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NUMS 2022

ORIGINAL COMPLETE QUESTION PAPER

152	150m	No	4
Questions	Time Limit	Neg. Marking	Subjects

PHYSICS (40 Qs) | **BIOLOGY (55 Qs)** | **ENGLISH (17 Qs)** | **CHEMISTRY (40 Qs)**

EXAM INSTRUCTIONS

Exam	NUMS 2022 — National University of Medical Sciences
Total Questions	152 MCQs across 4 subjects
Subjects	Physics (40) • Biology (55) • English (17) • Chemistry (40)
Time Allowed	150 minutes — 1 minute per question
Marking	+1 correct. No negative marking — attempt ALL questions
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NUMS 2022 PREP STRATEGY — Pakistan's #1 Free NUMS Resource	
Biology (55 Qs — 37%)	Highest weightage. Cell bio, genetics, human physiology, ecology. Every Bio mark = a seat.
Physics (40 Qs — 27%)	Mechanics, waves, electromagnetism, modern & nuclear. Practice numericals daily.
Chemistry (40 Qs — 27%)	Organic chemistry: reactions, mechanisms, functional groups = max marks.
English (17 Qs — 11%)	Grammar, prepositions, sentence correction, vocabulary. 15 min daily = full marks.
Attempt Order	English first (10 min) → Biology → Chemistry → Physics. Never leave blank.
Mock Tests	3 full past papers per week timed. Review every wrong answer same day.
Final 2 Weeks	Revision only. Full mock daily. Sleep 7-8 hrs. Confidence matters.
Free Downloads	mdcatguide.com/nums-past-papers-html/ — all years, all subjects, free forever

PRO TIP — Biology is the deciding subject. Who scores 50+ in Biology gets the MBBS seat. Physics & Chemistry separate average from good. English is the bonus that gets you ahead.

SECTION 1 — PHYSICS (Q.1–Q.40)

Q1 **The horizontal distance travelled by wave during one complete cycle is called:**

A Frequency
B Wavelength
C Amplitude
D Time period

Q2 **If the period of oscillation of mass (M) suspended from a spring is 1s, then the period of 16M will be:**

A 1s
B 2s
C 3s
D 4s

Q3 **Loudness of the sound is directly related to:**

A Intensity of sound
B Frequency of sound
C Wavelength of sound
D Pitch of sound

Q4 **The increase in the speed of sound in air for each degree rise above 0°C is:**

A 0.41 m/s
B 0.51 m/s
C 0.81 m/s
D 0.61 m/s

Q5 **First Law of Thermodynamics is based on:**

A Law of conservation of momentum
B Law of conservation of mass
C Law of conservation of charge
D Law of conservation of energy

Q6 **The thermodynamic process during which the pressure is kept constant is called:**

A Isochoric process
B Adiabatic process
C Isobaric process
D Isothermal process

Q7 **Energy stored in a capacitor is given by:**

A $E = \frac{1}{2}cv^2$
B $E = 2cv^2$
C $E = cv^2$
D $E = cv$

Q8 **Electric field intensity is:**

A Force per unit mass
B Force per unit tesla
C Force per unit charge
D Force per unit watt

Q9 **It stores electrical potential energy:**

A Capacitor
B Conductor
C Inductor
D Generator

Q10 **Ohm's Law states that current is proportional to voltage when temperature is constant. It is statement of:**

A Joule's Law
B Gauss's Law
C Ohm's Law
D Ampere's Law

Q11 **The resistance of pure metal increases with:**

A Increase in temperature
B Increase in pressure
C Decrease in temperature
D Decrease in pressure

Q12 **The magnetic field inside the current carrying wire varies:**

A Inversely with r
B Inversely with r^2
C Directly with r^2
D Directly with r

Q13 **Magnetic flux is maximum when angle between magnetic field and vector area is:**

A 0°
B 90°
C 180°
D 45°

Q14 **Lenz's law is based on the law of conservation of:**

A Mass
B Energy
C Charge
D Momentum

Q15 **In Fleming's right hand rule, the thumb indicates:**

A Force
B Magnetic field
C Induced current
D Electric field

Q16 **Transformer works on the principle of:**

A Half wave rectification
B Self-induction
C Mutual induction
D Full wave rectification

Q17 **A device that converts AC into DC is called:**

A Diode
B Transistor
C Capacitor
D Inductor

Q18 **The conversion of alternating current into direct current is called:**

A Amplification
B Rectification
C Magnification
D Resolution

Q19 **1 Gy is equal to:**

A 1 Jkg
B 1 JKg^{-1}
C 1 $J^{-1}Kg$
D $J^{-1}Kg^{-1}$

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

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

Q21 **An elastic collision is the one in which:**

A Kinetic energy and momentum is conserved
B Kinetic energy conserved but total energy not
C Momentum conserved but kinetic energy not
D Both KE and momentum are not conserved

Q22 **The time rate of change of velocity is called:**

A Force
B Acceleration
C Power
D Energy

Q23 In projectile motion, the range will be maximum at an angle of:

A 30 degrees
B 45 degrees
C 60 degrees
D 90 degrees

Q24 Which of the following is NOT TRUE about Newton's 3rd Law?

A Action and reaction have same nature
B Action and reaction have same line of action
C Action and reaction never act on same body
D Action and reaction can cancel each other

Q25 Two buses at 100 km/h and 80 km/h move in opposite directions. Relative velocity is:

A 100 km/h
B 20 km/h
C 80 km/h
D 180 km/h

Q26 Which pair of angles have same range for a projectile?

A 10° and 20°
B 75° and 15°
C 45° and 60°
D 0° and 30°

Q27 The angle for which maximum height equals horizontal range:

A 45°
B 90°
C 0°
D 76°

Q28 Explosion of explosive material is application of:

A Conservation of energy
B Conservation of mass
C Conservation of momentum
D Newton's third law

Q29 1 hp is equal to:

A 476 watts
B 647 watts
C 746 watts
D 467 watts

Q30 The product of force and velocity is equal to:

A Kinetic Energy
B Potential Energy
C Power
D Work done

Q31 One kilowatt-hour is equal to:

A 36 MJ
B 3.6 MJ
C 36 KJ
D 3.6 KJ

Q32 Work done to move a body to zero potential position without acceleration is:

A Kinetic Energy
B Potential Energy
C Gravitational Potential Energy
D Absolute Potential Energy

Q33 If speed of a body doubles, its kinetic energy becomes:

A mv^2
B $2mv^2$
C $\frac{1}{2}mv^2$
D $4mv^2$

Q34 An electric motor of power 2hp — its power is:

A 1500 w
B 742 w
C 148 w
D 1492 w

Q35 1 radian =

A 53.7°
B 73.5°
C 57.3°
D 37.5°

Q36 Minimum velocity to put a satellite into orbit is called:

A Terminal velocity
B Escape velocity
C Critical velocity
D Average velocity

Q37 A rotating wheel completes 12 rev in 4s. Angular velocity in rad/sec:

A 24.6 rad/s
B 10.8 rad/s
C 10.4 rad/s
D 18.8 rad/s

Q38 **During circular motion, direction of centripetal acceleration is:**

A Towards center
B Along tangent
C Along direction of motion
D Opposite direction of motion

Q39 **Crest of a wave acts as:**

A Concave lens
B Convex lens
C Convex mirror
D Plane mirror

Q40 **Speed of sound in air does not depend on:**

A Density of medium
B Pressure
C Temperature
D Moisture

SECTION 2 — BIOLOGY (Q.41–Q.95)

Q41 **Which one is NOT a function of large intestine?**

A Absorption of electrolytes
B Absorption of water
C Production of vitamin
D Absorption of amino acids

Q42 **The following part is common in both digestive and respiratory system:**

A Trachea
B Pharynx
C Larynx
D Oesophagus

Q43 **Heart beat is normally regulated by:**

A Purkinje fibres
B AV bundle
C Sino Atrial node
D Bundle of His

Q44 **The method which helps in developing immunity against bacteria is:**

A Radiotherapy
B Chemotherapy
C Vaccination
D Antibiotics

Q45 **Normal gestation period in humans is about _____ days.**

A 300-320
B 320-350
C 270-280
D 240-250

Q46 **After ovulation, remains of follicle secretes:**

A Progesterone
B FSH
C LH
D Testosterone

Q47 **In male reproductive system, hormone regulating spermatogenesis rate:**

A Luteinizing hormone
B Follicle-stimulating hormone
C Testosterone
D Inhibin

Q48 **Cervix is part of:**

A Vagina
B Oviduct
C Uterus
D Ovary

Q49 **Most abundant type of cartilage in human body:**

A Fibrous
B Hyaline
C Elastic
D Flexible

Q50 **Suture is an example of which joint?**

A Intervertebral discs
B Skull bones
C Costal cartilage
D Pubic symphysis

Q51 **Which event DOES NOT occur during muscle contraction?**

A I Band shortens
B A Band shortens
C H Zone disappears
D Z lines move closer

Q52 **Smooth muscles are spindle shaped with _____ nucleus per cell:**

A One
B Two
C Three
D Many

Q53 **Blood group known as universal donor:**

A A+
B O-
C AB+
D O+

Q54 **Living characteristic of virus:**

A Can be crystalized
B No cellular respiration
C Mutate their genetic material
D Lack biosynthetic machinery

Q55 **Organisms with similar morphology that breed to produce fertile offspring:**

A Species
B Domain
C Kingdom
D Diversity

Q56 **Complete aerobic breakdown of glucose in prokaryotes produces _____ ATP:**

A 20
B 36
C 38
D 40

Q57 **Products of light-dependent reactions of photosynthesis:**

A ATP, RuBP and reduced NAD
B ATP, oxygen and reduced NADP
C GP, oxygen and reduced NAD
D GP, reduced NADP and RuBP

Q58 **In photosynthesis, water acts as:**

A Proton acceptor
B Electron donor
C CO_2 reducer
D CO_2 acceptor

Q59 **During photosynthesis CO_2 works as:**

A Proton donor
B Electron donor
C Proton acceptor
D Source of O_2

Q60 **End product of Calvin Cycle:**

A 3 phosphoglycerate
B 1-3 biphosphoglycerate
C Glyceraldehyde 3 phosphate
D Glucose

Q61 **Organelles most abundant in secretory cells:**

A Lysosomes
B Golgi complex
C Vacuoles
D Centrioles

Q62 **Structure disappearing during cell division:**

A Vacuole
B Lysosome
C Nucleolus
D Endoplasmic reticulum

Q63 **ATP synthase is located on membrane of:**

A Nucleus
B Mitochondria
C Lysosome
D Vacuole

Q64 **Spherical sacs with single membrane containing hydrolytic enzymes:**

A Mitochondria
B Golgi Bodies
C Lysosomes
D Chloroplast

Q65 **Chromosomes exist in loosest state during interphase called:**

A Genes
B Ribosomes
C DNA
D Chromatin

Q66 **Within nucleus, _____ are made by the nucleolus:**

A Ribosomes
B mRNA
C Proteins
D Enzymes

Q67 **Which is correct for cell wall?**

A Semipermeable
B Differentially permeable
C Permeable
D Not permeable

Q68 **Plasma membrane is asymmetrical because:**

A Proteins not fixed
B Hydrophobic tail inward
C Two surfaces not identical
D Cholesterol only inside

Q69 **Cell membrane contains _____ for active/passive transport:**

A Lipids
B Corner Proteins
C Charged pores
D Carbohydrates

Q70 **Part of plasma membrane controlling fluidity:**

A Glycoprotein
B Carrier protein
C Lipid
D Carbohydrate

Q71 **Polysome attachment to mRNA controlled by:**

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

Q72 **Automatic involuntary response to stimulus:**

A Reflex
B Instinct
C Taxis
D Tropism

Q73 Resting membrane potential measures:

A -70mv
B -70v
C 70mv
D -90mv

Q74 Touch receptors are:

A Pacinian's corpuscles
B Olfactory receptors
C Meissner's corpuscles
D Nociceptors

Q75 Magnesium is important for plant formation of:

A Proteins
B Lipids
C Chlorophylls
D Enzymes

Q76 Respiratory system part with no cartilage:

A Larynx
B Trachea
C Bronchioles
D Bronchi

Q77 Enzymatic portion of gastric juice secreted by:

A Oxyntic cells
B Chief cells
C Mucus cells
D Endocrine cells

Q78 Which molecule contains amino acids?

A Cellulose
B Collagen
C Sucrose
D Ascorbic acid

Q79 Hydrolysis is breakdown of polymers by addition of:

A Hydroxyl group
B Hydrogen
C Water
D Nitrogen

Q80 Which is NOT a carbohydrate?

A Glucose $C_6H_{12}O_6$
B Sucrose $C_{12}H_{22}O_{11}$
C Ribose $C_5H_{10}O_5$
D Lactic Acid $C_3H_6O_3$

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

Q81 High heat of vaporization makes water a cooling agent because:

A Being excellent solvent
B Cooling agent
C Membrane stabilizer
D Thermal shock absorbent

Q82 Molecules not contributing to biological membranes:

A Glycoproteins
B Glycolipids
C Phospholipids
D Nucleoproteins

Q83 Which yields glucose and fructose on hydrolysis?

A Starch
B Maltose
C Sucrose
D Lactose

Q84 Terminal ends of chromosomes are called:

A Satelite
B Kinetomere
C Nucleolar organizers
D Telomeres

Q85 Gap between neurons at synapse:

A Synaptic knob
B Synaptic cell
C Synaptic cleft
D Synaptic vesicle

Q86 Brain part controlling body temperature:

A Thalamus
B Hypothalamus
C Pons
D Cerebellum

Q87 Long extension of nerve cell:

A Axon
B Auxin
C Schwan cell
D Dendrites

Q88 Which is a steroid hormone?

A Cortisone
B Adrenaline
C Insulin
D Thyroxin

Q89 **Molecules conveying messages between neurons:**

A Hormones
B Activators
C Neurotransmitters
D Enzymes

Q90 **Which enzyme works in alkaline pH?**

A Pepsin
B Sucrase
C Enterokinase
D Pancreatic lipase

Q91 **'Minimum temperature' in enzyme action refers to:**

A Enzymes start denaturing
B Enzymes become hyperactive
C Enzymes work best
D Inactive enzymes reactivated

Q92 **Correct about non-competitive inhibition:**

A Malonate acts as inhibitor
B Enzyme shape distorted
C Competition for active site
D Works for non-regulatory enzymes

Q93 **Most active enzyme in gut after eating bread:**

A Amylase
B Erypsin
C Lactase
D Carboxypeptidase

Q94 **Presented theory of origin of species by natural selection:**

A Lamarck
B Linnaeus
C Hardy-Weinberg
D Darwin

Q95 **NOT a mode of action of antibody:**

A Neutralizing an antigen
B Precipitating an antigen
C Secreting cytokines
D Enhancing phagocytosis

SECTION 3 — ENGLISH (Q.96–Q.112)

Q96 **Choose correct punctuation:**
He had no worries; his pension was adequate and there was a little more saved up besides.

A He had no worries, his pension was adequate and there was a little more saved up besides.

B He had no worries; his pension was adequate and there was a little more saved up besides.

C He had no worries; his pension was adequate, and there was a little more saved up besides.

D He had no worries: his pension was adequate and there was a little more saved up besides.

Q97 **Correct: 'There Mr. Hashim whose they say is best portrait painter in town.'**

A There's Mr. Hashim whose they say is the best portrait painter in the town.

B There's Mr. Hashim whom they say is the best portrait painter in the town.

C There's Mr. Hashim, who they say is the best portrait painter in the town.

D There's Mr. Hashim who they say is the best portrait painter in the town.

Q98 **A full description of the accidents _____ given in the report.**

A Are

B Have been

C Was

D Were

Q99 **Ahmed _____ me for a long time.**

A Know

B Have known

C Knows

D Knew

Q100 **'Ambidextrous' means:**

A Active and skillful

B Uses skills and wisdom

C Uses both hands with same skill

D Remains to the point

Q101 **'Ghettos' means:**

A Clean area

B Under privileged area

C Privileged area

D Modernly constructed

Q102 My friend has a fine _____ of old stamps.

A Group
B Bundle
C Band
D Collection

Q103 Choose correct option about 'every one of the prisons':

A Every one of the prisons are full.
B Every one of the prisons had full.
C Every one of the prisons have full.
D Every one of the prisons is full.

Q104 The Headmaster _____ to speak to you.

A Wants
B Is wanting
C Was wanting
D Want

Q105 Knowledge and wisdom _____ no time for connection.

A Has
B Have
C Had
D Are

Q106 Each of the boys _____ to ride.

A Loves
B Love
C Are loving
D Have loved

Q107 Correctly structured sentence about Mr. Shan:

A Mr. Shan; with his family together goes to England
B Mr. Shan, together with his family, goes to England.
C Mr. Shan; together with his family, go to England
D Mr. Shan, with his family, go to England together

Q108 Correct: 'The English man thinks he and his contry is the best.'

A The english man thinks that he and his country are best.
B The English man thinks that he and his country are the best.
C The English man thinks that he and his country is the best.
D The English man think that he, and his country, are the best.

Q109 During electrolysis, reduction occurs at the:

A Anode
B Cathode
C SHE
D Salt bridge

Q110 Hybridization of carbon in Ethene ($H_2C=CH_2$):

A sp^1
B sp^2
C sp
D dsp^2

Q111 Which molecule is polar?

A CCl_4
B $AlCl_3$
C CO_2
D HCl

Q112 Electron affinity decreases down the group because:

A Proton number increases
B Atomic radius increases
C Shielding decreases
D Atomic radius decreases

SECTION 4 — CHEMISTRY (Q.113–Q.152)

Q113 Which molecule is covalent in nature?

A NaCl
B $MgCl_2$
C $AlCl_3$
D KCl

Q114 Which property increases down group in alkali metals?

A Ionization energy
B Reactivity
C Electron affinity
D Electronegativity

Q115 Solubility of alkaline earth metals:

A Decreases down group
B Increases down group
C Remains constant
D First increases then decreases

Q116 Geometric isomerism is exhibited by:

A Alcohol
B Ethers
C Alkynes
D Alkenes

Q117 **Benzene from phenol by:**

A Reduction with H_2/Ni
B Reduction with zinc
C Reduction with alkali
D Reduction with acids

Q118 **Lucas test identifies:**

A Alkyl halides
B Alcohols
C Alkene
D Carboxylic acids

Q119 **Physical properties of phenol:**

A Colorless, crystalline solid
B Colorless, crystalline, deliquescent solid
C Colorless, amorphous solid
D Colorless, amorphous, deliquescent solid

Q120 **Cannizzaro's reaction given by:**

A Formaldehyde
B Acetaldehyde
C Acetone
D Butanone

Q121 **Identification test for Ketone:**

A Benedict's Test
B Fehling's Test
C Sodium Nitroprusside Test
D Tollen's Test

Q122 **Carboxylic acids are water soluble because:**

A Are more reactive
B Have hydrogen bonding
C Have low melting point
D Have high density

Q123 **Equation for ideal gas:**

A PV=RT
B PT=nRv
C P=nRT
D T=nPaS

Q124 **To prevent gas expansion when mass increases:**

A Lower T & increase P
B Increase T & lower P
C Lower T & P
D Increase T & P

Q125 Which variable is constant in Charles's Law?

A Volume
B Temperature
C Pressure
D Number of moles

Q126 Molecule with highest rate of evaporation:

A Acetone
B Ethanol
C Water
D Ethylene glycol

Q127 Specific heat of water:

A 4.18 J/g°C
B 9.82 J/g°C
C 6.04 J/g°C
D 8.47 J/g°C

Q128 Boiling point mostly raised by:

A Dipole-dipole
B London dispersion
C Intra-molecular H-bonding
D Inter-molecular H-bonding

Q129 Ionic substance dissolves in water because:

A Water molar mass 18.02
B Water forms dative bonding
C Water molecule is polar
D Water has high density

Q130 Nature of diamond as solid:

A Covalent
B Ionic
C Molecular
D Metallic

Q131 Light as feather, strong as iron:

A Graphite
B Graphene
C Mercury
D Diamond

Q132 pH of human blood:

A 7.35-7.45
B 8.35-8.45
C 6.35-7.45
D 5.57-6.57

Q133 Proton number of ^{23}Na:

A 23
B 11
C 12
D 34

Q134 One mole of ethanol and ethane have equal:

A Mass
B Number of atoms
C Number of electrons
D Number of molecules

Q135 First step in determining Empirical Formula:

A Finding gram atoms
B Percentage composition
C Atomic ratio
D Multiplication of atomic ratio

Q136 Moles of CO_2 containing 16g of oxygen:

A 0.25
B 0.5
C 1.00
D 1.50

Q137 Percentage of Carbon in CO_2:

A 30.46% C & 69.54% O
B 34.22% C & 78.79% O
C 27.27% C & 72.72% O
D 41.69% C & 58.12% O

Q138 Maximum electrons in p subshell:

A 2
B 4
C 6
D 14

Q139 n+l rule: highest energy orbital:

A 4d
B 2p
C 2s
D 3s

Q140 Mass of electron compared to proton:

A 1836× more than proton
B 1836× less than proton
C 1836× more than neutron
D 1836× more than H atom

Q141 Shape of orbital determined by:

A n
B l
C m
D s

Q142 Degenerate orbitals explained by:

A Aufbau Principle
B n+l Rule
C Hund's Rule
D Pauli Exclusion

Q143 Dissolved solute in equilibrium with undissolved — solution type:

A Dilute
B Saturated
C Unsaturated
D Supersaturated

Q144 Rate of reaction depends upon:

A Temperature
B Concentration
C Pressure
D Rate constant

Q145 What is NOT TRUE about reaction rate?

A Concentration doesn't affect rate
B Surface area affects rate
C Concentration affects rate
D Catalyst affects rate

Q146 Combustion is exothermic because:

A Energy in bond breaking > bond making
B Energy in bond making > bond breaking
C Energy absorbed in bond breaking > bond making
D Energy absorbed in bond making > bond breaking

Q147 One Calorie equivalent to:

A 4.184 J
B 4.184 kJ
C 0.4184 J
D 0.4184 kJ

Q148 Potential of Standard Hydrogen Electrode:

A 10
B 1
C -1
D Zero

Q149 Which molecule is polar?

A CCl_4
B $AlCl_3$
C CO_2
D HCl

Q150 Solubility of alkaline earth metal hydroxides:

A Decreases down group
B Increases down group
C Remains constant
D First increases then decreases

Q151 Specific heat of water:

A 4.18 J/g°C
B 9.82 J/g°C
C 6.04 J/g°C
D 8.47 J/g°C

Q152 Highest energy orbital by n+l rule:

A 4d
B 2p
C 2s
D 3s

QUICK ANSWER GRID — Check your answers fast

PHYSICS

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	D	A	D	D	C	A	C	A	C
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	D	A	B	A	C	A	B	B	D
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
A	B	B	D	D	B	D	C	C	C
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
B	D	D	D	C	C	D	A	B	B

BIOLOGY

Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50
D	B	C	C	C	A	D	C	B	B
Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60
B	A	B	C	A	C	B	B	C	C
Q61	Q62	Q63	Q64	Q65	Q66	Q67	Q68	Q69	Q70
B	C	B	C	D	A	C	C	C	C
Q71	Q72	Q73	Q74	Q75	Q76	Q77	Q78	Q79	Q80
B	A	A	A	C	C	B	B	C	D
Q81	Q82	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90
B	D	C	D	C	B	A	A	C	D
Q91	Q92	Q93	Q94	Q95					
D	B	A	D	C					

ENGLISH

Q96	Q97	Q98	Q99	Q100	Q101	Q102	Q103	Q104	Q105
B	C	C	B	C	B	D	D	A	A
Q106	Q107	Q108	Q109	Q110	Q111	Q112			
A	B	B	B	B	D	B			

CHEMISTRY

Q113	Q114	Q115	Q116	Q117	Q118	Q119	Q120	Q121	Q122
C	B	B	D	B	B	A	A	C	B
Q123	Q124	Q125	Q126	Q127	Q128	Q129	Q130	Q131	Q132
C	A	C	A	A	D	C	A	B	A
Q133	Q134	Q135	Q136	Q137	Q138	Q139	Q140	Q141	Q142
B	D	B	B	C	C	A	B	B	C
Q143	Q144	Q145	Q146	Q147	Q148	Q149	Q150	Q151	Q152
B	D	A	B	A	D	D	B	A	A

COMPLETE ANSWER KEY WITH DETAILED EXPLANATIONS

SECTION 1 — PHYSICS (Q.1–Q.40)

Q1. The horizontal distance travelled by wave during one complete cycle is called:

Correct Answer: B. Wavelength

Wavelength (λ) is the distance covered in one complete wave cycle — the spatial period of the wave, measured in metres.

Q2. If the period of oscillation of mass (M) suspended from a spring is 1s, then the period of 16M will be:

Correct Answer: D. 4s

$T \propto \sqrt{m}$. If mass becomes 16M: $T_{new} = T\sqrt{16} = 4 \times 1s = 4s$.

Q3. Loudness of the sound is directly related to:

Correct Answer: A. Intensity of sound

Loudness is the subjective perception of sound intensity. Greater intensity = louder sound. Measured in decibels (dB).

Q4. The increase in the speed of sound in air for each degree rise above 0°C is:

Correct Answer: D. 0.61 m/s

Speed of sound increases by 0.61 m/s per °C above 0°C. At 20°C: $v \approx 343$ m/s.

Q5. First Law of Thermodynamics is based on:

Correct Answer: D. Law of conservation of energy

First Law: $\Delta U = Q - W$. Energy cannot be created or destroyed — conservation of energy.

Q6. The thermodynamic process during which the pressure is kept constant is called:

Correct Answer: C. Isobaric process

Isobaric = constant pressure. Isochoric = constant volume. Isothermal = constant temperature. Adiabatic = no heat exchange.

Q7. Energy stored in a capacitor is given by:

Correct Answer: A. $E = \frac{1}{2}cv^2$

Energy in capacitor $E = \frac{1}{2}CV^2$. The ½ factor comes from the average voltage during gradual charging.

Q8. Electric field intensity is:

Correct Answer: C. Force per unit charge

$E = F/q$. Electric field intensity = force per unit positive charge. Unit: N/C or V/m.

Q9. It stores electrical potential energy:

Correct Answer: A. Capacitor

A capacitor stores electrical potential energy in the electric field between its plates: $E = \frac{1}{2}CV^2$.

Q10. Ohm's Law states that current is proportional to voltage when temperature is constant. It is statement of:

Correct Answer: C. Ohm's Law

Ohm's Law: $V = IR$. Current is proportional to voltage at constant temperature. Named after Georg Ohm.

Q11. The resistance of pure metal increases with:

Correct Answer: A. Increase in temperature

Higher temperature → more lattice vibrations → more electron collisions → greater resistance in metals.

Q12. The magnetic field inside the current carrying wire varies:

Correct Answer: D. Directly with r

Inside the wire: B ∝ r (proportional to distance from center). Outside: B ∝ 1/r.

Q13. Magnetic flux is maximum when angle between magnetic field and vector area is:

Correct Answer: A. 0°

Φ = BA cosθ. Maximum when θ = 0° (field parallel to area normal). cos0° = 1 → maximum flux.

Q14. Lenz's law is based on the law of conservation of:

Correct Answer: B. Energy

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

Q15. In Fleming's right hand rule, the thumb indicates:

Correct Answer: A. Force

Right Hand Rule for generators: Thumb = motion, Forefinger = magnetic field, Middle finger = induced current.

Q16. Transformer works on the principle of:

Correct Answer: C. Mutual induction

Transformer uses mutual induction — changing current in primary induces EMF in secondary through shared magnetic flux.

Q17. A device that converts AC into DC is called:

Correct Answer: A. Diode

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

Q18. The conversion of alternating current into direct current is called:

Correct Answer: B. Rectification

Rectification: converting AC to DC. Half-wave uses 1 diode; full-wave bridge rectifier uses 4 diodes.

Q19. 1 Gy is equal to:

Correct Answer: B. 1 JKg^{-1}

Gray (Gy) = SI unit of absorbed radiation dose. 1 Gy = 1 Joule of energy per kilogram of matter.

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

Correct Answer: D. 15 days

32→16→8→4→2 = 4 half-lives. 4t½ = 60 days. t½ = 15 days.

Q21. An elastic collision is the one in which:

Correct Answer: A. Kinetic energy and momentum is conserved

Elastic collision: BOTH kinetic energy AND momentum conserved. Inelastic: only momentum conserved.

Q22. The time rate of change of velocity is called:

Correct Answer: B. Acceleration

Acceleration a = Δv/Δt. It is the rate of change of velocity. Vector quantity, SI unit: m/s².

Q23. In projectile motion, the range will be maximum at an angle of:

Correct Answer: B. 45 degrees

R = v²sin2θ/g is maximum when sin2θ = 1 → 2θ = 90° → θ = 45°.

Q24. Which of the following is NOT TRUE about Newton's 3rd Law?

Correct Answer: D. Action and reaction can cancel each other

Action-reaction pairs act on DIFFERENT bodies, so they CANNOT cancel each other. They are equal and opposite.

Q25. Two buses at 100 km/h and 80 km/h move in opposite directions. Relative velocity is:

Correct Answer: D. 180 km/h

Relative velocity in opposite directions = $v_1 + v_2$ = 100 + 80 = 180 km/h.

Q26. Which pair of angles have same range for a projectile?

Correct Answer: B. 75° and 15°

Complementary angles (sum = 90°) give equal range: 75° + 15° = 90°. R = v²sin2θ/g is same for θ and (90°-θ).

Q27. The angle for which maximum height equals horizontal range:

Correct Answer: D. 76°

H = R when tanθ = 4 → θ = arctan(4) ≈ 76°.

Q28. Explosion of explosive material is application of:

Correct Answer: C. Conservation of momentum

Explosions: total momentum before (0) = total momentum after (fragments sum to zero). Conservation of momentum.

Q29. 1 hp is equal to:

Correct Answer: C. 746 watts

1 horsepower = 746 watts. Named by James Watt when comparing his steam engine to horse power output.

Q30. The product of force and velocity is equal to:

Correct Answer: C. Power

P = F × v. Power = force times velocity. Instantaneous power when force F acts on object at velocity v.

Q31. One kilowatt-hour is equal to:

Correct Answer: B. 3.6 MJ

1 kWh = 1000 W × 3600 s = 3,600,000 J = 3.6 MJ. The commercial unit for electrical energy billing.

Q32. Work done to move a body to zero potential position without acceleration is:

Correct Answer: D. Absolute Potential Energy

Absolute potential energy = work done to move mass from a point to infinity (zero potential) without acceleration.

Q33. If speed of a body doubles, its kinetic energy becomes:

Correct Answer: D. 4mv²

KE = ½mv². Double v → KE = ½m(2v)² = 4×½mv². KE quadruples.

Q34. An electric motor of power 2hp — its power is:

Correct Answer: D. 1492 w

2 hp = 2 × 746 W = 1492 W.

Q35. 1 radian =

Correct Answer: C. 57.3°

1 radian = 180°/π ≈ 57.3°. The angle subtended by an arc equal to the radius.

Q36. Minimum velocity to put a satellite into orbit is called:

Correct Answer: C. Critical velocity

Critical/orbital velocity = minimum speed for satellite orbit: v = √(GM/r).

Q37. A rotating wheel completes 12 rev in 4s. Angular velocity in rad/sec:

Correct Answer: D. 18.8 rad/s

ω = 2πf = 2π×(12/4) = 2π×3 = 6π ≈ 18.85 ≈ 18.8 rad/s.

Q38. During circular motion, direction of centripetal acceleration is:

Correct Answer: A. Towards center

Centripetal acceleration always points toward the center — causes change in direction, not speed.

Q39. Crest of a wave acts as:

Correct Answer: B. Convex lens

Wave crest acts as a convex lens — curves toward the center of curvature for incoming waves.

Q40. Speed of sound in air does not depend on:

Correct Answer: B. Pressure

v = √(γP/ρ). P and ρ change proportionally at constant T, so v is independent of pressure.

SECTION 2 — BIOLOGY (Q.41–Q.95)

Q41. Which one is NOT a function of large intestine?

Correct Answer: D. Absorption of amino acids

Amino acid absorption occurs in small intestine. Large intestine: absorbs water, electrolytes, produces vitamins via bacteria.

Q42. The following part is common in both digestive and respiratory system:

Correct Answer: B. Pharynx

Pharynx (throat) is shared by both systems — connects to both trachea (air) and esophagus (food).

Q43. Heart beat is normally regulated by:

Correct Answer: C. Sino Atrial node

SA node (sinoatrial node) is the heart's natural pacemaker, generating 60-100 bpm electrical impulses.

Q44. The method which helps in developing immunity against bacteria is:

Correct Answer: C. Vaccination

Vaccination stimulates immune system to produce antibodies and memory cells — creating long-lasting immunity.

Q45. Normal gestation period in humans is about _____ days.

Correct Answer: C. 270-280

Normal human gestation = 270-280 days (40 weeks). Counted from last menstrual period.

Q46. After ovulation, remains of follicle secretes:

Correct Answer: A. Progesterone

Corpus luteum (from ruptured follicle) secretes progesterone to maintain uterine lining for potential implantation.

Q47. In male reproductive system, hormone regulating spermatogenesis rate:

Correct Answer: D. Inhibin

Inhibin (from Sertoli cells) provides negative feedback to FSH, regulating the rate of spermatogenesis.

Q48. Cervix is part of:

Correct Answer: C. Uterus

Cervix = lower narrow portion of uterus that opens into the vagina. Dilates during childbirth.

Q49. Most abundant type of cartilage in human body:

Correct Answer: B. Hyaline

Hyaline cartilage is most abundant — found in articular surfaces, trachea, bronchi, costal cartilages.

Q50. Suture is an example of which joint?

Correct Answer: B. Skull bones

Sutures are immovable fibrous joints between skull bones, interlocking at irregular margins.

Q51. Which event DOES NOT occur during muscle contraction?

Correct Answer: B. A Band shortens

A band stays CONSTANT during contraction. I band shortens, H zone disappears, Z lines approach.

Q52. Smooth muscles are spindle shaped with _____ nucleus per cell:

Correct Answer: A. One

Smooth muscle = uninucleate (one nucleus), spindle-shaped, involuntary. Found in hollow organs.

Q53. Blood group known as universal donor:

Correct Answer: B. O-

O- lacks A, B antigens and Rh factor — can donate to any blood type in emergency transfusions.

Q54. Living characteristic of virus:

Correct Answer: C. Mutate their genetic material

Mutation of genetic material is a living characteristic — viruses evolve and adapt, showing genetic variation.

Q55. Organisms with similar morphology that breed to produce fertile offspring:

Correct Answer: A. Species

Biological species concept: organisms that can interbreed to produce fertile offspring belong to same species.

Q56. Complete aerobic breakdown of glucose in prokaryotes produces _____ ATP:

Correct Answer: C. 38

Aerobic respiration in prokaryotes: ~38 ATP total (glycolysis + Krebs + oxidative phosphorylation).

Q57. Products of light-dependent reactions of photosynthesis:

Correct Answer: B. ATP, oxygen and reduced NADP

Light reactions produce: ATP (energy currency), NADPH (reducing power), and O_2 (from water splitting).

Q58. In photosynthesis, water acts as:

Correct Answer: B. Electron donor

Water is electron donor: $2H_2O \rightarrow 4H^+ + 4e^- + O_2$. Electrons replace those lost from P680 (Photosystem II).

Q59. During photosynthesis CO_2 works as:

Correct Answer: C. Proton acceptor

CO_2 is the proton/hydrogen acceptor in Calvin cycle — accepts H from NADPH to form glucose.

Q60. End product of Calvin Cycle:

Correct Answer: C. Glyceraldehyde 3 phosphate

G3P (glyceraldehyde-3-phosphate) is the direct product of Calvin cycle — 3-carbon sugar used to make glucose.

Q61. Organelles most abundant in secretory cells:

Correct Answer: B. Golgi complex

Golgi complex (apparatus) — the cell's 'post office' — packages and secretes proteins. Most abundant in secretory cells.

Q62. Structure disappearing during cell division:

Correct Answer: C. Nucleolus

Nucleolus disappears in prophase as chromatin condenses into chromosomes. Reforms after division.

Q63. ATP synthase is located on membrane of:

Correct Answer: B. Mitochondria

ATP synthase is on the inner mitochondrial membrane (cristae), using proton gradient for ATP synthesis via chemiosmosis.

Q64. Spherical sacs with single membrane containing hydrolytic enzymes:

Correct Answer: C. Lysosomes

Lysosomes — membrane-bound, contain digestive enzymes for cellular waste, worn organelles, and foreign particles.

Q65. Chromosomes exist in loosest state during interphase called:

Correct Answer: D. Chromatin

During interphase, DNA exists as loosely coiled chromatin. Condenses to chromosomes only during cell division.

Q66. Within nucleus, _____ are made by the nucleolus:

Correct Answer: A. Ribosomes

Nucleolus synthesizes rRNA and assembles ribosome subunits. Ribosomes are built in the nucleolus.

Q67. Which is correct for cell wall?

Correct Answer: C. Permeable

Cell wall is fully permeable — allows free passage of water and most molecules. Plasma membrane is selectively permeable.

Q68. Plasma membrane is asymmetrical because:

Correct Answer: C. Two surfaces not identical

Membrane asymmetry: the two leaflets differ in lipid and protein composition — inner and outer surfaces are not identical.

Q69. Cell membrane contains _____ for active/passive transport:

Correct Answer: C. Charged pores

Channel proteins form charged pores allowing ions and molecules through by active or passive transport.

Q70. Part of plasma membrane controlling fluidity:

Correct Answer: C. Lipid

Cholesterol (lipid) regulates membrane fluidity — prevents rigidity in cold, prevents excessive fluidity in heat.

Q71. Polysome attachment to mRNA controlled by:

Correct Answer: B. Mg^{2+} ions

Mg^{2+} ions stabilize ribosome structure and ribosome-mRNA attachment in polysome formation.

Q72. Automatic involuntary response to stimulus:

Correct Answer: A. Reflex

Reflex = automatic, involuntary, rapid response via reflex arc: receptor → sensory neuron → spinal cord → motor neuron → effector.

Q73. Resting membrane potential measures:

Correct Answer: A. -70mv

Resting membrane potential ≈ -70 mV (inside negative). Maintained by Na^+/K^+ ATPase pump.

Q74. Touch receptors are:

Correct Answer: A. Pacinian's corpuscles

Pacinian corpuscles detect deep pressure and vibration. Meissner's detect light touch. Both are skin mechanoreceptors.

Q75. Magnesium is important for plant formation of:

Correct Answer: C. Chlorophylls

Mg^{2+} is the central atom of chlorophyll's porphyrin ring — essential for photosynthesis and green color.

Q76. Respiratory system part with no cartilage:

Correct Answer: C. Bronchioles

Bronchioles (<1mm diameter) lack cartilage. They have smooth muscle for dilation/constriction.

Q77. Enzymatic portion of gastric juice secreted by:

Correct Answer: B. Chief cells

Chief cells secrete pepsinogen (inactive). Parietal/oxyntic cells secrete HCl which activates pepsinogen to pepsin.

Q78. Which molecule contains amino acids?

Correct Answer: B. Collagen

Collagen is a protein (polypeptide chains of amino acids). Most abundant protein in body — structural roles.

Q79. Hydrolysis is breakdown of polymers by addition of:

Correct Answer: C. Water

Hydrolysis = water breaks bonds (hydro=water, lysis=break). Reverses condensation reactions.

Q80. Which is NOT a carbohydrate?

Correct Answer: D. Lactic Acid $C_3H_6O_3$

Lactic acid is an organic acid, not a carbohydrate. Carbohydrates have empirical formula $(CH_2O)n$.

Q81. High heat of vaporization makes water a cooling agent because:

Correct Answer: B. Cooling agent

Evaporation of water (sweating) removes large amounts of heat — powerful cooling due to high heat of vaporization.

Q82. Molecules not contributing to biological membranes:

Correct Answer: D. Nucleoproteins

Nucleoproteins (DNA/RNA + proteins) are in the nucleus — not membrane components. Membranes use phospholipids, glycolipids, proteins.

Q83. Which yields glucose and fructose on hydrolysis?

Correct Answer: C. Sucrose

Sucrose → glucose + fructose. Maltose → 2 glucose. Lactose → glucose + galactose.

Q84. Terminal ends of chromosomes are called:

Correct Answer: D. Telomeres

Telomeres are protective DNA caps at chromosome ends (TTAGGG repeats). Prevent chromosome degradation.

Q85. Gap between neurons at synapse:

Correct Answer: C. Synaptic cleft

Synaptic cleft = tiny gap (20-40nm) between presynaptic and postsynaptic membranes where neurotransmitters diffuse.

Q86. Brain part controlling body temperature:

Correct Answer: B. Hypothalamus

Hypothalamus = body's thermostat. Detects blood temperature, controls heat production/loss mechanisms.

Q87. Long extension of nerve cell:

Correct Answer: A. Axon

Axon = single long extension carrying electrical impulses AWAY from cell body. Can be up to 1 meter long.

Q88. Which is a steroid hormone?

Correct Answer: A. Cortisone

Cortisone (glucocorticoid) is derived from cholesterol — a steroid hormone. Others are non-steroids.

Q89. Molecules conveying messages between neurons:

Correct Answer: C. Neurotransmitters

Neurotransmitters cross synaptic cleft from presynaptic to postsynaptic neuron, transmitting the nerve signal.

Q90. Which enzyme works in alkaline pH?

Correct Answer: D. Pancreatic lipase

Pancreatic lipase: pH ~8 (alkaline). Pepsin: pH ~2 (acidic). Works in duodenum after alkaline pancreatic juice.

Q91. 'Minimum temperature' in enzyme action refers to:

Correct Answer: D. Inactive enzymes reactivated

Minimum temperature = lowest temperature at which dormant enzymes begin to show detectable activity.

Q92. Correct about non-competitive inhibition:

Correct Answer: B. Enzyme shape distorted

Non-competitive inhibitor binds allosteric site → changes enzyme shape (conformation) → reduces activity without competing.

Q93. Most active enzyme in gut after eating bread:

Correct Answer: A. Amylase

Bread = starch. Amylase (salivary and pancreatic) breaks starch → maltose → glucose in digestive tract.

Q94. Presented theory of origin of species by natural selection:

Correct Answer: D. Darwin

Charles Darwin, 'On the Origin of Species' (1859) — natural selection as the mechanism of evolution.

Q95. NOT a mode of action of antibody:

Correct Answer: C. Secreting cytokines

Cytokines are secreted by T-cells/macrophages, NOT antibodies. Antibodies: neutralize, precipitate, agglutinate, opsonize.

SECTION 3 — ENGLISH (Q.96–Q.112)

Q96. Choose correct punctuation:

Correct Answer: B. He had no worries; his pension was adequate and there was a little more saved up besides.

Semicolon correctly separates two independent clauses. Option B is correctly punctuated.

Q97. Correct: 'There Mr. Hashim whose they say is best portrait painter in town.'

Correct Answer: C. There's Mr. Hashim, who they say is the best portrait painter in the town.

'Who' (subject of relative clause) + comma for non-restrictive clause + 'There's' = correct.

Q98. A full description of the accidents _____ given in the report.

Correct Answer: C. Was

'A full description' is singular → singular verb 'was'. Prepositional phrase doesn't affect subject.

Q99. Ahmed _____ me for a long time.

Correct Answer: B. Have known

Present Perfect 'have known' — action started in past, continues to present. 'For a long time' = duration.

Q100. 'Ambidextrous' means:

Correct Answer: C. Uses both hands with same skill

Ambidextrous = able to use both hands equally well. From Latin 'ambi' (both) + 'dexter' (right hand).

Q101. 'Ghettos' means:

Correct Answer: B. Under privileged area

Ghetto = poor, overcrowded area where a minority group lives. Originally Jewish quarters in European cities.

Q102. My friend has a fine _____ of old stamps.

Correct Answer: D. Collection

'Collection' is the correct collective noun for stamps, coins, art. 'Bundle' = tied items.

Q103. Choose correct option about 'every one of the prisons':

Correct Answer: D. Every one of the prisons is full.

'Every one' = singular → 'is'. Prepositional phrase 'of the prisons' doesn't affect subject-verb agreement.

Q104. The Headmaster _____ to speak to you.

Correct Answer: A. Wants

'Wants' — stative verbs don't take continuous form. Simple present 'wants' is correct.

Q105. Knowledge and wisdom _____ no time for connection.

Correct Answer: A. Has

'Knowledge and wisdom' treated as a single concept → singular 'has'.

Q106. Each of the boys _____ to ride.

Correct Answer: A. Loves

'Each' always singular → 'loves'. Even followed by plural, 'each' takes singular verb.

Q107. Correctly structured sentence about Mr. Shan:

Correct Answer: B. Mr. Shan, together with his family, goes to England.

'Together with his family' is parenthetical (commas). Subject 'Mr. Shan' = singular → 'goes'.

Q108. Correct: 'The English man thinks he and his contry is the best.'

Correct Answer: B. The English man thinks that he and his country are the best.

'He and his country' = compound subject → plural 'are'. 'English' capitalized. 'That' introduces noun clause.

Q109. During electrolysis, reduction occurs at the:

Correct Answer: B. Cathode

RED CAT: Reduction at Cathode. AN OX: Anode = Oxidation. Always.

Q110. Hybridization of carbon in Ethene ($H_2C=CH_2$):

Correct Answer: B. sp^2

Ethene: each C forms double bond (σ + π). Uses sp^2 hybridization: 3 sp^2 orbitals + 1 unhybridized p for π.

Q111. Which molecule is polar?

Correct Answer: D. HCl

HCl is polar — different electronegativities of H and Cl create permanent dipole. CCl_4 and CO_2 are symmetric and nonpolar.

Q112. Electron affinity decreases down the group because:

Correct Answer: B. Atomic radius increases

Down the group, larger atomic radius → added electron further from nucleus → weaker attraction → lower electron affinity.

SECTION 4 — CHEMISTRY (Q.113-Q.152)

Q113. Which molecule is covalent in nature?

Correct Answer: C. $AlCl_3$

$AlCl_3$ has significant covalent character due to high charge density of Al^{3+} (Fajan's rules). Others are ionic.

Q114. Which property increases down group in alkali metals?

Correct Answer: B. Reactivity

Reactivity increases down alkali metal group — larger radius, easier to lose valence electron, lower ionization energy.

Q115. Solubility of alkaline earth metals:

Correct Answer: B. Increases down group

Alkaline earth metal hydroxide solubility increases down group: $Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$.

Q116. Geometric isomerism is exhibited by:

Correct Answer: D. Alkenes

Alkenes show cis-trans isomerism due to restricted rotation around C=C double bond.

Q117. Benzene from phenol by:

Correct Answer: B. Reduction with zinc

$C_6H_5OH + Zn \rightarrow C_6H_6 + ZnO$. Zinc removes the hydroxyl group at high temperature.

Q118. Lucas test identifies:

Correct Answer: B. Alcohols

Lucas test ($ZnCl_2$ + conc. HCl): 3° alcohol reacts immediately, 2° slowly, 1° unreactive. Distinguishes alcohol types.

Q119. Physical properties of phenol:

Correct Answer: A. Colorless, crystalline solid

Phenol = colorless crystalline solid at room temperature. MP = 40.5°C. Distinctive smell.

Q120. Cannizzaro's reaction given by:

Correct Answer: A. Formaldehyde

Cannizzaro reaction: disproportionation of aldehydes without alpha-H. Formaldehyde (HCHO) has no alpha-H.

Q121. Identification test for Ketone:

Correct Answer: C. Sodium Nitroprusside Test

Sodium nitroprusside (Legal's test) gives red color with ketones. Fehling's/Benedict's test for aldehydes.

Q122. Carboxylic acids are water soluble because:

Correct Answer: B. Have hydrogen bonding

COOH group forms H-bonds with water molecules through both C=O and O-H, making carboxylic acids water soluble.

Q123. Equation for ideal gas:

Correct Answer: C. P=nRT

PV = nRT. P=pressure, V=volume, n=moles, R=8.314 J/mol·K, T=temperature in Kelvin.

Q124. To prevent gas expansion when mass increases:

Correct Answer: A. Lower T & increase P

PV=nRT: to keep V constant when n increases, lower T or increase P (or both).

Q125. Which variable is constant in Charles's Law?

Correct Answer: C. Pressure

Charles's Law ($V \propto T$) holds PRESSURE constant: $V_1/T_1 = V_2/T_2$.

Q126. Molecule with highest rate of evaporation:

Correct Answer: A. Acetone

Acetone: weakest intermolecular forces, lowest BP (56°C), highest vapor pressure → fastest evaporation.

Q127. Specific heat of water:

Correct Answer: A. 4.18 J/g°C

Specific heat of water = 4.18 J/g°C. Highest of common substances — due to extensive H-bonding network.

Q128. Boiling point mostly raised by:

Correct Answer: D. Inter-molecular H-bonding

Intermolecular H-bonding requires more energy to overcome — significantly raises boiling point.

Q129. Ionic substance dissolves in water because:

Correct Answer: C. Water molecule is polar

Polar water molecules hydrate ions — orient around cations and anions, stabilizing them in solution.

Q130. Nature of diamond as solid:

Correct Answer: A. Covalent

Diamond = giant covalent solid. Each C bonded to 4 others by strong covalent bonds in tetrahedral lattice.

Q131. Light as feather, strong as iron:

Correct Answer: B. Graphene

Graphene = single graphite layer. Lightest yet strongest material — 200× stronger than steel.

Q132. pH of human blood:

Correct Answer: A. 7.35-7.45

Normal blood pH = 7.35-7.45 (slightly alkaline). Maintained by carbonate buffer system.

Q133. Proton number of ^{23}Na:

Correct Answer: B. 11

Atomic number of Na = 11 (proton number). Mass number 23 = 11 protons + 12 neutrons.

Q134. One mole of ethanol and ethane have equal:

Correct Answer: D. Number of molecules

1 mole of any substance = 6.022×10^{23} molecules (Avogadro's number) — same for both.

Q135. First step in determining Empirical Formula:

Correct Answer: B. Percentage composition

Step 1: find % composition by mass. Then divide by atomic mass to get mole ratios, simplify.

Q136. Moles of CO_2 containing 16g of oxygen:

Correct Answer: B. 0.5

Moles O = 16/16 = 1 mol O atoms. CO_2 has 2 O atoms → moles CO_2 = 1/2 = 0.5 mol.

Q137. Percentage of Carbon in CO_2:

Correct Answer: C. 27.27% C & 72.72% O

CO_2 M=44. C% = 12/44×100 = 27.27%. O% = 32/44×100 = 72.73%.

Q138. Maximum electrons in p subshell:

Correct Answer: C. 6

p subshell has 3 orbitals × 2 electrons each = 6 electrons maximum.

Q139. n+l rule: highest energy orbital:

Correct Answer: A. 4d

4d: n+l=6; 2p: 3; 2s: 2; 3s: 3. Highest n+l = highest energy. 4d wins.

Q140. Mass of electron compared to proton:

Correct Answer: B. 1836× less than proton

Proton mass = 1836 × electron mass. Electron is 1836 times LIGHTER than proton.

Q141. Shape of orbital determined by:

Correct Answer: B. l

Azimuthal quantum number l: l=0 (s=sphere), l=1 (p=dumbbell), l=2 (d=cloverleaf).

Q142. Degenerate orbitals explained by:

Correct Answer: C. Hund's Rule

Hund's rule: electrons fill degenerate orbitals singly with parallel spins before pairing.

Q143. Dissolved solute in equilibrium with undissolved — solution type:

Correct Answer: B. Saturated

Saturated solution: dynamic equilibrium between dissolved and undissolved solute. Cannot dissolve more.

Q144. Rate of reaction depends upon:

Correct Answer: D. Rate constant

Rate = $k[A]^n[B]^m$. Rate constant k is the fundamental parameter — depends on T and activation energy.

Q145. What is NOT TRUE about reaction rate?

Correct Answer: A. Concentration doesn't affect rate

Concentration DOES affect rate: Rate ∝ [reactant]^n. Option A is false. All other options are true.

Q146. Combustion is exothermic because:

Correct Answer: B. Energy in bond making > bond breaking

Exothermic: energy released in bond MAKING (CO_2, H_2O products) > energy absorbed in bond BREAKING.

Q147. One Calorie equivalent to:

Correct Answer: A. 4.184 J

1 thermochemical calorie = 4.184 J. Dietary Calorie (Cal) = 1 kcal = 4184 J.

Q148. Potential of Standard Hydrogen Electrode:

Correct Answer: D. Zero

SHE potential = 0.00 V by convention. All electrode potentials measured relative to it.

Q149. Which molecule is polar?

Correct Answer: D. HCl

HCl has permanent dipole due to electronegativity difference. Others are symmetric/nonpolar.

Q150. Solubility of alkaline earth metal hydroxides:

Correct Answer: B. Increases down group

$Ba(OH)_2$ > $Sr(OH)_2$ > $Ca(OH)_2$ > $Mg(OH)_2$. Solubility increases down group 2.

Q151. Specific heat of water:

Correct Answer: A. 4.18 J/g°C

4.18 J/g°C — highest of common substances. Essential for temperature regulation in biology and climate.

Q152. Highest energy orbital by n+l rule:

Correct Answer: A. 4d

4d: 4+2=6 (highest). 2p: 3. 2s: 2. 3s: 3. Highest n+l value = highest energy level.

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