotechnology  Computer Science

*# Compulsory subjects (for Science Students only)*

**Subjects in  
which**

appearing in  
CET\*

Physics  Chemistry  
 Mathematics  Biology  
 Biotechnology  Computer Science

**Candidate  
Name\***

**Father's Name\***

**Mother's  
Name\***

**Gender\***  Male  Female

**Date of Birth\***   (dd/mm/yyyy)

**Nationality\***

**Correspondence Address\***

Is your permanent Address same as Correspondence Address?

Yes

**Permanent Address\***

**Phone No./Mobile No.**

**E-mail ID\***

**Class +2 Roll No.\***

**Class +2 Board/University\***

**Year of Appearing/Passing (Class +2)\***

**10<sup>th</sup> Class %age\***

**Upload Photograph\***

**Upload Signature\***