

BIOLOGY:

- ICVCN is an abbreviated form of:
 - International Code of Virus Nomenclature
 - International Code for Virulence Nomenclature
 - International Code of Viral Classification and Nomenclature
 - International Code of Valuation in Nomenclature
- Growth, development and functioning of living body is due to:
 - Order
 - Homeostasis
 - Metabolism
 - Adaptation
- The term "New systematics" was introduced by:
 - Bentham and Hooker
 - Linnaeus
 - Julian Huxley
 - A.P. de Condolle
- Given below is the botanical name of mango. Mark the option in which the name is correctly written.
 - Magnifera Indica
 - Mangifera indica
 - Mangifera Indica*
 - Mangifera indica*
- The basic unit of classification is:
 - Genus
 - Species
 - Order
 - All of these
- Match column-I with column-II and select the correct answer using the codes given below.

Column-I	Column-II
A. Growth	I. Production of offspring
B. Reproduction	II. Composed of one or more cells
C. Metabolism	III. Increase in mass and increase in number of individuals
D. Cellular organisation	IV. Sum total of all chemical reactions occurring in body

 - A – I; B – II; C – III; D – IV
 - A – III; B – I; C – II; D – IV
 - A – III; B – I; C – IV; D – II
 - A – II; B – IV; C – III; D – I
- Mark the odd one in the following.
 - Family
 - Class
 - Taxon
 - Phylum
- An important criterion for modern day classification is:
 - Resemblances in morphology
 - Anatomical and physiological traits
 - Breeding habits
 - Presence or absence of notochord
- Which of the following statements are true?
 - Genus comprises a group of related species.
 - Taxon does not represents a taxonomic group of individual organisms.
 - Family comprises a group of related genera.
 - Taxonomic category class includes related orders.
 - (i), (ii), and (iv)
 - (ii) and (iv)
 - (i), (iii) and (iv)
 - (ii), (iii) and (iv)
- Select the true statement for reproduction.
 - It is not an all-exclusive defining characteristic of living organisms.
 - It is not an all-inclusive defining characteristic of living organisms.
 - It is an all-inclusive defining characteristic of plants and fungi only.
 - Photoperiod affects reproduction in seasonal plant breeders only.
 - Photoperiod affects reproduction in seasonal breeders both plants and animals.
 - Photoperiod has no role in reproduction.
 - (ii) and (v)
 - (iii) and (iv)
 - (iv) and (vi)
 - All of these
- Which of the following taxonomic category of housefly is incorrectly matched?
 - Genus – *Musca*
 - Family – Muscidae
 - Order – Primata
 - Class – Insecta
- Phenetic classification is based on:
 - sexual characteristics.
 - the ancestral lineage of existing organisms.
 - observable characteristics of existing organisms.
 - dendograms based on DNA characteristics.
- Artificial system of classification was first used by:
 - Linnaeus
 - De Candolle
 - Pliny the Edler
 - Bentham and Hooker

14. Who is the father of biology?
 (a) Hippocrates
 (b) Theophrastus
 (c) Aristotle
 (d) Darwin
15. Which of the following subdivisions deals with fossils?
 (a) Ecology
 (b) Ornithology
 (c) Ethology
 (d) Palaeontology
16. Which of the following shows the correct example of taxonomic category - Genus?
 (a) Potato, tomato and brinjal belong to *Solanum*.
 (b) Monkey, gorilla and gibbon are placed in Mammalia.
 (c) *Solanum*, *Petunia*, and *Datura* are placed in Solanaceae.
 (d) *Mangifera indica*, *Solanum tuberosum*, and *Panthera leo*.
17. Who developed the 'key' for identification of animals?
 (a) Goethe (b) John Ray
 (c) Theophrastus (d) George curier
18. An animal with same generic, specific and subspecific names is:
 (a) Man (b) Gorilla
 (c) Rabbit (d) Elephant
19. Group of organisms that closely resemble each other and freely interbreed in nature, constitute a:
 (1) Species (2) Genus
 (3) Family (4) Taxon
20. The term taxon refers to:
 (1) Name of a species (2) Name of genus
 (3) Name of family (4) A taxonomic group of any rank
21. Plant nomenclature means:
 (1) To give names to plants without any rules
 (2) Nomenclature of plants under the international rules
 (3) Nomenclature of plants in local language
 (4) Nomenclature of plants in English language
22. Scientific name of Mango plant is *Mangifera indica* Linn. in the above name Linn. refers to:
 (1) Variety of Mango
 (2) A taxonomist who proposed the present nomenclature in honour of linnaeus
 (3) A scientist who for the first time described Mango plant
 (4) A scientist who changed the name proposed by Linnaeus and proposed present name
23. Biological concept of species is given by:
 (1) Aristotle (2) Bentham
 (3) Koch (4) Mayr
24. For higher plants, flowers are chiefly used as a basis of classification, because:
 (1) These show a great variety in colour
 (2) It can be preserved easily
 (3) Reproductive parts are more conservative than vegetative parts
 (4) None of these
25. The standard size of herbarium sheets is:
 (1) 11.5" × 16.5" (2) 15.5" × 16.5"
 (3) 18.5" × 10.5" (4) 20.5" × 21.5"
26. Trinomial nomenclature of classification was proposed by:
 (1) Linnaeus (2) Huxley and Stricklandt
 (3) John. Ray (4) Theophrastus
27. Evolutionary classification is called:
 (1) Artificial system (2) Natural system
 (3) Phylogenetic system (4) None of the above
28. According to Whittaker, BGA are included in:
 (1) Mycota (2) Protista
 (3) Plantae (4) Monera
29. "Genera Plantarum" was written by:
 (1) Engler and Prantal (2) Hutchinson
 (3) Bentham & Hooker (4) Bessey
30. Kingdom Monera comprises the:
 (1) Plants of economic importance
 (2) All the plants studied in botany
 (3) Prokaryotic organisms
 (4) Plants of Thallophyta group

31. System of classification proposed by Linnaeus was:

- (1) Artificial (2) Natural
(3) Sexual (4) (1) and (3) both

32. In Whittaker's five kingdom classification, eukaryotes were assigned to:

- (1) All the five kingdom
(2) Only four of the five kingdoms
(3) Only three kingdom
(4) Only one kingdom

33. "Theorie elementaire de la botanique" is the book of:

- (1) Takhtajan (2) De Candolle
(3) Eichler (4) Linnaeus

34. The word Cryptogamia was coined by:

- (1) Theophrastus (2) Linnaeus
(3) Bentham & Hooker (4) John.Ray

35. According to Whittaker kingdom protista includes:

- (1) Prokaryotes
(2) Unicellular eukaryotes
(3) Slime molds & protozoa
(4) Multicellular & eukaryotes

36. An organism having cytoplasm, DNA and but no cell wall is:

- (a) Cyanobacterium (b) Mycoplasma
(c) Bacterium (d) Virus

37. During the evolution of eukaryotes from prokaryotes, which of the following did not occur?

- (a) Infolding of the flexible cell membrane.
(b) Loss of the cell wall.
(c) A switch from aerobic to anaerobic metabolism.
(d) Endosymbiosis of once free-living prokaryotes.

38. Which of the following facts differentiates the plant virus from other viruses?

- (a) DNA is the genetic material
(b) Obligate parasites
(c) RNA is the genetic material
(d) Nucleo-protein nature

39. Pseudomycelium is a characteristic feature of:

- (a) Mushroom (b) *Mucor*
(c) Bread mould (d) Yeast

40. Match column-I with column-II and select the correct answer using the codes given below.

Column-I (Fungus name)	Column-II (Commonly called)
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A. <i>Puccinia</i>	I. Yeast
B. <i>Ustilago</i>	II. Mushroom
C. <i>Agaricus</i>	III. Smut fungus
D. <i>Saccharomyces</i>	IV. Rust fungus

- (a) A – I; B – II; C – III; D – IV
(b) A – II; B – III; C – IV; D – I
(c) A – III; B – IV; C – I; D – II
(d) A – IV; B – III; C – II; D – I

41. Locomotory structures are absent in:

- (a) Sporozoans
(b) Ciliates
(c) Zooflagellates
(d) Rhizopods

42. How many kingdoms contain eukaryotes in five kingdom system of classification of R.H Whittaker?

- (a) Four kingdoms (b) One kingdom
(c) Two kingdoms (d) Three kingdoms

43. Litmus is obtained from:

- (a) Lichen (b) Algae
(c) Fungi (d) Protozoa

44. Read the given statements and answer the question.

- (i) It includes unicellular as well as multicellular fungi.
(ii) In multicellular forms, hyphae are branched and septate.
(iii) Conidiophore produces conidia (spores) exogenously in chain.
(iv) Sexual spores are ascospores produced endogenously in chain.
(v) Fruiting body is called ascocarp.

Identify the correct class of fungi which have all the above given characteristics.

- (a) Phycomycetes
(b) Sac fungi
(c) Club fungi
(d) Fungi imperfecti

45. Members of Phycmycetes are found:
- in aquatic habitats
 - on decaying wood
 - in moist and damp places
 - as obligate parasite on plants
- Which of the statements given above are correct?
- (i) and (ii)
 - (ii), (iii) and (iv)
 - (i), (ii) and (iii)
 - (i), (ii), (iii) and (iv)
46. Which of the following combinations of characters is true for slime moulds?
- Parasitic, plasmodium with true walls, spores dispersed by air currents.
 - Saprophytic, plasmodium without walls, spores dispersed by water.
 - Parasitic, plasmodium without walls, spores dispersed by water.
 - Saprophytic, plasmodium without walls, spores dispersed by air currents.
47. Which bacteria would function best in hot temperatures (45 – 60°C)?
- Psychrophiles
 - Thermophiles
 - Mesophiles
 - All would do equally well
48. In manufacturing of bread, it becomes porous due to release of CO₂ by the action of :
- Virus
 - Yeast
 - Bacteria
 - Protozoans
49. Match column-I with column-II and select the correct answer using the codes given below.
- | Column-I
(Group protista) | Column-II
(Example) |
|------------------------------|------------------------|
| A. Chrysophytes | I. <i>Paramecium</i> |
| B. Dinoflagellates | II. <i>Euglena</i> |
| C. Euglenoids | III. <i>Gonyaulax</i> |
| D. Protozoans | IV. Diatoms |
- A – I; B – III; C – II; D – IV
 - A – II; B – IV; C – III; D – I
 - A – IV; B – II; C – III; D – I
 - A – IV; B – III; C – II; D – I
50. *Plasmodium*, the parasite, belongs to class:
- Sarcodina
 - Ciliata
 - Sporozoa
 - Dinophyceae
51. Read the following statements and answer the question.
- Some members are saprophytes or parasites while a large number of them are decomposers of litter and help in mineral cycling.
 - They reproduce only by asexual spores known as conidia.
 - Mycelium is septate and branched.
 - Alternaria*, *Colletotrichum* and *Trichoderma* are examples of this class.
- Which of the following class of fungi is being described by the above statements?
- Phycmycetes
 - Deuteromycetes
 - Basidiomycetes
 - Ascomycetes
52. The main difference between Gram positive and Gram negative bacteria lies in the composition of :
- Cilia
 - Cell wall
 - Nucleolus
 - Cytoplasm
53. The conditions which would be favoured by thermoacidophiles are:
- Hot and alkaline
 - Snow and acidic
 - Hot sulphur spring
 - Gut of cows
54. The genetic material in viruses is/are:
- Only RNA
 - Only DNA
 - RNA and DNA both
 - RNA or DNA *i.e.* one nucleic acid in a virus
55. Match the terms given in column-I with their examples given in column-II and choose the correct option.
- | Column-I
(Terms) | Column-II
(Examples) |
|---------------------|-------------------------|
| A. Ascus | I. <i>Spirulina</i> |
| B. Basidium | II. <i>Penicillium</i> |
| C. Protista | III. <i>Agaricus</i> |
| D. Cyanobacteria | IV. <i>Euglena</i> |
| E. Animalia | V. Sponges |
- A – II; B – III; C – IV; D – V; E – I
 - A – I; B – II; C – III; D – V; E – IV
 - A – II; B – V; C – III; D – I; E – IV
 - A – II; B – III; C – IV; D – I; E – V

56. Which of the following statements is not correct for methanogens?
- They are archaeobacteria.
 - They live in marshy areas.
 - Methane is their preferred carbon source.
 - They are present in guts of several ruminant animals (cow, buffaloes) and produce biogas (CH_4) from the dung of these animals.
57. Cyanobacteria are:
- mosses which attack bacteria
 - bacteria which attack cyanophyceae
 - autotrophic organisms with phycocyanin
 - None of the above
58. Viruses that infect bacteria, multiply and cause their lysis, are called:
- Lysozymes
 - Lipolytic
 - Lytic
 - Lysogenic
59. Which of the following fixes atmospheric N_2 ?
- Nostoc*
 - Algae
 - Methanogens
 - None of these
60. Which of the following statements is not correct for viruses?
- Viruses are obligate parasites.
 - Viruses can multiply only when they are inside the living cells.
 - Viruses cannot pass through bacterial filters.
 - Viruses are made up of protein and DNA or RNA (never both DNA and RNA).
61. Koch's postulates are related to:
- Cell structure of bacteria
 - Cell structure of micro-organisms
 - Laws of diseases
 - Origin of micro-organisms
62. The organisms participating most actively in nitrogen cycle in nature are:
- Bacteria
 - Legumes
 - Parasitic algae
 - Fungi
63. *Trichodesmium erythrium* which imparts red colour to sea water of red sea is a:
- Cyanobacterium
 - Red Algae
 - Diatom
 - Red Coral
64. The function of mesosome in prokaryotes is:
- Aerobic respiration
 - Cell wall formation
 - Both (1) and (2)
 - N_2 – fixation
65. Which of the following performs respiration with the help of plasma membrane?
- Bacteria
 - Algae
 - Fungi
 - All the above
66. The most primitive monerans are:
- Archaeobacteria
 - Eubacteria
 - Filamentous bacteria
 - Cyanobacteria
67. Which one of the following fixes CO_2 in to carbohydrates?
- Rhizobium
 - E. coli*
 - Bacillus
 - Rhodospirillum
68. Cell membrane of bacteria is made up of:
- Cellulose and lipid
 - Chitin
 - Lipid + Protein
 - Protein and Cellulose
69. Souring of milk is due to:
- Aerobic bacteria
 - Anaerobic bacteria
 - Both
 - None
70. "Golden Algae" is the common name of Algae belonging to:
- Chrysophyta
 - Pyrrophyta
 - Euglenophyta
 - Cyanophyta
71. Oils and Leucosine are characteristic stored food in:
- Dinoflagellates
 - Euglenoids
 - Diatoms
 - None
72. The diatomaceous earth is used to insulate boilers and steam pipes because:
- The wall of diatoms is deposited with calcium
 - The diatomaceous earth is cheap
 - It is a good conductor of heat
 - The wall of diatoms is made of silica
73. Taxonomically the most controversial group is:
- Dinoflagellates
 - Diatoms
 - Euglenoids
 - Prokaryote
74. The most efficient locomotion in protists is through:
- Pseudopodia
 - Flagella
 - Cilia
 - Tentacles

75. "Fire algae" belongs to group:

- (1) Pyrrophyta (2) Chrysophyta
(3) Euglenophyta (4) Rhodophyta

76. Stored food of Diatoms:

- (1) Leucosin (2) Starch
(3) Floridian starch (4) Glycogen

77. Protists should be better termed as:

- (1) Acellular (2) Cellular
(3) Multicellular (4) Coenocytic

78. Auxospores are formed by:

- (1) Diatoms (2) Euglenoids
(3) Dinoflagellates (4) bacteria

79. 'Red tides' are produced by:

- (1) Red algae (2) Dinoflagellates
(3) Diatoms (4) Brown algae

80. A fungus completing its life cycle on a single host is known as:

- (1) Dikaryotic (2) Autoecious
(3) Heterocious (4) Heterothallic

81. Neurospora, which is popularly known as Drosophilla of plant kingdom, belongs to:

- (1) Phycomycetes (2) Ascomycetes
(3) Basidiomycetes (4) Deuteromycetes

82. Which of the following causes wheat rust disease?

- (1) A red Alga (2) A green Alga
(3) A fungus (4) Mycoplasma

83. Coenocytic mycelium is found in:

- (1) Rhizopus (2) Mucor
(3) Penicillium (4) Both 1 and 2

84. Edible part in mushrooms is:

- (1) Basidiospores (2) Mycelium
(3) Pseudomycelium (4) Complete basidiocarp

85. Deuteromycetes are called 'Imperfect fungi' as:

- (1) They have no cell wall
(2) No mycelium
(3) No sexual reproduction
(4) No asexual reproduction

86. Which of the following is called 'toad stools'?

- (1) All mushrooms (2) Edible mushrooms
(3) Poisonous mushrooms (4) None

87. Professor K.C. Mehta is known for his contribution in:

- (1) Bryology (2) Plant physiology
(3) Virology (4) Plant pathology

88. Plant group which shows Heterotrophic mode of nutrition is:

- (1) Algae (2) Fungi
(3) Bryophytes (4) Pteridophytes

89. Non-septate mycelium occurs in:

- (1) Phycomycetes (2) Ascomycetes
(3) Basidiomycetes (4) Deuteromycetes

90. All fungi are:

- (1) Symbionts (2) Parasites
(3) Saprophytes (4) Heterotrophs

CHEMISTRY

91. Irrespective of the source, pure sample, of water always yields 88.89% mass of oxygen and 11.11% mass of hydrogen. This is explained by the law of

- (a) conservation of mass (b) multiple proportions
(c) constant composition (d) constant volume

92. The amount of zinc required to produce 224 mL of H_2 at STP on treatment with dil. H_2SO_4 will be:

- (a) 6.5 g (b) 0.65 g
(c) 65 g (d) 0.065 g

93. The number of water molecules present in a drop of water (volume 0.0018 mL) density = 18 mL^{-1} at room temperature is

- (a) 1.084×10^{18} (b) 6.023×10^{19}
(c) 4.84×10^{17} (d) 6.023×10^{23}

94. If 3.01×10^{20} molecules are removed from 98 mg of H_2SO_4 , then the number of moles of H_2SO_4 left are:

- (a) 0.1×10^{-3} (b) 0.5×10^{-3}
(c) 1.66×10^{-3} (d) 9.95×10^{-2}

95. The density of 3M solution of sodium chloride is 1.252 g mL^{-1} . The molality of the solution will be:

- (molar mass, NaCl = 585 g mol^{-1})
(a) 2.60 m (b) 2.18 m (c) 2.79 m (d) 3.00 m

96. A compound contains 54.55 % carbon, 9.09% hydrogen, 36.36% oxygen. The empirical formula of this compound is:

- (a) C_3H_5O (b) $C_4H_8O_2$
(c) $C_2H_4O_2$ (d) C_2H_4O

97. 10 mL of 2 M NaOH solution is added to 200 mL of 0.5 M of NaOH solution. What is the final concentration?

- (a) 0.57 M (b) 5.7 M
(c) 11.4 M (d) 1.14 M

98. The number of moles of oxygen in one litre of air containing 21% oxygen by volume, under standard conditions are:

- (a) 0.0093 mole (b) 0.21 mole
(c) 2.10 mole (d) 0.186 mole

99. The mass of N_2F_4 produced by the reaction of 2.0 g of NH_3 and 8.0 g of F_2 is 3.56 g. What is the percent yield?



- (a) 79.0 (b) 71.2
(c) 84.6 (d) None of these

100. Complete combustion of 0.858 g of compound X gives 2.64 g of CO_2 and 1.26 g of H_2O . The lowest molecular mass X can have:

- (a) 43 g (b) 86 g (c) 129 g (d) 172 g

101. How many of 0.1N HCl are required to react completely with 1 g mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amounts of two?

- (a) 157.7 mL (b) 15.77 mL
(c) 147.7 mL (d) 14.77 mL

102. An aqueous solution of oxalic acid dehydrate contains its 6.3 g in 250 mL. The volume of 0.1 N NaOH required to completely neutralize 10 mL of this solution:

- (a) 4 mL (b) 20 mL (c) 2 mL (d) 40 mL

103. A gaseous compound of nitrogen and hydrogen contains 12.5% (by mass) of hydrogen. The density of the compound relative to hydrogen is 16. The molecular formula of the compound is:

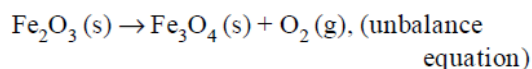
- (a) NH_2 (b) N_3H (c) NH_3 (d) N_2H_4

104. What is the molarity of SO_4^{2-} ion in aqueous solution that contain 34.2 ppm of $Al_2(SO_4)_3$?

(Assume complete dissociation and density of solution 1 g/mL)

- (a) $3 \times 10^{-4} \text{ M}$ (b) $2 \times 10^{-4} \text{ M}$
(c) 10^{-4} M (d) None of these

105. 2.0 g of a sample contains mixture of SiO_2 and Fe_2O_3 . On very strong heating, it leaves a residue weighing 1.96 g. The reaction responsible for loss of mass is given below.



What is the percentage by mass of SiO_2 in original sample?

- (a) 100 % (b) 20 % (c) 40 % (d) 60 %

106. 1.575 g of oxalic acid $(COOH)_2 \cdot xH_2O$ are dissolved in water and the volume made upto 250 mL. On titration 16.68 mL of this solution requires 25 mL of N/15 NaOH solution for complete neutralization, calculate x.

- (a) 3 (b) 2 (c) 4 (d) 5.

107. Which of the following is **not** permissible arrangement of electrons in an atom?

- (a) $n = 5, l = 3, m = 0, s = +1/2$
 (b) $n = 3, l = 2, m = -3, s = -1/2$
 (c) $n = 3, l = 2, m = -2, s = -1/2$
 (d) $n = 4, l = 0, m = 0, s = -1/2$

108. The Bohr's energy equation for H atom reveals that the energy level of a shell is given by

$E = -13.58/n^2\text{eV}$. The smallest amount that an H atom will absorb if in ground state is:

- (a) 1.0 eV (b) 3.39 eV
 (c) 6.79 eV (d) 10.19 eV

109. Excited hydrogen atom emits light in the ultraviolet region at 2.47×10^{15} Hz. With this frequency, the energy of a single photon is:

- ($h = 6.63 \times 10^{-34}$ Js)
 (a) 8.041×10^{-40} J (b) 2.680×10^{-19} J
 (c) 1.640×10^{-18} J (d) 6.111×10^{-17} J

110. Among the following groupings which represents the collection of isoelectronic species?

- (a) $\text{NO}^+, \text{C}_2^{2-}, \text{O}_2^-, \text{CO}$ (b) $\text{N}_2, \text{C}_2^{2-}, \text{CO}, \text{NO}$
 (c) $\text{CO}, \text{NO}^+, \text{CN}^-, \text{C}_2^{2-}$ (d) $\text{NO}, \text{CN}^-, \text{N}_2, \text{O}_2^{2-}$

111. What is the maximum wavelength line in the Lyman series of He^+ ion?

- (a) $3R$ (b) $\frac{1}{3R}$
 (c) $\frac{4}{4R}$ (d) None of these

112. When electronic transition occurs from higher energy state to lower energy state with energy difference equal to DE electron volts, the wavelength of the line emitted is approximately equal to:

- (a) $\frac{12395}{\Delta E} \times 10^{-10}m$ (b) $\frac{12395}{\Delta E} \times 10^{10}m$
 (c) $\frac{12395}{\Delta E} \times 10^{-10}cm$ (d) $\frac{12395}{\Delta E} \times 10^{10}cm$

113. In a hydrogen atom, if energy of an electron in ground state is 13.6. eV, then that in the 2nd excited state is.

- (a) 1.51 eV (b) 3.4 eV
 (c) 6.04 eV (d) 13.6 eV.

114. Which one of the following set of quantum numbers is not possible for 4p electron?

- (a) $n=4, l=1, m=-1, m_s = +\frac{1}{2}$
 (b) $n=4, l=1, m=0, m_s = +\frac{1}{2}$

- (c) $n=4, l=1, m=2, m_s = +\frac{1}{2}$
 (d) $n=4, l=1, m=-1, m_s = -\frac{1}{2}$

115. The de Broglie wavelength of a car of mass 1000 kg and velocity 36 km/hr is :

- (a) 6.626×10^{-34} m (b) 6.626×10^{-38} m
 (c) 6.626×10^{-31} m (d) 6.626×10^{-30} m

116. In an atom how many orbital(s) will have the quantum numbers; $n = 3, l = 2$ and $ml = +2$?

- (a) 5 (b) 3 (c) 1 (d) 7

117. If the de-Broglie wavelength of a particle of mass m is 100 times its velocity, then its value in terms of its mass (m) and Planck's constant (h) is.

- (a) $\frac{1}{10} \sqrt{\frac{m}{h}}$ (b) $10 \sqrt{\frac{h}{m}}$
 (c) $\frac{1}{10} \sqrt{\frac{h}{m}}$ (d) $10 \sqrt{\frac{m}{h}}$

118. The kinetic and potential energy (in eV) of an electron present in third Bohr's orbit of hydrogen atom are respectively:

- (a) -1.51, -3.02 (b) 1.51, -3.02
 (c) -3.02, 1.51 (d) 1.51, -1.51

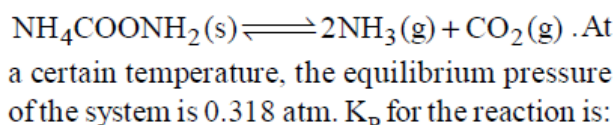
119. Which combinations of quantum numbers, n, l, m and s for the electron in an atom does not provide a permissible solution of the wave equation ?

- (a) $3, 2, 1, +\frac{1}{2}$ (b) $3, 1, 1, \frac{1}{2}$
 (c) $3, 3, 1, \frac{1}{2}$ (d) $3, 2, -2, +\frac{1}{2}$

120. In a multi-electron atom, which of the following orbitals described by the three quantum members will have the same energy in the absence of magnetic and electric fields?

- (A) $n = 1, l = 0, m = 0$ (B) $n = 2, l = 0, m = 0$
 (C) $n = 2, l = 1, m = 1$ (D) $n = 3, l = 2, m = 1$
 (E) $n = 3, l = 2, m = 0$
 (a) (D) and (E) (b) (C) and (D)
 (c) (B) and (C) (d) (A) and (B)

121. When heated, ammonium carbamate decomposes as follows:



- (a) 0.128 (b) 0.426
 (c) 4.76×10^{-3} (d) None of these

122. For the equilibrium system

$2HX(g) \rightleftharpoons H_2(g) + X_2(g)$ The equilibrium constant is 1.0×10^{-5} . What is the concentration of HX if the equilibrium concentration of H_2 and X_2 are 1.2×10^{-3} M, and 1.2×10^{-4} M respectively.

- (a) 12×10^{-4} M (b) 12×10^{-3} M
(c) 12×10^{-2} M (d) 12×10^{-1} M

123. If 1.0 mole of I_2 is introduced into 1.0 litre flask at 1000 K, at equilibrium ($K_c = 10^{-6}$), which one is correct

- (a) $[I_2(g)] > [I^-(g)]$ (b) $[I_2(g)] < [I^-(g)]$
(c) $[I_2(g)] = [I^-(g)]$ (d) $[I_2(g)] = \frac{1}{2}[I^-(g)]$

124. K_c for $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

0.04 at 250°C . How many moles of PCl_5 must be added to a 3 L flask to obtain a Cl_2 concentration of 0.15 M

- (a) 4.2 moles (b) 2.1 moles
(c) 5.5 moles (d) 6.3 moles

125. The value of K_p for the equilibrium reaction is 2. $N_2O_2(g) \rightleftharpoons 2NO_2(g)$ The percentage dissociation of $N_2O_4(g)$ at a pressure of 0.5 atm is.

- (a) 25 (b) 88 (c) 50 (d) 71

126. At 527°C , the reaction given below has $K_c = 4$
 $NH_3(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{3}{2}H_2(g)$ What is the K_p for the reaction? $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$.

- (a) $16 \times (800R)^2$ (b) $\left(\frac{800R}{4}\right)^{-2}$
(c) $\left(\frac{1}{4 \times 800R}\right)^2$ (d) None of these

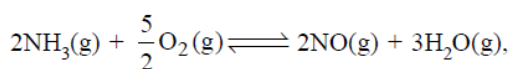
127. Some inert gas is added at constant volume to the following reaction at equilibrium



Predict the effect of adding the inert gas:

- (a) The equilibrium shifts in the forward direction
(b) The equilibrium shifts in the backward direction
(c) The equilibrium remains unaffected
(d) The value of K_p is increased

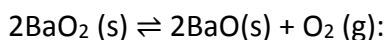
128. The equation for the equilibrium constant of the reaction



(K_4) in terms of K_1 , K_2 and K_3 is :

- (a) $\frac{K_1 \cdot K_2}{K_3}$ (b) $\frac{K_1 \cdot K_3^2}{K_2}$
(c) $K_1 K_2 K_3$ (d) $\frac{K_2 \cdot K_3^3}{K_1}$

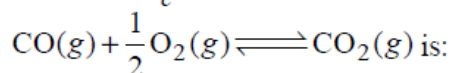
129. For the reaction:



$\Delta H = +ve$. In equilibrium condition, pressure of O_2 is dependent on

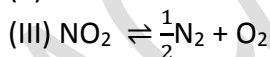
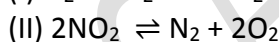
- (a) mass of BaO_2 (b) mass of BaO
(c) temperature of equilibrium
(d) mass of BaO_2 and BaO both

130. The ratio $\frac{K_p}{K_c}$ for the reaction



- (a) $\frac{1}{\sqrt{RT}}$ (b) $(RT)^{1/2}$
(c) RT (d) 1

131. K_1 , K_2 and K_3 are the equilibrium constants of the following reactions (I), (II) and (III) respectively:



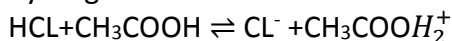
The correct relation from the following is:

- (a) $K_1 = \frac{1}{K_2} = \frac{1}{K_3}$ (b) $K_1 = \frac{1}{K_2} = \frac{1}{(K_3)^2}$
(c) $K_1 = \sqrt{K_2} = K_3$ (d) $K_1 = \frac{1}{K_2} = K_3$

132. The solubility of PbI_2 at 25°C is 0.7 g L^{-1} . The solubility product of PbI_2 at this temperature is (molar mass of $PbI_2 = 461.2 \text{ g mol}^{-1}$)

- (a) 1.40×10^{-9} (b) 0.14×10^{-9}
(c) 140×10^{-9} (d) 14.0×10^{-9}

133. The following equilibrium is established when hydrogen chloride is dissolved in acetic acid.



The set that characterises the conjugate acidbase pairs is:

- (a) (HCl, CH_3COOH) and ($CH_3COOH_2^+$, Cl^-)
(b) (HCl, $CH_3COOH_2^+$) and (CH_3COOH , Cl^-)
(c) ($CH_3COOH_2^+$, HCl) and (Cl^- , CH_3COOH)
(d) (HCl, Cl^-) and ($CH_3COOH_2^+$, CH_3COOH)






134. 8 mol of $AB_3(g)$ are introduced into a 1.0 dm^3 vessel. If it dissociates as $2AB_3(g) \rightleftharpoons A_2(g) + 3B_2(g)$. At equilibrium, 2mol of A_2 are found to be present. The equilibrium constant of this reaction is.



- (a) 2 (b) 3 (c) 27 (d) 36

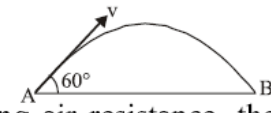
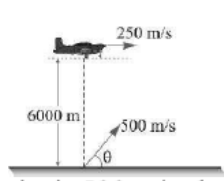
135. The hydrogen ion concentration of 0.2 N CH_3COOH which is 40% dissociated is.

- (a) 0.08 N (b) 0.12 N (c) 0.80 N (d) 1.2 N

PHYSICS:

136. If $Z = A^3$, then $\frac{\Delta Z}{Z} = \underline{\hspace{2cm}}$
- (a) $\frac{\Delta A^3}{A}$ (b) $\left(\frac{\Delta A}{A}\right)^3$
 (c) $3\left(\frac{\Delta A}{A}\right)$ (d) $\left(\frac{\Delta A}{A}\right)^{1/3}$
137. If $L = 2.331$ cm, $B = 2.1$ cm, then $L + B =$
- (a) 4.4 cm (b) 4 cm
 (c) 4.43 cm (d) 4.431 cm
138. In order to measure physical quantities in the sub-atomic world, the quantum theory often employs energy [E], angular momentum [J] and velocity [c] as fundamental dimensions instead of the usual mass, length and time. Then, the dimension of pressure in this theory is
-  **Toughnut**
- (a) $\frac{[E]^4}{[J]^3 [c]^3}$ (b) $\frac{[E]^2}{[J][c]}$
 (c) $\frac{[E]}{[J]^2 [c]^2}$ (d) $\frac{[E]^3}{[J]^2 [c]^2}$
139. If $x = at + bt^2$, where x is the distance travelled by the body in kilometers while t is the time in seconds, then the unit of b is
- (a) km/s (b) kms (c) km/s² (d) kms²
140. If unit of length and force are increased 4 times. The unit of energy
- (a) is increased by 4 times
 (b) is increased by 16 times
 (c) is increased by 8 times
 (d) remains unchanged
141. Young's modulus of steel is 1.9×10^{11} N/m². When expressed in CGS units of dyne/cm², it will be equal to (1N = 10⁵ dyne, 1 m² = 10⁴ cm²)
- (a) 1.9×10^{10} (b) 1.9×10^{11}
 (c) 1.9×10^{12} (d) 1.9×10^{13}
142. Which of the following quantities has not been expressed in proper unit?
- (a) torque, newton metre
 (b) stress, newton metre⁻²
 (c) modulus of elasticity, newton metre⁻²
 (d) surface tension, newton metre⁻²
143. In a certain system of units, 1 unit of time is 5 sec, 1 unit of mass is 20 kg and 1 unit of length is 10m. In this system, one unit of power will correspond to-
- (a) 16 watts (b) $\frac{1}{16}$ watts
 (c) 25 watts (d) $\frac{1}{25}$ watts
144. The dimensional formula for relative density is
- (a) [ML⁻³] (b) [M⁰L⁻³]
 (c) [M⁰L⁰T⁻¹] (d) [M⁰L⁰T⁰]
145. [MLT⁻¹] + [MLT⁻¹] =  **Tricky**
- (a) [M⁰L⁰T⁰] (b) [MLT⁻¹]
 (c) 2[MLT⁻¹] (d) None of these
146. Dimensions of specific heat are
- (a) [ML²T⁻²K] (b) [ML²T⁻²K⁻¹]
 (c) [ML²T²K⁻¹] (d) [L²T⁻²K⁻¹]
147. The division of energy by time is X. The dimensional formula of X is same as that of
- (a) momentum (b) power
 (c) torque (d) electric field
148. Which one of the following represents the correct dimensions of the coefficient of viscosity?
- (a) [ML⁻¹T⁻¹] (b) [MLT⁻¹]
 (c) [ML⁻¹T⁻²] (d) [ML⁻²T⁻²]
149. Two quantities A and B have same dimensions which mathematical operation given below is physically meaningful?  **Tricky**
- (a) A/B (b) A + B² (c) A² - B (d) A = B²
150. Distance travelled by a particle at any instant 't' can be represented as $S = A(t + B) + Ct^2$. The dimensions of B are  **Tricky**
- (a) [M⁰L¹T⁻¹] (b) [M⁰L⁰T¹]
 (c) [M⁰L⁻¹T⁻²] (d) [M⁰L²T⁻²]
151. Dimensions of 'resistance' are same as (where h is Planck's constant and e is charge)
- (a) $\frac{h}{e}$ (b) $\frac{h^2}{e}$ (c) $\frac{h}{e^2}$ (d) $\frac{h^2}{e^2}$
152. The displacement of a body at a particular second n is given by the expression $S_{nth} = u + \frac{a}{2}(2n - 1)$. The dimensional formula of S_{nth} in this equation is  **Tricky**
- (a) [M¹L⁰T¹] (b) [M⁰L¹T⁰]
 (c) [M⁰L¹T⁻¹] (d) [M⁰L⁰T⁰]

153. Let Q denote the charge on the plate of a capacitor of capacitance C . The dimensional formula for $\frac{Q^2}{C}$ is
 (a) $[L^2M^2T]$ (b) $[LMT^2]$
 (c) $[L^2MT^{-2}]$ (d) $[L^2M^2T^2]$
154. If the dimensions of a physical quantity are given by $M^a L^b T^c$, then the physical quantity will be
 (a) velocity if $a = 1, b = 0, c = -1$
 (b) acceleration if $a = 1, b = 1, c = -2$
 (c) force if $a = 0, b = -1, c = -2$
 (d) pressure if $a = 1, b = -1, c = -2$
155. Write the dimensions of $a \times b$ in the relation $E = \frac{b-x^2}{at}$, where E is the energy, x is the displacement and t is time
 (a) ML^2T (b) $M^{-1}L^2T^1$
 (c) ML^2T^{-2} (d) MLT^{-2}
156. What are the dimensions of A/B in the relation $F = A\sqrt{x} + Bt^2$, where F is the force, x is the distance and t is time?
 (a) ML^2T^{-2} (b) $L^{-1/2}T^2$ (c) $L^{-1/2}T^{-1}$ (d) LT^{-2}
157. A, B, C and D are four different physical quantities having different dimensions. None of them is dimensionless. But we know that the equation $AD = C \ln(BD)$ holds true. Then which of the combination is not a meaningful quantity?
 (a) $\frac{C}{BD} - \frac{AD^2}{C}$ (b) $A^2 - B^2C^2$
 (c) $\frac{A}{B} - C$ (d) $\frac{(A-C)}{D}$
158. If velocity (V), force (F) and energy (E) are taken as fundamental units, then dimensional formula for mass will be
 (a) $V^{-2}F^0E^3$ (b) V^0FE^2
 (c) $VF^{-2}E^0$ (d) $V^{-2}F^0E$
159. If the magnitudes of vectors \vec{A} , \vec{B} and \vec{C} are 12, 5 and 13 units respectively and $\vec{A} + \vec{B} = \vec{C}$, the angle between vectors A and B is :
 (a) 0 (b) π (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$
160. A body is projected from the ground with a velocity 50 m/s at an angle of 30° . It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground?
 [take $g = 10 \text{ m/s}^2$]
 (a) $50\sqrt{3}$ (b) $70\sqrt{2}$ (c) $15\sqrt{3}$ (d) $16\sqrt{2}$
161. Two balls are projected at an angle θ and $(90^\circ - \theta)$ to the horizontal with the same speed. The ratio of their maximum vertical heights is  **Tricky**
 (a) 1 : 1 (b) $\tan \theta : 1$
 (c) $1 : \tan \theta$ (d) $\tan^2 \theta : 1$
162. A stone is thrown from a point with a speed 5 m/s at an elevation angle of θ . From the same point and at the same instant, a person starts running with a constant speed 2.5 m/s to catch the stone. If the person will be able to catch the ball then, what should be the angle of projection θ ?
 (a) 75° (b) 30°  **Critical Thinking**
 (c) 60° (d) 45°
163. The vector that must be added to the vector $\hat{i} - 3\hat{j} + 2\hat{k}$ and $3\hat{i} - 6\hat{j} + 7\hat{k}$ so that the resultant vector is a unit vector along the y-axis, is
 (a) $4\hat{i} - 2\hat{j} + 5\hat{k}$ (b) $-4\hat{i} - 2\hat{j} + 5\hat{k}$
 (c) $3\hat{i} - 4\hat{j} + 5\hat{k}$ (d) null vector
164. The resultant of two vectors \vec{A} and \vec{B} is perpendicular to the vector \vec{A} and its magnitude is equal to half the magnitude of vector \vec{B} . The angle between \vec{A} and \vec{B} is
 (a) 120° (b) 150° (c) 135° (d) 180°
165. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is
 (a) 1 (b) $\sqrt{2}$ (c) $\sqrt{3}$ (d) 2
166. The condition for $\vec{A} + \vec{B}$ to be perpendicular to $\vec{A} - \vec{B}$ is that
 (a) $|\vec{A}| = |\vec{B}|$ (b) $\vec{A} = \vec{B}$
 (c) $\vec{B} = 0$ (d) $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$
167. A particle has an initial velocity $3\hat{i} + 4\hat{j}$ and an acceleration of $0.4\hat{i} + 0.3\hat{j}$. Its speed after 10 sec is
 (a) $7\sqrt{2}$ units (b) 7 units
 (c) 8.5 units (d) 10 units

168. The coordinates of a particle moving in x-y plane at any instant of time t are $x = 4t^2$; $y = 3t^2$. The speed of the particle at that instant is
 (a) $10t$ (b) $5t$ (c) $3t$ (d) $2t$
169. $\vec{a} = 3\hat{i} - 5\hat{j}$ and $\vec{b} = 6\hat{i} + 3\hat{j}$ are two vectors and \vec{c} is a vector such that $\vec{c} = \vec{a} \times \vec{b}$ then $|\vec{a}| : |\vec{b}| : |\vec{c}|$
 (a) $\sqrt{34} : \sqrt{45} : \sqrt{39}$ (b) $\sqrt{34} : \sqrt{45} : 39$
 (c) $34 : 39 : 45$ (d) $39 : 35 : 34$
170. If the vectors $(\hat{i} + \hat{j} + \hat{k})$ and $3\hat{i}$ form two sides of a triangle, the area of the triangle is :
 (a) $\sqrt{3}$ (b) $2\sqrt{3}$ (c) $\frac{3}{\sqrt{2}}$ (d) $3\sqrt{2}$
171. Let two vectors $\vec{A} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} - 2\hat{j} + 4\hat{k}$. Consider the unit vector perpendicular to both \vec{A} and \vec{B} is
 (a) $\frac{\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$ (b) $\frac{\hat{i} - \hat{j} - \hat{k}}{2\sqrt{3}}$
 (c) $\frac{-\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$ (d) $\frac{\hat{i} - \hat{j} - \hat{k}}{2\sqrt{3}}$
172. If the angles of projection of a projectile with same initial velocity exceed or fall short of 45° by equal amounts, then the ratio of horizontal ranges is
 (a) $1 : 2$ (b) $1 : 3$ (c) $1 : 4$ (d) $1 : 1$
173. A plane flying horizontally at a height of 1500 m with a velocity of 200 ms^{-1} passes directly overhead on anti-aircraft gun. Then the angle with the horizontal at which the gun should be fired from the shell with a muzzle velocity of 400 ms^{-1} to hit the plane, is
 (a) 90° (b) 60° (c) 30° (d) 45°
174. A bullet is fired with a speed of 1500 m/s in order to hit a target 100 m away. If $g = 10 \text{ m/s}^2$. The gun should be aimed
 (a) 15 cm above the target
 (b) 10 cm above the target
 (c) 2.2 cm above the target
 (d) directly towards the target
175. A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance that the boy can throw the same stone up to will be
 (a) $20\sqrt{2}$ m (b) 10m
 (c) $10\sqrt{2}$ m (d) 20m
176. A particle is projected at an angle of elevation α and after t seconds it appears to have an angle of elevation β as seen from point of projection. The initial velocity will be
 (a) $\frac{gt}{2 \sin(\alpha - \beta)}$ (b) $\frac{gt \cos \beta}{2 \sin(\alpha - \beta)}$
 (c) $\frac{\sin(\alpha - \beta)}{2gt}$ (d) $\frac{2 \sin(\alpha - \beta)}{gt \cos \beta}$
177. If a particle is projected with speed u from ground at an angle with horizontal, then radius of curvature of a point where velocity vector is perpendicular to initial velocity vector is given by
 (a) $\frac{u^2 \cos^2 \theta}{g}$ (b) $\frac{u^2 \cot^2 \theta}{g \sin \theta}$
 (c) $\frac{u^2}{g}$ (d) $\frac{u^2 \tan^2 \theta}{g \cos \theta}$
178. A projectile of mass m is thrown with a velocity v making an angle 60° with the horizontal. Neglecting air resistance, the change in velocity from the departure A to its arrival at B, along the vertical direction is
 (a) $2v$ (b) $\sqrt{3}v$ (c) v (d) $\frac{v}{\sqrt{3}}$
- 
179. An aircraft moving with a speed of 250 m/s is at a height of 6000 m, just overhead of an anti-aircraft gun. If the muzzle velocity is 500 m/s, the firing angle q should be:
 (a) $\tan^{-1} \frac{2}{3}$ (b) $\tan^{-1} \frac{3}{2}$
 (c) $\tan^{-1} \frac{7}{4}$ (d) $\tan^{-1} \frac{4}{5}$
- 

*****End of The Paper*****