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MM : 800

FTS for NEET-2023_Phase-1(B)-T01

Time : 200 Min.

Topics Covered:**Physics:** Physical World, Units & 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**General Instructions :**

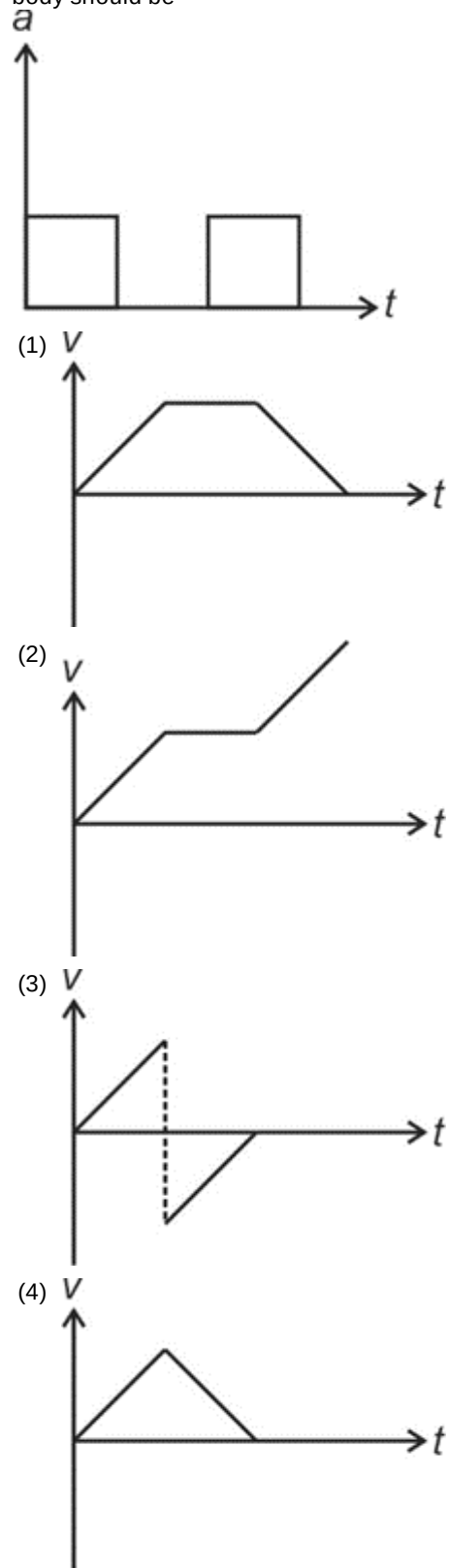
- (i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
- (ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted 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**SECTION-A**

1. The unit of temperature in SI system is
 - (1) °F
 - (2) °C
 - (3) K
 - (4) None of these
2. Velocity v is given by $v = at + b$, where t is time. The dimensions of a and b respectively are
 - (1) $[L^{-2}]$, $[LT]$
 - (2) $[L^{-2}]$, $[LT^{-1}]$
 - (3) $[LT]$, $[L^{-2}]$
 - (4) $[LT^{-1}]$, $[LT^{-1}]$
3. Time period of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where measurements of l and g have 2% and 3% errors respectively. The maximum percentage error in time period of the pendulum is
 - (1) 5%
 - (2) $\frac{7}{2}\%$
 - (3) 7%
 - (4) $\frac{5}{2}\%$
4. Two physical quantities A and B have different dimensions, then which of the following operations is valid?
 - (1) $A + B$
 - (2) $A - B$
 - (3) $\sin\left(\frac{A}{B}\right)$
 - (4) $A \times B$

5. A particle is said to have non-zero acceleration
- (1) Only if its direction of velocity changes
 - (2) Only if its magnitude of velocity changes
 - (3) Either its direction of velocity or magnitude of velocity or both changes
 - (4) Neither direction nor magnitude of velocity changes
6. A car was moving with 5 m/s towards east and after some time it is moving with 5 m/s towards north, the change in its velocity is
- (1) $5\sqrt{2}$ m/s towards north-east
 - (2) 5 m/s towards north-east
 - (3) 5 m/s towards north-west
 - (4) $5\sqrt{2}$ m/s towards north-west
7. A body is moving on x-axis and its position is related with time t as $x = \alpha t^2 + \beta t$, where α and β are positive constants, the retardation of the body is
- (1) αv^3
 - (2) $2\alpha v^3$
 - (3) $\frac{\alpha v^3}{2}$
 - (4) $2\alpha v^2$
8. Two identical balls A and B are thrown from the top of a tower. Ball A is thrown upwards with speed v and ball B is thrown downwards with speed v , then
- (1) Speed of ball A will be more than ball B at the ground
 - (2) Speed of ball B will be more than ball A at the ground
 - (3) Both balls A and B strike the ground with same speed
 - (4) Speed of ball A may be greater or less than speed of ball B at the ground

9. Acceleration-time graph of a body is given . The corresponding velocity-time graph of the body should be



10. A train is moving towards west and a car is along north, both with same speed. The direction of the velocity of train with respect to the passenger sitting in the car is

- (1) North-east
- (2) North-west
- (3) South-east
- (4) South-west

11. If a body is moving in a circle of radius r with a constant speed v , its angular and tangential accelerations respectively are

- (1) $\frac{v^2}{r}$, $\frac{v^2}{r}$
- (2) $\frac{v^2}{r}$, rv^2
- (3) $\frac{v^2}{r}$, zero
- (4) Zero, zero

12. An aeroplane flying horizontally 980 m above ground level at 80 m/s releases a packet. How far on ground will the packet strike?

- (1) $400\sqrt{2}$
- (2) $800\sqrt{2}$ m
- (3) 800 m
- (4) 980 m

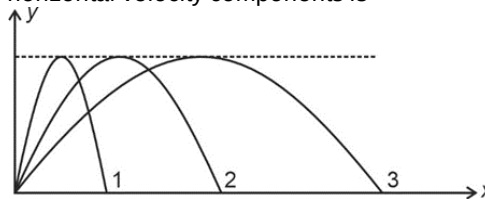
13. The greatest height to which a boy can throw a ball is H , then the greatest horizontal distance to which he can throw it, will be

- (1) H
- (2) $\frac{H}{2}$
- (3) $2H$
- (4) $\frac{H}{4}$

14. A projectile is projected from ground from point A with speed 10 m/s at an angle of 30° with horizontal and it strikes the ground at point B . The magnitude of change in velocity at points A and B is

- (1) 10 m/s
- (2) 20 m/s
- (3) 5 m/s
- (4) 15 m/s

15. Following figure shows three paths of projectile. The correct order of initial horizontal velocity components is



- (1) $1 > 2 > 3$
- (2) $1 < 2 < 3$
- (3) $1 = 2 = 3$
- (4) $1 > 3 > 2$

16. When a projectile is thrown with speed v at an angle θ has range 100 m on the surface of the Earth, then for the same v and θ the value of range on the surface of moon will be ($g_m = \frac{g_e}{6}$)

- (1) 100 m
- (2) 200 m
- (3) 600 m
- (4) 300 m

17. If $\vec{A} = \vec{B}$, then which of the following is incorrect?

- (1) $|\vec{A}| = |\vec{B}|$
- (2) $\hat{A} = \hat{B}$
- (3) $\vec{A} + \vec{B} = \hat{A} + \hat{B}$
- (4) $2\vec{A} = 2\vec{B}$

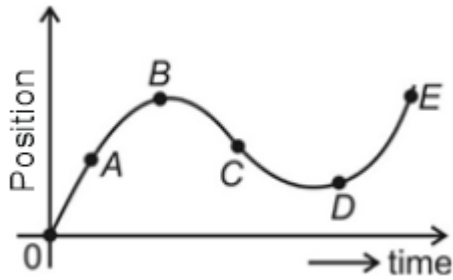
18. Which of the following is a more precise instrument?

- (1) Meter scale having smallest division 1 mm
- (2) Vernier callipers in which 20 vernier scale division coinciding with 19 main scale division (1 MSD = 1 mm)
- (3) Screw gauge with 0.5 mm smallest division on linear scale and 50 divisions on circular scale
- (4) Vernier callipers with least count 0.02 mm

19. A bomb is dropped from a fighter jet which is moving horizontally with constant speed. Ignore the effect of air resistance, the bomb

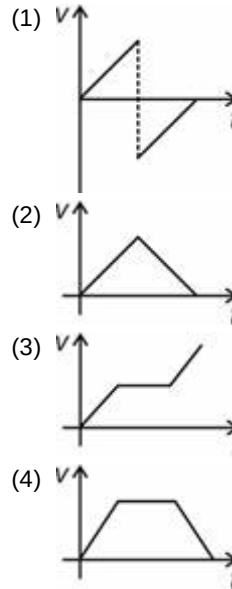
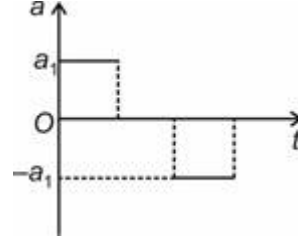
- (1) Falls on the Earth behind the fighter jet
- (2) Falls on the Earth ahead the fighter jet
- (3) Falls on the Earth exactly below the fighter jet
- (4) Continues to flies with the fighter jet

20. The position-time graph of a particle moving on a straight line is as shown. The section of the graph which corresponds to positive acceleration is



- (1) OA
 (2) AB
 (3) BC
 (4) DE
21. Speed of a projectile at the point of projection is $\sqrt{2}$ times the speed at its maximum height, the angle of projection of the projectile is
- (1) 30°
 (2) 45°
 (3) 60°
 (4) $\tan^{-1}(\sqrt{2})$
22. For a man walking with speed $3\sqrt{2}$ km/h rain appears to fall vertically downward. When he starts running with $5\sqrt{2}$ km/h rain appears to fall on him at an angle of 45° with vertical. The speed of rain w.r.t. ground (in km/h) is
- (1) $\sqrt{22}$
 (2) $2\sqrt{6}$
 (3) $\sqrt{26}$
 (4) $2\sqrt{7}$
23. A system of units has 10 kg, 10 cm and 10 s as the units of mass, length and time respectively. Then the value of 10 N in this system will be
- (1) 1000 units
 (2) 1 units
 (3) 10 units
 (4) 100 units

24. The correct velocity-time ($v-t$) graph corresponding to the given acceleration-time ($a-t$) graph is (initial velocity is zero)

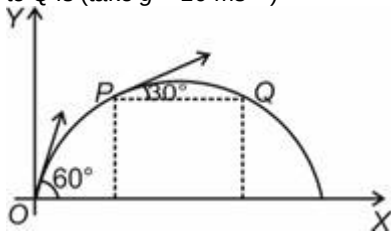


25. The total number of insignificant zeroes in the measurement of a quantity $x = 0.003270$ is
- (1) 2
 (2) 3
 (3) 4
 (4) 1
26. The percentage error in the measurement of a , b and c are 0.3%, 1% and 0.9% respectively. The maximum percentage error in the calculation of quantity $x = \frac{a^{1/3}b^2}{c}$ will be
- (1) 3%
 (2) 1.2%
 (3) 1%
 (4) 2.9%
27. If velocity (V), mass (M) and time (T) are taken as fundamental quantities, then dimensional formula of Young's modulus is
- (1) $[MV^2T^{-3}]$
 (2) $[MVT^{-2}]$
 (3) $[MV^{-1}T^{-3}]$
 (4) $[MV^{-2}T^{-3}]$

28. A particle is revolving on a circle of radius r with constant tangential acceleration. After one complete revolution, if speed of the particle becomes double of the initial speed v , then net acceleration of the particle when it just complete one revolution is

- (1) $\frac{v}{4\pi r} \sqrt{256}$
- (2) $\frac{v^2}{4\pi r} \sqrt{256\pi^2 + 9}$
- (3) $\frac{v^2}{4\pi r} \sqrt{265\pi^2 + 9}$
- (4) $\frac{v^2}{4\pi r^2} \sqrt{265}$

29. A particle is projected from ground with initial velocity $18\sqrt{3}$ m/s as shown in figure. The time taken by particle in moving from P to Q is (take $g = 10 \text{ ms}^{-2}$)



- (1) 1.8 s
- (2) 3.6 s
- (3) 5.4 s
- (4) 7.2 s

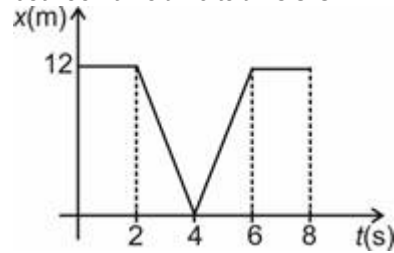
30. The phenomenon of scattering of light by change in wavelength is called

- (1) Chadwick scattering
- (2) Ramanujan scattering
- (3) Newton's scattering
- (4) Raman scattering

31. If linear momentum of a particle varies with distance x from origin as $P = \frac{A\sqrt{x}}{B+3x}$. Then dimensions of $\frac{A}{B}$ is (A and B are dimensional constants)

- (1) $[M L T^{-1}]$
- (2) $[M L^{3/2} T^{-1}]$
- (3) $[M L^{1/2} T^{-1}]$
- (4) $[M L^{-1/2} T^{-1}]$

32. The position-time graph of a particle moving along a straight line is given in following graph. The average speed of the particle between time $t = 0$ to $t = 8$ s is



- (1) 3 m/s
- (2) 9 m/s
- (3) 6 m/s
- (4) 0 m/s

33. A drunkard is walking straight such that he takes 5 steps forward and 3 steps backwards and continues with same repeated pattern. If each step is 1 m long and takes 1 s in each step, then after what duration of time he will fall in a pit at a distance 6 m from starting point?

- (1) 8 s
- (2) 16 s
- (3) 12 s
- (4) 24 s

34. The order of magnitude of 192 is

- (1) 0
- (2) 1
- (3) 2
- (4) 3

35. A shell is fired at $t = 0$ s from a gun having barrel at an angle of 45° with horizontal. If speed of shell is 60 m/s at $t = 0$, then the radius of curvature of the trajectory of the shell after $t = 3\sqrt{2}$ s is (take $g = 10 \text{ m/s}^2$)

- (1) 60 m
- (2) 90 m
- (3) 180 m
- (4) 200 m

SECTION-B

36. A particle moves a distance x in time t according to the equation $x = \frac{1}{\sqrt{(t+1)}}$. The acceleration of the particle is proportional to
- (1) (velocity) $^{\frac{2}{3}}$
 - (2) (velocity) $^{\frac{5}{3}}$
 - (3) (distance) $^{\frac{1}{3}}$
 - (4) (distance) $^{\frac{5}{2}}$
37. A ball is dropped from a high tower at $t = 0$. After 10 s another ball is thrown in downward direction from the same point with speed v . If these two balls meet at $t = 15$ s. Then the value of v is (take $g = 10 \text{ m/s}^2$)
- (1) 50 m/s
 - (2) 100 m/s
 - (3) 200 m/s
 - (4) 225 m/s
38. A particle is moving on a circle of radius 2 m. Its speed (v) varies with time t as $v = \alpha t^2$, where α is a constant. The ratio of radial acceleration to tangential acceleration of the particle at $t = 2$ s is
- (1) α
 - (2) 8
 - (3) 2α
 - (4) 4
39. If resultant of two unit vectors \hat{a} and \hat{b} is $\sqrt{3}$ in magnitude, then the magnitude of difference of these unit vectors is
- (1) Zero
 - (2) 1
 - (3) $\sqrt{3}$
 - (4) $\sqrt{2}$
40. Two quantities are measured as $A = 1.0 \text{ m} \pm 0.2 \text{ m}$ and $B = 2.0 \text{ m} \pm 0.2 \text{ m}$. The correct value of \sqrt{AB} should be reported as
- (1) $1.4 \text{ m} \pm 0.2 \text{ m}$
 - (2) $1.4 \text{ m} \pm 0.1 \text{ m}$
 - (3) $1.41 \text{ m} \pm 0.15 \text{ m}$
 - (4) $1.4 \text{ m} \pm 0.4 \text{ m}$
41. A particle is moving in x - y plane such that its position co-ordinates are varying w.r.t. time as $x = 5\sin 121\pi t$ and $y = 121\cos 5\pi t$ (where x and y are in metre and t is in second). The speed of the particle at $t = 1$ s is
- (1) $605\sqrt{2}\pi \text{ m/s}$
 - (2) $121\pi \text{ m/s}$
 - (3) $605\pi \text{ m/s}$
 - (4) $121\sqrt{2}\pi \text{ m/s}$
42. Speed of a swimmer in still water is 14.14 km/h. River water is flowing due east with speed 10 km/h. The swimmer on south bank of 1 km wide river wishes to cross the river via shortest path. Then the angle at which he/she should make strokes w.r.t. east direction and the corresponding time taken to cross the river is
- (1) $45^\circ, 1 \text{ h}$
 - (2) $45^\circ, 0.1 \text{ h}$
 - (3) $135^\circ, \sqrt{2} \text{ h}$
 - (4) $135^\circ, 0.1 \text{ h}$
43. The position vector of a particle moving in x - y plane is given by $\vec{r} = 2t\hat{i} + (3t - 6t^2)\hat{j}$. Then the equation of trajectory of the particle is
- (1) $y = \frac{3}{2}x(x + 1)$
 - (2) $y = \frac{3}{2}x(1 - x)$
 - (3) $y = x\left(\frac{3}{2} - \frac{x}{2}\right)$
 - (4) $y = 3x - 6x^2$
44. A particle is moving in x - y plane such that its linear momentum is varying w.r.t. time as $\vec{P}(t) = B[\sin\omega t\hat{i} + \cos\omega t\hat{j}]$, where B and ω are constants. Then which of the following is correct?
- (1) Force is parallel to linear momentum
 - (2) Force is perpendicular linear to momentum
 - (3) Force is antiparallel to linear momentum
 - (4) Force is at 60° with linear momentum

45. If two vectors $\vec{A} = \hat{i} + a\hat{j} + b\hat{k}$ and $\vec{B} = 5\hat{i} + 15\hat{j} + 25\hat{k}$ are parallel to each other, then the values of a and b respectively are
 (1) 5, 5
 (2) 3, 15
 (3) 15, 5
 (4) 3, 5
46. A particle moves with an initial velocity v_0 along a straight line with a retardation αv (α is a positive constant and v is velocity at any time t) then
 (1) The particle will come to rest after a time $\frac{1}{\alpha}$
 (2) The velocity of the particle will become $\frac{v_0}{\alpha}$ after a time $\frac{1}{\alpha}$
 (3) The total distance covered by the particle before coming to rest is $\frac{v_0}{\alpha}$
 (4) Velocity versus time graph will be linearly decreasing.
47. A man running on a horizontal road at 3 m/s (along +ve x direction) finds that rain is falling vertically. He increases his speed to 6 m/s and finds that rain drops make angle 30° with vertical. Velocity of rain w.r.t. road is (+ve y is along vertically upward)
 (1) $(3\hat{i} + \sqrt{3}\hat{j})$ m/s
 (2) $(\sqrt{3}\hat{i} + 3\sqrt{3}\hat{j})$ m/s
 (3) $(\sqrt{3}\hat{i} - 3\hat{j})$ m/s
 (4) $(3\hat{i} - 3\sqrt{3}\hat{j})$ m/s
48. The pitch of a screw gauge is 1 mm with 100 divisions on circular scale. In measurement of thickness of a wire, there are 3-divisions on linear scale and 25 divisions on circular scale coinciding with reference line. If nothing is put between the studs then 20th division on circular scale is coinciding with reference line such that zero of linear scale is visible, then thickness of wire is
 (1) 3.05 mm
 (2) 3.30 mm
 (3) 3.25 mm
 (4) 3.0 mm
49. A car starts from rest accelerates on a straight path with constant acceleration a for some time, after which it decelerates at constant value b and comes to rest. Total time elapsed is t , then average velocity of the car is
 (1) $\frac{abt}{a+b}$
 (2) $\frac{2abt}{(a+b)}$
 (3) $\frac{abt}{2(a+b)}$
 (4) $\frac{a^2t}{(a+b)}$
50. The equation of trajectory of a projectile is given by $cy = ax - bx^2$, then its angle of projection is
 (1) $\tan^{-1}(a)$
 (2) $\tan^{-1}\left(\frac{a}{c}\right)$
 (3) $\tan^{-1}\left(\frac{b}{c}\right)$
 (4) $\tan^{-1}\left(\frac{a}{b}\right)$

CHEMISTRY

SECTION-A

51. Angular nodes present in 4s and 2p orbitals respectively are
 (1) 1, 0
 (2) 3, 0
 (3) 0, 1
 (4) 2, 3
52. The angular momentum of electron in d -orbital is
 (1) Zero
 (2) $\frac{h}{\sqrt{2}\pi}$
 (3) $\sqrt{\frac{3}{2}} \frac{h}{\pi}$
 (4) $\frac{h}{2\pi}$

53. Maximum possible number of spectral lines obtained in Lyman series when an electron in H-atom sample de-excites from third excited state to ground state is

- (1) 3
- (2) 6
- (3) 4
- (4) 8

54. The number of revolution of electrons per second in n^{th} orbit of H-atom is ($k = \text{constant}$)

- (1) $\frac{k}{n}$
- (2) $\frac{k}{n^3}$
- (3) $\frac{k}{n^2}$
- (4) $\frac{k}{n^4}$

55. The number of significant figures in 50 pens is

- (1) Infinite
- (2) 2
- (3) Zero
- (4) 1

56. The lowest value of negative electron gain enthalpy among the following is associated with

- (1) Lithium
- (2) Sodium
- (3) Potassium
- (4) Caesium

57. 50 ml of 1 N NaOH is mixed with 150 ml of 2 N Ca(OH)_2 . The molarity of OH^- ions in the resulting solution will be [Consider complete dissociation of NaOH and Ca(OH)_2]

- (1) 2.5 M
- (2) 1.75 M
- (3) 1.25 M
- (4) 1.50 M

58. Among the following which has maximum number of molecules?

- (1) 49 g of H_3PO_4
- (2) 45 g of $\text{C}_6\text{H}_{12}\text{O}_6$
- (3) 28 g N_2
- (4) 36 g H_2O

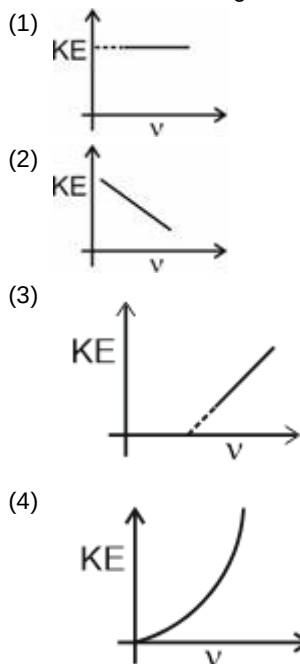
59. Match List I with List II.

a.	List I		List II
a.	Alkali metal	(i)	ns^2np^3
b.	Alkaline earth metal	(ii)	ns^1
c.	Transition metal	(iii)	$(n-1)d^{1-10}ns^{1-2}$
d.	Pnictogens	(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)

60. When light of frequency (ν) falls on a particular metal surface then the correct graph of kinetic energy (KE) of ejected electrons versus ν is given by



61. Total number of electrons in 2 mol of sulphide ion is

- (1) 3.6×10^{24}
- (2) 3.6×10^{23}
- (3) 2.16×10^{25}
- (4) 2.16×10^{23}

62. 68 g sample of a compound containing carbon and oxygen only, contains 47.05% oxygen by mass. The empirical formula of the compound is

- (1) CO
- (2) CO_2
- (3) C_3O_2
- (4) C_5O_2

63. One kilogram of electrons represents ____ mole of electrons. (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) $\frac{m_e}{N_A}$
64. 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
65. 20 ml of O₂ and 50 ml of H₂ are taken in a vessel and sparked till the reaction is completed to form H₂O(l). Assuming temperature and pressure constant, the reduction in volume of gases after reaction is
- (1) 50 ml
 - (2) 60 ml
 - (3) 70 ml
 - (4) 10 ml
66. An element E has following three isotopes ¹⁰⁰E : 80%, ⁹⁹E : 16%, ¹⁰¹E : 4%.
 The average atomic mass of element E is approximately
- (1) 97.9
 - (2) 96.8
 - (3) 98.8
 - (4) 99.9
67. The number of neutrons in Fe²⁺ ion is (Mass number of Fe is 56)
- (1) 26
 - (2) 56
 - (3) 32
 - (4) 30
68. Which of the following has the highest second ionisation enthalpy?
- (1) Li
 - (2) Na
 - (3) Al
 - (4) Be
69. Electromagnetic radiation with minimum wavelength is
- (1) IR
 - (2) Radio waves
 - (3) X-rays
 - (4) γ -rays
70. IUPAC name of the element having Z = 108 is
- (1) Unnilhexium
 - (2) Unniloctium
 - (3) Ununtrium
 - (4) Ununoctium
71. 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) $\frac{9}{7}R_H$
72. If an electron, α -particle, neutron and proton have same de Broglie wavelength, then kinetic energy will be minimum for
- (1) Electron
 - (2) Neutron
 - (3) α -particle
 - (4) Proton
73. Choose the incorrect order with respect to the given physical property.
- (1) Na > Na⁺ (Size)
 - (2) N > C (Electronegativity)
 - (3) Ga > Al (Metallic nature)
 - (4) Ne > Ar (Ionization Enthalpy)
74. Radius of 2nd orbit will be minimum for
- (1) He⁺
 - (2) Be³⁺
 - (3) H
 - (4) Li²⁺

75. Maximum atomic radius among the following is of
 (1) Be
 (2) Mg
 (3) B
 (4) Al
76. For which set of n and ℓ , electrons will have lowest energy among the following in the multielectron atom?
 (1) $n = 3, \ell = 1$
 (2) $n = 2, \ell = 1$
 (3) $n = 4, \ell = 0$
 (4) $n = 2, \ell = 0$
77. The energy of electron in an orbit of H-atom where two standing waves are present is
 (1) -13.6 eV
 (2) -1.7 eV
 (3) -1.51 eV
 (4) -3.4 eV
78. Mass of Mg required to produce 11.2 l of H_2 gas at STP on reaction with dilute HCl will be
 (1) 6 g
 (2) 18 g
 (3) 12 g
 (4) 24 g
79. The period which consists of Lanthanoids is
 (1) 3
 (2) 4
 (3) 5
 (4) 6
80. The correct expression for Heisenberg's uncertainty principle is
 (1) $\Delta x \times \Delta v \geq \frac{h}{4\pi}$
 (2) $\Delta x \times \Delta p \geq \frac{h}{2\pi}$
 (3) $\Delta x \times \Delta v \geq \frac{h}{2\pi}$
 (4) $\Delta x \times \Delta p \geq \frac{h}{4\pi}$
81. The number of orbitals in a ' ℓ ' subshell is given by
 (1) $2\ell + 1$
 (2) $\ell + 1$
 (3) $2(2\ell + 1)$
 (4) $2\ell + 2$
82. Mole fraction of NaOH in its aqueous solution having molality 2 is
 (1) 0.015
 (2) 0.035
 (3) 0.028
 (4) 0.045
83. Which one of the following is a metalloid?
 (1) P
 (2) Ga
 (3) Be
 (4) Ge
84. Which of the following series of transitions in the spectrum does not fall in infra red region?
 (1) Paschen series
 (2) Brackett series
 (3) Pfund series
 (4) Lyman series
85. All of the following are the representative elements, except
 (1) Indium
 (2) Scandium
 (3) Strontium
 (4) Antimony

SECTION-B

86. The number of photons emitted in one second by a 10 watt bulb, which emits monochromatic light of wavelength 662 nm, is
 $(h = 6.62 \times 10^{-34} \text{ Js})$
 (1) 6.28×10^{18}
 (2) 3.33×10^{19}
 (3) 5.21×10^{18}
 (4) 7.25×10^{17}
87. Cl^- is isoelectronic with
 (1) F^-
 (2) Ar
 (3) Br^-
 (4) S
88. Among the following ionic size is maximum for
 (1) S^{2-}
 (2) Cl^-
 (3) K^+
 (4) Ca^{2+}
89. Which of the following observations can be justified by wave nature of light?
 (1) Photoelectric effect
 (2) Variation of heat capacity of solids as a function of temperature
 (3) Black body radiation
 (4) Interference of light
90. Two electrons in the same orbital are distinguished by
 (1) Principal quantum number
 (2) Azimuthal quantum number
 (3) Magnetic quantum number
 (4) Spin quantum number
91. Atomic mass of Mg is 24 amu, it means that an atom of Mg is 24 times heavier than
 (1) Mass of one carbon atom (C-12)
 (2) $\left(\frac{1}{12}\right)^{th}$ mass of one carbon atom (C-12)
 (3) Mass of one mole carbon atom (C-12)
 (4) $\left(\frac{1}{24}\right)^{th}$ the mass of one carbon atom (C-12)
92. Ionization enthalpy of atomic hydrogen is $1.31 \times 10^6 \text{ J mol}^{-1}$. The energy of electron in the ground state of hydrogen atom is
 (1) $2.18 \times 10^{-18} \text{ J}$
 (2) $-2.18 \times 10^{-18} \text{ J}$
 (3) $6.55 \times 10^5 \text{ J}$
 (4) $-6.55 \times 10^{-6} \text{ J}$
93. In which mode of expression, the concentration of a solution does not depend on temperature?
 (1) Normality
 (2) Molarity
 (3) Volume strength
 (4) Mole fraction
94. The oxidation state and covalency of Al in $[\text{AlCl}(\text{H}_2\text{O})_5]^{2+}$ respectively are
 (1) +6 and 3
 (2) +6 and 6
 (3) +3 and 3
 (4) +3 and 6
95. Total number of atoms present in 11.2 ml of CO_2 (g) at STP is
 (1) $1.5 N_A$
 (2) $1.5 \times 10^{-5} N_A$
 (3) $1.5 \times 10^{-3} N_A$
 (4) $150 N_A$
96. In an organic compound containing carbon, hydrogen and oxygen, the percentage of carbon and hydrogen in it are 40% and 6.67% respectively. Its molecular formula may be
 (1) $\text{C}_2\text{H}_5\text{OH}$
 (2) CH_3CHO
 (3) $\text{C}_6\text{H}_{12}\text{O}_6$
 (4) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
97. The energy absorbed by each molecule of B_2 is $2.2 \times 10^{-18} \text{ J}$ and bond energy per molecule of B_2 is $2 \times 10^{-18} \text{ J}$. The kinetic energy of the bromine atom will be
 (1) $1 \times 10^{-18} \text{ J}$
 (2) $2 \times 10^{-19} \text{ J}$
 (3) $2 \times 10^{-20} \text{ J}$
 (4) $1 \times 10^{-19} \text{ J}$

98. The most acidic oxide among the following is
 (1) SO_2
 (2) Al_2O_3
 (3) Cl_2O_7
 (4) NO
99. Which of the following species has the maximum number of unpaired electrons?
 (1) Ni^{2+}
 (2) Cr^{3+}
 (3) Fe^{3+}
 (4) Co^{2+}
100. Mass of CaCO_3 required to react completely with 100 mL of 0.5 M H_2SO_4 is
 (1) 10 g
 (2) 5 g
 (3) 15 g
 (4) 25 g

BOTANY

SECTION-A

101. Key is an important taxonomical aid used for A of plants and animals based on B in a pair known as C.
 Find A, B and C.
 (1) A-Naming, B-Keys, C-Couplet
 (2) A-Identification, B-Contrasting characters, C-Couplet
 (3) A-Classification, B-Similarities, C-Keys
 (4) A-Taxonomy, B-Dissimilarities, C-Lead
102. (A) They can occur at great depths in the ocean.
 (B) The stored food is very similar to amylopectin and glycogen in structure.
 Above statements are true for all, **except**
 (1) *Polysiphonia*
 (2) *Dictyota*
 (3) *Gracilaria*
 (4) *Gelidium*
103. Select the **odd** one out w.r.t. zoological parks.
 (1) Wild animals are kept in zoos
 (2) It is an *in-situ* conservation strategy of animals
 (3) Animals are kept in protective environment under human care
 (4) National Zoological Park is located in Delhi
104. Identify the following statements as **true (T)** or **false (F)** and select the **correct** option.
 (i) Metabolic reactions can be demonstrated outside the body in cell free system.
 (ii) Isolated metabolic reactions *in vitro* are not living thing but surely living reactions.
- | | | |
|-----|-----|------|
| | (i) | (ii) |
| (1) | T | F |
| (2) | F | T |
| (3) | F | F |
| (4) | T | T |
- (1) (1)
 (2) (2)
 (3) (3)
 (4) (4)
105. How many of the given statements are **incorrect**?
 (a) The three domain system divides the Kingdom Monera into two domains.
 (b) Plants and fungi are similar in their cell wall composition.
 (c) All prokaryotic organisms were grouped together under Kingdom Protista.
 (d) Bacteria are the sole members of the Kingdom Monera.
 (e) Mycoplasma are the smallest living cells known and they cannot survive without oxygen.
 (1) Two
 (2) Four
 (3) Five
 (4) Three

106. Which of the following statements is correct?

- (1) Gymnosperms are both homosporous and heterosporous
- (2) Monoecious gametophytes are free living in pteridophytes
- (3) Stems are usually unbranched in both *Cycas* and *Cedrus*
- (4) Haploid endosperm is a feature of pteridophytes

107. Find the mismatched pair.

- (1) *Acetobacter aceti* – Vinegar production
- (2) *Bacillus vulgaris* – Ammonification
- (3) *Nitrosomonas* – N₂ fixation
- (4) *Lactobacillus* – Curd production

108. Dioecious liverwort is

- (1) *Funaria*
- (2) *Marchantia*
- (3) *Polytrichum*
- (4) *Riccia*

109. The parasitic fungus found on mustard leaves is

- (1) *Phytophthora*
- (2) *Albugo candida*
- (3) *Alternaria*
- (4) *Puccinia*

110. Read the given statements and select the correct option.

A. *Sphagnum* has great water absorbing capacity.

B. *Sphagnum* often grows in acidic marshes and can be used as fuel.

- (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

111. Which one is incorrectly matched?

- (1) Ascomycetes – *Penicillium*
- (2) Basidiomycetes – *Agaricus*
- (3) Zygomycetes – *Albugo candida*
- (4) Phycomycetes – *Rhizopus*

112. In bryophytes zygote undergoes A and develops into B

- (1) A = Meiosis, B = Haploid sporophyte
- (2) A = Meiosis, B = Diploid sporophyte
- (3) A = Mitosis, B = Haploid embryo
- (4) A = Mitosis, B = Diploid embryo

113. Read the following statements and identify the organism for which these statements hold true.

- a. They are very good indicators of water pollution.
- b. They are unicellular lacking flagella except in reproductive stage.

- (1) *Amoeba*
- (2) *Plasmodium*
- (3) *Euglena*
- (4) Diatoms

114. Find the mismatched pair.

	Algae	Feature
(1)	Chlorophyceae	Main pigments are chlorophyll a and d
(2)	Phaeophyceae	Main pigments are chlorophyll a and c
(3)	Rhodophyceae	Cell wall contains cellulose, pectin and polysulphate esters
(4)	Chlorophyceae	Cell wall contains cellulose and pectose

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

115. Sexual spores are produced exogenously in

- (1) *Alternaria* and *Trichoderma*
- (2) *Puccinia* and *Ustilago*
- (3) *Penicillium* and *Aspergillus*
- (4) *Neurospora* and *Phytophthora*

116. Slime moulds show similarity with plants and animals as

- (1) They have cell wall composed of peptidoglycan and do not reproduce asexually
- (2) They don't have cell wall at any stage of life and show heterotrophic mode of nutrition
- (3) They have cellulosic cell wall in their spores and main body plasmodium is without cell wall
- (4) They have cell wall composed of chitin in spores and main body lacks cell wall

117. Find the statement wrong for both virus and viroids

- (1) Both are non-infectious
- (2) Both have genetic material
- (3) Both are obligate parasites
- (4) Both are smaller than bacteria

118. Toxins released by which of the following organisms may even kill other marine animals such as fishes?

- (1) *Euglena*
- (2) Desmids
- (3) *Gonyaulax*
- (4) *Amoeba*

119. Which of the following provide index to the plant species found in a particular area?

- (1) Manuals
- (2) Catalogue
- (3) Flora
- (4) Monograph

120. Diplontic life cycle is seen in all of the following, **except**

- (1) *Cycas*
- (2) Rose
- (3) *Polysiphonia*
- (4) *Fucus*

121. Which of the following is **not** related to 'prions'?

- (1) Kuru disease
- (2) CFJ disease
- (3) BSE or Mad Cow disease
- (4) Potato spindle tuber disease

122. Which among the following is **not** a feature of gymnosperm?

- (1) Presence of naked seeds
- (2) Have vascular tissues
- (3) Show anemophily
- (4) Presence of vessels

123. Floridean starch is the stored food in

- (1) *Ectocarpus*
- (2) *Eudorina*
- (3) *Fucus*
- (4) *Porphyra*

124. Embryo sac represents female gametophyte in

- (1) Gymnosperms
- (2) Liverworts
- (3) Horsetails
- (4) Dicots

125. In which of the following numbers and codes are assigned to all the observable characters and all possible characters are compared by computers by giving equal importance?

- (1) Phylogenetic classification
- (2) Numerical taxonomy
- (3) Chemotaxonomy
- (4) Cytotaxonomy

126. Gemmae

- (a) Are green
 - (b) Are unicellular
 - (c) Are asexual buds
 - (d) Develop on sporophyte
- How many of the above given features are **correct**?

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

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

	Column I		Column II
a.	Algae	(i)	Vascular amphibians
b.	Bryophytes	(ii)	Mostly external fertilisation
c.	Pteridophytes	(iii)	Include liverworts and mosses
d.	Gymnosperms	(iv)	Ovules without ovary

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

128. Read the following statements, identify them as **true (T)** or **false (F)** and select the **correct** option.

- (A) Antheridiophores and archegoniophores are present in *Pinus*.
- (B) Heterospory is required for seed habit.
- (C) Gametophyte in ferns has two stages, protonema stage and leafy stage.

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

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

129. In Ascomycetes, ascospores are produced in fruiting bodies *i.e.* ascocarp. These ascospores are
- (1) Haploid and produced by meiosis
 - (2) Diploid and produced by mitosis
 - (3) Haploid and produced by fission
 - (4) Diploid and produced by meiosis
130. In fungi, sporangiospores are
- (1) Produced inside sporangia and are non motile
 - (2) Produced inside sporangia and are sexual motile spores
 - (3) Nonmotile and exogenously produced
 - (4) Motile and exogenously produced
131. Find the **odd** one w.r.t. *Mycoplasma*
- (1) They are pleomorphic and can change shape
 - (2) They are resistant to penicillin
 - (3) Their cell wall is composed of peptidoglycan
 - (4) They are heterotrophic and are pathogenic in plants and animals
132. Which among the following is a heterotrophic and parasitic plant?
- (1) Venus flytrap
 - (2) *Cuscuta*
 - (3) *Nepenthes*
 - (4) Bladderwort
133. Mark the statement depicting the living nature of viruses.
- (1) They have ability to get crystallized
 - (2) They lack protoplast
 - (3) They can take over biosynthetic machinery of the host cell to multiply
 - (4) Have high specific gravity and genetic material
134. Mark the **odd** one out w.r.t. defining features.
- (1) Cellular organisation
 - (2) Consciousness
 - (3) Metabolism
 - (4) Reproduction
135. Read the following statements and select the **correct** option.
- Assertion (A):** Archaeobacteria can survive in extreme conditions.
- Reason (R):** Archaeobacteria 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)

SECTION-B

136. Which of the given is **incorrectly** matched?
- (1) *Planaria* – Budding
 - (2) *E. coli* – Fission
 - (3) Fungi – Fragmentation
 - (4) *Hydra* – Budding
137. A is the branch of science which deals with diversity of organisms and the B relationship amongst them
- Fill in the blanks by choosing **correct** option for A and B.
- (1) A – Taxonomy, B – Reproductive
 - (2) A – Systematics, B – Evolutionary
 - (3) A – Classification, B – Evolutionary
 - (4) A – Identification, B – Evolutionary

138. *Panthera leo* and *Canis familiaris* are
- (1) Placed in same Kingdom and same genus
 - (2) Placed in different orders and different families
 - (3) Placed in same Kingdom and different families
 - (4) Placed in different Kingdom and different orders
139. In living organisms, growth is
- (1) Extrinsic
 - (2) Intrinsic
 - (3) Reversible
 - (4) Temporary
140. Two plants A and B can be conclusively said to belong to the same species if they
- (1) Have same number of nuclei in the cell
 - (2) Have more than 90% similar genes
 - (3) Can reproduce freely with each other and form seeds
 - (4) Are morphologically similar
141. Match the column I with column II and select the **correct** option.
- | Column I | Column II |
|----------------------|------------------------|
| a. Methanogens | (i) Photoautotrophic |
| b. Halophiles | (ii) Guts of ruminants |
| c. Thermoacidophiles | (iii) Heterotrophic |
| d. Cyanobacteria | (iv) Hot water springs |
- (1) a(ii), b(iii), c(i), d(iv)
 - (2) a(ii), b(iii), c(iv), d(i)
 - (3) a(ii), b(ii), c(i), d(iv)
 - (4) a(iii), b(ii), c(iv), d(i)
142. Cellular eukaryotic organism having stiff cellulosic plates on outer surface of cell wall is
- (1) Diatom
 - (2) Dinoflagellate
 - (3) Protozoan
 - (4) Euglenoid
143. All of the following form the basis for division of Kingdom Fungi into various classes, **except**
- (1) Morphology of mycelium
 - (2) Mode of nutrition
 - (3) Mode of spore formation
 - (4) Fruiting bodies
144. The peculiar feature which distinguishes *E.coli* from *Claviceps* is that the latter
- (1) Has polysaccharide in cell wall
 - (2) Produces meiotic haploid spores
 - (3) Is heterotrophic in nature
 - (4) Has 70S ribosomes
145. The sex organs are absent but plasmogamy is seen in members of
- (1) Phycomycetes
 - (2) Basidiomycetes
 - (3) Ascomycetes
 - (4) Deuteromycetes
146. In pea plant, egg apparatus is
- (1) 7-celled
 - (2) 3-celled
 - (3) 8-nucleated
 - (4) 8-celled
147. Which of the following is **correct** statement for largest cell of female gametophyte in angiosperms?
- (1) It bears two haploid nuclei
 - (2) It is located at chalazal end
 - (3) It is involved in syngamy
 - (4) It bears filiform apparatus
148. Find the **incorrect** match.
- (1) *Psilotum* – Psilopsida
 - (2) *Selaginella* – Sphenopsida
 - (3) *Equisetum* – Sphenopsida
 - (4) *Adiantum* – Pteropsida
149. Read the following statements are select the **correct** option.
- Assertion (A):** Mosses are of great ecological importance.
- Reason (R):** Mosses along with lichens are the first organisms to colonise rocks.
- (1) Assertion is correct but reason is incorrect
 - (2) Assertion is incorrect but reason is correct
 - (3) Both assertion (A) and reason (R) are correct but (R) is not correct explanation of (A)
 - (4) Both assertion (A) and reason (R) are correct and (R) is correct explanation of (A)
150. Fusion of two gametes which are flagellated and similar in size is seen in
- (1) *Ulothrix*
 - (2) *Eudorina*
 - (3) *Spirogyra*
 - (4) *Volvox*

ZOOLOGY

SECTION-A

151. Which of the following is associated with the members of phylum Aschelminthes?
 (1) Monoecious
 (2) Parapodia
 (3) Pseudocoelom
 (4) Metamerism
152. Identify a cartilaginous fish, which kills its enemies with an electric shock from the electric organ.
 (1) *Pristis*
 (2) *Catla*
 (3) *Pterophyllum*
 (4) *Torpedo*
153. Metameric segmentation is seen in members of all of the given phyla, **except**
 (1) Annelida
 (2) Arthropoda
 (3) Hemichordata
 (4) Chordata
154. Which one is **not** a feature of *Adamsia*?
 (1) Metagenesis
 (2) Gastrovascular cavity
 (3) Diploblastic
 (4) Cnidoblast
155. Choose the **odd** one w.r.t. class Osteichthyes.
 (1) *Hippocampus*
 (2) *Carcharodon*
 (3) *Labeo*
 (4) *Exocoetus*
156. How many of the following are economically beneficial insects?

Bombyx, Anopheles, Laccifer, Limulus, Wuchereria

 (1) Three
 (2) Four
 (3) Five
 (4) Two
157. Select the flightless bird from the following.
 (1) *Neophron*
 (2) *Aptenodytes*
 (3) *Psittacula*
 (4) *Columba*
158. Select the **incorrect** statement.
 (1) In Platyhelminthes, body cavity is absent
 (2) Notochord is an ectodermally derived rod-like structure
 (3) Choanocytes line the spongocoel
 (4) All chordates are triploblastic
159. Bony fishes and cartilaginous fishes are similar in possessing
 (1) Air bladder
 (2) Placoid scales
 (3) Cycloid scales
 (4) Two-chambered heart
160. The larva of which animal undergoes metamorphosis in fresh water and then returns to the ocean?
 (1) *Petromyzon*
 (2) *Branchiostoma*
 (3) *Ascidia*
 (4) *Salpa*
161. Complete the analogy and choose the **correct** option.
 Poikilothermous : *Chelone* : :
 Homeothermous : _____.
 (1) *Aptenodytes*
 (2) *Alligator*
 (3) *Bufo*
 (4) *Clarias*
162. Digestive system is complete but circulatory and respiratory system are absent in phylum
 (1) Platyhelminthes
 (2) Aschelminthes
 (3) Annelida
 (4) Arthropoda

163. Select the **incorrect** feature w.r.t. ctenophores.
- (1) Tissue level of body organisation
 - (2) Fertilization is external
 - (3) Ciliated comb plates primarily help in feeding
 - (4) Digestion is both extracellular and intracellular

164. Select an oviparous mammal.
- (1) *Balaenoptera*
 - (2) *Ornithorhynchus*
 - (3) *Delphinus*
 - (4) *Equus*

165. Match column I with column II and select the **correct** option.

	Column I		Column II
(a)	<i>Dentalium</i>	(i)	High regeneration capacity
(b)	<i>Pheretima</i>	(ii)	Radula
(c)	<i>Nereis</i>	(iii)	Longitudinal and circular muscles
(d)	<i>Planaria</i>	(iv)	Parapodia

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

166. All of the following possess radial symmetry in adult stages, **except**
- (1) Coelenterates
 - (2) Ctenophores
 - (3) Echinoderms
 - (4) Molluscs

167. The platyhelminth that absorbs nutrients from the host directly through its body surface is
- (1) Tapeworm
 - (2) Liver fluke
 - (3) Blood fluke
 - (4) Hookworm

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

Statement A : Members of subphyla Urochordata and Cephalochordata are often referred to as protochordates.

Statement B : *Ascidia* is a urochordate.

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

169. Choose the animal in which the alimentary canal, urinary and reproductive tracts do **not** open into cloaca.

- (1) *Ichthyophis*
- (2) *Bufo*
- (3) *Elephas*
- (4) *Salamandra*

170. Which of the following characters is possessed by reptiles without exception?

- (1) Two pairs of limbs
- (2) Three chambered heart
- (3) Presence of vertebral column
- (4) Shed their scales as skin cast

171. An important characteristic feature that is shared between *Balanoglossus* and *Pteropus* is

- (1) Presence of air sacs
- (2) Sexes are separate
- (3) Dorsal solid nerve cord
- (4) Presence of notochord

172. Choose the **odd** member w.r.t. monoecious animals.

- (1) *Pheretima*
- (2) *Hirudinaria*
- (3) *Nereis*
- (4) *Taenia*

173. In echinoderms, digestive system is complete with mouth on _____ side and anus on the _____ side. Select the correct option that fills the blanks, respectively.

- (1) Upper; lower
- (2) Ventral; dorsal
- (3) Dorsal; upper
- (4) Dorsal; ventral

174. Pseudocoelom is seen in

- (1) *Fasciola*
- (2) *Ancylostoma*
- (3) *Taenia*
- (4) *Hirudinaria*

175. Select the **mismatch** w.r.t. animals and their respective phylum.

- (1) Portuguese man of war – Cnidaria
- (2) Brittle star – Echinodermata
- (3) Tapeworm – Platyhelminthes
- (4) Hookworm – Mollusca

176. How many of the features listed below are **correct** w.r.t. phylum Porifera?

- (i) Internal cavities are lined with food filtering flagellated cells
- (ii) Body is made up of meshwork of cells
- (iii) Mostly asymmetrical
- (iv) Water vascular system

- (1) Zero
- (2) One
- (3) Two
- (4) Three

177. Calcareous spicules are present in the members of phylum

- (1) Annelida
- (2) Porifera
- (3) Arthropoda
- (4) Cnidaria

178. All of the following are exclusive features of birds, except

- (1) Pneumatic long bones
- (2) Presence of feathers
- (3) Air sacs connected to lungs to supplement respiration
- (4) Presence of crop and gizzard

179. Choose the odd one w.r.t. non-poisonous reptiles.

- (1) *Crocodilus*
- (2) *Vipera*
- (3) *Testudo*
- (4) *Calotes*

180. Which of the following is a feature of the phylum represented by animal given below?



- (1) Bilateral symmetry
- (2) Organ system level of body organisation
- (3) Direct development
- (4) Bioluminescence

181. Cnidoblasts are not used for

- (1) Anchorage
- (2) Capture of prey
- (3) Digestion of food
- (4) Defense

182. Select the **correct** statement.

- (1) Notochord is replaced by bony vertebral column in all adult vertebrates
- (2) In cephalochordates, notochord is persistent throughout their life
- (3) All chordates are vertebrates
- (4) In Urochordata, notochord extends from head to tail region

183. Animals having radial symmetry represents that

- (1) Any plane passing through the centre of the body does not divide the organism into equal halves
- (2) Any plane passing through the central axis of the body divides the organism into two identical halves
- (3) The body can be divided into identical left and right halves in only one horizontal plane
- (4) The body can be divided into two identical halves in only one longitudinal plane

184. The phylum in which triploblasty originated for the first time is

- (1) Ctenophora
- (2) Aschelminthes
- (3) Annelida
- (4) Platyhelminthes

185. All of the following are exclusively marine, except

- (1) *Doliolum*
- (2) *Antedon*
- (3) *Pleurobrachia*
- (4) *Clarias*

SECTION-B

186. Choose the option in which, the genus name, its two characters and class are **not** correctly matched.

	Genus name	Two characters	Class
(1)	<i>Myxine</i>	Ectoparasite, circular mouth	Cyclostomata
(2)	<i>Carcharodon</i>	Poikilothermous, operculum absent	Chondrichthyes
(3)	<i>Clarias</i>	Sexes are separate, skin with cycloid scales	Osteichthyes
(4)	<i>Ichthyophis</i>	Presence of two pairs of legs, tympanum present	Amphibia

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

187. Choose the set of animals that belong to the same class.

- (1) *Pterophyllum* and *Carcharodon*
- (2) *Ichthyophis* and *Pristis*
- (3) *Myxine* and *Petromyzon*
- (4) *Corvus* and *Pteropus*

188. **Assertion (A):** A closed circulatory system is present in annelids.

Reason (R): In annelids, the blood is circulated through a series of closed vessels of varying diameters.

In the light of above statements, choose the correct option.

- (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 correct explanation of (A)
- (3) (A) is true but (R) is false
- (4) (A) is false but (R) is true

189. Select the triploblastic animal which has no excretory system.

- (1) Lancelet
- (2) Lamprey
- (3) Sea urchin
- (4) Magur

190. 'The former is a sessile and cylindrical form whereas the latter is umbrella-shaped and free-swimming form of coelenterates.' The former and the latter respectively, are

- (1) Polyp; medusa
- (2) Medusa; Polyp
- (3) *Aurelia*; *Adamsia*
- (4) Sexually reproducing; asexually reproducing

191. Select the fresh water animal.

- (1) *Spongilla*
- (2) *Ctenoplana*
- (3) *Ophiura*
- (4) *Saccoglossus*

192. Select the organism which has the following characteristics.

- (i) The male bears a brood pouch where female lays egg
- (ii) Tail is pre-hensile
- (iii) Presence of long snout
- (iv) Bony endoskeleton

- (1) *Hippocampus*
- (2) *Catla*
- (3) *Scoliodon*
- (4) *Pristis*

193. The incorrect feature about feather like gills in the second largest animal phylum is

- (1) Present in space between the hump and the mantle
- (2) Have respiratory and excretory functions
- (3) Increases the area available for gas exchange
- (4) Play role in digestion

194. The mesoderm is present as scattered pouches in between the ectoderm and endoderm in the body cavity, in

- (1) *Aedes*
- (2) *Aplysia*
- (3) *Ancylostoma*
- (4) *Antedon*

195. Many living members of class A are ectoparasites on some other B.

Choose the option which fills the blanks **correctly**.

	A	B
(1)	Cyclostomata	Fishes
(2)	Chondrichthyes	Amphibians
(3)	Amphibia	Fishes
(4)	Reptilia	Osteichthyes

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

- 196.** Which of the following is the scientific name of Lion?
(1) *Camelus*
(2) *Panthera tigris*
(3) *Panthera leo*
(4) *Elephas*
- 197.** Select the incorrect match.
(1) *Pterophyllum* - Angel fish
(2) *Testudo* - Turtle
(3) *Sepia* - Cuttlefish
(4) *Ophiura* - Brittle star
- 198.** The common feature between butterfly, prawn, king crab and mosquito is
(1) They are mostly viviparous
(2) They all are terrestrial
(3) Tracheal respiration
(4) Chitinous exoskeleton
- 199.** Specialised cells called flame cells are present in members of the phylum that also possess
(1) Hooks and suckers in parasitic forms
(2) Regeneration capacity in all
(3) Direct development
(4) Longitudinal and circular muscles for locomotion
- 200.** Central nervous system is ventral, solid and double in
(1) *Periplaneta*
(2) *Petromyzon*
(3) *Pristis*
(4) *Psittacula*



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21/03/2023

Code-B



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Ph.011-47623456

MM : 800

FTS for NEET-2023_Phase-1(B)-T01

Time : 200 Min.

PHYSICS

SECTION-A

- | | |
|---------|---------|
| 1. (3) | 19. (3) |
| 2. (2) | 20. (4) |
| 3. (4) | 21. (2) |
| 4. (4) | 22. (3) |
| 5. (3) | 23. (1) |
| 6. (4) | 24. (4) |
| 7. (2) | 25. (2) |
| 8. (3) | 26. (1) |
| 9. (2) | 27. (3) |
| 10. (4) | 28. (2) |
| 11. (4) | 29. (1) |
| 12. (2) | 30. (4) |
| 13. (3) | 31. (3) |
| 14. (1) | 32. (1) |
| 15. (2) | 33. (3) |
| 16. (3) | 34. (3) |
| 17. (3) | 35. (3) |
| 18. (3) | |

SECTION-B

- | | |
|---------|---------|
| 36. (2) | 44. (2) |
| 37. (3) | 45. (4) |
| 38. (3) | 46. (3) |
| 39. (2) | 47. (4) |
| 40. (1) | 48. (1) |
| 41. (3) | 49. (3) |
| 42. (4) | 50. (2) |
| 43. (2) | |

CHEMISTRY

SECTION-A

- | | |
|---------|---------|
| 51. (3) | 69. (4) |
| 52. (3) | 70. (2) |
| 53. (1) | 71. (2) |
| 54. (2) | 72. (3) |
| 55. (1) | 73. (3) |
| 56. (4) | 74. (2) |
| 57. (2) | 75. (2) |
| 58. (4) | 76. (4) |
| 59. (2) | 77. (4) |
| 60. (3) | 78. (3) |
| 61. (3) | 79. (4) |
| 62. (3) | 80. (4) |
| 63. (3) | 81. (1) |
| 64. (1) | 82. (2) |
| 65. (2) | 83. (4) |
| 66. (4) | 84. (4) |
| 67. (4) | 85. (2) |
| 68. (1) | |

SECTION-B

- | | |
|---------|----------|
| 86. (2) | 94. (4) |
| 87. (2) | 95. (3) |
| 88. (1) | 96. (3) |
| 89. (4) | 97. (4) |
| 90. (4) | 98. (3) |
| 91. (2) | 99. (3) |
| 92. (2) | 100. (2) |
| 93. (4) | |

BOTANY

SECTION-A

- | | |
|----------|----------|
| 101. (2) | 119. (3) |
| 102. (2) | 120. (3) |
| 103. (2) | 121. (4) |

- 104. (4)
- 105. (4)
- 106. (2)
- 107. (3)
- 108. (2)
- 109. (2)
- 110. (1)
- 111. (3)
- 112. (4)
- 113. (4)
- 114. (1)
- 115. (2)
- 116. (3)
- 117. (1)
- 118. (3)

- 122. (4)
- 123. (4)
- 124. (4)
- 125. (2)
- 126. (2)
- 127. (3)
- 128. (2)
- 129. (1)
- 130. (1)
- 131. (3)
- 132. (2)
- 133. (3)
- 134. (4)
- 135. (3)

SECTION-B

- 136. (1)
- 137. (2)
- 138. (3)
- 139. (2)
- 140. (3)
- 141. (2)
- 142. (2)
- 143. (2)

- 144. (2)
- 145. (2)
- 146. (2)
- 147. (1)
- 148. (2)
- 149. (4)
- 150. (1)

ZOOLOGY

SECTION-A

- 151. (3)
- 152. (4)
- 153. (3)
- 154. (1)
- 155. (2)
- 156. (4)
- 157. (2)
- 158. (2)
- 159. (4)
- 160. (1)

- 169. (3)
- 170. (3)
- 171. (2)
- 172. (3)
- 173. (2)
- 174. (2)
- 175. (4)
- 176. (4)
- 177. (2)
- 178. (4)

161. (1)

179. (2)

162. (2)

180. (4)

163. (3)

181. (3)

164. (2)

182. (2)

165. (4)

183. (2)

166. (4)

184. (4)

167. (1)

185. (4)

168. (3)

SECTION-B

186. (4)

194. (3)

187. (3)

195. (1)

188. (1)

196. (3)

189. (3)

197. (2)

190. (1)

198. (4)

191. (1)

199. (1)

192. (1)

200. (1)

193. (4)

Hints and Solutions

PHYSICS

SECTION-A

(1) Answer : (3)

Solution:

kelvin (K) is the SI unit of temperature.

(2) Answer : (2)

Solution:

Dimension of a :

$$[v] = [at] \Rightarrow [LT^{-1}] = [a] [T]$$

$$[a] = [LT^{-2}]$$

Dimensions of b :

$$[v] = [b] \Rightarrow [b] = [LT^{-1}]$$

(3) Answer : (4)

Solution:

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$\frac{\Delta T}{T} \times 100 = \frac{1}{2} \left(\frac{\Delta l}{l} \times 100 \right) + \frac{1}{2} \left(\frac{\Delta g}{g} \times 100 \right)$$

$$\frac{\Delta T}{T} \times 100 = \left(\frac{1}{2} \times 2\% \right) + \left(\frac{1}{2} \times 3\% \right)$$

$$\frac{\Delta T}{T} \times 100 = \frac{5}{2}\%$$

(4) Answer : (4)

Solution:

Two physical quantities with different dimensions can be multiplied with each other.

(5) Answer : (3)

Solution:

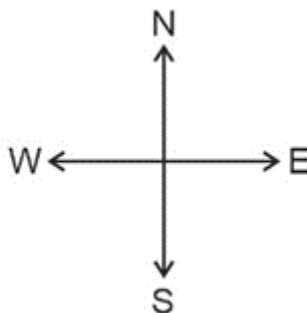
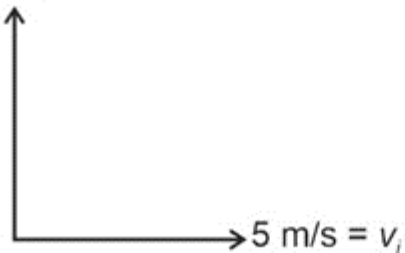
Acceleration is defined as rate of change of velocity and velocity has direction as well as magnitude.

Therefore, change in either direction of velocity or magnitude of velocity or both mean non-zero acceleration.

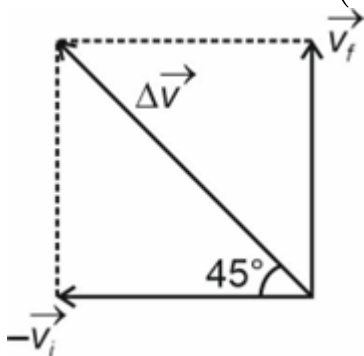
(6) Answer : (4)

Solution:

$$v_f = 5 \text{ m/s}$$



$$\Delta \vec{v} = \vec{v}_f - \vec{v}_i = \vec{v}_f + (-\vec{v}_i)$$



$$\Delta \vec{v} = 5\sqrt{2} \text{ m/s north-west}$$

(7) Answer : (2)

Solution:

$$t = \alpha x^2 + \beta x$$

Differentiate the above equation w.r.t. time

$$\frac{dt}{dt} = \alpha \frac{dx^2}{dt} + \beta \frac{dx}{dt}$$

$$1 = (\alpha \times 2xv) + \beta v \quad \dots(i) \quad \left\{ \frac{dx}{dt} = v \right\}$$

Again differentiate the above equation w.r.t. time

$$\frac{d1}{dt} = 2\alpha \frac{d}{dt}(xv) + \beta \frac{dv}{dt}$$

$$0 = 2\alpha(xa + v \times v) + \beta a \quad \left\{ \frac{dv}{dt} = a \right\}$$

$$0 = 2\alpha xa + 2\alpha v^2 + \beta a$$

$$a = \frac{-2\alpha v^2}{(2\alpha x + \beta)} \quad \dots(ii)$$

From equation (i), we have

$$v = \frac{1}{(2\alpha x + \beta)} \quad \dots(iii)$$

$$a = \frac{-2\alpha v^2}{\frac{1}{v}} = -2\alpha v^3$$

\therefore Retardation is equal to $2\alpha v^3$

(8) Answer : (3)

Solution:

Let the height of the tower be h .

For ball A:

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

$$2 \times (-g)x(-h) = v_A^2 - v^2$$

$$v_A^2 = v^2 + 2gh \quad \dots(i)$$

For ball B:

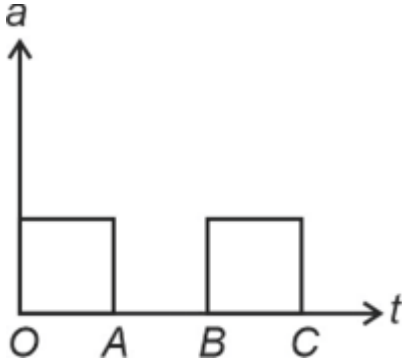
$$2 \times (-g) \times (-h) = v_B^2 - v^2$$

$$v_B^2 = 2gh + v^2 \quad \dots(ii)$$

Clearly, $v_A = v_B$

(9) Answer : (2)

Solution:



For O to A \Rightarrow acceleration is constant, hence slope of v - t graph will be constant and velocity will increase with time.

For A to B \Rightarrow acceleration is zero, hence velocity of the body will remain constant.

For B to C \Rightarrow exactly as O to A.

Therefore, graph (2) is the corresponding graph for the given motion.

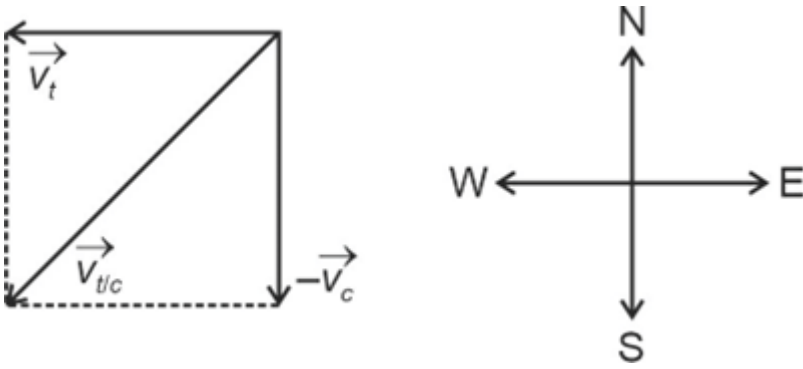
(10) Answer : (4)

Solution:

$$\text{Velocity of train} = \vec{v}_t$$

$$\text{Velocity of car} = \vec{v}_c$$

$$\text{Velocity of train w.r.t. car} \Rightarrow \vec{v}_{t/c} = \vec{v}_t - \vec{v}_c$$



(11) Answer : (4)

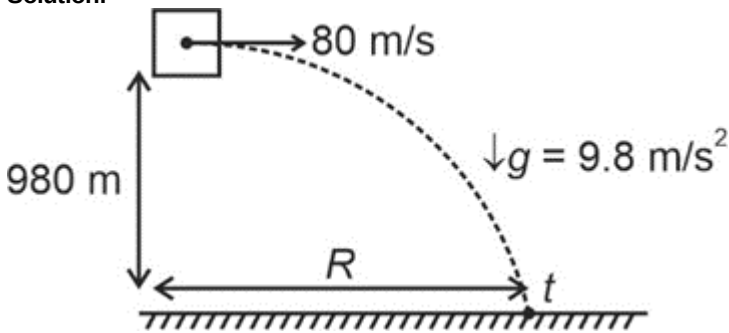
Solution:

Angular acceleration $\Rightarrow \alpha = \frac{d\omega}{dt} = 0$ $\{\omega = \text{constant}\}$

Tangential acceleration $\Rightarrow a_t = r\alpha = 0$

(12) Answer : (2)

Solution:



$$h = \frac{1}{2}gt^2 \Rightarrow 980 = \frac{1}{2} \times 9.8 \times t^2$$

$$t^2 = \frac{980 \times 2}{9.8} \Rightarrow t = 10\sqrt{2} \text{ s}$$

$$R = u_x \times t = 80 \times 10\sqrt{2} = 800\sqrt{2} \text{ m}$$

(13) Answer : (3)

Solution:

Greatest height can be achieved when the boy throw the ball upwards.

$$\therefore H = \frac{u^2}{2g} \Rightarrow u = \sqrt{2gH} \dots(i)$$

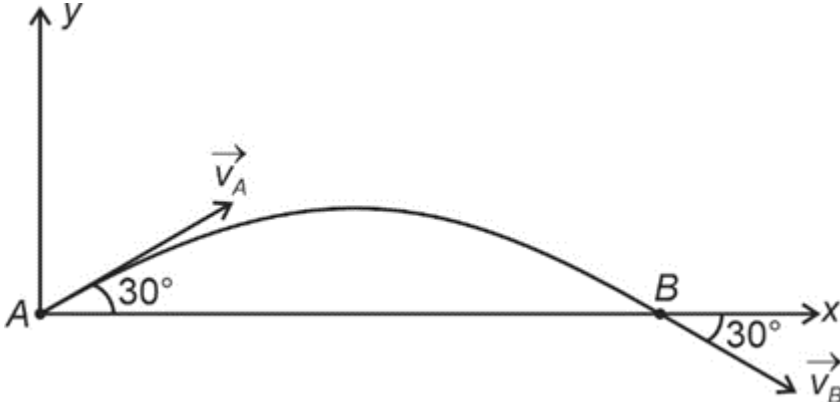
In projectile motion, the greatest range is achieved for $\theta = 45^\circ$. Therefore,

$$R = \frac{u^2 \sin 2\theta}{g} \Rightarrow R_{\text{max}} = \frac{u^2}{g}$$

$$R_{\text{max}} = \frac{2gH}{g} = 2H$$

(14) Answer : (1)

Solution:



$$\vec{v}_A = 10 \cos 30\hat{i} + 10 \sin 30\hat{j}$$

$$\vec{v}_B = 10 \cos 30\hat{i} - 10 \sin 30\hat{j}$$

$$\Delta \vec{v} = \vec{v}_B - \vec{v}_A = -10 \sin 30 \times 2\hat{j} = -10\hat{j}$$

$$|\Delta \vec{v}| = 10 \text{ m/s}$$

(15) Answer : (2)

Solution:

From the figure, H_{\max} is same for the three projectiles, and $H_{\max} = \frac{u^2 \sin^2 \theta}{2g}$.

$\therefore u \sin \theta$ is same for the three projectiles.

Also, time of flight, $T = \frac{2u \sin \theta}{g}$

\therefore Time of flight is same for the three projectiles

Range is given by $R = u_x \times T \Rightarrow R \propto u_x$

Since $R_3 > R_2 > R_1 \Rightarrow u_{x_3} > u_{x_2} > u_{x_1}$

(16) Answer : (3)

Solution:

Horizontal range is given by

$$R = \frac{u^2 \sin 2\theta}{g}$$

$$\text{On the Earth} \Rightarrow 100 = \frac{v^2 \sin 2\theta}{g} \dots (i)$$

$$\text{On the Moon} \Rightarrow R' = \frac{v^2 \sin 2\theta}{g/6} \dots (ii)$$

Divide (i) and (ii), we get

$$\frac{100}{R'} = \frac{g/6}{g} \Rightarrow R' = 600 \text{ m}$$

(17) Answer : (3)

Solution:

When two vectors are equal, then their direction as well as their magnitude are same.

$$\text{Let } \left| \vec{A} \right| = 2$$

$$\left| \vec{B} \right| = 3$$

$$\text{then, } \left| \vec{A} + \vec{B} \right| = 5 \text{ but } \left| \hat{A} + \hat{B} \right| = 2$$

$$\therefore \vec{A} + \vec{B} \neq \hat{A} + \hat{B}$$

(18) Answer : (3)

Solution:

Least count of screw gauge is $\frac{0.5}{50} = 0.01 \text{ mm}$

Which is smallest and hence most precise among all.

(19) Answer : (3)

Solution:

The horizontal velocity of the bomb will remain unaffected, therefore it will travel the same horizontal distance as the fighter jet.

(20) Answer : (4)

Solution:

Displacement-time graph is upward parabola for positive acceleration.

(21) Answer : (2)

Solution:

$$v = \sqrt{2}v \cos \theta$$

$$\cos \theta = \frac{1}{\sqrt{2}}$$

$$\theta = 45^\circ$$

(22) Answer : (3)

Solution:

$$\text{Let } \vec{V}_r = (a\hat{i} + b\hat{j}) \text{ km/h for first condition } \vec{V}_{rm} = (a\hat{i} + b\hat{j}) - 3\sqrt{2}\hat{i}$$

If appears vertically downward

$$\text{Then, } (a - 3\sqrt{2}) = 0 \Rightarrow a = 3\sqrt{2} \dots (i)$$

$$\text{For second condition, } \vec{V}_{rm} = (a\hat{i} + b\hat{j}) - 5\sqrt{2}\hat{i}$$

This appears at 45° with vertical

$$\Rightarrow a - 5\sqrt{2} = b$$

$$\Rightarrow 3\sqrt{2} - 5\sqrt{2} = b \Rightarrow b = -2\sqrt{2}$$

$$\therefore \vec{v}_r = (3\sqrt{2}\hat{i} - 2\sqrt{2}\hat{j}) \text{ km/h}$$

$$\therefore |\vec{v}_r| = \sqrt{(3\sqrt{2})^2 + (2\sqrt{2})^2} = \sqrt{18+8} = \sqrt{26} \text{ km/h}$$

(23) Answer : (1)

Solution:

$$n_1 u_1 = n_2 u_2$$

$$10 [M_1 L_1 T_1^{-2}] = n_2 [M_2 L_2 T_2^{-2}]$$

$$\Rightarrow n_2 = 10 \times \left(\frac{1 \text{ kg}}{10 \text{ kg}}\right) \times \left(\frac{100 \text{ cm}}{10 \text{ cm}}\right) \times \left(\frac{1 \text{ s}}{10 \text{ s}}\right)^{-2}$$

$$= 10 \times \frac{1}{10} \times 10 \times 10^2 = 1000$$

(24) Answer : (4)

Solution:

For acceleration (a_1) slope of v versus t graph is a positive constant.
For acceleration ($-a_1$) slope of v versus t graph is a negative constant.

(25) Answer : (2)

Solution:

Zeros to the left of last non-zero digit are insignificant.

(26) Answer : (1)

Solution:

Maximum percentage errors are to be added for multiplication and division.

$$X = \frac{a^{1/3} b^2}{c}$$

$$\Rightarrow \frac{\Delta X}{X} \times 100$$

$$= \frac{1}{3} \frac{\Delta a}{a} \times 100 + \frac{2\Delta b}{b} \times 100 + \frac{\Delta c}{c} \times 100$$

$$= \frac{1}{3} \times 0.3 + 2 \times 1 + 0.9 = 3\%$$

(27) Answer : (3)

Solution:

$$Y = \frac{\text{Stress}}{\text{Strain}}$$

$$[Y] = \frac{[\text{Stress}]}{[\text{Strain}]} = \frac{[F]}{[\text{mass} \times \text{acceleration}]}$$

$$= \frac{[(\text{length})^2]}{[M][VT^{-1}]^2} = [MV^{-1}T^{-3}]$$

(28) Answer : (2)

Solution:

$$a_r = \frac{(v')^2}{r} = \frac{4v^2}{r}$$

$$v^2 = u^2 + 2a_t s$$

$$\frac{4v^2 - v^2}{2 \times 2\pi r} = a_t$$

$$\Rightarrow \frac{3v^2}{4\pi r} = a_t$$

$$\therefore a = \sqrt{a_r^2 + a_t^2}$$

$$= \sqrt{\left(\frac{4v^2}{r}\right)^2 + \left(\frac{3v^2}{4\pi r}\right)^2}$$

$$= \frac{v^2}{r} \sqrt{16 + \frac{9}{16\pi^2}}$$

$$= \frac{v^2}{4\pi r} \sqrt{256\pi^2 + 9}$$

(29) Answer : (1)

Solution:

Let at point P speed = u

$$\therefore 18\sqrt{3} \cos 60^\circ = u \cos 30^\circ$$

$$u = \frac{18\sqrt{3}}{\frac{\sqrt{3}}{2}} \times \frac{1}{2} = 18 \text{ m/s}$$

Time taken from P to Q

$$T = \frac{2u \sin 30^\circ}{g} = \frac{2 \times 18 \times \frac{1}{2}}{10} = 1.8 \text{ s}$$

(30) Answer : (4)

Solution:

The scattering of light due to change in its wavelength is called Raman scattering.

(31) Answer : (3)

Solution:

$$[B] = [3x] = [L]$$

$$[P] = [MLT^{-1}]$$

$$[A] [L^{1/2}] = [P] [B + 3x] = [MLT^{-1}] \times [L]$$

$$\Rightarrow [A] = \frac{[ML^2T^{-1}]}{[L^{1/2}]} = [ML^{3/2}T^{-1}]$$

$$\therefore \left[\frac{A}{B} \right] = \frac{[ML^{3/2}T^{-1}]}{[L]} = [ML^{1/2}T^{-1}]$$

(32) Answer : (1)

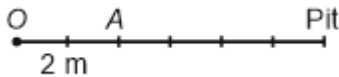
Solution:

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time}}$$

$$= \frac{12+12}{8} = 3 \text{ m/s}$$

(33) Answer : (3)

Solution:



From starting point O time taken to have 2 m as net displacement will be 8 s.

From point A the pit is at a distance of 4 m, therefore in 4th forward step from point A he will fall into the pit.

∴ Total time taken = 8 + 4 = 12 s

(34) Answer : (3)

Solution:

$$192 = 1.92 \times 10^2$$

(35) Answer : (3)

Solution:

$$T = \frac{2u \sin \theta}{g} = \frac{2 \times 60 \times \sin 45^\circ}{10} = 6\sqrt{2} \text{ s}$$

At $t = 3\sqrt{2}$ s particle is at the top of projectile with speed

$$u = 60 \cos 45^\circ = 60 \times \frac{1}{\sqrt{2}} = 30\sqrt{2} \text{ m/s}$$

∴ Radius of curvature

$$R = \frac{u^2}{g} = \frac{(30\sqrt{2})^2}{10} = 90 \times 2 = 180 \text{ m}$$

SECTION-B

(36) Answer : (2)

Solution:

$$x = (t + 1)^{-\frac{1}{2}}$$

$$v = -\frac{1}{2}(t + 1)^{-\frac{3}{2}}$$

$$a = +\frac{3}{4}(t + 1)^{-\frac{5}{2}} = \frac{3}{4}(t + 1)^{-\frac{5}{2} \times \frac{3}{3}}$$

$$= \frac{3}{4}(t + 1)^{-\frac{3}{2} \times \frac{5}{3}} = \frac{3}{2}v^{\frac{5}{3}}$$

(37) Answer : (3)

Solution:

$$\frac{1}{2} \times 10 \times 15^2 = v \times 5 + \frac{1}{2} \times 10 \times 25$$

$$\Rightarrow 225 = v + 25$$

$$\Rightarrow v = 200 \text{ m/s}$$

(38) Answer : (3)

Solution:

$$\begin{aligned} \therefore v &= \alpha t^2 \\ a_t &= 2\alpha t \\ \text{at } t &= 2 \text{ s} \\ a_t &= 4\alpha \\ a_r &= \frac{v^2}{r} = \frac{\alpha^2 t^4}{2} \\ &= 8\alpha^2 \\ \therefore \frac{a_r}{a_t} &= \frac{8\alpha^2}{4\alpha} = 2\alpha \end{aligned}$$

(39) Answer : (2)

Solution:

$$\begin{aligned} \therefore \sqrt{a^2 + b^2 + 2ab \cos \theta} &= \sqrt{3} \\ 2 \cos \frac{\theta}{2} &= \sqrt{3} \\ \cos \frac{\theta}{2} &= \frac{\sqrt{3}}{2} \\ \theta &= 60^\circ \\ \therefore |\hat{a} - \hat{b}| &= \sqrt{a^2 + b^2 - 2ab \cos \theta} \\ &= \sqrt{1 + 1 - 2 \times \frac{1}{2}} = 1 \end{aligned}$$

(40) Answer : (1)

Solution:

$$\begin{aligned} \text{Let } Y &= \sqrt{AB} = \sqrt{2} = 1.414 \text{ m} \\ \text{Rounding off to two significant digit} \\ Y &= 1.4 \text{ m} \\ \frac{\Delta Y}{Y} &= \frac{1}{2} \left[\frac{\Delta A}{A} + \frac{\Delta B}{B} \right] \\ \Rightarrow \Delta Y &= \frac{1}{2} \left[\frac{0.2}{1.0} + \frac{0.2}{2.0} \right] \times 1.4 = 0.21 \\ \text{So, result should be } &1.4 \text{ m} \pm 0.2 \text{ m} \end{aligned}$$

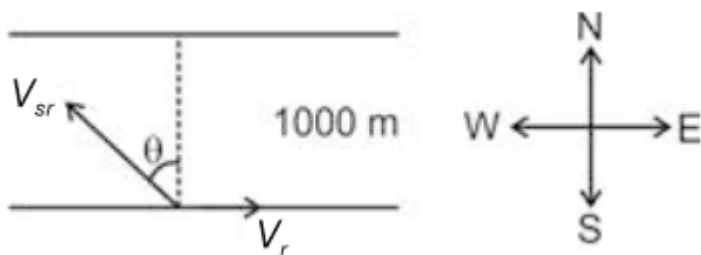
(41) Answer : (3)

Solution:

$$\begin{aligned} v_x &= 605\pi \cos 121\pi t \\ v_y &= -605\pi \sin 5\pi t \\ v_x(t = 1\text{s}) &= 605\pi \cos 121\pi \\ &= 605\pi(-1) = -605\pi \\ v_y(t = 1\text{s}) &= -605\pi \sin 5\pi \\ &= -605\pi \times 0 = 0 \\ \therefore \text{speed} &= \sqrt{v_x^2 + v_y^2} = 605\pi \text{ m/s} \end{aligned}$$

(42) Answer : (4)

Solution:



For shortest path, drift $x = 0$

$$\begin{aligned} \Rightarrow v_r &= v_{sr} \sin \theta \\ \Rightarrow \sin \theta &= \frac{v_r}{v_{sr}} = \frac{10}{14.14} = \frac{1}{\sqrt{2}} \\ \Rightarrow \theta &= 45^\circ \end{aligned}$$

Therefore, angle w.r.t. east = $(\theta + 90^\circ)$
 $= 45^\circ + 90^\circ = 135^\circ$

Time taken to cross the river

$$= t = \frac{1}{10\sqrt{2} \times \frac{1}{\sqrt{2}}} = 0.1 \text{ h}$$

(43) Answer : (2)

Solution:

$$x = 2t$$

$$y = 3t - 6t^2$$

$$\therefore t = \frac{x}{2}$$

$$\begin{aligned} \therefore y &= 3 \times \frac{x}{2} - 6 \times \frac{x^2}{4} \\ &= \left(\frac{3}{2}x - \frac{3}{2}x^2 \right) = \frac{3}{2}x(1-x) \end{aligned}$$

(44) Answer : (2)

Solution:

$$\vec{P}(t) = B\sin\omega t \hat{i} + B\cos\omega t \hat{j}$$

$$\frac{d\vec{P}}{dt} = \vec{F} = B\omega\cos\omega t \hat{i} - B\omega\sin\omega t \hat{j}$$

$$\therefore \vec{P} \cdot \vec{F} = B^2\omega\cos\omega t\sin\omega t - B^2\omega\sin\omega t\cos\omega t = 0$$

$$\Rightarrow \left[\vec{F} \perp \vec{P} \right]$$

(45) Answer : (4)

Solution:

$$\vec{A} \parallel \vec{B}$$

$$\therefore \frac{1}{5} = \frac{a}{15} = \frac{b}{25}$$

$$\Rightarrow a = 3, b = 5$$

(46) Answer : (3)

Solution:

$$\text{Retardation} = \alpha v$$

$$\text{Since, } vdv = adx$$

$$\Rightarrow vdv = -\alpha v dx$$

$$\Rightarrow \int_{v_0}^0 \frac{dv}{\alpha} = -\int_0^x dx$$

$$\Rightarrow -\frac{v_0}{\alpha} = -x$$

$$\Rightarrow \boxed{x = \frac{v_0}{\alpha}}$$

$$\text{Also, } \frac{dv}{dt} = -\alpha v$$

$$\Rightarrow \int_{v_0}^v \frac{dv}{v} = -\int_0^t \alpha dt$$

$$\Rightarrow \ln\left(\frac{v}{v_0}\right) = -\alpha t$$

$$\Rightarrow v = v_0 e^{-\alpha t}$$

Therefore, v versus t graph will be an exponentially decreasing in nature.

(47) Answer : (4)

Solution:

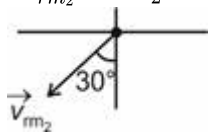
$$\vec{v}_{m_1} = 3\hat{i} \text{ m/s}$$

$$\vec{v}_{rm_1} = -v_1\hat{j} \text{ m/s}$$

$$\vec{v}_{r_1} = (3\hat{i} - v_1\hat{j}) \text{ m/s}$$

$$\vec{v}_{m_2} = 6\hat{i} \text{ m/s}$$

$$\vec{v}_{rm_2} = -v_2 \sin 30^\circ \hat{i} - v_2 \cos 30^\circ \hat{j}$$



$$\therefore \vec{v}_{r_2} = \vec{v}_{rm_2} + \vec{v}_{m_2}$$

$$= -\frac{v_2}{2}\hat{i} - \frac{\sqrt{3}v_2}{2}\hat{j} + 6\hat{i}$$

$$= \left(6 - \frac{v_2}{2}\right)\hat{i} - \frac{\sqrt{3}}{2}v_2\hat{j}$$

$$\vec{v}_{r_1} = \vec{v}_{r_2}$$

$$\Rightarrow 3\hat{i} - v_1\hat{j} = \left(6 - \frac{v_2}{2}\right)\hat{i} - \frac{\sqrt{3}}{2}v_2\hat{j}$$

Comparing components we get,

$$3 = 6 - \frac{v_2}{2} \text{ and } v_1 = \frac{\sqrt{3}}{2}v_2$$

$$\Rightarrow -3 = -\frac{v_2}{2} \quad v_1 = \frac{\sqrt{3}}{2} \times 6 = 3\sqrt{3}$$

$$\Rightarrow v_2 = 6$$

$$\therefore \vec{v}_{r1} = 3\hat{i} - v_1\hat{j} = (3\hat{i} - 3\sqrt{3}\hat{j}) \text{ m/s}$$

(48) Answer : (1)

Solution:

$$\text{Least count} = \frac{1 \text{ mm}}{100} = 0.01 \text{ mm}$$

$$\text{Zero error} = 20 \times 0.01 = 0.20 \text{ mm}$$

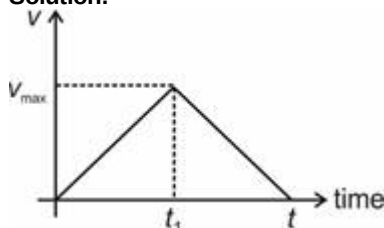
$$\text{Linear scale reading} = 25 \times 0.01 = 0.25 \text{ mm}$$

$$\text{Measured reading} = 3 + 0.25 = 3.25 \text{ mm}$$

$$\text{Absolute reading} = 3.25 - 0.2 = 3.05 \text{ mm}$$

(49) Answer : (3)

Solution:



Velocity versus time graph is

$$v_{\max} = v = at_1$$

$$0 = v - b(t - t_1)$$

$$\Rightarrow b(t - t_1) = v = at_1$$

$$\Rightarrow bt = t_1(a + b)$$

$$\Rightarrow t_1 = \frac{bt}{a+b}$$

$$\therefore v = \frac{a \times bt}{a+b} = \frac{abt}{a+b}$$

\therefore Average velocity

$$v_{av} = \frac{\frac{1}{2} \times t \times v}{t} = \frac{v}{2} = \frac{abt}{2(a+b)}$$

(50) Answer : (2)

Solution:

General equation of trajectory of projectile is

$$y = x \tan \theta - \frac{gx^2}{2u^2 \cos^2 \theta}$$

Given equation is

$$y = \frac{a}{c}x - \frac{b}{c}x^2$$

$$\therefore \tan \theta = \frac{a}{c} \Rightarrow \theta = \tan^{-1} \left(\frac{a}{c} \right)$$

CHEMISTRY

SECTION-A

(51) Answer : (3)

Solution:

No. of angular nodes = ℓ & ℓ value for s and $p = 0$ & 1 respectively.

\therefore Angular nodes for $4s$ and $2p$ are 0 and 1 respectively.

(52) Answer : (3)

Solution:

Orbital angular momentum

$$= \sqrt{\ell(\ell + 1)} \frac{h}{2\pi}$$

$$\sqrt{2(2 + 1)} \frac{h}{2\pi} = \sqrt{6} \frac{h}{2\pi}$$

or $\sqrt{\frac{3}{2}} \frac{h}{\pi}$

(53) Answer : (1)

Solution:

For Lyman series $n_1 = 1$ & $n_2 = 3$

$$\therefore \text{Number of spectral lines} = \frac{(n_2 - n_1)(n_2 - n_1 + 1)}{2}$$

$$= \frac{(3-1)(3-1+1)}{2} = \frac{3 \times 2}{2} = 3$$

(54) Answer : (2)

Solution:

$$\text{Number of revolution per second} \propto \frac{v}{r} \propto \frac{\left(\frac{z}{n}\right)}{\left(\frac{r^2}{z}\right)} \propto \frac{z^2}{n^3}$$

(55) Answer : (1)

Solution:

Counting numbers of object have infinite significant figures.

(56) Answer : (4)

Solution:

Moving down the group, the negative value of electron gain enthalpy decreases

$$\text{Li} = -60 \text{ kJ mol}^{-1}$$

$$\text{Na} = -53 \text{ kJ mol}^{-1}$$

$$\text{K} = -48 \text{ kJ mol}^{-1}$$

$$\text{Cs} = -46 \text{ kJ mol}^{-1}$$

(57) Answer : (2)

Solution:

$$N_1 V_1 + N_2 V_2 = N_3 V_3$$

$$1 \times 50 + 2 \times 150 = N_3 \times 200$$

$$N_3 = 1.75 \text{ N}$$

$$\therefore \text{Molarity of OH}^- \text{ ions} = 1.75 \text{ M}$$

(58) Answer : (4)

Solution:

$$\bullet 49 \text{ g H}_3\text{PO}_4 = 0.5 \text{ mole} = 0.5 N_A \text{ molecules}$$

$$\bullet 45 \text{ g C}_6\text{H}_{12}\text{O}_6 = 0.25 \text{ mole} = 0.25 N_A \text{ molecules}$$

$$\bullet 28 \text{ g N}_2 = 1 \text{ mole} = N_A \text{ molecules}$$

$$\bullet 36 \text{ g H}_2\text{O} = 2 \text{ mole} = 2 N_A \text{ molecules}$$

(59) Answer : (2)

Solution:

$$\text{Alkali metal} - ns^1$$

$$\text{Alkaline earth metal} - ns^2$$

$$\text{Transition metal} - (n-1)d^{1-10} ns^{1-2}$$

$$\text{Pnictogens} - ns^2 np^3$$

(60) Answer : (3)

Solution:

Since $\text{KE} = h\nu - h\nu_0$ therefore kinetic energy of photoelectrons increases linearly with increase in frequency.

(61) Answer : (3)

Solution:

$$1 \text{ S}^{2-} \text{ ions has } 16 + 2 = 18 \text{ e}^-$$

$$\therefore 2 \text{ mol of S}^{2-} \text{ ion has } (18 \times 2) = 36 \text{ mol of electrons}$$

$$\text{Total number of electrons} = 36 \times 6.022 \times 10^{23}$$

$$\approx 2.167 \times 10^{25} \text{ electrons}$$

(62) Answer : (3)

Solution:

$$\text{Mole of oxygen} = \frac{68 \times \frac{47.05}{100}}{16} = 2$$

$$\text{Mass of carbon} = \frac{68 \times \frac{(100-47.05)}{100}}{12} = 3$$

$$\therefore \text{Empirical formula} = \text{C}_3\text{O}_2$$

(63) Answer : (3)

Solution:

1 electron = m_e kg

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

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

(64) Answer : (1)

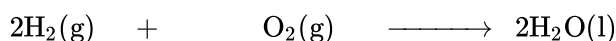
Solution:

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

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

(65) Answer : (2)

Solution:



t = 0, 50 ml 20 ml 0

Final 10 ml 0

\therefore Reduction in volume of gases

= $[50 + 20] - [10] = 60$ ml

(66) Answer : (4)

Solution:

Average atomic mass = $\frac{100 \times 80 + 99 \times 16 + 101 \times 4}{100}$

= $\frac{8000 + 1584 + 404}{100} \approx 99.88$

(67) Answer : (4)

Solution:

Number of neutrons = $56 - 26 = 30$

(68) Answer : (1)

Solution:

After loosing first electron, Li acquires He configuration. So, removal of 2nd electron from Li^+ is most energetic as compared to the 2nd ionisation enthalpy of other elements given in options.

(69) Answer : (4)

Solution:

Order of wavelength $\gamma < X < \text{IR} < \text{Radio waves}$.

(70) Answer : (2)

Solution:

IUPAC name

Un nil oct ium

1 0 8

(71) Answer : (2)

Solution:

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

For Paschen Series shortest wavelength:

$n_1 = 3, n_2 = \infty$

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

(72) Answer : (3)

Solution:

$$\lambda = \frac{h}{\sqrt{2mKE}}$$

$$KE \propto \frac{1}{m}$$

So, minimum kinetic energy will be associated with the particle having highest mass.

\therefore α -particle has highest mass and hence minimum Kinetic energy.

(73) Answer : (3)

Solution:

- Cation has smaller size as compared to the size of parent atom generally.
- Electronegativity and ionisation enthalpy decrease moving down the group of modern periodic table.
- In group 13, Al has more metallic nature than Ga due to shielding effect.
- Ne has greater ionization energy than Ar due to small size.

(74) Answer : (2)

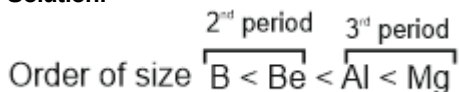
Solution:

$$r_n = 0.53 \frac{n^2}{Z} \text{ \AA}$$

For same value of n , r_n will be minimum for the species with highest 'Z'. So, radius of 2nd orbit of Be^{3+} will be minimum.

(75) Answer : (2)

Solution:



(76) Answer : (4)

Solution:

Lower the value of $(n + \ell)$, lower will be the energy of subshell, for same value of $(n + \ell)$, energy will be less. For the electron for which n value is less.

$$\text{Energy order : } \underset{(n=2, \ell=0)}{2s} < \underset{(n=2, \ell=1)}{2p} < \underset{(n=3, \ell=1)}{3p} < \underset{(n=4, \ell=0)}{4s}$$

(77) Answer : (4)

Solution:

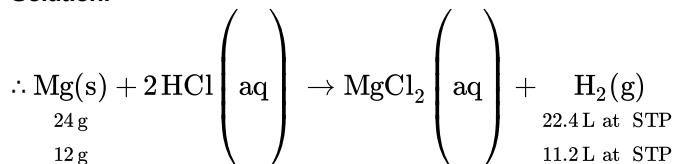
$$E_n = -13.6 \frac{Z^2}{n^2} \text{ eV}$$

Where, $n = 2$, $Z = 1$

$$\text{So } E_n = -13.6 \times \frac{1}{4} = -3.4 \text{ eV}$$

(78) Answer : (3)

Solution:



(79) Answer : (4)

Solution:

In Modern Periodic Table, lanthanoid are present in (6th period).

(80) Answer : (4)

Solution:

$$\text{Heisenberg Uncertainty Principle: } \Delta x \times \Delta p \geq \frac{h}{4\pi} \text{ or } \Delta x \times \Delta v \geq \frac{h}{4\pi m}$$

(81) Answer : (1)

Solution:

ℓ subshell has $(2\ell + 1)$ orbitals.

(82) Answer : (2)

Solution:

$$X_{\text{NaOH}} = \frac{2}{2 + \frac{1000}{18}} = 0.035$$

(83) Answer : (4)

Solution:

Germanium is a metalloid which is present in group 14.

(84) Answer : (4)

Solution:

Lyman series lies in ultraviolet region.

(85) Answer : (2)

Solution:

The elements of s block and p block are called representative elements. Scandium is a d block element.

SECTION-B

(86) Answer : (2)

Solution:

Let the number of photons emitted be X

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

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

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

(87) Answer : (2)

Solution:

Isoelectronic species have same number of electrons Cl^- and Ar both have $18 e^-$ so, these are isoelectronic to each other.

(88) Answer : (1)

Solution:

The anion with greater negative charge has largest ionic radius among isoelectronic species.

(89) Answer : (4)

Solution:

Interference of light can be justified by wave nature of light.

(90) Answer : (4)

Solution:

Two electrons occupying same orbital are distinguished by spin quantum number.

(91) Answer : (2)

Solution:

1 amu is $\frac{1}{12}$ th mass of one carbon atom.

(92) Answer : (2)

Solution:

1 mol H atom needs energy for ionisation = $1.31 \times 10^6 \text{ J}$

\therefore 1 atom of H needs energy for ionisation = $\frac{1.31 \times 10^6}{6.02 \times 10^{23}} \approx 2.18 \times 10^{-18} \text{ J}$

So, H atom in ground state has $-2.18 \times 10^{-18} \text{ J}$

(93) Answer : (4)

Solution:

Volume is temperature dependent and all the concentration terms those include volume get altered due to change in temperature.

(94) Answer : (4)

Solution:

Oxidation state of Al in $[\text{AlCl}(\text{H}_2\text{O})_5]^{2+}$

$\Rightarrow x + (-1) + 0 = +2$

$\therefore x = +3$

Covalency = secondary valency = 6

(95) Answer : (3)

Solution:

$n_{\text{CO}_2} = \frac{11.2 \times 10^{-3}}{22.4} = 5 \times 10^{-4} \text{ mol.}$

Number of atoms

$= 3 \times 5 \times 10^{-4} \times N_A = 1.5 \times 10^{-3} N_A$

(96) Answer : (3)

Solution:

	Mass	mol		Simple ratio
C	40	40/12	= 3.33	3.33/3.33 = 1
H	6.67	6.67/1	= 6.67	6.67/3.33 = 1
O	53.3	53.3/16	= 3.33	3.33/3.33 = 1

So, empirical formula $\Rightarrow \text{CH}_2\text{O}$

So, the possible molecular formula is $\text{C}_6\text{H}_{12}\text{O}_6$

(97) Answer : (4)

Solution:

$\text{B}_2 \xrightarrow{h\nu} 2\text{B}$

Energy absorbed = $BE + 2x$

$x = \frac{2.2 \times 10^{-18} - 2 \times 10^{-18}}{2}$

$= 0.1 \times 10^{-18} = 10^{-19} \text{ J}$

(98) Answer : (3)

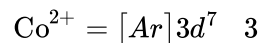
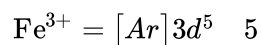
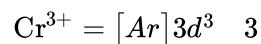
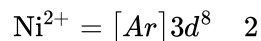
Solution:

Moving left to right along a period of the Modern Periodic Table, acidic nature of oxides increases.

(99) Answer : (3)

Solution:

Unpaired electron

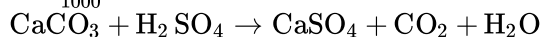


(100) Answer : (2)

Solution:

Moles of $\text{H}_2\text{SO}_4 = M \times V(\text{L})$

$$= \frac{0.5 \times 100}{1000} = 0.05 \text{ mol}$$



1 mol $\text{CaCO}_3 \equiv$ 1 mol H_2SO_4

\therefore 0.05 mol of H_2SO_4 will react with = 0.05 mol of CaCO_3

Mass of $\text{CaCO}_3 \Rightarrow 0.05 \times 100 = 5 \text{ g}$

BOTANY

SECTION-A

(101) Answer : (2)

Solution:

Keys are used for identification of plants and animals based on contrasting characters in a pair known as couplet.

(102) Answer : (2)

Solution:

Red algae can occur at great depths in ocean. The food is stored in form of floridean starch in Rhodophyceae which is structurally similar to amylopectin and glycogen.

(103) Answer : (2)

Solution:

Zoological parks are method of *ex-situ* conservation strategy of animals.

(104) Answer : (4)

Solution:

Both the statements are true. Metabolic reactions can be demonstrated outside the body in cell free system and isolated metabolic reactions *in vitro* are not living things but surely living reactions.

(105) Answer : (4)

Solution:

- Plants and fungi differ in their cell wall composition.
- All prokaryotic organisms were grouped together under Kingdom Monera.
- Mycoplasma are the smallest living cells known and they can survive without oxygen.

(106) Answer : (2)

Solution:

Gymnosperms are heterosporous and have haploid endosperm. Stems are usually unbranched in *Cycas* but are branched in *Cedrus*.

(107) Answer : (3)

Solution:

Nitrosomonas is a nitrifying bacteria.

(108) Answer : (2)

Solution:

In *Marchantia*, male and female gametophytes are separate.

(109) Answer : (2)

Solution:

Albugo candida causes white rust of mustard.

(110) Answer : (1)

Solution:

Sphagnum grows in acidic marshes, has great water absorbing capacity and can be used as fuel.

(111) Answer : (3)

Solution:

Albugo candida is a member of Oomycetes.

(112) Answer : (4)

Solution:

Bryophytes are first embryophytes. Their zygote undergoes mitosis and develops into diploid embryo.

(113) Answer : (4)

Solution:

Diatoms are usually unicellular and lack flagella except in reproductive stage. They are very good indicators of water pollution.

(114) Answer : (1)

Solution:

Chlorophyceae members contain pigments chlorophyll a and b.

(115) Answer : (2)

Solution:

Sexual spores which are produced exogenously are basidiospores found in Basidiomycetes as in *Puccinia* and *Ustilago*.

(116) Answer : (3)

Solution:

In slime moulds, spores have cellulosic cell wall similar to plants.

(117) Answer : (1)

Solution:

Both viruses and viroids cause infection.

(118) Answer : (3)

Solution:

Toxins released by large numbers of dinoflagellates, such as *Gonyaulax*, may even kill other marine animals such as fishes.

(119) Answer : (3)

Solution:

Flora provide index to the plant species found in a particular area.

(120) Answer : (3)

Solution:

Polysiphonia is a red alga and is haplodiplontic.

(121) Answer : (4)

Solution:

Potato spindle tuber disease is caused by viroids.

(122) Answer : (4)

Solution:

Gymnosperms have well developed vascular tissues but they lack vessels.

(123) Answer : (4)

Solution:

Floridean starch is the stored food in red algae eg. *Porphyra*.

(124) Answer : (4)

Solution:

Embryo sac represents female gametophyte in angiosperms.

(125) Answer : (2)

Solution:

In numerical taxonomy, numbers and codes are assigned to all the observable characters like plus (+), minus (-), data not available 0. All possible characters are compared by computers by giving equal importance.

(126) Answer : (2)

Solution:

Gemmae are green, multicellular asexual buds which are produced in gemma cups located on gametophytic thallus of liverworts.

(127) Answer : (3)

Solution:

Algae mostly show external fertilisation.

Bryophytes include liverworts and mosses.

Pteridophytes are vascular amphibians.

Gymnosperms have ovule without ovary.

(128) Answer : (2)

Solution:

Antheridiophores and archegoniophores are absent in gymnosperm.

Gametophyte in mosses has two stages, protonema stage and leafy stage.

(129) Answer : (1)

Solution:

Ascospores are sexual spores. They are haploid and produced by meiosis.

(130) Answer : (1)

Solution:

Sporangiospores are endogenous and nonmotile spores produced inside sporangia.

(131) Answer : (3)

Solution:

Mycoplasma lacks cell wall.

(132) Answer : (2)

Solution:

Venus flytrap, *Nepenthes* and bladderwort are insectivorous plants and *Cuscuta* is a parasitic plant.

(133) Answer : (3)

Solution:

Viruses have high specific gravity which is found only in non living objects.

(134) Answer : (4)

Solution:

Reproduction is a characteristic feature. Some organisms do not reproduce, e.g. mules, sterile worker bees, infertile human couples.

(135) Answer : (3)

Solution:

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

SECTION-B

(136) Answer : (1)

Solution:

Planaria shows regeneration.

(137) Answer : (2)

Solution:

Systematics is the branch of science which deals with diversity of organisms and the evolutionary relationships among them.

(138) Answer : (3)

Solution:

Panthera leo belongs to Felidae family

Canis familiaris belongs to Canidae family

Felidae and Canidae are in same order Carnivora and same Kingdom Animalia

(139) Answer : (2)

Solution:

In living organisms, growth is from inside and irreversible.

(140) Answer : (3)

Solution:

Two plants A and B can be conclusively said to belong to the same species if they can reproduce freely with each other and form seeds.

(141) Answer : (2)

Solution:

Methanogens are chemoautotrophic and are found in guts of ruminants.

Halophiles are heterotrophic and are found in extreme saline environment. Thermoacidophiles are found in hot water springs.

Cyanobacteria are photoautotrophic.

(142) Answer : (2)

Solution:

Protist having stiff cellulosic plates on cell wall are dinoflagellates e.g. *Gonyaulax*.

(143) Answer : (2)

Solution:

All the members of fungi are heterotrophic.

(144) Answer : (2)

Solution:

Meiotic haploid sexual spores are formed in fungi.

(145) Answer : (2)

Solution:

The sex organs are absent but plasmogamy is seen in members of Basidiomycetes.

(146) Answer : (2)

Solution:

Egg apparatus comprises of two synergids and one egg cell thus is 3-celled.

(147) Answer : (1)

Solution:

Central cell is the largest cell of embryo sac of angiosperm and bears two polar nuclei.

(148) Answer : (2)

Solution:

Selaginella belongs to class Lycopsidea.

(149) Answer : (4)

Solution:

Bryophytes play an important role in plant succession on bare rocks/soil.

(150) Answer : (1)

Solution:

Gametes are flagellated and similar in size in *Ulothrix*.

ZOOLOGY

SECTION-A

(151) Answer : (3)

Solution:

Parapodia and metamerism are features of phylum Annelida.

(152) Answer : (4)

Solution:

Torpedo is an electric ray.

(153) Answer : (3)

Solution:

Annelids, arthropods and chordates exhibit metamerism.

(154) Answer : (1)

Solution:

Metagenesis is found in *Obelia*.

(155) Answer : (2)

Solution:

Carcharodon belongs to class Chondrichthyes.

(156) Answer : (4)

Solution:

Bombyx (Silkworm) and *Laccifer* (Lac insect) are economically beneficial insects.
Anopheles is a vector and *Wuchereria* is a pathogen.
Limulus is a living fossil.

(157) Answer : (2)

Solution:

Struthio, *Aptenodytes*, etc. are flightless birds.

(158) Answer : (2)

Solution:

Notochord is a mesodermally derived rod-like structure.

(159) Answer : (4)

Solution:

Cycloid scales and air bladder are present in bony fishes.

Cartilaginous fishes have placoid scales.

(160) Answer : (1)

Solution:

Petromyzon shows anadromous migration.

(161) Answer : (1)

Solution:

Birds and mammals are homeothermous.

(162) Answer : (2)

Solution:

Digestive system is incomplete in platyhelminthes.

Circulatory system is present in annelids.

Both circulatory and respiratory system are present in arthropods.

(163) Answer : (3)

Solution:

In ctenophores, ciliated comb plates help in locomotion.

(164) Answer : (2)

Solution:

Ornithorhynchus (Platypus) is a connecting link between reptiles and mammals.

(165) Answer : (4)

Solution:

Dentalium (Mollusc) - Radula

Pheretima (Annelid) - Longitudinal and circular muscles

Nereis (Aquatic annelid) - Parapodia

Planaria (Platyhelminth) - High regeneration capacity

(166) Answer : (4)

Solution:

Radial symmetry is present in coelenterates, ctenophores and adult echinoderms. Molluscs are bilaterally symmetrical.

(167) Answer : (1)

Solution:

Digestive system is absent in tapeworms.

(168) Answer : (3)

Solution:

Ascidians are tunicates and are classified under protochordates.

(169) Answer : (3)

Solution:

Cloaca is present in amphibians.

(170) Answer : (3)

Solution:

Limbs are absent in snakes.

Heart is four - chambered in crocodiles.

Only lizards and snakes shed their scales as skin cast.

(171) Answer : (2)

Solution:

Balanoglossus belongs to Hemichordata while *Pteropus* belongs to Mammalia.

(172) Answer : (3)

Solution:

Nereis is dioecious while earthworms, many tapeworms and leeches are monoecious.

(173) Answer : (2)

Solution:

In echinoderms, digestive system is complete with mouth on the lower (ventral) side and anus on the upper (dorsal) side.

(174) Answer : (2)

Solution:

Members of phylum Aschelminthes are pseudocoelomate animals.

(175) Answer : (4)

Solution:

Ancylostoma i.e. hookworm belongs to phylum Aschelminthes.

(176) Answer : (4)

Solution:

In poriferans, water canal system is present. Presence of water vascular system is a feature of echinoderms.

(177) Answer : (2)

Solution:

Calcereous spicules along with spongin fibres form the skeleton of poriferans.

(178) Answer : (4)

Solution:

Additional chambers, crop and gizzard are present in both birds and cockroaches.

(179) Answer : (2)

Solution:

Vipera is a poisonous snake.

(180) Answer : (4)

Solution:

The given diagram is of *Pleurobrachia* and it belongs to phylum Ctenophora, showing radial symmetry, bioluminescence and indirect development.

(181) Answer : (3)

Solution:

Cnidoblasts are used for anchorage, defence and for the capture of prey.

(182) Answer : (2)

Solution:

All vertebrates are chordates but all chordates are not vertebrates. In cephalochordates, notochord extends from head to tail region and persists throughout their life.

(183) Answer : (2)

Solution:

Asymmetry - Any plane that passes through the centre does not divide animals into equal halves.

Bilateral symmetry - The body of animal can be divided into identical left and right halves in only one plane.

(184) Answer : (4)

Solution:

Platyhelminthes are triploblastic, acoelomate animals. Ctenophores are diploblastic.

(185) Answer : (4)

Solution:

Clarias (Magur) is a freshwater bony fish.

SECTION-B

(186) Answer : (4)

Solution:

Ichthyophis is a limbless amphibian.

(187) Answer : (3)

Solution:

Myxine and *Petromyzon* belong to class Cyclostomata.

Chondrichthyes – *Carcharodon*, *Pristis*

Osteichthyes – *Pterophyllum*

Aves – *Corvus*

Mammalia – *Pteropus*

Amphibia – *Ichthyophis*

(188) Answer : (1)

Solution:

In closed type circulatory system, the blood is circulated through a series of vessels of varying diameters (arteries, veins and capillaries).

(189) Answer : (3)

Solution:

Excretory system is absent in echinoderms.

(190) Answer : (1)

Solution:

Polyp is a sessile and cylindrical form like *Hydra*, *Adamsia*, etc. whereas, the medusa is umbrella-shaped and free-swimming like *Aurelia*.

(191) Answer : (1)

Solution:

Ctenoplana, *Ophiura* and *Saccoglossus* are exclusively marine animals.

(192) Answer : (1)

Solution:

Hippocampus (Sea horse) is a bony fish.

(193) Answer : (4)

Solution:

The space between the hump and the mantle is called the mantle cavity in which feather like gills are present.

(194) Answer : (3)

Solution:

Ancylostoma (aschelminth) is a pseudocoelomate.

Aedes (arthropod), *Aplysia* (mollusc) and *Antedon* (echinoderm) are coelomates.

(195) Answer : (1)

Solution:

Many living members of class Cyclostomata are ectoparasites on some other fishes.

(196) Answer : (3)

Solution:

Panthera leo is the scientific name of lion.

(197) Answer : (2)

Solution:

Testudo - Tortoise

Chelone - Turtle

(198) Answer : (4)

Solution:

Chitinous exoskeleton is a universal character of arthropods.

(199) Answer : (1)

Solution:

Flame cells help in osmoregulation and excretion in platyhelminths. Development is through many larval stages. Some members like *Planaria* possess regeneration capacity.

(200) Answer : (1)

Solution:

Central nervous system is ventral, solid and double in non-chordates.