CEE 2026

MBBS ENTRANCE MOCK TEST

180 EXTREMELY HARD & DEEP MCQs | MAT EXCLUDED

PCB section of the 200-mark CEE format • 3 hours • -0.25 for each wrong response

Name: _____ Roll No.: _____ Date: _____

Instructions: Select the single best response. Use careful conceptual reasoning; several distractors reflect common misconceptions.

Blueprint

Zoology 40 • Botany 40 • Chemistry 50 • Physics 50 (15 numerical + 35 conceptual)

CEE MCQ's & Sure Shots

ZOOLOGY

Questions 1-40

1. After selection, a population resumes random mating with recessive-allele frequency q=0.20 and no other evolutionary force. What heterozygote frequency is expected in the next zygotes?

A. 0.64
B. 0.32
C. 0.80
D. 0.04

2. Miller-Urey type synthesis supports chemical evolution but does not by itself demonstrate:

A. abiotic formation of organic monomers
B. the plausibility of prebiotic chemistry
C. energy-driven atmospheric reactions
D. self-replication and heredity in protocells

3. A trait improves survival before reproduction but reduces survival after reproduction. Natural selection will most directly favor it when:

A. its early reproductive gain exceeds its later cost
B. the trait is acquired during life
C. post-reproductive survival determines allele transmission
D. the population is very small only

4. An animal is triploblastic, bilaterally symmetrical, pseudocoelomate and unsegmented. Which comparison is most defensible?

A. It is more consistent with Aschelminthes than Platyhelminthes
B. It must be an annelid because it is triploblastic
C. It is necessarily diploblastic internally
D. It must possess a true coelom lined by mesoderm

5. Two organisms have radial adults, bilateral larvae and a water vascular system. Their shared larval symmetry most strongly suggests:

A. complete absence of evolutionary relationship
B. secondary radial symmetry in the adult lineage
C. loss of mesoderm during metamorphosis
D. classification with cnidarians solely by adult symmetry

6. Which feature best separates chordates from superficially fish-like non-chordates at some stage of life?

A. Bilateral symmetry
B. Segmented muscles alone
C. A complete digestive tract
D. A dorsal hollow nerve cord associated with a notochord

7. A specimen has jointed appendages, an open circulation and a chitinous exoskeleton. If gas exchange occurs through book lungs, the strongest placement is:

A. Crustacea
B. Arachnida
C. Insecta
D. Mollusca

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8. A tissue tolerates repeated stretching yet prevents urine from contacting underlying connective tissue. Its function depends chiefly on:

A. keratinized surface cells
B. ciliated pseudostratified cells
C. simple squamous cells with wide intercellular spaces
D. transitional epithelium with shape-changing superficial cells

9. After damage to a tendon, repair is slow compared with skin. Which tissue property best explains the difference?

A. Tendon lacks extracellular matrix
B. Skin contains no collagen
C. Tendon cells divide faster but migrate poorly
D. Dense regular collagen has limited vascularity and few cells

10. A gland releases product together with the apical part of its cells. Relative to merocrine secretion, this necessarily involves:

A. diffusion without vesicles
B. complete destruction of every secretory cell
C. loss of some cytoplasm during secretion
D. release only through ducts lined by muscle

11. Loss of myelin around a peripheral axon most directly reduces conduction speed because:

A. the axon loses all ion channels
B. synaptic transmitter cannot be synthesized in the cell body
C. saltatory propagation between nodes is impaired
D. action potentials can no longer change membrane voltage anywhere

12. In earthworm, closing nephridiopores while filtration continues would initially disturb:

A. locomotion by setae only
B. gas exchange through gills
C. intracellular digestion
D. nitrogenous waste removal and water balance

13. A cockroach is deprived of oxygen while its blood continues to circulate. Tissue hypoxia occurs mainly because:

A. tracheal delivery, not blood transport, supplies most tissues
B. haemolymph normally carries all oxygen
C. Malpighian tubules consume oxygen first
D. its heart stops whenever spiracles close

14. A frog remains submerged in cool, well-aerated water. Which change most supports continued respiration?

A. Exclusive positive-pressure lung ventilation
B. Dry keratinized skin
C. Moist vascular skin with reduced metabolic demand
D. Closure of all skin capillaries

15. In a bony fish, puncture of the swim bladder would most directly require greater muscular effort to:

A. excrete ammonia
B. maintain depth in water
C. oxygenate blood at gills
D. digest proteins

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16. A pigeon has efficient gas exchange during both inspiration and expiration chiefly because:

A. airflow through parabronchi is largely unidirectional
B. air sacs themselves are the principal exchange surface
C. oxygenated and deoxygenated air mix completely
D. lungs expand like mammalian alveoli

17. Compared with a frog, a rabbit sustains higher aerobic activity partly because its circulation:

A. uses skin as its only respiratory organ
B. separates pulmonary and systemic blood more completely
C. delivers blood without capillaries
D. has one atrium and one ventricle

18. A person hyperventilates before holding breath. The delay in urge to breathe is caused mainly by an initial fall in:

A. haemoglobin concentration
B. lung residual volume
C. blood nitrogen
D. arterial carbon dioxide and hydrogen ion drive

19. If afferent arteriolar resistance increases while other factors remain initially constant, the most likely immediate renal effect is:

A. lower glomerular pressure and lower filtration
B. unchanged filtration with higher urine glucose
C. complete loss of tubular reabsorption
D. higher glomerular pressure and higher filtration

20. A fall in plasma protein concentration, with capillary pressure unchanged, tends to cause edema because it:

A. reduces reabsorption of tissue fluid at the venous end
B. raises plasma oncotic pull
C. closes arterial capillaries
D. increases lymph protein synthesis

21. During vigorous exercise, increased CO_2 and temperature in muscle promote oxygen unloading through:

A. conversion of haemoglobin into plasma protein
B. closure of tissue capillaries
C. a left shift of the oxyhaemoglobin curve
D. a right shift and reduced haemoglobin affinity

22. If the sinoatrial node fails and an atrioventricular pacemaker takes over, which change is most likely?

A. A slower but coordinated rhythm
B. Higher normal heart rate
C. Immediate permanent ventricular tetany
D. No ventricular contraction is possible

23. A meal rich in fat reaches the duodenum. Which coordinated response is most appropriate?

A. Bile delivery plus pancreatic enzyme secretion
B. Less bile and less pancreatic lipase
C. Only salivary amylase secretion
D. Closure of the pylorus forever

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24. Damage restricted to pancreatic beta cells would initially produce:

A. loss of thyroxine secretion
B. increased ADH with dilute urine
C. reduced glucagon and persistent hypoglycaemia
D. reduced insulin and impaired cellular glucose uptake

25. A dehydrated person secretes more ADH. The most direct nephron response is:

A. reduced collecting-duct water permeability
B. complete inhibition of sodium reabsorption
C. increased collecting-duct water permeability and concentrated urine
D. increased glucose filtration only

26. When an impulse reaches a chemical synapse, removal of extracellular Ca2+ chiefly prevents:

A. myelin formation
B. axon depolarization everywhere
C. synaptic vesicle fusion and transmitter release
D. postsynaptic receptor synthesis

27. A lesion damages the dorsal root of a spinal nerve but spares the ventral root. Which deficit is expected in that segment?

A. Loss of sensory input with motor output relatively preserved
B. Enhanced sensory input and paralysis
C. Loss of both cerebral hemispheres
D. Loss of motor output only

28. A person moves suddenly from dim to bright light. The rapid reduction in retinal illumination results from:

A. lens flattening only
B. circular iris muscle contraction and pupil constriction
C. retinal detachment
D. radial muscle contraction and pupil dilation

29. If parathyroid hormone secretion falls markedly, which sequence is most consistent?

A. Urine becomes dilute because ADH rises
B. Blood Ca2+ falls and neuromuscular excitability may rise
C. Blood Ca2+ rises and neuromuscular excitability falls
D. Blood glucose falls because insulin disappears

30. Failure of negative feedback from thyroxine would most directly disrupt regulation of:

A. ADH action on kidney
B. gastrin action in stomach
C. insulin release after meals
D. TSH secretion from the pituitary

31. A man produces normal testosterone but sperm fail to mature because epididymal function is lost. Which conclusion follows?

A. Androgen production and sperm maturation are distinct functions
B. Testosterone is made only in epididymis
C. Fertilization normally occurs in seminiferous tubules
D. Spermatogenesis occurs in prostate

32. At ovulation, the secondary oocyte has completed:

A. meiosis I but not meiosis II
B. both meiotic divisions regardless of fertilization
C. mitosis only
D. no nuclear division since fetal life

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33. A bacterium survives penicillin exposure because it lacks the drug target. This resistance differs from vaccination because vaccination:

A. induces host adaptive immune memory
B. always gives immediate passive antibodies
C. acts directly on bacterial cell walls
D. cannot prevent infectious disease

34. A second exposure to the same antigen produces a faster, stronger response mainly due to:

A. reduced clonal selection
B. loss of all antibodies after first exposure
C. nonspecific skin barriers
D. memory lymphocytes formed after the first exposure

35. Antibiotics do not cure influenza primarily because influenza virus:

A. is larger than bacteria
B. uses host-cell machinery and lacks bacterial targets
C. is eliminated only by red cells
D. has a cell wall impermeable to all drugs

36. If helper T-cell numbers fall severely, both antibody and cell-mediated responses weaken because helper T cells:

A. form the skin barrier
B. coordinate activation of multiple immune cell types
C. carry oxygen to lymph nodes
D. directly secrete every antibody

37. PCR can detect a pathogen before antibodies appear because PCR amplifies:

A. host memory cells
B. whole bacterial colonies only
C. antigen-antibody precipitate
D. a specific nucleic-acid sequence

38. In DNA fingerprinting, two samples matching at many variable loci are more informative than matching at one locus because:

A. one locus contains the entire genome
B. all humans differ at every locus
C. each additional independent match reduces chance coincidence
D. matching proves the samples are from different people

39. Removal of a top predator causes herbivores to increase and plant biomass to decline. This is best interpreted as:

A. a trophic cascade
B. competitive exclusion among plants only
C. primary succession
D. nitrogen fixation

40. A small isolated population loses alleles after a random cyclone. The immediate process is:

A. adaptive radiation caused by mutation alone
B. directional selection for cyclone resistance
C. gene flow into the population
D. genetic drift through a bottleneck

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BOTANY

Questions 41-80

41. Heating an enzyme gradually reduces reaction rate even though substrate remains abundant. The best molecular explanation is:

A. substrate becomes an enzyme
B. active-site conformation is disrupted beyond an optimum
C. peptide bonds always hydrolyse at body temperature
D. activation energy becomes zero

42. A membrane phospholipid placed in water forms a bilayer because its molecules are:

A. covalently bonded to water
B. entirely hydrophobic
C. amphipathic, with opposing interactions of heads and tails
D. identical to cellulose

43. A photosynthetic prokaryote releases oxygen but has no membrane-bound organelles. It is most consistent with:

A. cyanobacteria
B. fungi
C. protozoa
D. bryophytes

44. A fungus obtains carbon from a living host and later produces resistant spores. Which observation best distinguishes it from a green plant?

A. Absorptive heterotrophy with chitinous wall
B. Multicellularity
C. Formation of spores
D. Presence of a cell wall

45. A bryophyte and a fern both require free water for fertilization, but the fern is taller chiefly because it possesses:

A. seeds and flowers
B. vascular tissues and a dominant sporophyte
C. a dominant gametophyte only
D. pollen tubes

46. Which evolutionary transition most reduced dependence of fertilization on external water?

A. Fragmentation in algae
B. Flagellated sperm in moss
C. Pollen formation in seed plants
D. Prothallus formation in fern

47. A gymnosperm seed differs from an angiosperm seed most fundamentally because gymnosperm ovules are:

A. produced inside fruits
B. not enclosed within an ovary
C. always dispersed by water
D. formed without meiosis

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48. A flower has parallel venation, fibrous roots and floral parts in threes. If secondary growth is absent, the combined evidence supports:

A. a bryophyte
B. a typical monocot
C. a typical dicot
D. a gymnosperm

49. Lichens colonize bare rock successfully because the association combines:

A. fungal mineral/water retention with photosynthetic carbon gain
B. two autotrophs competing for light
C. a root and mycorrhiza of a vascular plant
D. a virus and bacterium

50. In alternation of generations, meiosis directly produces:

A. gametes in all plants
B. a diploid zygote
C. haploid spores from diploid sporophyte cells
D. a multicellular sporophyte without mitosis

51. If archegonia are present but seeds are absent, the plant could belong to:

A. angiosperms only
B. bryophytes or pteridophytes
C. fungi only
D. cyanobacteria only

52. Two plant species use the same limiting mineral but different soil depths. Their coexistence is best explained by:

A. identical niches
B. absence of competition
C. resource partitioning
D. primary productivity being zero

53. Net primary productivity is lower than gross primary productivity because plants:

A. transfer all energy to herbivores
B. consume some fixed carbon in respiration
C. do not photosynthesize
D. convert energy completely into heat before fixation

54. During primary succession on lava, early colonizers facilitate later species mainly by:

A. forming soil and modifying microclimate
B. eliminating nutrient cycles
C. preventing weathering
D. removing all organic matter

55. Biomagnification predicts the highest concentration of a persistent lipid-soluble pesticide in:

A. decomposers regardless of food web
B. top consumers feeding through several trophic levels
C. soil water only
D. producers exposed briefly

56. A plant cell in concentrated salt solution loses turgor but its wall retains shape. The immediate event is:

A. rupture caused by turgor
B. active uptake of all salt
C. exosmosis and plasmolysis
D. endosmosis and deplasmolysis

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57. Blocking spindle formation during mitosis most directly prevents:

A. cell-wall synthesis in every phase
B. chromosome segregation to daughter nuclei
C. DNA replication in interphase
D. transcription permanently

58. A secretory plant cell makes large amounts of protein. Which pathway is most directly involved?

A. Rough ER to Golgi to vesicles
B. Smooth ER to centriole only
C. Nucleus to cell wall by diffusion of DNA
D. Chloroplast to vacuole without ribosomes

59. If mitochondrial inner membranes lose their proton gradient, the most direct consequence is reduced:

A. light absorption by chlorophyll
B. ATP synthesis by oxidative phosphorylation
C. DNA replication in nucleus
D. cellulose synthesis in wall

60. A cell doubles its DNA content but does not divide. Relative to G1, it is most consistent with:

A. G0 with no replication
B. post-S or G2 phase
C. a haploid gamete necessarily
D. late cytokinesis only

61. In AaBb × aabb, genes assort independently. Among offspring showing the dominant phenotype for A, the fraction also dominant for B is:

A. 1/2
B. 3/4
C. 1/4
D. 1

62. A testcross yields offspring in a 1:1 ratio of parental types with no recombinants. The most defensible inference is:

A. the two loci are completely linked in that cross
B. both genes are lethal
C. independent assortment produced only parentals
D. the tested individual is homozygous

63. A point mutation changes a codon but not its amino acid. This illustrates:

A. degeneracy of the genetic code
B. polyploidy
C. absence of translation
D. crossing over

64. A carrier female for an X-linked recessive trait mates with a normal male. Which child has the highest specified risk?

A. All sons: affected
B. Any daughter: 50% affected
C. Any son: 50% affected
D. All daughters: carriers

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65. Two tall pea plants produce a dwarf offspring. Assuming complete dominance, the parents must be:

A. tt and Tt
B. TT and Tt
C. Tt and Tt
D. TT and TT

66. Nondisjunction in meiosis I differs from meiosis II because meiosis I failure separates neither:

A. genes during transcription
B. centromeres during mitosis
C. homologous chromosomes
D. sister chromatids

67. A ring of bark is removed without damaging wood. Sugar accumulates above the ring while leaves initially remain hydrated. This demonstrates that:

A. phloem translocates organic solutes while xylem still carries water
B. both tissues were removed
C. transpiration stops immediately
D. xylem transports sugar downward

68. Secondary growth increases stem girth because vascular cambium produces:

A. primary xylem outward only
B. secondary xylem inward and secondary phloem outward
C. epidermis inward
D. cortex on both sides

69. A xerophyte with sunken stomata and thick cuticle primarily reduces:

A. water-vapour diffusion from moist internal surfaces
B. root pressure
C. CO_2 fixation to zero
D. mineral absorption by roots

70. Opening stomata requires guard cells to become turgid. Which change most directly promotes this?

A. Solute accumulation followed by water entry
B. Complete loss of guard-cell ions
C. Water leaving guard cells
D. Cell-wall digestion

71. A plant is transferred from humid to dry moving air with soil water initially adequate. Transpiration first rises because:

A. humidity inside leaves falls to zero
B. stomata necessarily close before transfer
C. xylem becomes impermeable
D. the water-vapour gradient and boundary-layer removal increase

72. If light intensity rises but CO_2 becomes limiting, the photosynthetic rate will:

A. increase indefinitely in direct proportion to light
B. equal respiration exactly
C. approach a plateau
D. become negative at all intensities

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73. A plant supplied nitrate but lacking magnesium develops chlorosis because magnesium is required chiefly for:

A. DNA base pairing only
B. stomatal pores
C. the chlorophyll molecule and enzyme function
D. cellulose monomers

74. Auxin from the shoot tip promotes phototropic bending because it redistributes toward the shaded side and:

A. inhibits all elongation there
B. moves only through xylem upward
C. promotes greater cell elongation there
D. destroys chloroplasts on lit side

75. During ascent of sap in a tall tree, the continuity of the water column depends most directly on:

A. cohesion among water molecules and tension from transpiration
B. root hairs pushing water to any height without loss
C. active pumping by every vessel element
D. phloem pressure only

76. Double fertilization produces a zygote and endosperm. The endosperm usually receives nuclei in the ratio:

A. two sperms plus one egg
B. one egg plus one synergid
C. two eggs plus one sperm
D. one sperm plus two polar nuclei

77. Removing anthers before dehiscence and then applying selected pollen is useful because it:

A. converts ovules into pollen
B. guarantees apomixis
C. prevents unwanted self-pollination while permitting controlled crossing
D. prevents fertilization completely

78. Micropropagation can produce many uniform plants rapidly because differentiated plant cells often retain:

A. absence of DNA
B. totipotency
C. permanent haploidy
D. obligate heterotrophy

79. Crop rotation with legumes can reduce nitrogen fertilizer need primarily through:

A. conversion of nitrate into atmospheric nitrogen only
B. elimination of all soil microbes
C. photosynthesis by roots
D. symbiotic biological nitrogen fixation

80. A genetically engineered insect-resistant crop reduces insecticide use, but resistance management is needed because:

A. all insects mutate only after spraying
B. the transgene disappears in one generation
C. natural selection cannot act on insects
D. selection can increase resistant insect genotypes

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CHEMISTRY

Questions 81-130

81. For $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$, an inert gas is added at constant volume. At unchanged temperature, which statement is correct?

A. Kp increases
B. Equilibrium shifts right because total pressure rises
C. Equilibrium shifts left because mole fraction falls
D. Equilibrium composition is unchanged because reacting partial pressures are unchanged

82. A spontaneous process has $\Delta H>0$. Which condition must make spontaneity possible?

A. Entropy of surroundings alone must rise while universe entropy falls
B. $\Delta S<0$ at all temperatures
C. $T\Delta S>\Delta H$ with $\Delta S>0$
D. $\Delta G>0$

83. Equal masses of two ideal gases at the same temperature have rms speeds in ratio 2:1. Their molar masses are in ratio:

A. 2:1
B. 1:2
C. 1:4
D. 4:1

84. A weak acid HA is half-neutralized by strong base. Neglecting activity effects, which relation holds?

A. pH=pKa because [HA]=[A−]
B. Ka=0
C. pH=7 always
D. [H+]=initial acid concentration

85. For a first-order reaction, doubling initial concentration while keeping temperature constant changes the half-life to:

A. four times
B. unchanged
C. twice
D. half

86. A catalyst speeds both forward and reverse reactions because it:

A. lowers activation barriers for both directions
B. makes an endothermic reaction exothermic
C. changes $\Delta G°$
D. increases equilibrium constant

87. A gas expands freely into vacuum in an insulated vessel. For an ideal gas, which set is correct?

A. $q=0, w<0, \Delta T>0$
B. $q>0, w<0, \Delta U=0$
C. $q=0, w=0, \Delta U=0$
D. $q<0, w=0, \Delta U<0$

88. In a galvanic cell, increasing the concentration of oxidized species in the reduction half-cell generally:

A. lowers its reduction potential by Nernst equation
B. reverses electron flow in every case
C. leaves potential necessarily zero
D. raises its reduction potential

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89. Two solutions have pH 3 and pH 5. The first has, ideally:

A. 100 times the [H+]
B. 2 times the [H+]
C. the same [H+]
D. 1/100 the [H+]

90. At equilibrium, ΔG for the reaction as written is zero, while ΔG° may be nonzero because:

A. all concentrations equal unity
B. forward and reverse activation energies vanish
C. Q has adjusted so $\Delta G^\circ + RT \ln Q = 0$
D. standard free energy never relates to K

91. A saturated solution of a sparingly soluble salt receives a common ion. Precipitation occurs when:

A. ionic product exceeds Ksp
B. ionic product falls below Ksp
C. temperature alone is unchanged
D. Ksp becomes zero

92. Real gases approach ideal behavior most closely at:

A. critical point only
B. high pressure and low temperature
C. low volume with strong attraction
D. low pressure and high temperature

93. For an exothermic equilibrium, raising temperature causes:

A. activation energy to become negative
B. K to decrease as equilibrium favors reactants
C. K to increase because collisions increase
D. K to remain constant at all temperatures

94. A solution freezes below the pure solvent. For equal molalities, the greatest ideal depression is produced by:

A. urea
B. glucose
C. ethanol
D. NaCl (complete dissociation)

95. In electrolysis of aqueous $CuSO_4$ using inert electrodes, Cu deposits preferentially at the cathode because:

A. the cathode oxidizes Cu^{2+}
B. copper atoms are negatively charged
C. sulfate is reduced first
D. Cu^{2+} reduction is favored over water reduction under the stated conditions

96. The slope of ln k versus 1/T is negative. Its magnitude is proportional to:

A. collision frequency independent of temperature
B. activation energy
C. equilibrium concentration
D. reaction enthalpy only

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97. When equal volumes of 0.10 M strong acid and 0.10 M strong base are mixed at 25°C, the final pH is near 7 because:

A. H+ and OH− react stoichiometrically to water
B. both remain at 0.05 M
C. the acid becomes weak
D. pH values are averaged arithmetically

98. The first ionization energy of oxygen is lower than nitrogen despite greater nuclear charge mainly because oxygen has:

A. paired-electron repulsion in a 2p orbital
B. a larger principal shell
C. no shielding
D. a filled 2p subshell

99. Across a period, oxide character generally changes from basic to acidic because:

A. metallic character decreases and electronegativity increases
B. atomic size always increases
C. all oxides become ionic
D. oxidation states become zero

100. $AlCl_3$ behaves as a Lewis acid because aluminium:

A. can accept an electron pair into an incomplete valence shell
B. releases H+ from every solvent
C. donates a lone pair
D. has a filled octet in the monomer

101. NH_3 has a higher boiling point than PH_3 chiefly because NH_3 molecules exhibit:

A. stronger hydrogen bonding
B. ionic bonding
C. greater molar mass
D. metallic bonding

102. Chlorine disproportionates in cold dilute alkali. This means chlorine is:

A. only reduced
B. neither oxidized nor reduced
C. only oxidized
D. simultaneously oxidized and reduced

103. Transition metals commonly show variable oxidation states because:

A. their nuclei change charge in reactions
B. they lack d electrons entirely
C. their ns and (n−1)d energies are comparable
D. all their compounds are covalent

104. Aqueous Cu^{2+} is colored whereas Zn^{2+} is usually colorless because Cu^{2+} has:

A. a completely filled d subshell like Zn^{2+}
B. no d electrons
C. partially filled d orbitals permitting d-level transitions
D. only s-s transitions in visible light

105. Amphoteric Al_2O_3 reacts with both acid and strong base. The best interpretation is that it can:

A. act solely as neutral oxide
B. only release oxygen gas
C. change aluminium atomic number
D. behave as basic oxide toward acid and acidic oxide toward base

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106. Among halide ions, reducing power in aqueous solution generally increases down the group because:

A. ionic radius decreases
B. larger ions lose electrons more readily despite hydration effects
C. all bond energies increase uniformly
D. electron affinity becomes infinitely large

107. Temporary hardness is removed by boiling because bicarbonates decompose to:

A. metal atoms
B. insoluble carbonates with CO_2 and water
C. nitrates
D. soluble chlorides

108. 2-methylpropene reacts with HBr without peroxide. The major product follows Markovnikov addition because:

A. the double bond remains unchanged
B. the more stable tertiary carbocation pathway is favored
C. Br+ attacks the less substituted carbon first
D. a primary radical is mandatory

109. Which reagent sequence most directly converts a primary alcohol to a carboxylic acid without changing carbon number?

A. Hydrogenation over Ni
B. Mild dehydration only
C. Aqueous base only
D. Strong oxidation under reflux

110. Phenol is more acidic than cyclohexanol chiefly because:

A. phenol has no O-H bond
B. cyclohexanol is aromatic
C. phenoxide concentrates charge on carbon only
D. phenoxide ion is resonance stabilized

111. An aldehyde and a ketone have the same molecular formula. Tollens reagent distinguishes them because aldehydes:

A. cannot contain carbonyl groups
B. undergo only reduction
C. are always aromatic
D. are more readily oxidized under mild conditions

112. Hydrolysis of an ester in alkali is effectively driven forward because the carboxylic acid product:

A. becomes an alkane
B. immediately reforms ester quantitatively
C. produces no alcohol
D. forms a resonance-stabilized carboxylate salt

113. Benzene undergoes substitution rather than ordinary addition mainly because addition would:

A. retain all six π electrons unchanged
B. make every carbon sp hybridized
C. destroy aromatic stabilization
D. increase resonance

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114. Which pair represents functional isomers?

A. Ethane and ethene
B. Ethanol and dimethyl ether
C. Propan-1-ol and propan-2-ol
D. cis- and trans-but-2-ene

115. A compound rotates plane-polarized light only when the sample contains:

A. a net excess of one enantiomer
B. equal enantiomers
C. only constitutional isomers
D. a carbonyl group necessarily

116. During SN1 substitution of a tertiary halide, rate depends mainly on:

A. both nucleophile and halide equally in one step
B. product concentration
C. halide concentration alone in the rate-determining ionization
D. nucleophile concentration only

117. A primary alkyl halide with a strong nucleophile favors SN2 because:

A. steric crowding accelerates attack
B. backside attack can occur with low steric hindrance
C. a primary carbocation is highly stable
D. reaction proceeds through two carbocations

118. Dehydration of butan-2-ol can yield more than one alkene. The major product is generally the:

A. more substituted, more stable alkene
B. alcohol with more water
C. product formed by carbon-chain cleavage only
D. least substituted alkane

119. Ethanal reacts with HCN to give a cyanohydrin. The carbonyl carbon is attacked because it is:

A. strongly nucleophilic
B. electron deficient due to C=O polarization
C. negatively charged in the reactant
D. aromatic

120. Aniline is less basic than ethylamine because the nitrogen lone pair in aniline is:

A. held by hydrogen only
B. converted into a σ bond with oxygen
C. delocalized into the benzene ring
D. absent

121. A peptide bond forms through condensation between:

A. amino and carboxyl groups with loss of water
B. two phosphate groups
C. an aldehyde and alkane only
D. two hydrocarbon groups with gain of oxygen

122. Glucose gives a positive reducing-sugar test despite being predominantly cyclic because:

A. it contains a ketone only and never opens
B. the test hydrolyses it to methane
C. all alcohols reduce Cu2+ identically
D. its ring can equilibrate with an open-chain aldehyde form

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123. Addition polymerization of ethene changes each monomer primarily by:

A. eliminating CO_2 from every unit
B. opening the π bond to form new σ bonds in a chain
C. retaining isolated C=C bonds in each repeat unit
D. forming peptide bonds

124. A compound C_3H_6O is oxidized by Tollens reagent and reduced to a primary alcohol. It is most consistent with:

A. propanoic acid
B. propan-2-ol
C. propanone
D. propanal

125. Soap cleans oily dirt poorly in hard water chiefly because Ca^{2+} and Mg^{2+}:

A. increase soap solubility indefinitely
B. oxidize water into oxygen
C. form insoluble salts with fatty-acid anions
D. convert oil to glucose

126. Ozone depletion by chlorofluorocarbons is catalytic because a chlorine radical:

A. adds ozone to make more ozone
B. acts only as greenhouse gas without reaction
C. is regenerated while converting ozone to oxygen
D. is permanently consumed in the first step

127. In Haber manufacture, high pressure favors ammonia yield, but moderate temperature is used as a compromise between:

A. atomic number and isotope abundance
B. electrode mass and charge
C. pH and solubility only
D. equilibrium yield and reaction rate

128. In acid-base titration, an indicator should be chosen so its transition range lies:

A. within the steep pH change near equivalence
B. outside every attainable pH
C. exactly at pH 7 for all titrations
D. at the initial pH only

129. Repeated measurements are tightly clustered but far from the accepted value. They are:

A. neither measurable nor reproducible
B. both accurate and precise
C. precise but inaccurate
D. accurate but imprecise

130. A precipitate is washed before gravimetric weighing mainly to:

A. add indicator color
B. remove soluble adhering impurities without dissolving appreciable precipitate
C. increase its unknown composition
D. convert it completely to filtrate

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PHYSICS

Questions 131-180

131. **[Numerical]** A block slides from rest down a frictionless height h, crosses a rough horizontal patch of length L (coefficient μ), then rises frictionlessly. If μL<h, its greatest final height is:

A. h+μL
B. μh/L
C. h−μL
D. h(1−μ)

132. Two projectiles are launched with equal speed at complementary angles. Ignoring air resistance, they have equal range. Which comparison is correct?

A. The larger-angle projectile has greater height and longer flight time
B. The smaller-angle projectile has greater height but shorter time
C. Their velocity vectors are identical at every instant
D. Equal maximum height and flight time

133. **[Numerical]** A 2 kg body moving at 6 m/s sticks to a 1 kg body at rest. The fraction of initial kinetic energy lost is:

A. 3/4
B. 1/2
C. 2/3
D. 1/3

134. A satellite in a circular orbit is moved instantaneously to a larger circular orbit. Compared with the original orbit, its speed and total mechanical energy respectively:

A. increase; become less negative
B. decrease; become more negative
C. decrease; become less negative
D. increase; become more negative

135. **[Numerical]** A car travels half a distance at speed v and the other half at 2v. Its average speed is:

A. √2v
B. 4v/3
C. 3v/2
D. 5v/4

136. A rigid body has zero net external force but a nonzero net external torque about its centre of mass. It can have:

A. zero angular acceleration necessarily
B. neither translation nor rotation
C. constant linear momentum and changing angular momentum
D. changing linear momentum and constant angular momentum

137. A ball is thrown vertically upward inside a lift accelerating upward. Relative to the lift, and ignoring air resistance, the ball has:

A. downward acceleration g+a
B. downward acceleration smaller than g
C. zero acceleration at the top
D. upward acceleration a

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138. **[Numerical]** A uniform rod of length 2 m pivots about one end. A 6 N force perpendicular to the rod at its centre balances a perpendicular force F at the far end. F equals:

A. 1.5 N
B. 12 N
C. 6 N
D. 3 N

139. For uniform circular motion, work done by the centripetal force over any interval is zero because the force is:

A. opposite to velocity
B. perpendicular to instantaneous displacement
C. constant in direction
D. zero

140. A spring is cut into two equal lengths. Each half, made of the same material and coil geometry, has spring constant approximately:

A. 4k
B. k/2
C. k
D. 2k

141. An ideal gas undergoes a complete cycle. Which quantity must be zero over the cycle?

A. Net work done
B. Net heat absorbed
C. Change in internal energy
D. Area enclosed on a P-V diagram

142. A metal ring is heated uniformly. Its central hole:

A. expands as if the missing material also expanded
B. remains unchanged
C. contracts because material expands inward
D. first closes and then opens

143. **[Numerical]** Equal heat is supplied to 100 g water and 100 g copper. Taking $c_{water}=4200$ and $c_{copper}=400$ J kg−1 K−1, the ratio $\Delta T_{copper}/\Delta T_{water}$ is:

A. 1
B. 0.095
C. 42
D. 10.5

144. During isothermal expansion of an ideal gas, its internal energy remains constant because internal energy depends only on:

A. temperature
B. pressure
C. volume
D. work

145. A refrigerator cannot transfer heat from cold to hot without external work because that would violate the:

A. conservation of charge
B. second law of thermodynamics
C. law of gravitation
D. zeroth law only

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146. **[Numerical]** An engine absorbs 600 J and rejects 360 J per cycle. Its efficiency is:

A. 1.67
B. 0.60
C. 0.24
D. 0.40

147. At the same temperature, molecules of H2 and O2 have equal average translational kinetic energy, but H2 has:

A. zero momentum always
B. higher rms speed
C. the same rms speed
D. lower rms speed

148. A wave travels from a light string into a heavier string under equal tension. At the boundary its frequency:

A. decreases
B. becomes zero
C. remains fixed by the source
D. increases

149. **[Numerical]** A pipe closed at one end has fundamental frequency v/4L. If its length doubles with v unchanged, the new fundamental is:

A. v/16L
B. v/2L
C. v/8L
D. v/4L

150. Two coherent equal-amplitude waves arrive π radians out of phase. Their resultant intensity ideally is:

A. four times one wave
B. zero
C. equal to one wave
D. twice one wave

151. **[Numerical]** A convex lens forms a real image twice the object size. If focal length is 10 cm, the object distance is:

A. 5 cm
B. 30 cm
C. 15 cm
D. 10 cm

152. When light passes from air to glass, which pair remains unchanged?

A. Frequency and phase velocity
B. Speed and wavelength
C. Wavelength and speed
D. Frequency and color as set by frequency

153. A myopic eye is corrected with a concave lens because the lens:

A. increases focal power of the eye
B. converges rays more strongly
C. diverges incoming rays so the eye focuses them on retina
D. moves retina forward

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154. In Young double-slit interference, increasing slit separation while other quantities remain fixed causes fringe width to:

A. decrease
B. become wavelength independent
C. remain constant
D. increase

155. Total internal reflection occurs only when light travels:

A. from vacuum to glass normally
B. from denser to rarer with incidence above critical angle
C. through a thin lens
D. from rarer to denser at any angle

156. Two resistors R and 2R are in parallel across a battery. The ratio of powers PR:P2R is:

A. 1:2
B. 1:4
C. 4:1
D. 2:1

157. [Numerical] A cell of emf 12 V and internal resistance 1 Ω supplies 5 Ω. The terminal voltage is:

A. 14 V
B. 10 V
C. 12 V
D. 2 V

158. [Numerical] A wire is stretched to twice its length without volume change. If resistivity is unchanged, its resistance becomes:

A. 4R
B. R
C. R/2
D. 2R

159. Kirchhoff junction rule follows directly from conservation of:

A. energy
B. magnetic flux
C. charge
D. momentum

160. A charged particle moves parallel to a uniform magnetic field. Its magnetic force is:

A. qvB
B. zero
C. qvB/2
D. dependent only on mass

161. Two long parallel wires carry currents in the same direction. They:

A. exert no force
B. alternate attraction and repulsion
C. repel
D. attract

162. [Numerical] A 2 Ω and 4 Ω resistor are in series across 12 V. Power in the 4 Ω resistor is:

A. 8 W
B. 16 W
C. 4 W
D. 24 W

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163. Lenz law states that induced current opposes:

A. the magnetic field itself in every case
B. electric current in the source always
C. the change in magnetic flux producing it
D. motion regardless of flux change

164. A transformer cannot operate with steady DC because steady DC produces:

A. a changing flux of constant rate
B. no continuously changing magnetic flux
C. infinite secondary voltage
D. zero primary current

165. Inside a conductor in electrostatic equilibrium, the electric field is zero because free charges:

A. cease to exist
B. become neutrons
C. are all at the centre
D. redistribute until their field cancels the internal applied field

166. **[Numerical]** Two identical capacitors C are first connected in parallel and then in series. The ratio Ceq(parallel):Ceq(series) is:

A. 1:4
B. 4:1
C. 2:1
D. 1:1

167. A dielectric is inserted into an isolated charged capacitor. Which pair decreases?

A. Capacitance and charge
B. Charge and capacitance
C. Capacitance and electric permittivity
D. Potential difference and stored energy

168. Electric potential can be nonzero where electric field is zero, as illustrated by:

A. a point on an electric field line
B. every point near a single charge
C. the surface of an uncharged conductor only
D. the centre of a uniformly charged spherical shell

169. Light of frequency below the threshold strikes a metal with arbitrarily high intensity. Photoelectrons are absent because:

A. total energy is always zero
B. intensity lowers work function to infinity
C. electrons require momentum but photons have none
D. each photon lacks sufficient energy

170. **[Numerical]** For a radioactive sample with half-life 6 h, the fraction remaining after 18 h is:

A. 1/6
B. 1/18
C. 1/8
D. 1/3

171. In Bohr model, an electron moving from n=3 to n=2 emits a photon whose energy equals:

A. E3+E2
B. E3−E2 in magnitude
C. E2−E3 with negative photon energy
D. the ionization energy from n=1

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172. An electron and a proton have equal de Broglie wavelength. They must have equal:

A. speed
B. mass
C. momentum magnitude
D. kinetic energy

173. A p-n junction under forward bias has reduced barrier potential, so its current:

A. decreases below reverse saturation current
B. remains exactly zero
C. flows without charge carriers
D. increases strongly after threshold

174. An intrinsic semiconductor is warmed. Its conductivity generally:

A. decreases because all electrons stop
B. increases because more electron-hole pairs are generated
C. remains exactly constant
D. becomes superconducting

175. A NAND gate output is 0 only when inputs are:

A. 1,0
B. 0,0
C. 1,1
D. 0,1

176. **[Numerical]** A nucleus has mass defect 0.20 u. Using 1 u≈931 MeV/c^2, its binding energy is approximately:

A. 46.6 MeV
B. 931 MeV
C. 93.1 MeV
D. 186 MeV

177. In β− decay, conservation laws require emission of an electron and:

A. a neutrino with zero role
B. a proton only
C. an antineutrino
D. an alpha particle

178. **[Numerical]** A galaxy recedes at 1400 km/s. If H0=70 km s−1 Mpc−1, its estimated distance is:

A. 10 Mpc
B. 98 Mpc
C. 70 Mpc
D. 20 Mpc

179. Gamma rays differ from alpha particles because gamma rays:

A. are stopped more easily by paper than alpha rays
B. are electrons from nucleus
C. are neutral electromagnetic radiation with high penetration
D. carry charge +2e and mass 4 u

180. In the photoelectric effect, raising light frequency above threshold at fixed intensity primarily increases:

A. maximum kinetic energy of emitted electrons
B. number of photons necessarily without limit
C. work function of metal
D. threshold frequency

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ANSWER KEY

Independently checked single-best responses. Physics numerical items are marked N.

1	2	3	4	5	6	7	8	9	10
1. B	2. D	3. A	4. A	5. B	6. D	7. B	8. D	9. D	10. C
11. C	12. D	13. A	14. C	15. B	16. A	17. B	18. D	19. A	20. A
21. D	22. A	23. A	24. D	25. C	26. C	27. A	28. B	29. B	30. D
31. A	32. A	33. A	34. D	35. B	36. B	37. D	38. C	39. A	40. D
41. B	42. C	43. A	44. A	45. B	46. C	47. B	48. B	49. A	50. C
51. B	52. C	53. B	54. A	55. B	56. C	57. B	58. A	59. B	60. B
61. A	62. A	63. A	64. C	65. C	66. C	67. A	68. B	69. A	70. A
71. D	72. C	73. C	74. C	75. A	76. D	77. C	78. B	79. D	80. D
81. D	82. C	83. C	84. A	85. B	86. A	87. C	88. D	89. A	90. C
91. A	92. D	93. B	94. D	95. D	96. B	97. A	98. A	99. A	100. A
101. A	102. D	103. C	104. C	105. D	106. B	107. B	108. B	109. D	110. D
111. D	112. D	113. C	114. B	115. A	116. C	117. B	118. A	119. B	120. C
121. A	122. D	123. B	124. D	125. C	126. C	127. D	128. A	129. C	130. B
131. C (N)	132. A	133. D (N)	134. C	135. B (N)	136. C	137. A	138. D (N)	139. B	140. D
141. C	142. A	143. D (N)	144. A	145. B	146. D (N)	147. B	148. C	149. C (N)	150. B
151. C (N)	152. D	153. C	154. A	155. B	156. D	157. B (N)	158. A (N)	159. C	160. B
161. D	162. B (N)	163. C	164. B	165. D	166. B (N)	167. D	168. D	169. D	170. C (N)
171. B	172. C	173. D	174. B	175. C	176. D (N)	177. C	178. D (N)	179. C	180. A

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