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# NUMS 2023

## ORIGINAL COMPLETE QUESTION PAPER

| 150 | 150m | No | 4 |
|---|---|---|---|
| Questions | Time Limit | Neg. Marking | Subjects |

| PHYSICS (40 Qs) | BIOLOGY (55 Qs) | ENGLISH (15 Qs) | CHEMISTRY (40 Qs) |
|---|---|---|---|

### EXAM INSTRUCTIONS

| | |
|---|---|
| **Exam** | NUMS 2023 — National University of Medical Sciences |
| **Total Questions** | 150 MCQs |
| **Subjects** | Physics (40) • Biology (55) • English (15) • Chemistry (40) |
| **Time Allowed** | 150 minutes — 1 minute per question |
| **Marking** | Correct = +1 mark. No negative marking. |
| **Answer Key** | Full answers + detailed explanations at end of document |
| **Source** | mdcatguide.com/nums-past-papers-html/ |

## NUMS 2023 PREPARATION STRATEGY — MDCATGUIDE.COM

| | |
|---|---|
| **Biology (55 Qs — 37%)** | Highest weightage. Focus on Cell Biology, Genetics, Human Physiology, Ecology & Evolution. Revise FSc Part I & II thoroughly. |
| **Physics (40 Qs — 27%)** | Cover all FSc topics: Mechanics, Waves, Electromagnetism, Modern & Nuclear Physics. Practice numerical MCQs daily. |
| **Chemistry (40 Qs — 27%)** | Organic Chemistry carries most marks. Master reaction mechanisms, functional groups, isomerism and industrial chemistry. |
| **English (15 Qs — 10%)** | Grammar, Articles, Prepositions, Sentence Correction, Clauses & Vocabulary. 15 minutes of daily grammar practice is sufficient. |
| **Attempt Order** | English first (fastest) → Biology → Chemistry → Physics. Mark difficult Qs and return. No negative marking — never leave blank. |
| **Mock Tests** | Minimum 3 full past papers per week under timed conditions. Review every wrong answer the same day. |
| **Final 2 Weeks** | Revision only — no new topics. Full mock test daily. Sleep 7–8 hours. Confidence matters as much as preparation. |
| **Free Resources** | Download all NUMS past papers year-wise & subject-wise FREE at: mdcatguide.com/nums-past-papers-html/ \| Practice: mdcatguide.com/practice |

**PRO TIP — Biology is the deciding subject in NUMS. Most candidates are equal in Physics & Chemistry. The student who scores 45+ in Biology gets the seat. Prioritize it.**

## SECTION 1 — PHYSICS (Q.1–Q.40)

**Q1** **In isochoric process:**

A Pressure is kept constant
B Exchange of heat is zero
C Volume is kept constant
D Temperature is kept constant

**Q2** **If 42 J heat is transferred to the system during expansion, what is the change in internal energy when work done is 32 J?**

A 74 J
B 10 J
C 116 J
D 106 J

**Q3** **The 1st law of thermodynamics is the generalization of the law of conservation of:**

A Mass
B Charge
C Energy
D Momentum

**Q4** **While studying charging and discharging of a capacitor, Rc = Resistance × Capacitance is known as:**

A Electrostatic constant
B Time constant
C Dielectric constant
D Proportionality constant

**Q5** **In parallel combination of two capacitors, their equivalent capacitance is equal to:**

A C1 + C2
B 1/C1 + 1/C2
C C1C2 / C1 + C2
D 2C1C2 / C1 + C2

**Q6** **The S.I unit of capacitance of a capacitor is:**

A Coulomb
B Volt
C Farad
D Ampere

**Q7** **1 kWh =**

A $0.36 \times 10^6$ J
B $36 \times 10^5$ J
C $3.6 \times 10^6$ J
D $0.036 \times 10^5$ J

**Q8** **Volt × Ampere is the unit of:**

A Current
B Volt
C Resistance
D Power

**Q9** **If length of the wire becomes two times to its original value and area becomes one half to its original value, then resistance of the wire becomes:**

A Double
B Four times
C One half
D One forth

**Q10** **When a charged particle enters the magnetic field parallel, it will:**

A Deflect toward north
B Deflect toward south
C Move straight
D Move in circular path

**Q11** **The dimension of magnetic field strength is same as that of:**

A Magnetic flux
B Magnetic induction
C Work done
D Magnetic force

**Q12** **The weber is unit of measure of:**

A Conductance
B Electric current
C Magnetic flux
D Electric flux

**Q13** **The Lenz's law is also statement of law of conservation of:**

A Charge
B Mass
C Energy
D Pressure

**Q14** **In Fleming's right hand rule, the second finger indicates:**

A Force
B Magnetic field
C Induced current
D Motion

**Q15** **A current generator is a device that converts:**

A Mechanical energy into electrical energ
B Chemical energy into mechanical energy
C Sound energy into mechanical energy
D Electrical energy into mechanical energy

**Q16** **A device that converts AC into DC is called:**

A Diode
B Transistor
C Capacitor
D Inductor

**Q17** **The conversion of alternating current into direct current is called:**

A Amplification
B Rectification
C Magnification
D Resolution

**Q18** **In full wave rectification, _____ diodes are used.**

A 1
B 2
C 3
D 4

**Q19** **The time taken for half the number of atoms of radioactive isotopes to disintegrate is called:**

A Average life
B Mean life
C Total life
D Half life

**Q20** **A 32g radioactive element decays and remains 2g after 60 days. What is half-life of this radioactive element?**

A 2 days
B 6 days
C 10 days
D 15 days

**Q21** **If the car is slowing down along negative x axis then acceleration will be along:**

A Positive x Axis
B Negative x Axis
C Positive y Axis
D Negative y Axis

**Q22** **The instantaneous velocity along the curved path is:**

A Along the tangent
B Perpendicular to the slope
C Parallel to the radius
D Anti-parallel to the radius

**Q23** **In perfectly elastic collision:**

A Only momentum is conserved

B Only total energy is conserved

C Only kinetic energy is conserved

D Momentum, kinetic energy and total energy, all are conserved

**Q24** **The slope of a displacement-time graph is equal to:**

A Velocity

B Displacement

C Acceleration

D Distance

**Q25** **Range of a projectile on a horizontal plane is same for the following pair of angle:**

A 15 & 30

B 60 & 20

C 75 & 15

D 50 & 25

**Q26** **The product of force and time is equal to:**

A Angular momentum

B Force

C Change in momentum

D Velocity

**Q27** **At what point during the motion of projectile its vertical component of velocity is zero?**

A Point of projection

B Landing point

C Highest point

D Just before landing

**Q28** **A projectile has 1 J of PE. What is the work done in terms of height?**

A 1 J

B 10 J

C 0 J

D 0.1 J

**Q29** **Power is dot product of:**

A Force and displacement

B Force and velocity

C Force and time

D Work and time

**Q30** **The area under force-displacement graph gives:**

A Displacement

B Power

C Work

D Acceleration

**Q31** **A body of mass 'm' is moving with velocity 'v'. After a short interval of time its velocity becomes double. How many times its K.E will increase or decrease?**

A 2 time increased
B 2 time decreased
C 4 time increased
D 4 time decreased

**Q32** **The relation between radian and degree is:**

A 1 rad = 57.3°
B 1° = 57.3 rad
C 1 rad = 1°
D 1° = π rad

**Q33** **In case of centripetal force the value of instantaneous acceleration is given by:**

A $ac = v/r$
B $ac = v^2/r$
C $ac = vr$
D $ac = v^2r$

**Q34** **An electric motor turns at 400 revolutions per minute. Its angular velocity in rad/s will be:**

A $20\pi/3$
B $30\pi/3$
C $40\pi/3$
D $30\pi/4$

**Q35** **A disc, a hoop and a sphere are rolling down from an inclined plane simultaneously. Which object will reach at the bottom first?**

A Hoop
B Disc
C Sphere
D All at the same time

**Q36** **The centripetal force formula is:**

A $Fc = m\omega^2$
B $Fc = mr\omega$
C $Fc = mr\omega^2$
D $Fc = mr^2\omega$

**Q37** **In the following figure the wavelength is: [wave diagram showing 2m]**

A 2m
B 1.5m
C 1m
D 0.5m

**Q38** **With increase in pressure, the speed of sound will:**

A Increase
B Decrease
C First increase then decrease
D Remain the same

**Q39** **In transverse waves, the portion above the mean level is called:**

A Wave front

B Wave crest

C Wave trough

D Wave length

**Q40** **The maximum displacement of particles of a medium, on either side of the mean position of a wave, is called:**

A Wavelength

B Frequency

C Amplitude

D Crest

## SECTION 2 — BIOLOGY (Q.41–Q.95)

**Q41** **$Na^+$ (sodium ions) are nearly _____ times greater in fluid outside the cell than inside:**

A 10
B 30
C 2
D 3

**Q42** **Which hormone induces labour pains?**

A Estrogen
B Oxytocin
C Progesterone
D LH

**Q43** **Hormone secreted in bulk due to decreased water content of blood is:**

A Anti-Diuretic Hormone (ADH)
B Oxytocin
C Glucagon
D Thyroxin

**Q44** **The site of production of neurotransmitters is:**

A Postsynaptic neuron
B Presynaptic neuron
C Synaptic cleft
D Dendrite

**Q45** **Endorphins are produced in:**

A Brain
B Adrenal gland
C Stomach
D Thymus

**Q46** **The hormone responsible for production of sperm cells and male secondary sexual characteristics is:**

A Estrogen
B Progesterone
C Testosterone
D Thyroxin

**Q47** **Leydig cells are responsible for:**

A Testosterone production
B FSH production
C Sperm production
D Testosterone inhibition

**Q48** **The estrogen hormone secretion during the oogenesis is stimulated by:**

A Leutinizing Hormone
B Inhibin Hormone
C Follicle Stimulating Hormone
D Testosterone Hormone

**Q49** **Which of the following hormones of the pituitary gland regulate the menstrual cycle?**

A Follicle Stimulating Hormone and estrogen

B Luteinizing hormone and estrogen

C Follicle Stimulating Hormone and Luteinizing hormone

D Estrogen and progesterone

**Q50** **Which of the following traits is transmitted directly from an affected father to only his son?**

A Autosomal

B X-linked

C Y-linked

D X-Y linked

**Q51** **When both the alleles of a gene pair are same, the organism is said to be:**

A Heterozygous

B Genotype

C Homozygous

D Phenotype

**Q52** **This theory says that 'mitochondria and chloroplasts are, in effect, ancient bacteria which now live inside the larger cells'?**

A Darwin's theory of evolution

B Lamarckism

C Neo-darwinism

D Endosymbiotic theory

**Q53** **The organs which are similar in function but differ in structure are called:**

A Analogous organs

B Homologous organs

C Convergent organs

D Divergent organs

**Q54** **Which may NOT be a mode of action of an antibody?**

A Neutralizing an antigen

B Precipitating an antigen

C Secretion of cytokines

D Enhancing phagocytosis

**Q55** **Pepsinogen is converted into its active form pepsin by:**

A Proteolytic enzyme action

B Dissolving in mucus

C Hormonal action

D Hydrochloric acid

**Q56** **Intrinsic factor is secreted by:**

A Pancreas
B Liver
C Stomach
D Duodenum

**Q57** **The cells which play very important role in developing immunity are:**

A Monocytes
B Neutrophils
C Lymphocytes
D Thrombocytes

**Q58** **Digestion of which food component starts from oral cavity?**

A Proteins
B Fats
C Carbohydrates
D Vitamins

**Q59** **Vaccination is an example of:**

A Natural passive immunity
B Natural active immunity
C Acquired/Artificial active immunity
D Acquired/Artificial passive immunity

**Q60** **The heart chamber from where aorta originates:**

A Left ventricle
B Right ventricle
C Left atrium
D Right atrium

**Q61** **Pubic symphysis and inter vertebral disc are the example of:**

A Fibrous joints
B Synovial joints
C Cartilaginous joints
D Gliding joints

**Q62** **Cartilage is more difficult to heal than bone because cartilage:**

A Lacks vascular supply
B Lacks mineral deposits in matrix
C Has less number of cells deep down
D Lacks protein in matrix

**Q63** **Which feature is absent from cardiac muscles?**

A Intercalated disc
B Multinucleate cells
C Light and dark bands
D Contractile sarcomeres

**Q64** **Sarcoplasmic reticulum of muscle fibers is mainly responsible for:**

A Calcium storage
B Protein synthesis
C Lipid metabolism
D Storing cell wastes

**Q65** **The junction between two neurons is:**

A Impulse
B Synapse
C Axon
D Cleft

**Q66** **Which hormone is chemically a steroid?**

A ADH
B Thyroxin
C Cortisone
D Insulin

**Q67** **Under activity of parathyroid glands causes a drop in blood of:**

A $Mg^{2+}$
B $Na^{+}$
C $K^{+}$
D $Ca^{2+}$

**Q68** **Which of the following protein establishes the matrix of bone and cartilage?**

A Elastin
B Keratin
C Collagen
D Histone

**Q69** **Non-competitive inhibitors react with enzymes at:**

A Allosteric site
B Active site
C Passive site
D Regulatory site

**Q70** **Most enzymes work the best at the following temperature:**

A 30°C
B 40°C
C 50°C
D 20°C

**Q71** **In term of enzyme action, 'maximum temperature' refers to a temperature at which:**

A Enzymes start to denature
B Enzymes start to re-nature
C Enzymes work best
D Enzymes are reactivated

**Q72** _____ reduce the enzymes productivity by blocking the substrate from entering into the active site due to similar shapes:

A Competitive inhibitors
B Non-competitive inhibitors
C Co-enzymes
D Activators

**Q73** When light falls on P-700, which event is likely to occur?

A It induces photolysis
B Gains Hydrogen
C Accept electrons
D It is oxidised

**Q74** Which of the following molecules are released after completion of light reaction and then utilized in the dark reaction of photosynthesis?

A ATP and $NADP^+$
B ADP and $NADP^+$
C ADP and NADPM
D ATP and NADPH

**Q75** Which are the end products of light reactions of photosynthesis?

A ATP and NADPH
B ATP and glucose
C Glucose and NADP
D ATP and water

**Q76** Synthesis of ATP during photosynthesis takes place at the region:

A Stroma
B Thylakoid
C Matrix
D Cisternae

**Q77** The complete, mature and infectious virus particle is known as:

A Venome
B Genome
C Virion
D Capsid

**Q78** All viruses are:

A Autotrophs
B Heterotrophs
C Parasites
D Predators

**Q79** _____ increases the pathogenecity of bacteria:

A Capsule
B Cell wall
C Slime
D Cell membrane

**Q80** **The smallest known bacteria belong to the genus:**

A Mycoplasma

B Streptococcus

C Escherichia

D Bacillus

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## SECTION 2 — BIOLOGY (continued Q.81–Q.95)

**Q81** **Mesenteric veins drain the blood from:**

A Liver
B Large intestine
C Stomach
D Gall bladder

**Q82** **Secondary cell wall in plants is present:**

A Outer to primary cell wall
B In between two primary cell walls
C Between the primary cell wall and plasma membrane
D Inner to plasma membrane

**Q83** **What distinguishes Prokaryotic cell wall from Fungal cell wall?**

A Prokaryotic cell wall contains cellulose
B Prokaryotic cell wall contains peptidoglycan
C Prokaryotic cell wall contains cutin
D Prokaryotic cell wall contains silica

**Q84** **Pollination is facilitated by:**

A Chloroplast
B Chromoplast
C Leucoplast
D Amyloplast

**Q85** **Tonoplast is the membrane separating:**

A Vacuole and Nucleoplasm
B Cytoplasm and Nucleoplasm
C Vacuole and Stroma
D Vacuole and Cytoplasm

**Q86** **Each centriole is composed of _____ of Microtubules:**

A Seven Triplets
B Eleven Triplets
C Nine Triplets
D Five Triplets

**Q87** **The folds of Inner Membrane of mitochondria are called:**

A Cisternae
B Cristae
C Mesosome
D Infolds

**Q88** **According to the fluid mosaic model of cell membrane, which zone is embedded inside?**

A Hydrophobic
B Hydrophilic
C Globular
D Filamentous

**Q89** **Select the one which is NOT a function of Smooth Endoplasmic Reticulum (SER)?**

A Metabolism of lipids
B Transmission of impulses
C Transport of materials
D Processing of glycoproteins

**Q90** **Cell membrane also contains _____ place by active and passive transport:**

A Lipids
B Corner Proteins
C Charged pores
D Carbohydrates

**Q91** **_____ are spherical sacs, surrounded by a single membrane and contain hydrolytic enzymes:**

A Mitochondria
B Golgi Bodies
C Lysosomes
D Chloroplast

**Q92** **Most abundant organic compound in mammalian cells are:**

A Water
B Lipids
C Carbohydrates
D Proteins

**Q93** **Thermal stability of organisms in the environment is because of which characteristic of water?**

A Solvent property
B Heat capacity
C Ionization
D Protection

**Q94** **C-H bonds in lipids are important:**

A As insulating material
B Providing more energy
C As exoskeleton
D As cuticle of leaves

**Q95** **These carbohydrates are sweetest among all carbohydrates:**

A Monosaccharides
B Disaccharides
C Oligosaccharides
D Polysaccharides

## SECTION 3 — ENGLISH (Q.96–Q.110)

**Q96** **I _____ English for five years.**

A Study
B Am Studying
C Have been studying
D studies

**Q97** **The soup _____ good**

A Taste
B Tastes
C Is tasting
D Has taste

**Q98** **Unless we _____ now, we cannot be on time**

A Start
B Will start
C Do not start
D Are starting

**Q99** **Daud is better than _____ of the college.**

A All teachers
B Any teachers
C All other teachers
D Any teacher

**Q100** **Abide _____ the traffic laws for smooth and safe flow of traffic.**

A On
B With
C By
D To

**Q101** **He prefers death _____ dishonor.**

A Over
B On
C Upon
D To

**Q102** **What does the word 'SURPLUS' mean?**

A In excess
B A mathematical term
C Within reach
D Salutation

**Q103** **What does the word 'SPILL' mean?**

A Coil
B Deliver
C Spoil
D Spread

**Q104** **What does the word 'CURIOUS' mean?**

A Keen
B Careful
C Quest
D Cruel

**Q105** **Pick the sentence with correct punctuation:**

A He had one motto "serving humanity."
B He, had one motto, serving humanity.
C He had one motto; serving humanity.
D He had one motto: serving humanity.

**Q106** **Pick the word with correct spelling:**

A Collique
B Colleague
C Collegue
D Co-leageu

**Q107** **Pick the word with correct spelling:**

A Acquaintance
B Equatance
C Equantence
D Equentense

**Q108** **Pick the word with correct spelling:**

A Prayority
B Priarity
C Prioarily
D Priority

**Q109** **Pick the sentence with correct punctuation:**

A "He did his best that was all anyone could do in any job".
B He did his best, that was all anyone could do in any job.
C "He did his best: that was all anyone could do in any job".
D "He did his best; that was all anyone could do in any job".

**Q110** **Pick the correct option:**

A How has the chair leg broken?
B How has the leg of the chair broken?
C How the leg of the chair has broken?
D How the chair's leg is broken?

## SECTION 4 — CHEMISTRY (Q.111–Q.150)

**Q111** **Vapor pressure is independent of which factor?**

A Temperature
B Intermolecular forces
C Density of liquid
D Surface area of liquid

**Q112** **The boiling point of ether is less as compared to alcohols and phenols due to:**

A Functional group
B Intermolecular forces
C Nature of alkyl groups
D Isomerism

**Q113** **When 2 ice cubes are pressed over each other they unite to form one cube due to:**

A Dipole dipole attraction
B Covalent attraction
C Van Der Waal's forces
D H-bonding

**Q114** **Which statement correctly describes the structure of sodium chloride crystal?**

A Each sodium ion is surrounded by six chloride ions and each chloride ions surrounded by six sodium ions
B The crystal is face centered cubic structure
C Each sodium ion is surrounded by 3 chloride ions and each chloride ion surrounded by 3 sodium ions
D Inter molecular forces are present between two oppositely charges ions

**Q115** **The greater Lattice energy is shown by:**

A NaCl
B NaBr
C NaI
D NaF

**Q116** **Thermal conductivity of metals is due to:**

A Layered structure of metals
B Freely moving electrons
C Loosely held metal atoms
D Vibrational movement of metals

**Q117** **The high pressure of 200 atm in Haber's process is used for:**

A Better yield
B Lower yield
C Lower rate
D Cost decrease

**Q118** **By which of the following factors equilibrium state is attained earlier?**

A Temperature
B Pressure
C Concentration
D Catalyst

**Q119** **When temperature of reacting gases is raised by 10 K, the reaction rate will increase to:**

A Double
B Three times
C Four times
D Five times

**Q120** **The minimum amount of energy required by the colliding particles for effective collisions is called:**

A Activation energy
B Lattice energy
C Bond energy
D Hydration energy

**Q121** **Which of the following is not a state function?**

A Pressure (P)
B Work (W)
C Volume (V)
D Temperature (T)

**Q122** **Equation represents which energy change? $Mg^{2+}(g) + O^{2-}(g) \rightarrow MgO(s)$**

A Atomization
B Neutralization
C Lattice energy
D Solution

**Q123** **When nitric oxide reacts with ozone, the order of reaction will be:**

A 2nd
B 3rd
C 1st
D Zero

**Q124** **During electrolysis, reduction always occurs at the:**

A Anode
B Cathode
C SHE
D Salt bridge

**Q125** **The reason of highest electronegativity value of Fluorine is:**

A Complete outermost shell
B Ability to form negative ion
C Existence as diatomic molecule
D Smaller size and higher nuclear charge in the respective period

**Q126** **Valance shell electron pair repulsion theory explains:**

A Bond Energy
B Bond Length
C Shapes and Bond Energy
D Shapes

**Q127** **Which of the following has $sp^3$ hybridization?**

A $BF_3$

B $C_2H_4$

C $BeCl_2$

D $CH_4$

**Q128** **The factor which is not affecting bond length is:**

A Pressure of multiple bonds

B Nature of hybridization present

C Difference in electronegativity between the two bonded atoms

D Ionization energies of the two bonded atoms

**Q129** **Which of the following substance is malleable and ductile?**

A Sodium chloride

B Copper sulphate

C Mercury

D Aluminum

**Q130** **Co-ordination number of Na is:**

A 10

B 9

C 8

D 12

**Q131** **The cracking method used to obtain better quality gasoline is:**

A Thermal

B Catalytic

C Steam

D Radiations

**Q132** **Homocyclic organic compounds are sub divided into two types namely:**

A Alicyclic and Aromatic

B Open chain and branched chain

C Aromatic and non-aromatic

D Antiaromatic and antialicyclic

**Q133** **Acetophenone can be formed by which of the following reaction of benzene?**

A Alkylation

B Acylation

C Halogenation

D Nitration

**Q134** **Generic formula of cycloalkane is:**

A $C_nH_{2n+2}$

B $C_nH_{2n}$

C $C_nH_{2n-1}$

D $C_nCH_{2n-2}$

**Q135** **Which of the following reactions differentiates alcohol from phenol?**

A Lucas test
B Halogenations
C Nitration
D Iodoform test

**Q136** **The order of reactivity of alcohol when C-O bond breaks is:**

A Tertiary alcohol > secondary alcohol > Primary alcohol
B Secondary alcohol > primary alcohol > tertiary alcohol
C Primary alcohol > secondary alcohol > tertiary alcohol
D Tertiary alcohol > primary alcohol > secondary alcohol

**Q137** **$C_nH_{2n}O$ is the general formula of:**

A Ether
B Carboxylic acid
C Ketones
D Carbolic acid

**Q138** **Catalytic reduction of aldehyde & Ketone forms:**

A Alcohol
B Carboxylic acid
C Alkane
D Aldehyde

**Q139** **Which of the following reacts with Carboxylic Acid to form Ester?**

A Aldehyde
B Alkyl Halide
C Ketones
D Alcohol

**Q140** **Hydrolysis of Nitriles produces:**

A Carboxylic acid
B Aldehydes
C Ketones
D Esters

**Q141** **What is the mass of sulphur in 24.5 g of $H_2SO_4$?**

A 32 g
B 24 g
C 16 g
D 8 g

**Q142** **From the equation ($N_2 + 3H_2 \rightarrow 2NH_3$), how many moles of $NH_3$ are produced from 2.5 moles of $N_2$?**

A 2.5 moles
B 2 moles
C 5 moles
D 7.5 moles

**Q143** **The amount of energy associated with quantum of radiation is directly proportional to:**

A Photon
B Wavelength
C Frequency
D Velocity

**Q144** **If value of azimuthal quantum number is 2 then total values of magnetic quantum number will be:**

A 03
B 05
C 07
D 10

**Q145** **Total number of directions of f-orbitals in space are:**

A 05
B 03
C 07
D 06

**Q146** **Which of the following quantum number is not obtained from Schrodinger Wave equation?**

A Principal Quantum Number
B Spin Quantum Number
C Azimuthal Quantum Number
D Magnetic Quantum Number

**Q147** **The electronic configuration for degenerate orbitals is explained by:**

A Aufbau Principle
B n + l rule
C Hund's rule
D Pauli exclusion principle

**Q148** **The idea that molecules in gases are in constant movement is called:**

A Kinetic theory of gases
B Crystal field theory
C Molecular orbital theory
D Transition state theory

**Q149** **The SI unit for pressure is:**

A mm of Hg
B Pascal
C Bar
D Torr

**Q150** **If both temperature and volume of gas are doubled, the pressure:**

A Cannot be predicted
B Is reduced to ½
C Remains unchanged
D Is doubled

# COMPLETE ANSWER KEY WITH DETAILED EXPLANATIONS

## SECTION 1 — PHYSICS (Q.1–Q.40)

**Q1. In isochoric process:**

**Correct Answer: C. Volume is kept constant**

Isochoric means constant volume (iso = same, choric = volume). No work is done as W = P×ΔV = 0 when ΔV = 0.

**Q2. If 42 J heat is transferred to the system during expansion, what is the change in internal energy when work done is 32 J?**

**Correct Answer: B. 10 J**

By 1st Law: ΔU = Q - W = 42 - 32 = 10 J. Heat added minus work done by system gives change in internal energy.

**Q3. The 1st law of thermodynamics is the generalization of the law of conservation of:**

**Correct Answer: C. Energy**

The 1st law of thermodynamics states energy cannot be created or destroyed, only converted — this is conservation of energy.

**Q4. While studying charging and discharging of a capacitor, Rc = Resistance × Capacitance is known as:**

**Correct Answer: B. Time constant**

RC = Time constant (τ). It represents the time for a capacitor to charge to ~63% of its maximum voltage or discharge to ~37%.

**Q5. In parallel combination of two capacitors, their equivalent capacitance is equal to:**

**Correct Answer: A. C1 + C2**

In parallel, capacitances add directly: Ceq = C1 + C2. Each capacitor has the same voltage but stores charge independently.

**Q6. The S.I unit of capacitance of a capacitor is:**

**Correct Answer: C. Farad**

The SI unit of capacitance is the Farad (F), named after Michael Faraday. 1 Farad = 1 Coulomb per Volt.

**Q7. 1 kWh =**

**Correct Answer: C. $3.6 \times 10^6$ J**

1 kWh = 1000 W × 3600 s = 3,600,000 J = $3.6 \times 10^6$ J. This is the unit used for electrical energy billing.

**Q8. Volt × Ampere is the unit of:**

**Correct Answer: D. Power**

Power P = V × I (Voltage × Current). So Volt × Ampere = Watt = unit of Power.

**Q9. If length of the wire becomes two times to its original value and area becomes one half to its original value, then resistance of the wire becomes:**

**Correct Answer: B. Four times**

R = ρL/A. New R = ρ(2L)/(A/2) = 4ρL/A = 4R. When L doubles and A halves, resistance becomes 4 times.

**Q10. When a charged particle enters the magnetic field parallel, it will:**

**Correct Answer: C. Move straight**

When velocity is parallel to magnetic field, the angle θ = 0°, so F = qvB sin0° = 0. No force acts — particle moves straight.

**Q11. The dimension of magnetic field strength is same as that of:**

**Correct Answer: B. Magnetic induction**

Magnetic field strength B has the same dimension as magnetic induction (both measured in Tesla = $kg/As^2$).

**Q12. The weber is unit of measure of:**

**Correct Answer: C. Magnetic flux**

Weber (Wb) is the SI unit of magnetic flux. 1 Weber = 1 Volt·second. Named after Wilhelm Eduard Weber.

**Q13. The Lenz's law is also statement of law of conservation of:**

**Correct Answer: C. Energy**

Lenz's law states induced EMF opposes the change causing it — this is a consequence of conservation of energy (no free energy).

**Q14. In Fleming's right hand rule, the second finger indicates:**

**Correct Answer: C. Induced current**

Fleming's Right Hand Rule: thumb = motion, forefinger = magnetic field, second/middle finger = induced current direction.

**Q15. A current generator is a device that converts:**

**Correct Answer: A. Mechanical energy into electrical energy**

A generator (dynamo) converts mechanical energy (rotation) into electrical energy using electromagnetic induction.

**Q16. A device that converts AC into DC is called:**

**Correct Answer: A. Diode**

A diode (specifically a rectifier diode) allows current in only one direction, converting alternating current to direct current.

**Q17. The conversion of alternating current into direct current is called:**

**Correct Answer: B. Rectification**

Rectification is the process of converting AC to DC. A rectifier uses diodes to allow current flow in one direction only.

**Q18. In full wave rectification, _____ diodes are used.**

**Correct Answer: D. 4**

Full wave bridge rectifier uses 4 diodes arranged in a bridge configuration to rectify both half-cycles of AC.

**Q19. The time taken for half the number of atoms of radioactive isotopes to disintegrate is called:**

**Correct Answer: D. Half life**

Half-life ($t_{½}$) is the time for half the radioactive atoms to decay. It is a fundamental property of each radioactive isotope.

**Q20. A 32g radioactive element decays and remains 2g after 60 days. What is half-life of this radioactive element?**

**Correct Answer: D. 15 days**

32→16→8→4→2g requires 4 half-lives. So $4t_{½} = 60$ days, $t_{½} = 15$ days.

**Q21. If the car is slowing down along negative x axis then acceleration will be along:**

**Correct Answer: A. Positive x Axis**

Car moves in -x direction and slows down. Deceleration opposes motion, so acceleration is in +x direction (opposite to velocity).

**Q22. The instantaneous velocity along the curved path is:**

**Correct Answer: A. Along the tangent**

Instantaneous velocity is always directed along the tangent to the path at that point, regardless of the curve's shape.

**Q23. In perfectly elastic collision:**

**Correct Answer: D. Momentum, kinetic energy and total energy, all are conserved**

In perfectly elastic collision, both momentum AND kinetic energy are conserved. Total energy is always conserved (1st law).

**Q24. The slope of a displacement-time graph is equal to:**

**Correct Answer: A. Velocity**

Slope = Δdisplacement/Δtime = velocity. The gradient of a displacement-time graph gives instantaneous velocity.

**Q25. Range of a projectile on a horizontal plane is same for the following pair of angle:**

**Correct Answer: C. 75 & 15**

Range $R = v^2\sin2\theta/g$. Angles that are complementary (add to 90°) give same range: 75° + 15° = 90°. ✓

**Q26. The product of force and time is equal to:**

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

Impulse = F × t = Change in momentum (Δp). This is the impulse-momentum theorem from Newton's 2nd law.

**Q27. At what point during the motion of projectile its vertical component of velocity is zero?**

**Correct Answer: C. Highest point**

At the highest point of projectile motion, the vertical velocity component becomes zero momentarily before the projectile falls.

**Q28. A projectile has 1 J of PE. What is the work done in terms of height?**

**Correct Answer: C. 0 J**

At maximum height, KE = 0 and PE = 1J. Work done by gravity during flight = 0 (conservative force, no net work in cycle).

**Q29. Power is dot product of:**

**Correct Answer: B. Force and velocity**

$P = \vec{F} \cdot \vec{v}$ (dot product of force and velocity). Power = rate of doing work = $Fv\cos\theta$.

**Q30. The area under force-displacement graph gives:**

**Correct Answer: C. Work**

Work = $\int F \cdot dx$. The area under a Force vs Displacement graph equals the work done by that force.

**Q31. A body of mass 'm' is moving with velocity 'v'. After a short interval of time its velocity becomes double. How many times its K.E will increase or decrease?**

**Correct Answer: C. 4 time increased**

$KE = \frac{1}{2}mv^2$. If v doubles to 2v: new $KE = \frac{1}{2}m(2v)^2 = 4 \times \frac{1}{2}mv^2$. KE increases 4 times.

**Q32. The relation between radian and degree is:**

**Correct Answer: A. 1 rad = 57.3°**

1 radian = $180°/\pi \approx 57.3°$. This is the conversion factor between radians and degrees.

**Q33. In case of centripetal force the value of instantaneous acceleration is given by:**

**Correct Answer: B. $a_c = v^2/r$**

Centripetal acceleration $a_c = v^2/r$. This acceleration points toward the center of the circular path.

**Q34. An electric motor turns at 400 revolutions per minute. Its angular velocity in rad/s will be:**

**Correct Answer: C. $40\pi/3$**

$\omega = 400 \text{ rev/min} \times 2\pi \text{ rad/rev} \div 60 \text{ s/min} = 800\pi/60 = 40\pi/3$ rad/s.

**Q35. A disc, a hoop and a sphere are rolling down from an inclined plane simultaneously. Which object will reach at the bottom first?**

**Correct Answer: C. Sphere**

Sphere has smallest moment of inertia ratio ($I = 2/5\ mr^2$) vs disc (1/2) vs hoop ($mr^2$). Sphere reaches bottom first.

**Q36. The centripetal force formula is:**

**Correct Answer: C. $F_c = mr\omega^2$**

Centripetal force $F_c = mr\omega^2 = mv^2/r$. Here m=mass, r=radius, ω=angular velocity.

**Q37. In the following figure the wavelength is: [wave diagram showing 2m]**

**Correct Answer: A. 2m**

The figure shows one complete wave over 2m distance. Wavelength is the length of one complete wave cycle = 2m.

**Q38. With increase in pressure, the speed of sound will:**

**Correct Answer: D. Remain the same**

Speed of sound v = √(γP/ρ). Since both P and ρ increase proportionally with pressure, v remains unchanged.

**Q39. In transverse waves, the portion above the mean level is called:**

**Correct Answer: B. Wave crest**

In transverse waves, the crest is the highest point above the equilibrium/mean position. Trough is the lowest point.

**Q40. The maximum displacement of particles of a medium, on either side of the mean position of a wave, is called:**

**Correct Answer: C. Amplitude**

Amplitude is the maximum displacement from the equilibrium/mean position. It determines the energy carried by the wave.

## SECTION 2 — BIOLOGY (Q.41–Q.95)

**Q41. $Na^+$ (sodium ions) are nearly _____ times greater in fluid outside the cell than inside:**

**Correct Answer: A. 10**

$Na^+$ concentration is ~142 mEq/L outside vs ~14 mEq/L inside — approximately 10 times higher extracellularly. This gradient drives nerve impulses.

**Q42. Which hormone induces labour pains?**

**Correct Answer: B. Oxytocin**

Oxytocin (from posterior pituitary) stimulates uterine contractions during labor. Synthetic oxytocin (Pitocin) is used to induce labor.

**Q43. Hormone secreted in bulk due to decreased water content of blood is:**

**Correct Answer: A. Anti-Diuretic Hormone (ADH)**

ADH (vasopressin) is released when blood osmolarity increases (water decreases). It causes kidneys to retain water, concentrating urine.

**Q44. The site of production of neurotransmitters is:**

**Correct Answer: B. Presynaptic neuron**

Neurotransmitters are synthesized and stored in vesicles in the presynaptic neuron's terminal bouton, then released into the synapse.

**Q45. Endorphins are produced in:**

**Correct Answer: A. Brain**

Endorphins are produced in the brain (particularly the pituitary gland and hypothalamus). They are natural pain relievers (endogenous opioids).

**Q46. The hormone responsible for production of sperm cells and male secondary sexual characteristics is:**

**Correct Answer: C. Testosterone**

Testosterone (produced by Leydig cells in testes) drives spermatogenesis and develops male secondary sexual characteristics.

**Q47. Leydig cells are responsible for:**

**Correct Answer: A. Testosterone production**

Leydig cells (interstitial cells) in the testes produce testosterone in response to LH from the anterior pituitary.

**Q48. The estrogen hormone secretion during the oogenesis is stimulated by:**

**Correct Answer: C. Follicle Stimulating Hormone**

FSH stimulates granulosa cells in developing follicles to produce estrogen during follicular phase of oogenesis.

**Q49. Which of the following hormones of the pituitary gland regulate the menstrual cycle?**

**Correct Answer: C. Follicle Stimulating Hormone and Luteinizing hormone**

FSH and LH (both from anterior pituitary) regulate the menstrual cycle. FSH stimulates follicle growth; LH triggers ovulation.

**Q50. Which of the following traits is transmitted directly from an affected father to only his son?**

**Correct Answer: C. Y-linked**

Y-linked (holandric) traits pass from father to ALL sons because sons always inherit the Y chromosome from father.

**Q51. When both the alleles of a gene pair are same, the organism is said to be:**

**Correct Answer: C. Homozygous**

Homozygous = both alleles identical (AA or aa). Heterozygous = different alleles (Aa). Genotype is the genetic makeup; phenotype is expression.

**Q52. This theory says that 'mitochondria and chloroplasts are, in effect, ancient bacteria which now live inside the larger cells'?**

**Correct Answer: D. Endosymbiotic theory**

The Endosymbiotic Theory (Lynn Margulis) proposes mitochondria and chloroplasts were once free-living prokaryotes engulfed by larger cells.

**Q53. The organs which are similar in function but differ in structure are called:**

**Correct Answer: A. Analogous organs**

Analogous organs = same function, different structure/origin (e.g. bird wing & butterfly wing). Result of convergent evolution.

**Q54. Which may NOT be a mode of action of an antibody?**

**Correct Answer: C. Secretion of cytokines**

Cytokines are secreted by T-cells and macrophages, NOT antibodies. Antibodies work by neutralization, precipitation, and opsonization.

**Q55. Pepsinogen is converted into its active form pepsin by:**

**Correct Answer: D. Hydrochloric acid**

HCl in stomach converts inactive pepsinogen to active pepsin by cleaving its inhibitory peptide. Low pH activates the enzyme.

**Q56. Intrinsic factor is secreted by:**

**Correct Answer: C. Stomach**

Intrinsic factor is secreted by parietal cells of the stomach. It is essential for vitamin B12 absorption in the ileum.

**Q57. The cells which play very important role in developing immunity are:**

**Correct Answer: C. Lymphocytes**

Lymphocytes (B-cells and T-cells) are the primary cells of adaptive immunity. B-cells produce antibodies; T-cells mediate cell immunity.

**Q58. Digestion of which food component starts from oral cavity?**

**Correct Answer: C. Carbohydrates**

Salivary amylase (ptyalin) in saliva begins carbohydrate digestion in the mouth, breaking starch into maltose.

**Q59. Vaccination is an example of:**

**Correct Answer: C. Acquired/Artificial active immunity**

Vaccination introduces antigens to stimulate the immune system to produce antibodies — this is artificially acquired active immunity.

**Q60. The heart chamber from where aorta originates:**

**Correct Answer: A. Left ventricle**

The aorta originates from the left ventricle. It is the largest artery carrying oxygenated blood to the systemic circulation.

**Q61. Pubic symphysis and inter vertebral disc are the example of:**

**Correct Answer: C. Cartilaginous joints**

Pubic symphysis and intervertebral discs are cartilaginous joints (symphyses), joined by fibrocartilage allowing slight movement.

**Q62. Cartilage is more difficult to heal than bone because cartilage:**

**Correct Answer: A. Lacks vascular supply**

Cartilage is avascular (no blood vessels). Without blood supply, nutrients and repair cells cannot reach damaged cartilage easily.

**Q63. Which feature is absent from cardiac muscles?**

**Correct Answer: B. Multinucleate cells**

Cardiac muscle cells are uninucleate (one nucleus each). Skeletal muscle is multinucleate. Cardiac has intercalated discs and striations.

**Q64. Sarcoplasmic reticulum of muscle fibers is mainly responsible for:**

**Correct Answer: A. Calcium storage**

Sarcoplasmic reticulum (SR) stores and releases calcium ions ($Ca^{2+}$) that trigger muscle contraction by binding troponin.

**Q65. The junction between two neurons is:**

**Correct Answer: B. Synapse**

A synapse is the junction between two neurons where neurotransmitters are released to transmit signals from one neuron to the next.

**Q66. Which hormone is chemically a steroid?**

**Correct Answer: C. Cortisone**

Cortisone (and all corticosteroids) are steroid hormones derived from cholesterol. ADH, thyroxin, and insulin are non-steroid.

**Q67. Under activity of parathyroid glands causes a drop in blood of:**

**Correct Answer: D. $Ca^{2+}$**

Parathyroid hormone (PTH) raises blood calcium. Hypoparathyroidism leads to hypocalcemia (low $Ca^{2+}$), causing muscle tetany.

**Q68. Which of the following protein establishes the matrix of bone and cartilage?**

**Correct Answer: C. Collagen**

Collagen is the most abundant structural protein, forming the organic matrix of bone (ossein) and cartilage. Calcium minerals deposit on it.

**Q69. Non-competitive inhibitors react with enzymes at:**

**Correct Answer: A. Allosteric site**

Non-competitive inhibitors bind the allosteric site (not active site), changing enzyme shape and reducing activity without competing with substrate.

**Q70. Most enzymes work the best at the following temperature:**

**Correct Answer: B. 40°C**

Human enzymes typically have optimal activity at 37–40°C (body temperature). Above this, denaturation begins. Below, reaction rate decreases.

**Q71. In term of enzyme action, 'maximum temperature' refers to a temperature at which:**

**Correct Answer: A. Enzymes start to denature**

Maximum temperature = temperature at which enzyme denaturation begins to occur. Beyond this, the active site loses its shape permanently.

**Q72. _____ reduce the enzymes productivity by blocking the substrate from entering into the active site due to similar shapes:**

**Correct Answer: A. Competitive inhibitors**

Competitive inhibitors have similar shape to substrate, compete for the active site, and reduce enzyme productivity by blocking substrate entry.

**Q73. When light falls on P-700, which event is likely to occur?**

**Correct Answer: D. It is oxidised**

P-700 (Photosystem I) absorbs light and becomes excited, losing electrons (oxidized). Electrons are replaced from Photosystem II.

**Q74. Which of the following molecules are released after completion of light reaction and then utilized in the dark reaction of photosynthesis?**

**Correct Answer: D. ATP and NADPH**

Light reactions produce ATP and NADPH. These energy carriers are then used in the Calvin cycle (dark reactions) to fix $CO_2$ into glucose.

**Q75. Which are the end products of light reactions of photosynthesis?**

**Correct Answer: A. ATP and NADPH**

End products of light reactions: ATP (energy), NADPH (reducing power), and $O_2$ (released). These drive the Calvin cycle.

**Q76. Synthesis of ATP during photosynthesis takes place at the region:**

**Correct Answer: B. Thylakoid**

ATP synthesis occurs at the thylakoid membrane during the light reactions. ATP synthase uses the proton gradient created by the electron transport chain.

**Q77. The complete, mature and infectious virus particle is known as:**

**Correct Answer: C. Virion**

A virion is a complete, structurally intact, and infectious viral particle outside a host cell. It consists of nucleic acid + capsid (± envelope).

**Q78. All viruses are:**

**Correct Answer: C. Parasites**

All viruses are obligate intracellular parasites — they cannot replicate without a host cell and depend entirely on host machinery.

**Q79. _____ increases the pathogenecity of bacteria:**

**Correct Answer: A. Capsule**

Bacterial capsule protects against phagocytosis, increases virulence, and helps bacteria evade host immune system, enhancing pathogenicity.

**Q80. The smallest known bacteria belong to the genus:**

**Correct Answer: A. Mycoplasma**

Mycoplasma is the smallest known bacterium (0.1–0.3 µm). It has no cell wall, making it resistant to penicillin.

**Q81. Mesenteric veins drain the blood from:**

**Correct Answer: B. Large intestine**

Mesenteric veins (superior and inferior) drain blood from the intestines (large and small intestine) into the portal vein.

**Q82. Secondary cell wall in plants is present:**

**Correct Answer: C. Between the primary cell wall and plasma membrane**

Secondary cell wall is deposited between the primary cell wall and plasma membrane. It is thick, rigid, and provides structural support.

**Q83. What distinguishes Prokaryotic cell wall from Fungal cell wall?**

**Correct Answer: B. Prokaryotic cell wall contains peptidoglycan**

Prokaryotic cell walls contain peptidoglycan (murein). Fungal walls contain chitin. Plant walls contain cellulose.

**Q84. Pollination is facilitated by:**

**Correct Answer: B. Chromoplast**

Chromoplasts contain colored pigments (carotenoids) that give flowers and fruits their colors, attracting pollinators for pollination.

**Q85. Tonoplast is the membrane separating:**

**Correct Answer: D. Vacuole and Cytoplasm**

Tonoplast is the membrane surrounding the central vacuole, separating vacuole contents from the cytoplasm (cytosol).

**Q86. Each centriole is composed of _____ of Microtubules:**

**Correct Answer: C. Nine Triplets**

Each centriole is made of 9 triplets of microtubules (9 × 3 = 27 microtubules total), arranged in a cylindrical pattern.

**Q87. The folds of Inner Membrane of mitochondria are called:**

**Correct Answer: B. Cristae**

Cristae are the folds of the inner mitochondrial membrane. They increase surface area for ATP synthesis via oxidative phosphorylation.

**Q88. According to the fluid mosaic model of cell membrane, which zone is embedded inside?**

**Correct Answer: A. Hydrophobic**

In the fluid mosaic model, the hydrophobic fatty acid tails of phospholipids face inward (away from water), embedded inside the bilayer.

**Q89. Select the one which is NOT a function of Smooth Endoplasmic Reticulum (SER)?**

**Correct Answer: D. Processing of glycoproteins**

Glycoprotein processing occurs in the Rough ER (which has ribosomes) and Golgi apparatus. SER handles lipids, detoxification, and transport.

**Q90. Cell membrane also contains _____ place by active and passive transport:**

**Correct Answer: C. Charged pores**

Cell membranes contain channel proteins (charged pores) that allow ions and molecules to pass through by active or passive transport.

**Q91. _____ are spherical sacs, surrounded by a single membrane and contain hydrolytic enzymes:**

**Correct Answer: C. Lysosomes**

Lysosomes are membrane-bound organelles containing hydrolytic enzymes for intracellular digestion of worn-out organelles and foreign particles.

**Q92. Most abundant organic compound in mammalian cells are:**

**Correct Answer: D. Proteins**

Proteins are the most abundant organic compound in cells, making up ~50% of dry mass. They serve as enzymes, structural components, and signals.

**Q93. Thermal stability of organisms in the environment is because of which characteristic of water?**

**Correct Answer: B. Heat capacity**

Water has a high specific heat capacity, meaning it can absorb large amounts of heat with little temperature change — stabilizing organism temperatures.

**Q94. C-H bonds in lipids are important:**

**Correct Answer: B. Providing more energy**

C-H bonds in lipids are non-polar and highly reduced, releasing more energy per gram when oxidized compared to carbohydrates or proteins.

**Q95. These carbohydrates are sweetest among all carbohydrates:**

**Correct Answer: A. Monosaccharides**

Monosaccharides (especially fructose) are the sweetest carbohydrates. Sweetness decreases as molecular complexity increases.

## SECTION 3 — ENGLISH (Q.96–Q.110)

**Q96. I _____ English for five years.**

**Correct Answer: C. Have been studying**

'For five years' indicates duration up to now — use Present Perfect Continuous: 'have been studying'. Shows ongoing action from past to present.

**Q97. The soup _____ good**

**Correct Answer: B. Tastes**

'Soup' is singular third person. Stative verbs like 'taste' don't use continuous form when describing quality. Use simple present: 'tastes'.

**Q98. Unless we _____ now, we cannot be on time**

**Correct Answer: A. Start**

'Unless' = 'if not'. Conditional clause uses simple present tense: 'Unless we start now...' (not future tense in condition clause).

**Q99. Daud is better than _____ of the college.**

**Correct Answer: C. All other teachers**

When comparing someone with others in their own group, use 'any other': 'better than any other teacher' OR 'better than all other teachers'.

**Q100. Abide _____ the traffic laws for smooth and safe flow of traffic.**

**Correct Answer: C. By**

'Abide by' is the correct phrasal verb meaning to follow/comply with rules or laws. 'Abide by the rules/laws' is standard usage.

**Q101. He prefers death _____ dishonor.**

**Correct Answer: D. To**

'Prefer ... to' is the correct structure. 'He prefers death to dishonor' — comparing two things uses 'to', not 'over' in formal English.

**Q102. What does the word 'SURPLUS' mean?**

**Correct Answer: A. In excess**

Surplus = an amount left over; excess beyond what is needed. From Latin 'super' (over) + 'plus' (more). e.g. 'budget surplus'.

**Q103. What does the word 'SPILL' mean?**

**Correct Answer: D. Spread**

Spill = to cause liquid to flow over the edge of a container; to spread or scatter. e.g. 'Don't spill the milk.'

**Q104. What does the word 'CURIOUS' mean?**

**Correct Answer: A. Keen**

Curious = eager to know or learn; showing keen interest. Synonyms: inquisitive, eager, keen. e.g. 'She was curious about science.'

**Q105. Pick the sentence with correct punctuation:**

**Correct Answer: D. He had one motto: serving humanity.**

A colon (:) is used to introduce a list, explanation, or quotation. 'He had one motto: serving humanity.' is correctly punctuated.

**Q106. Pick the word with correct spelling:**

**Correct Answer: B. Colleague**

The correct spelling is 'Colleague' — a fellow worker or associate. From French 'collègue'. Common misspelling is 'collegue'.

**Q107. Pick the word with correct spelling:**

**Correct Answer: A. Acquaintance**

'Acquaintance' is correct — a person one knows slightly. The 'cq' combination is a common source of error. From Old French 'acointance'.

**Q108. Pick the word with correct spelling:**

**Correct Answer: D. Priority**

'Priority' is the correct spelling — something regarded as more important. From Latin 'prioritas'. Note: 'prior' + 'ity'.

**Q109. Pick the sentence with correct punctuation:**

**Correct Answer: D. "He did his best; that was all anyone could do in any job".**

A semicolon (;) joins two independent clauses. 'He did his best; that was all anyone could do' — both are complete sentences.

**Q110. Pick the correct option:**

**Correct Answer: B. How has the leg of the chair broken?**

'How has the leg of the chair broken?' uses correct interrogative structure with present perfect 'has broken' and proper word order.

## SECTION 4 — CHEMISTRY (Q.111–Q.150)

**Q111. Vapor pressure is independent of which factor?**

**Correct Answer: D. Surface area of liquid**

Vapor pressure depends on temperature and nature of liquid (intermolecular forces). It is independent of surface area — more area doesn't change equilibrium vapor pressure.

**Q112. The boiling point of ether is less as compared to alcohols and phenols due to:**

**Correct Answer: B. Intermolecular forces**

Alcohols have O-H groups forming strong hydrogen bonds, raising BP. Ethers cannot form H-bonds with each other, so weaker intermolecular forces and lower BP.

**Q113. When 2 ice cubes are pressed over each other they unite to form one cube due to:**

**Correct Answer: D. H-bonding**

Ice cubes unite when pressed due to regelation — pressure melts ice temporarily, and when released, H-bonds reform between water molecules.

**Q114. Which statement correctly describes the structure of sodium chloride crystal?**

**Correct Answer: A. Each sodium ion is surrounded by six chloride ions and each chloride ions surrounded by six sodium ions**

NaCl has face-centered cubic structure where each $Na^+$ is surrounded by 6 $Cl^-$ and vice versa (coordination number = 6 for both).

**Q115. The greater Lattice energy is shown by:**

**Correct Answer: D. NaF**

Lattice energy increases as ionic radius decreases. $F^-$ has the smallest radius, so NaF has the strongest ionic attraction and highest lattice energy.

**Q116. Thermal conductivity of metals is due to:**

**Correct Answer: B. Freely moving electrons**

Free electrons in metals act as heat carriers. They move rapidly throughout the metal lattice, transferring kinetic energy and conducting heat efficiently.

**Q117. The high pressure of 200 atm in Haber's process is used for:**

**Correct Answer: A. Better yield**

In $N_2 + 3H_2 \rightarrow 2NH_3$, 4 moles of gas become 2 moles. By Le Chatelier's principle, high pressure favors the side with fewer moles → better $NH_3$ yield.

**Q118. By which of the following factors equilibrium state is attained earlier?**

**Correct Answer: D. Catalyst**

A catalyst provides an alternative reaction pathway with lower activation energy, increasing reaction rate in both directions equally, reaching equilibrium faster.

**Q119. When temperature of reacting gases is raised by 10 K, the reaction rate will increase to:**

**Correct Answer: A. Double**

Rule of thumb: reaction rate approximately doubles for every 10°C rise in temperature. This is based on collision theory and Arrhenius equation.

**Q120. The minimum amount of energy required by the colliding particles for effective collisions is called:**

**Correct Answer: A. Activation energy**

Activation energy (Ea) is the minimum energy required for a collision to result in a chemical reaction. It is the energy barrier for the reaction.

**Q121. Which of the following is not a state function?**

**Correct Answer: B. Work (W)**

Work (W) is NOT a state function — it depends on the path taken. P, V, T, and U are state functions depending only on current state.

**Q122. Equation represents which energy change? $Mg^{2+}(g) + O^{2-}(g) \rightarrow MgO(s)$**

**Correct Answer: C. Lattice energy**

Lattice energy is the energy released when gaseous ions combine to form an ionic solid. $Mg^{2+}(g) + O^{2-}(g) \rightarrow MgO(s)$ represents lattice energy.

**Q123. When nitric oxide reacts with ozone, the order of reaction will be:**

**Correct Answer: A. 2nd**

$NO + O_3 \rightarrow NO_2 + O_2$ is a bimolecular reaction (2 reactant molecules). The reaction is 2nd order overall (1st order each in NO and $O_3$).

**Q124. During electrolysis, reduction always occurs at the:**

**Correct Answer: B. Cathode**

Reduction (gain of electrons) always occurs at the cathode. Oxidation occurs at the anode. Memory: RED CAT (Reduction at Cathode).

**Q125. The reason of highest electronegativity value of Fluorine is:**

**Correct Answer: D. Smaller size and higher nuclear charge in the respective period**

Fluorine has the highest electronegativity due to its small atomic size and high effective nuclear charge, creating strong attraction for shared electrons.

**Q126. Valance shell electron pair repulsion theory explains:**

**Correct Answer: D. Shapes**

VSEPR theory predicts the 3D shape/geometry of molecules based on electron pair repulsion around the central atom.

**Q127. Which of the following has $sp^3$ hybridization?**

**Correct Answer: D. $CH_4$**

$CH_4$ (methane): C has 4 bond pairs, no lone pairs → $sp^3$ hybridization, tetrahedral shape. $BF_3$=$sp^2$, $C_2H_4$=$sp^2$, $BeCl_2$=sp.

**Q128. The factor which is not affecting bond length is:**

**Correct Answer: D. Ionization energies of the two bonded atoms**

Bond length is affected by bond order, hybridization, and electronegativity. Ionization energy is not a direct factor in bond length determination.

**Q129. Which of the following substance is malleable and ductile?**

**Correct Answer: D. Aluminum**

Aluminum is a metal with free electrons and non-directional metallic bonds, allowing layers to slide — making it malleable and ductile.

**Q130. Co-ordination number of Na is:**

**Correct Answer: C. 8**

Sodium has BCC structure with coordination number 8 (surrounded by 8 nearest neighbors). In NaCl, Na has coordination number 6.

**Q131. The cracking method used to obtain better quality gasoline is:**

**Correct Answer: B. Catalytic**

Catalytic cracking uses zeolite catalysts at lower temperatures to break heavy hydrocarbons into high-octane gasoline with branched chains.

**Q132. Homocyclic organic compounds are sub divided into two types namely:**

**Correct Answer: A. Alicyclic and Aromatic**

Homocyclic compounds have rings of same atoms (all carbon). They divide into Alicyclic (non-aromatic rings) and Aromatic (benzene ring compounds).

**Q133. Acetophenone can be formed by which of the following reaction of benzene?**

**Correct Answer: B. Acylation**

Acetophenone ($C_6H_5COCH_3$) is formed by Friedel-Crafts acylation of benzene with acetyl chloride ($CH_3COCl$) and $AlCl_3$ catalyst.

**Q134. Generic formula of cycloalkane is:**

**Correct Answer: B. $C_nH_{2n}$**

Cycloalkanes have formula $C_nH_{2n}$ — same as alkenes but are cyclic saturated hydrocarbons. Alkanes=$C_nH_{2n+2}$, Alkynes=$C_nH_{2n-2}$.

**Q135. Which of the following reactions differentiates alcohol from phenol?**

**Correct Answer: A. Lucas test**

Lucas test ($ZnCl_2$ + HCl) distinguishes alcohols by reactivity: tertiary reacts immediately, secondary reacts slowly, primary doesn't react. Phenols don't react.

**Q136. The order of reactivity of alcohol when C-O bond breaks is:**

**Correct Answer: A. Tertiary alcohol > secondary alcohol > Primary alcohol**

Tertiary carbocations are most stable, so tertiary alcohols react fastest in SN1. Order: 3° > 2° > 1° when C-O bond breaks.

**Q137. $C_nH_{2n}O$ is the general formula of:**

**Correct Answer: C. Ketones**

Ketones have general formula $C_nH_{2n}O$. Ethers: $C_nH_{2n+2}O$, Carboxylic acids: $C_nH_{2n}O_2$, Aldehydes also $C_nH_{2n}O$ but ketones are the answer here.

**Q138. Catalytic reduction of aldehyde & Ketone forms:**

**Correct Answer: A. Alcohol**

Catalytic hydrogenation ($H_2$/Ni) reduces C=O of aldehyde to primary alcohol and ketone to secondary alcohol.

**Q139. Which of the following reacts with Carboxylic Acid to form Ester?**

**Correct Answer: D. Alcohol**

Esterification: Carboxylic acid + Alcohol → Ester + Water. R-COOH + R'-OH → R-COO-R' + $H_2O$ (Fischer esterification).

**Q140. Hydrolysis of Nitriles produces:**

**Correct Answer: A. Carboxylic acid**

Hydrolysis of nitriles (R-C≡N) with acid/water produces carboxylic acids (R-COOH) via amide intermediate.

**Q141. What is the mass of sulphur in 24.5 g of $H_2SO_4$?**

**Correct Answer: D. 8 g**

Molar mass $H_2SO_4$ = 98 g/mol. S in $H_2SO_4$ = 32/98. Mass of S = (32/98) × 24.5 = 8 g.

**Q142. From the equation ($N_2 + 3H_2 \rightarrow 2NH_3$), how many moles of $NH_3$ are produced from 2.5 moles of $N_2$?**

**Correct Answer: C. 5 moles**

From stoichiometry: 1 mole $N_2$ → 2 moles $NH_3$. So 2.5 moles $N_2$ → 5 moles $NH_3$.

**Q143. The amount of energy associated with quantum of radiation is directly proportional to:**

**Correct Answer: C. Frequency**

E = hf (Planck's equation). Energy of a photon is directly proportional to frequency (f). E is inversely proportional to wavelength.

**Q144. If value of azimuthal quantum number is 2 then total values of magnetic quantum number will be:**

**Correct Answer: B. 05**

For l=2 (d orbital): m ranges from -2 to +2 → values: -2,-1,0,+1,+2 = 5 values total.

**Q145. Total number of directions of f-orbitals in space are:**

**Correct Answer: C. 07**

f-subshell has l=3, so m = -3,-2,-1,0,+1,+2,+3 → 7 orientations/directions in space.

**Q146. Which of the following quantum number is not obtained from Schrodinger Wave equation?**

**Correct Answer: B. Spin Quantum Number**

Spin quantum number (ms = +½ or -½) was introduced separately by Uhlenbeck & Goudsmit. Schrödinger's equation gives n, l, and ml.

**Q147. The electronic configuration for degenerate orbitals is explained by:**

**Correct Answer: C. Hund's rule**

Hund's rule of maximum multiplicity states that electrons fill degenerate (equal energy) orbitals singly before pairing, maximizing spin multiplicity.

**Q148. The idea that molecules in gases are in constant movement is called:**

**Correct Answer: A. Kinetic theory of gases**

Kinetic Molecular Theory of gases states gas molecules are in constant random motion. It explains pressure, temperature, and diffusion behavior.

**Q149. The SI unit for pressure is:**

**Correct Answer: B. Pascal**

The SI unit of pressure is Pascal (Pa) = 1 N/m². 1 atm = 101,325 Pa = 760 mmHg = 760 Torr = 1.01325 bar.

**Q150. If both temperature and volume of gas are doubled, the pressure:**

**Correct Answer: C. Remains unchanged**

PV/T = constant. If V×2 and T×2: P(2V)/(2T) = PV/T → P remains unchanged. The two effects cancel each other.

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