Sample Papers
CBSE CLASS 11

Reference Link:
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6. MATHEMATICS (Code No 041)

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage from where the students go either for higher academic education in Mathematics or for professional courses like engineering, physical and Bioscience, commerce or computer applications. The present revised syllabus has been designed in accordance with National Curriculum Frame work 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students. Motivating the topics from real life situations and other subject areas, greater emphasis has been laid on application of various concepts.

Objectives
The broad objectives of teaching Mathematics at senior school stage intend to help the pupil:

- to acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- to feel the flow of reasons while proving a result or solving a problem.
- to apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- to develop positive attitude to think, analyze and articulate logically.
- to develop interest in the subject by participating in related competitions.
- to acquaint students with different aspects of mathematics used in daily life.
- to develop an interest in students to study mathematics as a discipline.
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of sex biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

COURSE STRUCTURE
Class XI

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<th>One Paper</th>
<th>Three Hours</th>
<th>Max Marks. 100</th>
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75
UNIT-I: SETS AND FUNCTIONS

1. Sets:
   (12) Periods

2. Relations & Functions:
   (14) Periods
   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 \( \mathbb{R} \times \mathbb{R} \)). 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 functions, 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:
   (18) Periods
   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 the following:

\[
\tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}, \quad \cot(x + y) = \frac{\cot x \cot y + 1}{\cot y + \cot x},
\]

\[
\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \quad \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},
\]

\[
\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \quad \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}.
\]

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 formulæ.

UNIT-II: ALGEBRA

1. Principle of Mathematical Induction:
   (06) Periods
   Process 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:** (10 Periods)
   Need for complex numbers, especially \( \sqrt{-1} \), to be motivated by inability to solve some of the quadratic equations. 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. Square root of a complex number.

3. **Linear Inequalities:** (10 Periods)
   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 & Combinations:** (12 Periods)
   Fundamental principle of counting. Factorial \( n! \). Permutations and combinations, derivation of formulae and their connections, simple applications.

5. **Binomial Theorem:** (08 Periods)
   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. **Sequence and Series:** (10 Periods)
   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 \( \sum_{k=1}^{n} k^3 \).

**UNIT-III: COORDINATE GEOMETRY**

1. **Straight Lines:** (09 Periods)
   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, intercept 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:** (12 Periods)
   Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a 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** (08 Periods)
   Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.
UNIT-IV: CALCULUS

1. Limits and Derivatives: (18 Periods)
   Limit of function intuitive idea of derivative introduced as rate of change of distance functions
   and its geometric meaning. \( \lim_{x \to 0} \frac{\log_e (1+x)}{x}, \lim_{x \to 0} \frac{e^x - 1}{x} \)
   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.

UNIT-V: MATHEMATICAL REASONING

1. Mathematical Reasoning: (08 Periods)
   Mathematically acceptable statements. Connecting words/ phrases - consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implies 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 contrapositive.

UNIT-VI: STATISTICS & PROBABILITY

1. Statistics: (10 Periods)
   Measures of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability: (10 Periods)
   Random experiments, outcomes, sample spaces (set representation). Events; occurrence of events, 'not', 'and' 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.
# CLASS XI SUBJECT MATHEMATICS
## SESSION ENDING EXAMINATION BLUE PRINT

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<td>48(12)</td>
<td>42(7)</td>
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1. * FOR INTERNAL CHOICE
2. NUMBER IN BRACKETS SHOWS THE NUMBER OF QUESTIONS
3. VSA (1) SA (4) LSA (6)
Model Question Paper
MATHEMATICS
Class XI

Time : 3 Hours
Max. Marks : 100

General Instructions
1. All questions are compulsory.
2. The question paper consists of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION A
1. Write the set \( A = \{ x : x \) is a prime number which is a divisor of 60\} in roster form.
2. Simplify and write the values of \( a \) and \( b \), where \( a + bi = \left( \frac{1}{5} + i \frac{2}{5} \right) - \left( \frac{4}{5} + i \frac{8}{5} \right) \)
3. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there?
4. Find the coefficient of \( x^5 \) in \( (x^3 + 3)^8 \)
5. Evaluate \( \lim_{x \to 1} \frac{4x + 3}{2x - 1} \)
6. Evaluate \( \lim_{x \to 0} x \sec x \)
7. Find the component statements of “All rational numbers are real and all real numbers are complex”.
8. Write the negation of the statement: “Chennai is the capital of Tamil Nadu”.
9. Write the contrapositive and converse of the statement: “If \( x \) is a prime number, then \( x \) is odd”
10. There are four men and six women on the city council. If one council member is selected for a committee at random, how likely is it that it is a woman?

SECTION B
11. If \( A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\} \), Prove that \( A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \)
12. Let \( A = \{1, 2, 3, 4, 6\} \). Let \( R \) be the relation on \( A \) defined by \( (a, b) : a , b \in A, b \) is exactly divisible by \( a \} \).
   (i) Write \( R \) in roster form
   (ii) Find the domain of \( R \)
   (iii) Find the range of \( R \).
13. Find the domain and range of \( f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12} \), also find \( f(3) \).
14. Show that \( \tan 3x \tan 2x \tan x = \tan 3x \tan 2x - \tan x \).

OR
Find \( \sin \frac{x}{2}, \cos \frac{x}{2}, \tan \frac{x}{2} \) where it is given that \( \tan x = -\frac{4}{3} \), and \( x \) is in second quadrant.

15. Express the expression in the form of \( a + ib \):
\[
\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+i\sqrt{2})-(\sqrt{3}+i\sqrt{2})}.
\]

OR

Find the modulus and argument of the complex number \( \frac{1}{1+i} \).

16. Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,
   (i) do the words start with P
   (ii) do all the vowels always occur together
   (iii) do the vowels never occur together
   (iv) do the words begin with I and end in P?

17. Find \( a \) if the coefficients of \( x^2 \) and \( x^3 \) in the expansion of \( (3 + ax)^9 \) are equal.

18. Find the sum of the sequence 7, 77, 777, 7777, ... to \( n \) terms.

19. Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latusrectum of the ellipse \( \frac{x^2}{16} + \frac{y^2}{36} = 1 \).

20. The vertices of \( \triangle PQR \) are \( P (2, 1) \), \( Q (-2, 3) \) and \( R (4, 5) \). Find equation of the altitude through the vertex \( R \).

   OR

   Find the equation of the line parallel to \( y \)-axis and drawn through the point of intersection of the lines \( x - 7y + 5 = 0 \) and \( 3x + y = 0 \).

21. Find the derivative of \( f(x) = \frac{1}{x} \).

   OR

   Find the derivative of \( \sin x \).

22. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that
   (a) Both Anil and Ashima will not qualify the examination.
   (b) At least one of them will not qualify the examination and
   (c) Only one of them will qualify the examination.

SECTION C

23. Show that the following four conditions are equivalent: (i) \( A \subseteq B \) (ii) \( A \cap B = \emptyset \) (iii) \( A \cup B = B \) (iv) \( A \cap B = A \)

   OR

   In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Draw a venn diagram describing above sets and Find:
(i) The number of people who read at least one of the newspapers.
(ii) The number of people who read exactly one newspaper.
(iii) Who read H but neither T nor I.
(iv) Who read T and H but not I.

24. Find the general and particular solutions of \( \sin x + \sin 3x + \sin 5x = 0 \).

25. Prove by using mathematical induction rule: 
\[
\frac{1}{(3n-1)(3n+2)} = \frac{n}{(6n+4)}
\]

26. Solve the system of inequalities graphically \( 2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6, \) and \( x \geq 0, y \geq 0 \)

27. The coefficients of the \((r-1)^{th}\), \(r^{th}\) and \((r+1)^{th}\) terms in the expansion of \((x + 1)^n\), are in the ratio 1 : 3 : 5. Find \(n\) and \(r\).

OR

28. Find the sum to \(n\) terms of the series \( 1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots \)

29. Find the coordinates of the foot of perpendicular from the point \((-1, 3)\) to the line \(3x - 4y - 16 = 0\).

29. Find the mean, variance and standard deviation for the data given below.

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<th>0 – 30</th>
<th>30-60</th>
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One Paper | Time | Max Marks: 70
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Class XI | Weightage
Unit I | Physical World & Measurement | 03
Unit II | Kinematics | 10
Unit III | Laws of Motion | 10
Unit IV | Work, Energy & Power | 06
Unit V | Motion of System of particles & Rigid Body | 06
Unit VI | Gravitation | 05
Unit VII | Properties of Bulk Matter | 10
Unit VIII | Thermodynamics | 05
Unit XI | Behaviour of Perfect Gas & Kinetic Theory of gases | 05
Unit X | Oscillations & Waves | 10
Total | | 70

**Unit I: Physical World and Measurement** *(periods 10)*
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; significant figures.
Dimensions of physical quantities, dimensional analysis and its applications.

**Unit II: Kinematics** *(Periods 30)*
Frame of reference. Motion in a straight line: Position-time graph, speed and velocity.
Uniform and non-uniform motion, speed and velocity - average and instantaneous
Uniformly accelerated motion, velocity-time graph and position-time graph, equations for uniformly accelerated motion (graphical treatment only).
Simple introduction to elementary concepts of differentiation and integration for describing motion.
Scalar and vector quantities: vectors, notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Position and displacement vectors, relative velocity.
Unit vector; Resolution of a vector in a plane - rectangular components. Motion in a plane.
Projectile motion, circular motion.

**Unit III: Laws of Motion** *(Periods 16)*
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.
Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

**Unit IV: Work, Energy and Power** *(Periods 16)*
Scalar product of vectors. Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.
Potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: elastic collisions and elementary idea of inelastic collisions.
Unit V: Motion of System of Particles and Rigid Body (Periods 18)
Centre of mass of a two-particle system, Centre of mass of rigid bodies. Momentum conservation and motion centre of mass.
Vector product of vectors; moment of a force, torque, angular momentum, conservation of angular momentum with some examples.
Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions;
Moment of inertia, radius of gyration. Moments of inertia for simple geometrical objects (no derivation). Only statement of parallel and perpendicular axes theorems and their applications.

Unit VI: Gravitation (Periods 14)
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; gravitational potential. Escape velocity. Orbital velocity of a satellite.
Geo-stationary satellites.

Unit VII: Properties of Bulk Matter (Periods 28)
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, Reynold’s number, streamline and turbulent flow.
Bernoulli’s theorem and its applications.
Surface energy and surface tension, angle of contact, application of surface tension to drops, bubbles and capillary action.
Heat, temperature, thermal expansion; specific heat capacity - calorimetry; change of state - latent heat.
Heat transfer-conduction, convection and radiation, thermal conductivity, Newton’s law of cooling.

Unit VIII: Thermodynamics (Periods 12)
Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics.

Unit IX: Kinetic Theory of Gases (Periods 8)
Equation of state of a perfect gas, work done on compressing a gas.
Kinetic theory of gases - assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro’s number.

Unit X: Oscillations and Waves (Periods 28)
Periodic motion - period, frequency, displacement as a function of time. Periodic functions.
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 and forced (damped) oscillations (qualitative ideas only), resonance.

Practicals

Note: Every student will perform 10 experiments (5 from each section) and 8 activities (4 from each section) during the academic year. Two demonstration experiments must be performed by the teacher with participation of students. The students will maintain a record of these demonstration experiments. Schools are advised to follow the guidelines for evaluation in practicals for Class XII.

Evaluation Scheme for Practical Examinations

- One experiment from any one section: 8 marks
- Two activities (one from each section) (4+4): 8 marks
- Practical record (experiments & activities): 6 marks
- Record of demonstration experiment & Viva based on these experiments: 3 marks
- Viva on experiments & activities: 5 marks

Total 30 marks

SECTION A

Experiments

1. Use of Vernier Callipers
   (i) to measure diameter of a small spherical/cylindrical body.
   (ii) to measure dimensions of a given regular body of known mass and hence find its density.
   (iii) to measure internal diameter and depth of a given beaker/calorimeter and hence find its volume.
2. Use of screw gauge
   (i) to measure diameter of a given wire and (ii) to measure thickness of a given sheet.
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To find the weight of a given body using parallelogram law of vectors.
5. Using a simple pendulum, plot $L-T$ and $L-T^2$ graphs. To find the (a) effective length of second’s pendulum using appropriate graph (b) acceleration due to gravity.
6. To study the relationship between force of limiting friction and normal reaction and to find coefficient of friction between a block and a horizontal surface.

Activities

1. To make a paper scale of given least count, e.g. 0.2cm, 0.5cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a jet of water with angle of projection.
6. To study the conservation of energy of a ball rolling down on inclined plane (using a double inclined plane).
SECTION B

Experiments
1. To determine Young’s modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and I/V.
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.
   (ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.
8. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.

Activities
1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observations.
4. To study the effect of detergent on surface tension by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped metre scale loaded (i) at its end (ii) in the middle.

SUGGESTED LIST OF DEMONSTRATION EXPERIMENTS

CLASS XI
1. To demonstrate that a centripetal force is necessary for moving a body with a uniform speed along a circle, and that the magnitude of this force increases with increase in angular speed.
2. To demonstrate inter-conversion of potential and kinetic energy
3. To demonstrate conservation of linear momentum.
4. To demonstrate conservation of angular momentum.
5. To demonstrate the effect of angle of launch on range of a projectile.
6. To demonstrate that the moment of inertia of a rod changes with the change of position of a pair of equal weights attached to the rod.
7. To study variation of volume of a gas with its pressure at constant temperature using a doctors' syringe.
8. To demonstrate Bernoulli’s theorem with simple illustrations
9. To demonstrate that heat capacities of equal masses of different materials are different.
10. To demonstrate free oscillations of different vibrating systems.
11. To demonstrate resonance with a set of coupled pendulums.
12. To demonstrate longitudinal and transverse waves.
13. To demonstrate the phenomenon of beats, due to superposition, of waves produced by two sources.
of sound of slightly different frequencies
14. To demonstrate resonance using an open pipe.
15. To demonstrate the direction of torque.
16. To demonstrate the law of moments.

**Recommended Textbooks.**
1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT
PHYSICS

CLASS - XI

General Instructions

(a) Questions from question no. 1-4 carry 1 marks each, 5-12 carry 2 marks each, 13-27 carry 3 marks each and 28-30 carry 5 marks each.

(b) There is no overall choice but one choice is given in 2 marks question, two choice in 3 marks question and all three choices in five marks question.

(c) You may use the following physical constant where ever necessary:

- Speed of light \( C = 3 \times 10^8 \text{ ms}^{-1} \)
- Gravitational constant \( G = 6.6 \times 10^{-11} \text{ Nm}^2 \text{ Kg}^{-2} \)
- Gas constant \( R = 8.314 \text{ J Mol}^{-1} \text{ k}^{-1} \)
- Mass of electron = \( 9.110 \times 10^{-31} \text{ Kg} \)
- Mechanical equivalent of heat = \( 4.185 \text{ J Cal}^{-1} \)
- Standard atmospheric pressure = \( 1.013 \times 10^5 \text{ Pa} \)
- Absolute zero \( 0K = -273.15^\circ C \)
- Acceleration due to gravity = \( 9.8 \text{ Ms}^{-2} \)

Use of calculator is not permitted. However you may use log table, if required. Draw neat labelled diagram wherever necessary to explain your answer.

1. A light body and heavy body have equal momentum, which one have greater kinetic energy?
2. What does speedometer of a car indicates?
3. Write down the dimensions of viscosity coefficient
4. Why do we use ball-bearings?
5. How errors are combined in following mathematical operations of physical quantities?
   (i) Subtraction   (ii) Product

6. Draw the Velocity - Time graph for following cases when (i) Object is moving in positive direction with acceleration (ii) An object is under free fall.

7. Derive the necessary relation for safest velocity of an automobile on a banked road radius $r$ and friction coefficient $\mu$.

8. If variation of position with time $t$ is given by $x = a + bt + ct^2$. Write the dimensions of $a$, $b$ & $c$.

9. The forces whose magnitude is in the ratio of 3:5 give a resultant of 35 N. If the angle b/w them is 60°. Find the magnitude of each force.

10. What is an impulse? A ball coming towards a batsman with a certain velocity $U$. He deflects the ball by an angle $Q$ and its velocity increases to $V$. Draws A vector diagram to show initial momentum, find momentum and impulse.

11. In the given system of masses $m_1 = 5 \text{ kg}$, and coefficient of friction for each constant is 0.2. Calculate the mass $m_2$, if $m_1$ is sliding down with an acceleration of 2 m/s². What will be the tension in the string?

12. The radius and length of a solid cylinder is measured as $R = (10.0 \pm 0.2)$ cm, $l = (20.0 \pm 0.5)$ cm. Calculate the volume and surface area of the cylinder and error in them.

13. A bomb is exploded into three fragments of mass 1:2:3. The fragment having lighter masses move with a speed of 40 m/s in mutually perpendicular to each other. Calculate the velocity of the third fragment.

14. If $\vec{A} = (2\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{B} = (3\hat{i} + 4\hat{j})$. Determine the vector having same magnitude as $\vec{B}$ and parallel to $\vec{A}$.
15. A force acting on an object is given by \( \mathbf{F} = (3\mathbf{i} + 4\mathbf{j} - 5\mathbf{k}) \) N and the displacement made by it is given by \( \mathbf{r} = (6\mathbf{i} - 2\mathbf{j} - \mathbf{k}) \). Calculate the work done and power if work is done in 2 s.


17. If the momentum of an object is increased by 50%, Calculate the percentage changes in its K.E.

\[ \text{OR} \]

Two particles having mass ratio of 4:5 have same K.E. Calculate the ration of their linear momentum.

18. The velocity- Time relation of a particle is given by \( \mathbf{V} = (3t^2 - 2t - 1)\mathbf{m/s} \). Calculate using calculus method, the position and acceleration of the particle when the velocity of the particle is zero. Given that the initial position of the object is 5m.

19. Express 10J of energy in a new system of units in which 100g, 10 cm, 30 sec are the fundamental units. Determine which one of them is bigger unit of energy.

20. The escape velocity \( (v) \) of a body depends upon the mass \( (m) \) of body, gravitational acceleration \( (g) \) and radius \( (R) \) of the planet. Derive the relation for escape velocity dimensionally.

21. State and Prove Work- Energy Theorem. OR Define uniform velocity of an object moving along a straight line. What will be shape of velocity time and position-time graphs of such a motion?

22. If a composite physical quantity in terms of moment of inertia \( I \), force \( F \), velocity \( V \), work \( W \) and length \( L \) is define as, \( Q = (IF^2WL^3) \). Find the dimension of \( Q \) and identify it.

23. Explain why a man who fall from a height on a cemented floor receive more injury then when he fall from the same height on the heap of sand.

24. Is it possible to have collision in which all the kinetic energy is lost? If so cite an example.

\[ \text{OR} \]

\[ XI - Physics \]

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Prove that mechanical energy remains conserved during motion when a body of mass \( m \) is dropped from a height \( h \).

25. Two masses 8 kg and 12 kg are connected at the two ends of an inextensible string that passes over a frictionless pulley. Find the acceleration of the masses and tension in the string when masses are released.

26. A body of mass 1 Kg initially at rest is moved by a horizontal force of 0.5 N on a smooth friction less table. Calculate the work done by the force in 10 S and show that it is equal to the change in kinetic energy of the body.

27. Two bodies of masses \( m_1 \) and \( m_2 \) \((m_1 \neq m_2)\) moving with initial velocities \( u_1 \) and \( u_2 \) \((u_1 > u_2)\), along a straight line in the same direction, suffer perfect head on collision. Find their velocities after collision.

28. State Parallelogram law of vector addition. Find the magnitude and direction of the resultant of two vectors A and B in terms of their magnitudes and angle between them.

OR

28. (i) Explain why it is easier to pull a roller than to push it.

   (ii) State Newton's laws of motion with at least one example of each. Show that Newton's second law is the real law.

29. What do you understand by friction? Explain static friction, limiting friction and kinetic friction. Which of them self adjusting in nature? Draw a graph to show the variation of frictional force with applied force.

OR

(i) Derive the equation \( S = ut + \frac{1}{2} at^2 \) using graphical method.

(ii) Show that the velocity of particle in a circular is always tangential to the circle.

30. A projectile is fired in air making an angle \( \theta \) with horizontal. Show that

   (i) Its path is parabolic in nature.

   (ii) \( \tan \theta = \frac{4H}{R} \) where \( H \) is maximum height attained and \( R \) is the range of projectile.
XI Chemistry Syllabus for 2012

Total Periods : 180

One Paper

Time: 3 Hours

70 marks

Unit No. | Title | Marks
---|---|---
Unit I | Some Basic Concepts of Chemistry | 5
Unit II | Structure of Atom | 6
Unit III | Classification of Elements and Periodicity in Properties | 4
Unit IV | Chemical Bonding and Molecular Structure | 5
Unit V | States of Matter: Gases and Liquids | 4
Unit VI | Thermodynamics | 6
Unit VII | Equilibrium | 6
Unit VIII | Redox Reactions | 3
Unit IX | Hydrogen | 3
Unit X | s -Block Elements | 5
Unit XI | Some p -Block Elements | 5
Unit XII | Organic Chemistry: Some basic Principles and Techniques | 7
Unit XIII | Hydrocarbons | 8
Unit XIV | Environmental Chemistry | 3

Total 70

Unit I: Some Basic Concepts of Chemistry (Periods 14)

General Introduction: Importance and scope of chemistry.

Historical approach to particulate 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.

Unit II: Structure of Atom (Periods 16)


Unit III: Classification of Elements and Periodicity in Properties (Periods 8)

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, electronegativity, valence.
Unit IV: Chemical Bonding and Molecular Structure (Periods 16)
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 hybridization, involving s,p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

Unit V: States of Matter: Gases and Liquids (Periods 14)
Three states of matter, intermolecular interactions, types 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. Deviation from ideal behaviour.
Liquid State- vapour pressure, viscosity and surface tension (qualitative idea only)

Unit VI: Thermodynamics (Periods 16)
System and types of system, surrounding, work, heat, energy, extensive and intensive properties, state functions.
First law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat, measurement of ?U and ?H, Hess's law of constant heat summation, enthalpies 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 process criteria for equilibrium.

Unit VII: Equilibrium (Period 16)
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 - ionization of acids and bases, strong and weak electrolytes, degree of ionization, concept of pH, hydrolysis of salts (elementary idea), buffer solution, solubility product, common ion effect (with illustrative examples).

Unit VIII: Redox Reactions (Period 6)
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

Unit IX: Hydrogen (Period 8)
Position of hydrogen in periodic table, occurrence, isotopes, preparation and uses of hydrogen, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen peroxide -preparation, reactions and structure and use; hydrogen as a fuel.

Unit X: s -Block Elements (Alkali and Alkaline Earth Metals) (Periods 12)

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 ionization 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 industrial uses of lime and limestone, biological importance of Magnesium and Calcium.

**Unit XI: Some p-Block Elements** *(Periods 14)*

**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 acid, boron hydrides, Aluminium: 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 elements 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.

**Unit XII: Organic Chemistry -Some Basic Principles and Technique**(Periods 14)

General introduction, methods of qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds.

Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyperconjugation.

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

**Unit XIII: Hydrocarbons** *(Periods 16)*

**Classification of Hydrocarbons**

**Aliphatic Hydrocarbons:**

- Alkanes- Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of 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 (Markonikov'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. nitrationsulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in monosubstituted benzene. Carcinogenicity and toxicity.
Unit XIV: Environmental Chemistry (Periods 8)
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, strategies for control of environment pollution.

Practicals

Evaluation Scheme for Examination

<table>
<thead>
<tr>
<th>Evaluation Scheme for Examination</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>Volumetric Analysis</td>
<td>10</td>
</tr>
<tr>
<td>Salt Analysis</td>
<td>6</td>
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<tr>
<td>Content Based Experiment</td>
<td>4</td>
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<tr>
<td>Class Record and Viva</td>
<td>5</td>
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<tr>
<td>Investigatory project</td>
<td>5</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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**PRACTICALS SYLLABUS** (Total Periods 60)

A. Basic Laboratory Techniques (Periods 2)
1. Cutting glass tube and glass rod
2. Bending a glass tube
3. Drawing out a glass jet
4. Boring a cork

B. Characterization and Purification of Chemical Substances (Periods 6)
Crystallization of an impure sample of any one of the following: alum, copper sulphate, benzoic acid.

C. Experiments based on pH (Periods 6)
Any one of the following experiments:
" Determination of pH of some solutions obtained from fruit juices, varied concentrations of acids, bases and salts using pH paper or universal indicator.
" Comparing the pH of solutions of strong and weak acids of same concentration.

D. Chemical Equilibrium (Periods 4)
One of the following experiments:
(a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
(b) Study the shift in equilibrium between \([\text{Co(H}_2\text{O)}_6]\text{2+}\) and chloride ions by changing the concentration of either of the ions.

E. Thermochemistry (Periods 4)
Any one of the following experiments
i) Enthalpy of dissolutions of copper sulphate or potassium nitrate.
ii) Enthalpy of neutralization of strong acid (HC1) and strong base (NaOH)
iii) Determination of enthalpy change during interaction (hydrogen bond formation) between acetone and chloroforms.
F. Quantitative estimation  (Periods 16)
• Using a chemical balance.
• Preparation of standard solution of oxalic acid.
• Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.
• Preparation of standard solution of sodium carbonate.
• Determination of strength of a given solution of hydrochloric acid by titrating it against standard sodium carbonate solution.

G. Qualitative Analysis  (Periods 16)
Determination of one anion and one cation in a given salt

Cations - Pb^{2+}, Cu^{2+}, As^{3+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH^{+}

Anions - CO_{3}^{2-}, S^{2-}, SO_{4}^{2-}, NO_{3}^{-}, NO_{2}^{-}, Cl^{-}, Br^{-}, I^{-}, PO_{4}^{3-}, C_{2}O_{4}^{2-}, CH_{3}COO^{-}

(Note: Insoluble salts excluded)

H. Extra Elements - nitrogen, sulphur, chlorine, bromine and iodine  (Periods 10)
in an organic compound.

PROJECT
Scientific investigations involving laboratory testing and collecting information from other sources.

A Few suggested Projects
• Checking the bacterial contamination in drinking water by testing sulphide ion.
• Study of the methods of purification of water.
• Testing the hardness, presence of iron, fluoride, chloride etc. Depending upon the regional variation in drinking water and study of causes of presences of these ions above permissible limit (if any).
• Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on it.
• Study the acidity of different samples of tea leaves.
• Determination of the rate of evaporation of different liquids.
• Study the effect of acids and bases on the tensile strength of fibers.
• Study of acidity of fruit and vegetable juices.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

Recommended Textbooks.
1. Chemistry Part -I, Published by NCERT, 2006
2. Chemistry Part -II, Published by NCERT, 2006
SAMPLE PAPER
CLASS XI
CHEMISTRY

Time: 3 Hours  Maximum Marks: 70

General Instructions:
(3) All questions are compulsory.
(4) Marks of each question are indicated against it.
(5) Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
(6) Question nos. 9 to 18 are short answer questions and carry 2 marks each.
(7) Question nos. 19 to 27 also short answer questions and carry 3 marks each.
(8) Question nos. 28 to 30 are long answer question and carry 5 marks each.
(9) Use log tables if necessary, use of calculators is not allowed.

Q1 How are 0.50 mol Na$_2$CO$_3$ and 0.50 M Na$_2$CO$_3$ different?
Q2 How many subshells are present in M shell?
Q3 Which property of element is used to classify them in long form of periodic table?
Q4 Write resonance structure of Ozone or sulphurdioxide.
Q5 Write conjugate base for water and NH$_4$+ species.
Q6 What do you understand by Hydrogen economy?
Q7 Find out oxidation number of chromium in K$_2$Cr$_2$O$_7$ molecule.
Q8 Indicate sigma and pie bonds in CH$_2$=C=CH$_2$.

Q9 Calculate number of photons with a wavelength of 3000pm that provides 1 Joule of energy.

Q10 Explain why bond angle in NH$_3$ is more than in H$_2$O molecule though both have sp3 hybridization.

Q11 At constant temperature if the pressure of a fixed mass of gas is doubled what happens to its volume? Which law governs this behavior of gases?

Q12 How many grams of oxygen is required for complete combustion of 29g of butane as per the equation C$_4$H$_{10}$+ 4.5O$_2$=2CO$_2$+5H$_2$O.
Q13 Calculate bond order of oxygen molecule. List all the information provided by the bond about this molecule.  
2 Marks

Q14 Calculate the total pressure in a mixture of 16 g of oxygen and 4g of Hydrogen confined in a vessel of 1dm$^3$ at 27 degree celsius. (Molar mass of oxygen 32 Hydrogen 2 R=0.083bar dm$^3$ K-1mol$^{-1}$) 
2 Marks

Q15 Balance following equation in acidic medium showing all steps, 
$\text{Br}_2 + \text{H}_2\text{O}_2 \rightarrow \text{BrO}_2 + \text{H}_2\text{O}$ 
2 Marks

Q16 How are silicones prepared? Write necessary reaction. Write two uses of silicones. 
2 marks

Q17 What is demineralised water? How is it obtained? 
2 Marks

Q18 What is the reason of diagonal relationship of elements? Write two properties of any two diagonally related elements. 

Or

Give reasons 
(1) why alkali metals when dissolved in Liquid ammonia give blue solution? 
(2) Beryllium and Magnesium do not impart colour to the flame while other members do.

Q19 (1) State Heisenberg's Uncertainty principle. 
(2) Write electronic configuration of Cu metal (Z=29) and Cr$^{3+}$ ion. 
(3) Which orbital is represented by n=4 and l=3? 
3 Marks

Q20 Explain why 
(1) Halogens act as good oxidizing reagent. 
(2) Electron gain enthalpy of inert gases is zero. 
(3) Ionization enthalpy of Mg is higher than that of Na. 
3 Marks

Q21 (1) What do you mean by Bond Enthalpy? 
(2) Calculate bond enthalpy of Cl--Cl bond from following data. 
$\text{CH}_4(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow \text{CH}_3\text{Cl}(\text{g}) + \text{HCl}(\text{g})$ \[\Delta H = -109.3\text{kJ mol}^{-1}\] 
Bond enthalpy of C—H Bond = 413kJ, C—Cl Bond =326 kJ and H—Cl Bond =431kJ mol$^{-1}$ 
3 Marks

Q22 (1) What are extensive properties? 
(2) Write Gibbs free energy equation giving meaning of each term used. 
(3) Under what condition \[\Delta U = \Delta H\] ? 
3 Marks
Q23 Write chemical equation only for preparation of
(1) Plaster of Paris
(2) Quick lime
(3) Slaked lime. 3 Marks

Q24 (1) What do you mean by functional isomerism?
(2) What are electrophiles?
(3) What is inductive effect? Give an example. 3 Marks

Or
(1) Write IUPAC names for \( C_6H_5CH_2CHO \) and \( (CH_3)_2—CH(NH_2)CH_3 \)
(2) Write an example of geometrical isomerism.
(3) What do you mean by electromeric effect? 3 Marks

Q25 (1) Draw eclipsed and staggered conformations of ethane.
(2) Write one equation each to show Wurtz reaction and Friedal craft alkylation. 3 Marks

Q26 (1) How nitrogen is detected in an organic compound? Write necessary reactions.
(2) How a molecular formula is different from empirical formula? 3 Marks

Q27 (1) What do you mean by green chemistry?
(2) Explain terms BOD and COD with reference to environmental chemistry. 3 Marks

Q28 (1) For the reaction \( N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \) the value of \( K_p \) is \( 3.6 \times 10^{-2} \). Calculate the value of \( K_c \) for the reaction at the same temperature. \( R=0.083 \text{ bar} \text{ L K}^{-1} \text{ mol}^{-1} \).
(2) What do you understand by (1) Common ion effect (2) Buffer solution. 3+2 Marks

Or
(1) For the reaction \( PCl_5 \rightleftharpoons PCl_3 + Cl_2 \) at 473K the value of equilibrium constant \( K_c \) is \( 8.3 \times 10^{-3} \). (1) Write an expression for \( K_c \) (2) What is the value of \( K_c \) for reverse reaction at same temperature. (3) What would be effect on \( K_c \) if pressure is increased.
(2) State Henry’s Law. Write pH value of 1x10^{-5} M HCl solution. 3+2 Marks

Q29 Give reasons for
(1) \([\text{SiF}_6^{2-}]\) is known whereas \([\text{SiCl}_6]^{-2}\) is not known.
(2) Diamond is a covalent solid, yet it has highest Melting Point.
(3) Boric acid is considered a weak base.
(4) BF3 behaves as Lewis acid.
(5) CO₂ is a gas while SiO₂ is a solid at room temperature.

Or

(1) What are fullerenes?
(2) Why is boric acid monobasic?
(3) What is inert pair effect?
(4) Why is PbCl₂ a good oxidizing reagent?
(5) Write the formula of inorganic benzene.

Q30 (1) State Markovnicoff’s rule. Using this write the reaction of propene with HCl.

(2) Carry out following conversions
(1) Ethyl alcohol to ethane.
(2) Sodium acetaldehyde to benzene.
(3) Benzene to nitrobenzene.

Or

(10) Write two reactions to show acidic nature of ethyne
(11) Complete the following reactions-
ozone/Zn/H₂O

(12) CH₃—CH=CH₂ --------→
aquous KMnO₄

(13) CH₃—CH=CH₂------------------------→

(14) CH=CH + Br₂ water----------------→

Marking Scheme
SESSION ENDING EXAMINATION
CLASS XI
CHEMISTRY

Q1 Correct meaning ½ + 1/2
Q2 Two one s and one p ½ + 1/2
Q3 Atomic Number
Q4 Correct structure 1 mark
Q5 Correct answer ½ + 1/2
Q6 correct answer 1mark
Q7 +6 1mark
Q8 Sigma 6 pie 2 1mark
Q9 E=hv \( \frac{1}{2} \) 

\[ E = 6.626 \times 10^{-34} \times 3000 \times 10^{-10} = 19.878 \times 10^{-41} \text{ J} \] 1mark

\[ \frac{1}{19.878 \times 10^{-41}} = 5.03 \times 10^{-39} \text{ photons} \] \( \frac{1}{2} \) mark

Q10 Correct explanation with correct structure 1+1 mark

Q11 Decreases to half, Boyle’s Law 1+1 mark

Q12 Correct formula \( \frac{1}{2} \) mark

Correct values and calculation 1mark

Ans. 2.06 mol/ Kg \( \frac{1}{2} \) mark

Q13 correct formula \( \frac{1}{2} \) mark

Correct values and calculation 1mark

Correct answer with units \( \frac{1}{2} \) mark

Q14 correct bond order 1mark + correct information 1mark

Q15 correct steps \( 4 \times 1/2 = 2 \)

Q16 correct method +correct uses 1+1 mark

Q17 correct reasons 1+1 or correct reason 1mark + two properties 1mark

Q 18 correct definition + One correct method 1+1 mark

Q19 (1) correct definition 1mark

(2) Correct configuration \( \frac{1}{2} +1/2 \)

(3) 4f 1mark

Q20 correct answer 1mark each

Q21 correct definition 1mark

\[ \sum \text{Bond enthalpy of reactants} - \sum \text{Bond enthalpy of Products} \] \( \frac{1}{2} \) mark

Correct value and calculation 1 mark

Answer 234.7 kJ \( \frac{1}{2} \) mark
Q22 Correct answer 1 mark each

Q23 Correct method with equation 1 mark each

Q24 Correct Answer of each part 1 mark each

Q25 Correct Answer of each part 1 mark each

Q26 Correct method with equation 2 mark

Correct relation 1 mark

Q27 Correct answer of each part 1 mark each

Q28 (1) Correct relation ½ mark, Δ n=-2 ½ mark

Correct value and calculation 1 mark, answer ½ mark

(2) Correct meaning 1 mark each

Or (1) Correct answer of each part 1 mark each

(2) Correct statement 1 mark, pH=5 1 mark

Q29 Correct answer of each part 1 mark each.

Q30 (1) Correct rule 1 mark, correct reaction 1 mark

(2) Correct answer of each part 1 mark each

Or

(1) two correct reaction 2 mark

(2) Correct answer of each part 1 mark each.
9. BIOLOGY (Code No. 044)

The present syllabus reinforces the ideas introduced till the secondary classes. It provides the students with new concepts along with an extended exposure to contemporary areas of the subject. The syllabus also aims at emphasizing on the underlying principles that are common to both animals and plants as well as highlighting the relationship of biology with other areas of knowledge. The format of the syllabus allows a simple, clear, sequential flow of concepts without any jarring jumps. The syllabus also stresses on making connections better among biological concepts. It relates the study of biology to real life through the use of technology. It links the discoveries and innovations in biology to everyday life, such as environment, industry, health and agriculture. The updated syllabus also focuses on reducing the curriculum load while ensuring that ample opportunities and scope for learning and appreciating basic concepts of the subject continue to be available within its framework.

The prescribed syllabus is expected to
- promote understanding of basic principles of Biology
- encourage learning of emerging knowledge and its relevance to individual and society
- promote rational/specific attitude to issues related to population, environment and development
- enhance awareness about environmental issues and problems and the appropriate solutions
- create awareness amongst the learners about variations amongst the living, and developing respect for the diversity and to appreciate that the most complex biological phenomena are also built on essentially simple processes.

It is expected that the students would get an exposure to various branches of Biology in the syllabus in a more contextual and friendly manner as they study its various units.

**COURSE STRUCTURE**

**CLASS XI (Theory)**

<table>
<thead>
<tr>
<th>One Paper</th>
<th>Time : 3 Hours</th>
<th>Max. Marks : 70 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit</strong></td>
<td><strong>Title</strong></td>
<td><strong>Marks</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Diversity of Living Organisms</td>
<td>07</td>
</tr>
<tr>
<td>2.</td>
<td>Structural Organisation in plants and animals</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>Cell: Structure and Function</td>
<td>15</td>
</tr>
<tr>
<td>4.</td>
<td>Plant Physiology</td>
<td>18</td>
</tr>
<tr>
<td>5.</td>
<td>Human Physiology</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>
Unit I: Diversity of Living Organism (25 Periods)

What is living? Biodiversity; Need for classification; Three domain of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy-Museums, Zoos, 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, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (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 chordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples).

Unit II: Structural Organisation in Animals and Plants (25 Periods)

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 system (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (A brief account only)

Unit III: Cell Structure and Function (40 Periods)

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; 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 (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleous.

Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbohydrates, lipid, nucleic acids, Enzymes-types, properties, enzymes action.

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

Unit IV: Plant Physiology (45 Periods)

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 (brief mention).

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; Where does photosynthesis take place, How many pigments are involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; C3 and C4 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, dedifferentiation and redifferentiation; sequence of developmental process in a plant cell; Growth regulators-auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation: Photoperiodism.

Unit V: 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 value of proteins, carbohydrates and fat (for box item not to be evaluated); Egestion; Nutritional and digestive disorders-PEM, indigestion, constipation, vomiting, jaundice, diarrhea.

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 (To be dealt with the relevant practical of Practical syllabus); 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 (Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exophthalmic goiter, diabetes, Addision's disease). 

Imp: Diseases related to all the human physiology systems to be taught in brief.

Practicals

60 Periods

A. List of Experiments

1. Study and describe three locally available common flowering plants from each of the following families (Solanaceae, Fabaceae and Liliaceae) including dissection and display of floral whorls and anther and ovary to show number of chambers. Types of root (Tap and Adventitious); Stem (Herbaceous and woody); Leaf (arrangement, shape, venation, simple and compound).

2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).

3. Study of osmosis by potato osmometer.

4. Study of plasmolysis in epidermal peels (e.g. Rhoeo leaves)

5. Study of distribution of stomata in the upper and lower surface of leaves.

6. Comparative study of the rates of transpiration in the upper and lower surface of leaves.

7. Test for the presence of sugar, starch, proteins and fats. To detect them in suitable plant and animal materials.

8. Separation of plant pigments through paper chromatography.

9. To study the rate of respiration in flower buds/leaf tissue and germinating seeds.

10. To test the presence of urea in urine.

11. To detect the presence of sugar in urine/blood sample.

12. To detect the presence of albumin in urine.

13. To detect the presence of bile salts in urine.

B. Study/observation of the following (spotting)

1. Study parts of a compound microscope.

2. Study of the specimens and identification with reasons-Bacteria, Oscillatoria, Spirogyra, Rhizopus, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant and one dicotyledonous plant and one lichen.

3. Study of specimens and identification with reasons-Amoeba, Hydra, Liverfluke, Ascaris, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard,
pigeon and rabbit.

4. Study of tissues and diversity in shapes and sizes of plant and animal cells (e.g. palisade cells, guard cells, parenchyma, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibers and mammalian blood smear) through temporary/permanent slides.

5. Study of mitosis in onion root tips cells and animals cells (grasshopper) from permanent slides.

6. Study of different modifications in root, stem and leaves.

7. Study and identification of different types of inflorescence.

8. Study of imbibition in seeds/raisins.

9. Observation and comments of the experimental set up for showing:
   a. Anaerobic respiration
   b. Phototropism
   c. Apical bud removal
   d. Suction due to transpiration

10. Study of human skeleton and different types of joints.

11. Study of external morphology of cockroach through models.
Model Question Paper - 1

XI

BIOLOGY (Theory)

Time : 3 Hrs.] \[M.M : 70\]

General Instruction :

(i) All questions are compulsory.

(ii) The questions paper consist of four section A, B, C and D. Section ‘A’ contain 8 questins of 1 mark each. Section ‘B’ is of 10 questions of 2 marks each. Section ‘C’ has 9 questions of 3 marks each. Section ‘D’ is of 3 question of 5 marks each.

(iii) There is no overall choice. However, and intornal choice has been provided in one question of 2 marks. One question of 3 marks and all the three questions of 5 marks.

(iv) Wherever necessary, the diagram draw should be neat and properly labelled.

Section ‘A’

1. What is function of mucus present is gastric juice ?
2. In which stage of interphase the amount of DNA doubles per cell.
3. Name the polysaccharide which constitutes the exoskeleton of arthropods.
4. Why do lichen generally grow at high altitude ?
5. Select the uricotelic from the following mammals, birds. Cockroach, reptiles.
6. Which is the lowest category in taxonomic categories.
7. Write the floral formula of family Liliaceae.
8. Define sarcomere.

Section ‘B’

9. Write any two differences between a prokaryotic cell and a euakaryotic cell.
10. Illustrate a glycosidic and phosphodiester bond.

11. State the importance of air bladder in pisces.

12. Bile juice contain no digestive enzyme, yet it is important for digestion. Why?

13. Explain the role played by protein pumps during active transport in plants.

14. State the functions of PCT in our body.

15. How are exarch and endarch conditions differ anatomically in stem and root?

16. What is the importance of $F_o - F_1$ particles in ATP synthesis during aerobic respiration?

17. Define the following: (i) Tidal volume (ii) Inspiratory capacity

OR

Where is Carbonic anhydrase is found? Write its function.

18. In the given table, showing the name of some hormone and their function. Fill in the blank A to D

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolactin</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Stimulates Contraction of muscle</td>
</tr>
<tr>
<td></td>
<td>of uterus during parturition</td>
</tr>
<tr>
<td>Thymus</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>regulate female sexual behaviour</td>
</tr>
</tbody>
</table>

Section ‘C’

19. Give the account of total ATP production in aerobic respiration.

20. (a) How does abscisic acid acts antagonistically to auxin and Gibberellin?

(b) Name the growth regulator used for each of the following.

(i) ripening of fruits

(ii) Induce parthenocarpy

22. State the location and function of different types of meristem.

23. How do concentration of substrate affects the activity of an enzyme?

24. Explain the process of depolarisation of the plasma membrane of a nerve fibre.

25. Differentiate between:
   (a) Apocarpus and syncarpus ovary
   (b) Actinomorphic and Zygomorphic flower
   (c) Racemose and Cymose inflorescence.

   OR

   Name the three Classes of algae. Write major pigment and food stored in them.

26. (a) Why is mitosis called equational division?

   (b) How does Cytokinesis in plant cells differ from that of animal cells.

27. Where do you find the following and give their function also.
   (i) Setae  (ii) Malpighian tubules

   Section ‘D’

28. (a) What is blood? Give the composition of plasma.

   (b) Name the three types of Blood cells found is blood. Give their number per mm³ and also their functions.

   OR

   (a) What is Lymph? Where is it found?

   (b) Describe Mechanism of blood Coagulations takes place after an injury in our body.

29. (a) What is Chromatin? Name two components of Chromatin.

   (b) Describe four types of Chromosomes with diagram of each.
OR

(a) What is a mesosome in a prokaryotic cell? Mention its function.
(b) Draw a neat diagram of typical animal cell and label the following parts - nucleus, mitochondria, ER, centriole,
(c) Give one point difference in animal cell and plant cell.

30. Describe the process of CO$_2$ fixation given by Hatch and Slack

OR

Where does non-cycle photophosphorylation takes place? Describe this process. Why is this process referred to as non-cyclic?
14. COMPUTER SCIENCE (Code 083)

Learning Objectives:
1. To develop logic for Problem Solving
2. To understand the concept of Object Oriented Methodology
3. To implement Object Oriented Programming using C++
4. To understand the concept of working with Relational Database
5. To understand the basic concept of Computing Logic
6. To understand the basic concepts of Communication and Networking technologies
7. To understand Open Source Software

Competencies:
The student will develop the following proficiency:
1. Identifying Computer Components / Subsystems / Peripherals
2. Problem Solving using Object Oriented Programming
3. Database Handling

Class XI (Theory)
Duration: 3 hours Total Marks: 70

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Unit Name</th>
<th>Periods</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Th</td>
<td>Pr</td>
</tr>
<tr>
<td>1.</td>
<td>COMPUTER FUNDAMENTALS</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>INTRODUCTION TO C++</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>PROGRAMMING METHODOLOGY</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>PROGRAMMING IN C++</td>
<td>60</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>110</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

UNIT 1: COMPUTER FUNDAMENTALS

Evolution of computers; Basics of computer and its operation: Functional Components and their intercon-nections, 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 -
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)


Number System: Binary, Octal, Decimal, Hexadecimal and conversion between two different 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; Types - CISC, RISC

Memory Concepts:
- Units: Byte, Kilo Byte, Mega Byte, Giga Byte, Tera Byte, Peta Byte
- Primary Memory: Cache, RAM, ROM
- Secondary Memory: Fixed and Removable Storage - Hard Disk Drive, CD/DVD Drive, Pen Drive, Blue Ray Disk


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

UNIT 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 - \n, \t, \b), 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

**Operator and Expressions:**

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

**UNIT 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)

**UNIT 4: PROGRAMMING IN C++**

**Flow of control:**

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

**Inbuilt Functions**

<table>
<thead>
<tr>
<th>Header file Categorization</th>
<th>Header File</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard input/output functions</td>
<td>stdio.h</td>
<td>gets (), puts ()</td>
</tr>
</tbody>
</table>
| 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 (), sqrt (),
| | | sin (), cos (), abs () |
| Other Functions | stdlib.h | randomize (), random (),
| | | itoa (), atoi () |
User Defined Functions:
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:
User defined data type

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 symbole name using typedef keyword and defining a macro using #define directive.
Class XI (Practical)

Duration: 3 hours

Total Marks: 30

1. **Programming in C++**

   One programming problem in C++ to be developed and tested in Computer during the examination. Marks are allotted on the basis of following:

   - Logic : 5 Marks
   - Documentation/Indentation : 2 Marks
   - Output presentation : 3 Marks

2. **Project Work**

   Problems related to String, Number and Array manipulation

   General Guidelines: Initial Requirement, developing an interface for user (it is advised to use text based interface screen), developing logic for playing the game and developing logic for scoring points

   1. Memory Game: A number guessing game with application of 2 dimensional arrays containing randomly generated numbers in pairs hidden inside boxes.
   2. Cross 'N Knots Game: A regular tic-tac-toe game
   3. Hollywood/Hangman: A word Guessing game
   4. Cows 'N Bulls: A word/number Guessing game

   or

   Similar projects may be undertaken in other domains

   (As mentioned in general guidelines for project, given at the end of the curriculum in a group of 2-4 students)

3. **Practical File**

   (a) Record of the configuration of computer system used by the student in the computer lab (by exploring inside computer system in the first 2 lab classes).

   (b) Must have minimum 15 programs from the topics covered in class XI course.

   - 5 Programs on Control structures
   - 4 Programs on Array manipulations
   - 4 Programs on String Manipulations
   - 2 Programs on structure manipulations

4. **Viva Voce**

   Viva will be asked from the syllabus covered in class XI and the project developed by the student(s).
1. a) What are the different functions of operating system?  
   b) How the information can be used as a data explain?  
   c) What do you mean by unary operators  
   d) What are the different parts of CPU? Explain every part in brief.  
   e) Define System Software and what are its two main types? Give examples.  
   f) What is Booting?  
   g) Which of the following are hardware and software?  
      (i) Capacitor (ii) Internet Explorer (iii) Hard disk (iv) UNIX

2. Explain the following term: (Give answer any six)  
   i) Variable  
   ii) Token  
   iii) Array  
   iv) Debugging  
   v) Comment  
   vi) Keyword

3. a) What is the difference b/w “while” & “do while” loop?  
   b) What are data types? What are all predefined data types in C++?  
   c) What will be the size of following constants?  
      ‘v’, “v”,  
   d) Write the corresponding C++ expressions for the following mathematical expressions:  
      i) \( \sqrt{a^2 + b^2} \)  
      ii) \( \frac{a+b}{p+q} \)  
   e) Evaluate the following, where p, q are integers and r, f are floating point numbers.  
      The value of p=8, q=4 and r=2.5  
      (i) \( f = p \times q + \frac{p}{q} \)  
      (ii) \( r = p+q + p \% q \)

4. a) What is the output of the following?  
   i) #include<iostream.h>  
      void main ( )  
      {  
         int i=0;  
         cout<<i++<<" ";cout<<i++<<" ";cout<<i++<<endl;  
         cout<<i++<<" ";cout<<i++<<" ";cout<<i++<<endl  
      }
   
   ii) #include<iostream.h>  
      void main( )  
      {  
         a=3;  
         a=a+1;  
         if (a>5)  
            cout<<a;  
         else  
            cout<<(a+5);  
      }
iii) What will be the output of the following program segment?
   If input is as:       (a) g       (b) b       (c) e       (d) p
   cin >>ch;
   switch (ch)
   { case 'g': cout<<"Good";
     case 'b': cout<<"Bad";
     break;
     case 'e': cout<<" excellent ";
     break;
     default: cout<<" wrong choice";
   }

iv) Determine the output:
   for(i=20;i<=100;i+=10)
   { 
     j=i/2;
     cout<<j<<"";
   }

v) What output will be the following code fragment produce?
   void main( )
   {
     int val, res, n=1000;
     cin>>val;
     res = n+val >1750 ? 400:200;
     cout<<res;
   }
   (i) if val=2000   (ii) if  val=1000(iii) if val=500

5 a) Find the error from the following code segment and rewrite the corrected code underlining the correction made.

   # include<iostream.h>
   void main ( )
   int X,Y;
   cin>>>X;
   for(Y=0,Y<10, Y++)
     if X= =Y
     cout<<Y+X;
   else
     cout>>Y;
   }

b) Convert the following code segment into switch case construct.

   int ch;
   cin>>ch;
   If(ch = = 1)
   {   cout<<" Laptop";
   }
   else if(ch = = 2)
   {   cout<<"Desktop ";
   }   else if(ch= = 3)
c) Convert the following code segment into do-while loop.
```cpp
#include<iostream.h>
void main()
{
    int i;
    for(i=1;i<=20;++i)
        cout<<"\n"<<i;
}
```

d) Given the following code fragment
```cpp
int ch=5;
cout << ++ch<< "\n"<<ch<<"\n";
```
i) What output does the above code fragment produce?  
ii) What is the effect of replacing ++ ch with ch+1?  

6 a) Which header files are required for the following? 
   (i) frexp() (ii) sqrt() (iii) rand() (iv) isupper()  
   b) Evaluate:  
      i) \((12)_{10} = (X)_{2}\)  
      ii) \((347)_{8} = (X)_{10}\)  
      iii) \((896)_{16} = (X)_{8}\)  
      iv) \((100)_{10} = (X)_{2}\)  

7 a) Write a C++ program to check a year for leap year or not.  
b) Write a C++ program to check a number for Armstrong or not.  
c) Write a C++ program to calculate the factorial of any given number  
d) Write a C++ program to print the Fibonacci series  
e) Write a C++ program to print table a given number.
Q.No.1

a. Major OS functions are listed below
      Management (Student has to describe all in brief)
b. The processed information can be used as a data again to produce a next level information.
   For example- total no. of students school wise can give the information that how students are there in one region again this information as a data can be used to calculate that how many students are studying in KVS
c. Unary operators are the operators, having one operand and two operators. There are two types of unary operators-
   i. Unary increment (Ex. a++; (post increment))/++a (pre increment))
   ii. Unary decrement (a--; (post decrement))/--a (pre decrement))
d. ALU (Arithmetic logic unit), CU (control unit), MU (memory unit)
e. System software are the software that govern the operation of computer system and make the hardware run. These software can be classified into two categories.
   Operating System & Language Processor
f. Booting is a process through which operating system makes the computer system ready to perform user’s task
g. Hardware- I&II, Software- II&IV

Q.No.2

i. Variable is a name given to the memory location, whose value can be changed during run time.
ii. The smallest individual unit in a program is known as a token
iii. Array is a combination of similar data values. It is used to store more than one value under same name
iv. Debugging is a way to correct the errors in the program during compilation
v. Comments are non-executable statements, used to give the information about the code for future use.
vi. Keywords are the reserved words, programmed by the programmer to perform the specific task. The keyword cannot be taken as a name of variable.

Q.No.3

a. While loop is entry control loop i.e. while loop first will test the condition and if condition is true then only the body of the loop will be executed. While do-while loop is exit control loop and even the condition is not true at least one time the body of the loop will be executed.
b. Data types are means to identify the types of data and associated operation of handling it. The fundamental data types are- char, int, float, double and void.
c. One byte
d. i. \sqrt{a^2+b^2} \quad \& \quad ii. \frac{(a+b)}{(p+q)(p+q)}
e. Students do yourself

Q.No.4

a. i. 0 1 2
   4 5 6 , ii. 9 , iii. For g- good & bad/ for b – bad / for e – excellent / for – p wrong choice
   iv. 10,15,20,25,30,35,40,45,50 v. 400, 400, 200

Q.No.5

a. Errors – if x==y (correct- if(x==y)) & cout>>y(correct cout<<y)
b. int ch; cin>>ch;
   switch(ch)
   {
   Case 1: cout<<" Laptop"; break;
   Case 2: cout<<"Desktop "; break;
   Case 3: cout<<"Notebook";break;
   Default : cout<<"Invalid Choice";
c. ```
#include<iostream.h>
void main()
{
    int i;
    i=1
    do
    { cout<<"\n"<<i;
        ++i
    }while (i<=20);
}
```  
d. In both condition output will be 6 5

Q.No.6  
a. ```
math.h , math.h , stdlib.h , ctype.h
```  
b. 1100, (232) , (4226), (1100100)

Q.No.7  
a. ```
#include<iostream.h>
#include<conio.h>

void main()
{
    clrscr();
    int year;
    cout<<"Enter Year(ex:1900):";
    cin>>year;
    if(year%100==0)
    {
        if(year%400==0)
            cout<<"\nLeap Year";
    }
    else
    if(year%4==0)
        cout<<"\nLeap Year";
    else
        cout<<"\nNot a Leap Year";
    getch();
}
```  
b. ```
#include<iostream.h>
#include<conio.h>
void main()
{
    int Number,Temp,b=0;
    cout<<"Enter any number to check";
    cin>>Number;
    Temp=Number;
    int P;
    while(Temp>0)
    {
        P=Temp%10;
        b=b P*P*P;
        Temp=Temp/10;
    }
```
if(b==Number)
{
    cout<<endl<<"Armstrong no";
}
else
{
    cout<<"Not an armstrong no";
}
getch();
}

c.
#include <iostream.h>
int factorial(int);

void main(void) {
    int number;

    cout << "Please enter a positive integer: ";
    cin >> number;
    if (number < 1)
        cout << "That is not a positive integer.\n";
    else
        cout << number << " factorial is: " << factorial(number) << endl;
}

int factorial(int number) {
    if(number <= 1) return 1;
    else
        return number * factorial(number - 1);
}

d.
#include<iostream.h>
#include<conio.h>
int main()
{
    clrscr();
    unsigned long first,second,third,n;
    int i;
    first=0;
    second=1;
    cout<<"how many elements(>5)? \n";
    cin>>n;
    cout<<"fibonacci series\n";
    cout<<first<<" "<<second;
    for(i=2;i<n;i++)
    {
        third=first+second;
        cout<<" "<<third;
        first=second;
        Second=third;
    }
    return 0;
    getch();}


```cpp
#include<iostream.h>
#include<stdio.h>

void main()
{
    int r,m,i,n;
    cout<<"Enter the number to generate its table"; 
    cin>>n;
    cout<<"Enter the number(table upto)";
    cin>>m;
    i=1;
    while(i<=m)
    {
        r=n*i;
        cout<<n<<"*"<<i<<"="<<r<<endl;
    }
}
```