NATIONAL UNIVERSITY OF MEDICAL SCIENCES

# NUMS 2025

## ORIGINAL COMPLETE QUESTION PAPER

| 150 | 4 | Full | NUMS |
|---|---|---|---|
| Questions | Subjects | Answer Key | Official 2025 |

| PHYSICS (Q.1–40) | CHEMISTRY (Q.30–69) | ENGLISH (Q.70–84) | BIOLOGY (Q.86–150) |
|---|---|---|---|

With Complete Answer Key & Detailed Explanations

YouTube • Facebook • Instagram: Mdcat Guide | MbBs.Com.Pk

## EXAM INSTRUCTIONS

| | |
|---|---|
| **Exam** | NUMS (National University of Medical Sciences) Entrance Test 2025 |
| **Total Questions** | 150 MCQs |
| **Subjects** | Physics (40) • Chemistry (40) • English (15) • Biology (55) |
| **Time Allowed** | 150 minutes (2.5 hours) — 1 minute per question |
| **Marking Scheme** | Each correct answer = +1 mark. No negative marking. |
| **Difficulty Level** | High — NUMS is one of Pakistan's most competitive medical entrance tests |
| **Answer Key** | Provided at the end of this document with detailed explanations |

## NUMS PREPARATION STRATEGY

| | |
|---|---|
| **Biology (55 Qs)** | Highest weightage — focus on Cell Biology, Genetics, Physiology, Ecology & Evolution. Revise FSc Part I & II thoroughly. |
| **Physics (40 Qs)** | Cover all FSc topics: Mechanics, Waves, Electromagnetism, Modern Physics. Practice numerical MCQs daily. |
| **Chemistry (40 Qs)** | Organic Chemistry carries most marks. Master reaction mechanisms, functional groups, and industrial chemistry. |
| **English (15 Qs)** | Focus on Grammar, Vocabulary, Sentence Structure, Articles, and Prepositions. Read English newspapers daily. |
| **Time Strategy** | Attempt English & Biology first (more predictable). Flag difficult Physics/Chemistry and return at end. |
| **Practice Pattern** | Solve minimum 3 past papers per week under timed conditions. Review every wrong answer immediately. |
| **Revision Plan** | Final 2 weeks: daily revision of weak topics + full mock tests. Avoid new topics in last 3 days. |

## SECTION 1 — PHYSICS (Q.1 – Q.40)

**Q1** **The path of a charged particle in a plane perpendicular to a uniform magnetic field is:**

A Circular
B Helical
C Parabola
D Elliptical

**Q2** **Magnetic force acting on a charge at rest is:**

A Zero
B Positive
C Negative
D Infinite

**Q3** **If mass of a charged particle is doubled, cyclotron frequency becomes:**

A Doubled
B Halved
C Quadrupled
D One fourth

**Q4** **In uniform circular motion, average velocity is equal to same as:**

A Linear velocity
B Average velocity
C Uniform velocity
D Instantaneous velocity

**Q5** **Electric field intensity of infinite charge sheet:**

A $E = 2\sigma/\varepsilon_0$
B $E = 1/\varepsilon_0$
C $E = \sigma/\varepsilon_0$
D $\sigma/(2\varepsilon_0)$

**Q6** **Stability of radioactivity element is determined by:**

A Decay constant
B Rate of the radioactive decay
C Time of decay
D Number of radioactive nuclei

**Q7** **1 kWh is equal to:**

A 3.6 MW
B 3.6 MJ
C 3.6 kJ
D 3.6 GJ

**Q8** **Rectifier converts:**

A Alternating voltage into Direct voltage
B Direct voltage into Alternating voltage
C Alternating current into Direct current
D Direct current into Alternating current

**Q9** **Basic requirement for induced emf is:**

A Flux linked to coil
B No flux linked to coil
C Coil should be circular
D Change in flux links to the coil

**Q10** **Product of force and time is equal to:**

A Change in displacement
B Change in momentum
C Change in velocity
D Change in acceleration

**Q11** **Resistivity of copper is:**

A $1.54 \times 10^{-8}$ Ω·m
B $1.34 \times 10^{-8}$ Ω·m
C $1.45 \times 10^{-8}$ Ω·m
D $1.64 \times 10^{-8}$ Ω·m

**Q12** **Bursting of tire is an example of which process?**

A Adiabatic
B Isochoric
C Isothermal
D Isobaric

**Q13** **Direction of angular velocity can be found by:**

A Right-hand rule
B Fleming's left-hand rule
C Lenz's law
D Faraday's law

**Q14** **When star moves towards the earth, the shift is known as:**

A Blue shift
B Red shift
C Compton shift
D None

**Q15** **Angle at which maximum range of projectile is achieved?**

A 0°
B 45°
C 90°
D 76°

**Q16** **Which of the following spectrum is produced when atoms are in the gaseous state?**

A Continuous spectrum
B Band spectrum
C Line spectrum
D Absorption spectrum

**Q17** **Conductance is reciprocal of resistance, its unit is:**

A Siemen
B Ohm
C Ampere
D Watt

**Q18** **During rubbing of hands, internal energy:**

A Increases
B Decreases
C Zero
D Remains same

**Q19** **If velocity is doubled, what happens to kinetic energy:**

A Remains same
B Doubles
C Quadruples
D Halves

**Q20** **On a clear day at noon, intensity of solar energy is:**

A 1.4 $kW/m^2$
B 1.2 $kW/m^2$
C 1 $kW/m^2$
D 1.3 $kW/m^2$

**Q21** **Work done is positive if angle is:**

A $0° < \theta < 90°$

B $0° < \theta < 180°$

C $90° < \theta < 270°$

D None of these

**Q22** **The electric potential at a distance r is given by the formula:**

A $V = kq/r$

B $1/4\pi\varepsilon_0 qr$

C $Ed$

D $Ir$

**Q23** **Which of the following act as a semiconductor?**

A Iron

B Silicon

C Zinc

D Tungsten

**Q24** **The fraction change in resistance per kelvin is:**

A Coefficient of conductivity

B Temperature coefficient of resistance

C Coefficient of conductance

D Coefficient of resistivity

**Q25** **Quantized momentum was explained by:**

A Einstein

B Bohr

C de-Broglie

D Rutherford

**Q26** **Angle between a and r is:**

A 90°

B 80°

C 45°

D 60°

**Q27** **EMF induced is zero when plane of coil is:**

A Perpendicular to B

B Parallel to B

C Antiparallel

D None of these

**Q28** **The spectra obtained by absorption or emission of radiation by atoms of the gas:**

A Atomic spectra
B Molecular spectra
C Band spectra
D Continuous spectra

**Q29** **Two waves identical traveling in the same medium are superposed:**

A Interference
B Diffraction
C Reflection
D Refraction

**Q30** **The work done by centripetal force is:**

A Maximum
B Minimum
C Zero
D Negative

**Q31** **Which of the following has highest specific heat capacity?**

A Copper
B Iron
C Water
D Glass

**Q32** **In photoelectric effect, stopping potential depends upon:**

A Intensity of light
B Frequency of light
C Speed of light
D Amplitude of light

**Q33** **Power of a lens is measured in:**

A Meter
B Dioptre
C Candela
D Watt

**Q34** **The SI unit of magnetic flux is:**

A Tesla
B Weber
C Henry
D Farad

**Q35** **Half-life of a radioactive element is 10 days. After 30 days, fraction remaining is:**

A 1/2
B 1/4
C 1/8
D 1/16

**Q36** **Which type of wave cannot be polarized?**

A Radio waves
B Light waves
C Sound waves
D X-rays

**Q37** **The energy stored in a capacitor is:**

A QV
B QV/2
C $Q^2V$
D 2QV

**Q38** **Which phenomenon proves the transverse nature of light?**

A Interference
B Diffraction
C Polarization
D Refraction

**Q39** **Absolute zero temperature is equal to:**

A 0°C
B -173°C
C -273°C
D -373°C

**Q40** **The process of converting AC into pulsating DC is called:**

A Amplification
B Modulation
C Rectification
D Filtration

## SECTION 2 — CHEMISTRY (Q.30 – Q.69)

**Q41** **Most molecular crystals melt below:**

A 200°C
B 280°C
C 330°C
D 480°C

**Q42** **How much heavier is the H-atom as compared to electron?**

A 1937
B 1737
C 1837
D 1637

**Q43** **The value of equilibrium constant for the decomposition of ozone at 25°C:**

A $10^{55}$
B $10^{65}$
C $10^{25}$
D $10^{50}$

**Q44** **A reaction is first order with respect to A and third order with respect to B, the rate equation is:**

A Rate = $K[A][B]^2$
B Rate = $K[A]^2[B]$
C Rate = $K[A][B]^3$
D Rate = $K[A]$

**Q45** **For a reaction A → Product, if concentration of A is doubled, product increases 4 times. The order of reaction will be:**

A Zero
B 1st
C 2nd
D 3rd

**Q46** **Select the spontaneous reaction from the following:**

A Reaction of nitrogen and oxygen
B Emission of α-particles from polonium
C Thermal decomposition of marble
D Burning of paper

**Q47** **Select the exothermic reaction among the following:**

A Thermal composition of $P_2O_5$
B Formation of atmospheric nitric oxide
C Burning of methane
D Sublimation of dry ice

**Q48** **The oxidation number of Cl in $HClO_2$ is:**

A +1
B +3
C +5
D +7

**Q49** **Bond order is equal to:**

A Difference between number of bonding electrons and antibonding electrons
B The sum of number of bonding electrons and antibonding electrons
C Half of the difference between number of bonding electrons and antibonding electrons
D Quarter of the difference between number of bonding electrons and antibonding electrons

**Q50** **Which of the following molecule has non-polar covalent bond?**

A Methyl chloride
B Methanol
C Carbon dioxide
D Tetrachloromethane

**Q51** **Which of the following alcohols will give oily layer upon heating?**

A 3-Methyl-2-butanol
B 2-Methyl-2-butanol
C 2-Butanol
D Ethyl alcohol

**Q52** **Formalin is a mixture of:**

A 40% HCHO, 8% $CH_3OH$, 52% $H_2O$
B 40% $CH_3CHO$, 8% $CH_3OH$, 50% $H_2O$
C 40% $CH_3CHO$, 8% $C_2H_5OH$, 50% $H_2O$
D 45% HCHO, 8% $C_2H_5OH$, 50% $H_2O$

**Q53** **Polymerization of HCHO and $CH_3CHO$ occurs in the presence of:**

A Conc. $H_2SO_4$
B Dil. $H_2SO_4$
C Conc. $H_2CO_3$
D Dil. $H_2CO_3$

**Q54** **The boiling point of carboxylic acids are relatively high due to:**

A Increased molecular mass
B Intermolecular carbon bonding
C Intermolecular oxygen bonding
D Intermolecular hydrogen bonding

**Q55** **Carboxylic acid reacts with metal carbonate. The colorless gas evolved is:**

A $H_2$
B $O_2$
C $CO_2$
D CO

**Q56** **Which of the following compound will react with 2,2-dimethyl propanoic acid to produce ester?**

A Ethanoic acid
B Propane
C Ethanol
D Propanone

**Q57** **The most abundant protein in animal kingdom forming 25–35% of body proteins is/are:**

A Derived proteins
B Simple proteins
C Compound proteins
D Conjugated proteins

**Q58** **Protein present in connective tissues of human body is:**

A Phosphoprotein
B Collagen
C Lecithin
D Cholesterol

**Q59** **In human body Ferritin is used to store:**

A P
B Ca
C Fe
D Zn

**Q60** **In human body Ceruloplasmin acts as a carrier of:**

A $O_2$
B Zn
C Cu
D Fe

**Q61** **Predict the element with lowest ionization energy:**

A Mg
B Ar
C Si
D P

**Q62** **Select the group II element which has the highest atomic radius?**

A Be
B Ca
C Ba
D Sr

**Q63** **Which of the following element has least boiling point?**

A Li
B Na
C K
D Cs

**Q64** **2-pentanone and 3-pentanone are examples of:**

A Metamers
B Functional group isomers
C Tautomerism
D Position isomers

**Q65** **Which of the following will show optical isomerism?**

A 2,2-Dihydroxy propanoic acid
B 2-Hydroxy butanedioic acid
C Butanoic acid
D 2-Hydroxy propanoic acid

**Q66** **Which of the following is an electrophile in sulphonation?**

A $SO_3H$
B $SO_3$
C $SO_2$
D $SO_3^+$

**Q67** **Acetylene reacts with hydrogen bromide to form:**

A 2,2-Dibromoethane
B 1,1-Dibromoethane
C 1,2-Dibromoethane
D 1,1,2,2-Tetrabromoethane

**Q68** **Generally the decreasing order of reactivity is:**

A Alkane > Alkynes > Alkene

B Alkene < Alkynes < Alkanes

C Alkene > Alkynes > Alkanes

D Alkynes < Alkanes < Alkene

**Q69** **Racemic mixture formed in SN1 reaction is due to presence of empty:**

A s-orbital

B p-orbital

C $sp^3$-orbital

D $sp^2$-orbital

**Q70** **The order of reactivity of alcohol with respect to cleavage of C–O bond:**

A Tertiary > Secondary > Primary

B Primary > Tertiary > Secondary

C Secondary > Tertiary > Primary

D Tertiary < Secondary < Primary

**Q71** **$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$. When 40g of NaOH reacts with 49g of $H_2SO_4$, the number of water molecules produced are:**

A $6.02 \times 10^{23}$

B $6.02 \times 10^{24}$

C $1.2044 \times 10^{23}$

D $1.204 \times 10^{24}$

**Q72** **The number of electrons in a subshell can be calculated by the formula:**

A 2l + 1

B 2l + 2

C 2(2 + l)

D 2(2l + 1)

**Q73** **When 5d orbital is complete, the entering electron goes into:**

A 6s

B 6p

C 6d

D 6f

**Q74** **Which of the following relationship is correct for kinetic energy of gases?**

A K.E = 2RT/3NA

B K.E = 3RT/2NA

C K.E = 2mNT/2R

D K.E = 2NA/3RT

**Q75** **The fourth state of matter is:**

A Solid

B Liquid

C Gaseous liquid

D Plasma

**Q76** **Which factor does not affect the rate of evaporation?**

A Amount of liquid

B Surface area

C Temperature

D Inter-molecular forces

**Q77** **Which of the following is responsible for the low boiling point of diethyl ether as compared to water?**

A Weak intermolecular forces

B High surface tension

C Low vapour pressure

D High vapour pressure

**Q78** **Hydrogen bonding does not exist in:**

A Proteins

B Alcohols

C Liq HF

D $SiH_4$

**Q79** **The factor that affects the lattice energy is:**

A Charge to size ratio

B Shielding effect

C Crystal structure

D Atomic radius

**Q80** **The shape of the crystal lattice depends upon:**

A Size of particles

B Nature of particles

C Arrangement of particles

D Size of unit cell

## SECTION 3 — ENGLISH (Q.70 – Q.84)

**Q81** **Identify the sentence with correct punctuations:**

A Ali received a Parker pen, Hamza: a watch.

B Ali received a Parker pen; Hamza a watch.

C Ali received a Parker pen; Hamza: a watch.

D Ali received a Parker pen; Hamza, a watch.

**Q82** **Fill in the correct articles:**
**_____ female lion is called _____ lioness. She has no mane.**

A A, the

B The, a

C The, the

D A, a

**Q83** **'Whatever you order for dinner' is fine with me. The underlined part is:**

A Noun clause

B Adjective clause

C Adverb clause

D Independent clause

**Q84** **After midnight, the ghost will come out of the haunted attic to scare the people. The sentence is:**

A Simple

B Compound

C Complex

D Compound-Complex

**Q85** **I suggest that you _____ visit a doctor.**

A Must

B Should

C Ought to

D Have to

**Q86** **Choose the correctly structured sentence.**

A Had he been there, he would see us.

B Had he been there, he would had seen us.

C Had he been there, he would have seen us.

D Had he had been there, he would have seen us.

**Q87** **Identify the sentence with correct structure.**

A We noticed the boy, walking down the street.

B We noticed, the boy walk down the, street.

C We noticed, that the boy was walking down the street.

D We noticed the boy, who was walking down the street.

**Q88** **He circled _____ whole world on his ship and on _____ island he encountered _____ fierce giant.**

A the, an, the

B the, a, a

C the, an, a

D the, an, an

**Q89** **Choose the sentence with correct order of adjectives.**

A I met, young two, beautiful, British girls at the airport.

B I met two beautiful, young, British girls at the airport.

C I met two, British, young, beautiful girls at the airport.

D I met two young, beautiful British girls at the airport.

**Q90** **Identify the underlined part of the sentence:**
**I know you have already read this book.**

A Independent clause

B Adjective clause

C Adverb clause

D Noun clause

**Q91** **Choose the sentence with correct punctuations.**

A "go then," Said the ant, "And dance winter away."

B "Go then" Said the Ant, and "dance winter away."

C "Go then," said the ant, "and dance winter away."

D "go then". Said the Ant, "and dance Winter away."

**Q92** **Which of the following verbs takes the preposition 'from' with it?**

A Abstain

B Accused

C Desirous

D Ignorant

**Q93** **According to scientists, the sun is _____ and we can find the early discoveries made by scientists in black and white on _____. Choose correctly spelt homophones:**

A Stationery, Stationary

B Stationary, Stationery

C Stationary, Stationary

D Stationery, Stationary

**Q94** **Choose the correct preposition.**
**One hour _____ glorious life is worth an age without a name.**

A In

B Of

C To

D With

**Q95** **Clive had been only a few months in the army when announced that peace had been concluded between great britain and france. The sentence contains errors of:**

A Comma

B Comma and full stop

C Comma and capitalization

D Capitalization

## SECTION 4 — BIOLOGY (Q.86 – Q.150)

**Q96** **Induced fit model of enzyme activity suggests that an enzyme:**

A Cannot modify its active sites

B Can bind to a single substrate

C Can catalyze related specific reaction

D Usually belongs to non-regulatory enzyme

**Q97** **Select the one which is used by hexokinase as an activator:**

A $Cu^{++}$

B $Zn^{++}$

C $Mg^{++}$

D $Fe^{++}$

**Q98** **The linkage between substrate molecule and active site is:**

A Ionic bonding

B Disulfide bonding

C Hydrogen bonding

D Covalent bonding

**Q99** **Activated pepsin in which polypeptide fragment is removed is an example of:**

A Apo-enzyme

B Holoenzyme

C Regulatory enzyme

D Non-regulatory enzyme

**Q100** **Reversible inhibitors affect the enzyme catalyzed reaction by:**

A Forming covalent bonds with active site

B Destroying the globular structure

C Forming weak linkages with enzymes

D Activating the catalytic sites

**Q101** **What is the required medium for the maximum activity of the given enzymes?**
**(Lipase / Pepsin)**

A Acidic / Basic

B Acidic / Acidic

C Basic / Acidic

D Basic / Basic

**Q102** **What distinguishes the concept of special creation from concept of evolution?**

A Life is not the product of sudden creative act

B Unicellular prokaryotes might be the life ancestors

C Rely on inspiration and meditation for life origin

D Life results from innumerable changes

**Q103** **Which of the following idea is a part of Lamarckism?**

A Use and disuse of organs

B Survival of the fittest

C Origin of species

D Variation

**Q104** **Choose the correct pair for homology?**

A Wings of birds and wings of butterfly

B Forelimbs of birds and fins of whales

C Leaves of pines and cactus

D Gills of fish and lungs of humans

**Q105** **Which chronological sequence is correct among the classes of vertebrates as evidence of evolution?**

A Birds → fish → amphibians → reptiles

B Reptiles → birds → fishes → amphibians

C Fish → amphibians → reptiles → birds

D Amphibians → reptiles → birds → fish

**Q106** **The reduction of population carrying a specific allele and genotype due to natural disaster is called:**

A Mutation

B Bottle neck effect

C Founder effect

D Speciation

**Q107** **Which of the following increases variation within a gene pool?**

A Adaptation
B Genetic drift
C Gene mutation
D Neutral selection

**Q108** **Identify the location of mitral valve in human heart:**

A Between right ventricle and pulmonary trunk
B Between left ventricle and aorta
C Between right atrium and right ventricle
D Between left atrium and left ventricle

**Q109** **Which of the following components are present both in blood and lymph?**

A $O_2$, water, large proteins
B RBCs, electrolytes, amino acids
C $CO_2$, RBCs and water
D $CO_2$, glucose and water

**Q110** **Blood flow in vessels least depends on:**

A Total cross sectional area of vessels
B Blood pressure
C Skeletal muscle contraction
D Heart beat

**Q111** **Which T-lymphocytes do not directly attack invading microbes?**

A Natural killer cell
B Macrophages
C B-lymphocytes
D Neutrophils

**Q112** **A woman cuts her finger while working in kitchen. Which chemical substance will cause inflammation around wound?**

A Interleukin – I
B Histamine
C Interleukin – II
D Heparin

**Q113** **Choose the mismatched:**

A Acetylcholine – gastrin

B Enterokinase – lipase

C Emulsification – fat droplets

D Chylomicrons – cholesterol + carbohydrates

**Q114** **Which protein is present in the walls of alveoli?**

A Collagen

B Hemoglobin

C Myoglobin

D Myosin

**Q115** **Which of the following acts as an enzyme activator in human digestive system?**

A Erepsin

B Enterokinase

C Pepsinogen

D Trypsinogen

**Q116** **How would you classify a bacterium having a group of 2 or more flagella at one pole?**

A Lophotrichous

B Amphitrichous

C Monotrichous

D Peritrichous

**Q117** **Which of the following bacteria is used for developing vaccine against tuberculosis?**

A Mycobacterium tuberculosis

B E. coli

C Salmonella typhi

D Mycobacterium bovis

**Q118** **If a bacteria can grow in the presence or absence of oxygen it would be a(n):**

A Aerobic

B Anaerobic

C Facultative anaerobe

D Microaerophilic

**Q119** **Which testicular cells in a human male with high testosterone level will start the endocrine activity?**

A Interstitial cell
B Sertoli cells
C Spermatogonial cells
D Leydig cells

**Q120** **Which layer of uterus is composed of contractile muscles?**

A Endometrium
B Perimetrium
C Myometrium
D Both endo and myometrium

**Q121** **One of the endocrine glands responsible for failure in ovulation is:**

A Pituitary
B Placenta
C Thyroid
D Adrenal

**Q122** **Identify the exact function of ATP hydrolysis during muscle contraction:**

A Formation of cross bridges
B Breaking of cross bridges
C Displacement of tropomyosin
D Release of $Ca^{2+}$ ions from sarcoplasmic reticulum

**Q123** **The reason behind the slow healing of cartilage is:**

A Absence of minerals in matrix
B Absence of nervous supply
C Absence of blood supply
D Loose arrangement of cells

**Q124** **H zone of sarcomere consists of:**

A Proteins supporting myosin filaments
B Myosin overlapped by actin
C Only actin filament
D Only myosin filament

**Q125** **Which cell is most important to cause bone resorption?**

A Osteoblast
B Osteoclast
C Osteocyte
D Fibroblast

**Q126** **Activity of which organ would be compromised with impaired function of smooth muscles?**

A Heart
B Lungs
C Stomach
D Tongue

**Q127** **The phenomena of gene linkage rejects the concept of:**

A Law of segregation
B Polygenic traits
C Epistasis
D Law of independent assortment

**Q128** **Which of the following is used to determine linkage between two gene pairs?**

A Test cross
B Back cross
C Monohybrid cross
D Dihybrid cross

**Q129** **The process by which unwanted structures are engulfed and digested within the lysosome is termed as:**

A Autophagy
B Autolysis
C Endocytosis
D Exocytosis

**Q130** **Fluidity of biological membranes is maintained by:**

A Glycoprotein
B Saturated fatty acid
C Fatty acids
D Phospholipids

**Q131** **Which of the following independently reproduces in the cell?**

A Golgi complex
B Nucleus
C Chloroplast
D Endoplasmic reticulum

**Q132** **Which statement best describes difference of prokaryotic cell from eukaryotic cell?**

A Prokaryote: Membrane bound organelle is present / Eukaryote: Membrane bound organelle is absent

B Prokaryote: Ribosomal subunits are 50S & 30S / Eukaryote: Ribosomal subunits are 60S & 40S

C Prokaryote: DNA is double stranded / Eukaryote: DNA is circular

D Prokaryote: Multicellular / Eukaryote: Multicellular and unicellular

**Q133** **Skeletal muscle cells are having:**

A Less SER & more RER

B More SER & less RER

C Equal amount of SER & RER

D No SER & RER

**Q134** **Which one is the correct direction of action potential along the neuron?**

A Axon → post synaptic terminal

B Schwann cells → pre synaptic terminal

C Cell body → pre synaptic terminal

D Dendrite → post synaptic terminal

**Q135** **Concentration of $Na^+$ and $K^+$ ions during resting membrane potential is:**
**(Inside Neuron / Outside Neuron)**

A $K^+$ 30 times / $Na^+$ 10 times

B $K^+$ 10 times / $Na^+$ 30 times

C $Na^+$ 10 times / $K^+$ 30 times

D $Na^+$ 30 times / $K^+$ 10 times

**Q136** **A brief phase in which neuron regains its original ionic distribution and polarity is called:**

A Repolarization

B Synaptic delay

C Saltatory period

D Refractory period

**Q137** **Parts of brain that comprise the limbic system:**

A Thalamus, amygdala, hippocampus

B Hypothalamus, amygdala, hippocampus

C Hypothalamus, corpus callosum, hippocampus

D Thalamus, hypothalamus, pons

**Q138** **Ions involved in synaptic transmission of nerve impulse:**

A $K^+$, $Ca^{2+}$, $Na^+$

B $Na^+$, $K^+$

C $Na^+$, $Ca^{2+}$

D $K^+$, $Ca^{2+}$

**Q139** **Correct sequence of the four elements of a neural pathway in simple-reflex circuit:**

A Sensory neuron → associative neuron → motor neuron → muscles

B Muscles → sensory neuron → associative neuron → motor neuron

C Motor neurons → associate neuron → sensory neuron → muscles

D Associate neuron → sensory neuron → motor neuron → muscles

**Q140** **In humans memory storage for behavior and coordination is well developed in the:**

A Amygdala

B Cerebrum

C Medulla

D Cerebellum

**Q141** **Choose the correct pairing:**
**(Chemical Nature / Hormones / Glands)**

A Proteins / Insulin / Pancreas

B Steroid / Cortisone / Thymus

C Catecholamine / Estrogen / Adrenal medulla

D Amino acid derivative / Thyroxine / Parathyroid

**Q142** **Which phyla exhibit first true coelom?**

A Cnidaria
B Annelida
C Mollusca
D Platyhelminthes

**Q143** **Which invertebrate has exceptionally large and complex brain with highly developed capabilities to learn and remember?**

A Snail
B Cattle fish
C Octopus
D Giant squid

**Q144** **Arthropods constitute 54% of kingdom Animalia. What is the reason for their success?**

A Diversity and articulation of exoskeleton
B Existence of haemocoel
C Well-developed reproductive system
D Bilateral symmetry

**Q145** **Which of the following virus is having double stranded RNA in its core?**

A Small pox
B Mild rash virus
C Diarrhea virus
D Rubella virus

**Q146** **Pore size of porcelain filter ranges between:**

A 10 – 100 nm
B 100 – 1000 nm
C 10 – 10 µm
D 100 – 1000 µm

**Q147** **Reverse transcriptase converts:**

A ds RNA to ss RNA
B ss RNA to ds RNA
C ss RNA to ds DNA
D ss DNA to ds DNA

**Q148** **Which symptoms disappear after few months in an asymptomatic carrier of HIV?**

A Loss of memory

B Swollen lymph gland

C Weight loss

D Night sweats

**Q149** **The primary purpose of photosystem-II in thylakoid membrane is:**

A Synthesis of ATP

B Oxidation of water

C Reduction of NADP+ to NADPH

D Oxidation of cytochrome

**Q150** **In glycolysis glucose is:**

A Oxidized into pyruvic acid

B Reduced into pyruvate

C Broken down to G3P

D Reduced to NADPH

## COMPLETE ANSWER KEY WITH EXPLANATIONS

### SECTION 1 — PHYSICS (Q.1 – Q.40)

**Q1. The path of a charged particle in a plane perpendicular to a uniform magnetic field is:**

**Correct Answer: A. Circular**

In a uniform magnetic field, a charged particle moving perpendicular to the field experiences a constant centripetal force (F = qvB), causing it to move in a circular path.

**Q2. Magnetic force acting on a charge at rest is:**

**Correct Answer: A. Zero**

Magnetic force F = qv × B. If the charge is at rest, v = 0, so F = 0. Magnetic force only acts on moving charges.

**Q3. If mass of a charged particle is doubled, cyclotron frequency becomes:**

**Correct Answer: B. Halved**

Cyclotron frequency f = qB / (2πm). Since frequency is inversely proportional to mass, doubling mass halves the frequency.

**Q4. In uniform circular motion, average velocity is equal to same as:**

**Correct Answer: C. Uniform velocity**

In uniform circular motion, the speed (magnitude of velocity) remains constant throughout — this is the definition of uniform velocity in terms of speed. The particle moves at constant speed, making it 'uniform velocity' in magnitude.

**Q5. Electric field intensity of infinite charge sheet:**

**Correct Answer: D. $\sigma/(2\varepsilon_0)$**

For an infinite plane sheet of charge with surface charge density σ, the electric field on each side is $E = \sigma/(2\varepsilon_0)$, derived from Gauss's law.

**Q6. Stability of radioactivity element is determined by:**

**Correct Answer: A. Decay constant**

The decay constant (λ) characterizes the stability of a radioactive nucleus — a larger λ means less stable (faster decay). It is unique to each isotope.

**Q7. 1 kWh is equal to:**

**Correct Answer: B. 3.6 MJ**

1 kWh = 1000 W × 3600 s = 3,600,000 J = $3.6 \times 10^6$ J = 3.6 MJ.

**Q8. Rectifier converts:**

**Correct Answer: A. Alternating voltage into Direct voltage**

A rectifier is an electronic device that converts alternating voltage (AC) into direct voltage (DC) using diodes. It is the primary function of rectifier circuits.

**Q9. Basic requirement for induced emf is:**

**Correct Answer: D. Change in flux links to the coil**

By Faraday's law, emf = $-d\Phi/dt$. An emf is induced only when there is a CHANGE in magnetic flux linking the coil, not merely flux being present.

**Q10. Product of force and time is equal to:**

**Correct Answer: B. Change in momentum**

Impulse = Force × Time = $F \cdot t = \Delta p$ (change in momentum). This is the impulse-momentum theorem.

**Q11. Resistivity of copper is:**

**Correct Answer: A. $1.54 \times 10^{-8}$ Ω·m**

According to Pakistani FSc Physics textbook (Punjab Textbook Board), the resistivity of copper is given as $1.54 \times 10^{-8}$ Ω·m. This is the standard value used in Pakistani curriculum.

**Q12. Bursting of tire is an example of which process?**

**Correct Answer: A. Adiabatic**

When a tire bursts, air expands rapidly without exchanging heat with surroundings (too fast for heat transfer). This is an adiabatic process.

**Q13. Direction of angular velocity can be found by:**

**Correct Answer: A. Right-hand rule**

The direction of angular velocity vector (ω) is determined by the right-hand rule: curl the fingers in the direction of rotation, and the thumb points in the direction of ω.

**Q14. When star moves towards the earth, the shift is known as:**

**Correct Answer: A. Blue shift**

When a star moves towards Earth, the light waves are compressed (Doppler effect), increasing frequency and shifting toward the blue end of the spectrum — called Blue shift.

**Q15. Angle at which maximum range of projectile is achieved?**

**Correct Answer: B. 45°**

Range $R = v^2\sin(2\theta)/g$ is maximum when $\sin(2\theta) = 1$, i.e., $2\theta = 90°$, so $\theta = 45°$.

**Q16. Which of the following spectrum is produced when atoms are in the gaseous state?**

**Correct Answer: C. Line spectrum**

When atoms in gaseous state are excited, electrons transition between discrete energy levels and emit photons of specific wavelengths, producing a line (emission) spectrum.

**Q17. Conductance is reciprocal of resistance, its unit is:**

**Correct Answer: A. Siemen**

Conductance G = 1/R. Its SI unit is Siemen (S), also written as mho (℧).

**Q18. During rubbing of hands, internal energy:**

**Correct Answer: A. Increases**

Rubbing hands converts mechanical (kinetic) energy to heat via friction, increasing the internal (thermal) energy of the hands.

**Q19. If velocity is doubled, what happens to kinetic energy:**

**Correct Answer: C. Quadruples**

KE = ½mv². If v is doubled → KE = ½m(2v)² = ½m·4v² = 4 × original KE. Kinetic energy quadruples.

**Q20. On a clear day at noon, intensity of solar energy is:**

**Correct Answer: A. 1.4 kW/m²**

The solar constant (intensity of sunlight at Earth's surface on a clear day at noon) is approximately 1.4 kW/m² (1000–1400 W/m²).

**Q21. Work done is positive if angle is:**

**Correct Answer: A. $0° < \theta < 90°$**

$W = Fd\cdot\cos\theta$. Work is positive when $\cos\theta > 0$, which occurs when $0° \leq \theta < 90°$.

**Q22. The electric potential at a distance r is given by the formula:**

**Correct Answer: A. V = kq/r**

Electric potential $V = kq/r = q/(4\pi\varepsilon_0 r)$. Here $k = 1/(4\pi\varepsilon_0)$, so V = kq/r is the standard form.

**Q23. Which of the following act as a semiconductor?**

**Correct Answer: B. Silicon**

Silicon (Si) is a classic semiconductor with a bandgap of ~1.1 eV, widely used in electronics. Iron, Zinc, and Tungsten are conductors.

**Q24. The fraction change in resistance per kelvin is:**

**Correct Answer: B. Temperature coefficient of resistance**

Temperature coefficient of resistance ($\alpha$) = $\Delta R/(R_0\cdot\Delta T)$. It represents the fractional change in resistance per unit change in temperature.

**Q25. Quantized momentum was explained by:**

**Correct Answer: B. Bohr**

Bohr postulated that the angular momentum of electrons is quantized: mvr = nh/2π. De Broglie later EXPLAINED why — through wave nature of matter. But the quantization of momentum was first proposed by Bohr.

**Q26. Angle between a and r is:**

**Correct Answer: A. 90°**

In circular motion, centripetal acceleration (a) is always directed toward the center (radially inward), while the radius vector (r) points outward — making the angle between them 90°.

**Q27. EMF induced is zero when plane of coil is:**

**Correct Answer: A. Perpendicular to B**

EMF = NBAω·sin(θ), where θ is angle between plane of coil and B. When the plane of coil is PERPENDICULAR to B, the flux through coil is maximum but rate of change of flux = 0, so induced EMF = 0. When parallel to B, EMF is maximum.

**Q28. The spectra obtained by absorption or emission of radiation by atoms of the gas:**

**Correct Answer: A. Atomic spectra**

Atomic spectra arise from electronic transitions within individual atoms in the gaseous state, producing sharp lines characteristic of that element.

**Q29. Two waves identical traveling in the same medium are superposed:**

**Correct Answer: A. Interference**

When two identical waves traveling in the same medium overlap, the principle of superposition applies — the result is interference (constructive or destructive).

**Q30. The work done by centripetal force is:**

**Correct Answer: C. Zero**

Centripetal force always acts perpendicular to the velocity (toward center). Since W = F·d·cosθ and θ = 90°, cos90° = 0. Therefore work done by centripetal force is always zero.

**Q31. Which of the following has highest specific heat capacity?**

**Correct Answer: C. Water**

Water has the highest specific heat capacity (4200 J/kg·K) among common substances due to hydrogen bonding. This is why it is used as a coolant and moderates Earth's climate.

**Q32. In photoelectric effect, stopping potential depends upon:**

**Correct Answer: B. Frequency of light**

Stopping potential ($V_0$) depends only on frequency of incident light, not intensity. Higher frequency → greater KE of emitted electrons → higher stopping potential. $eV_0 = hf - \varphi$.

**Q33. Power of a lens is measured in:**

**Correct Answer: B. Dioptre**

Power of a lens P = 1/f (f in meters). Its SI unit is Dioptre (D). Converging lens has positive power; diverging lens has negative power. 1D = 1 $m^{-1}$.

**Q34. The SI unit of magnetic flux is:**

**Correct Answer: B. Weber**

Magnetic flux $\Phi = B \cdot A \cdot \cos\theta$. Its SI unit is Weber (Wb). 1 Wb = 1 $T \cdot m^2$. Tesla is unit of magnetic flux density B; Henry is inductance; Farad is capacitance.

**Q35. Half-life of a radioactive element is 10 days. After 30 days, fraction remaining is:**

**Correct Answer: C. 1/8**

Number of half-lives = 30 ÷ 10 = 3. Fraction remaining = $(1/2)^3 = 1/8$. Each half-life reduces the amount by half.

**Q36. Which type of wave cannot be polarized?**

**Correct Answer: C. Sound waves**

Polarization is only possible for transverse waves. Sound waves are longitudinal (particles vibrate along direction of propagation), so they cannot be polarized.

**Q37. The energy stored in a capacitor is:**

**Correct Answer: B. QV/2**

Energy stored $E = \frac{1}{2}QV = \frac{1}{2}CV^2 = Q^2/2C$. The factor ½ arises because voltage builds up gradually from 0 to V during charging, making average voltage = V/2.

**Q38. Which phenomenon proves the transverse nature of light?**

**Correct Answer: C. Polarization**

Polarization restricts light vibration to one plane — possible only for transverse waves. This definitively proves light is a transverse electromagnetic wave.

**Q39. Absolute zero temperature is equal to:**

**Correct Answer: C. -273°C**

Absolute zero = 0 K = −273.15°C ≈ −273°C. At this temperature, all molecular motion theoretically ceases and entropy reaches its minimum value.

**Q40. The process of converting AC into pulsating DC is called:**

**Correct Answer: C. Rectification**

Rectification converts alternating current (AC) into pulsating direct current (DC) using diodes. Half-wave rectifier uses 1 diode; full-wave bridge rectifier uses 4 diodes.

## SECTION 2 — CHEMISTRY (Q.30 – Q.69)

**Q41. Most molecular crystals melt below:**

**Correct Answer: A. 200°C**

Molecular crystals are held together by weak van der Waals forces and dipole-dipole interactions. These weak forces result in low melting points, generally below 200°C.

**Q42. How much heavier is the H-atom as compared to electron?**

**Correct Answer: C. 1837**

Mass of proton ≈ $1.673 \times 10^{-27}$ kg; mass of electron ≈ $9.109 \times 10^{-31}$ kg. Ratio = 1836 ≈ 1837. A hydrogen atom is approximately 1837 times heavier than an electron.

**Q43. The value of equilibrium constant for the decomposition of ozone at 25°C:**

**Correct Answer: A. $10^{55}$**

The decomposition of ozone ($2O_3 \rightleftharpoons 3O_2$) has a very large equilibrium constant (~$10^{55}$ at 25°C), indicating the reaction strongly favors product formation.

**Q44. A reaction is first order with respect to A and third order with respect to B, the rate equation is:**

**Correct Answer: C. Rate = K[A][B]³**

Rate law = $K[A]^1[B]^3$. First order w.r.t. A and third order w.r.t. B gives Rate = $K[A][B]^3$. Overall order = 1 + 3 = 4.

**Q45. For a reaction A → Product, if concentration of A is doubled, product increases 4 times. The order of reaction will be:**

**Correct Answer: C. 2nd**

Rate = $K[A]^n$. If [A] doubles and rate quadruples: $4 = 2^n \rightarrow n = 2$. The reaction is second order.

**Q46. Select the spontaneous reaction from the following:**

**Correct Answer: B. Emission of α-particles from polonium**

Radioactive decay (emission of α-particles from polonium) is spontaneous — it occurs naturally without requiring external energy input.

**Q47. Select the exothermic reaction among the following:**

**Correct Answer: C. Burning of methane**

Burning of methane ($CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$) is highly exothermic ($\Delta H = -890$ kJ/mol). Sublimation and decomposition are endothermic.

**Q48. The oxidation number of Cl in $HClO_2$ is:**

**Correct Answer: B. +3**

In $HClO_2$: H = +1, O = −2. Equation: $+1 + Cl + 2(-2) = 0 \rightarrow Cl = +3$.

**Q49. Bond order is equal to:**

**Correct Answer: C. Half of the difference between number of bonding electrons and antibonding electrons**

Bond Order = (Bonding electrons − Antibonding electrons) / 2. This is the standard molecular orbital theory definition.

**Q50. Which of the following molecule has non-polar covalent bond?**

**Correct Answer: C. Carbon dioxide**

In $CO_2$, although each C=O bond is polar, the linear geometry means the dipoles cancel, making the overall molecule non-polar. $CCl_4$ is also non-polar but has polar bonds.

**Q51. Which of the following alcohols will give oily layer upon heating?**

**Correct Answer: B. 2-Methyl-2-butanol**

Lucas test: Tertiary alcohols react immediately with Lucas reagent ($ZnCl_2$/HCl) giving an oily layer. 2-Methyl-2-butanol is a tertiary alcohol.

**Q52. Formalin is a mixture of:**

**Correct Answer: A. 40% HCHO, 8% $CH_3OH$, 52% $H_2O$**

Formalin is an aqueous solution of formaldehyde: 40% HCHO (formaldehyde), 8% methanol ($CH_3OH$, added as stabilizer), and 52% water.

**Q53. Polymerization of HCHO and $CH_3CHO$ occurs in the presence of:**

**Correct Answer: A. Conc. $H_2SO_4$**

Aldol condensation and polymerization of aldehydes (HCHO, $CH_3CHO$) is catalyzed by concentrated $H_2SO_4$ (a strong acid catalyst).

**Q54. The boiling point of carboxylic acids are relatively high due to:**

**Correct Answer: D. Intermolecular hydrogen bonding**

Carboxylic acids form strong intermolecular hydrogen bonds (O–H···O=C) and even dimerize. This requires more energy to break, resulting in unusually high boiling points.

**Q55. Carboxylic acid reacts with metal carbonate. The colorless gas evolved is:**

**Correct Answer: C. $CO_2$**

$2RCOOH + Na_2CO_3 \rightarrow 2RCOONa + H_2O + CO_2\uparrow$. The colorless gas produced is carbon dioxide ($CO_2$), which turns lime water milky.

**Q56. Which of the following compound will react with 2,2-dimethyl propanoic acid to produce ester?**

**Correct Answer: C. Ethanol**

Esters are formed by reaction of a carboxylic acid with an alcohol. Ethanol ($C_2H_5OH$) reacts with 2,2-dimethylpropanoic acid to form an ester + water.

**Q57. The most abundant protein in animal kingdom forming 25–35% of body proteins is/are:**

**Correct Answer: B. Simple proteins**

Collagen is the most abundant protein in animals (~25–35% of total body protein). It is a simple (fibrous) protein found in connective tissue, skin, bones.

**Q58. Protein present in connective tissues of human body is:**

**Correct Answer: B. Collagen**

Collagen is the main structural protein in connective tissues (tendons, ligaments, skin, cartilage). It provides tensile strength.

**Q59. In human body Ferritin is used to store:**

**Correct Answer: C. Fe**

Ferritin is an intracellular protein that stores and releases iron (Fe) in a controlled manner. It acts as the primary iron storage protein in the body.

**Q60. In human body Ceruloplasmin acts as a carrier of:**

**Correct Answer: C. Cu**

Ceruloplasmin is a copper-carrying (ferroxidase) enzyme in blood plasma. It carries about 95% of the total copper in healthy human plasma.

**Q61. Predict the element with lowest ionization energy:**

**Correct Answer: A. Mg**

Among Mg, Ar, Si, P — Magnesium has the lowest ionization energy. Ar (noble gas) has very high IE. Si and P have higher IE than Mg due to greater nuclear charge effects.

**Q62. Select the group II element which has the highest atomic radius?**

**Correct Answer: C. Ba**

In Group II, atomic radius increases down the group. Ba (Barium) is at the bottom of Group IIA among given options and has the largest atomic radius.

**Q63. Which of the following element has least boiling point?**

**Correct Answer: D. Cs**

In Group IA alkali metals, boiling point decreases down the group as metallic bonding weakens with larger atomic size. Cs has the lowest boiling point (944 K) among the options.

**Q64. 2-pentanone and 3-pentanone are examples of:**

**Correct Answer: D. Position isomers**

2-pentanone ($CH_3COCH_2CH_2CH_3$) and 3-pentanone ($CH_3CH_2COCH_2CH_3$) have the same molecular formula but the carbonyl group is at different positions — position isomers.

**Q65. Which of the following will show optical isomerism?**

**Correct Answer: D. 2-Hydroxy propanoic acid**

2-Hydroxy propanoic acid (lactic acid, $CH_3CH(OH)COOH$) has a chiral carbon (C-2 bonded to OH, H, $CH_3$, COOH — four different groups), showing optical isomerism.

**Q66. Which of the following is an electrophile in sulphonation?**

**Correct Answer: B. $SO_3$**

In sulphonation of benzene, $SO_3$ acts as the electrophile. It is a strong electrophile due to the highly electrophilic sulfur atom (attacked by the π electrons of benzene).

**Q67. Acetylene reacts with hydrogen bromide to form:**

**Correct Answer: B. 1,1-Dibromoethane**

$HC{\equiv}CH + 2HBr \rightarrow CH_3CHBr_2$ (1,1-dibromoethane) by Markovnikov's rule. First addition gives vinyl bromide, second addition gives 1,1-dibromoethane.

**Q68. Generally the decreasing order of reactivity is:**

**Correct Answer: C. Alkene > Alkynes > Alkanes**

Reactivity towards electrophilic addition: Alkenes > Alkynes > Alkanes. Alkenes are most reactive due to the accessible π bond; alkanes are least reactive (only substitution).

**Q69. Racemic mixture formed in SN1 reaction is due to presence of empty:**

**Correct Answer: B. p-orbital**

SN1 forms a planar carbocation intermediate with an empty p-orbital. Nucleophile attack from both faces equally gives a racemic mixture (50:50 enantiomers).

**Q70. The order of reactivity of alcohol with respect to cleavage of C–O bond:**

**Correct Answer: A. Tertiary > Secondary > Primary**

Tertiary carbocations are most stable, so tertiary alcohols undergo C–O cleavage most readily. Order: Tertiary > Secondary > Primary.

**Q71. $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$. When 40g of NaOH reacts with 49g of $H_2SO_4$, the number of water molecules produced are:**

**Correct Answer: A. $6.02 \times 10^{23}$**

Moles NaOH = 40/40 = 1 mol. Moles $H_2SO_4$ = 49/98 = 0.5 mol. Reaction: $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$. 0.5 mol $H_2SO_4$ produces 1 mol $H_2O = 6.02 \times 10^{23}$ molecules.

**Q72. The number of electrons in a subshell can be calculated by the formula:**

**Correct Answer: D. 2(2l + 1)**

Number of electrons in a subshell = 2(2l + 1). For l=0 (s): 2(1)=2; l=1 (p): 2(3)=6; l=2 (d): 2(5)=10; l=3 (f): 2(7)=14. ✓

**Q73. When 5d orbital is complete, the entering electron goes into:**

**Correct Answer: B. 6p**

After 5d is filled (configuration: ...$5d^{10}$), following Aufbau principle the next electron enters the 6p subshell.

**Q74. Which of the following relationship is correct for kinetic energy of gases?**

**Correct Answer: B. K.E = 3RT/2NA**

Average kinetic energy per molecule = 3kT/2 = 3RT/(2NA). This is the fundamental kinetic theory result for a monatomic ideal gas.

**Q75. The fourth state of matter is:**

**Correct Answer: D. Plasma**

The four states of matter are solid, liquid, gas, and plasma. Plasma is the fourth state, consisting of ionized gas with free electrons and ions.

**Q76. Which factor does not affect the rate of evaporation?**

**Correct Answer: A. Amount of liquid**

Rate of evaporation depends on surface area, temperature, and intermolecular forces. The amount (volume) of liquid does not affect the rate — only the total evaporation time.

**Q77. Which of the following is responsible for the low boiling point of diethyl ether as compared to water?**

**Correct Answer: A. Weak intermolecular forces**

Diethyl ether lacks O–H groups for hydrogen bonding; it only has weak van der Waals forces. This results in lower boiling point compared to water (strong H-bonding).

**Q78. Hydrogen bonding does not exist in:**

**Correct Answer: D. $SiH_4$**

$SiH_4$ has no electronegative atom (N, O, F) bonded to H, so no hydrogen bonding exists. Si is not electronegative enough to create the required dipole.

**Q79. The factor that affects the lattice energy is:**

**Correct Answer: A. Charge to size ratio**

Lattice energy $\propto$ (charge $\times$ charge) / distance. The charge-to-size ratio (ionic potential) is the primary factor — higher charge and smaller size → greater lattice energy.

**Q80. The shape of the crystal lattice depends upon:**

**Correct Answer: C. Arrangement of particles**

The shape of a crystal lattice is determined by the arrangement (geometric pattern) of particles (atoms, ions, molecules) in the unit cell repeated in 3D space.

## SECTION 3 — ENGLISH (Q.70 – Q.84)

**Q81. Identify the sentence with correct punctuations:**

**Correct Answer: C. Ali received a Parker pen; Hamza: a watch.**

A semicolon separates two independent clauses, and a colon introduces what follows. 'Ali received a Parker pen; Hamza: a watch.' is correctly punctuated.

**Q82. Fill in the correct articles:**

**Correct Answer: B. The, a**

'The female lion' uses 'the' (referring to a specific/known category). 'A lioness' uses 'a' (introducing the term for the first time).

**Q83. 'Whatever you order for dinner' is fine with me. The underlined part is:**

**Correct Answer: A. Noun clause**

'Whatever you order for dinner' functions as the subject of the sentence — it acts as a noun, making it a noun clause.

**Q84. After midnight, the ghost will come out of the haunted attic to scare the people. The sentence is:**

**Correct Answer: A. Simple**

The sentence has one independent clause and no subordinate clauses (the infinitive phrase 'to scare' is not a clause). It is a simple sentence with modifying phrases.

**Q85. I suggest that you _____ visit a doctor.**

**Correct Answer: B. Should**

After 'suggest that,' the subjunctive mood is used. 'Should' is the most appropriate modal for advice/suggestion in this structure.

**Q86. Choose the correctly structured sentence.**

**Correct Answer: C. Had he been there, he would have seen us.**

Third conditional structure: If + past perfect, would + have + past participle. 'Had he been there, he would have seen us.' is grammatically correct.

**Q87. Identify the sentence with correct structure.**

**Correct Answer: D. We noticed the boy, who was walking down the street.**

'We noticed the boy, who was walking down the street.' correctly uses a relative clause. Option A creates a dangling modifier ambiguity.

**Q88. He circled _____ whole world on his ship and on _____ island he encountered _____ fierce giant.**

**Correct Answer: C. the, an, a**

'The whole world' (unique entity), 'an island' (any/unspecified island — starts with vowel sound, needs 'an'), 'a fierce giant' (first mention, consonant sound).

**Q89. Choose the sentence with correct order of adjectives.**

**Correct Answer: D. I met two young, beautiful British girls at the airport.**

Correct adjective order: Determiner → Number → Opinion → Size → Age → Shape → Color → Origin → Material. 'Two young, beautiful British girls' follows this order correctly.

**Q90. Identify the underlined part of the sentence:**

**Correct Answer: D. Noun clause**

'You have already read this book' is the object of 'know' — it functions as a noun (object), making it a noun clause.

**Q91. Choose the sentence with correct punctuations.**

**Correct Answer: C. "Go then," said the ant, "and dance winter away."**

Dialogue punctuation: comma after speech tag inside quotes, 'said' (not capitalized mid-sentence), lowercase continuation inside quotes. Option C is correct.

**Q92. Which of the following verbs takes the preposition 'from' with it?**

**Correct Answer: A. Abstain**

'Abstain from' is the correct collocation (e.g., 'abstain from voting'). 'Accused of,' 'desirous of,' and 'ignorant of' take 'of'.

**Q93. According to scientists, the sun is _____ and we can find the early discoveries made by scientists in black and white on _____. Choose correctly spelt homophones:**

**Correct Answer: B. Stationary, Stationery**

'Stationary' means not moving (the sun appears stationary). 'Stationery' refers to writing materials (paper/printed materials where discoveries are recorded).

**Q94. Choose the correct preposition.**

**Correct Answer: B. Of**

'One hour of glorious life' — 'of' is used to show possession/relationship between the hour and the life. This is from Byron's poem.

**Q95. Clive had been only a few months in the army when announced that peace had been concluded between great britain and france. The sentence contains errors of:**

**Correct Answer: D. Capitalization**

The errors are capitalization: 'great britain' should be 'Great Britain' and 'france' should be 'France' (proper nouns must be capitalized).

## SECTION 4 — BIOLOGY (Q.86 – Q.150)

**Q96. Induced fit model of enzyme activity suggests that an enzyme:**

**Correct Answer: C. Can catalyze related specific reaction**

The Induced Fit Model (Koshland, 1958) proposes that the enzyme's active site changes shape upon substrate binding. This allows the enzyme to catalyze related (structurally similar) substrates.

**Q97. Select the one which is used by hexokinase as an activator:**

**Correct Answer: C. $Mg^{++}$**

Hexokinase requires $Mg^{2+}$ (magnesium ions) as a cofactor/activator. $Mg^{2+}$ is essential for the enzyme's catalytic activity in phosphorylation of glucose.

**Q98. The linkage between substrate molecule and active site is:**

**Correct Answer: C. Hydrogen bonding**

The substrate binds to the enzyme's active site primarily through non-covalent interactions: hydrogen bonds, ionic interactions, hydrophobic interactions, and van der Waals forces — with hydrogen bonding being predominant.

**Q99. Activated pepsin in which polypeptide fragment is removed is an example of:**

**Correct Answer: D. Non-regulatory enzyme**

Pepsin is activated from pepsinogen by removal of a polypeptide fragment. Once activated, it performs its function without allosteric regulation — making it a non-regulatory enzyme.

**Q100. Reversible inhibitors affect the enzyme catalyzed reaction by:**

**Correct Answer: C. Forming weak linkages with enzymes**

Reversible inhibitors bind to enzymes through weak, non-covalent interactions (hydrogen bonds, van der Waals, ionic bonds). This allows them to dissociate, restoring enzyme activity.

**Q101. What is the required medium for the maximum activity of the given enzymes?**

**Correct Answer: C. Basic / Acidic**

Lipase (from pancreas) works optimally in basic/neutral medium (pH 7–8 in the small intestine). Pepsin works optimally in strongly acidic medium (pH 1.5–2 in the stomach). Therefore: Lipase = Basic, Pepsin = Acidic → Option C.

**Q102. What distinguishes the concept of special creation from concept of evolution?**

**Correct Answer: C. Rely on inspiration and meditation for life origin**

Special creation relies on supernatural/divine inspiration and belief — not natural processes. Evolution relies on natural mechanisms like mutation, selection, and innumerable changes over time.

**Q103. Which of the following idea is a part of Lamarckism?**

**Correct Answer: A. Use and disuse of organs**

Lamarck's theory of evolution includes: (1) Use and disuse of organs, (2) Inheritance of acquired characters. 'Survival of the fittest' is Darwin's concept.

**Q104. Choose the correct pair for homology?**

**Correct Answer: B. Forelimbs of birds and fins of whales**

Homologous structures have the same embryonic origin but different functions. Forelimbs of birds and fins of whales both derive from the same ancestral limb structure — classic homology.

**Q105. Which chronological sequence is correct among the classes of vertebrates as evidence of evolution?**

**Correct Answer: C. Fish → amphibians → reptiles → birds**

Vertebrate evolutionary sequence: Fish (first) → Amphibians → Reptiles → Birds/Mammals. This follows the fossil record and evolutionary tree.

**Q106. The reduction of population carrying a specific allele and genotype due to natural disaster is called:**

**Correct Answer: B. Bottle neck effect**

Bottleneck effect: a dramatic reduction in population size due to a catastrophic event (natural disaster), randomly reducing genetic diversity. Founder effect occurs when a few individuals start a new population.

**Q107. Which of the following increases variation within a gene pool?**

**Correct Answer: C. Gene mutation**

Gene mutation introduces new alleles into the gene pool, directly increasing genetic variation. Genetic drift and natural selection typically reduce variation.

**Q108. Identify the location of mitral valve in human heart:**

**Correct Answer: D. Between left atrium and left ventricle**

The mitral (bicuspid) valve is located between the left atrium and left ventricle. It prevents backflow of blood when the left ventricle contracts.

**Q109. Which of the following components are present both in blood and lymph?**

**Correct Answer: D. $CO_2$, glucose and water**

Both blood and lymph contain $CO_2$, glucose, and water. RBCs are absent in lymph. Large proteins and RBCs are not found in lymph.

**Q110. Blood flow in vessels least depends on:**

**Correct Answer: C. Skeletal muscle contraction**

Blood flow primarily depends on blood pressure, vessel resistance (cross-section), and heart beat. Skeletal muscle contraction assists venous return but is not a primary factor in arterial flow.

**Q111. Which T-lymphocytes do not directly attack invading microbes?**

**Correct Answer: C. B-lymphocytes**

B-lymphocytes are not T-lymphocytes. Among T-cells, Helper T-cells (CD4+) do not directly attack microbes — they coordinate immune response. However the question asks which T-lymphocytes don't attack: B-lymphocytes (not T-cells) don't directly attack.

**Q112. A woman cuts her finger while working in kitchen. Which chemical substance will cause inflammation around wound?**

**Correct Answer: B. Histamine**

Histamine is released by mast cells and basophils upon tissue injury, causing vasodilation and increased vascular permeability — the hallmark signs of inflammation (redness, swelling, heat).

**Q113. Choose the mismatched:**

**Correct Answer: D. Chylomicrons – cholesterol + carbohydrates**

Chylomicrons transport triglycerides (fats) and cholesterol, NOT carbohydrates. Carbohydrates are transported separately as glucose in blood. This pairing is incorrect.

**Q114. Which protein is present in the walls of alveoli?**

**Correct Answer: A. Collagen**

Collagen and elastin are present in alveolar walls, providing structural support and elasticity. Hemoglobin is in RBCs; myoglobin is in muscle; myosin is a motor protein.

**Q115. Which of the following acts as an enzyme activator in human digestive system?**

**Correct Answer: B. Enterokinase**

Enterokinase (enteropeptidase) activates trypsinogen → trypsin, which then activates other proenzymes. It is the key enzyme activator in the digestive system.

**Q116. How would you classify a bacterium having a group of 2 or more flagella at one pole?**

**Correct Answer: A. Lophotrichous**

Lophotrichous: tuft of flagella at one pole. Amphitrichous: flagella at both poles. Monotrichous: single flagellum. Peritrichous: flagella all over the surface.

**Q117. Which of the following bacteria is used for developing vaccine against tuberculosis?**

**Correct Answer: D. Mycobacterium bovis**

BCG (Bacillus Calmette-Guérin) vaccine uses attenuated Mycobacterium bovis (bovine TB bacteria) to provide immunity against tuberculosis.

**Q118. If a bacteria can grow in the presence or absence of oxygen it would be a(n):**

**Correct Answer: C. Facultative anaerobe**

Facultative anaerobes can grow with or without oxygen. They prefer oxygen (aerobic respiration) but can switch to anaerobic respiration or fermentation when oxygen is absent.

**Q119. Which testicular cells in a human male with high testosterone level will start the endocrine activity?**

**Correct Answer: D. Leydig cells**

Leydig cells (interstitial cells of Leydig) in the testes produce testosterone. High LH stimulates Leydig cells to produce testosterone — they are the primary endocrine cells of the testis.

**Q120. Which layer of uterus is composed of contractile muscles?**

**Correct Answer: C. Myometrium**

Myometrium is the middle muscular layer of the uterus, composed of smooth muscle. It contracts during labor (parturition) to expel the baby.

**Q121. One of the endocrine glands responsible for failure in ovulation is:**

**Correct Answer: A. Pituitary**

The pituitary gland releases FSH and LH, which are essential for ovulation. Dysfunction of the pituitary (hypopituitarism) is a primary cause of anovulation.

**Q122. Identify the exact function of ATP hydrolysis during muscle contraction:**

**Correct Answer: B. Breaking of cross bridges**

ATP hydrolysis (by myosin ATPase) causes the detachment (breaking) of cross bridges between myosin and actin, allowing the cycle to continue. ATP binding releases the cross bridge.

**Q123. The reason behind the slow healing of cartilage is:**

**Correct Answer: C. Absence of blood supply**

Cartilage is avascular (no blood vessels). Nutrients reach chondrocytes by diffusion only. The absence of blood supply means slow delivery of cells/nutrients for repair.

**Q124. H zone of sarcomere consists of:**

**Correct Answer: D. Only myosin filament**

The H zone (Hensen zone) is the central region of the A band containing only thick myosin filaments (not overlapped by actin). It shortens during contraction.

**Q125. Which cell is most important to cause bone resorption?**

**Correct Answer: B. Osteoclast**

Osteoclasts are large multinucleated cells responsible for bone resorption. They secrete acids and proteolytic enzymes to break down bone matrix.

**Q126. Activity of which organ would be compromised with impaired function of smooth muscles?**

**Correct Answer: C. Stomach**

The stomach wall contains smooth muscle for peristalsis (churning food). Heart has cardiac muscle; tongue has skeletal muscle; lungs use diaphragm (skeletal muscle).

**Q127. The phenomena of gene linkage rejects the concept of:**

**Correct Answer: D. Law of independent assortment**

Mendel's Law of Independent Assortment states genes on different chromosomes segregate independently. Gene linkage (genes on same chromosome) violates this law.

**Q128. Which of the following is used to determine linkage between two gene pairs?**

**Correct Answer: A. Test cross**

A test cross (crossing with homozygous recessive) reveals the phenotypic ratios that deviate from 1:1:1:1 when genes are linked, thus determining linkage.

**Q129. The process by which unwanted structures are engulfed and digested within the lysosome is termed as:**

**Correct Answer: A. Autophagy**

Autophagy ('self-eating') is the process by which cells degrade and recycle their own damaged organelles and proteins using lysosomes.

**Q130. Fluidity of biological membranes is maintained by:**

**Correct Answer: D. Phospholipids**

Phospholipids form the bilayer of cell membranes. Their unsaturated fatty acid tails maintain membrane fluidity by preventing tight packing of lipid molecules.

**Q131. Which of the following independently reproduces in the cell?**

**Correct Answer: C. Chloroplast**

Chloroplasts (and mitochondria) contain their own DNA and ribosomes and can independently reproduce by binary fission — evidence of endosymbiotic origin.

**Q132. Which statement best describes difference of prokaryotic cell from eukaryotic cell?**

**Correct Answer: B. Prokaryote: Ribosomal subunits are 50S & 30S / Eukaryote: Ribosomal subunits are 60S & 40S**

Prokaryotes have 70S ribosomes (50S + 30S subunits); Eukaryotes have 80S ribosomes (60S + 40S subunits). This is a key distinguishing feature.

**Q133. Skeletal muscle cells are having:**

**Correct Answer: B. More SER & less RER**

Skeletal muscle cells have abundant Smooth ER (sarcoplasmic reticulum) for $Ca^{2+}$ storage — essential for muscle contraction. They have less RER as they don't actively secrete proteins.

**Q134. Which one is the correct direction of action potential along the neuron?**

**Correct Answer: A. Axon → post synaptic terminal**

Action potential travels: Dendrites → Cell body → Axon → Axon terminals (pre-synaptic terminal). Option A correctly states Axon → post synaptic terminal direction.

**Q135. Concentration of $Na^+$ and $K^+$ ions during resting membrane potential is:**

**Correct Answer: B. $K^+$ 10 times / $Na^+$ 30 times**

At resting potential: $K^+$ is ~30× more concentrated INSIDE the neuron; $Na^+$ is ~10× more concentrated OUTSIDE. The $Na^+/K^+$ pump maintains this gradient.

**Q136. A brief phase in which neuron regains its original ionic distribution and polarity is called:**

**Correct Answer: D. Refractory period**

The refractory period is when the neuron restores its resting membrane potential after an action potential. During this time, no new action potential can be initiated.

**Q137. Parts of brain that comprise the limbic system:**

**Correct Answer: B. Hypothalamus, amygdala, hippocampus**

The limbic system includes: hypothalamus, amygdala, hippocampus, cingulate gyrus, and olfactory bulbs. It regulates emotions, memory, and behavior.

**Q138. Ions involved in synaptic transmission of nerve impulse:**

**Correct Answer: C. $Na^+$, $Ca^{2+}$**

$Na^+$ influx generates the action potential; $Ca^{2+}$ influx at the pre-synaptic terminal triggers neurotransmitter vesicle fusion and release. Both are essential for synaptic transmission.

**Q139. Correct sequence of the four elements of a neural pathway in simple-reflex circuit:**

**Correct Answer: A. Sensory neuron → associative neuron → motor neuron → muscles**

Simple reflex arc: Receptor → Sensory neuron → Interneuron (associative) → Motor neuron → Effector (muscles). Option A correctly shows this sequence.

**Q140. In humans memory storage for behavior and coordination is well developed in the:**

**Correct Answer: D. Cerebellum**

The cerebellum is responsible for coordination, balance, and procedural memory (learned motor skills). The cerebrum handles conscious memory; amygdala handles emotional memory.

**Q141. Choose the correct pairing:**

**Correct Answer: A. Proteins / Insulin / Pancreas**

Insulin is a protein hormone produced by beta cells of the pancreas. This pairing is correct. Cortisone is a steroid from adrenal cortex (not thymus); Estrogen is a steroid (not catecholamine); Thyroxine is from thyroid (not parathyroid).

**Q142. Which phyla exhibit first true coelom?**

**Correct Answer: B. Annelida**

Annelida (earthworms, leeches) were classically considered the first phylum with a true coelom (schizocoel). Cnidaria and Platyhelminthes are acoelomate.

**Q143. Which invertebrate has exceptionally large and complex brain with highly developed capabilities to learn and remember?**

**Correct Answer: C. Octopus**

Octopus has the most complex brain among invertebrates, with exceptional learning and memory capabilities. It can solve puzzles, use tools, and recognize individual humans.

**Q144. Arthropods constitute 54% of kingdom Animalia. What is the reason for their success?**

**Correct Answer: A. Diversity and articulation of exoskeleton**

The diverse and articulated exoskeleton is the primary reason for Arthropod success — it provides protection, muscle attachment, prevention of desiccation, and adaptability to various environments.

**Q145. Which of the following virus is having double stranded RNA in its core?**

**Correct Answer: C. Diarrhea virus**

Rotavirus (diarrhea virus) has double-stranded RNA (dsRNA) genome. Smallpox is dsDNA; Rubella is ssRNA; Smallpox virus is also dsDNA.

**Q146. Pore size of porcelain filter ranges between:**

**Correct Answer: B. 100 – 1000 nm**

Porcelain (Chamberland) filters have pore sizes of approximately 100–1000 nm (0.1–1 µm), capable of filtering out bacteria but not viruses.

**Q147. Reverse transcriptase converts:**

**Correct Answer: C. ss RNA to ds DNA**

Reverse transcriptase (found in retroviruses like HIV) synthesizes DNA from an RNA template — converting single-stranded RNA (ssRNA) into double-stranded DNA (dsDNA) via an intermediate.

**Q148. Which symptoms disappear after few months in an asymptomatic carrier of HIV?**

**Correct Answer: B. Swollen lymph gland**

In early HIV infection, initial flu-like symptoms appear then disappear. Swollen lymph glands are characteristic early symptoms that subside as the patient enters the clinically latent (asymptomatic) stage lasting years.

**Q149. The primary purpose of photosystem-II in thylakoid membrane is:**

**Correct Answer: B. Oxidation of water**

Photosystem II (PS-II) performs photolysis — splitting of water molecules: $2H_2O \rightarrow 4H^+ + 4e^- + O_2$. This oxidation of water is the primary function of PS-II and the source of all atmospheric oxygen.

**Q150. In glycolysis glucose is:**

**Correct Answer: A. Oxidized into pyruvic acid**

In glycolysis, glucose ($C_6H_{12}O_6$) is oxidized through 10 enzyme-catalyzed steps to produce 2 pyruvic acid molecules ($C_3H_4O_3$), 2 ATP (net), and 2 NADH. It is an oxidation process, not reduction.