

# **ECONOMICS (Code No. 030)**

## **(2020-21)**

### **Rationale**

Economics is one of the social sciences, which has great influence on every human being. As economic life and the economy go through changes, the need to ground education in children's own experience becomes essential. While doing so, it is imperative to provide them opportunities to acquire analytical skills to observe and understand the economic realities.

At senior secondary stage, the learners are in a position to understand abstract ideas, exercise the power of thinking and to develop their own perception. It is at this stage, the learners are exposed to the rigour of the discipline of economics in a systematic way.

The economics courses are introduced in such a way that in the initial stage, the learners are introduced to the economic realities that the nation is facing today along with some basic statistical tools to understand these broader economic realities. In the later stage, the learners are introduced to economics as a theory of abstraction.

The economics courses also contain many projects and activities. These will provide opportunities for the learners to explore various economic issues both from their day-to-day life and also from issues, which are broader and invisible in nature. The academic skills that they learn in these courses would help to develop the projects and activities. The syllabus is also expected to provide opportunities to use information and communication technologies to facilitate their learning process.

### **Objectives:**

- Understanding of some basic economic concepts and development of economic reasoning which the learners can apply in their day-to-day life as citizens, workers and consumers.
- Realisation of learners' role in nation building and sensitivity to the economic issues that the nation is facing today.
- Equipment with basic tools of economics and statistics to analyse economic issues. This is pertinent for even those who may not pursue this course beyond senior secondary stage.
- Development of understanding that there can be more than one view on any economic issue and necessary skills to argue logically with reasoning.

# ECONOMICS (030)

## CLASS – XI (2020-21)

Theory: 80 Marks

3 Hours

Project: 20 Marks

Units		Marks	Periods
<b>Part A</b>	<b>Statistics for Economics</b>		
	Introduction	13	07
	Collection, Organisation and Presentation of Data		27
	Statistical Tools and Interpretation	27	41
		<b>40</b>	<b>75</b>
<b>Part B</b>	<b>Introductory Microeconomics</b>		
	Introduction	4	4
	Consumer's Equilibrium and Demand	13	32
	Producer Behaviour and Supply	13	26
	Forms of Market and Price Determination under perfect competition with simple applications	10	13
		<b>40</b>	<b>75</b>
<b>Part C</b>	<b>Project Work</b>	<b>20</b>	<b>15</b>

### Part A: Statistics for Economics

In this course, the learners are expected to acquire skills in collection, organisation and presentation of quantitative and qualitative information pertaining to various simple economic aspects systematically. It also intends to provide some basic statistical tools to analyse, and interpret any economic information and draw appropriate inferences. In this process, the learners are also expected to understand the behaviour of various economic data.

#### Unit 1: Introduction

**07 Periods**

What is Economics?

Meaning, scope, functions and importance of statistics in Economics

#### Unit 2: Collection, Organisation and Presentation of data

**27 Periods**

**Collection of data** - sources of data - primary and secondary; how basic data is collected with concepts of Sampling; methods of collecting data; some important sources of secondary data: Census of India and National Sample Survey Organisation.

**Organisation of Data:** Meaning and types of variables; Frequency Distribution.

**Presentation of Data:** Tabular Presentation and Diagrammatic Presentation of Data:  
(i) Geometric forms (bar diagrams and pie diagrams), (ii) Frequency diagrams (histogram, polygon and Ogive) and (iii) Arithmetic line graphs (time series graph).

### **Unit 3: Statistical Tools and Interpretation**

**41 Periods**

For all the numerical problems and solutions, the appropriate economic interpretation may be attempted. This means, the students need to solve the problems and provide interpretation for the results derived.

**Measures of Central Tendency-** Arithmetic mean, median and mode

**Measures of Dispersion** - absolute dispersion standard deviation); relative dispersion co-efficient of variation)

**Correlation** – meaning and properties, scatter diagram; Measures of correlation - Karl Pearson's method (two variables ungrouped data)

**Introduction to Index Numbers** - meaning, types - wholesale price index, consumer price index, uses of index numbers; Inflation and index numbers.

## **Part B: Introductory Microeconomics**

### **Unit 4: Introduction**

**4 Periods**

Meaning of microeconomics and macroeconomics; positive and normative economics

What is an economy? Central problems of an economy: what, how and for whom to produce; opportunity cost.

### **Unit 5: Consumer's Equilibrium and Demand**

**32 Periods**

Consumer's equilibrium - meaning of utility, marginal utility, law of diminishing marginal utility, conditions of consumer's equilibrium using marginal utility analysis.

Indifference curve analysis of consumer's equilibrium-the consumer's budget (budget set and budget line), preferences of the consumer (indifference curve, indifference map) and conditions of consumer's equilibrium.

Demand, market demand, determinants of demand, demand schedule, demand curve and its slope, movement along and shifts in the demand curve; price elasticity of demand - factors affecting price elasticity of demand; measurement of price elasticity of demand – percentage-change method.

**Unit 6: Producer Behaviour and Supply**

**26 Periods**

Meaning of Production Function – Short-Run and Long-Run

Total Product, Average Product and Marginal Product.

Returns to a Factor

Cost: Short run costs - total cost, total fixed cost, total variable cost; Average cost; Average fixed cost, average variable cost and marginal cost-meaning and their relationships.

Revenue - total, average and marginal revenue - meaning and their relationship.

Supply, market supply, determinants of supply, supply schedule, supply curve and its slope, movements along and shifts in supply curve, price elasticity of supply; measurement of price elasticity of supply - percentage-change method.

**Unit 7: Forms of Market and Price Determination under Perfect Competition with simple applications.**

**13 Periods**

Perfect competition - Features; Determination of market equilibrium and effects of shifts in demand and supply.

Simple Applications of Demand and Supply: Price ceiling, price floor.

**Part C: Project in Economics**

**20 Periods**

Guidelines as given in class XII curriculum

**Suggested Question Paper Design**  
**Economics (Code No. 030)**  
**Class XI (2020-21)**  
**March 2021 Examination**

**Marks: 80**

**Duration: 3 hrs.**

<b>SN</b>	<b>Typology of Questions</b>	<b>Marks</b>	<b>Percentage</b>
1	<p><b>Remembering and Understanding:</b>  Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.  Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	44	55%
2	<p><b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	18	22.5%
3	<p><b>Analysing, Evaluating and Creating:</b>  Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.  Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.  Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.</p>	18	22.5%
	<b>Total</b>	<b>80</b>	<b>100%</b>

**ECONOMICS**  
**CLASS - XII (2020-21)**

Theory: 80 Marks  
Project: 20 Marks

**3 Hours**

Units		Marks	Periods
<b>Part A</b>	<b>Introductory Macroeconomics</b>		
	National Income and Related Aggregates	10	23
	Money and Banking	6	8
	Determination of Income and Employment	12	22
	Government Budget and the Economy	6	15
	Balance of Payments	6	7
		<b>40</b>	<b>75</b>
<b>Part B</b>	<b>Indian Economic Development</b>		
	Development Experience (1947-90) and Economic Reforms since 1991	12	28
	Current Challenges facing Indian Economy	22	35
	Development Experience of India – A Comparison with Neighbours	06	12
	<b>Theory Paper (40+40 = 80 Marks)</b>	<b>40</b>	<b>75</b>
<b>Part C</b>	<b>Project Work</b>	<b>20</b>	<b>15</b>

## **Part A: Introductory Macroeconomics**

### **Unit 1: National Income and Related Aggregates**

**23 Periods**

What is Macroeconomics?

Basic concepts in macroeconomics: consumption goods, capital goods, final goods, intermediate goods; stocks and flows; gross investment and depreciation.

Circular flow of income (two sector model); Methods of calculating National Income - Value Added or Product method, Expenditure method, Income method.

Aggregates related to National Income:

Gross National Product (GNP), Net National Product (NNP), Gross Domestic Product (GDP) and Net Domestic Product (NDP) - at market price, at factor cost; Real and Nominal GDP.

GDP and Welfare

### **Unit 2: Money and Banking**

**8 Periods**

Money - meaning and supply of money - Currency held by the public and net demand deposits held by commercial banks.

Money creation by the commercial banking system.

Central bank and its functions (example of the Reserve Bank of India): Bank of issue, Govt. Bank, Banker's Bank, Control of Credit

**Unit 3: Determination of Income and Employment**

**22 Periods**

Aggregate demand and its components.

Propensity to consume and propensity to save (average and marginal).

Short-run equilibrium output; investment multiplier and its mechanism.

Meaning of full employment and involuntary unemployment.

Problems of excess demand and deficient demand; measures to correct them - changes in government spending, taxes and money supply through Bank Rate, CRR, SLR, Repo Rate and Reverse Repo Rate, Open Market Operations, Margin requirement.

**Unit 4: Government Budget and the Economy**

**15 Periods**

Government budget - meaning, objectives and components.

Classification of receipts - revenue receipts and capital receipts; classification of expenditure – revenue expenditure and capital expenditure.

Measures of government deficit - revenue deficit, fiscal deficit, primary deficit their meaning.

**Unit 5: Balance of Payments**

**7 Periods**

Balance of payments account - meaning and components;

Foreign exchange rate - meaning of fixed and flexible rates and managed floating.

**Part B: Indian Economic Development**

**Unit 6: Development Experience (1947-90) and Economic Reforms since 1991:**

**28 Periods**

A brief introduction of the state of Indian economy on the eve of independence.

Indian economic system and common goals of Five Year Plans.

Main features, problems and policies of agriculture (institutional aspects and new agricultural strategy), industry (IPR 1956; SSI – role & importance) and foreign trade.

**Economic Reforms since 1991:**

Features and appraisals of liberalisation, globalisation and privatisation (LPG policy);  
Concepts of demonetization and GST

**Unit 7: Current challenges facing Indian Economy**

**35 Periods**

**Poverty-** absolute and relative; Main programmes for poverty alleviation: A critical assessment;

**Human Capital Formation:** How people become resource; Role of human capital in economic development;

**Rural development:** Key issues - credit and marketing - role of cooperatives; agricultural diversification;

**Employment:** Growth and changes in work force participation rate in formal and informal sectors; problems and policies

**Infrastructure:** Meaning and Types: Case Studies: Health: Problems and Policies- A critical assessment;

**Sustainable Economic Development:** Meaning, Effects of Economic Development on Resources and Environment, including global warming

**Unit 8: Development Experience of India:**

**12 Periods**

A comparison with neighbours

India and Pakistan

India and China

Issues: economic growth, population, sectoral development and other Human Development Indicators

**Part C: Project in Economics**

**15 Periods**

**Prescribed Books:**

1. Statistics for Economics, NCERT
2. Indian Economic Development, NCERT
3. Introductory Microeconomics, NCERT
4. Macroeconomics, NCERT
5. Supplementary Reading Material in Economics, CBSE

**Note:** The above publications are also available in Hindi Medium.



**Suggested Question Paper Design**  
**Economics (Code No. 030)**  
**Class XII (2020-21)**  
**March 2021 Examination**

**Marks: 80**

**Duration: 3 hrs.**

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	<b>Total</b>	<b>80</b>	<b>100%</b>

## Guidelines for Project Work in Economics (Class XI and XII)

The **objectives** of the project work are to enable learners to:

- probe deeper into theoretical concepts learnt in classes XI and XII
- analyse and evaluate real world economic scenarios using theoretical constructs and arguments
- demonstrate the learning of economic theory
- follow up aspects of economics in which learners have interest
- develop the communication skills to argue logically

The **expectations** of the project work are that:

- learners will complete only **ONE** project in each academic session
- project should be of 3,500-4,000 words (excluding diagrams & graphs), preferably hand-written
- it will be an independent, self-directed piece of study

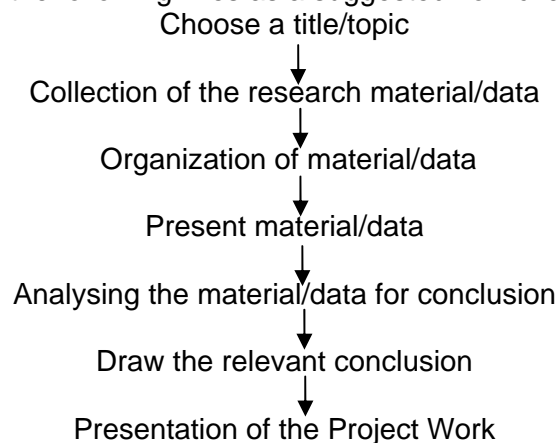
### **Role of the teacher:**

The teacher plays a critical role in developing thinking skills of the learners. A teacher should:

- help each learner select the topic based on recently published extracts from the news media, government policies, RBI bulletin, NITI Aayog reports, IMF/World Bank reports etc., after detailed discussions and deliberations of the topic
- play the role of a facilitator and supervisor to monitor the project work of the learner through periodic discussions
- guide the research work in terms of sources for the relevant data
- educate learner about plagiarism and the importance of quoting the source of the information to ensure authenticity of research work
- prepare the learner for the presentation of the project work
- arrange a presentation of the project file

### **Scope of the project:**

Learners may work upon the following lines as a suggested flow chart:



### **Expected Checklist:**

- Introduction of topic/title
- Identifying the causes, consequences and/or remedies
- Various stakeholders and effect on each of them
- Advantages and disadvantages of situations or issues identified
- Short-term and long-term implications of economic strategies suggested in the course of research
- Validity, reliability, appropriateness and relevance of data used for research work and for presentation in the project file
- Presentation and writing that is succinct and coherent in project file
- *Citation of the materials referred to, in the file in footnotes, resources section, bibliography etc.*

### **Mode of presentation/submission of the Project:**

At the end of the stipulated term, each learner will present the research work in the Project File to the External and Internal examiner. **The questions should be asked from the Research Work/ Project File of the learner. The Internal Examiner should ensure that the study submitted by the learner is his/her own original work.** In case of any doubt, authenticity should be checked and verified.

### **Marking Scheme :**

Marks are suggested to be given as –

<b>S. No.</b>	<b>Heading</b>	<b>Marks Allotted</b>
1.	Relevance of the topic	3
2.	Knowledge Content/Research Work	6
3.	Presentation Technique	3
4.	Viva-voce	8
	Total	20 Marks

### **Suggestive List of Projects:**

<b>Class XI</b>	
• Effect on PPC due to various government policies	• Invisible Hand (Adam Smith)
• Opportunity Cost as an Economic Tool (taking real life situations)	• Effect of Price Change on a Substitute Good (taking prices from real life visiting local market)
• Effect on equilibrium Prices in Local Market (taking real life situation or recent news)	• Effect of Price Change on a Complementary Good (taking prices from real life visiting local market)
• Solar Energy, a Cost Effective Comparison with Conventional Energy Sources	• Bumper Production- Boon or Bane for the Farmer
• Any other newspaper article and its evaluation on basis of economic principles	• <b>Any other topic</b>

<b>Class XII</b>	
• Micro and Small Scale Industries	• Food Supply Channel in India
• Contemporary Employment situation in India	• Disinvestment policy of the government
• Goods and Services Tax Act and its Impact on GDP	• Health Expenditure (of any state)
• Human Development Index	• Inclusive Growth Strategy
• Self-help group	• Trends in Credit availability in India
• Monetary policy committee and its functions	• Role of RBI in Control of Credit
• Government Budget & its Components	• Trends in budgetary condition of India
• Exchange Rate determination – Methods and Techniques	• Currency War – reasons and repercussions
• Livestock – Backbone of Rural India	• Alternate fuel – types and importance
• Sarwa Siksha Abhiyan – Cost Ratio Benefits	• Golden Quadrilateral- Cost ratio benefit
• Minimum Support Prices	• Relation between Stock Price Index and Economic Health of Nation
• Waste Management in India – Need of the hour	• Minimum Wage Rate – approach and Application
• Digital India- Step towards the future	• Rain Water Harvesting – a solution to water crises
• Vertical Farming – an alternate way	• Silk Route- Revival of the past
• Make in India – The way ahead	• Bumper Production- Boon or Bane for the farmer
• Rise of Concrete Jungle- Trend Analysis	• Organic Farming – Back to the Nature
• Any other newspaper article and its evaluation on basis of economic principles	• <b>Any other topic</b>

**Revised Informatics Practices (2020-21)**  
**CLASS XI Code No. 065**

1. **Prerequisite.** None

**2. Learning Outcomes**

At the end of this course, students will be able to:

- Identify the components of computer system.
- Create Python programs using different data types, lists and dictionaries.
- Understand database concepts and Relational Database Management Systems.
- Retrieve and manipulate data in RDBMS using Structured Query Language
- Identify the Emerging trends in the fields of Information Technology.

**3. Distribution of Marks and Periods**

Unit No	Unit Name	Marks	Periods		Total Period
			Theory	Practical	
1	Introduction to computer system	10	10	-	10
2	Introduction to Python	25	35	28	63
3	Database concepts and the Structured Query Language	30	23	17	40
4	Introduction to Emerging Trends	5	7	-	7
	Practical	30	-	-	-
	Total	100	75	45	120

**4. Unit Wise syllabus**

**Unit 1: Introduction to Computer System**

Introduction to computer and computing: evolution of computing devices, components of a computer system and their interconnections, Input/output devices.

Computer Memory: Units of memory, types of memory – primary and secondary, data deletion, its recovery and related security concerns.

Software: purpose and types – system and application software, generic and specific purpose software.

**Unit 2: Introduction to Python**

Basics of Python programming, Python interpreter - interactive and script mode, the structure of a program, indentation, identifiers, keywords, constants, variables, types of operators, precedence of operators, data types, mutable and immutable data types, statements, expressions, evaluation and comments, input and output statements, data type conversion, debugging.

Control Statements: if-else, for loop

Lists: list operations - creating, initializing, traversing and manipulating lists, list methods and built-in functions.

Dictionary: concept of key-value pair, creating, initializing, traversing, updating and deleting elements, dictionary methods and built-in functions.

### Unit 3: Database concepts and the Structured Query Language

Database Concepts: Introduction to database concepts and its need, Database Management System.

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

Advantages of using Structured Query Language, Data Definition Language, Data Query Language and Data Manipulation Language, Introduction to MySQL, creating a database using MySQL, Data Types

Data Definition: CREATE TABLE

Data Query: SELECT, FROM, WHERE.

Data Manipulation: INSERT

### Unit 4: Introduction to the Emerging Trends

Artificial Intelligence, Machine Learning, Natural Language Processing, Immersive experience (AR, VR), Robotics, Big data and its characteristics, Internet of Things (IoT), Sensors, Smart cities, Cloud Computing and Cloud Services (SaaS, IaaS, PaaS); Grid Computing, Block chain technology.

#### Practical Marks Distribution

S.No.	Unit Name	Marks
1	Problem solving using Python programming language	11
3	Creating database using MySQL and performing Queries	7
4	Practical file (minimum of 14 python programs, and 14 SQL queries)	7
5	Viva-Voce	5
	Total	30

### 5. Suggested Practical List

#### 5.1 Programming in Python

1. To find average and grade for given marks.
2. To find sale price of an item with given cost and discount (%).
3. To calculate perimeter/circumference and area of shapes such as triangle, rectangle, square and circle.
4. To calculate Simple and Compound interest.
5. To calculate profit-loss for given Cost and Sell Price.
6. To calculate EMI for Amount, Period and Interest.
7. To calculate tax - GST / Income Tax.
8. To find the largest and smallest numbers in a list.
9. To find the third largest/smallest number in a list.
10. To find the sum of squares of the first 100 natural numbers.
11. To print the first 'n' multiples of given number.
12. Create a dictionary to store names of states and their capitals.

13. Create a dictionary of students to store names and marks obtained in 5 subjects.
14. To print the highest and lowest values in the dictionary.

### 5.3 Data Management: SQL Commands

15. To create a database
16. To create student table with the student id, class, section, gender, name, dob, and marks as attributes where the student id is the primary key.
17. To insert the details of at least 10 students in the above table.
18. To display the entire content of table.
19. To display Rno, Name and Marks of those students who are scoring marks more than 50.
20. To find the average of marks from the student table.
21. To find the number of students, who are from section 'A'.
22. To display the information all the students, whose name starts with 'AN' (Examples: ANAND, ANGAD,..)
23. To display Rno, Name, DOB of those students who are born between '2005-01-01' and '2005-12-31'.
24. To display Rno, Name, DOB, Marks, Email of those male students in ascending order of their names.
25. To display Rno, Gender, Name, DOB, Marks, Email in descending order of their marks.
26. To display the unique section available in the table.

### Suggested material

NCERT Informatics Practices - Text book for class - XI (ISBN- 978-93-5292-148-5 )

Excluded topics

- Nested loop(Chapter -3, Section - 3.13)
- Loading and saving NumPy array in text files (Chapter-6, Sections- 6.10 and 6.11)

**Informatics Practices**  
**CLASS XII**  
**Code No. 065**  
**2020-2021**

**1. Prerequisite: Informatics Practices – Class XI**

**2. Learning Outcomes**

At the end of this course, students will be able to:

- Create Series, Data frames and apply various operations.
- Visualize data using relevant graphs.
- Design SQL queries using aggregate functions.
- Import/Export data between SQL database and Pandas.
- Learn terminology related to networking and internet.
- Identify internet security issues and configure browser settings.
- Understand the impact of technology on society including gender and disability issues.

**3. Distribution of Marks and Periods**

Unit No	Unit Name	Marks	Periods		Total Period
			Theory	Practical	
1	Data Handling using Pandas and Data Visualization	25	25	25	50
2	Database Query using SQL	25	20	17	37
3	Introduction to Computer Networks	10	12	0	12
4	Societal Impacts	10	14	-	14
	Project	-	-	7	7
	Practical	30	-	-	-
	Total	100	71	49	120

**4. Unit Wise syllabus**

**Unit 1: Data Handling using Pandas -I**

Introduction to Python libraries- Pandas, Matplotlib.

Data structures in Pandas - Series and Data Frames.

Series: Creation of Series from – ndarray, dictionary, scalar value; mathematical operations; Head and Tail functions; Selection, Indexing and Slicing.



Data Frames: creation - from dictionary of Series, list of dictionaries, Text/CSV files; display; iteration; Operations on rows and columns: add, select, delete, rename; Head and Tail functions; Indexing using Labels, Boolean Indexing;

Importing/Exporting Data between CSV files and Data Frames.

### **Data Visualization**

Purpose of plotting; drawing and saving following types of plots using Matplotlib – line plot, bar graph, histogram

Customizing plots: adding label, title, and legend in plots.

### **Unit 2: Database Query using SQL**

Math functions: POWER (), ROUND (), MOD ().

Text functions: UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/SUBSTR (), LENGTH (), LEFT (), RIGHT (), INSTR (), LTRIM (), RTRIM (), TRIM ().

Date Functions: NOW (), DATE (), MONTH (), MONTHNAME (), YEAR (), DAY (), DAYNAME ().

Aggregate Functions: MAX (), MIN (), AVG (), SUM (), COUNT (); using COUNT (\*).

Querying and manipulating data using Group by, Having, Order by.

### **Unit 3: Introduction to Computer Networks**

Introduction to networks, Types of network: LAN, MAN, WAN.

Network Devices: modem, hub, switch, repeater, router, gateway

Network Topologies: Star, Bus, Tree, Mesh.

Introduction to Internet, URL, WWW, and its applications- Web, email, Chat, VoIP.

Website: Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website.

Web Browsers: Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies.

### **Unit 4: Societal Impacts**

Digital footprint, net and communication etiquettes, data protection, intellectual property rights (IPR), plagiarism, licensing and copyright, free and open source software (FOSS), cybercrime and cyber laws, hacking, phishing, cyber bullying, overview of Indian IT Act.

E-waste: hazards and management.

Awareness about health concerns related to the usage of technology.

### **Project Work**

The aim of the class project is to create tangible and useful IT application. The learner may identify a real-world problem by exploring the environment. e.g. Students can visit shops/business places, communities or other organizations in their localities and enquire about functioning of the organization, and how data are generated, stored, and managed.

The learner can take data stored in csv or database file and analyze using Python libraries and generate appropriate charts to visualize.

If an organization is maintaining data offline, then the learner should create a database using MySQL and store the data in tables. Data can be imported in Pandas for analysis and visualization.

Learners can use Python libraries of their choice to develop software for their school or any other social good.

Learners should be sensitized to avoid plagiarism and violation of copyright issues while working on projects. Teachers should take necessary measures for this. Any resources (data, image etc.) used in the project must be suitably referenced.

The project can be done individually or in groups of 2 to 3 students. The project should be started by students at least 6 months before the submission deadline.

### Practical Marks Distribution

S.No.	Unit Name	Marks
1	Programs using Pandas and Matplotlib	8
2	SQL Queries	7
3	Practical file (minimum of 15 programs based on Pandas, 4 based on Matplotlib and 15 SQL queries must be included)	5
4	Project Work (using concepts learned in class XI and XII)	5
5	Viva-Voce	5
	TOTAL	30

## 5. Suggested Practical List

### 5.1 Data Handling

1. Create a panda's series from a dictionary of values and a ndarray
2. Given a Series, print all the elements that are above the 75th percentile.
3. Create a Data Frame quarterly sales where each row contains the item category, item name, and expenditure. Group the rows by the category and print the total expenditure per category.
4. Create a data frame for examination result and display row labels, column labels data types of each column and the dimensions
5. Filter out rows based on different criteria such as duplicate rows.

6. Importing and exporting data between pandas and CSV file

## 5.2 Visualization

1. Given the school result data, analyses the performance of the students on different parameters, e.g subject wise or class wise.
2. For the Data frames created above, analyze, and plot appropriate charts with title and legend.
3. Take data of your interest from an open source (e.g. data.gov.in), aggregate and summarize it. Then plot it using different plotting functions of the Matplotlib library.

## 5.3 Data Management

1. Create a student table with the student id, name, and marks as attributes where the student id is the primary key.
2. Insert the details of a new student in the above table.
3. Delete the details of a student in the above table.
4. Use the select command to get the details of the students with marks more than 80.
5. Find the min, max, sum, and average of the marks in a student marks table.
6. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.
7. Write a SQL query to order the (student ID, marks) table in descending order of the marks.

**PHYSICAL EDUCATION (048)**  
**Class XII (2020–21)**  
**(RATIONALIZED)**

Theory

Max. Marks 70

**Unit I Planning in Sports**

- Meaning & Objectives Of Planning
- Various Committees & its Responsibilities (pre; during & post)
- Tournament – Knock-Out, League Or Round Robin & Combination
- Procedure To Draw Fixtures – Knock-Out (Bye & Seeding) & League (Staircase & Cyclic)

**Unit II Sports & Nutrition**

- Balanced Diet & Nutrition: Macro & Micro Nutrients
- Nutritive & Non-Nutritive Components Of Diet
- Eating For Weight Control – A Healthy Weight, The Pitfalls of Dieting, Food Intolerance & Food Myths

**Unit III Yoga & Lifestyle**

- Asanas as preventive measures
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavanuktasana, Ardh Matsyendrasana
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana
- Hypertension: Tadasana, Vajrasana, Pavanuktasana, Ardha Chakrasana, Bhujangasana, Sharasana

**Unit IV Physical Education & Sports for CWSN (Children With Special Needs - *Divyang*)**

- Concept of Disability & Disorder
- Types of Disability, its causes & nature (cognitive disability, intellectual disability, physical disability)
- Types of Disorder, its cause & nature (ADHD, SPD, ASD, ODD, OCD)
- Disability Etiquettes
- Strategies to make Physical Activities assessable for children with special need.

**Unit V Children & Women in Sports**

- Motor development & factors affecting it
- Exercise Guidelines at different stages of growth & Development
- Common Postural Deformities - Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis and their corrective measures
- Sports participation of women in India

**Unit VI Test & Measurement in Sports**

- Motor Fitness Test – 50 M Standing Start, 600 M Run/Walk, Sit & Reach, Partial Curl Up, Push Ups (Boys), Modified Push Ups (Girls), Standing Broad Jump, Agility – 4x10 M Shuttle Run
- Measurement of Cardio Vascular Fitness – Harvard Step Test/Rockport Test -  
Computation of Fitness Index:  $\frac{\text{Duration of the Exercise in Seconds} \times 100}{5.5 \times \text{Pulse count of 1-1.5 Min after Exercise}}$
- Rikli & Jones - Senior Citizen Fitness Test
  1. Chair Stand Test for lower body strength
  2. Arm Curl Test for upper body strength
  3. Chair Sit & Reach Test for lower body flexibility
  4. Back Scratch Test for upper body flexibility
  5. Eight Foot Up & Go Test for agility
  6. Six Minute Walk Test for Aerobic Endurance

### **Unit VII Physiology & Injuries in Sports**

- Physiological factor determining component of Physical Fitness
- Effect of exercise on Cardio Respiratory System
- Effect of exercise on Muscular System
- Sports injuries: Classification (Soft Tissue Injuries:(Abrasion, Contusion, Laceration, Incision, Sprain & Strain) Bone & Joint Injuries: (Dislocation, Fractures: Stress Fracture, Green Stick, Communated, Transverse Oblique & Impacted) Causes, Prevention&treatment
- First Aid – Aims & Objectives

### **Unit VIII Biomechanics & Sports**

- Meaning and Importance of Biomechanics in Sports
- Types of movements (Flexion, Extension, Abduction & Adduction)
- Newton's Law of Motion & its application in sports

### **Unit IX Psychology & Sports**

- Personality; its definition & types – Trait & Types (Sheldon & Jung Classification) & Big Five Theory
- Motivation, its type & techniques
- Meaning, Concept & Types of Aggressions in Sports

### **Unit X Training in Sports**

- Strength – Definition, types & methods of improving Strength – Isometric, Isotonic & Isokinetic
- Endurance - Definition, types & methods to develop Endurance – Continuous Training, Interval Training & Fartlek Training
- Speed – Definition, types & methods to develop Speed – Acceleration Run & Pace Run
- Flexibility – Definition, types & methods to improve flexibility
- Coordinative Abilities – Definition & types

### **Practical**

**Max. Marks 30**

- |   |           |
|---|-----------|
| 01. Physical Fitness Test   | - 6 Marks |
| 02. Proficiency in Games and Sports (Skill of any one Game of choice from the given list*)- 7 Marks | - 7 Marks |
| 03. Yogic Practices   | - 7 Marks |
| 04. Record File **  | - 5 Marks |
| 05. Viva Voce (Health/ Games & Sports/ Yoga)  | - 5 Marks |

\* Basketball, Football, Kabaddi, Kho-Kho, Volleyball, Handball, Hockey, Cricket, Bocce & Unified Basketball [CWSN (Children With Special Needs - Divyang)]

**\*\*Record File shall include:**

*Practical-1: Fitness tests administration for all items.*

*Practical-2: Procedure for Asanas, Benefits & Contraindication for any two Asanas for each lifestyle disease.*

*Practical-3: Any one game of your choice out of the list above. Labelled diagram of field & equipment (Rules, Terminologies & Skill)*

## **Revised MATHEMATICS (XI-XII)**

**(Code No. 041)**

**Session – 2020-21**

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 Biological science, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 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 students:

- 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 gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

**COURSE STRUCTURE**  
**CLASS XI (2020-21)**

One Paper

Total Periods–168 [35 Minutes Each]

**Three Hours**

**Max Marks: 80**

No.	Units	No. of Periods	Marks
I.	Sets and Functions	43	23
II.	Algebra	41	30
III.	Coordinate Geometry	33	10
IV.	Calculus	30	07
V.	Statistics and Probability	21	10
	Total	168	80
	Internal Assessment		20

\*No chapter/unit-wise weightage. Care to be taken to cover all the chapters.

**Unit-I: Sets and Functions**

**1. Sets**

**(14) Periods**

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

**2. Relations & Functions**

**(15) 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 ( $\mathbb{R} \times \mathbb{R}$  only). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs.

### 3. Trigonometric Functions

(14) Periods

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

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

$$\sin \alpha \pm \sin \beta = 2 \sin \frac{1}{2}(\alpha \pm \beta) \cos \frac{1}{2}(\alpha \mp \beta)$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha - \cos \beta = -2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ .

### Unit-II: Algebra

#### 1. 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. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.

#### 2. Linear Inequalities

(15) 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 method of finding a solution of system of linear inequalities in two variables.



**3. Permutations and Combinations (8) Periods**

Fundamental principle of counting. Factorial  $n$ . ( $n!$ ) Permutations and combinations, formula for  ${}^n P_r$  and  ${}^n C_r$ , simple applications.

**4. Sequence and Series (8) 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., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

**Unit-III: Coordinate Geometry**

**1. Straight Lines (8) Periods**

Brief recall of two dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Distance of a point from a line.

**2. Conic Sections (15) Periods**

Sections of a cone: circles, ellipse, parabola, hyperbola. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

**3. Introduction to Three-dimensional Geometry (10) 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 (30) Periods**

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. 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: Statistics and Probability**

### **1. Statistics**

**(11) Periods**

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data.

### **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, Probability of an event, probability of 'not', 'and' and 'or' events.

**MATHEMATICS**  
**QUESTION PAPER DESIGN**  
**CLASS – XI (2020-21)**

Time : 3 Hours

Max. Marks: 80

S. No.	Typology of Questions	Total Marks	% Weight age
1	<p><b>Remembering:</b> Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.</p> <p><b>Understanding:</b> Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	44	55
2	<p><b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	20	25
3	<p><b>Analysing :</b> Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations</p> <p><b>Evaluating:</b> Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.</p> <p><b>Creating:</b> Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions</p>	16	20
	<b>Total</b>	80	100

- No chapter wise weightage. Care to be taken to cover all the chapters*
- Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

**Choice(s):**

There will be no overall choice in the question paper.

However, 33% internal choices will be given in all the sections

<b>INTERNAL ASSESSMENT</b>	<b>20 MARKS</b>
Periodic Tests ( Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

Note: Please refer the guidelines given under XII Mathematics Syllabus:

**CLASS-XII**  
**(2020-21)**

**One Paper**

**Max Marks:80**

No.	Units	No. of Periods	Marks
I.	Relations and Functions	17	08
II.	Algebra	35	10
III.	Calculus	57	35
IV.	Vectors and Three - Dimensional Geometry	26	14
V.	Linear Programming	13	05
VI.	Probability	20	08
	<b>Total</b>	168	80
	<b>Internal Assessment</b>		20

**Unit-I: Relations and Functions**

**1. Relations and Functions** **9 Periods**

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

**2. Inverse Trigonometric Functions** **8 Periods**

Definition, range, domain, principal value branch.

**Unit-II: Algebra**

**1. Matrices** **17 Periods**

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices, Invertible matrices; (Here all matrices will have real entries).

## 2. Determinants

18 Periods

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

## Unit-III: Calculus

### 1. Continuity and Differentiability

16 Periods

Continuity and differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

### 2. Applications of Derivatives

7 Periods

Applications of derivatives: increasing/decreasing functions, tangents and normals, 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

15 Periods

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

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

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

### 4. Applications of the Integrals

9 Periods

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

## 5. Differential Equations

10 Periods

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree of the type:  $\frac{dy}{dx} = f(y/x)$ . Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constant.}$$

## Unit-IV: Vectors and Three-Dimensional Geometry

### 1. Vectors

13 Periods

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. 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. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

### 2. Three - dimensional Geometry

13 Periods

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Distance of a point from a plane.

## **Unit-V: Linear Programming**

### **1. Linear Programming**

**13 Periods**

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

## **Unit-VI: Probability**

### **1. Probability**

**20 Periods**

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution.

### **Prescribed Books:**

- 1) Mathematics Textbook for Class XI, NCERT Publications
- 2) Mathematics Part I - Textbook for Class XII, NCERT Publication
- 3) Mathematics Part II - Textbook for Class XII, NCERT Publication
- 4) Mathematics Exemplar Problem for Class XI, Published by NCERT
- 5) Mathematics Exemplar Problem for Class XII, Published by NCERT
- 6) Mathematics Lab Manual class XI, published by NCERT
- 7) Mathematics Lab Manual class XII, published by NCERT

**MATHEMATICS (Code No. - 041)**  
**QUESTION PAPER DESIGN CLASS - XII**  
**(2020 - 21)**

Time: 3 hours

Max. Marks: 80

S. No.	Typology of Questions	Total Marks	% Weightage
1	<p><b>Remembering:</b> Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.</p> <p><b>Understanding:</b> Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	44	55
2	<p><b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	20	25
3	<p><b>Analysing :</b> Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations</p> <p><b>Evaluating:</b> Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.</p> <p><b>Creating:</b> Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions</p>	16	20
	<b>Total</b>	80	100

- No chapter wise weightage. Care to be taken to cover all the chapters*
- Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

**Choice(s):**

There will be no overall choice in the question paper.

However, 33% internal choices will be given in all the sections

<b>INTERNAL ASSESSMENT</b>	<b>20 MARKS</b>
Periodic Tests ( Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

**Note:** For activities NCERT Lab Manual may be referred



## Conduct of Periodic Tests:

Periodic Test is a Pen and Paper assessment which is to be conducted by the respective subject teacher. The format of periodic test must have questions items with a balance mix, such as, very short answer (VSA), short answer (SA) and long answer (LA) to effectively assess the knowledge, understanding, application, skills, analysis, evaluation and synthesis. Depending on the nature of subject, the subject teacher will have the liberty of incorporating any other types of questions too. The modalities of the PT are as follows:

- a) **Mode:** The periodic test is to be taken in the form of pen-papertest.
- b) **Schedule:** In the entire Academic Year, three Periodic Tests in each subject may be conducted as follows:

Test	Pre Mid-term (PT-I)	Mid-Term (PT-II)	Post Mid-Term (PT-III)
Tentative Month	July-August	November	December-January

*This is only a suggestive schedule and schools may conduct periodic tests as per their convenience. The winter bound schools would develop their own schedule with similar time gaps between two consecutive tests.*

- c) **Average of Marks:** Once schools complete the conduct of all the three periodic tests, they will convert the weightage of each of the three tests into ten marks each for identifying best two tests. The best two will be taken into consideration and the average of the two shall be taken as the final marks for PT.
- d) The school will ensure simple documentation to keep a record of performance as suggested in detail circular no.Acad-05/2017.
- e) **Sharing of Feedback/Performance:** The students' achievement in each test must be shared with the students and their parents to give them an overview of the level of learning that has taken place during different periods. Feedback will help parents formulate interventions (conducive ambience, support materials, motivation and morale-boosting) to further enhance learning. A teacher, while sharing the feedback with student or parent, should be empathetic, non-judgmental and motivating. It is recommended that the teacher share best examples/performances of IA with the class to motivate all learners.

### **Assessment of Activity Work:**

Through out the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class ( XI or XII) which is available on the link : <http://www.ncert.nic.in/exemplar/labmanuals.html> a record of the same may be kept by the student. An year end test on the activity may be conducted

The weightage are as under:

- The activities performed by the student through out the year and record keeping : 5 marks
- Assessment of the activity performed during the year end test: 3 marks
- Viva-voce : 2 marks

**Revised PHYSICS**  
**Class XI-XII (Code N. 042)**  
**(2020-21)**

Senior Secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present updated syllabus keeps in view the rigour and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features of the syllabus include:

- Emphasis on basic conceptual understanding of the content.
- Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of Physics concepts.

**Besides, the syllabus also attempts to**

- Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

**PHYSICS (Code No. 042)**  
**COURSE STRUCTURE**  
**Class XI – 2020-21 (Theory)**

Time: 3 hrs.

Max Marks: 70

		No. of Periods	Marks
<b>Unit-I</b>	<b>Physical World and Measurement</b>	<b>6</b>	<b>23</b>
	Chapter-1: Physical World		
	Chapter-2: Units and Measurements		
<b>Unit-II</b>	<b>Kinematics</b>	<b>16</b>	
	Chapter-3: Motion in a Straight Line		
	Chapter-4: Motion in a Plane		
<b>Unit-III</b>	<b>Laws of Motion</b>	<b>10</b>	
	Chapter-5: Laws of Motion		
<b>Unit-IV</b>	<b>Work, Energy and Power</b>	<b>12</b>	
	Chapter-6: Work, Energy and Power		
<b>Unit-V</b>	<b>Motion of System of Particles and Rigid Body</b>	<b>16</b>	<b>17</b>
	Chapter-7: System of Particles and Rotational Motion		
<b>Unit-VI</b>	<b>Gravitation</b>	<b>8</b>	
	Chapter-8: Gravitation		
<b>Unit-VII</b>	<b>Properties of Bulk Matter</b>	<b>22</b>	
	Chapter-9: Mechanical Properties of Solids		
	Chapter-10: Mechanical Properties of Fluids		
	Chapter-11: Thermal Properties of Matter		
<b>Unit-VIII</b>	<b>Thermodynamics</b>	<b>10</b>	<b>20</b>
	Chapter-12: Thermodynamics		
<b>Unit-IX</b>	<b>Behaviour of Perfect Gases and Kinetic Theory of Gases</b>	<b>08</b>	
	Chapter-13: Kinetic Theory		
<b>Unit-X</b>	<b>Oscillations and Waves</b>	<b>23</b>	<b>10</b>
	Chapter-14: Oscillations		
	Chapter-15: Waves		
<b>Total</b>		<b>131</b>	<b>70</b>

**Unit I: Physical World and Measurement**

**6 Periods**

**Chapter–1: Physical World**

Physics-scope and excitement; nature of physical laws; Physics, technology and society.

(To be discussed as a part of Introduction and integrated with other topics)

**Chapter–2: Units and Measurements**

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.

**Unit II: Kinematics**

**16 Periods**

**Chapter–3: Motion in a Straight Line**

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

Relations for uniformly accelerated motion (graphical treatment).

**Chapter–4: Motion in a Plane**

Scalar and vector quantities; position and displacement vectors, general vectors and their notations; 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.

**Unit III: Laws of Motion****10 Periods****Chapter–5: 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. (recapitulation only)*

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 a level circular road, vehicle on a banked road).

**Unit IV: Work, Energy and Power****12 Periods****Chapter–6: 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 a vertical circle; elastic and inelastic collisions in one and two dimensions.

**Unit V: Motion of System of Particles and Rigid Body****16 Periods****Chapter–7: System of Particles and Rotational Motion**

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 a uniform rod.

Moment of a force, torque, angular momentum, law 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).

**Unit VI: Gravitation****8 Periods****Chapter–8: Gravitation**

*Universal law of gravitation. Acceleration due to gravity (recapitulation only) and its variation with altitude and depth.*

Gravitational potential energy and gravitational potential, escape velocity, orbital velocity of a satellite, Geo-stationary satellites.

**Unit VII: Properties of Bulk Matter****22 Periods****Chapter–9: Mechanical Properties of Solids**

Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus

**Chapter–10: Mechanical Properties of Fluids**

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, 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.

**Chapter–11: Thermal Properties of Matter**

*Heat, temperature, (recapitulation only) 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 (recapitulation only), thermal conductivity, qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law, Greenhouse effect.

## **Unit VIII: Thermodynamics**

**10 Periods**

### **Chapter–12: 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

## **Unit IX: Behaviour of Perfect Gases and Kinetic Theory of Gases 08 Periods**

### **Chapter–13: Kinetic Theory**

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

Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition 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**

**23 Periods**

### **Chapter–14: Oscillations**

Periodic motion - time period, frequency, displacement as a function of time, periodic functions.

Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a loaded 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.

### **Chapter–15: Waves**

Wave motion: Transverse and longitudinal waves, speed of travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, Beats



## PRACTICALS

**Total Periods: 32**

The record, to be submitted by the students, at the time of their annual examination, has to include:

Record of at least **8** Experiments **4** from each section, to be performed by the students

Record of at least 6 Activities [with 3 each from section A and section B], to be demonstrated by teacher.

## EVALUATION SCHEME

**Time Allowed: Three hours**

**Max. Marks: 30**

Two experiments one from each section	<b>(8+8)Marks</b>
Practical record (experiment and activities)	<b>7Marks</b>
Viva on experiments, and activities	<b>7 Marks</b>
<b>Total</b>	<b>30 Marks</b>

## SECTION–A

### Experiments

- 1.To measure diameter of a small spherical/cylindrical body and to measure internal diameter and depth of a given beaker/calorimeter using Vernier Callipers and hence find its volume.
- 2.To measure diameter of a given wire and thickness of a given sheet using screw gauge.

**OR**

To determine volume of an irregular lamina using screw gauge.

- 3.To determine radius of curvature of a given spherical surface by a spherometer.
- 4.To determine the mass of two different objects using a beam balance.
- 5.To find the weight of a given body using parallelogram law of vectors.

6. Using a simple pendulum, plot its  $L-T^2$  graph and use it to find the effective length of second's pendulum.

**OR**

To study variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.

7. To study the relationship between force of limiting friction and normal reaction and to find the co-efficient of friction between a block and a horizontal surface.

**OR**

To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination  $\theta$  by plotting graph between force and  $\sin \theta$ .

### **Activities**

1. To make a paper scale of given least count, e.g., 0.2cm, 0.5 cm.
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 projectile with angle of projection.
6. To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

## SECTION-B

### Experiments

1. To determine Young's modulus of elasticity of the material of a given wire.

**OR**

To find the force constant of a helical spring by plotting a graph between load and extension.

1. 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  $1/V$ .
2. To determine the surface tension of water by capillary rise method.

**OR**

To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.

3. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
4. To determine specific heat capacity of a given solid by method of mixtures.
5. To study the relation between frequency and length of a given wire under constant tension using sonometer.

**OR**

To study the relation between the length of a given wire and tension for constant frequency using sonometer.

7. 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 of water 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 at (i) its end (ii) in the middle.
7. To observe the decrease in pressure with increase in velocity of a fluid.

### **Practical Examination for Visually Impaired Students Class XI**

**Note:** Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

#### **A. Items for Identification/Familiarity of the apparatus for assessment in practicals (All experiments)**

Spherical ball, Cylindrical objects, vernier calipers, beaker, calorimeter, Screw gauge, wire, Beam balance, spring balance, weight box, gram and milligram weights, forceps, Parallelogram law of vectors apparatus, pulleys and pans used in the same 'weights' used, Bob and string used in a simple pendulum, meter scale, split cork, suspension arrangement, stop clock/stop watch, Helical spring, suspension arrangement used, weights, arrangement used for measuring extension, Sonometer, Wedges, pan and pulley used in it, 'weights' Tuning Fork, Meter scale, Beam balance, Weight box, gram and milligram weights, forceps, Resonance Tube, Tuning Fork, Meter scale, Flask/Beaker used for adding water.

#### **B. List of Practicals**

1. To measure diameter of a small spherical/cylindrical body using vernier calipers.
2. To measure the internal diameter and depth of a given beaker/calorimeter using vernier calipers and hence find its volume.
3. To measure diameter of given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.

5. To determine the mass of a given object using a beam balance.
6. To find the weight of given body using the parallelogram law of vectors.
7. Using a simple pendulum plot L-T and L-T<sup>2</sup> graphs. Hence find the effective length of second's pendulum using appropriate length values.
8. To find the force constant of given helical spring by plotting a graph between load and extension.
9. (i) To study the relation between frequency and length of a given wire under constant tension using a sonometer.  
(ii) To study the relation between the length of a given wire and tension, for constant frequency, using a sonometer.
10. To find the speed of sound in air, at room temperature, using a resonance tube, by observing the two resonance positions.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

**Prescribed Books:**

1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT
3. Laboratory Manual of Physics, Class XI Published by NCERT
4. The list of other related books and manuals brought out by NCERT  
(consider multimedia also).

**CLASS XII (2020-21) (THEORY)**

**Time: 3 hrs.**

**Max Marks: 70**

		<b>No. of Periods</b>	<b>Marks</b>
<b>Unit-I</b>	<b>Electrostatics</b>	<b>23</b>	<b>16</b>
	Chapter-1: Electric Charges and Fields		
	Chapter-2: Electrostatic Potential and Capacitance		
<b>Unit-II</b>	<b>Current Electricity</b>	<b>15</b>	
	Chapter-3: Current Electricity		
<b>Unit-III</b>	<b>Magnetic Effects of Current and Magnetism</b>	<b>16</b>	<b>17</b>
	Chapter-4: Moving Charges and Magnetism		
	Chapter-5: Magnetism and Matter		
<b>Unit-IV</b>	<b>Electromagnetic Induction and Alternating Currents</b>	<b>19</b>	
	Chapter-6: Electromagnetic Induction		
	Chapter-7: Alternating Current		
<b>Unit-V</b>	<b>Electromagnetic Waves</b>	<b>2</b>	
	Chapter-8: Electromagnetic Waves		
<b>Unit-VI</b>	<b>Optics</b>	<b>18</b>	<b>18</b>
	Chapter-9: Ray Optics and Optical Instruments		
	Chapter-10: Wave Optics		
<b>Unit-VII</b>	<b>Dual Nature of Radiation and Matter</b>	<b>7</b>	
	Chapter-11: Dual Nature of Radiation and Matter		
<b>Unit-VIII</b>	<b>Atoms and Nuclei</b>	<b>11</b>	<b>12</b>
	Chapter-12: Atoms		
	Chapter-13: Nuclei		
<b>Unit-IX</b>	<b>Electronic Devices</b>	<b>7</b>	
	Chapter-14: Semiconductor Electronics: Materials, Devices and Simple Circuits		
<b>Total</b>		<b>118</b>	<b>70</b>

## **Unit I: Electrostatics**

**23 Periods**

### **Chapter–1: Electric Charges and Fields**

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

### **Chapter–2: Electrostatic Potential and Capacitance**

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.

## **Unit II: Current Electricity**

**15 Periods**

### **Chapter–3: 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; temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's laws and simple applications, Wheatstone bridge, metre bridge(**qualitative ideas only**)

Potentiometer - principle and its applications to measure potential difference and for

comparing EMF of two cells; measurement of internal resistance of a cell(**qualitative ideas only**)

**Unit III: Magnetic Effects of Current and Magnetism**

**16 Periods**

**Chapter–4: Moving Charges and Magnetism**

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire. Straight and toroidal solenoids (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields

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.

**Chapter–5: Magnetism and Matter**

Current loop as a magnetic dipole and its magnetic dipole moment, magnetic dipole moment of a revolving electron, bar magnet as an equivalent solenoid, magnetic field lines; earth's magnetic field and magnetic elements.

Unit IV: Electromagnetic Induction and Alternating Currents

19 Periods

**Chapter–6: Electromagnetic Induction**

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

**Chapter–7: Alternating Current**

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

AC generator and transformer.



**Unit V: Electromagnetic waves**

**2 Periods**

**Chapter–8: Electromagnetic Waves**

Electromagnetic waves, their characteristics, their Transverse nature (qualitative ideas only).

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

**Unit VI: Optics**

**18 Periods**

**Chapter–9: Ray Optics and Optical Instruments**

**Ray Optics:** Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lensmaker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

**Chapter–10: Wave Optics**

**Wave optics:** Wave front and Huygen's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygen'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

**Unit VII: Dual Nature of Radiation and Matter**

**7 Periods**

**Chapter–11: Dual Nature of Radiation and Matter**

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations;

Einstein's photoelectric equation-particle nature of light.

Experimental study of photoelectric effect

Matter waves-wave nature of particles, de-Broglie relation

**Unit VIII: Atoms and Nuclei**

**11 Periods**

**Chapter–12: Atoms**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

**Chapter–13: Nuclei**

Composition and size of nucleus

**Nuclear force**

Mass-energy relation, mass defect, nuclear fission, nuclear fusion.

**Unit IX: Electronic Devices**

**7 Periods**

**Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits**

Energy bands in conductors, semiconductors and insulators (qualitative ideas only)

Semiconductor diode - I-V characteristics in forward and reverse bias, diode as a rectifier;

Special purpose p-n junction diodes: LED, photodiode, solar cell.

**PRACTICALS**

**Total Periods: 32**

The record to be submitted by the students at the time of their annual examination has to include:

- Record of at least **8** Experiments [with **4** from each section], to be performed by the students.
- Record of at least **6** Activities [with **3** each from section A and section B], to be demonstrated by teacher

## Evaluation Scheme

**Time Allowed: Three hours**

**Max. Marks: 30**

Two experiments one from each section	<b>8+8 marks</b>
Practical record [experiments and activities]	<b>7 marks</b>
Viva on experiments, <b>and</b> activities	<b>7 marks</b>
<b>Total</b>	<b>30 marks</b>

### **SECTION–A Experiments**

1. To determine resistivity of two / three wires by plotting a graph for potential difference versus current.
2. To find resistance of a given wire / standard resistor using metre bridge.

**OR**

To verify the laws of combination (series) of resistances using a metre bridge.

**OR**

To verify the laws of combination (parallel) of resistances using a metre bridge.

3. To compare the EMF of two given primary cells using potentiometer.

**OR**

To determine the internal resistance of given primary cell using potentiometer.

4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

## OR

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.

6. To find the frequency of AC mains with a sonometer.

### Activities

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

## SECTION-B

### Experiments

1. .To find the focal length of a convex lens by plotting graphs between  $u$  and  $v$  or between  $1/u$  and  $1/v$ .
2. To find the focal length of a convex mirror, using a convex lens.

## OR

To find the focal length of a concave lens, using a convex lens.

3. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
4. To determine refractive index of a glass slab using a travelling microscope.
5. To find refractive index of a liquid by using convex lens and plane mirror.
6. To draw the I-V characteristic curve for a p-n junction diode in forward bias and reverse bias.

## Activities

1. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
2. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.
3. To study effect of intensity of light (by varying distance of the source) on an LDR.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe polarization of light using two Polaroids.
6. To observe diffraction of light due to a thin slit.
7. To study the nature and size of the image formed by a (i) convex lens, (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

### Practical Examination for Visually Impaired Students of Classes XI and XII Evaluation Scheme

**Time Allowed: Two hours**

**Max. Marks: 30**

Identification/Familiarity with the apparatus	5 marks
Written test (based on given/prescribed practicals)	10 marks
Practical Record	5 marks
Viva	10 marks
<b>Total</b>	<b>30 marks</b>

### General Guidelines

- The practical examination will be of two hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.

- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory/principle/concept, apparatus/ materials/chemicals required, procedure, precautions, sources of error

## **Class XII**

### **A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments)**

Meter scale, general shape of the voltmeter/ammeter, battery/power supply, connecting wires, standard resistances, connecting wires, voltmeter/ammeter, meter bridge, screw gauge, jockey Galvanometer, Resistance Box, standard Resistance, connecting wires, Potentiometer, jockey, Galvanometer, Lechlanche cell, Daniell cell [simple distinction between the two vis-à-vis their outer (glass and copper) containers], rheostat connecting wires, Galvanometer, resistance box, Plug-in and tapping keys, connecting wires battery/power supply, Diode, Resistor (Wire-wound or carbon ones with two wires connected to two ends), capacitors (one or two types), Inductors, Simple electric/electronic bell, battery/power supply, Plug-in and tapping keys, Convex lens, concave lens, convex mirror, concave mirror, Core/hollow wooden cylinder, insulated

wire, ferromagnetic rod, Transformer core, insulated wire.

## **B. List of Practicals**

1. To determine the resistance per cm of a given wire by plotting a graph between voltage and current.
2. To verify the laws of combination (series/parallel combination) of resistances by Ohm's law.
3. To find the resistance of a given wire / standard resistor using a meter bridge.
4. To compare the e.m.f of two given primary cells using a potentiometer.
5. To determine the resistance of a galvanometer by half deflection method.
6. To identify a resistor, capacitor, inductor and diode from a mixed collection of such items.
7. To observe the difference between
  - (i) a convex lens and a concave lens
  - (ii) a convex mirror and a concave mirror and to estimate the likely difference between the power of two given convex /concave lenses.
8. To design an inductor coil and to know the effect of
  - (i) change in the number of turns
  - (ii) Introduction of ferromagnetic material as its core material on the inductance of the coil.
9. To design a (i) step up (ii) step down transformer on a given core and know the relation between its input and output voltages.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

### **Prescribed Books:**

1. Physics, Class XI, Part -I and II, Published by NCERT.
2. Physics, Class XII, Part -I and II, Published by NCERT.
3. Laboratory Manual of Physics for class XII Published by NCERT.
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).

## QUESTION PAPER DESIGN

Theory (Class: XI/XII)

Maximum Marks: 70

Duration: 3 hrs.

S	Typology of Questions	Total Marks	Approximate Percentage
1	<p><b>Remembering:</b> Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.</p> <p><b>Understanding:</b> Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	27	38 %
2	<p><b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	22	32%
3	<p><b>Analysing :</b> Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations</p> <p><b>Evaluating :</b> Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.</p> <p><b>Creating:</b> Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.</p>	21	30%
	Total Marks	70	100

**Practical: 30 Marks**

**Note:**

- Internal Choice:** *There is no overall choice in the paper. However, there will be at least 33% internal choice.*
- The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*



## 8. CHEMISTRY (Code No. 043)

### Rationale

Higher Secondary is the most crucial stage of school education because at this juncture specialized discipline based, content -oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after the senior secondary stage.

The new and updated curriculum is based on disciplinary approach with rigour and depth taking care that the syllabus is not heavy and at the same time it is comparable to the international level. The knowledge related to the subject of Chemistry has undergone tremendous changes during the past one decade. Many new areas like synthetic materials, bio -molecules, natural resources, industrial chemistry are coming in a big way and deserve to be an integral part of chemistry syllabus at senior secondary stage. At international level, new formulations and nomenclature of elements and compounds, symbols and units of physical quantities floated by scientific bodies like IUPAC and CGPM are of immense importance and need to be incorporated in the updated syllabus. The revised syllabus takes care of all these aspects. Greater emphasis has been laid on use of new nomenclature, symbols and formulations, teaching of fundamental concepts, application of concepts in chemistry to industry/ technology, logical sequencing of units, removal of obsolete content and repetition, etc.

### Objectives

The curriculum of Chemistry at Senior Secondary Stage aims to:

- promote understanding of basic facts and concepts in chemistry while retaining the excitement of chemistry.
- make students capable of studying chemistry in academic and professional courses (such as medicine, engineering, technology) at tertiary level.
- expose the students to various emerging new areas of chemistry and apprise them with their relevance in future studies and their application in various spheres of chemical sciences and technology.
- equip students to face various challenges related to health, nutrition, environment, population, weather, industries and agriculture.
- develop problem solving skills in students.
- expose the students to different processes used in industries and their technological applications.
- apprise students with interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.
- acquaint students with different aspects of chemistry used in daily life.
- develop an interest in students to study chemistry as a discipline.
- integrate life skills and values in the context of chemistry.

## COURSE STRUCTURE CLASS-XI (THEORY) (2020-21)

Total Periods (Theory 119 + Practical 44)  
Total Marks 70

Time: 3 Hours

Unit No.	Title	No. of Periods	Marks
Unit I	Some Basic Concepts of Chemistry	10	11
Unit II	Structure of Atom	12	
Unit III	Classification of Elements and Periodicity in Properties	6	04
Unit IV	Chemical Bonding and Molecular Structure	14	21
Unit V	States of Matter: Gases and Liquids	9	
Unit VI	Chemical Thermodynamics	14	
Unit VII	Equilibrium	12	
Unit VIII	Redox Reactions	4	16
Unit IX	Hydrogen	4	
Unit X	s -Block Elements	5	
Unit XI	Some p -Block Elements	9	
Unit XII	Organic Chemistry: Some basic Principles and Techniques	10	18
Unit XIII	Hydrocarbons	10	
	<b>Total</b>	<b>119</b>	<b>70</b>

**Unit I: Some Basic Concepts of Chemistry** **10 Periods**

General Introduction: Importance and scope of Chemistry.

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** **12 Periods**

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's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

- Unit III: Classification of Elements and Periodicity in Properties** **06 Periods**  
Modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.
- Unit IV: Chemical Bonding and Molecular Structure** **14 Periods**  
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** **9 Periods**  
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 and deviation from ideal behavior.
- Unit VI: Chemical Thermodynamics** **14 Periods**  
Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.  
First law of thermodynamics -internal energy and enthalpy, measurement of  $\Delta U$  and  $\Delta H$ , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction)  
Introduction of entropy as a state function, Gibb's energy change for spontaneous and non-spontaneous processes.  
Third law of thermodynamics (brief introduction).
- Unit VII: Equilibrium** **12 Periods**  
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, ionization of poly basic acids, acid strength, concept of pH, buffer solution, solubility product, common ion effect (with illustrative examples).
- Unit VIII: Redox Reactions** **04 Periods**  
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.
- Unit IX: Hydrogen** **04 Periods**  
Position of hydrogen in periodic table, occurrence, isotopes, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen as a fuel.

- Unit X: s-Block Elements (Alkali and Alkaline Earth Metals)** **5 Period**  
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.
- Unit XI: Some p-Block Elements** **9 Periods**  
**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.  
**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.
- Unit XII: Organic Chemistry -Some Basic Principles and Techniques** **10 Periods**  
General introduction, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond:  
inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.
- Unit XIII: Hydrocarbons** **10 Periods**  
**Classification of Hydrocarbons**  
**Aliphatic Hydrocarbons:**  
Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions.  
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 Craft's alkylation and acylation, directive influence of functional group in monosubstituted benzene. Carcinogenicity and toxicity.

## PRACTICALS

Evaluation Scheme for Examination	Marks
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class record and viva	04
<b>Total</b>	<b>30</b>

## PRACTICAL SYLLABUS

Total Periods: 44

Micro-chemical methods are available for several of the practical experiments, wherever possible such techniques should be used.

### A. Basic Laboratory Techniques

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

1. Determination of melting point of an organic compound.
2. Determination of boiling point of an organic compound.
3. Crystallization of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic Acid.

### C. Quantitative Estimation

- i. Using a mechanical balance/electronic balance.
- ii. Preparation of standard solution of Oxalic acid.
- iii. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.
- iv. Preparation of standard solution of Sodium carbonate.
- v. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

### D. Qualitative Analysis

#### a) Determination of one anion and one cation in a given salt

Cations-  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{As}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

Anions –  $(\text{CO}_3)^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{CH}_3\text{COO}^-$

(Note: Insoluble salts excluded)

**b) Detection of -Nitrogen, Sulphur, Chlorine in organic compounds.**

**c) PROJECTS**

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 presence 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.

## Practical Examination for Visually Impaired Students Class XI

**Note:** Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

### A. List of apparatus for identification for assessment in practicals (All experiments)

Beaker, tripod stand, wire gauze, glass rod, funnel, filter paper, Bunsen burner, test tube, test tube stand, dropper, test tube holder, ignition tube, china dish, tongs, standard flask, pipette, burette, conical flask, clamp stand, dropper, wash bottle

- Odour detection in qualitative analysis
- Procedure/Setup of the apparatus

### B. List of Experiments

#### A. Characterization and Purification of Chemical Substances

1. Crystallization of an impure sample of any one of the following: copper sulphate, benzoic acid

#### B. Experiments based on pH

1. Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper
2. Comparing the pH of solutions of strong and weak acids of same concentration.

#### C. Quantitative estimation

1. Preparation of standard solution of oxalic acid.
2. Determination of molarity of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.

#### D. Qualitative Analysis

1. Determination of one anion and one cation in a given salt
2. Cations -  $\text{NH}_4^+$   
Anions -  $(\text{CO}_3)^{2-}$ ,  $\text{S}^{2-}$ ,  $(\text{SO}_3)^{2-}$ ,  $\text{Cl}^-$ ,  $\text{CH}_3\text{COO}^-$   
(Note: insoluble salts excluded)
3. Detection of Nitrogen in the given organic compound.
4. Detection of Halogen in the given organic compound.

**Note :** The above practicals may be carried out in an experiential manner rather than recording observations.

### Prescribed Books:

1. Chemistry Part – I, Class-XI, Published by NCERT.
2. Chemistry Part – II, Class-XI, Published by NCERT.

**CLASS XII (2020-21)**  
**(THEORY)**

**Total Periods (Theory 98 + Practical 36)**

**Time : 3 Hours**

**70 Marks**

Unit No.	Title	No. of Periods	Marks
Unit I	Solid State	8	23
Unit II	Solutions	8	
Unit III	Electrochemistry	7	
Unit IV	Chemical Kinetics	5	
Unit V	Surface Chemistry	5	
Unit VII	p -Block Elements	7	19
Unit VIII	d -and f -Block Elements	7	
Unit IX	Coordination Compounds	8	
Unit X	Haloalkanes and Haloarenes	9	28
Unit XI	Alcohols, Phenols and Ethers	9	
Unit XII	Aldehydes, Ketones and Carboxylic Acids	10	
Unit XIII	Amines	7	
Unit XIV	Biomolecules	8	
	<b>Total</b>	<b>98</b>	<b>70</b>

**Unit I: Solid State**

**8 Periods**

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, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects.

**Unit II: Solutions**

**8 Periods**

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties.

**Unit III: Electrochemistry**

**7 Periods**

Redox reactions, 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, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis.



**Unit IV: Chemical Kinetics****5 Periods**

Rate of a reaction (Average and instantaneous), factors affecting rate 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).

**Unit V: Surface Chemistry****5 Periods**

Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, colloidal state: distinction between true solutions, colloids and suspension; lyophilic, lyophobic, multi-molecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation.

**Unit VII:p-Block Elements****7 Periods**

**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.

**Group 16 Elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, dioxygen: preparation, properties and uses, classification of Oxides, Ozone, Sulphur -allotropic forms; compounds of Sulphur: preparation properties and uses of Sulphur-dioxide, Sulphuric Acid:-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.

**Unit VIII: d and f Block Elements****7 Periods**

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

**Lanthanoids** - Electronic configuration, oxidation states and lanthanoid contraction and its consequences.

**Unit IX: Coordination Compounds****8 Periods**

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT.

**Unit X: Haloalkanes and Haloarenes.****9 Periods**

**Haloalkanes:** Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions.

**Haloarenes:** Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).

**Unit XI: Alcohols, Phenols and Ethers****9 Periods**

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

**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.

**Unit XII: Aldehydes, Ketones and Carboxylic Acids****10 Periods**

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

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

**Unit XIII: Amines****7 Periods**

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

**Unit XIV: Biomolecules****8 Periods**

**Carbohydrates** - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration

**Proteins** -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins.

**Nucleic Acids:** DNA and RNA.

**PRACTICALS**

Evaluation Scheme for Examination	Marks
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class record and viva	04
<b>Total</b>	<b>30</b>

**PRACTICAL SYLLABUS****36 Periods**

Micro-chemical methods are available for several of the practical experiments. Wherever possible, such techniques should be used.

## A. Chromatography

- Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R<sub>f</sub> values.
- Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in R<sub>f</sub> values to be provided).

## A. Preparation of Inorganic Compounds

Preparation of double salt of Ferrous Ammonium Sulphate or Potash Alum.

Preparation of Potassium Ferric Oxalate.

## B. Tests for the functional groups present in organic compounds:

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.

## C. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given foodstuffs.

## D. Determination of concentration/ molarity of KMnO<sub>4</sub> solution by titrating it against a standard solution of:

- Oxalic acid,
- Ferrous Ammonium Sulphate

(Students will be required to prepare standard solutions by weighing themselves).

## E. Qualitative analysis

**Determination of one cation and one anion in a given salt.**

**Cation :** Pb<sup>2+</sup>, Cu<sup>2+</sup>, As<sup>3+</sup>, Al<sup>3+</sup>, Fe<sup>3+</sup>, Mn<sup>2+</sup>, Zn<sup>2+</sup>, Cu<sup>2+</sup>, Ni<sup>2+</sup>, Ca<sup>2+</sup>, Sr<sup>2+</sup>, Ba<sup>2+</sup>, Mg<sup>2+</sup>, NH<sub>4</sub><sup>+</sup>

**Anions:** (CO<sub>3</sub>)<sup>2-</sup>, S<sup>2-</sup>, (SO<sub>3</sub>)<sup>2-</sup>, (NO<sub>2</sub>)<sup>-</sup>, (SO<sub>4</sub>)<sup>2-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, (C<sub>2</sub>O<sub>4</sub>)<sup>2-</sup>, CH<sub>3</sub>COO<sup>-</sup>, NO<sub>3</sub><sup>-</sup>

**(Note: Insoluble salts excluded)**

## PROJECT

### Scientific investigations involving laboratory testing and collecting information from other sources

#### A few suggested Projects.

- Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- Study of quantity of casein present in different samples of milk.
- Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)
- Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.
- Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).
- Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

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

**Practical Examination for Visually Impaired Students of Classes XI and XII  
Evaluation Scheme**

Time Allowed: Two hours

Max. Marks:30

Identification/Familiarity with the apparatus	5 marks
Written test (based on given/prescribed practicals)	10 marks
Practical Record	5 marks
Viva	10 marks
<b>Total</b>	<b>30 marks</b>

**General Guidelines**

- The practical examination will be of two hour duration.
  - A separate list of ten experiments is included here.
  - The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
  - The written test will be of 30 minutes duration.
- 
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
  - A writer may be allowed to such students as per CBSE examination rules.
  - All questions included in the question papers should be related to the listed practicals. Every question should require about two minutes to be answered.
  - These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
  - The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
  - Questions may be generated jointly by the external/internal examiners and used for assessment.
  - The viva questions may include questions based on basic theory/principle/concept, apparatus/materials/ chemicals required, procedure, precautions, sources of error etc.
- A. Items for Identification/Familiarity of the apparatus for assessment in practical (All experiments)**
- Beaker, glass rod, tripod stand, wire gauze, Bunsen burner, Whatman filter paper, gas jar, capillary tube, pestle and mortar, test tubes, tongs, test tube holder, test tube stand, burette, pipette, conical flask, standard flask, clamp stand, funnel, filter paper
- Hands-on Assessment
- Identification/familiarity with the apparatus
  - Odour detection in qualitative analysis

**B. List of Practical**

**The experiments have been divided into two sections: Section A and Section B. The experiments mentioned in Section B are mandatory.**

## SECTION- A

### A Chromatography

(1) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of  $R_f$  values (distance values may be provided).

### B Tests for the functional groups present in organic compounds:

- (1) Alcoholic and Carboxylic groups.
- (2) Aldehydic and Ketonic

### C Characteristic tests of carbohydrates and proteins in the given foodstuffs.

### D Preparation of Inorganic Compounds- Potash Alum

## SECTION-B (Mandatory)

### E Quantitative analysis

- (1) (a) Preparation of the standard solution of Oxalic acid of a given volume  
(b) Determination of molarity of  $\text{KMnO}_4$  solution by titrating it against a standard solution of Oxalic acid.
- (2) The above exercise [F 1 (a) and (b)] to be conducted using Ferrous ammonium sulphate (Mohr's salt)

### F Qualitative analysis:

- (1) Determination of one cation and one anion in a given salt. Cation  $-\text{NH}_4^+$   
Anions  $-\text{CO}_3^{2-}, \text{S}^{2-}, \text{SO}_3^{2-}, \text{Cl}^-, \text{CH}_3\text{COO}^-$   
(Note: Insoluble salts excluded)

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

### Prescribed Books:

1. Chemistry Part -I, Class-XII, Published by NCERT.
2. Chemistry Part -II, Class-XII, Published by NCERT.

**ENGLISH (CORE)- 301**  
**RATIONALISED CURRICULUM (2020-21)**

**Background**

Students are expected to have acquired a reasonable degree of language proficiency in English Language by the time they come to class XI, and the course aims, essentially, at promoting the higher-order language skills.

For a large number of students, the higher secondary stage will be a preparation for the university, where a fairly high degree of proficiency in English may be required. But for another large group, the higher secondary stage may be a preparation for entry into the professional domain. The Core Course should cater to both groups by promoting the language skills required for academic study as well as the language skills required for the workplace.

**Competencies to be focused on:**

The general objectives at this stage are to:

- listen and comprehend live as well as record in writing oral presentations on a variety of topics
- develop greater confidence and proficiency in the use of language skills necessary for social and academic purpose to participate in group discussions, interviews by making short oral presentation on given topics
- perceive the overall meaning and organisation of the text (i.e., correlation of the vital portions of the text)
- identify the central/main point and supporting details, etc., to build communicative competence in various lexicons of English
- promote advanced language skills with an aim to develop the skills of reasoning, drawing inferences, etc. through meaningful activities
- translate texts from mother tongue(s) into English and vice versa
- develop ability and acquire knowledge required in order to engage in independent reflection and enquiry
- read and comprehend extended texts (prescribed and non-prescribed) in the following genres: science fiction, drama, poetry, biography, autobiography, travel and sports literature, etc.
- text-based writing (i.e., writing in response to questions or tasks based on prescribed or unseen texts) understand and respond to lectures, speeches, etc.

- write expository / argumentative essays, explaining or developing a topic, arguing a case, etc. write formal/informal letters and applications for different purposes
- make use of contextual clues to infer meanings of unfamiliar vocabulary
- select, compile and collate information for an oral presentation
- produce unified paragraphs with adequate details and support
- use grammatical structures accurately and appropriately
- write items related to the workplace (minutes, memoranda, notices, summaries, reports etc.
- filling up of forms, preparing CV, e-mail messages., making notes from reference materials, recorded talks etc.

The core course should draw upon the language items suggested for class IX-X and delve deeper into their usage and functions. Particular attention may, however, be given to the following areas of grammar:

- The use of passive forms in scientific and innovative writings.
- Convert one kind of sentence/clause into a different kind of structure as well as other items to exemplify stylistic variations in different discourses modal auxiliaries-uses based on semantic considerations.

### **A. Specific Objectives of Reading**

Students are expected to develop the following study skills:

- skim for main ideas and scan for details
- refer to dictionaries, encyclopedia, thesaurus and academic reference material in any format
- select and extract relevant information, using reading skills of skimming and scanning
- understand the writer's purpose and tone
  - comprehend the difference between the literal and the figurative
- differentiate between claims and realities, facts and opinions, form business opinions on the basis of latest trends available
- comprehend technical language as required in computer related fields, arrive at personal conclusion and logically comment on a given text.

- Specifically develop the ability to be original and creative in interpreting opinion, develop the ability to be logically persuasive in defending one's opinion and making notes based on a text.

### **Develop literary skills as enumerated below:**

- respond to literary texts
- appreciate and analyse special features of languages that differentiate literary texts from non-literary ones, explore and evaluate features of character, plot, setting, etc.
- understand and appreciate the oral, mobile and visual elements of drama .Identify the elements of style such as humour, pathos, satire and irony, etc.
- make notes from various resources for the purpose of developing the extracted ideas into sustained pieces of writing

## **B. Listening and Speaking**

Speaking needs a very strong emphasis and is an important objective leading to professional competence. Hence, testing of oral skills must be made an important component of the overall testing pattern. To this end, speaking and listening skills are overtly built into the material to guide the teachers in actualization of the skills.

### **I. Specific Objectives of Listening & Speaking**

Students are expected to develop the ability to:

- take organized notes on lectures, talks and listening passages
- listen to news bulletins and to develop the ability to discuss informally a wide ranging issues like current national and international affairs, sports, business, etc.
- respond in interviews and to participate in formal group discussions.
- make enquiries meaningfully and adequately and to respond to enquiries for the purpose of travelling within the country and abroad.
- listen to business news and to be able to extract relevant important information.
- to develop public speaking skills.

## **II. Guidelines for Assessment in Listening and Speaking Skills**

### **i. Activities:**

- Activities for listening and speaking available at [www.cbseacademic.in](http://www.cbseacademic.in) can be used for developing listening and speaking skills of students.



- Subject teachers should also refer to books prescribed in the syllabus.
- In addition to the above, teachers may plan their own activities and create their own material for assessing the listening and speaking skills.

**ii. Parameters for Assessment:**

The listening and speaking skills are to be assessed on the following parameters:

- i. Interactive competence (Initiation & turn taking, relevance to the topic).
- ii. Fluency (cohesion, coherence and speed of delivery).
- iii. Pronunciation
- iv. Language (accuracy and vocabulary).

**iii. Schedule:**

- The practice of listening and speaking skills should be done throughout the academic year.
- The final assessment of the skills is to be done as per the convenience and schedule of the school.

**III. Record keeping:**

The record of the activities done and the marks given must be kept for three months after the declaration of result, for any random checking by the Board.

**No recording of speaking skills is to be sent to the Board.**

**C. Specific Objectives of Writing**

**The students will be able to:**

- write letters to friends, relatives, etc. to write business and official letters.
- open accounts in post offices and banks. To fill in railway/airline reservation forms.
- draft notices, advertisements and design posters effectively and appropriately
- write on various issues to institutions seeking relevant information, lodge complaints, express gratitude or render apology.
- write applications, fill in application forms, prepare a personal bio-data for admission into colleges, universities, entrance tests and jobs.
- write informal reports as part of personal letters on functions, programmes and activities held in school (morning assembly, annual day, sports day, etc.)
- write formal reports for school magazines/events/processes/ or in local newspapers about events or occasions.
- express opinions, facts, arguments in the form of speech or debates, using a variety of accurate sentence structures
- draft papers to be presented in symposia.

- take down notes from talks and lectures.
- write examination answers according to the requirement of various subjects.
- summarise a text.

#### **D. More About Reading**

Inculcating good reading habits in children has always been a concern for all stakeholders in education. The purpose is to create independent thinking individuals with the ability to not only create their own knowledge but also critically interpret, analyse and evaluate it with objectivity and fairness. This will also help students in learning and acquiring better language skills.

Creating learners for the 21st century involves making them independent learners who can learn, unlearn and relearn. If our children are in the habit of reading, they will learn to reinvent themselves and deal with the many challenges that lie ahead of them.

Reading is not merely decoding information or pronouncing words correctly. It is an interactive dialogue between the author and the reader in which the reader and the author share their experiences and knowledge with each other. Good readers are critical readers with an ability to arrive at a deeper understanding of not only the world presented in the book but also of the real world around them.

Consequently, they become independent thinkers capable of taking their own decisions in life rationally. Hence, a few activities are suggested below which teachers may use as a part of the reading project.

- Short review / dramatization of the story
- Commentary on the characters
- Critical evaluation of the plot, storyline and characters
- Comparing and contrasting the characters within the story, with other characters in stories by the same author or by different authors
- Extrapolating about the story read or life of characters after the story ends
- defending characters actions in the story
- Making an audio story out of the novel/text to be read aloud.
- Interacting with the author
- Holding a literature fest where students role-play as various characters to interact with each other
- Role playing as authors/poets/dramatists, to defend their works and characters
  - Symposiums and seminars for introducing a book, an author, or a theme
- Creating graphic novels out of novel or short stories they read
- Dramatizing incidents from a novel or a story

- Creating their own stories
- Books of one genre to be read by the whole class.

Teachers may select books and e-books suitable to the age and level of the learners. Care ought to be taken to choose books that are appropriate in terms of language, theme and content and which do not hurt the sensibilities of a child.

Teachers may later suggest books from other languages by dealing with the same themes as an extended activity. The Project should lead to independent learning/reading skills and hence the chosen book should not be taught in class, but may be introduced through activities and be left for the students to read at their own pace. Teachers may, however, choose to assess a student's progress or success in reading the book by asking for verbal or written progress reports, looking at their diary entries, engaging in a discussion about the book, giving a short quiz or a work sheet about the book/short story. A befitting mode of assessment may be chosen by the teacher.

## **Methods and Techniques**

The techniques used for teaching should promote habits of self-learning and reduce dependence on the teacher. In general, we recommend a multi-skill, learner-centred, activity based approach, of which there can be many variations. The core classroom activity is likely to be that of silent reading of prescribed/selected texts for comprehension, which can lead to other forms of language learning activities such as role-play, dramatization, group discussion, writing, etc., although many such activities could be carried out without the preliminary use of textual material. It is important that students be trained to read independently and intelligently, interacting actively with texts, with the use of reference materials (dictionary, thesaurus, etc.) where necessary. Some pre-reading activity will generally be required, and the course books should suggest suitable activities, leaving teachers free to devise other activities when desired. So also, the reading of texts should be followed by post reading activities. It is important to remember that students should be encouraged to interpret texts in different ways.

Group and pair activities can be resorted to when desired, although many useful language activities can be carried out individually. In general, teachers should encourage students to interact actively with texts and with each other. Oral activity (group discussion, etc.) should be encouraged.

**ENGLISH CORE (CODE NO. 301)**

**CLASS – XI (2020-21)**

**PART A - 40 MARKS**

**Reading**

**18 Marks**

I. Multiple Choice questions based on one unseen passage to assess comprehension, interpretation and inference. Vocabulary and inference of meaning will also be assessed. The passage may be factual, descriptive or literary. Ten out of eleven questions to be done. **(10x1=10 Marks)**

II. Multiple Choice questions based on one unseen **case-based** factual passage with verbal/visual inputs like statistical data, charts etc. Eight out of Nine questions to be done. **(8x1=8 Marks)**

*Note: The combined word limit for both the passages will be 600-750.*

**Grammar**

**8 Marks**

III. Multiple choice questions on Gap filling (Determiners, Tenses)

IV. Multiple choice questions on re-ordering/transformation of sentences

**(Total eight questions to be done out of the ten given).**

**Literature Section**

**14 Marks**

V. Multiple Choice questions from an extract from Poetry from **Hornbill** to assess comprehension and appreciation. Any 1 out of 2 extracts to be done. **(3x1=3)**

VI. Multiple Choice questions based on two Prose extracts, out of the three given, from Prose (**Hornbill as well as Snapshots** to assess comprehension and appreciation. **(6x1=6)**

VII. Text based Multiple Choice Questions to assess comprehension, analysis and interpretation, from Prose and Poetry. Five questions out of six to be done. **(5x1=5)**

## PART B - 40 MARKS

### Reading Section:

8 Marks

Q1. Note Making and Summarization based on a passage of approximately 200-250 words.

I. Note Making:

5 Marks

- Title: 1
- Numbering and indenting: 1
- Key/glossary: 1
- Notes: 2

II. Summary (up to 50 words): 3 Marks

- Content: 1
- Expression: 1

### Writing Section:

16 Marks

Q2. Short writing task **-Notice** writing up to 50 words. One out of the two given questions to be answered (**3 Marks**: Format : 1 / Content : 1 / Expression : 1)

Q3. Short writing task **-Poster** up to 50 words. One out of the two given questions to be answered. (**3marks**:Format : 1 / Content : 1 / Expression : 1)

Q4. Letters based on verbal/visual input, to be answered in 120-150 words. Business or official letters (for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies), letter to the school or college authorities, regarding admissions, school issues, requirements / suitability of courses, etc. One out of the two given questions to be answered (**5 Marks**: Format: 1 / Content: 2 / Expression: 2)

Q5 .Writing composition based on visual/verbal inputs in 120-150 words. May be descriptive / argumentative in nature such as **speech/debate**. The theme should be contemporary topical issues. One out of the two given questions to be answered. (**5 Marks**: Format: 1 / Content: 2 / Expression: 2)

### Literature Section:

16 Marks

Q6. **Two** Short answer type question(**one from Prose and one from Poetry from the book Hornbill**), **out of four**, to be answered in 30-40 words. Questions should elicit inferential responses through critical thinking. (**2x2=4**)

Q7. One Short answer type question, from **Prose (Snapshots)**, to be answered in 40-50 words. Questions should elicit inferential responses through critical thinking. Any 1 out of 2 questions to be done. **(1x2=2)**

Q 8. One Long answer type question, from **Prose/poetry (Hornbill)**, to be answered in 120-150 words to assess global comprehension and extrapolation beyond the text. Questions to provide evaluative and analytical responses using incidents, events, themes as reference points. Any 1 out of 2 questions to be done.**(1x5=5)**

**Q.9** One Long answer type question, based on the chapters from the book **Snapshots**, to be answered in 120-150 words to assess global comprehension and extrapolation beyond the text. Questions to provide evaluative and analytical responses using incidents, events, themes as reference points. Any 1 out of 2 questions to be done.**(1x5=5)**

### **Deleted Topics**

#### **Writing**

- **Classified Advertisements,**
- **Letters to the editor (giving suggestions/opinions on an issue) Provide realistic context in the form of newspaper report/article to which the students may respond.**
- **Application for a job with a bio-data or résumé**
- **Article & Report Writing**
- **Narrative**

#### **Grammar**

- **Modals**
- **Clauses**
- **Change of Voice**
- **Error Correction, editing task/cloze passages**

#### **Literature**

##### **Hornbill**

- ***Father To Son***
- ***The Adventure***

##### **Snapshots**

- ***The Ghat of the Only World***
- ***The Tale of Melon City***

#### **Prescribed Books**

1. **Hornbill:** English Reader published by National Council of Education Research and Training, New Delhi

**2. Snapshots:** Supplementary Reader published by National Council of Education Research and Training, New Delhi

**Question Paper Design 2020-21**

**English CORE XI (Code No. 301)**

<b>Section</b>	<b>Competencies</b>	<b>Total marks</b>	<b>%</b>
Reading Comprehension	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s	26	32.5%
Creative Writing Skills and Grammar	Conceptual Understanding, application of rules, Analysis, Reasoning, appropriacy of style and tone, using appropriate format and fluency, inference, analysis, evaluation and creativity	24	30%
Literature Textbooks and Supplementary Reading Text	Recalling, reasoning, appreciating literary convention, inference, analysis, creativity with fluency	30	37.5%
	<b>TOTAL</b>	<b>80</b>	<b>100%</b>
Assessment of Listening and Speaking Skills		<b>20</b>	-
	<b>GRAND TOTAL</b>	<b>100</b>	

**ENGLISH CORE (CODE NO. 301)**

**CLASS – XII 2020-21**

**PART A 40 MARKS**

**Reading Comprehension 20 Marks**

I. Multiple Choice questions based on one unseen passage to assess comprehension, interpretation and inference. Vocabulary and inference of meaning will also be assessed. The passage may be factual, descriptive or literary. Ten out of eleven questions to be done. **(10x1=10 Marks)**

II. Multiple Choice questions based on one unseen **case-based** factual passage with verbal/visual inputs like statistical data, charts, newspaper report etc. Ten out of eleven questions to be done. **(10x1=10 Marks)**

Note: The combined word limit for both the passages will be 700-750 words.

**Literature 20 Marks**

III. Multiple Choice Questions based on two prose extracts, one each from the books **Flamingo and Vistas**, to assess comprehension and appreciation. Refer to the lines to answer questions based on the given extract. Any 2 out of 3 extracts to be done. **(8x1=8)**

IV. Multiple Choice Questions based on a poetry extract from the book **Flamingo** to assess comprehension, analysis and inference. Refer to the lines to answer questions based on the given extract. Any 1 out of 2 extracts to be done. **(4x1=4)**

VI. Text based questions to assess comprehension, analysis, inference and interpretation from the books **Flamingo and Vistas**. Eight out of ten questions to be done. **(8x1=8)**



## PART B (SUBJECTIVE QUESTIONS) - 40 MARKS

### Writing Section: 16 Marks

Q1. Short writing task –Notice/Advertisement up to 50 words. One out of the two given questions to be answered.(3 Marks: Format : 1 / Content : 1 / Expression : 1).

Q2. Short writing task –Formal/Informal Invitation and Reply up to 50 words.One out of the two given questions to be answered.(3 Marks: Format : 1 / Content : 1 / Expression : 1)

Q3. Letters based on verbal/visual input, to be answered in approximately 120-150 words. Letter types include application for a job, Letters to the editor (giving suggestions or opinion on issues of public interest) . One out of the two given questions to be answered (5 Marks :Format: 1 / Content: 2 / Expression: 2)

Q4. Article/ Report Writing, descriptive and analytical in nature, based on verbal inputs, to be answered in 120-150 words. One out of the two given questions to be answered (5Marks:Format : 1 / Content : 2 / Expression : 2)

### Literature Section: 24 Marks

Q6. **Five** Short answer type question, **out of six, from Prose and Poetry from the book Flamingo**, to be answered in 30-40 words. Questions should elicit inferential responses through critical thinking.(5x2=10)

Q7. **Two** Short answer type question ,out of three, from **Prose (Vistas)**, to be answered in 30-40 words. Questions should elicit inferential responses through critical thinking. (2x2=4)

Q 8. **One** Long answer type question, from **Prose/poetry (Flamingo)**, to be answered in 120-150 words to assess global comprehension and extrapolation beyond the text. Questions to provide evaluative and analytical responses using incidents, events, themes as reference points. Any 1 out of 2 questions to be done.(1x5=5)

**Q.9 One** Long answer type question, based on the chapters from the book **Vistas**, to be answered in 120-150 words to assess global comprehension and extrapolation beyond the text. Questions to provide evaluative and analytical responses using incidents, events, themes as reference points. Any 1 out of 2 questions to be done.(1x5=5)

## **Prescribed Books**

1. **Flamingo:** English Reader published by National Council of Education Research and Training, New Delhi
2. **Vistas:** Supplementary Reader published by National Council of Education Research and Training, New Delhi

## **Deleted Topics**

### **Reading**

### **Note Making & Summarizing**

### **Literature**

#### **FLAMINGO**

- |                       |                     |
|-----------------------|---------------------|
| 1. Poets and Pancakes | 1. A Roadside Stand |
| 2. The Interview      |                     |
| 3. Going Places       |                     |

#### **VISTAS**

1. The Tiger King
2. Journey to the end of the Earth
3. Memories of Childhood

### **Writing**

- Poster making
- Business or official letters (for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies)
- Speech, Debate

**Question Paper Design 2020-21**

**English CORE XII (Code No. 301)**

<b>Section</b>	<b>Competencies</b>	<b>Total marks</b>	<b>%</b>
Reading Comprehension	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s	20	25%
Creative Writing Skills	Conceptual Understanding, application of rules, Analysis, Reasoning, appropriacy of style and tone, using appropriate format and fluency, inference, analysis, evaluation and creativity	16	20%
Literature Textbooks and Supplementary Reading Text	Recalling, reasoning, appreciating literary convention, inference, analysis, creativity with fluency	44	55%
	<b>TOTAL</b>	<b>80</b>	<b>100%</b>
Assessment of Listening and Speaking Skills		<b>20</b>	-
	<b>GRAND TOTAL</b>	<b>100</b>	

## **BIOLOGY (Code No. 044)**

**2020-21**

The present curriculum provides the students with updated concepts along with an extended exposure to contemporary areas of the subject. The curriculum also aims at emphasizing the underlying principles that are common to animals, plants and microorganisms as well as highlighting the relationship of Biology with other areas of knowledge. The format of the curriculum allows a simple, clear, sequential flow of 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 curriculum focuses on understanding and application of scientific principles, while ensuring that ample opportunities and scope for learning and appreciating basic concepts continue to be available within its framework. The curriculum is expected to:

- promote understanding of basic principles of Biology
- encourage learning of emerging knowledge and its relevance to individual and society
- promote rational/scientific attitude towards issues related to population, environment and development
- enhance awareness about environmental issues, problems and their appropriate solutions
- create awareness amongst the learners about diversity in the living organisms and developing respect for other living beings
- appreciate that the most complex biological phenomena are built on essentially simple processes

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

## **BIOLOGY (Code No. 044)**

### **COURSE STRUCTURE**

### **CLASS XI (2020 -21) (THEORY)**

**Time:3 Hours**

**Max. Marks: 70**

<b>Unit</b>	<b>Title</b>	<b>Marks</b>
<b>I</b>	Diversity of Living Organisms	15
<b>II</b>	Structural Organization in Plants and Animals	8
<b>III</b>	Cell: Structure and Function	15
<b>IV</b>	Plant Physiology	15
<b>V</b>	Human Physiology	17
	<b>Total</b>	<b>70</b>

## Unit-I Diversity of Living Organisms

### **Chapter-1: The Living World**

What is living? Biodiversity; Need for classification; three domains of life; concept of species and taxonomical hierarchy; binomial nomenclature.

### **Chapter-2: Biological Classification**

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

### **Chapter-3: Plant Kingdom**

Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta and Gymnospermae. (salient and distinguishing features and a few examples of each category).

### **Chapter-4: Animal Kingdom**

Salient features and classification of animals, non-chordates up to phyla level and chordates up to class level (salient features and distinguishing features of a few examples of each category). (No live animals or specimen should be displayed.)

## Unit-II Structural Organization in Animals and Plants

### **Chapter-5: Morphology of Flowering Plants**

Morphology of inflorescence and flower, Description of 01 family: Solanaceae or Liliaceae (to be dealt along with the relevant experiments of the Practical Syllabus).

### **Chapter-7: Structural Organisation in Animals**

Animal tissues.

## Unit-III Cell: Structure and Function

### **Chapter-8: Cell-The Unit of Life**

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.

### **Chapter-9: Biomolecules**

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

### **Chapter-10: Cell Cycle and Cell Division**

Cell cycle, mitosis, meiosis and their significance

## Unit-IV Plant Physiology

### **Chapter-13: Photosynthesis in Higher Plants**

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.

#### **Chapter-14: Respiration in Plants**

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.

#### **Chapter-15: Plant - Growth and Development**

Growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

### **Unit-V Human Physiology**

#### **Chapter-17: Breathing and Exchange of Gases**

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.

#### **Chapter-18: 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.

#### **Chapter-19: 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 - uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.

#### **Chapter-20: Locomotion and Movement**

Skeletal muscle, contractile proteins and muscle contraction.

#### **Chapter-21: 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.

#### **Chapter-22: Chemical Coordination and Integration**

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, goiter, exophthalmic goiter, diabetes, Addison's disease.

**Note:** Diseases related to all the human physiological systems to be taught in brief.

## PRACTICALS

**Time Allowed : Three hours**

**Max. Marks: 30**

Evaluation Scheme	Marks	
One Major Experiment Part A (Experiment No- 1,3)	5	
One Minor Experiment Part A (Experiment No- 4,5,6)	4	
Slide Preparation Part A (Experiment No- 2)	5	
Spotting Part B	7	
Practical Record + Viva Voce	} Credit to the students' work over the academic session may be given	4
Project Record + Viva Voce		5
<b>Total</b>	<b>30</b>	

### **A: List of Experiments**

1. Study and describe a locally available common flowering plant, from any one family: Solanaceae or Liliaceae (Poaceae, Asteraceae or Brassicaceae can be substituted in case of particular geographical location) including dissection and display of floral whorls, anther and ovary to show number of chambers (floral formulae and floral diagrams).
2. Study of distribution of stomata in the upper and lower surfaces of leaves.
3. Separation of plant pigments through paper chromatography.
4. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
5. Test for presence of sugar in urine.
6. Test for presence of albumin in urine.

### **B. Study/Observer of the following (spotting)**

1. Parts of a compound microscope.
2. Specimens/slides/models and identification with reasons - Bacteria, *Oscillatoria*, *Spirogyra*, *Rhizopus*, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant, one dicotyledonous plant and one lichen.
3. Virtual specimens/slides/models and identifying features of - *Amoeba*, *Hydra*, liverfluke, *Ascaris*, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Tissues and diversity in shape and size of animal cells (squamous epithelium, smooth, skeletal and cardiac muscle fibers and mammalian blood smear) through temporary/permanent slides.
5. Mitosis in onion root tip cells and animal cells (grasshopper) from permanent slides.

### **Practical Examination for Visually Impaired Students Class XI**

**Note:** The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

#### **A. Items for Identification/Familiarity with the apparatus / equipments/animal and plant material / chemicals etc. for assessment in practicals (All experiments)**

- Plants of Solanaceae - Brinjal, Petunia, any other or Liliaceae- Any of the Lilies.
- Mushroom, Succulents such as *Aloe vera*/*Kalanchoe*, Raisins, Potatoes.
- Honey comb, Mollusc shell, Model of cockroach, Pigeon and Star fish.

- Compound microscope, Test tube, Petri dish, Beaker, Scalpel.
- Chromatography paper, Chromatography chamber, Alcohol.

## B. List of Practicals

1. Study one locally available common flowering plant of the family– Solanaceae or Liliaceae and identify inflorescence/flower.
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Study honey-bee/butterfly, snail shell, Starfish, Pigeon (through models).
4. Identify the given specimen of a fungus – Mushroom, gymnosperm- pine cone

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

### Prescribed Books:

1. Biology Class-XI, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia)

## CLASS XII (2020 - 21) (THEORY)

**Time:3 Hours**

**Max. Marks:70**

Unit	Title	Marks
VI	Reproduction	14
VII	Genetics and Evolution	18
VIII	Biology and Human Welfare	14
IX	Biotechnology and its Applications	12
X	Ecology and Environment	12
<b>Total</b>		<b>70</b>

### Unit-VI Reproduction

#### Chapter-2: Sexual Reproduction in Flowering Plants

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 dispersal and fruit formation.

#### Chapter-3: 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).

#### Chapter-4: Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); 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).

## **Unit-VII Genetics and Evolution**

### **Chapter-5: Principles of Inheritance and Variation**

**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 human being, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans -thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

### **Chapter-6: 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, Human and rice genome projects; DNA fingerprinting.

## **Unit-VIII Biology and Human Welfare**

### **Chapter-8: Human Health and Diseases**

Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

### **Chapter-10: Microbes in Human Welfare**

Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.

## **Unit-IX Biotechnology and its Applications**

### **Chapter-11: Biotechnology - Principles and Processes**

Genetic Engineering (Recombinant DNA Technology).

### **Chapter-12: Biotechnology and its Application**

Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, biopiracy and patents.

## **Unit-X Ecology and Environment**

### **Chapter-13: Organisms and Populations**

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.

## Chapter-15: Biodiversity and its Conservation

Biodiversity - Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

### PRACTICALS

**Time allowed: 3 Hours**

**Max. Marks: 30**

Evaluation Scheme	Marks	
One Major Experiment 5, 6	5	
One Minor Experiment 2, 3	4	
Slide Preparation 1, 4	5	
Spotting	7	
Practical Record + Viva Voce	Credit to the students' work over the academic session may be given	4
Investigatory Project and its Project and its Record + Viva Voce		5
<b>Total</b>	<b>30</b>	

#### A. List of Experiments

1. Prepare a temporary mount to observe pollen germination.
2. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity. Correlate with the kinds of plants found in them.
3. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.
4. Prepare a temporary mount of onion root tip to study mitosis.
5. Study the effect of different temperatures or three different pH on the activity of salivary amylase on starch.
6. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, etc.

#### B. Study/observation of the following (Spotting)

1. Flowers adapted to pollination by different agencies (wind, insects, birds).
2. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
3. Meiosis in onion bud cell or grasshopper testis through permanent slides.
4. T.S. of blastula through permanent slides (Mammalian).
5. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
6. Common disease causing organisms like *Ascaris*, *Entamoeba*, *Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images. Comment on symptoms of diseases that they cause.
7. Two plants and two animals (models/virtual images) found in xeric conditions. Comment

- upon their morphological adaptations.
8. Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations.

**Practical Examination for Visually Impaired Students of Classes XI and XII  
Evaluation Scheme**

**Time Allowed: Two hours**

**Max. Marks: 30**

Topic	Marks
Identification/Familiarity with the apparatus	5
Written test (Based on given / prescribed practicals)	10
Practical Records	5
Viva	10
<b>Total</b>	<b>30</b>

**General Guidelines**

- The practical examination will be of two hour duration. A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question paper should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory / principle / concept, apparatus / materials / chemicals required, procedure, precautions, sources of error etc.

**Class XII**

**A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments)**

- Soil from different sites- sandy, clayey, loamy; Small potted plants, Cactus/*Opuntia* (model), Large flowers, Maize inflorescence.
- Model of *Ascaris* and developmental stages of frog highlighting morula and blastula.
- Beaker, flask, petri plates, test tubes, aluminium foil, paint brush, bunsen burner/spirit lamp/water bath.
- Starch solution, iodine, ice cubes.

### **A. List of Practicals**

1. Study of the soil obtained from at least two different sites for their texture.
2. Study of flowers adapted to pollination by different agencies (wind, insects).
3. Identification of T.S of morula or blastula of frog (model).
4. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.
5. Identify common disease causing organisms like *Ascaris* (*Model*) and learn some common symptoms of the disease that they cause.
6. Comment upon the morphological adaptations of plants found in xerophytic conditions.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

### **Prescribed Books:**

1. Biology, Class-XII, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia)
3. Biology Supplementary Material (Revised). Available on CBSE website.

**Assessment Areas (Theory) 2020-21**  
**Class XII**  
**Biology (044)**

**Time : 3 hrs.**

**Maximum Marks: 70 Marks**

<b>Competencies</b>	
<b>Demonstrate Knowledge and Understanding</b>	50%
<b>Application of Knowledge / Concepts</b>	30%
<b>Analyse, Evaluate and Create</b>	20%

**Note:**

- Typology of questions: VSA including MCQs, Assertion – Reasoning type questions; SA; LA-I; LA-II; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

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**Suggestive verbs for various competencies**

- **Demonstrate Knowledge and Understanding**  
State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- **Application of Knowledge/Concepts**  
Calculate, illustrate, show, adapt, explain, distinguish, etc.
- **Analyze, Evaluate and Create**  
Interpret, analyse, compare, contrast, examine, evaluate, discuss, construct, etc.