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SYLLABUS  
FOR  
ENTRANCE TEST  
**2016**



UNIVERSITY OF HEALTH SCIENCES  
LAHORE, PAKISTAN

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## STRUCTURE OF ENTRANCE TEST PAPER 2016

Sr.#	Subject	No. of Questions
1.	PHYSICS	44
2.	CHEMISTRY	58
3.	ENGLISH	30
4.	BIOLOGY	88
TOTAL		220

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CONTENTS	PAGE#
PHYSICS	
Syllabus	1-5
TOS	6
CHEMISTRY	
Syllabus	7-18
TOS	19
ENGLISH	
Syllabus	20-24
BIOLOGY	
Syllabus	25-31
TOS	32

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# PHYSICS

## STRUCTURE OF THE SYLLABUS (2016)

F.Sc. and Non-F.Sc.

### TABLE OF CONTENTS

1. Physical Quantities and Units
2. Forces
3. Fluid Dynamics
4. Light
5. Waves
6. Deformation of Solids
7. Ideal Gases
8. Heat and Thermodynamics
9. Electronics
10. Current Electricity
11. Magnetism and Electromagnetism
12. Modern Physics
13. Nuclear Physics

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## 1. PHYSICAL QUANTITIES AND UNITS:

### Learning Outcomes

- Understand what is physics.
- Understand that all physical quantities consist of a numerical magnitude and a unit.
- Recall the following base quantities and their units; mass (kg), length (m), time (s), current (A), temperature (K), luminous intensity (cd) and amount of substance (mol)
- Describe and use base units and derived units.
- Dimensional units of physical quantities.

## 2. FORCES:

### Learning Outcomes

- Show an understanding the concept of weight.
- Show an understanding that the weight of a body may be taken as acting at a single point known as its centre of gravity.
- Weightlessness in an elevator.
- Define and apply the moment of force.

## 3. FLUID DYNAMICS:

### Learning Outcomes

- Concept of viscosity.
- Understand the terms steady (Laminar, streamline) flow, incompressible flow, non-viscous flow as applied to the motion of an ideal fluid.
- Appreciate the equation of continuity.

$$A_1V_1 = A_2V_2 \text{ for the flow of an ideal and incompressible fluid.}$$

- Understand Bernoulli's equation

$$P + \frac{1}{2} \rho v^2 + \rho gh = \text{Constant}$$

- Understand that the pressure difference can arise from different rates of flow of a fluid (Blood flow).

#### 4. LIGHT:

##### Learning Outcomes

- Understand interference of light.
- Understand diffraction of light.
- Describe the phenomenon of diffraction of X-rays by crystals and its use.
- Understand polarization of light.
- Concepts of least distance of distinct vision.
  - Short sightedness, long sightedness.
- Understand the terms magnifying power and resolving power  
( $R = \frac{1}{r_{\min}}$ ,  $R = \frac{\Delta}{\lambda}$ ) of optical instruments.
- Derive expressions for magnifying power of simple microscope and compound microscope.
- Understand the principle of optical fibres, types and its application.

#### 5. WAVES:

##### Learning Outcomes

- Understand the simple harmonic motion with examples.
- Explain energy in simple harmonic motion.
- Describe practical examples of free and forced oscillations.
- Understand the resonance with its applications.
- Understand and describe Doppler's effect and its causes. Recognize the application of Doppler's effect.
- Understand Ultrasound with its uses in scanning.
- Show an understanding speed of sound in different media.
- Audioable frequency range.

#### 6. DEFORMATION OF SOLIDS:

##### Learning Outcomes

- Appreciate deformation caused by a force and that is in one dimension.
- Understand tensile or compressive deformation.
- Understand the terms stress, strain young's modulus and Bulk modulus.
- Energy stored in deformed material.

## 7. IDEAL GAS:

### Learning Outcomes

- Recall and use equation of state of an ideal gas  $PV = nRT$ .
- State the basic assumptions of Kinetic theory of gases.
- Derive gas laws on the basis of kinetic theory of gases.
- Understand pressure of gas  $P = \frac{2}{3} N_0 < \frac{1}{2} mv^2 >$ .

## 8. HEAT AND THERMODYNAMICS:

### Learning Outcomes

- Understand the term thermal equilibrium.
- Concepts of temperature and temperature scales.
- Compare the relative advantage and disadvantage of thermocouple, thermometer and mercury thermometer.
- Understand laws of thermodynamics.
- Show an understanding the term internal energy.

## 9. ELECTRONICS:

### Learning Outcomes

- Logic gates:
  - OR gate, AND gate, NOT Gate, NOR gate and NAND gate.
- Understand the basic principle of Cathode Ray Oscilloscope and appreciate its use.

## 10. CURRENT ELECTRICITY:

### Learning Outcomes

- State Ohm's law and solve problems  $V = IR$
- Combinations of resistors.
- Show an understanding of a capacitor.
- Combinations of capacitors.

## 11. MAGNETISM AND ELECTROMAGNETISM:

### Learning Outcomes

- a) Magnetic field due to current in
  - i) Straight wire
  - ii) Solenoid
- b) Understand Magnetic Resonance Imaging (MRI)

## 12. MODERN PHYSICS:

### Learning Outcomes

- a) Principle of production of X-rays by electron bombardment on metal target.
- b) Describe main features of X-ray tube.
- c) Use of X-rays in imaging internal body structures.
- d) Show an understanding of the purpose of computed tomography or CT scanning.
- e) Show an understanding of the principles of CT scanning.
- f) Understand laser principle and its type (Helium – Neon Laser).
- g) Describe the application of laser in medicine and industry.

## 13. NUCLEAR PHYSICS:

### Learning Outcomes

- a) Understand Radioactivity.
- b) Understand Radioactive decay.
- c) Radio Isotopes and their biological uses.
- d) Nuclear radiation detectors
  - GM tube, Wilson cloud chamber.
- e) Radiation hazards and biological effect of radiation.



Table of Specification (PHYSICS-2016)

F.Sc. and Non-F.Sc.

Sr. No	Topic	MCQs
1.	Physical Quantities and Units	02
2.	Forces	02
3.	Fluid Dynamics	03
4.	Light	04
5.	Waves	04
6.	Deformation of Solids	02
7.	Ideal Gases	02
8.	Heat and Thermodynamics	03
9.	Electronics	02
10.	Current Electricity	03
11.	Magnetism and Electromagnetism	03
12.	Modern Physics	07
13.	Nuclear Physics	07
	Total	44

# CHEMISTRY

## STRUCTURE OF THE SYLLABUS (2016)

F.Sc. and Non-F.Sc.

### TABLE OF CONTENTS

#### A. Physical Chemistry

1. Fundamental Concepts
2. States of Matter
3. Atomic Structure
4. Chemical Bonding
5. Chemical Energetics
6. Solutions
7. Electrochemistry
8. Chemical Equilibrium
9. Reaction Kinetics

#### B. Inorganic Chemistry

1. Periods
2. Groups
3. Transition elements
4. Elements of Biological Importance

#### C. Organic Chemistry

1. Fundamental Principles
2. Hydrocarbon
3. Alkyl Halides
4. Alcohols and Phenols
5. Aldehydes and Ketones
6. Carboxylic Acid
7. Amino Acids
8. Macromolecules
9. Environmental Chemistry

## A. PHYSICAL CHEMISTRY

### 1. FUNDAMENTAL CONCEPTS:

In this topic, candidate should be able to:

- a) Define relative atomic, isotopic, molecular and formula masses, based on the  $^{12}\text{C}$  scale.
- b) Explain mole in terms of the Avogadro's constant.
- c) Apply mass spectrometric technique in determining the relative atomic mass of an element using the mass spectral data provided.
- d) Calculate empirical and molecular formulae, using combustion data.
- e) Understand stoichiometric calculations using mole concept involving.
  - i) Reacting masses
  - ii) Volume of gases

### 2. STATES OF MATTER:

In this topic, candidate should be able to:

- a) Understate gaseous state with reference to:
  - i) Postulates of kinetic molecular theory
  - ii) Deviation of real gases from ideal behavior
  - iii) Gas laws: Boyle's law, Charles law, Avogadro's law and gas equation ( $PV=nRT$ ) and calculations involving gas laws.
  - iv) Deviation of real gases from ideal behaviour at low temperature and high pressure
  - v) Causes of deviation from ideal behaviour
  - vi) Conditions necessary for gasses to approach ideal behaviour
- b) Discuss liquid state with reference to:
  - Evaporation, vapour pressure, boiling and hydrogen bonding in water
- c) Explain the lattice structure of a crystalline solid with special emphasis on:
  - i) Giant ionic structure, as in sodium chloride.
  - ii) Simple molecular, as in iodine
  - iii) Giant molecular, as in graphite; diamond; silicon(IV) oxide
  - iv) Hydrogen-bonded, as in ice
  - v) Metallic as in Cu and Fe.
- d) Outline the importance of hydrogen bonding to the physical properties of substances, including  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{C}_2\text{H}_5\text{OH}$  and ice.
- e) Suggest from quoted physical data the type of structure and bonding present in a substance

### 3. ATOMIC STRUCTURE:

In this topic, candidate should be able to:

- a) Identify and describe the proton, neutron and electron in terms of their relative charges and relative masses
- b) Discuss the behaviour of beams of protons, neutrons and electrons in electric fields
- c) Calculate the distribution of mass and charges within an atom from the given data
- d) Deduce the number of protons, neutrons and electrons present in both atoms and ions for a given proton and nucleon numbers/charge.
- e)
  - i) Describe the contribution of protons and neutrons to atomic nuclei in terms of proton number and nucleon number
  - ii) Distinguish between isotopes on the basis of different numbers of neutrons present
- f) Describe the number and relative energies of the s, p and d orbitals for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbitals
- g) Describe the shapes of s and p orbitals
- h) State the electronic configuration of atoms and ions given the proton number/charge
- i) Explain:
  - i) Ionization energy
  - ii) The factors influencing the ionization energies of elements
  - iii) The trends in ionization energies across a Period and down a Group of the Periodic Table

### 4. CHEMICAL BONDING:

In this topic, candidate should be able to:

- a) Characterise electrovalent (ionic) bond as in sodium chloride and Calcium oxide.
- b) Use the 'dot-and-cross' diagrams to explain
  - i) Covalent bonding, as in hydrogen( $H_2$ ); oxygen( $O_2$ ); chlorine( $Cl_2$ ); hydrogen chloride; carbon dioxide; methane and ethene
  - ii) Co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in  $H_3N^+ - BF_3$ .
- c) Describe the shapes and bond angles in molecules by using the qualitative model of electron-pair repulsion theory up to 4 pairs of electron including bonded electron pair and lone pair around central atom.
- d) Describe covalent bonding in terms of orbital overlap, giving  $\sigma$  and  $\pi$  bonds
- e) Explain the shape of, and bond angles in ethane, ethene and benzene molecules in terms of  $\sigma$  and  $\pi$  bonds

- f) Describe hydrogen bonding, using ammonia and water as simple examples of molecules containing N-H and O-H groups
- g) Explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds
- h) Describe intermolecular forces (Van der Waal's forces), based on permanent and induced dipoles, as in  $\text{CHCl}_3$ ,  $\text{Br}_2$  and in liquid noble gases
- i) Describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons
- j) Describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; Van der Waal's forces and metallic bonding) on the physical properties of substances
- k) Deduce the type of bonding present in a substance from the given information

## 5. CHEMICAL ENERGETICS:

In this topic, candidate should be able to:

- a) Understand concept of energy changes during chemical reactions with examples of exothermic and endothermic reactions.
- b) Explain and use the terms:
  - i) Enthalpy change of reaction and standard conditions, with particular reference to: Formation; combustion; hydration; solution; neutralization and atomisation
  - ii) Bond energy (  $\Delta H$  positive, i.e. bond breaking)
  - iii) Lattice energy (  $\Delta H$  negative, i.e. gaseous ions to solid lattice)
- c) Find heat of reactions/neutralization from experimental results using mathematical relationship.
 
$$H = mc \Delta T$$
- d) Explain, in qualitative terms, the effect of ionic charge and of ionic radius on the numerical magnitude of lattice energy
- e) Apply Hess's Law to construct simple energy cycles, and carry out calculations involving such cycles and relevant energy terms, with particular reference to:
  - i) Determining enthalpy changes that cannot be found by direct experiment, e.g. an enthalpy change of formation from enthalpy changes of combustion
  - ii) Average bond energies
  - iii) Born-Haber cycles (including ionisation energy and electron affinity)

## 6. SOLUTIONS:

In this topic, candidate should be able to:

- a) Describe and explain following concentration units of solutions
  - i) Percentage composition
  - ii) Molarity (M)
  - iii) Molality (m)
  - iv) Mole fraction (X)
  - v) Parts of million (ppm)
- b) Understand concept and applications of colligative properties such as:
  - i) Elevation of boiling point
  - ii) Depression of freezing point
  - iii) Osmotic pressure

## 7. ELECTROCHEMISTRY:

In this topic, candidate should be able to:

- a) Explain the industrial processes of the electrolysis of brine, using a diaphragm cell
- b) Describe and explain redox processes in terms of electron transfer and/or of changes in oxidation number
- c) Define the terms:
  - Standard electrode (redox) potential and Standard cell potential
- d) Describe the standard hydrogen electrode as reference electrode
- e) Describe methods used to measure the standard electrode potentials of metals or non-metals in contact with their ions in aqueous solution
- f) Calculate a standard cell potential by combining two standard electrode potentials
- g) Use standard cell potentials to:
  - i) Explain/deduce the direction of electron flow in the external circuit.
  - ii) Predict the feasibility of a reaction
- h) Construct redox equations using the relevant half-equations
- i) State the possible advantages of developing the H<sub>2</sub>/O<sub>2</sub> fuel cell
- j) Predict and to identify the substance liberated during electrolysis from the state of electrolyte (molten or aqueous), position in the redox series (electrode potential) and concentration

## 8. CHEMICAL EQUILIBRIUM:

In this topic, candidate should be able to:

- a) Explain, in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium
- b) State Le Chatelier's Principle and apply it to deduce qualitatively the effects of changes in temperature, concentration or pressure, on a system at equilibrium
- c) Deduce whether changes in concentration, pressure or temperature or the presence of a catalyst affect the value of the equilibrium constant for a reaction
- d) Deduce expressions for equilibrium constants in terms of concentrations,  $K_c$ , and partial pressures,  $K_p$
- e) Calculate the values of equilibrium constants in terms of concentrations or partial pressures from appropriate data
- f) Calculate the quantities present at equilibrium, given appropriate data
- g) Describe and explain the conditions used in the Haber process.
- h) Understand and use the Bronsted-Lowry theory of acids and bases
- i) Explain qualitatively the differences in behaviour between strong and weak acids and bases and the pH values of their aqueous solutions in terms of the extent of dissociation
- j) Explain the terms pH;  $K_a$ ;  $pK_a$ ;  $K_w$  and use them in calculations
- k) Calculate  $[H^+(aq)]$  and pH values for strong and weak acids and strong bases
- l) Explain how buffer solutions control pH
- m) Calculate the pH of buffer solutions from the given appropriate data
- n) Show understanding of, and use, the concept of solubility product,  $K_{sp}$
- o) Calculate  $K_{sp}$  from concentrations and vice versa
- p) Show understanding of the common ion effect

## 9. REACTION KINETICS:

In this topic, candidate should be able to:

- Explain and use the terms: rate of reaction; activation energy; catalysis; rate equation; order of reaction; rate constant; half-life of a reaction; rate-determining step
- Explain qualitatively, in terms of collisions, the effect of concentration changes on the rate of a reaction
- Explain that, in the presence of a catalyst, a reaction has a different mechanism, i.e. one of lower activation energy
- Describe enzymes as biological catalysts (proteins) which may have specific activity
- Construct and use rate equations of the form

$$\text{Rate} = k[\text{A}]^m[\text{B}]^n$$

with special emphasis on:

- Deducing the order of a reaction by the initial rates method
  - Justifying, for zero- and first-order reactions, the order of reaction from concentration-time graphs
  - Verifying that a suggested reaction mechanism is consistent with the observed kinetics
  - Predicting the order that would result from a given reaction mechanism (and vice versa)
  - Calculating an initial rate using concentration data
- Show understanding that the half-life of a first-order reaction is independent of initial concentration and use the half-life to calculate order of reaction.
  - Calculate the rate constant from the given data
  - Name a suitable method for studying the rate of a reaction, from given information

## B. INORGANIC CHEMISTRY

### 1. PERIODS:

In this topic, candidate should be able to:

Discuss the variation in the physical properties of elements belonging to period 2 and 3 and to describe and explain the periodicity in the following physical properties of elements.

- Atomic radius
- Ionic radius
- Melting point
- Boiling point
- Electrical conductivity
- Ionization energy



## 2. GROUPS:

In this topic, candidate should be able to:

Describe and explain the variation in the properties of group II, IV and VII elements from top to bottom with special emphasis on:

- a) Reactions of group-II elements with oxygen and water
- b) Characteristics of oxides of carbon and silicon
- c) Properties of halogens and uses of chlorine in water purification and as bleaching agent
- d) Uses of Nobel gases (group VIII)

## 3. TRANSITION ELEMENTS:

In this topic, candidate should be able to:

Discuss the chemistry of transition elements of 3-d series with special emphasis on:

- a) Electronic configuration
- b) Variable oxidation states
- c) Use as a catalyst
- d) Formation of complexes
- e) Colour of transition metal complexes

## 4. ELEMENTS OF BIOLOGICAL IMPORTANCE:

In this topic, candidate should be able to:

- a) Describe the inertness of Nitrogen
- b) Manufacture of Ammonia by Haber process
- c) Discuss the preparation of Nitric acid and nitrogenous fertilizers
- d) Describe the presence of Sulphur dioxide in the atmosphere which causes acid rain
- e) Describe the manufacture of Sulphuric acid by contact method

## C. ORGANIC CHEMISTRY

### 1. FUNDAMENTAL PRINCIPLES:

In this topic, candidate should be able to:

- a) Classify the organic compounds
- b) Explain the types of bond fission, homolytic and heterolytic
- c) Discuss the types of organic reactions; Polar and free radical
- d) Discuss the types of reagents; nucleophile, electrophile and free radicals
- e) Explain isomerism; structural and cis-trans
- f) Describe and explain condensed structural formula, displayed and skeletal formula
- g) Discuss nomenclature of organic compounds with reference to IUPAC names of Alkanes, Alkenes, Alcohols and Acids

### 2. HYDROCARBON:

In this topic, candidate should be able to:

Describe the chemistry of Alkanes with emphasis on

- a) Combustion
- b) Free radical substitution including mechanism

Discuss the chemistry of Alkenes with emphasis on

- a) Preparation of alkenes by elimination reactions
  - i) Dehydration of alcohols
  - ii) Dehydrohalogenation of Alkyl halide
- b) Reaction of Alkenes such as
  - i) Catalytic hydrogenation
  - ii) Halogenation ( $\text{Br}_2$  addition to be used as a test of an alkene)
  - iii) Hydration of alkenes
  - iv) Reaction with HBr with special reference to Markownikoff's rule
  - v) Oxidation of alkenes using Bayer's reagent (cold alkaline  $\text{KMnO}_4$ ) and using hot concentrated acidic  $\text{KMnO}_4$  for cleavage of double bond
  - vi) Polymerization of ethene

Discuss chemistry of Benzene with examples

- a) Structure of benzene showing the delocalized  $\pi$ -orbital which causes stability of benzene
- b) Electrophilic substitution reactions of benzene
  - i) Nitration including mechanism
  - ii) Halogenation
  - iii) Friedel Craft's reaction

### 3. ALKYL HALIDES:

In this topic, candidate should be able to:

- a) Discuss importance of halogenoalkanes in everyday life with special use of CFCs, haloethanes,  $\text{CCl}_4$ ,  $\text{CHCl}_3$  and Teflon
- b) Reaction of alkyl halides such as:  
 $\text{S}_\text{N}$ -reactions, (Reactions of alcohols with aqueous KOH, KCN in alcohol and with aqueous  $\text{NH}_3$ )  
Elimination reaction with alcoholic KOH to give alkenes.

### 4. ALCOHOLS AND PHENOLS:

In this topic, candidate should be able to:

Discuss Alcohols with reference to

- a) Classification of alcohols into primary, secondary and tertiary
- b) Preparation of ethanol by fermentation process
- c) Reaction of alcohol with
  - i)  $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4$
  - ii)  $\text{PCl}_5$
  - iii) Na-metal
  - iv) Alkaline aqueous Iodine
  - v) Esterification
  - vi) Dehydration

Phenols

- a) Discuss reactions of phenol with:
  - i) Bromine
  - ii)  $\text{HNO}_3$
- b) Explain the relative acidity of water, ethanol and phenol

## 5. ALDEHYDES AND KETONES:

In this topic, candidate should be able to:

- a) Describe the structure of aldehyde and ketones
- b) Discuss preparation of aldehydes and ketones by oxidation of alcohols
- c) Discuss following reactions of aldehydes and ketones
  - i) Common to both
    - 2,4-DNPH
    - HCN
  - ii) Reactions in which Aldehydes differs from ketones
    - Oxidation with  $K_2Cr_2O_7 + H_2SO_4$ , Tollen's reagent and Fehling solution
    - Reduction with sodium boron hydride
  - iii) Reaction which show presence of  $CH_3CO$  group in aldehydes and ketones
    - Triiodomethane test (Iodo form test) using alkaline aqueous iodine.

## 6. CARBOXYLIC ACID:

In this topic, candidate should be able to:

- a) Show preparation of ethanoic acid by oxidation of ethanol or by the hydrolysis of  $CH_3CN$
- b) Discuss the reactions of ethanoic acid with emphasis on:
  - i) Salt formation
  - ii) Esterification
  - iii) Acid chloride formation
  - iv) Amide formation
- c) Hydrolysis of amide in basic and acidic medium
- d) Describe the strength of organic acids relative to chloro substituted acids

## 7. AMINO ACIDS:

In this topic, candidate should be able to:

- a) Describe the general structure of  $\alpha$ -amino acids found in proteins
- b) Classify the amino acids on the basis of nature of R-group
- c) Describe what is meant by essential amino acids
- d) Understand peptide bond formation and hydrolysis of polypeptides/protein

## 8. MACROMOLECULES:

In this topic, candidate should be able to describe and explain

- a) Addition polymers such as polyethene, polypropene, polystyrene and PVC.
- b) Condensation polymers such as polyesters, nylon
- c) Structure of proteins
- d) Chemistry of carbohydrates
- e) Chemistry of lipids
- f) Enzymes
- g) Structure and function of nucleic acid (DNA & RNA)

## 9. ENVIRONMENTAL CHEMISTRY:

In this topic, candidate should be able to

- a) Understand causes of water pollution
- b) Discuss disposal of solid wastes
- c) Understand chemistry and causes of
  - i) Smog
  - ii) Acid rain
  - iii) Ozone layer

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82.	Brio
83.	Broach
84.	Broadside
85.	Buckle
86.	Buoyant
87.	Burgeoning
88.	Cachet
89.	Caesarean
90.	Caliph
91.	Calisthenics
92.	Camber
93.	Cameo
94.	Capital
95.	Carapace
96.	Cardigan
97.	Career
98.	Caricature
99.	Cartographer
100.	Cast
101.	Catalyst
102.	Catharsis
103.	Caulk
104.	Centennial
105.	Chastise
106.	Chiaroscuro
107.	Chimerical
108.	Chivalry
109.	Chromosome
110.	Churn
111.	Chutzpah
112.	Clamorous
113.	Claret
114.	Classic
115.	Classical
116.	Clement
117.	Close
118.	Coast
119.	Cobble
120.	Coccyx
121.	Coercive
122.	Collage
123.	Comatose
124.	Comely
125.	Commiserate
126.	Commute
127.	Compact
128.	Compatible
129.	Complacent
130.	Concerted
131.	Conciliatory
132.	Condone
133.	Confiscatory
134.	Confound
135.	Congeval.
136.	Congruent
137.	Contemporary
138.	Contiguous
139.	Contravention
140.	Contrive

141.	Contusion
142.	Coquetry
143.	Cordial
144.	Cordiality
145.	Corked
146.	Corollary
147.	Corpuscle
148.	Corroborating
149.	Cosset
150.	Coterie
151.	Covert
152.	Coveted
153.	Crass
154.	Craven
155.	Crescent
156.	Criterion
157.	Cue
158.	Cygnets
159.	Cynical
160.	Dale
161.	Dam
162.	Dappled
163.	Dark horse
164.	Deadhead
165.	Debility
166.	Debunk
167.	Debut
168.	Decant
169.	Decelerate
170.	Decorum
171.	Decry
172.	Deferential
173.	Deferment
174.	Delegate
175.	Demographics
176.	Demure
177.	Denomination
178.	Desiccate
179.	Deuce
180.	Devious
181.	Dexter
182.	Diffidence
183.	Diffident
184.	Diligence
185.	Diligent
186.	Discombobulate
187.	Discourse
188.	Discrepancy
189.	Discretion
190.	Disdain
191.	Disingenuous
192.	Dissension
193.	Dissent
194.	Dissenter
195.	Dissonance
196.	Divagate
197.	Divulge
198.	Docent
199.	Dote

200.	Downy
201.	Droll
202.	Dulcet
203.	Dunce
204.	Duplicitous
205.	Effect
206.	Effervescent
207.	Electrolytes
208.	Elicit
209.	Elucidate
210.	Elusive
211.	Embed
212.	Embedded
213.	Emblazon
214.	Emblematic
215.	Emboss
216.	Emit
217.	Empathy
218.	Emulate
219.	Encumber
220.	Encyclical
221.	Enhance
222.	Ennui
223.	Epicenter
224.	Equipose
225.	Equivocate
226.	Ergometer
227.	Eschew
228.	Espalier
229.	Ethic
230.	Euphonious
231.	Evanescent
232.	Evasive
233.	Evocative
234.	Excavate
235.	Execrable
236.	Exhortation
237.	Exonerate
238.	Exploitation
239.	Extemporaneous
240.	Extrapolate
241.	Extricate
242.	Extrinsic
243.	Fabricate
244.	Facile
245.	Facilitate
246.	Fateful
247.	Fawning
248.	Feasible
249.	Feckless
250.	Felicitous
251.	Felicity
252.	Feral
253.	Fermentation
254.	Fiesta
255.	Figment
256.	Filigree
257.	Finagle
258.	Flaunt



259.	Florid
260.	Flux
261.	Fop
262.	Forswear
263.	Frowsy
264.	Gable
265.	Galvanize
266.	Gambit
267.	Garnish
268.	Gaudy
269.	Genocide
270.	Gesticulate
271.	Gild
272.	Glaucoma
273.	Glaze
274.	Glib
275.	Glucose
276.	Gradient
277.	Grapevine
278.	Green
279.	Gridlock
280.	Guileless
281.	Guise
282.	Gull
283.	Guru
284.	Hackles
285.	Hail
286.	Hammer and tongs
287.	Harangue
288.	Hawk
289.	Hector
290.	Heinous
291.	Herbicide
292.	Herculean
293.	Hermetic
294.	Heterogeneous
295.	Hiatus
296.	Holistic- medicine
297.	Homeopathy
298.	Hone
299.	Horse latitudes
300.	Hue and cry
301.	Humane
302.	Hydra
303.	Hypertension
304.	Hypothermia
305.	Idealist
306.	Ilk
307.	Illicit
308.	Imam
309.	Immobilize
310.	Immolate
311.	Impediment
312.	Impending
313.	Impetuous
314.	Impetus
315.	Impinge
316.	Implacable

317.	Importune
318.	Imprecation
319.	Impregnable
320.	Improvise
321.	Impute
322.	Incarname
323.	Incentive
324.	Incisive
325.	Inculcate
326.	Indigent
327.	Ineradicable
328.	Inertia
329.	Infallible
330.	Infidel
331.	Infusion
332.	Inherent
333.	Innocuous
334.	Innovate
335.	Inoculate
336.	Inordinate
337.	Inquisition
338.	Inscrutable
339.	Inter
340.	Intransigent
341.	Intrinsic
342.	Irrefutable
343.	Isotropic
344.	Itinerant
345.	Jackknife
346.	Jaded
347.	Jargon
348.	Jell
349.	Jeopardy
350.	Jettison
351.	Jig
352.	Jihad
353.	Jingoism
354.	Jitney
355.	Jocular
356.	Jocund
357.	Journeyman
358.	Jubilee
359.	Judicial
360.	Judicious
361.	Juncture
362.	Junket
363.	Junta
364.	Justify
365.	Juxtapose
366.	Ken
367.	Kiln
368.	Kismet
369.	Lacerating
370.	Laconic
371.	Lampoon
372.	Lapidary
373.	Largess
374.	Latent
375.	Lathe

376.	Laud
377.	Lee
378.	Lemming
379.	Ligament
380.	Lineage
381.	Lion's share
382.	Lipid
383.	Lissome
384.	Litter
385.	Liturgy
386.	Lucidity
387.	Lulu
388.	Macrame
389.	Magnanimous
390.	Magnum
391.	Malevolence
392.	Maneuver
393.	Manicured
394.	Manifestation
395.	Matriculation
396.	Mausoleum
397.	Maverick
398.	Mean
399.	Medley
400.	Menial
401.	Mentor
402.	Meritorious
403.	Mesa
404.	Mesmerize
405.	Metabolism
406.	Microcosm
407.	Militate
408.	Mirth
409.	Misanthropy
410.	Misapprehension
411.	Mitigation
412.	Modish
413.	Monolithic
414.	Monotheism
415.	Montage
416.	Moot
417.	Morass
418.	Moratorium
419.	Mordant
420.	Mosaic
421.	Mosey
422.	Mote
423.	Motif
424.	Motley
425.	Mountebank
426.	Mumbo jumbo
427.	Murky
428.	Muse
429.	Must
430.	Myriad
431.	Nary
432.	Nexus
433.	Niche
434.	Nike

435.	Nip and tuck
436.	Nuance
437.	Nuclear family
438.	Obeisance
439.	Obliterate
440.	Obsequious
441.	Obstreperous
442.	Obtuse
443.	Odometer
444.	Onerous
445.	Onslaught
446.	Onyx
447.	Opaque
448.	Opportune
449.	Optimum
450.	Orb
451.	Orthodox
452.	Overdraft
453.	Pad
454.	Paddy
455.	Palatable
456.	Palaver
457.	Palazzo
458.	Palpitation
459.	Pampas
460.	Pan
461.	Pandemic
462.	Par
463.	Paradox
464.	Paragon
465.	Paramedic
466.	Parameter
467.	Parcel
468.	Pare
469.	Parlous
470.	Paroxysm
471.	Pathos
472.	Patisserie
473.	Pedestrian
474.	Peerless
475.	Pending
476.	Peninsula
477.	Perfidious
478.	Perfidy
479.	Perfunctory
480.	Perimeter
481.	Peripheral
482.	Periphery
483.	Permeate
484.	Permutation
485.	Peroration
486.	Perpetuate
487.	Perseverance
488.	Perspicacious
489.	Phlegmatic
490.	Piety
491.	Pilaster
492.	Placate
493.	Plague

494.	Platonic
495.	Pollex
496.	Pomp
497.	Portmanteau
498.	Portray
499.	Postulate
500.	Potable
501.	Potpourri
502.	Precipitate
503.	Précis
504.	Preclude
505.	Precursor
506.	Predatory
507.	Pre-emptive
508.	Premise
509.	Premonition
510.	Preplate
511.	Prevail
512.	Prevalent
513.	Prig
514.	Primal
515.	Privation
516.	Procure
517.	Prodigious
518.	Prolific
519.	Proponent
520.	Proscription
521.	Provender
522.	Provident
523.	Provocative
524.	Prowess
525.	Prune
526.	Purchase
527.	Putrid
528.	Quadriceps
529.	Quagmire
530.	Quarter
531.	Queasy
532.	Querulous
533.	Queue
534.	Quorum
535.	Radiant
536.	Rakish
537.	Rapacious
538.	Rapport
539.	Raze
540.	Reactionary
541.	Recapitulate
542.	Reciprocal
543.	Reclamation
544.	Reclusive
545.	Reconnoitre
546.	Rectify
547.	Red herring
548.	Redolent
549.	Regime
550.	Regnant
551.	Relegate
552.	Relief

553.	Remedial
554.	Renovate
555.	Repute
556.	Resonance
557.	Resound
558.	Restitution
559.	Resuscitate
560.	Retrench
561.	Riff
562.	Robust
563.	Roil
564.	Roster
565.	Ruddy
566.	Rue
567.	Ruminant
568.	Sagacity
569.	Sampler
570.	Sanatorium
571.	Sanctity
572.	Sandbagger
573.	Sanguine
574.	Sarong
575.	Satiate
576.	Satire
577.	Scam
578.	Sceptic
579.	Sciatica
580.	Score
581.	Scorned
582.	Scruple
583.	Scrutinize
584.	Scuttle
585.	Sear
586.	Sec
587.	Sedate
588.	Sediment
589.	Segment
590.	Seminary
591.	Sensibility
592.	Septic
593.	Shrapnel
594.	Sidle
595.	Siesta
596.	Silhouette
597.	Singe
598.	Sisyphean
599.	Skeptical
600.	Skew
601.	Skittish
602.	Snide
603.	Sojourn
604.	Solvent
605.	Somatic
606.	Sophistry
607.	Spa
608.	Specious
609.	Specter
610.	Splotch
611.	Spurious

612.	Squander
613.	Stalwart
614.	Stanch
615.	Staples
616.	Static
617.	Stay
618.	Stentorian
619.	Steppe
620.	Sticky wicket
621.	Stilted
622.	Stimuli
623.	Stipulate
624.	Stoicism
625.	Stratagem
626.	Subdivision
627.	Succumb
628.	Superficial
629.	Superfluous
630.	Supposition
631.	Surplice
632.	Surrealism
633.	Surrealistic
634.	Swivel
635.	Sycophantic
636.	Symbiosis
637.	Taboo
638.	Tactile
639.	Tank
640.	Tariff

641.	Taxidermy
642.	Telepathy
643.	Temperance
644.	Tenacious
645.	Therapeutic
646.	Tinge
647.	Tipping point
648.	Titan
649.	Torpid
650.	Traction
651.	Tranquil
652.	Transcend
653.	Transient
654.	Transmute
655.	Trash talk
656.	Treacly
657.	Trepidation
658.	Trifle
659.	Trilogy
660.	Tussle
661.	Uber
662.	Uncanny
663.	Understeer
664.	Undulate
665.	Undulating
666.	Unmitigated
667.	Urbane
668.	Vale
669.	Vanquish

670.	Vascular
671.	Vegetate
672.	Venality
673.	Vendetta
674.	Veneer
675.	Venerable
676.	Venomous
677.	Ventricle
678.	Veracity
679.	Vertex
680.	Verve
681.	Viability
682.	Vintage
683.	Virago
684.	Virulent
685.	Vista
686.	Vociferous
687.	Voracious
688.	Vortex
689.	Vulcanize
690.	Wan
691.	Wheedle
692.	Woof
693.	Wry
694.	Xenophobic
695.	Xeric

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## 1. INTRODUCTION TO BIOLOGY:

### Content

Branches of Biology

### Learning outcomes:

a) Define the following terms:

Transgenic plants, Cloning, Pasteurization, Preventive measure, Vaccinization, Drug therapy

## 2. CELL BIOLOGY:

### Content

Cell structure

Structure and Function of cellular organelles

Cell division

### Learning outcomes:

a) Compare the structure of typical animal and plant cell

b) Compare and contrast the structure of Prokaryotic cell with Eukaryotic cells

c) Fluid mosaic model of cell membrane and transportation (diffusion, facilitated diffusion, active and passive transport), endocytosis and exocytosis.

d) Outline the structure and function of the following organelles:

Nucleus, Endoplasmic reticulum, Golgi apparatus, Mitochondria, Centrioles, Ribosomes

e) Describe Meiotic errors (Down's syndrome, Klinefelter's syndrome, Turner's syndrome)

## 3. BIOLOGICAL MOLECULES:

### Content

Carbohydrate

Proteins

Lipids

Nucleic acids

Deoxyribonucleic acid (DNA)

Ribonucleic acid (RNA)

Enzymes

#### Learning outcomes:

- a) Discuss carbohydrates: Monosaccharides (Glucose), Oligosaccharides (Cane sugar, sucrose), Polysaccharides (Starches)
- b) Describe Proteins: Amino acids, structure of proteins
- c) Describe Lipids: waxes, Phospholipids, Terpenoids
- d) Describe the structure along its back bone composition and function of DNA as hereditary material, Replication of DNA (Semi-conservative), Role of triplet codons, Transcription (making up of mRNA), Translation (protein synthesis: role of ribosomes, mRNA, tRNA)
- e) Give the structure and types of RNA (mRNA, rRNA, tRNA)
- f) What is enzyme and its role in reducing activation energy?
- g) Define the following terms:
  - Enzymes, Coenzyme, Co-factor, Prosthetic group, Apoenzyme and Holoenzyme
- h) Explain the mode/mechanism of enzyme action
- i) Describe the effects of temperature, pH, enzyme concentration and substrate concentration on the rate of enzyme catalysed reaction
- j) Explain the effects of reversible and irreversible, competitive and non-competitive inhibitors on the rate of enzyme activity

#### 4. MICROBIOLOGY:

##### Content

Virus

Bacteria

Fungi

##### Learning outcomes

- a) Which are the viral diseases in humans?
- b) Reteroviruses and Acquired Immunodeficiency diseases
- c) Describe the Life cycle of Bacteriophage (in detail with its all steps) including:
  - Lytic cycle
  - Lysogenic cycle
- d) Describe the structure and types of bacteria
- e) Discuss in detail:
  - Gram +ve bacteria
  - Gram -ve bacteria
  - Nutrition in bacteria
- f) What are the uses and misuses of antibiotics?
- g) What are molds (fungi)? How they are useful and harmful to mankind, give examples.
- h) Describe the Life cycle of fungus (Rhizopus).

## 5. KINGDOM ANIMALIA:

### Content

Kingdom Animalia (phyla)

#### Learning outcomes:

- a) Porifera (with respect to their capacity to regenerate)
- b) Coelenterata (coral reefs as habitat for sea animals)
- c) Platyhelminthes
- d) Aschelminthes (Infection in humans) with examples
- e) Arthropoda (Economic importance of Arthropods and harmful impacts on Man)
- f) Define the following terms:
  - Coelomata, Acoelomata, Pseudocoel, Radiata, Bilateria, Diploblastic and Triploblastic organization.

## 6. HUMAN PHYSIOLOGY:

### Content

- a) Digestive System
- b) Gas exchange and Transportation
- c) Excretion and Osmoregulation
- d) Nervous System
- e) Reproduction
- f) Support and Movement
- g) Hormonal Control (Endocrine Glands)
- h) Immunity

#### Learning outcomes:

- a) Digestive System:
  - Anatomy of digestive system and specify the digestion in:
    - Oral cavity (role of saliva and enzymes)
    - Stomach (enzymes)
    - Small intestine
    - Large intestine
- b) Gas exchange and Transportation:
  - Anatomy of respiratory system (nostrils, trachea, lungs)
  - Explain the term breathing
  - Lymph, structure of heart, carriage of oxygen and carbon dioxide
- c) Excretion and Osmoregulation:
  - Describe the structure of kidney and its functions with respect to homeostasis
  - What are Kidney problems and cures?
    - Kidney stones, lithotripsy, kidney transplant, dialysis, renal failure

- What do you understand by the term Homeostasis?
- d) Nervous System:
- What is Nervous system and its types?
  - Explain CNS (Central Nervous System) including forebrain, mid brain, hind brain and spinal cord
  - Explain PNS (Peripheral Nervous System) and its types (Autonomic and Sympathetic Nervous System)
  - Neurons (Associative, motor and sensory neuron)
  - Discuss the Nervous disorders (Parkinson's disease, Epilepsy and Alzheimer's disease)
  - What do you understand by Biological clock and circadian Rhythms?
- e) Reproduction:
- Explain the Reproductive system in male in detail
  - Explain the Reproductive system in female / Menstrual cycle
  - Explain:
    - Spermatogenesis
    - Oogenesis
  - Discuss the following Diseases in detail which are sexually transmitted:
    - Gonorrhoea, Syphilis, AIDS and how these diseases can be controlled (treatment is not required)
- f) Support and Movement:
- Explain the role of Human skeleton and skeletal muscles in locomotion
  - Explain the process of muscle contraction
  - What is Muscle fatigue, Tetani, Cramps?
  - Describe the structure and functions of involuntary, voluntary and cardiac muscles
- g) Hormonal control (Endocrine glands):
- What are hormones?
  - Describe Hypothalamus with its hormones.
  - Describe Pituitary gland with hormones secreted from its Anterior, Median and Posterior lobe
  - Describe adrenal gland with its hormones.
  - What are Islets of langerhans?
  - What are the hormones of alimentary canal (Gastrin, secretin)?
  - The hormones of ovaries and testes
- h) Immunity:
- Immune system and define its components:
    - Antigen
    - Antibody (structure of antibody)
    - Lymphocytes (B and T cells)



- What is cell mediated response and humoral immune response?
- Types of Immunity:
  - Active immunity
  - Passive immunity
- What do you mean by vaccination?

## 7. BIOENERGETICS:

### Content

Photosynthesis and cellular respiration

### Learning outcomes

- a) Photosynthetic pigments and their absorption spectrum
- b) Light dependent stage
- c) Light independent stage
- d) Describe the respiration at cellular level including:
  - Glycolysis, Krebs cycle, Electron Transport Chain

## 8. BIOTECHNOLOGY:

### Content

DNA technology

### Learning outcomes

- a) Explain Recombinant DNA Technology
- b) Discuss Polymerase Chain Reaction (detailed procedure)
- c) What do you understand by the following terms:
  - Gene therapy
  - Transgenic animals

## 9. ECOSYSTEM:

### Content

Components of Ecosystem

Biological succession

Energy flow in ecosystem

Impacts of Human activity on ecosystem

### Learning outcomes:

- a) What is succession, give various stages of succession on land.
- b) What is the significance of Human activity on ecosystem as population, deforestation, ozone depletion, Green house effect.

## 10. EVOLUTION AND GENETICS:

### Content

- Darwin's theory
- Lamarck's theory
- Evidences of evolution
- Genetics

### Learning outcomes

- a) Theory of Darwin and Lamarck, also discuss the merits and demerits
- b) Evidences of evolution from paleontology
- c) Sex determination and sex linkage in humans
- d) Define the following terms:
  - Mutations, Epistasis, Gene, Allele, Multiple allele.

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