22/03/2024

Phase-I
CODE-B

Aakash
Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test -I** **Time : 3 Hrs. 20 Mins.**

Topics covered :

Physics : Units and Measurements, Motion in a Straight Line, Motion in a Plane
Chemistry : Some Basic Concepts of Chemistry, Structure of Atom, Classification of Elements and Periodicity in Properties
Botany : The Living World, Biological Classification, Plant Kingdom
Zoology : Animal Kingdom

Instructions :

(i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.
(iii) Use blue/black ballpoint pen only to darken the appropriate circle.
(iv) Mark should be dark and completely fill the circle.
(v) Dark only one circle for each entry.
(vi) Dark the circle in the space provided only.
(vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

PHYSICS

Choose the correct answer :

SECTION - A

1. A physical quantity P is related with four quantities a, b, c and d as follows: $P = \frac{ab}{c^{5/2}d^{1/2}}$.

The percentage error in the measurement of a, b, c and d are 1%, 2%, 0.5% and 1.5% respectively. The maximum percentage error in P is

(1) 5% (2) 6.5%
(3) 8% (4) 3%

2. A ball is dropped from a building of height 40 m, simultaneously another ball is thrown up with a speed of 20 m/s. The relative speed of first ball w.r.t. second ball at t = 1 s is (g = 10 m/s^2)

(1) 20 m/s (2) 10 m/s
(3) 30 m/s (4) Zero

3. If a particle is dropped from top of a tower, then ratio of time in falling first three successive equal distances is

(1) 1 : 2 : 3
(2) $1:\sqrt{2}:\sqrt{3}$
(3) $1:(\sqrt{2}-1):(\sqrt{3}-\sqrt{2})$
(4) 1 : 4 : 9

4. In a system of units, unit of force is 100 N, unit of length is 20 m and unit of time is 100 s. The unit of mass in this system of unit is

(1) 10^5 kg (2) 10^4 kg
(3) 5×10^4 kg (4) 5×10^5 kg

5. A ball starts moving eastward with speed 35 m/s. An acceleration of 10 m/s^2 is acting on it in westward direction. What is the distance travelled by the ball in 4th second of its motion?

(1) Zero (2) 1.25 m

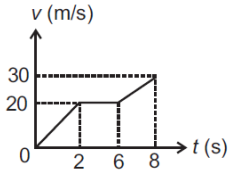
(3) 2.5 m (4) 5 m

6. The addition of lengths 100 m and 0.2 m up to appropriate significant figure will be

(1) 100 m (2) 100.2 m

(3) 101 m (4) 100.02 m

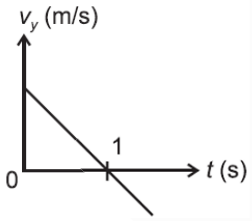
7. Figure given below, shows the graph of velocity (v) of a particle moving along x-axis as a function of time (t). Average acceleration from time t = 1 s to t = 7 s is



(1) 1.5 m/s^2 (2) 1 m/s^2

(3) 2 m/s^2 (4) 2.5 m/s^2

8. Given graph (for a projectile motion) shows variation of vertical velocity (y-component of velocity) with time. Then the maximum height of projectile is [g = 10 m/s^2]



(1) 10 m (2) 20 m

(3) 5 m (4) Data is insufficient

9. If random error in an experiment for 10 observations is e, then random error in the same experiment for 60 observations will be

(1) e (2) $\frac{e}{6}$

(3) $6e$ (4) $\frac{e}{36}$

10. A man moves on a horizontal road towards east at a speed of 1 km/h and the rain appears to him falling vertically at a speed of 2 km/h. The actual speed of the rain is

(1) 1 km/h

(2) $\sqrt{2}$ km/h

(3) $\sqrt{3}$ km/h

(4) $\sqrt{5}$ km/h

11. If the equation of trajectory of a particle in vertical plane is $y = ax - bx^2$, where a and b are positive constants, then angle of elevation of highest point from the point of projection is

(1) $\tan^{-1}(a)$ (2) $\tan^{-1}\left(\frac{a}{2}\right)$

(3) $\tan^{-1}(b)$ (4) $\tan^{-1}\left(\frac{b}{2}\right)$

12. The variation of position (x) of particle with time (t) is given as $x = 6\,(t - e^{-2t})$. Initial velocity of the particle is

(1) 6 m/s (2) 12 m/s

(3) 8 m/s (4) 18 m/s

13. The dimensions [ML^{-1}T^{-2}] and [ML^{-3}] respectively corresponds to

(1) Angular momentum, density

(2) Energy density, density

(3) Potential energy, density

(4) Power, force

14. A stone is dropped from a balloon going up with a uniform velocity of 15 m/s. If the balloon was 20 m high when the stone was dropped, then the distance covered by balloon till the time stone hits the ground is

(1) 100 m (2) 18.5 m

(3) 60 m (4) 20 m

Space for Rough Work

15. **Assertion (A):** A coin is allowed to fall in a train moving with constant velocity. Its trajectory is a straight line as seen by an observer attached to the train.

Reason (R): An observer on ground will see the path of coin as parabola.

(1) Both (A) and (R) are true and (R) is correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not correct explanation of (A)

(3) (A) is true, (R) is false

(4) (A) is false, (R) is true

16. If position $X = A + Bt + Ct^2$ (where t is time) then dimensional formula of C is

(1) $[MLT^{-1}]$

(2) $[M^0LT^{-1}]$

(3) $[M^0LT^{-3}]$

(4) $[M^0LT^{-2}]$

17. A particle passes a point moving in north direction with uniform velocity of $2\sqrt{3}$ m/s. After sometime it turns in the east and moves with uniform velocity 6 m/s. Direction of change in its velocity vector is

(1) 30° east of north (2) 60° east of north

(3) 60° south of east (4) 30° south of east

18. A particle is moving along x-axis whose position is given by $x = \left(4 - 9t + \frac{t^3}{3}\right)$ then choose the **correct** statement for this motion.

(1) Direction of motion is not changing at any instant

(2) For $0 < t < 3$ s, the particle is slowing down

(3) For $0 < t < 3$ s, the particle is speeding up

(4) For $0 < t < 3$ s, the particle is at rest

19. A vehicle travels half the distance with speed v and the remaining distance with speed $3v$. Average speed of the particle is

(1) $\frac{v}{2}$ (2) $\frac{3v}{2}$

(3) $2v$ (4) $\frac{5v}{2}$

20. A body is projected from ground such that its horizontal range is four times the maximum height attained then angle of projection of body with vertical is

(1) 30° (2) 45°

(3) 60° (4) 90°

21. The equation of path of projectile is given by $y = \left(\sqrt{3}x - 5x^2\right)$ m, then the range of projectile is

(1) $\frac{5}{\sqrt{3}}$ m (2) $\frac{\sqrt{3}}{5}$ m

(3) 5 m (4) 3 m

22. A river of width 1 km is flowing with a speed of 1 km/h. A man can swim with speed 2 km/h in still water. If he wants to cross the river along shortest path then speed of man with respect to ground is

(1) $\frac{\sqrt{3}}{2}$ km/h

(2) $\sqrt{3}$ km/h

(3) $\frac{1}{\sqrt{2}}$ km/h

(4) $\sqrt{2}$ km/h

23. A train of length 200 metre is moving with speed 54 km/h on a straight track. Time taken by it to cross a bridge of length 1 km will be

(1) 70 s (2) 60 s

(3) 90 s (4) 80 s

Space for Rough Work

24. **Statement I:** If tangential acceleration of a particle in non-uniform circular motion is in direction of velocity, speed of particle increases and if it is in opposite direction of velocity, speed decreases.

Statement II: In non-uniform circular motion, magnitude of centripetal acceleration is variable.

Consider the given statements and choose the **correct** option.

(1) Statement I is true but statement II is false
(2) Statement I is false but statement II is true
(3) Both statements I and II are true
(4) Neither statement I nor II are true

25. A particle is moving on a circular path with speed given by $v = \beta t$, where β is a constant. The centripetal acceleration of the particle at the instant when it has covered $\left(\frac{1}{4}\right)$th fraction of the circle is (r is the radius of circle)

(1) $4\pi\beta r$ (2) $\frac{4\pi r}{\beta}$

(3) $\frac{2\pi r}{\beta}$ (4) $\pi\beta$

26. Three particles P, Q and R are projected from the same point with the same initial speed making angles 30°, 45° and 60° respectively with the horizontal. Based on given information choose the **correct** statement.

(1) P, Q and R have equal ranges
(2) Ranges of P and R are equal and less than that of Q
(3) Ranges of P and R are equal and greater than that of Q
(4) P, Q and R have different ranges

27. Consider the following statements:

A. Average velocity in a circular motion may be zero.
B. In circular motion, velocity changes at every point.
C. In non-uniform circular motion, magnitude of centripetal acceleration remains constant.

The correct statement(s) is/are

(1) Only A (2) Both A and B
(3) Both A and C (4) Both B and C

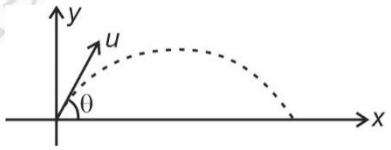
28. Which of the following statement may be correct for a moving body?

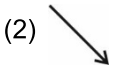
(1) Distance cannot have zero or negative values
(2) Displacement may be positive, negative or zero
(3) Distance is always equal to displacement
(4) Both (1) and (2) are correct

29. If two projectiles thrown in different directions, have equal time of flight then their

(1) Initial vertical speeds are unequal
(2) Maximum heights are same
(3) Horizontal range are same
(4) Horizontal speeds are same

30 A particle is projected from ground with initial velocity u making an angle θ with the horizontal as shown. The acceleration vector for the projectile may be represented as (ignore air resistance)



(1) 
(2) 
(3) 
(4) 

Space for Rough Work

31. In a vernier calliper 10 small divisions of the vernier scale are equal to 9 small divisions of main scale. If the small division of the main scale is $\frac{1}{2}$ mm, then vernier constant is

(1) 0.5 mm (2) 0.45 mm

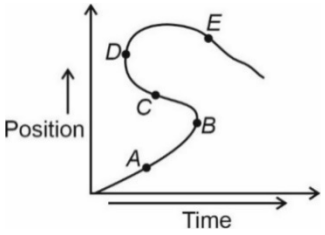
(3) 0.05 mm (4) 0.55 mm

32. In an experiment if refractive index of water is found to be 1.32, 1.34, 1.36, 1.38 respectively, their mean absolute error in measurement is

(1) 0.1 (2) 0.02

(3) 0.03 (4) 0.05

33. The position-time graph of a moving particle is shown. The instantaneous velocity of the particle is negative at the point



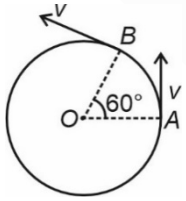
(1) *A*

(2) *B*

(3) *C*

(4) Graph is not possible

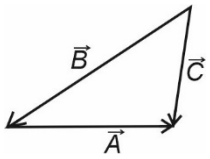
34. A particle is moving in a circle of radius 1 m having centre at *O*, with a constant speed of 2 m/s. The magnitude of change in velocity in moving from *A* to *B* is



(1) 2 m/s (2) $2\sqrt{2}$ m/s

(3) Zero (4) $2\sqrt{3}$ m/s

35. For the given diagram, the correct relation between vectors $\vec{A}, \vec{B}$ and $\vec{C}$ is



(1) $\vec{C}+\vec{B}=\vec{A}$

(2) $\vec{A}+\vec{C}=\vec{B}$

(3) $\vec{B}+\vec{A}=\vec{C}$

(4) $\vec{A}-\vec{C}-\vec{B}=\vec{A}$

SECTION-B

36. Let $\vec{v}$ and $\vec{a}$ denote the velocity and acceleration respectively of a body in one dimensional motion. Then correct option is

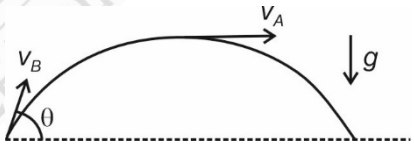
(1) $|\vec{v}|$ must decrease when $\vec{a}=0$

(2) Speed must increase when *a* is non-zero

(3) Speed will decrease when $\vec{v}$ and $\vec{a}$ are anti parallel

(4) All of these

37. The trajectory of a particle for ground to ground projection is shown. Which of the following relation is correct?



(1) $v_A = v_B\cos\theta$ (2) $v_A = v_B\sin\theta$

(3) $v_A = \frac{v_B}{\cos\theta}$ (4) $v_A = \frac{v_B}{\sin\theta}$

38. If velocity of particle is given by $v = (2t + 3)$, where t is time, then the average velocity for interval $0 \le t \le 3$ second is

(1) 2 m/s (2) 3 m/s

(3) 9 m/s (4) 6 m/s

Space for Rough Work

39. If the initial velocity of a particle is u and its acceleration is given as $a = At^3$, where A is constant and t is time, then its instantaneous velocity v as a function of time is given as

(1) $v = u + At^4$ (2) $v = u + \frac{At^4}{4}$

(3) $v = u + At^3$ (4) $v = u + \frac{At^3}{3}$

40. Two cars A and B are approaching each other head-on with speeds 20 m/s and 10 m/s respectively. When their separation is X, then A and B start braking at 4 m/s^2 and 2 m/s^2 respectively. Minimum value of X to avoid collision is

(1) 60 m (2) 75 m
(3) 80 m (4) 90 m

41. Rounding off the value 324.13821 upto four significant digits is

(1) 324.1 (2) 324.0
(3) 324.3 (4) 324.2

42. The length of second's hand of a watch is 1 cm. The speed (in m/s) of its tip is

(1) $\pi \times 10^{-3}$ (2) $\frac{2\pi}{3} \times 10^{-3}$

(3) $\frac{\pi}{3} \times 10^{-3}$ (4) $\frac{\pi}{2} \times 10^{-3}$

43. A boy can throw a stone upto a maximum height of 10 m when thrown vertically upward. The maximum horizontal distance upto which the boy can throw the same stone is

(1) $20\sqrt{2}$ m (2) 10 m
(3) $10\sqrt{2}$ m (4) 20 m

44. If A, B and C are physical quantities, having different dimensions, then which of the following combination can never be a meaningful quantity?

(1) $\frac{(A-B)}{C}$ (2) $AB - C$

(3) $\frac{AB}{C}$ (4) $AB - C^2$

45. A body is moving with speed (10.00 ± 0.01) m/s. The distance covered in time (5.00 ± 0.01) s is

(1) (50.0 ± 0.3%) m (2) (2.00 ± 0.3%) m
(3) (20.0 ± 0.3%) m (4) (50.0 ± 2%) m

46. Co-ordinates of a particle changes according to the relations $x = 4t^2$, $y = 3t$, $z = 0$. The magnitude of velocity of particle at time t = 1 s is (All quantities are to be taken in SI units)

(1) $\sqrt{73}$ m/s (2) $\sqrt{67}$ m/s
(3) 11 m/s (4) 3 m/s

47. A particle is moving along a circular path of radius 5 m with a constant speed of $\frac{5}{2}$ m/s. The average acceleration over a quarter circle is

(1) $\frac{10}{\pi}$ m/s^2 (2) $\frac{5\sqrt{2}}{\pi}$ m/s^2

(3) $\frac{5}{\pi}$ m/s^2 (4) $\frac{5}{\sqrt{2}\pi}$ m/s^2

48. A fighter plane is flying horizontally at an altitude of 2000 m with speed 720 km/h. At a particular angle of sight (with respect to horizontal) when target is seen, the pilot drops a bomb in order to attack the target. This angle is

(1) $\tan^{-1}\left(\frac{1}{2}\right)$ (2) $\tan^{-1}(1)$

(3) $\tan^{-1}\left(\frac{1}{4}\right)$ (4) $\tan^{-1}(2)$

49. The number of significant figures in 0.00602 g are

(1) 3 (2) 6
(3) 5 (4) 2

50. Which among the following is supplementary unit?

(1) Candela (2) Mole
(3) Radian (4) Ampere

Space for Rough Work

CHEMISTRY

SECTION - A

51. The number of electrons in 0.4 mol of Al^{3+} ion is
(1) $0.4 \times N_A$ (2) $2 \times N_A$
(3) N_A (4) $4 \times N_A$

52. The maximum amount of magnesium oxide formed when 16 g of Mg is burnt with 16 g of O_2 in a closed vessel is
(1) 26.67 g (2) 40 g
(3) 32 g (4) 24.67 g

53. The maximum number of electrons that can be identified with the quantum number $\ell = 2$ for Fe^{3+} ion will be
(1) 3 (2) 4
(3) 5 (4) 6

54. The element with highest electron affinity, belongs to
(1) Period 2, group 17 (2) Period 3, group 17
(3) Period 2, group 16 (4) Period 3, group 16

55. Maximum possible electron(s) in Mn, for which n + l + m = 5 is
(1) 1 (2) 2
(3) 3 (4) 10

56. Given below are the two statements.
Statement-I: The characteristics of cathode rays do not depend upon the material of electrodes used.
Statement-II: In absence of electrical or magnetic field, cathode rays travel in straight lines.
In light of above statements, choose the correct answer.
(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are correct
(4) Both statement I and statement II are incorrect

57. If the mass percentage $\left(\frac{w}{w}\%\right)$ of glucose in the aqueous solution is 36% then the molality of glucose in the solution will be nearly
(1) 2.1 m (2) 3.1 m
(3) 4.5 m (4) 6.2 m

58. Volume of one molecule of oxygen gas at S.T.P. is
(1) 3.7×10^{-20} mL (2) 2.5×10^{-21} mL
(3) 3.1×10^{-22} mL (4) 6.1×10^{-23} mL

59. Consider the following statements
a. $^{14}_{6}C$ and $^{14}_{7}N$ are isobars.
b. A tritium atom contains 1 proton and 2 neutrons.
c. All the isotopes of a given element show same chemical behaviour.
The correct statements are
(1) a and b only (2) b and c only
(3) a and c only (4) a, b and c

60. Which of the following can be explained by wave nature of electromagnetic radiation?
(1) Black body radiation
(2) Photoelectric effect
(3) Line spectra of hydrogen atom
(4) Interference

61. What is the average atomic mass of silicon, if it occurs naturally in 3 isotopes Si^{28}, Si^{29}, Si^{30} with the abundance of 92.2%, 4.7% and 3.1% respectively?
(1) 28.9 amu (2) 28.1 amu
(3) 28.5 amu (4) 29.1 amu

Space for Rough Work

62. How much water should be added to 300 ml of decinormal HCl solution to make it 0.01 N?
(1) 3000 ml (2) 2700 ml
(3) 300 ml (4) 270 ml

63. The potential energy of an electron in the H-atom is –6.8 eV. In which excited state, the electron is present?
(1) First (2) Second
(3) Third (4) Fourth

64. Number of Zn ions present in 121.5 g of ZnO is (Atomic wt. of Zn = 65)
(1) N_A (2) $\frac{N_A}{2}$
(3) $\frac{3N_A}{2}$ (4) $2N_A$

65. Ratio of the radius of first orbit of Li^{2+} to the third orbit of He^{+} ions will be
(1) 1 : 5 (2) 2 : 5
(3) 3 : 8 (4) 2 : 27

66. If the mole fraction of urea in water is 0.15, then molality of urea in the solution will be
(1) 3.4 m (2) 2.5 m
(3) 7.5 m (4) 9.8 m

67. Total number of lines emitted in infrared region when electron is de-excited from 5^{th} excited state to ground state in hydrogen atom is
(1) 3 (2) 4
(3) 5 (4) 6

68. Consider the following statements
a. Antimony is a metalloid.
b. Calcium and vanadium are representative elements.
c. Beryllium shows diagonal relationship with aluminum.
The correct statements are
(1) a and b only (2) b and c only
(3) a and c only (4) a, b and c

69. Number of urea molecules present in 800 mL of 0.5 M solution is
(1) 400 N_A (2) 40 N_A
(3) 4 N_A (4) 0.4 N_A

70. Ratio of total energy of electron of 1^{st} orbit of hydrogen (H), 2^{nd} orbit of $He^{\oplus}$ ion and 3^{rd} orbit of Li^{2+} ion will be
(1) 1 : 2 : 3 (2) 1 : 1 : 1
(3) 1 : 4 : 9 (4) 3 : 2 : 1

71. Given below are the two statements, one is labelled as **Assertion (A)** and other is labelled as **Reason (R)**:
Assertion (A): Atomic radius of sulphur is greater than atomic radius of chlorine.
Reason (R): Effective nuclear charge of chlorine is greater than sulphur.
In light of above statements, choose the correct answer.
(1) (A) is correct but (R) is not correct
(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(4) (A) is not correct but (R) is correct

72. Orbital angular momentum of 3*p* orbital is
(1) $2\hbar$ (2) $\sqrt{2}\hbar$
(3) $2\sqrt{3}\hbar$ (4) $6\hbar$

73. 6.02×10^{22} atoms of A, 0.2 mole of B and 12.04×10^{22} atoms of C combine to make a compound, the empirical formula of the compound is
(1) A_2B_2C (2) ABC_2
(3) AB_2C_2 (4) A_2BC

74. Total number of node(s) in $4p_x$ orbital is
(1) 1 (2) 2
(3) 3 (4) 4

Space for Rough Work

75. Which of the following orders is not correct with the property indicated against them?
(1) C > Be > B (Ionisation enthalpy)
(2) F > Cl > Br (Electronegativity)
(3) S > O > Se (Negative electron gain enthalpy)
(4) Cs > K > Na (Metallic nature)

76. Match the species given in List-I with number of unpaired electrons given in List-II.

	List-I		List-II
a.	Cr^{2+}	(i)	2
b.	V^{2+}	(ii)	5
c.	Mn^{2+}	(iii)	3
d.	Ni^{2+}	(iv)	4

The correct match is
(1) a(iv), b(iii), c(i), d(ii) (2) a(iv), b(iii), c(ii), d(i)
(3) a(iii), b(iv), c(i), d(ii) (4) a(ii), b(iii), c(iv), d(i)

77. The molar concentration of H^+ ion when 300 ml of water is added in 0.1 M 200 ml of H_2SO_4 solution is
(1) 0.08 M (2) 0.004 M
(3) 0.01 M (4) 0.008 M

78. A polymer consist of 8 atoms of sulphur per molecule which is 2% by mass. The molar mass of the polymer is
(1) 25600 g mol^{-1} (2) 12800 g mol^{-1}
(3) 2560 g mol^{-1} (4) 1280 g mol^{-1}

79. IUPAC official name of an element having atomic number 105 is
(1) Nobelium (2) Dubnium
(3) Bohrium (4) Rutherfordium

80. Correct order of value of work function for the given metals is
(1) Na > K > Mg (2) K > Na > Mg
(3) Mg > K > Na (4) Mg > Na > K

81. 25 g of an impure sample of $CaCO_3$ gave 9.68 g of CO_2 on complete decomposition. Percentage purity of $CaCO_3$ sample is
(1) 65% (2) 88%
(3) 96% (4) 72%

82. Consider the following statements.
a. Principal quantum number determines the size of atomic orbital.
b. Number of degenerate orbitals in third shell of He^+ ion is 9.
c. Magnetic orbital quantum number determines the three-dimensional shape of the orbital.
d. Maximum number of electrons present in a *p*-orbital is 2.
The correct statements are
(1) a, c and d only (2) b, c and d only
(3) a, b and d only (4) a, b, c and d

83. The concentration of an aqueous solution of H_2SO_4 is 98% (w/w) and its density 1.8 g/mL.
The volume of this acid required to make 400 mL of 0.9 M H_2SO_4 solution is
(1) 40 mL (2) 30 mL
(3) 50 mL (4) 20 mL

84. The correct order of energy of given orbitals for multielectronic species is
(1) $7s > 6p > 4f > 5p$ (2) $4f > 7s > 6p > 5p$
(3) $4f > 6p > 7s > 5p$ (4) $7s > 6p > 5p > 4f$

85. Number of mole of oxygen in 10 L of air containing 20% oxygen by volume at STP is
(1) 0.25 (2) 0.022
(3) 0.089 (4) 1.25

SECTION - B

86. Correct order of energy of the given radiations is
(1) X-rays > IR > Microwave > Radio waves
(2) Radio waves > Microwave > IR > X-rays
(3) Microwave > Radio waves > IR > X-rays
(4) Radio waves > IR > Microwave > X-rays

Space for Rough Work

87. Given below are the two statements.

Statement-I: For a given value of l, m_l has (2l + 1) values.

Statement-II: For l = 0, the only permitted value of $m_l = 0$.

The correct option is

(1) Both Statements I and II are correct

(2) Both Statements I and II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

88. Mg^{2+} is isoelectronic with

(1) Na^+ (2) Ca^{2+}

(3) Be^{2+} (4) K^+

89. Match the following and choose the correct option.

	Column-I		**Column-II**
a.	N_2O	(i)	Amphoteric
b.	As_2O_3	(ii)	Acidic
c.	K_2O	(iii)	Neutral
d.	SO_2	(iv)	Basic

(1) a(ii), b(i), c(iv), d(iii) (2) a(iii), b(i), c(ii), d(iv)

(3) a(iii), b(i), c(iv), d(ii) (4) a(iv), b(iii), c(ii), d(i)

90. A gaseous mixture contains equal mass of oxygen and hydrogen. The ratio of their molecules is

(1) 1 : 4 (2) 1 : 16

(3) 1 : 2 (4) 1 : 32

91. Select the correct statement regarding photoelectric effect.

(1) Number of ejected electrons are independent of intensity of light

(2) Kinetic energy of electrons are independent of intensity of light

(3) Kinetic energy of electrons are independent of frequency of light

(4) Number of ejected electrons depends on the frequency of light

92. Molarity of OH^- ions in a mixture of 100 mL of 0.1 M H_2SO_4 and 300 mL of 0.1 M NaOH is

(1) 0.1 M (2) 0.50 M

(3) 0.050 M (4) 0.025 M

93. Which of the following pairs of *d*-orbitals will have electron density along the axes?

(1) $d_{x^2-y^2}, d_{z^2}$ (2) d_{xy}, d_{z^2}

(3) $d_{yz}, d_{x^2-y^2}$ (4) d_{xy}, d_{yz}

94. What is the maximum number of electrons that can be associated with following set of quantum numbers n = 4, l = 2?

(1) 2 (2) 5

(3) 14 (4) 10

95. Match List I with List II.

	List I		**List II**
a.	Alkali metal	(i)	ns^2np^4
b.	Alkaline earth metal	(ii)	ns^1
c.	Halogens	(iii)	ns^2np^5
d.	Chalcogens	(iv)	ns^2

Choose the correct option.

(1) a(ii), b(iv), c(i), d(iii) (2) a(ii), b(iv), c(iii), d(i)

(3) a(ii), b(iii), c(iv), d(i) (4) a(iv), b(iii), c(ii), d(i)

96. Moles of electrons present in one kilogram of electrons is (m_e = mass of one electron in kg)

(1) $\frac{N_A}{m_e}$ (2) $m_e N_A$

(3) $\frac{1}{m_e N_A}$ (4) $\frac{m_e}{N_A}$

Space for Rough Work

97. Given below are the two statements:

Statement-I: Chromium and copper both have exceptional electronic configuration.

Statement-II: Total number of *d* electrons in copper and chromium are 10 and 5 respectively.

In the light of above statements, choose the most appropriate answer from the options given below:

(1) Both statement I and statement II are correct

(2) Both statement I and statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

98. The wave number for the shortest wavelength transition in the Paschen series of atomic hydrogen is (R_H : Rydberg constant)

(1) R_H (2) $\frac{R_H}{9}$

(3) $\frac{7R_H}{144}$ (4) $\frac{9}{7}R_H$

99. Given below ae the two statements:

Statement-I: Splitting of the spectral lines in magnetic field is known as Stark effect.

Statement-II: Splitting of the spectral lines in electric field is known as Zeeman effect.

(1) Both statement I and statement II are correct

(2) Both statement I and statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

100. The number of photons emitted in one second by a 10 watt bulb, which emits monochromatic light of wavelength 662 nm, is

($h = 6.62 \times 10^{-34}$ Js)

(1) 6.28×10^{18}

(2) 3.33×10^{19}

(3) 5.21×10^{18}

(4) 7.25×10^{17}

BOTANY

SECTION - A

101. An example of heterosporous plant is

(1) *Salvinia* (2) *Dryopteris*

(3) *Polytrichum* (4) *Sphagnum*

102. Haplontic life cycle pattern is exhibited by

(1) *Spirogyra* (2) *Polysiphonia*

(3) *Fucus* (4) *Ectocarpus*

103. Septate, branched mycelium is found in all given classes of fungi, **except**

(1) Deuteromycetes (2) Basidiomycetes

(3) Phycomycetes (4) Ascomycetes

104. Infectious agent which cause potato spindle tuber disease is

(1) Prion (2) Virusoid

(3) Viroid (4) Virus

105. Read the following statements and choose the **correct** option.

Statement A: The three-domain system divides the kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in third domain.

Statement B: *Thermoplasma* is a facultative anaerobe which oxidises sulphur to sulphuric acid under aerobic conditions.

(1) Both statements A and B are incorrect

(2) Both statements A and B are correct

(3) Only statement A is correct

(4) Only statement B is correct

Space for Rough Work

106. Identify the organism on the basis of below given features.

a. Presence of protein rich layer called pellicle

b. Reserve food material is paramylon

c. Pigments are identical to those present in higher plants

d. Have two flagella, one short and another long

(1) Diatoms (2) Dinoflagellates

(3) Euglenoids (4) Slime moulds

107. Match **List-I** with **List-II**.

	List-I		**List-II**
a.	*Eucalyptus*	(i)	Stored food is laminarin
b.	*Gelidium*	(ii)	Non-vascular embryophyte
c.	*Funaria*	(iii)	Non-archegoniate embryophyte
d.	*Dictyota*	(iv)	Agar Agar

Choose the **correct** option.

(1) a(iii), b(i), c(ii), d(iv) (2) a(ii), b(iii), c(iv), d(i)

(3) a(iii), b(iv), c(ii), d(i) (4) a(ii), b(i), c(iii), d(iv)

108. Classification system given by Bentham and Hooker

(1) Was based only on gross superficial morphological characters like androecium structure.

(2) Was based on evolutionary relationships between various organisms.

(3) Is an artificial system of classification

(4) Was based on natural affinities among the organisms and considered not only external but also internal features.

109. Select the **incorrect** statement w.r.t mosses.

(1) Predominant stage in life cycle is the gametophyte

(2) They have an elaborate mechanism of spore dispersal

(3) Their juvenile stage is represented by leafy stage

(4) Vegetative reproduction occurs by fragmentation and budding in secondary protonema

110. Read the following statements and select the **correct** option.

Assertion (A): Viruses did not get any place in five kingdom classification system.

Reason (R): Viruses are not truly living.

(1) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(2) Both (A) and (R) are true and (R) is the correct explanation of (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

111. Which of the following options has structures of gymnosperm that are haploid in nature?

(1) Pollen, ovule

(2) Microspore, Megasporophyll

(3) Male gametophyte, Archegonia

(4) Ovule, megaspore

112. Unicellular fungus used in brewing and baking industry is

(1) Morels (2) Yeast

(3) *Penicillium* (4) *Neurospora*

113. Which of the following statements is **correct** for the organisms which are commonly called the 'Jokers of plant kingdom'?

(1) They infect animals only

(2) They have cellulosic cell wall

(3) They have both RNA and DNA

(4) They are sensitive to penicillin

114. Pyrenoids in green algae contain

(1) Protein and starch

(2) Cellulose and fatty acids

(3) Cellulose and starch

(4) Glucose and glycogen

Space for Rough Work

115. During unfavourable conditions, plasmodium of slime mould differentiates and forms
(1) Fruiting bodies (2) Wall-less spores
(3) Mycelium (4) Biflagellate spores

116. Consciousness is considered a defining property of living organisms because
(1) Except plants, all eukaryotes can sense their surroundings
(2) Most complex organisms are unable to respond to environmental stimuli
(3) All organisms are aware of their surroundings and respond to external environmental stimuli
(4) Except microbes, all organisms show consciousness

117. Which among the following algae has stored food very similar to amylopectin and glycogen in structure?
(1)  (2) 
(3)  (4) 

118. In angiosperms, egg apparatus
(1) Has haploid cells
(2) Is present inside central cell
(3) Consists of two egg cells and one synergid
(4) Is 7 celled 8 nucleate structure

119. Select the **incorrect** statement.
(1) *Albugo* is a parasitic fungus on mustard.
(2) Fungi cause diseases in both plants and animals.
(3) Toadstools are poisonous fungi.
(4) The cell wall of fungi is mainly composed of cellulose and peptidoglycan.

120. The plant body is thalloid in
(1) *Pteris* (2) *Selaginella*
(3) *Marchantia* (4) *Equisetum*

121. Edible basidiocarp is present in
(1) *Agaricus* (2) Truffles
(3) *Ustilago* (4) Morels

122. Coralloid roots of _____ are associated with N_2-fixing cyanobacteria.
(1) *Pinus* (2) *Cycas*
(3) *Ginkgo* (4) *Cedrus*

123. Which of the following contains the actual account of habitat and distribution of plants of a given area?
(1) Manuals (2) Flora
(3) Monographs (4) Catalogues

124. Convolvulaceae and Solanaceae are included in the order
(1) Polymoniales (2) Dicotyledonae
(3) Sapindales (4) Poales

125. Key is an important taxonomic aid and
(a) It is generally analytical in nature
(b) It is used for identification of plants only
(c) It is based on contrasting characters generally in a pair called couplet
Choose the **correct** option.
(1) (b) only (2) (a) and (c) only
(3) (a) and (b) only (4) All (a), (b) and (c)

126. State **True (T)** or **False (F)** to the given statements.
(A) Higher the taxa, more are the characteristics that the members within the taxon share.
(B) Properties of tissues are not present in the constituent cells but arise as a result of interactions among the constituent cells.
(C) In unicellular organisms, growth and reproduction are mutually inclusive events
(D) Systematics includes characterisation, identification, nomenclature and classification of organisms along with their evolutionary studies.

	(A)	(B)	(C)	(D)
(1)	F	F	T	T
(2)	F	T	T	T
(3)	T	T	F	T
(4)	T	F	F	T

Space for Rough Work

127. Select the **correctly** matched pair.
(1) Methanogens – Facultative anaerobes
(2) Amoeboid protozoans – Silica shells in some marine forms
(3) *Puccinia* – White rust on mustard
(4) *Gonyaulax* – Chief producers of ocean

128. *Selaginella* differs from *Pinus* as the former
(1) Produces seeds without covering
(2) Has multicellular, independent haploid gametophyte in the life cycle
(3) Shows presence of vascular tissues
(4) Is heterosporous

129. Choose the **correct** option w.r.t. herbarium
(1) It serves as ideal means to study and learn different food habits of variety of animals
(2) It provides information about local flora as well as flora of distant areas
(3) It is a storehouse of dead plant specimens which are preserved in jars
(4) It is a storehouse of living plants and insects

130. Which of the following is **incorrect** about *Fucus*?
(1) It possesses air bladders
(2) Possesses the pigments chlorophyll a and c
(3) Shows diplontic life cycle
(4) Carrageen is obtained from it

131. Both diatoms and dinoflagellates are protists but differ in
(1) Mode of nutrition
(2) Cell wall composition
(3) Body organisation
(4) Habitat as former is aquatic and latter is terrestrial

132. Prothallus found in pteridophytes is
(1) Mostly photosynthetic
(2) Unicellular
(3) Diploid
(4) A spore producing structure

133. How many feature(s) is/are common between bryophytes and pteridophytes?
a. True leaves
b. Diploid sporophyte
c. Jacketed sex organs
d. Motile male gametes
e. Haplo-diplontic life cycle
(1) Three (2) Four
(3) Two (4) One

134. *Selaginella*, *Dryopteris*, *Equisetum*, *Adiantum*, *Lycopodium* and *Pteris* belong to how many classes of pteridophytes?
(1) One (2) Two
(3) Three (4) Four

135. Which feature of living beings is absent in mules?
(1) Growth (2) Metabolism
(3) Reproduction (4) Consciousness

SECTION-B

136. Cellulose, pectin and polysulphate esters are present in the cell wall of
(1) *Gracilaria* (2) *Volvox*
(3) *Ulothrix* (4) *Ectocarpus*

137. Royal Botanical Garden is located in
(1) Lucknow (2) Howrah
(3) Kew, England (4) Darjeeling

138. Two kingdom classification system was proposed by
(1) Carolus Linnaeus
(2) Aristotle
(3) R.H. Whittaker
(4) Haeckel

139. Which of the following is **correct** about prions?
(1) They replicate within the host and do not cause any infection
(2) These agents are similar in size to viruses
(3) These agents are known to cause diseases in plants only
(4) These were discovered by T.O. Diener

Space for Rough Work

140. Select the **incorrectly** matched pair.
(1) *Eudorina* – Anisogamous sexual reproduction
(2) *Laminaria* – Rich source of iodine
(3) *Marchantia* – Dioecious
(4) Triploid endosperm – Gymnosperms

141. Majority of the red algae are marine and reach the maximum depth in sea water where no other type of photosynthetic organisms grow. Red colour of these algae is due to the abundance of
(1) Chlorophyll a (2) Chlorophyll b
(3) Fucoxanthin (4) Phycoerythrin

142. Read the following statements and select the **correct** option.
Assertion (A): Archaebacteria can survive in extreme conditions.
Reason (R): Archaebacteria have a different cell wall structure from other bacteria.
(1) (A) is true and (R) is false
(2) (A) is false and (R) is true
(3) Both (A) and (R) are true and (R) is correct explanation of (A)
(4) Both (A) and (R) are true but (R) is not correct explanation of (A)

143. *pardus, leo* and *melongena*
(1) Represent the different ranks of different categories
(2) Belong to the same genus
(3) Share same morphological characters
(4) Represent the different taxa at same level

144. Both *Neurospora* and *Claviceps* form
(1) Endogenous asexual and exogenous sexual spores
(2) Conidia as asexual and basidiospore as sexual spores
(3) Zoospore as asexual and ascospore as sexual spores
(4) Exogenous asexual and endogenous sexual spores

145. Majority of bacteria are
(1) Parasites (2) Chemoautotrophs
(3) Photoautotrophs (4) Decomposers

146. Read the following statements and select the **correct** option.
Statement A: Bacilli are rod shaped bacteria.
Statement B: Some heterotrophic bacteria help in fixing nitrogen in legumes.
(1) Only statement A is correct
(2) Only statement B is correct
(3) Both the statements A and B are correct
(4) Both the statements A and B are incorrect

147. Select the **odd** ones w.r.t. seven obligate categories of taxonomic hierarchy.
(1) Kingdom, Phylum, Division
(2) Tribe, Variety
(3) Species, Genus, Family
(4) Order, Family, Genus

148. The homosporous vascular cryptogams
(1) Show the events precursor to the seed habit
(2) Produce same types of spores
(3) Are aquatic ferns only
(4) Show haplontic life-cycle pattern

149. Members of liverworts
(a) Have true leaves
(b) Have free living sporophyte
(c) Have true roots
(d) Have sporophyte differentiated into foot, seta and capsule
Select the option having **correct** statements.
(1) (d) only (2) (a) & (b) only
(3) (c) & (d) (4) (a), (b) & (c)

150. PEN is formed after fertilization in
(1) *Cycas, Ginkgo, Pinus*
(2) *Wolffia*, *Eucalyptus*, *Pinus*
(3) Sunflower, *Wolffia*, *Eucalyptus*
(4) *Ginkgo*, *Wolffia*, *Cycas*

Space for Rough Work

ZOOLOGY

SECTION - A

151. Which of the following vertebrates do not possess jaws?
(1) *Petromyzon* (2) *Ichthyophis*
(3) *Pristis* (4) *Clarias*

152. Pisces and Tetrapoda are two super classes of
(1) Division Vertebrata
(2) Subphylum Gnathostomata
(3) Subphylum Chordata
(4) Division Gnathostomata

153. True segmentation in the body was first observed in the members of which of the following phyla?
(1) Platyhelminthes (2) Chordata
(3) Annelida (4) Arthropoda

154. Members of which of the following classes are well adapted to live both on land and in water?
(1) Amphibia (2) Reptilia
(3) Aves (4) Mammalia

155. Which of the following is/are unique feature(s) of mammals?
(a) Presence of mammary glands
(b) Presence of hair on the skin
(c) Viviparity
Select the **correct** option.
(1) (a) only (2) (b) only
(3) (a) and (b) only (4) (a), (b) and (c)

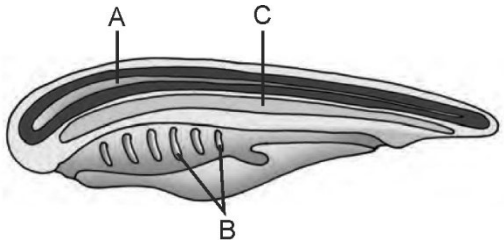
156. Choose the **incorrect** statement w.r.t. hemichordates.
(1) They are considered as most primitive chordates.
(2) Body is differentiated into proboscis, collar and trunk.
(3) Sexes are separate, hence considered dioecious.
(4) They are worm-like marine animals.

157. Which of the following is the common feature of non-chordates and chordates?
(1) Notochord
(2) Post-anal tail
(3) Central nervous system
(4) Pharyngeal gill slits

158. **Assertion (A):** In vertebrates, notochord is replaced by a cartilaginous or bony vertebral column.
Reason (R): All vertebrates are chordates but all chordates are not vertebrates.
In the light of above statements, choose the **correc**t answer from the options given below.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true, (R) is false
(4) Both (A) and (R) are false

159. All of the following animals are representatives of phyla of exclusively marine animals, **except**
(1) *Ctenoplana*
(2) *Meandrina*
(3) *Antedon*
(4) *Saccoglossus*

160. Fundamental characteristics of chordates are diagrammatically shown in following figure. Identify A, B and C and choose the **correct** option.



Space for Rough Work

	A	B	C
(1)	Mesodermally derived rod-like structure	Pharynx with gill slits	Ectodermal derived tube-like structure
(2)	Digestive tract which opens into mouth	Post-anal tail	Mesodermally derived rod-like structure
(3)	Ventral, solid and double CNS	Pharynx perforated by gill slits	Neural tube which forms brain and spinal cord
(4)	Nerve cord dorsal to notochord	Pharynx perforated by gill slits	Notochord ventral to nerve cord and dorsal to gut

161. All of the following animals have three-chambered heart, **except**
(1) *Calotes* (2) *Salamandra*
(3) *Ichthyophis* (4) *Crocodilus*

162. Which of the following animals is not a poikilotherm?
(1) *Labeo* (2) *Alligator*
(3) *Naja* (4) *Psittacula*

163. Select the characteristic shared by birds and all mammals.
(1) Oviparity
(2) Presence of scales
(3) Pulmonary respiration
(4) Presence of pneumatic bones

164. *Limulus* is a living fossil placed in the phylum
(1) Chordata (2) Mollusca
(3) Annelida (4) Arthropoda

165. Match following columns and select the **correct** option.

Column I	**Column II**
a. *Sycon*	(i) Brittle star
b. *Adamsia*	(ii) Chiton
c. *Chaetopleura*	(iii) Sea anemone
d. *Ophiura*	(iv) Scypha

(1) a(i), b(ii), c(iii), d(iv) (2) a(iv), b(iii), c(ii), d(i)
(3) a(iii), b(iv), c(i), d(ii) (4) a(iv), b(iii), c(i), d(ii)

166. In which of the following sets of animals, all the animals are oviparous?
(1) Penguin, Dolphin, Cobra, Viper
(2) Crocodile, Ostrich, Kangaroo, Salamander
(3) Frog, Great white Shark, Angel fish
(4) Alligator, Crow, Platypus, Flying fish

167. Select an animal which can fly with the help of its chitinous wings
(1) *Struthio* (2) *Pavo*
(3) Prawn (4) Mosquito

168. Choose the **correct** option to complete the analogy.
Electric organ : *Torpedo* :: Poison sting : _____
(1) *Pristis* (2) *Exocoetus*
(3) *Trygon* (4) *Testudo*

169. Select the **incorrect** options w.r.t. members of phylum Echinodermata.
(1) Endoskeleton is formed by calcareous ossicles.
(2) They are exclusively marine, triploblastic and acoelomates.
(3) Mouth is situated on the lower side and anus is situated on the upper side.
(4) Fertilisation is usually external and development is indirect.

170. **Assertion (A):** *Taenia* absorbs nutrients from the host directly through its body surface.
Reason (R): Hooks and suckers present in it are parasitic adaptations.
In the light of above statements, select the **correct** answer from the options given below:
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of the (A)
(3) (A) is true, (R) is false
(4) Both (A) and (R) are false

Space for Rough Work

171. All of the following are true for *Planaria*, **except**
(1) Dorso-ventrally flattened body
(2) Possesses high regeneration capacity
(3) Sexes are not separate
(4) Triploblastic pseudocoelomate animal

172. Central gastro-vascular cavity with a single opening, mouth on hypostome is a feature of
(1) Porifers (2) Coelenterates
(3) Platyhelminthes (4) Ctenophores

173. In most primitive multicellular animals, which of the following options is helpful in food gathering, respiratory exchange and removal of waste?
(1) Water vascular system
(2) Water transport system
(3) Blood vascular system
(4) Gastro-vascular cavity

174. Select a set of animals which are diploblastic, radially symmetrical and acoelomates.
(1) *Spongilla*, *Fasciola*, *Wuchereria*
(2) *Pennatula*, *Pleurobrachia*, *Physalia*
(3) *Euspongia*, *Taenia*, *Hirudinaria*
(4) *Adamsia*, *Gorgonia*, *Aplysia*

175. Read the following statements carefully w.r.t. annelids.
(a) They have longitudinal and circular muscles in their body wall which help in locomotion.
(b) They have a well developed closed circulatory system as well as respiratory system.
(c) Their body is externally and internally divided into metameres without division of any organ.
(d) Nervous system consists of paired ganglia connected by longitudinal nerves to a single ventral nerve cord.
(e) They all are monoecious and perform sexual reproduction.

Choose the option with only **correct** statement(s).
(1) (a) and (c) only (2) (b), (c) and (d)
(3) (a), (b), (c) and (d) (4) (a) only

176. An undifferentiated layer, (A) is present between the ectoderm and endoderm in (B) .

Select the option that fills the blanks (A) and (B) **correctly**.
(1) A – Mesoglea, B – Sponges
(2) A – Mesoderm, B – Coelenterates
(3) A – Mesoglea, B – Coelenterates
(4) A – Mesoderm, B – Comb jellies

177. Select the **odd one** w.r.t. symmetry commonly present in adult forms.
(1) Sponges (2) Ctenophores
(3) Coelenterates (4) Echinoderms

178. Select the **correct** statement w.r.t adult porifers.
(1) Fertilisation is external with direct development.
(2) Water enters the body of poriferans *via* osculum and leaves *via* ostia.
(3) They are hermaphrodite *i.e.*, eggs and sperms are produced by the same individual.
(4) The body is supported by a skeleton made up of calcium and magnesium only.

179. Which of the following have the most complex level of organisation?
(1) Coelenterates (2) Porifers
(3) Platyhelminthes (4) Annelids

180. Choose the **correct** match.

(1)	*Taenia*	–	Incomplete digestive system
(2)	*Locusta*	–	Absence of blood capillaries
(3)	*Asterias*	–	Presence of radula
(4)	*Gorgonia*	–	Bilateral symmetry

181. Read the given statements and select the **correct** option.

Statement (A): Metagenesis refers to occurrence of drastic change in sponges.

Statement (B): Chitinous exoskeleton is mainly responsible for diversification of insects on land.

Space for Rough Work

(1) Both statements (A) and (B) are correct
(2) Both statements (A) and (B) are incorrect
(3) Only statement (A) is correct
(4) Only statement (B) is correct

182. Select the group of animals that possesses closed type of circulation.
(1) Earthworm, Silkworm, Hookworm
(2) Salamander, Earthworm, Turtle
(3) Roundworm, Earthworm, Honeybee
(4) Lizard, Earthworm, Roundworm

183. What is true about *Nereis*, *Periplaneta* and *Apis*?
(1) They all belong to the same phylum
(2) They all have jointed anal style
(3) They all possess dorsal heart
(4) None of them is aquatic

184. Bilateral symmetry first evolved in the members of phylum
(1) Arthropoda (2) Aschelminthes
(3) Platyhelminthes (4) Chordata

185. Select the **correct** match w.r.t genus, its characteristics and taxon.

	Genus	Characteristics	Taxon
(1)	*Hirudinaria*	Digestion of food is extracellular	Aschelminthes
(2)	*Bombyx*	Malpighian tubules for respiration	Arthropoda
(3)	*Saccoglossus*	Open circulatory system	Hemichordata
(4)	*Echinus*	Hermaphrodite	Echinodermata

SECTION - B

186. Which set includes arthropods of economic importance providing useful products to humans?
(1) *Limulus*, *Locusta*, *Bombyx*
(2) *Culex*, *Limulus*, *Laccifer*
(3) *Apis*, *Bombyx*, *Laccifer*
(4) *Anopheles*, *Locusta*, *Limulus*

187. Choose the **correct** match w.r.t. animals and their taxonomic category.

(1)	Jelly fish, Cuttlefish, Flying fish	–	Pisces
(2)	Housefly, Butterfly, Scorpion, Silkworm	–	Arthropoda
(3)	*Culex*, *Aedes*, Scorpion, Spider	–	Mollusca
(4)	Sea hare, Sea urchin, Sea anemone	–	Coelenterata

188. Which of the following animals is considered as true fish?
(1) Devil fish (2) Cuttlefish
(3) Dogfish (4) Star fish

189. Select the **incorrect** match w.r.t. animal and its taxon.
(1) *Aptenodytes* – Aves
(2) *Clarias* – Chondrichthyes
(3) *Macropus* – Mammalia
(4) *Ichthyophis* – Amphibia

190. Characteristics that distinguish arthropods from annelids and molluscs are
a. Subdivision of the legs into movable segments
b. Distinct mandibles
c. Chitinous exoskeleton
d. Level of organisation
Select the **correct** option.
(1) a, b, c and d (2) a, b and c
(3) a, c and d (4) b, c and d

191. Choose the **incorrect** option w.r.t. reptiles.
(1) First true land vertebrates
(2) These are poikilotherms and shed their scales as skin cast
(3) They are mostly viviparous and development is direct
(4) External ear openings are absent

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192. Indirect development involves transformation of a larval stage which is morphologically distinct from the adult. This phenomenon is not seen in
(1) *Ascidia* (2) *Asterias*
(3) *Ancylostoma* (4) *Alligator*

193. How many of the organisms given below in the box are not flightless birds?

Psittacula, *Neophron*, *Pavo*, *Columba*, *Aptenodytes*, *Struthio, Corvus*

Select the **correct** option.
(1) Six (2) Four
(3) Three (4) Five

194. Select the **correct** statement.
(1) Crocodile and penguin are similar to whale and dogfish in having gill slits at some stage.
(2) Body of all arthropods are divided into head, thorax and abdomen and respires by tracheal tubes.
(3) *Calotes* is the scientific name of the common wall lizard.
(4) Echinoderms possess pentamerous radial symmetry and all show internal fertilisation.

195. Choose the **incorrect** statement w.r.t. kingdom Animalia.
(1) All members are multicellular *i.e.* their body is made up of more than one cell.
(2) In higher phyla, tissues are grouped together to form organs.
(3) Members have different grades of organisation.
(4) All bilaterally symmetrical animals have ventral, solid and double nerve cord.

196. How many of the given statements are **correct**?
a. Cyclostomes are the most primitive living marine vertebrates and are ectoparasites on fishes.
b. Avian skin is moist with glands.
c. Mammals possess heterodont dentition.
d. Echinoderms have a well organised excretory system.

Select the **correct** option.
(1) One
(2) Two
(3) Three
(4) Four

197. The distinction between sponges and other animal phyla is mainly based on the absence of which of the following feature in the former group of animals?
(1) Gametogenesis (2) Aquatic habitat
(3) Fertilization (4) Tissues

198. The water vascular system of *Ophiura*
(1) Participates in conduction of nerve impulses
(2) Functions in locomotion and feeding
(3) Is helpful in embryonic development
(4) Helps in gametogenesis and reproduction

199. Select the second largest phylum of animal kingdom.
(1) Arthropoda (2) Mollusca
(3) Echinodermata (4) Hemichordata

200. All are key evolutionary advancements of flatworms, **except**
(1) Bilateral symmetry
(2) Organ level of body organization
(3) Cephalisation
(4) Complete digestive system

❑ ❑ ❑

Space for Rough Work

22/03/2024

Phase-I
CODE-B

Aakash
Medical | IIT-JEE | Foundations

Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 1** **Time : 3 Hrs. 20 Mins.**

Answers

1. (1)	41. (1)	81. (2)	121. (1)	161. (4)
2. (1)	42. (3)	82. (3)	122. (2)	162. (4)
3. (3)	43. (4)	83. (4)	123. (2)	163. (3)
4. (3)	44. (1)	84. (1)	124. (1)	164. (4)
5. (3)	45. (1)	85. (3)	125. (2)	165. (2)
6. (1)	46. (1)	86. (1)	126. (2)	166. (4)
7. (4)	47. (4)	87. (1)	127. (2)	167. (4)
8. (3)	48. (1)	88. (1)	128. (2)	168. (3)
9. (2)	49. (1)	89. (3)	129. (2)	169. (2)
10. (4)	50. (3)	90. (2)	130. (4)	170. (2)
11. (2)	51. (4)	91. (2)	131. (2)	171. (4)
12. (4)	52. (1)	92. (4)	132. (1)	172. (2)
13. (2)	53. (3)	93. (1)	133. (2)	173. (2)
14. (3)	54. (2)	94. (4)	134. (3)	174. (2)
15. (2)	55. (3)	95. (2)	135. (3)	175. (4)
16. (4)	56. (3)	96. (3)	136. (1)	176. (3)
17. (4)	57. (2)	97. (1)	137. (3)	177. (1)
18. (2)	58. (1)	98. (2)	138. (1)	178. (3)
19. (2)	59. (4)	99. (2)	139. (2)	179. (4)
20. (2)	60. (4)	100. (2)	140. (4)	180. (2)
21. (2)	61. (2)	101. (1)	141. (4)	181. (4)
22. (2)	62. (2)	102. (1)	142. (3)	182. (2)
23. (4)	63. (1)	103. (3)	143. (4)	183. (3)
24. (3)	64. (3)	104. (3)	144. (4)	184. (3)
25. (4)	65. (4)	105. (2)	145. (4)	185. (3)
26. (2)	66. (4)	106. (3)	146. (3)	186. (3)
27. (2)	67. (4)	107. (3)	147. (2)	187. (2)
28. (4)	68. (3)	108. (4)	148. (2)	188. (3)
29. (2)	69. (4)	109. (3)	149. (1)	189. (2)
30. (3)	70. (2)	110. (2)	150. (3)	190. (2)
31. (3)	71. (2)	111. (3)	151. (1)	191. (3)
32. (2)	72. (2)	112. (2)	152. (4)	192. (4)
33. (4)	73. (3)	113. (3)	153. (3)	193. (4)
34. (1)	74. (3)	114. (1)	154. (1)	194. (1)
35. (3)	75. (3)	115. (1)	155. (3)	195. (4)
36. (3)	76. (2)	116. (3)	156. (1)	196. (2)
37. (1)	77. (1)	117. (2)	157. (3)	197. (4)
38. (4)	78. (2)	118. (1)	158. (2)	198. (2)
39. (2)	79. (2)	119. (4)	159. (2)	199. (2)
40. (2)	80. (4)	120. (3)	160. (4)	200. (4)

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test - I** **Time : 3 Hrs. 20 Mins.**

Answers and Solutions

PHYSICS

SECTION - A

1. Answer (1)

$$\frac{\Delta P}{P}\times 100 = \frac{\Delta a}{a}\times 100 + \frac{\Delta b}{b}\times 100 + \frac{5}{2}\cdot\frac{\Delta c}{c}\times 100 + \frac{1}{2}\cdot\frac{\Delta d}{d}\times 100$$

$$= 1\% + 2\% + \frac{5}{2}\times 0.5\% + \frac{1}{2}\times 1.5\% = 5\%$$

2. Answer (1)

At t = 1 s, both balls are in air.

a_{rel} = zero

$v_{rel} = u_{rel} + a_{rel}t$ = 20 m/s

3. Answer (3)

$$t_1 : t_2 : t_3 = 1 : (\sqrt{2}-1) : (\sqrt{3}-\sqrt{2})$$

4. Answer (3)

$n_1u_1 = n_2u_2$

$1(M)\ (20\text{ m})\ (100\text{ s})^{-2} = 100\ (1\text{ kg})\ (1\text{ m})\ (1\text{ s})^{-2}$

$$\Rightarrow M = 100\ (1\text{ kg})\left(\frac{1\text{ m}}{20\text{ m}}\right)\left(\frac{1}{100\text{ s}}\right)^{-2}$$

$$= 100\times\frac{1}{20}\times(100)^2\text{ kg}$$

$= 5 \times 10^4$ kg

5. Answer (3)

Ball will stop momentarily at t = 3.5 s.

Distance travelled in 4th second will be

$$S = 2\times\frac{1}{2}a(0.5)^2$$

$$\Rightarrow S = 2\times\frac{1}{2}\times 10(0.5)^2 = 2.5\text{ m}$$

6. Answer (1)

From rules for arithmetic operation with significant figures.

$L = L_1 + L_2$

= 100 m + 0.2 m

= 100.2 m

$L \simeq$ 100 m upto appropriate significant number.

7. Answer (4)

From the graph at t = 1 s, v_i = 10 m/s

at t = 7 s, v_f = 25 m/s

$$a_{average} = \frac{v_f - v_i}{\Delta t} = \frac{15}{6} = 2.5\text{ m/s}^2$$

8. Answer (3)

$$\because \quad h_{max} = \frac{u_y^2}{2g}$$

$u_y \rightarrow$ initial vertical component of velocity.

$v_y = u_y - g \times t$

$0 = u_y - 10 \times 1$

u_y = 10 m/s

$\therefore \quad h_{max}$ = 5 m

9. Answer (2)

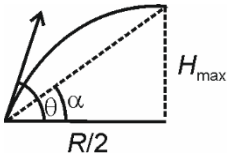
Random error $\propto \frac{1}{n}$ (Where n is number of observation)

$$\frac{e_1}{e_2} = \frac{60}{10} \Rightarrow e_2 = \frac{e_1}{6} = \frac{e}{6}$$

10. Answer (4)

$$\left|\vec{v}_{rain}\right| = \sqrt{1^2 + 2^2} = \sqrt{5}\text{ km/h}$$

11. Answer (2)



$y = ax - bx^2$

$\Rightarrow \tan\theta = a$

$$\tan\alpha = \frac{H_{max}}{R/2}$$

$$\Rightarrow \tan\alpha = \frac{\tan\theta}{2}$$

$$\alpha = \tan^{-1}\left(\frac{a}{2}\right)$$

12. Answer (4)

$$x = 6\left(t - e^{-2t}\right)$$

$$v = \frac{dx}{dt} = 6 - 6\times(-2)e^{-2t} = 6 + 12e^{-2t}$$

$v_{(t=0)} = 6 + 12 = 18$ m/s

13. Answer (2)

[Energy density] = $[ML^{-1}T^{-2}]$

[Density] = $[ML^{-3}]$

14. Answer (3)

$x = -20$ m

$u = 15$ m/s

$a = -10$

$$x = ut + \frac{1}{2}at^2$$

$$-20 = 15t - \frac{1}{2}\times 10t^2$$

$5t^2 - 15t - 20 = 0$

$5[t^2 - 3t - 4] = 0$

$t^2 - 3t - 4 = 0$

$t^2 - 4t + t - 4 = 0$

$t(t-4) + 1(t-4) = 0$

$t = 4$ s

In 4 s balloon travels = 15 × 4 = 60 m distance

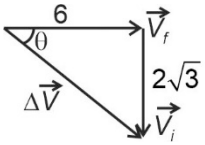
15. Answer (2)

Relative velocity of coin with respect to observer attached to train is zero in horizontal direction.

16. Answer (4)

$$[X] = [C][T^2] \Rightarrow [C] = \frac{[L]}{[T^2]} = [LT^{-2}]$$

17. Answer (4)



$$\tan\theta = \frac{1}{\sqrt{3}}$$

$\Rightarrow \theta = 30°$

18. Answer (2)

$$x = 4 - 9t + \frac{t^3}{3}$$

$$v = \frac{dx}{dt} = -9 + t^2$$

$$a = \frac{dv}{dt} = 2t$$

$\therefore$ $v < 0$ for period $0 < t < 3$ s

i.e. the velocity of particle reduces between $t = 0$ to $t = 3$ s and changes direction of motion at $t = 3$ s.

19. Answer (2)

$$\langle v \rangle = \frac{2v_1v_2}{v_1 + v_2} = \frac{2\times v\times 3v}{4v} = \frac{3v}{2}$$

20. Answer (2)

$$\frac{2u_xu_y}{g} = 4\times\frac{u_y^2}{2g}$$

$4\cos\theta = 4\sin\theta$

$\tan\theta = 1$

$\theta = 45°$

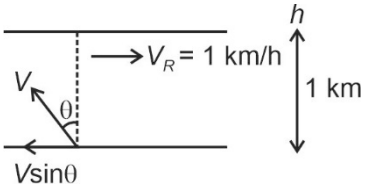
21. Answer (2)

$$y = x\tan\theta\left(1 - \frac{x}{R}\right)$$

$$y = \sqrt{3}x\left[1 - \frac{1}{\frac{\sqrt{3}}{5}}\right]$$

$$\Rightarrow R = \frac{\sqrt{3}}{5}$$

22. Answer (2)



$V\sin\theta = V_R$

$2 \times \sin\theta = V_R$

$\sin\theta = \frac{1}{2}$

$\theta = 30°$

$V_{m/g} = 2 \times \frac{\sqrt{3}}{2} = \sqrt{3}$ km/h

23. Answer (4)

$v = 54 \times \frac{5}{18} = 15$ m/s

Distance = 1000 + 200 = 1200 m

$t = \frac{1200}{15}$ = 80 second

24. Answer (3)

If the direction of tangential acceleration is along velocity, then speed increases and if it is in opposite direction then it decreases.

In non-uniform circular motion, magnitude of centripetal acceleration is variable.

25. Answer (4)

$a_t = \beta \Rightarrow \alpha = \frac{\beta}{r}$

Applying

$2\alpha\theta = \omega^2 - \omega_0^2$

$2 \times \frac{\beta}{r} \times \frac{\pi}{2} = \omega_f^2$

$\Rightarrow \quad \omega_f^2 = \frac{\beta\pi}{r}$

$\Rightarrow \quad a_c = r\omega_f^2 = \beta\pi$

26. Answer (2)

Bodies projected with same speed at complimentary angles with horizontal have equal ranges. Maximum range of projectile is when it is projected at 45°.

27. Answer (2)

- In one complete rotation, average velocity of the particle become zero.
- In circular motion, direction of motion changes hence velocity is variable.
- In non-uniform circular motion, speed varies and hence magnitude of centripetal acceleration varies.

28. Answer (4)

For a moving body

Distance $\geq$ |Displacement|

Distance cannot have zero or negative values and displacement may be +ve, – ve or zero.

29. Answer (2)

If $T_A = T_B$

$(u_y)_A = (u_y)_B$

$\Rightarrow \quad H_A = H_B$

30. Answer (3)

Projectile motion is motion under gravity where acceleration is acting in downward direction.

31. Answer (3)

1 MSD = $\frac{1}{2}$ mm

10 VSD = 9 MSD

1 VSD = 0.9 MSD

= 0.9 × 0.5

= 0.45 mm

Vernier constant or least count

= 1 MSD – 1 VSD

= 0.5 – 0.45

= 0.05 mm

32. Answer (2)

$a_m = \frac{1.32 + 1.34 + 1.36 + 1.38}{4}$

$a_m = 1.35$

$\Delta a_m = \frac{|1.35 - 1.32| + |1.35 - 1.34| + |1.35 - 1.36| + |1.35 - 1.38|}{4}$

$\Delta a_m = 0.02$

33. Answer (4)

The given graph depict two different positions of particle at the same instant which is not possible.

34. Answer (1)

$|\vec{v}_A - \vec{v}_B| = \sqrt{v_A^2 + v_B^2 - 2v_A v_B \cos\theta}$

$= \sqrt{v^2 + v^2 - 2v^2 \cos 60°}$

$= \sqrt{v^2}$

$= v$

$= 2 \text{ m s}^{-1}$

35. Answer (3)

By triangle law of vector addition, $\vec{B} + \vec{A} = \vec{C}$.

SECTION-B

36. Answer (3)

Speed decreases if velocity and acceleration are antiparallel in one-dimensional motion.

37. Answer (1)

From the given figure in question:

$v_A = v_B \cos\theta$

38. Answer (4)

$\langle v \rangle = \frac{\int_0^3 v\,dt}{\int_0^3 dt}$

$$= \frac{\int_0^3 (2t+3)dt}{\int_0^3 dt}$$

= 6 m/s

39. Answer (2)

$$\int_u^v dv = \int_0^t At^3 dt$$

$$\therefore\ v - u = \frac{At^4}{4}$$

40. Answer (2)

Use $2as = v^2 - u^2$

$x = s_1 + s_2$

$$x = \frac{(20)^2}{2\times 4} + \frac{(10)^2}{2\times 2} = 50 + 25 = 75 \text{ m}$$

41. Answer (1)

From rules of significant digits, if uncertain digit is less than 5 then neglect it and previous digit remains same.

42. Answer (3)

$$v = r\omega \Rightarrow v = \frac{1}{100}\times\frac{2\pi}{60} = \frac{\pi}{3}\times 10^{-3} \text{ m/s}$$

43. Answer (4)

In vertical direction:

$$\frac{u^2}{2g} = 10 \text{ m}$$

$$R_{max} = \frac{u^2}{g}$$

$$\therefore\quad \frac{u^2}{g} = 20 \text{ m}$$

44. Answer (1)

Only similar physical quantities can be added or subtracted.

45. Answer (1)

$S = v\cdot t = (10.00)(5.00)$

$S = 50.0$ m

$$\frac{\Delta S}{S} = \frac{\Delta v}{v} + \frac{\Delta t}{t} \Rightarrow \frac{\Delta S}{S} = \frac{0.01}{10} + \frac{0.01}{5} = \frac{0.03}{10}$$

$$\frac{\Delta S}{S}\times 100 = \frac{0.03}{10}\times 100 = 0.3\%$$

$S = (50.0 \pm 0.3\%)$ m

46. Answer (1)

$x = 4t^2 \Rightarrow v_x = 8t$

$y = 3t \Rightarrow v_y = 3$

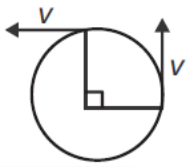
$z = 0$ = constant $\Rightarrow v_z = 0$

$$v = \sqrt{v_x^2 + v_y^2 + v_z^2} = \sqrt{(8t)^2 + 3^2}$$

$$v_{(t=1)} = \sqrt{64+9}$$

$$v = \sqrt{73} \text{ m/s}$$

47. Answer (4)

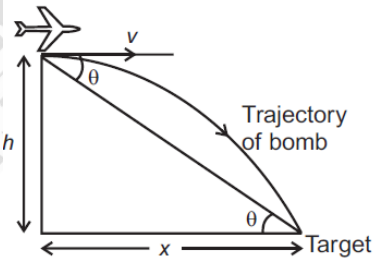


$$v = \frac{5}{2} \text{ m/s}$$

$r = 5$ m

$$a = \frac{v\sqrt{2}}{t} = \frac{v\sqrt{2}}{\frac{\pi r}{2v}} = \frac{5}{\sqrt{2}\pi} \text{ m/s}^2$$

48. Answer (1)



$$x = v\sqrt{\frac{2h}{g}} = 200\sqrt{\frac{2\times 2000}{10}} = 4000 \text{ m}$$

Angle of sight w.r.t. horizontal

$$\tan\theta = \frac{h}{x} = \frac{2000}{4000} = \frac{1}{2}$$

or, $\theta = \tan^{-1}\left(\frac{1}{2}\right)$

49. Answer (1)

Zeroes at the beginning are not significant, hence 3 significant figures are there in the given number.

50. Answer (3)

Radian is the supplementary unit among given options.

CHEMISTRY

SECTION - A

51. Answer (4)

13 electron in Al atom and 10 electron in each Al^{+3} ion. So, total electrons in 0.4 mole of Al^{+3} ion is $0.4 \times N_A \times 10 = 4\ N_A$

52. Answer (1)

$$Mg + \frac{1}{2}O_2 \rightarrow MgO$$

Mole of Mg = $\frac{16}{24} = \frac{2}{3}$

Mole of O_2 = $\frac{16}{32} = \frac{1}{2}$

Mg is limiting reagent

Mass of MgO = $\frac{2}{3} \times 40 = 26.67$ g

53. Answer (3)

l = 2 means *d*-orbital

Fe^{3+} : $3d^5 4s^0$

So, 3*d* have 5 electrons

54. Answer (2)

Cl belongs to period 3, group 17 and has maximum electron affinity.

55. Answer (3)

- For Mn 3*d* orbital has n + l + m = 3 + 2 + 0 = 5 and 3*p* orbital has n + l + m = 3 + 1 + 1 = 5 therefore total electrons will be 3.

56. Answer (3)

Characteristics of cathode rays do not depend upon the material of electrodes and the nature of the gas present in the cathode ray tube.

57. Answer (2)

Mass of glucose = 36 g

Mass of H_2O = (100 – 36) g = 64 g

Molality (m) = $\frac{\frac{36}{180}}{\frac{64}{1000}} = \frac{36}{180} \times \frac{1000}{64} = 3.125$ molal

58. Answer (1)

Volume of one molecule of O_2

$= \frac{22400}{6.02 \times 10^{23}}$ mL at STP

$= 3.7 \times 10^{-20}$ mL

59. Answer (4)

Chemical properties of atoms are controlled by the number of electrons, which are determined by the number of protons in the nucleus. Therefore, all the isotopes of a given element show same chemical behaviour.

60. Answer (4)

Interference can be explained on the basis of wave theory.

61. Answer (2)

$$\%\text{ Avg. weight} = \frac{28 \times 92.2 + 4.7 \times 29 + 30 \times 3.1}{100} = 28.10 \text{ amu}$$

62. Answer (2)

$0.1 \times 300 = 0.01 \times V$

V = 3000 ml

So, volume of water added = 3000 – 300

= 2700 ml

63. Answer (1)

Energy of electron $= -\frac{13.6Z^2}{n^2} = -\frac{-6.8}{2}$

$n^2 = 4 \Rightarrow n = 2$

$\therefore$ Electron is in first-excited state.

64. Answer (3)

122 g of ZnO = 1.5 mole of Zn

$= 1.5 \times N_A$ atom of Zn

65. Answer (4)

$r \propto \frac{n^2}{Z}$

$r_1(Li^{2+}) \propto \frac{1^2}{3}$

$r_3(He^{+}) \propto \frac{3^2}{2}$

$\frac{r_1(Li^{2+})}{r_3(He^{+})} = \frac{1}{3} \times \frac{2}{9} = \frac{2}{27}$

66. Answer (4)

Mole fraction of water = 0.85

Molality $= \frac{0.15}{\frac{0.85 \times 18}{1000}} = \frac{0.15 \times 1000}{0.85 \times 18} = 9.8$ m

67. Answer (4)

5^{th} excited state = 6^{th} shell

Total number of lines in infrared region

$= 6 \rightarrow 5, 6 \rightarrow 4, 6 \rightarrow 3$

$5 \rightarrow 4, 5 \rightarrow 3,$

$4 \rightarrow 3$

i.e. = six lines

68. Answer (3)

s-block and *p*-block elements are called representative elements.

69. Answer (4)

Number of urea molecules

$= 800 \times 0.5 \times 10^{-3} \times N_A$

$= 0.4\ N_A$

70. Answer (2)

$\because \quad E_n \propto \frac{Z^2}{n^2}, \ \therefore \ (E_1)_H : (E_2)_{He^+} : (E_3)_{Li^{2+}} :: 1:1:1$

71. Answer (2)

Atomic size generally decreases across a period because within the period outer electrons are in the same valence shell and the effective nuclear charge increases as the atomic number increases leading to decrease in atomic size.

72. Answer (2)

ℓ = 1, Orbital angular momentum = $\sqrt{\ell(\ell+1)}\,\hbar$

$= \sqrt{2}\,\hbar$

73. Answer (3)

6.02×10^{22} atom of A = 0.1 mole

12.04×10^{22} atom of C = 0.2 mole

0.1 mole of A and 0.2 mole of C combines with 0.2 mole of B, so the empirical formula of the compound is AB_2C_2

74. Answer (3)

Total nodes = n – 1

= 4 – 1 = 3

75. Answer (3)

S > Se > O (Negative electron gain enthalpy).

76. Answer (2)

Species	Number of unpaired electrons
Cr^{2+}	4
V^{2+}	3
Mn^{2+}	5
Ni^{2+}	2

77. Answer (1)

On dilution

$M = \frac{M_1V_1}{(V_1+V_2)} = \frac{0.1\times 200\times 2}{200+300} = 0.08\ M$ of H^+ ion.

78. Answer (2)

$\frac{8\times 32}{M}\times 100 = 2$

or, $M = \frac{8\times 32\times 100}{2} = 12800$

Molar mass of polymer = 12800 g mol^{-1}

79. Answer (2)

Atomic number	IUPAC official name
102	Nobelium
105	Dubnium
107	Bohrium
104	Rutherfordium

80. Answer (4)

Metals	Values of work function (eV)
Na	2.3
K	2.25
Mg	3.7

81. Answer (2)

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

Mole of $CO_2 = \frac{9.68}{44} = 0.22$

Mass of $CaCO_3$ decomposed = 0.22 × 100 = 22

Percentage purity = $\frac{22}{25}\times 100 = 88\%$

82. Answer (3)

Magnetic orbital quantum number gives information about the spatial orientation of the orbital with respect to standard set of co-ordinate axis.

83. Answer (4)

$M = \frac{\%\ \text{by mass} \times \text{density} \times 10}{\text{molar mass}} = \frac{98\times 1.8\times 10}{98} = 18\ M$

Now, $M_1V_1 = M_2V_2$

$\Rightarrow 18\ V_1 = 0.9\times 400 \Rightarrow V_1 = 20\ mL$

84. Answer (1)

- For multielectronic species, higher is the value of (n + l), higher is the energy of orbital.
- For same value of (n + l), higher is the value of n, higher is the energy of orbital.

85. Answer (3)

Volume of $O_2 = \frac{20}{100}\times 10 = 2\ L$

Mole of $O_2 = \frac{2}{22.4} = 0.089$

SECTION - B

86. Answer (1)

Correct order of energy of the given radiations is

Radio waves < Microwave < IR < X-rays

87. Answer (1)

For a given value of l, m_l values are –l to +l

For example, if l = 1

then m_l = –1, 0, +1 (3 values)

∴ Total values = (2 × 1 + 1) = 3 values

for l = 2

m_l = –2, –1, 0, 1, 2 (five values)

(2l + 1) = (2 × 2 + 1) = 5 values.

88. Answer (1)

Na^+ and Mg^{2+} contain 10 electrons each.

89. Answer (3)

Moving left to right along a period, acidic nature of oxides increases while moving down the group, acidic nature of oxides decreases.

Metallic oxides are generally amphoteric or basic in nature while non-metallic oxides are generally acidic or neutral in nature.

90. Answer (2)

$$\frac{\text{Molecules of } O_2}{\text{Molecules of } H_2} = \frac{\text{Mole of } O_2}{\text{Mole of } H_2}$$

$$= \frac{w}{32} \times \frac{2}{w} = \frac{1}{16}$$

91. Answer (2)

Kinetic energy of photo electrons depends on frequency not on intensity.

92. Answer (4)

Moles of OH^- ion in NaOH – moles of H^+ ions in H_2SO_4

$$= \frac{(300 \times 0.1)}{1000} - \left(\frac{100 \times 0.1 \times 2}{1000}\right) = 0.01 \text{ mol}$$

$$\therefore \quad \text{Molarity of } [\overline{OH}] = \frac{0.01 \times 1000}{(100 + 300)} \Rightarrow \frac{0.01 \times 1000}{400}$$

of excess OH^- ion

= 0.025 M

93. Answer (1)

$d_{x^2-y^2}$ and d_{z^2} will have electron density along the axes.

94. Answer (4)

l = 2, corresponds to *d* orbital.

95. Answer (2)

Alkali metal – ns^1

Alkaline earth metal – ns^2

Halogens – ns^2np^5

Chalcogens – ns^2np^4

96. Answer (3)

1 electron = m_e kg

$$\therefore \quad \text{Number of electrons in 1 kg} = \frac{1}{m_e} \text{ electrons}$$

$$\therefore \quad \text{Mole of electrons} = \frac{\left(\frac{1}{m_e}\right)}{N_A} = \frac{1}{m_e N_A}$$

97. Answer (1)

Electronic configuration of Cu = $[Ar]3d^{10}\ 4s^1$

Electronic configuration of Cr = $[Ar]3d^5\ 4s^1$

98. Answer (2)

$$\overline{\nu} = R_H Z^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

For Paschen Series shortest wavelength:

$n_1 = 3,\ n_2 = \infty$

$$\therefore \quad \overline{\nu} = R_H \times (1)^2 \times \left(\frac{1}{3^2} - 0\right) = \frac{R_H}{9}$$

99. Answer (2)

The splitting of spectral lines in the presence of magnetic field (Zeeman effect) or an electric field (Stark effect).

100. Answer (2)

Let the number of photons emitted be X

$$\text{Power} = \frac{\text{Energy}}{\text{Time}}$$

$$10 = \frac{X \times \frac{hc}{\lambda}}{1} \Rightarrow x = \frac{10\ \lambda}{hc}$$

$$= \frac{10 \times 662 \times 10^{-9}}{6.62 \times 10^{-34} \times 3 \times 10^8} = 3.33 \times 10^{19}$$

BOTANY

SECTION - A

101. Answer (1)

Bryophytes are homosporous. Some pteridophytes are heterosporous. *Selaginella* and *Salvinia* produce two kinds of spores.

102. Answer (1)

Fucus shows diplontic life cycle pattern. *Polysiphonia* and *Ectocarpus* exhibit haplo-diplontic life cycle pattern.

103. Answer (3)

Mycelium is aseptate and coenocytic in the members of phycomycetes.

104. Answer (3)

Viroids are infectious RNA particles which are devoid of protein coat.

105. Answer (2)

Thermoplasma is a thermoacidophile (an archaebacteria). Difference in cell wall structure is responsible for their survival in extreme conditions. Three domains are bacteria, archaea and eukarya proposed by Woese.

106. Answer (3)

In *Euglena,* cell wall is absent but a covering pellicle is present which is proteinaceous in nature. Photosynthetic pigments are chlorophyll **a** chlorophyll **b**, xanthophyll and β-carotenes in *Euglena*.

107. Answer (3)

Bryophytes are the first non-vascular embryophytes, *Funaria* is a moss. Laminarin is a stored food in members of phaeophyceae *i.e. Dictyota*. Agar Agar is obtained from *Gelidium* (red algae). *Eucalyptus* is an angiosperm, in which ovary lacks archegonia.

108. Answer (4)

Natural systems of classification were based on natural affinities among the organisms and considered both internal and external features.

109. Answer (3)

The juvenile stage in the life cycle of mosses is represented by protonema stage. The adult phase is leafy stage.

110. Answer (2)

Viruses did not get any place in classification system because they are not truly living.

111. Answer (3)

Pollen grains, megaspore and microspore are haploid where as ovule, megasporophyll are diploid.

112. Answer (2)

Yeast is used in brewing and baking industry.

113. Answer (3)

Mycoplasma are called PPLO or jokers of the plant kingdom. They infect both plants and animals. They do not have cell wall. They are insensitive to penicillin.

114. Answer (1)

Pyrenoids contain protein besides starch.

115. Answer (1)

Fruiting bodies are formed by slime moulds in unfavourable conditions.

116. Answer (3)

All organisms from the prokaryotes to the most complex eukaryotes can sense and respond to environmental cues. That is why, consciousness is a defining feature of living organisms.

117. Answer (2)

Stored food in brown algae are mannitol and laminarin.

Alga shown in option (2) is *Porphyra* (red alga) and has stored food as floridean starch.

118. Answer (1)

Egg apparatus is haploid and is a three–celled structure.

119. Answer (4)

The cell wall of fungi is chitinous.

120. Answer (3)

Marchantia is a thalloid liverwort.

121. Answer (1)

Agaricus is a common field mushroom with edible basidiocarp and is a member of basidiomycetes.

122. Answer (2)

Coralloid roots of *Cycas* are associated with N_2-fixing cyanobacteria.

123. Answer (2)

Flora contains the actual account of habitat and distribution of plants of a given area.

124. Answer (1)

Different plant families like Convolvulaceae and Solanaceae are included in the order Polymoniales based on similar floral characters.

125. Answer (2)

Key is used for identification of plants and animals based on similarities and dissimilarities.

126. Answer (2)

Higher the taxa, lesser are the characteristics that the members within the taxon share.

127. Answer (2)

Methanogens are obligate anaerobes. *Puccinia* causes rust disease in wheat. Diatoms are the chief producers of ocean.

128. Answer (2)

In Gymnosperms, haploid gametophyte is short lived and is dependent on the photosynthetic sporophyte.

129. Answer (2)

Herbarium is a storehouse of collected plant specimens that are dried, pressed and preserved on sheets.

130. Answer (4)

Carrageen is a hydrocolloid, one of the commercial products obtained from Red algae.

131. Answer (2)

Cell wall in diatoms is impregnated with silica whereas dinoflagellates have cell wall composed of cellulose and pectin.

132. Answer (1)

Prothallus is small and multicellular free living photosynthetic, thalloid, gametophyte.

133. Answer (2)

Bryophytes have leaf-like structures.

134. Answer (3)

Lycopsida – *Selaginella* and *Lycopodium*

Sphenopsida – *Equisetum*

Pteropsida – *Dryopteris*, *Pteris* and *Adiantum*

135. Answer (3)

Reproduction is absent in mules. Rest all features are seen in mules.

SECTION – B

136. Answer (1)

Cell wall of Rhodophyceae members contains pectin, cellulose and polysulphate esters.

137. Answer (3)

Royal Botanical Garden is located in Kew (England).

138. Answer (1)

Carolus Linnaeus classified the living organisms into two kingdoms - Plantae and Animalia.

139. Answer (2)

Prions are similar in size to viruses. These are infectious agents consist of abnormally folded protein. Prions cause certain diseases like Kuru disease, Scrapie disease in sheep, mad cow disease in cattles.

140. Answer (4)

In gymnosperms, endosperm is haploid and in angiosperms, endosperm is triploid.

141. Answer (4)

Red algae have phycoerythrin pigment.

142. Answer (3)

Archaebacteria differ from other bacteria in having a different cell wall structure and this feature is responsible for their survival in extreme conditions.

143. Answer (4)

pardus and *leo* belong to the genus *Panthera* and *melongena* belong to the genus *Solanum*.

144. Answer (4)

Neurospora and *Claviceps* belong to Ascomycetes. They produce conidia and ascospores. Conidia are produced exogenously and ascospores are produced endogenously.

145. Answer (4)

Majority of bacteria are decomposers.

146. Answer (3)

Rhizobium helps in nitrogen fixation in legumes and it is a heterotroph.

147. Answer (2)

Tribe, variety – Intermediate categories.

148. Answer (2)

Vascular cryptogams are pteridophytes. Homosporous pteridophytes produce same types of spores.

149. Answer (1)

Liverworts are bryophytes and have sporophyte differentiated into foot, seta and capsule. They do not have free living sporophyte. They do not have true roots, true stems and true leaves.

150. Answer (3)

PEN (Primary endosperm nucleus) is product of triple fusion in angiosperms *i.e.*, fusion of 1 male gamete with 2 polar nuclei.

ZOOLOGY

SECTION - A

151. Answer (1)

The vertebrates without jaws are placed in division Agnatha and class Cyclostomata *e.g. Petromyzon*.

152. Answer (4)

Vertebrata is subphylum of phylum Chordata. Division Gnathostomata is divided into two super classes Pisces and Tetrapoda.

153. Answer (3)

Metameric segmentation was first of all observed in the members of phylum Annelida.

154. Answer (1)

Amphibians are well adapted to live both on land as well as in water.

155. Answer (3)

The unique features of mammals are the presence of mammary glands and hair on the skin. Some mammals are oviparous and some reptiles, amphibians and fishes are also viviparous.

156. Answer (1)

Hemichordata was earlier considered as a sub-phylum under phylum Chordata due to presence of stomochord. But now it is placed as a separate phylum under non-chordata.

157. Answer (3)

Central nervous system is present in both chordates and non-chordates. In chordates, CNS is dorsal, hollow and single, whereas in non-chordates, CNS is ventral, solid and double.

158. Answer (2)

All vertebrates are chordates but all chordates are not vertebrates because in protochordates (urochordates and cephalochordates), notochord is not replaced by vertebral column.

159. Answer (2)

Meandrina is placed in the phylum Coelenterata which also contains fresh water animals *e.g.*, *Hydra*.

160. Answer (4)

In chordates, nerve cord is a dorsal and hollow tube situated dorsal to both notochord and gut. Pharynx is perforated by gill slits during embryonic state. Notochord is mesodermally derived rod-like structure situated dorsal to gut and ventral to nerve cord.

161. Answer (4)

Crocodilus has four-chambered heart. *Salamandra* and *Ichthyophis* are amphibians and have three-chambered heart. *Calotes* is a reptile.

Heart is usually three chambered in reptiles.

162. Answer (4)

Psittacula is a bird and is a homeotherm. *Labeo*, *Alligator* and cobra are poikilotherms.

163. Answer (3)

Pulmonary respiration is a feature shared by both birds and mammals.

164. Answer (4)

Limulus (King crab) is a living fossil placed in the phylum Arthropoda.

165. Answer (2)

Animal		**Common name**
Sycon	–	Scypha
Adamsia	–	Sea anemone
Chaetopleura	–	Chiton
Ophiura	–	Brittle star

166. Answer (4)

Platypus is an egg laying mammal. Bony fishes are oviparous and cartilaginous fishes are majorly viviparous. Dolphins and kangaroos are viviparous mammals.

167. Answer (4)

Struthio is a flightless bird. *Pavo* is a bird and can fly with the help of feather wings. Prawn is an aquatic insect. Mosquitoes are terrestrial insects which can fly with the help of chitinous wings.

168. Answer (3)

Trygon is a cartilaginous fish which possesses a poison sting. *Exocoetus* is a marine bony fish. *Testudo* is a reptile and commonly called tortoise.

169. Answer (2)

Echinoderms are triploblastic coelomates with complete digestive tract.

170. Answer (2)

In *Taenia*, alimentary canal is completely absent and it can absorb nutrients from the host directly through its body surface. Hooks and suckers are structures for anchorage of parasite with intestine.

171. Answer (4)

Planaria is a member of the phylum Platyhelminthes. The member of this phylum are commonly called flatworms. Their body is triploblastic without coelom.

172. Answer (2)

Coelenterates have a gastro-vascular cavity with a single opening, mouth on hypostome. In sponges a number of openings are present in body for incurrent of water called ostia. In ctenophores and platyhelminths, hypostome is absent.

173. Answer (2)

Sponges are the most primitive multicellular animals. They have water transport or canal system which is helpful in food gathering, respiratory exchange and removal of wastes.

174. Answer (2)

Sponges have cellular level of body organisation. *Fasciola*, *Wuchereria*, *Taenia*, *Hirudinaria* and *Aplysia* are triploblastic animals.

175. Answer (4)

Respiratory system is absent in annelids. Their body is externally and internally divided into segments with serial repetition of atleast some organs. Nervous system consists of paired ganglia connected by transverse nerves to a double ventral nerve cord. *Nereis* is a dioecious annelid.

176. Answer (3)

Coelenterates and ctenophores are diploblastic animals.

177. Answer (1)

Coelenterates, ctenophores and adult echinoderms exhibit radial symmetry while sponges are mostly asymmetrical.

178. Answer (3)

In sponges, fertilisation is internal and development is indirect having a larval stage which is morphologically distinct from the adult.

179. Answer (4)

Annelids possess organ-system level of organisation.

180. Answer (2)

Radula is a file-like rasping organ found in molluscs and *Asterias* is an echinoderm.

Digestive system is absent in *Taenia*.

181. Answer (4)

Metagenesis refers to alternation of generation between asexual and sexual phases of an organism. It is exhibited by coelenterates.

182. Answer (2)

Annelids and chordates possess closed type of circulatory system.

183. Answer (3)

Nereis is an annelid while *Periplaneta* and *Apis* are arthropods. These all are non-chordates in which heart is dorsal.

184. Answer (3)

First phylum of animal kingdom to exhibit bilateral symmetry was Platyhelminthes.

185. Answer (3)

Hirudinaria belongs to the phylum Annelida.

Malpighian tubules are excretory organs found in arthropods.

SECTION - B

186. Answer (3)

Economically important insects include *Apis* (Honey bee), *Bombyx* (Silkworm) and *Laccifer* (Lac insect).

187. Answer (2)

Jelly fish – Coelenterata

Cuttlefish – Mollusca

Sea urchin – Echinodermata

188. Answer (3)

Devil fish and cuttlefish belong to the phylum Mollusca while dogfish belongs to class Chondrichthyes.

189. Answer (2)

Clarias belongs to the class Osteichthyes.

190. Answer (2)

Arthropods, annelids and molluscs possess organ-system level of organisation.

191. Answer (3)

Reptiles are oviparous and development is direct.

192. Answer (4)

Alligator is a reptile and development is direct.

193. Answer (4)

Aptenodytes and *Struthio* are flightless birds.

194. Answer (1)

Echinoderms possess pentamerous radial symmetry and mostly show external fertilisation.

195. Answer (4)

Non-chordates are bilaterally symmetrical and have ventral, solid and double nerve cord. Chordates are also bilaterally symmetrical and have dorsal hollow and single nerve cord.

196. Answer (2)

Specialised excretory system is absent in echinoderms.

Skin of Aves is dry without glands except the oil gland or preen gland or uropygial gland at the base of the tail for lubrication of feathers.

197. Answer (4)

Sponges have cellular level of organisation. The cells in their body do not form the tissues.

198. Answer (2)

Unique to echinoderms is the water vascular system, a network of hydraulic canals branching into extensions called tube feet that function in locomotion and feeding.

199. Answer (2)

Mollusca is the second largest phylum of animal kingdom.

200. Answer (4)

Flatworms have blind sac type of body plan. The food enters and leave through a common opening.

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