

Physics

1. A stone is released from a rising balloon accelerating upward with acceleration a . The acceleration of the stone just after the release is

- A) a upward B) g downward
 C) $(g - a)$ downward D) $(g + a)$ downward

2. A ball is thrown vertically upwards from the ground. If T_1 and T_2 are the respective time taken in going up and coming down, and the air resistance is not ignored, then

- A) $T_1 > T_2$ B) $T_1 = T_2$
 C) $T_1 < T_2$ D) nothing can be said

3. The length of a seconds hand in a watch is 1 cm. The change in velocity of its tip in 15 s is

- A) zero B) $\frac{\pi}{30\sqrt{2}}$ cm/s
 C) $\frac{\pi}{30}$ cm/s D) $\frac{\pi\sqrt{2}}{30}$ cm/s

4. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant? Take $g = 10 \text{ m/s}^2$.

- A) 1.25 m B) 2.50 m
 C) 3.75 m D) 4.00 m

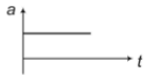
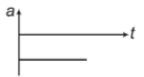
5. A ball is released from the top of a tower of height h metre. It takes T second to reach the ground. What is the position of the ball in $T/3$ second?

- A) $\frac{h}{9}$ metre from the ground B) $\frac{7h}{9}$ metre from the ground
 C) $\frac{8h}{9}$ metre from the ground D) $\frac{17h}{18}$ metre from the ground

6. An ant is at a corner of a cubical room of side a . The ant can move with a constant speed u . The minimum time taken to reach the farthest corner of the cube is

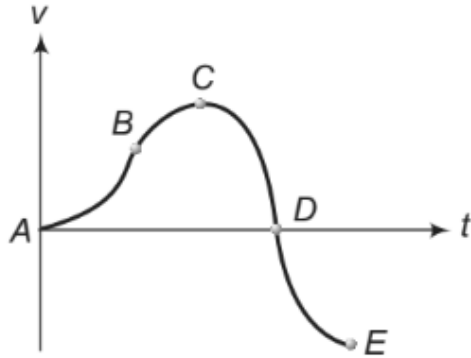
- A) $\frac{\sqrt{3}a}{u}$ B) $\frac{3a}{u}$
 C) $\frac{\sqrt{5}a}{u}$ D) $\frac{(\sqrt{2}+1)a}{u}$

7. Match the Columns — Match Column I with Column II.

Column I	Column II
(a) 	(p) speed must be increasing
(b) 	(q) speed must be decreasing
(c) 	(r) speed may be increasing
(d) 	(s) speed may be decreasing

- A) (a) $\rightarrow$ r, s, (b) $\rightarrow$ r, s, B) (a) $\rightarrow$ r, s, (b) $\rightarrow$ p (c) $\rightarrow$ p, (d) $\rightarrow$ q
 C) (a) $\rightarrow$ r, s, (b) $\rightarrow$ r, s, D) (a) $\rightarrow$ r, s, (b) $\rightarrow$ q, (c) $\rightarrow$ q, (d) $\rightarrow$ q
 (c) $\rightarrow$ q, (d) $\rightarrow$ q (c) $\rightarrow$ p, (d) $\rightarrow$ r, s

8. Match the Columns Q3 — The velocity-time graph of a particle moving along the X-axis is shown. Match the entries of Column I with Column II.



Column I	Column II
(a) For AB, particle is	(p) Moving in +ve X-direction with increasing speed
(b) For BC, particle is	(q) Moving in +ve X-direction with decreasing speed
(c) For CD, particle is	(r) Moving in -ve X-direction with increasing speed
(d) For DE, particle is	(s) Moving in -ve X-direction with decreasing speed

- A) (a) → p, (b) → p, (c) → q, (d) → r
 B) (a) → r, (b) → p, (c) → q, (d) → r
 C) (a) → p, (b) → p, (c) → q, (d) → q
 D) (a) → p, (b) → r, (c) → q, (d) → r

9. Two bodies are thrown with the same initial velocity at angles θ and $(90^\circ - \theta)$ respectively with the horizontal, then their maximum heights are in the ratio

- A) 1 : 1
 B) $\sin \theta : \cos \theta$
 C) $\sin^2 \theta : \cos^2 \theta$
 D) $\cos \theta : \sin \theta$

10. 3 Question: The range of a projectile at an angle θ is equal to half of the maximum range if thrown at the same speed. The angle of projection θ is given by

- A) 15°
 B) 30°
 C) 60°
 D) data insufficient

11. A ball is projected with a velocity 20 ms^{-1} at an angle to the horizontal. In order to have the maximum range. Its velocity at the highest position must be

- A) 10 ms^{-1}
 B) 14 ms^{-1}
 C) 18 ms^{-1}
 D) 16 ms^{-1}

12. A body is projected at an angle 60° with the horizontal with kinetic energy K . When the velocity makes an angle 30° with the horizontal, the kinetic energy of the body will be

- A) $K/2$
 B) $K/3$
 C) $2K/3$
 D) $3K/4$

13. If T_1 and T_2 are the times of flight for two complementary angles, then the range of projectile R is given by

- A) $R = 4gT_1T_2$
 B) $R = 2gT_1T_2$
 C) $R = \frac{1}{4}gT_1T_2$
 D) $R = \frac{1}{2}gT_1T_2$

14. A gun is firing bullets with velocity v_0 by rotating it through 360° in the horizontal plane. The maximum area covered by the bullets is

- A) $\frac{\pi v_0^2}{g}$
 B) $\frac{\pi^2 v_0^2}{g}$
 C) $\frac{\pi v_0^4}{g^2}$
 D) $\frac{\pi^2 v_0^4}{g^2}$

15. A grasshopper can jump maximum distance 1.6 m. It spends negligible time on ground. How far can it go in $10\sqrt{2}$ s?

- A) 45 m
 B) 30 m
 C) 20 m
 D) 40 m

16. Two stones are projected with the same speed but making different angles with the horizontal. Their horizontal ranges are equal. The angle of projection of one is $\frac{\pi}{3}$ and the maximum height reached by it is 102 m. Then the maximum height reached by the other in metres is

- A) 76
 B) 84
 C) 56
 D) 34

17. A ball is projected upwards from the top of a tower with a velocity 50 ms^{-1} making an angle 30° with the horizontal. The height of tower is 70 m. After how many seconds from the instant of throwing, will the ball reach the ground? ($g = 10 \text{ ms}^{-2}$)

- A) 2 s
 B) 5 s
 C) 7 s
 D) 9 s

18. Average velocity of a particle in projectile motion between its starting point and the highest point of its trajectory is (projection speed = u , angle of projection from horizontal = θ)

- A) $u \cos \theta$
 B) $\frac{u}{2} \sqrt{1 + 3 \cos^2 \theta}$
 C) $\frac{u}{2} \sqrt{2 + \cos^2 \theta}$
 D) $\frac{u}{2} \sqrt{1 + \cos^2 \theta}$

19. A body is projected horizontally with a velocity $3 \times 10^2 \text{ ms}^{-1}$ from the top of a tower of height 80 m. The time after which the body will strike the ground is ($g = 10 \text{ ms}^{-2}$)

- A) 3 s
 B) 2 s
 C) 4 s
 D) 6 s

20. A body is projected horizontally with a velocity $3 \times 10^2 \text{ ms}^{-1}$ from the top of a tower of height 80 m. The distance from the point of projection at which the body will strike the ground is

- A) 250 m B) 1200 m
C) 600 m D) 300 m

21. A particle starts from the origin of coordinates at time $t = 0$ and moves in the xy plane with a constant acceleration α in the y -direction. Its equation of motion is $y = \beta x^2$. Its velocity component in the x -direction is

- A) variable B) $\frac{2\alpha}{\beta}$
C) $\frac{\alpha}{\beta}$ D) $\sqrt{\frac{\alpha}{2\beta}}$

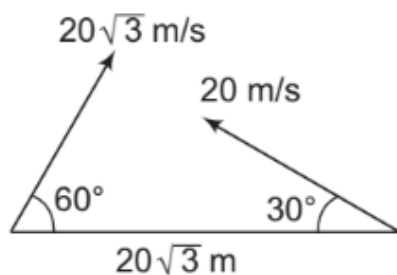
22. A projectile is projected with speed u at an angle of 60° with horizontal from the foot of an inclined plane. If the projectile hits the inclined plane horizontally, the range on inclined plane will be

- A) $\frac{u^2 \sqrt{21}}{2g}$ B) $\frac{3u^2}{4g}$
C) $\frac{u^2}{2\beta}$ D) $\frac{u^2 \sqrt{21}}{8g}$

23. A shell fired from the base of a mountain just clears it. If α is the angle of projection, then the angular elevation of the summit β is

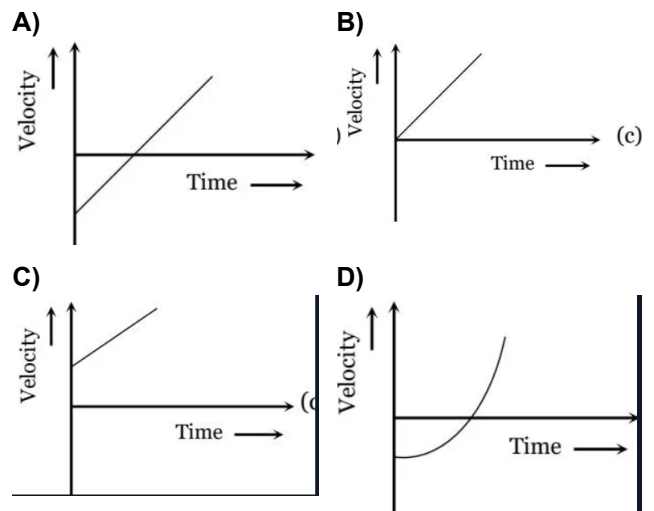
- A) $\frac{\alpha}{2}$ B) $\tan^{-1} \left(\frac{1}{2 \tan \alpha} \right)$
C) $\tan^{-1} \left(\frac{\tan \alpha}{2} \right)$ D) $\tan^{-1} (2 \tan \alpha)$

24. In the figure shown, the two projectiles are fired simultaneously. The minimum distance between them during their flight is

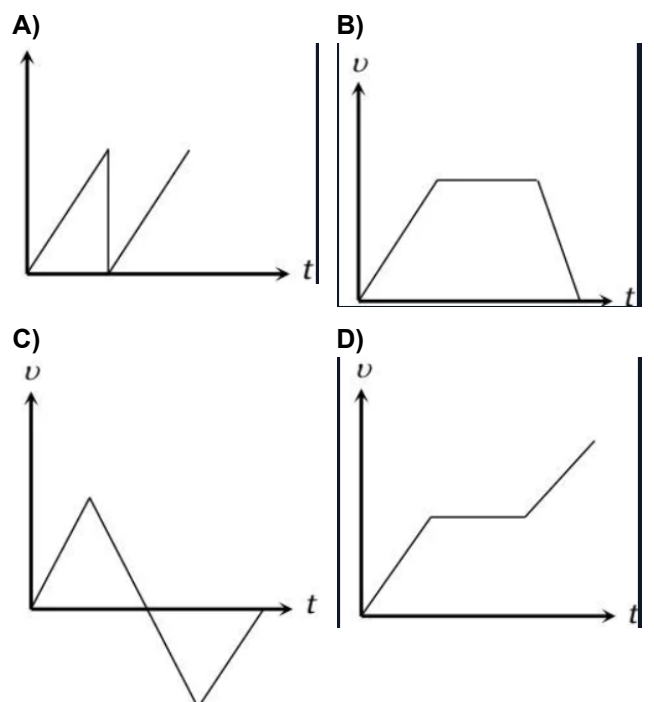
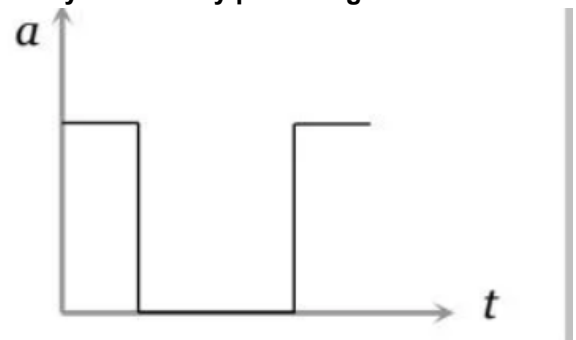


- A) 20 m B) $10\sqrt{3}$ m
C) 10 m D) None of the above

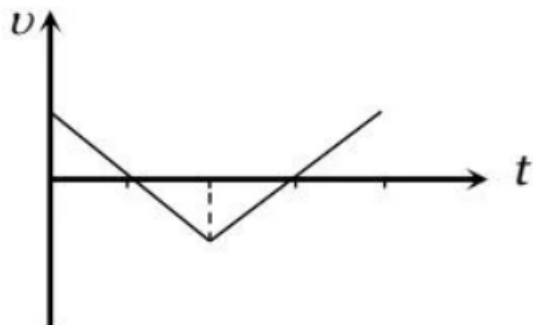
25. A particle is moving in such a way that its displacement is related with time by the equation $x = (10 - 4t + 6t^2) \text{ m}$. The diagram showing variation of velocity of particle with time is



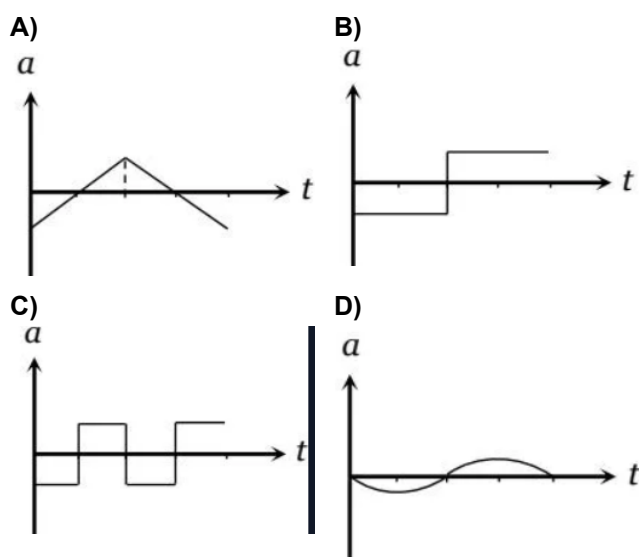
26. The acceleration-time graph for a body is shown in the following graph. Which of the following graphs would probably represent the velocity of the body plotted against time



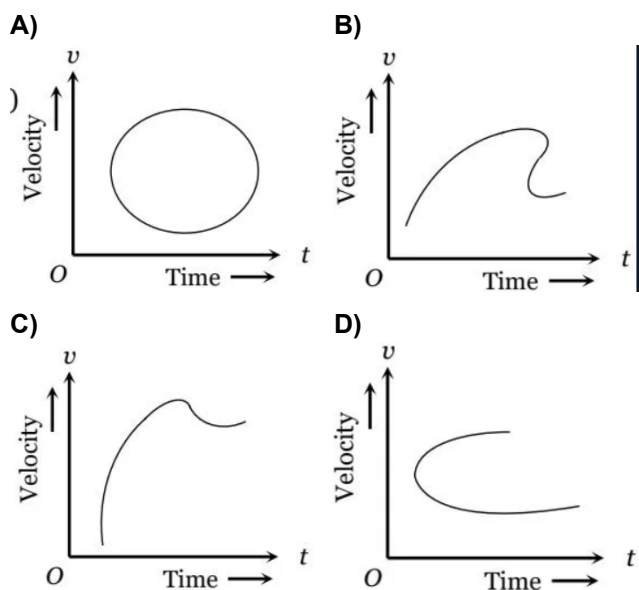
27. The graph below shows the velocity versus time graph for a body



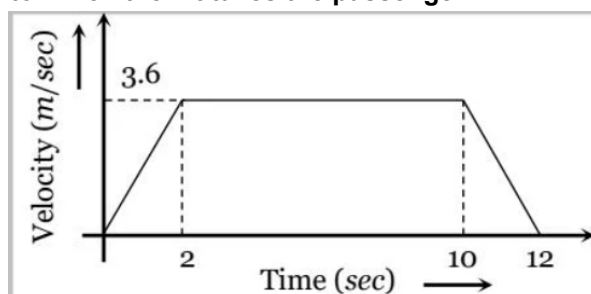
Which of the following graphs represents the corresponding acceleration versus time graphs



28. Which of the following velocity time graphs is possible.

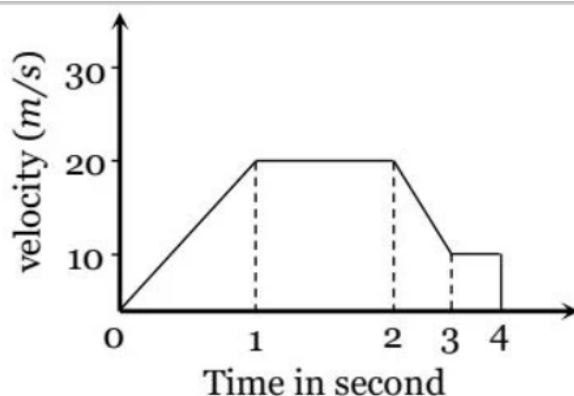


29. A lift is going up. The variation in the speed of the lift is as given in the graph. What is height to which the lift takes the passenger



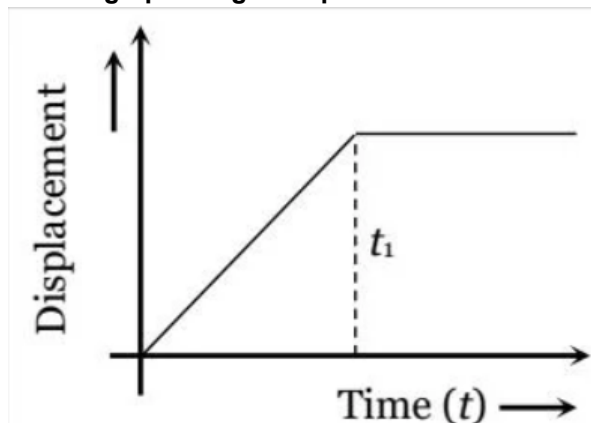
- A) 3.6 m B) 28.8 m
C) 36.0 m D) Cannot be calculated from the above graph

30. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled by the particle in four seconds is



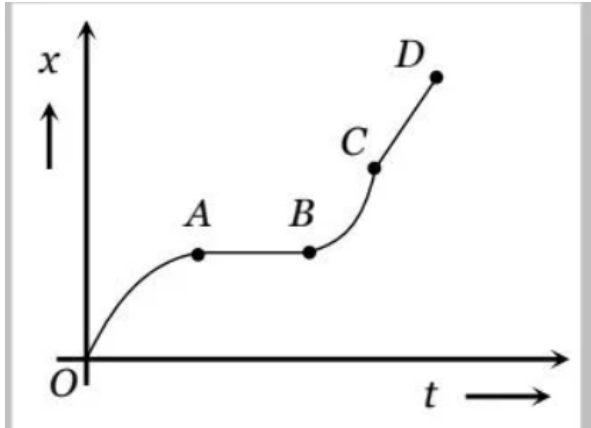
- A) 60 m B) 55 m
C) 25 m D) 30 m

31. The x-t graph in figure represents



- A) Constant velocity B) Velocity of the body continuously changing
C) Instantaneous velocity D) The body travels with constant speed up to time t_1 and then stops

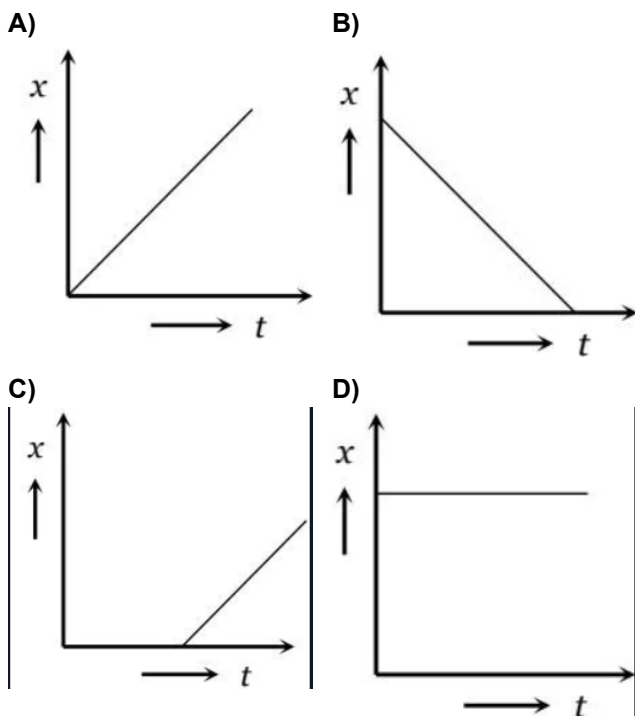
32. The graph between the displacement x and time t for a particle moving in a straight line is shown in figure. During the interval OA, AB, BC and CD, the acceleration of the particle is



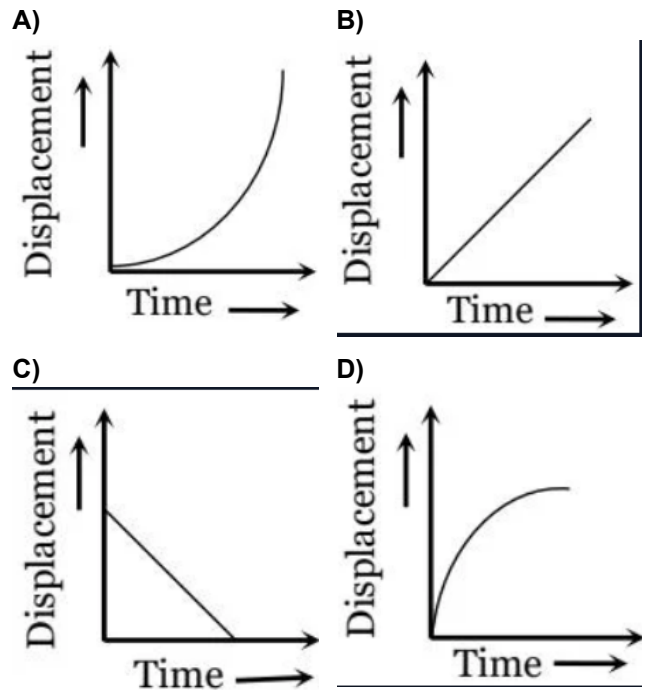
OA AB BC CD

- A) OA+, AB-, BC+, CD+
 B) OA+, AB-, BC-, CD-
 C) OA+, AB-, BC-, CD+
 D) OA-, AB-, BC-, CD-

33. Which of the following can not be the distance time graph



34. A car decelerates at a constant rate during a period commencing at $t=0$. Which of the displacement time graphs represents the displacement of the car



35. If the body covers one-third distance at speed v_1 , next one third at speed v_2 and last one third at speed v_3 , then average speed will be

- A) $\frac{v_1 v_2 + v_2 v_3 + v_3 v_1}{v_1 + v_2 + v_3}$
 B) $\frac{v_1 + v_2 + v_3}{3}$
 C) $\frac{v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$
 D) $\frac{3 v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$

36. A particle moving in a straight line covers half the distance with speed of 3 m/s. The other half of the distance is covered in two equal time intervals with speed of 4.5 m/s and 7.5 m/s respectively. The average speed of the particle during this motion is

- A) 4.0 m/s
 B) 5.0 m/s
 C) 5.5 m/s
 D) 4.8 m/s

37. A body has speed V , $2V$ and $3V$ in first $1/3$ of distance S , seconds $1/3$ of S and third $1/3$ of S respectively. Its average speed will be

- A) V
 B) $2V$
 C) $\frac{18}{11} V$
 D) $\frac{11}{18} V$

38. A car travels a distance S on a straight road in two hours and then returns to the starting point in the next three hours. Its average velocity is

- A) $S / 5$
 B) $2S / 5$
 C) $S / 2 + S / 3$
 D) None of the above

39. A car travels a distance of 2000 m. If the first half distance is covered at 40 km/hour and the second half with speed v and the average speed is 48 km/hour, then the value of v is

- A) 56 km/hour B) 60 km/hour
C) 50 km/hour D) 48 km/hour

40. A car moves for half of its time at 80 km/h and for rest half of time at 40 km/h. Total distance covered is 60 km. What is the average speed of the car

- A) 60 km/h B) 80 km/h
C) 120 km/h D) 180 km/h

41. A particle moves along x-axis in such a way that its coordinate x varies with time t according to the equation $x = (2 - 5t + 6t^2)m$. The initial velocity of the particle is

- A) -5 m/s B) 6 m/s
C) -3 m/s D) 3 m/s

42. An object is projected with a velocity of 20 m/s making an angle of 45° with horizontal. The equation for the trajectory is $h = Ax - Bx^2$ where h is height, x is horizontal distance, A and B are constants. The ratio $A : B$ is ($g = 10 \text{ m/s}^2$)

- A) 1:5 B) 5:1
C) 1:40 D) 40:1

43. The equation of motion of a projectile is $y = 12x - \frac{3}{4}x^2$. Given that $g = 10 \text{ ms}^{-2}$, what is the range of the projectile

- A) 12.4 m B) 16 m
C) 30.6 m D) 36.0 m

44. A particle is projected with a speed $2\sqrt{gh}$ so that it clears two walls of equal height h which are at a distance $2h$ from each other. The time taken by the particle to pass between the two walls is

- A) $\sqrt{\frac{2h}{g}}$ B) $\frac{2h}{g}$
C) $\sqrt{2} \frac{h}{g}$ D) $2\sqrt{\frac{h}{g}}$

45. Galileo's experiment showed that if two bodies of unequal masses are dropped from the same height, the time required by them to reach the ground are equal. But if they are thrown vertically upwards with the same initial velocity, the ratio of the time required to reach the ground is equal to

- A) The ratio of their masses B) The inverse of the ratio of their masses
C) One D) The product of their masses

Chemistry

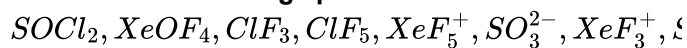
46. The correct order of ONO bond angle in the given species is:

- A) $\text{NO}_2^+ < \text{NO}_2 < \text{NO}_3^- < \text{NO}_2^- < \text{NO}_3^- < \text{NO}_2 < \text{NO}_2^+$
B) $\text{NO}_2^+ < \text{NO}_2 < \text{NO}_3^- < \text{NO}_2^- < \text{NO}_3^- < \text{NO}_2 < \text{NO}_2^+$
C) $\text{NO}_3^- < \text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+ < \text{NO}_3^- < \text{NO}_2^+ < \text{NO}_2$
D) $\text{NO}_3^- < \text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+ < \text{NO}_3^- < \text{NO}_2^+ < \text{NO}_2$

47. The correct order of dipole moments for the given species is:

- A) $\text{BF}_3 = \text{NH}_4^+ < \text{NF}_3 < \text{BH}_3 < \text{NH}_4^+ < \text{NF}_3 < \text{NH}_3$
B) $\text{BF}_3 = \text{NH}_4^+ < \text{NF}_3 < \text{BH}_3 < \text{NH}_4^+ < \text{NF}_3 < \text{NH}_3$
C) $\text{NH}_4^+ < \text{BF}_3 < \text{NH}_3 < \text{NF}_3 < \text{NH}_4^+ < \text{NH}_3 < \text{NF}_3$
D) $\text{NH}_4^+ < \text{BF}_3 < \text{NH}_3 < \text{NF}_3 < \text{NH}_4^+ < \text{NH}_3 < \text{NF}_3$

48. Consider the following species:



List-I contains different molecular shapes and

List-II contains total number of species with

the same molecular shapes from the given

species. Match each entry in List-I with the

appropriate entry in List-II and choose the

correct option.

List-I	List-II
(P) See-saw	(1) one
(Q) T-Shaped	(2) two
(R) Trigonal Planar	(3) three
(S) Square Pyramidal	(4) four
	(5) zero

- A) $P \rightarrow 1; Q \rightarrow 2; R \rightarrow 5; SP \rightarrow 3; S \rightarrow 4$
B) $P \rightarrow 1; Q \rightarrow 2; R \rightarrow 5; SP \rightarrow 3; S \rightarrow 4$
C) $P \rightarrow 3; Q \rightarrow 2; R \rightarrow 1; SP \rightarrow 4; S \rightarrow 4$
D) $P \rightarrow 3; Q \rightarrow 2; R \rightarrow 1; SP \rightarrow 4; S \rightarrow 4$

49. Regarding the molecular orbital (MO) energy levels for homonuclear diatomic molecules, the INCORRECT statement(s) is(are) A) Bond order of Ne_2 is zero. B) The highest occupied molecular orbital (HOMO) of F_2 is σ -type. C) Bond energy of O_2^+ is smaller than the bond energy of O_2 . D) Bond length of Li_2 is larger than the bond length of B_2 .

- A) B, C B) A, C
C) D, C D) B, D

50. Statement 1: Boron always forms covalent bond. Statement 2: The small size of B^{3+} favours formation of covalent bond.

- A) Statement 1 is True, Statement 2 is True, Statement 2 is a CORRECT explanation for Statement 1
B) Statement 1 is True, Statement 2 is True, Statement 2 is NOT a CORRECT explanation for Statement 1
C) Statement 1 is True, Statement 2 is False
D) Statement 1 is False, Statement 2 is True

51. Read the following Assertion and Reason and answer as per the options given below:

Assertion: $LiCl$ is predominantly a covalent compound. Reason: Electronegativity difference between Li and Cl is too small.

- A) If both assertion and reason are correct and reason is the correct explanation of the assertion
B) If both assertion and reason are correct and reason is not the correct explanation of the assertion
C) If assertion is correct but reason is incorrect
D) If assertion is incorrect but reason is correct

52. Match List - I with List - II according to shape.

List – I List – II

A. XeO_3 I. BrF_5

B. XeF_2 II. NH_3

C. XeO_2F_2 III. $[I_3]^-$

D. $XeOF_4$ IV. SF_4

- A) A-II, B-III, C-I, D-IV B) A-III, B-II, C-IV, D-I
C) A-II, B-III, C-IV, D-I D) A-II, B-I, C-III, D-IV

53. The maximum number of 90° angles between bond pair-bond pair of electrons is observed in:

- A) dsp^2 hybridization B) sp^3d hybridization
C) dsp^3 hybridization D) sp^3d^2 hybridization

54. Which one of the following has the regular tetrahedral structure? (Atomic nos. : B = 5, S = 16, Ni = 28, Xe = 54)

- A) BF_4^- B) SF_4
C) XeF_4 D) $[Ni(CN)_4]^{2-}$

55. The bond order in NO is 2.5 while that in NO^+ is 3. Which of the following statements is true for these two species?

- A) Bond length in NO^+ is equal to that in NO B) Bond length in NO is greater than in NO^+
C) Bond length in NO^+ is greater than in NO D) Bond length is unpredictable

56. Which of the following species is diamagnetic in nature?

- A) H_2^- B) H_2^+
C) H_2 D) He_2^+

57. Lattice energy of an ionic compound depends upon:

- A) Charge on the ion and size of the ion B) Packing of ions only
C) Size of the ion only D) Charge on the ion only

58. The decreasing values of bond angles from NH_3 (106°) to SbH_3 (101°) down Group 15 of the periodic table is due to:

- A) decreasing $lp - bp$ repulsion B) decreasing electronegativity
C) increasing $bp - bp$ repulsion D) increasing p -orbital character in sp^3

59. In which of the following molecules/ions are all the bonds not equal?

- A) XeF_4 B) BF_4^-
C) SF_4 D) SiF_4

60. Bond order normally gives an idea of the stability of a molecular species. All the molecules viz. H_2 , Li_2 , and B_2 have the same bond order yet they are not equally stable. Their stability order is:

- A) $H_2 > B_2 > Li_2$ B) $Li_2 > H_2 > B_2$
C) $Li_2 > B_2 > H_2$ D) None of the above

61. Arrange the bonds in order of increasing ionic character in the molecules: LiF , K_2O , N_2 , SO_2 , and ClF_3 .

- A) $\text{ClF}_3 < \text{N}_2 < \text{SO}_2 < \text{K}_2\text{O} < \text{LiF}$
 B) $\text{LiF} < \text{K}_2\text{O} < \text{ClF}_3 < \text{SO}_2 < \text{N}_2$
 C) $\text{N}_2 < \text{SO}_2 < \text{ClF}_3 < \text{K}_2\text{O} < \text{LiF}$
 D) $\text{LiF} < \text{ClF}_3 < \text{SO}_2 < \text{K}_2\text{O} < \text{N}_2$

62. Assuming $2s - 2p$ orbital mixing is NOT operative, the paramagnetic species among the following is:

- A) Be_2
 B) B_2
 C) C_2
 D) N_2

63. The central atom shows d -orbital participation in hybridisation in

- A) XeF_2
 B) SO_2
 C) NH_4^+
 D) CH_4

64. The hybridisation scheme for the central atom includes a d -orbital contribution in

- A) I_3^-
 B) PCl_3
 C) NO_3^-
 D) H_2Se

65. Which one of the following is/are linear structure? I. I_3^- II. NO_2^- III. I_3^+ IV. SO_2 V. N_3^-

- A) I, II and III
 B) I and V
 C) II, III and IV
 D) All of these

66. Consider the following molecules: Br_3O_8 , F_2O , $\text{H}_2\text{S}_4\text{O}_6$, $\text{H}_2\text{S}_5\text{O}_6$, and C_3O_2 . Count the number of atoms existing in their zero oxidation state in each molecule. Their sum is _____.

- A) 6
 B) 9
 C) 1
 D) 10

67. The sum of the number of unpaired electron(s) in the highest occupied molecular orbital (HOMO) of the following species respectively: N_2 , N_2^+ , O_2 , O_2^+ ?

- A) 6
 B) 9
 C) 1
 D) 4

68. The dipole moment of KCl is $3.336 \times 10^{-29} \text{ C} \cdot \text{m}$. The interatomic distance between K^+ and Cl^- in this molecule is $2.6 \times 10^{-10} \text{ m}$. Calculate the percentage ionic character of the KCl molecule assuming complete separation of a unit fundamental charge ($1.602 \times 10^{-19} \text{ C}$).

- A) 6
 B) 30
 C) 80
 D) 10

69. The sum of the number of lone pairs of electrons on each central atom in the species $[\text{TeBr}_6]^{2-}$, $[\text{BrF}_2]^+$, SNF_3 , and $[\text{XeF}_3]^-$ is:

(Atomic numbers:

$\text{N} = 7, \text{F} = 9, \text{S} = 16, \text{Br} = 35, \text{Te} = 52, \text{Xe} = 54$)

- A) 6
 B) 9
 C) 1
 D) 10

70. Among H_2 , He_2^+ , Li_2 , Be_2 , B_2 , C_2 , N_2 , O_2^- , and F_2 , the number of diamagnetic species is: (Atomic number: $\text{H}=1, \text{He}=2, \text{Li}=3, \text{Be}=4, \text{B}=5, \text{C}=6, \text{N}=7, \text{O}=8, \text{F}=9$)

- A) 5
 B) 9
 C) 1
 D) 6

71. Which of the following is electron-deficient?

- A) $(\text{BH}_3)_2$
 B) PH_3
 C) $(\text{CH}_3)_2$
 D) $(\text{SiH}_3)_2$

72. In BrF_3 molecule, the lone pairs occupy equatorial positions to minimise

- A) lone pair-bond pair repulsion only
 B) bond pair-bond pair repulsion only
 C) lone pair-lone pair repulsion and lone pair-bond pair repulsion
 D) lone pair-lone pair repulsion only

73. OF and F_2 can be compared in terms of

- A) OF is paramagnetic while F_2 is diamagnetic
 B) OF is more stable towards dissociation into atoms
 C) Both (a) and (b) are correct
 D) None of the above is correct

74. The structure of H_2O_2 is

- A) planar, linear
 B) non-planar, linear
 C) planar, non-linear
 D) non-planar, non-linear

75. In which pair or pairs is the stronger bond found in the first species? I. O_2^{2-} , O_2 ; II. N_2 , N_2^+ ; III. NO^+ , NO^-

- A) I only
 B) II only
 C) I and II only
 D) II and III only

76. In the molecules CH_4 , NF_3 , NH_4^+ , and H_2O

- A) number of lone pairs are same
 B) all have same hybridisation of centre of atom
 C) the bond angles are same
 D) number of bond pairs are same

77. The most volatile compound among the given option is

- A) o-nitrophenol B) p-nitrophenol
C) m-nitrophenol D) can't say

78. The structure of ClF_3 is

- A) T-shape B) bent shape
C) linear D) trigonal planar

79. Which of the following is diamagnetic in nature?

- A) O_2 B) O_2^{2-}
C) N_2^{2+} D) B_2

80. The correct order of bond order in SO_2 , SO_3 , SO_4^{2-} , SO_3^{2-} is

- A) $SO_3^{2-} > SO_4^{2-} > SO_3 > SO_2$ B) $SO_4^{2-} > SO_3 > SO_2 > SO_3^{2-}$
C) $SO_2 = SO_3 > SO_4^{2-} > SO_3^{2-}$ D) Can't say

81. Match the following columns:

	Column I (Compound)		Column II (Structure)
A.	ClF_3	1.	Square planar
B.	PCl_5	2.	Tetrahedral
C.	IF_5	3.	Trigonal bipyramidal
D.	CCl_4	4.	Square pyramidal
E.	XeF_4	5.	T-shaped

- A) A - 5, B - 4, C - 3, D - 2, E - 1 B) A - 5, B - 3, C - 4, D - 1, E - 2
C) A - 5, B - 3, C - 4, D - 1, E - 2 D) A - 5, B - 3, C - 4, D - 2, E - 1

82. The correct order of pseudohalide, polyhalide and interhalogen is

- A) BrI_2^{2-} , OCN^- , IF_5 B) IF_5 , BrI_2^{2-} , OCN^-
C) OCN^- , IF_2 , BrI_2^{2-} D) OCN^- , BrI_2^{2-} , IF_5

83. Match List I with List II.

List I (Molecule)		List II (Number and types of bond/s between two carbon atoms)
A.	Ethane	I. One σ -bond and two π -bonds
B.	Ethene	II. Two π -bonds
C.	Carbon molecule, C_2	III. One σ -bond
D.	Ethyne	IV. One σ -bond and one π -bond.

Choose the correct answer from the options given below:

- A) A-I, B-IV, C-II, D-III B) A-IV, B-III, C-II, D-I
C) A-III, B-IV, C-II, D-I D) A-III, B-II, C-IV, D-I

84. Match List I with List II.

List-I (Molecule)	List-II (Bond enthalpy, kJ mol^{-1})
A. HCl	I. 435.8
B. N_2	II. 498
C. H_2	III. 946.0
D. O_2	IV. 431.0

Choose the correct answer from the options given below:

- A) A-III, B-IV, C-I, D-II B) A-IV, B-I, C-III, D-II
C) A-IV, B-III, C-II, D-I D) A-IV, B-III, C-I, D-II

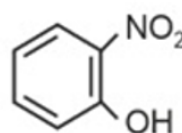
85. Given below are two statements: Statement I: The boiling point of hydrides of Group 16 elements follow the order

$H_2O > H_2Te > H_2Se > H_2S$. Statement II: On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in H_2O , it has higher boiling point. In the light of the above statements, choose the correct answer from the options given below:

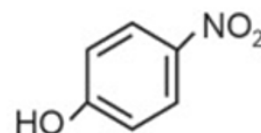
- A) Both Statement I and Statement II are true B) Both Statement I and Statement II are false
C) Statement I is true but Statement II is false D) Statement I is false but Statement II is true

86. Intramolecular hydrogen bonding is present in:

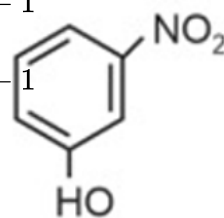
A)



B)



D) HF



87. The correct order of dipole moments for molecules NH_3 , H_2S , CH_4 and HF, is:

- A) $CH_4 > H_2S > NH_3 > HF$ B) $HF > NH_3 > H_2S > CH_4$
C) $NH_3 > HF > CH_4 > H_2S$ D) $HF > NH_3 > H_2S > CH_4$

88. The correct order of bond angles in the following compounds/ species is:

- A) $CO_2 < NH_3 < H_2O < NH_4^+$ B) $CO_2 < NH_3 < NH_4^+ < H_2O$
 C) $H_2O < NH_4^+ < NH_3 < CO_2$ D) $H_2O < NH_4^+ = NH_3 < CO_2$

89. Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions?

- A) ClF_3 B) IF_5
 C) SF_4 D) XeF_2

90. Which of the following molecules is non-polar in nature?

- A) $POCl_3$ B) CH_2O
 C) $SbCl_5$ D) NO_2

Botany

91. Which of the following is a unicellular alga rich in proteins and used as a food supplement by space travellers?

- A) Chlorella B) Volvox
 C) Ulothrix D) Spirogyra

92. Agar-agar, widely used in microbiology media and ice-creams, is commercially obtained from:

- A) Gelidium and Gracilaria B) Sargassum and Laminaria
 C) Chlamydomonas and Volvox D) Ectocarpus and Dictyota

93. The cell wall of green algae (Chlorophyceae) is characteristically made up of an inner layer of _____ and an outer layer of _____.

- A) Cellulose, Pectin B) Cellulose, Chitin
 C) Chitin, Pectin D) Pectin, Cellulose

94. Which algal group characteristically possesses chlorophyll a, c, carotenoids, and xanthophylls (fucoxanthin)?

- A) Phaeophyceae B) Chlorophyceae
 C) Rhodophyceae D) Cyanophyceae

95. Floridean starch, which is structurally very similar to amylopectin and glycogen, is the reserve food material in:

- A) Spirogyra B) Sargassum
 C) Fucus D) Porphyra

96. Hydrocolloids like algin and carrageen are extracted from which groups respectively?

- A) Red algae and Brown algae B) Brown algae and Red algae
 C) Green algae and Brown algae D) Brown algae and Green algae

97. Pyriform (pear-shaped) zoospores with two unequal, laterally attached flagella are characteristic of:

- A) Polysiphonia B) Ulothrix
 C) Laminaria D) Gelidium

98. The cell wall of Rhodophyceae contains cellulose, pectin, and polysulphate esters along with:

- A) Agar and Carrageen B) Algin
 C) Chitin D) Muramic acid

99. Isogamous reproduction with non-flagellated gametes is observed in:

- A) Spirogyra B) Chlamydomonas
 C) Volvox D) Xanthophyceae

100.

Zygotic meiosis is a characteristic feature of:

- A) Chlamydomonas B) Marchantia
 C) Funaria D) Dryopteris

101.

The prominent, independent, and photosynthetic phase in the life cycle of bryophytes is the:

- A) Sporophyte B) Gametophyte
 C) Seta D) Sporogonium

102.

The thallus of Marchantia is characteristically:

- A) Dorsiventral and closely appressed to the substrate B) Isobilateral and erect
 C) Filamentous and branched D) Prostrate with true roots

103.

The juvenile filamentous stage in the life cycle of mosses, developed directly from a spore, is called:

- A) Protonema B) Prothallus
 C) Gemma D) Antheridiophore

104.

Rhizoids in mosses are typically:

- | | |
|--------------------------------------|--------------------------------------|
| A) Multicellular and branched | B) Unicellular and unbranched |
| C) Absent | D) Modified true roots |

105.

In bryophytes, the division of the zygote gives rise directly to:

- | | |
|--------------------------------------|---------------------------------------|
| A) A multicellular sporophyte | B) An independent gametophyte |
| C) A free-living protonema | D) A dynamic primary endosperm |

106.

Which of the following is a true moss?

- | | |
|----------------------|-------------------------|
| A) Irish moss | B) Reindeer moss |
| C) Club moss | D) Funaria |

107.

The leaves of mosses are arranged on the stem-like axis in which pattern?

- | | |
|--------------------|---------------------|
| A) Whorled | B) Alternate |
| C) Opposite | D) Spiral |

108.

Bryophytes prevent soil erosion because they:

- | | |
|--|--|
| A) Excrete chemicals that solidify | B) Have deep taproot systems |
| C) Interlock soil with massive trunks | D) sand Form dense mats on the soil |

109.

The cell ploidy of protonema, rhizoids, and archegonia walls in a moss is:

- | | |
|-------------------------|------------------------|
| A) Haploid (n) | B) Diploid (2n) |
| C) Triploid (3n) | D) Polyploid |

110.

The sporophyte of mosses is more elaborate than that of liverworts and consists of:

- | | |
|-----------------------------------|----------------------------------|
| A) Foot, seta, and capsule | B) Root, stem, and leaves |
| C) Prothallus and gemmae | D) Holdfast and frond |

111.

Antherozoids in bryophytes are:

- | | |
|--|---|
| A) Non-motile and single-celled | B) Multiflagellate and motile |
| C) Biflagellate and motile | D) Produced inside the archegonium |

112.

Why do bryophytes require water for fertilization?

- | | |
|---|---|
| A) Water triggers mechanical explosion of capsules | B) Swimming antherozoids must reach the egg in the archegonium |
| C) Spores require water to undergo meiosis | D) Gametophyte cannot survive dry air |

113.

An evolutionary precursor to the seed habit is distinctly noticed in pteridophytes because:

- | | |
|---|--|
| A) The female gametophyte is retained on the parent sporophyte | B) They produce specialized flowers |
| C) Cones protect the naked seeds | D) Megaspores are shed into the water |

114.

Microphylls (small micro-leaves) are found in which pteridophyte?

- | | |
|---------------------|-----------------------|
| A) Psilotum | B) Ferns |
| C) Equisetum | D) Selaginella |

115.

Macrophylls (large megaphyllous leaves) are characteristic of:

- | | |
|----------------------|-----------------------|
| A) Ferns | B) Selaginella |
| C) Lycopodium | D) Equisetum |

116.

To which class of pteridophytes does the 'Horse-tail' (Equisetum) belong?

- | | |
|-----------------------|----------------------|
| A) Sphenopsida | B) Psilopsida |
| C) Lycopsidea | D) Pteropsida |

117.

The major water conducting element present in the xylem of pteridophytes is:

- | | |
|-----------------------|---------------------------|
| A) Sieve tubes | B) Vessels |
| C) Tracheids | D) Companion cells |

118.

Which of the following classes is correctly matched with its example?

- | | |
|------------------------------------|-----------------------------------|
| A) Lycopsidea - Selaginella | B) Psilopsida - Equisetum |
| C) Sphenopsida - Pteris | D) Pteropsida - Lycopodium |

119.

The spread of living pteridophytes is limited and restricted to narrow geographical regions because:

- | | |
|--|---|
| A) They cannot tolerate sunlight at all | B) Gametophytes need cool, damp places and water for fertilization |
| C) They lack true stems and leaves | D) They reproduce only via vegetative means |

120.

In ferns, the specialized clusters of sporangia present on the ventral side of fertile leaves are called:

- | | |
|-------------------|--------------------|
| A) Sori | B) Strobili |
| C) Ramenta | D) Indusium |

121.

Which of the following is an aquatic pteridophyte?

- | | |
|----------------------|---------------------|
| A) Adiantum | B) Equisetum |
| C) Dryopteris | D) Salvinia |

122.

The prothallus of a fern is:

- | | |
|---------------------------------------|-------------------------------------|
| A) Monoecious and autotrophic | B) Dioecious and saprophytic |
| C) Dependent on the sporophyte | D) A dynamic triploid layer |

123.

Identify the 'living fossil' among pteridophytes:

- | | |
|---------------------|-----------------------|
| A) Psilotum | B) Selaginella |
| C) Equisetum | D) Marsilea |

124.

The primary mode of pollination in gymnosperms is:

- | | |
|------------------------------|---------------------------------|
| A) Hydrophily (Water) | B) Entomophily (Insects) |
| C) Anemophily (Wind) | D) Zoophily (Animals) |

125.

Male and female gametophytes do not possess an independent free-living existence in:

- | | |
|--|--------------------------------|
| A) Angiosperms and Gymnosperms | B) Algae and Bryophytes |
| C) Bryophytes and Pteridophytes | D) Pteridophytes only |

126.

Coralloid roots of Cycas are specifically associated with:

- | | |
|---|---|
| A) Mycorrhizal fungi | B) Nitrogen-fixing cyanobacteria |
| C) Phosphate-solubilizing bacteria | D) Parasitic angiosperms |

127.

Mycorrhiza, a fungal association with roots, is prominently found in the genus:

- | | |
|------------------|------------------|
| A) Pinus | B) Cycas |
| C) Ginkgo | D) Cedrus |

128.

The giant redwood tree, Sequoia, which is one of the tallest tree species, is a/an:

- | | |
|------------------------|----------------------|
| A) Gymnosperm | B) Angiosperm |
| C) Pteridophyte | D) Bryophyte |

129.

The leaves of gymnosperms are well-adapted to withstand extremes of temperature, humidity, and wind due to:

- | | |
|---|---|
| A) Sunken stomata, thick cuticle, and needle-like leaves | B) Broad lamina and thin cuticular walls |
| C) Absence of stomata on upper surfaces | D) Presence of massive air spaces |

130.

The stems are branched in which of the following gymnosperm genera?

- | | |
|----------------------------|----------------------------|
| A) Pinus and Cedrus | B) Cycas |
| C) Cycas and Pinus | D) Cycas and Cedrus |

131.

The megaspore mother cell in gymnosperms differentiates from one of the cells of the:

- | | |
|---------------------|-----------------------|
| A) Nucellus | B) Integument |
| C) Micropyle | D) Archegonium |

132.

In gymnosperms, the multicellular female gametophyte is retained within the:

- | | |
|---------------------------|--------------------------|
| A) Microsporangium | B) Megasporangium |
| C) Pollen tube | D) Antheridium |

133.

Which of the following gymnosperms is a branched, dioecious tree that is considered a living fossil?

- | | |
|--------------------------|----------------------------|
| A) Ginkgo biloba | B) Pinus sylvestris |
| C) Cycas revoluta | D) Cedrus deodara |

134.

Endosperm in gymnosperms is formed _____ fertilization and is _____,

- A) Before, diploid B) After, triploid
C) Before, haploid D) After, haploid

135.

Assertion: Heterospory is an essential step toward seed habit. Reason: Megaspores develop into female gametophytes retained on parent sporophyte.

- A) Both Assertion and Reason are true, and Reason is the correct explanation B) Both Assertion and Reason are true, but Reason is not the correct explanation
C) Assertion is true, Reason is false D) Both are false

Zoology

136.

Read the following statements regarding AIDS: 1. AIDS is caused by Human Immunodeficiency Virus. 2. HIV belongs to the group of retroviruses. 3. HIV contains RNA as its genetic material. 4. HIV can multiply independently outside a living host cell.

Which of the above statements are correct?

- A) 1, 2 and 3 only B) 1 and 4 only
C) 2, 3 and 4 only D) 1, 2, 3 and 4

137.

A student makes the following statements about HIV infection: 1. HIV enters the body mainly through sexual contact, contaminated blood and infected mother-to-child transmission. 2. HIV infection immediately produces complete destruction of the immune system. 3. The virus attacks cells of the immune system. 4. The progressive reduction of immunity makes the infected individual susceptible to opportunistic infections. Which combination is correct?

- A) 1, 3 and 4 only B) 1 and 2 only
C) 2, 3 and 4 only D) All four

138.

Consider the following statements concerning HIV replication: 1. HIV has an RNA genome. 2. After entering the host cell, viral RNA can be used to produce DNA. 3. Reverse transcriptase is involved in this process. 4. The viral DNA can become integrated into the host cell's genetic material. Which option is correct?

- A) 1, 2, 3 and 4 B) 1 and 3 only
C) 2 and 4 only D) 1, 2 and 4 only

139.

Which of the following statements correctly explains why AIDS is primarily regarded as a disease of the immune system?

- A) HIV directly destroys all erythrocytes, resulting in severe anaemia B) HIV progressively reduces the population/function of immune cells, weakening the body's defence against infections.
C) HIV specifically infects only cancer cells and converts them into malignant cells. D) HIV prevents oxygen transport by destroying haemoglobin.

140.

A person infected with HIV may remain apparently healthy for several years before developing serious manifestations. Which explanation best agrees with the NCERT description?

- A) HIV remains permanently outside the body and becomes active only after many years. B) Progressive damage to the immune system eventually allows opportunistic infections and other manifestations to occur.
C) HIV is eliminated completely during the asymptomatic period and later reappears. D) The virus remains restricted to red blood cells during the asymptomatic phase.

141.

Which of the following combinations concerning AIDS transmission is incorrect?

- A) Sexual contact — possible route B) Transfusion of infected blood — possible route
C) Sharing infected needles — possible route D) Sharing food and water with an infected person — established route

142.

Consider the following statements regarding prevention of AIDS: 1. Avoiding multiple sexual partners reduces the risk of HIV transmission. 2. Screening of blood before transfusion is important. 3. Using disposable or properly sterilised needles helps prevent transmission. 4. HIV transmission can be prevented by avoiding all physical contact with infected individuals. Choose the correct answer.

- A) 1, 2 and 3 only B) 1 and 4 only
C) 2, 3 and 4 only D) All four

143.

Which statement most appropriately distinguishes cancer cells from normal cells?

- | | |
|--|---|
| A) Cancer cells always stop dividing when they come in contact with neighbouring cells. | B) Cancer cells lose normal regulatory mechanisms controlling cell division and may continue proliferating abnormally. |
| C) Cancer cells are unable to divide by mitosis. | D) Cancer cells can never invade neighbouring tissues. |

144.

A tumour remains confined to its original location and does not invade neighbouring tissues or spread to distant organs. Such a tumour is generally described as:

- | | |
|---------------------|----------------------|
| A) Malignant | B) Metastatic |
| C) Benign | D) Infectious |

145.

Which one of the following best describes metastasis?

- | | |
|---|--|
| A) Conversion of a normal cell into an immune cell | B) Spread of cancer cells from their original site to distant parts of the body |
| C) Destruction of cancer cells by antibodies | D) Formation of a blood clot around a tumour |

146.

Regarding carcinogens, consider: 1. Physical agents can act as carcinogens. 2. Chemical substances may induce cancer. 3. Oncogenic viruses can contribute to cancer development. 4. Tobacco smoke contains carcinogenic substances. Which statements are correct?

- | | |
|-------------------------|---------------------------|
| A) 1 and 2 only | B) 2 and 3 only |
| C) 1, 2, 3 and 4 | D) 1, 3 and 4 only |

147.

Which of the following is correctly associated with cancer?

- | | |
|---|--|
| A) Transformation of normal cells into cancerous cells — oncogenic transformation | B) Spread of malignant cells to distant organs — metastasis |
| C) Detection of cancer at an early stage — improved chance of successful treatment | D) All of the above |

148.

Cancer may arise due to: 1. Activation of cellular oncogenes/proto-oncogenes. 2. Genetic changes affecting regulation of cell division. 3. Exposure to carcinogenic agents. 4. Certain viral infections. Which combination is most appropriate?

- | | |
|---------------------------|---------------------------|
| A) 1 and 2 only | B) 1, 2 and 3 only |
| C) 2, 3 and 4 only | D) 1, 2, 3 and 4 |

149.

A physician suspects cancer in a patient. Which combination of methods may be useful for cancer detection/diagnosis?

- | | |
|--|---|
| A) Biopsy and histopathological examination | B) Imaging techniques such as radiography/CT/MRI depending on the suspected tumour |
| C) Certain biochemical or molecular tests where appropriate | D) All of the above |

150.

Which statement regarding cancer treatment is most appropriate?

- | | |
|--|---|
| A) Cancer treatment is always based exclusively on antibiotics. | B) Surgery, radiotherapy and chemotherapy are among the important approaches used depending on the type and stage of cancer. |
| C) Vaccination immediately eliminates every malignant tumour. | D) Cancer can never be treated successfully if detected early. |

151.

To which type of barriers under innate immunity, do the saliva in the mouth and the tears from the eyes, belong?

- | | |
|-----------------------------|----------------------------------|
| A) Physical barriers | B) Cytokine barriers |
| C) Cellular barriers | D) Physiological barriers |

152.

Which one of the following acts as a physiological barrier to the entry of micro organisms in human body?

- | | |
|-----------------|--|
| A) Skin | B) Epithelium of urogenital tract |
| C) Tears | D) monocytes |

153.

Immunoglobulins are

- | | |
|-----------------------|-----------------------|
| A) antigen | B) antibodies |
| C) antiseptics | D) antibiotics |

154.

The letter T in T-lymphocyte refers to:

- A) thymus** **B) thyroid**
C) thalamus **D) tonsil**

155.

The exaggerated response of the immune system to certain antigens is called

- A)** primary response **B)** secondary response
C) immune suppression **D)** allergy response

156.

Passive immunity is defined as immunity

- A)** inherited from the parents.
- B)** achieved through vaccination.
- C)** acquired through first exposure to the disease.
- D)** achieved through the sera of other animals enriched in antibodies.

157.

When body cannot differentiate between its own and foreign matter it is referred to as

- A) passive immunity** **B) active immunity**
C) autoimmunity **D) immunodeficiency**

158.

Short-lived immunity acquired from mother to foetus across placenta or through mother's milk to the infant, is categorized as

- A) active immunity** **B) passive immunity**
C) cellular immunity **D) innate non-specific immunity**

159.

Organ transplant rejection may be prevented by using

- A)** antibodies
B) new T cells
C) immunosuppressive drug
D) immunostimulatory drug

160.

Antigen binding site in an antibody is found between

- A)** two light chains
C) one heavy and one light chain
- B)** two heavy chains
D) either between two light chains or between one heavy and one light chain depending upon the nature of antigen

161.

Inflammatory response in allergy is caused by

- A) histamines** **B) antigen**
C) prothrombin **D) antibodies**

162.

The foetus gets immunized after receiving antibodies from the mother through placenta)
This type of immunization is called

- A) active immunity** **B) innate immunity**
C) passive immunity **D) humoral immunity**

163.

When a quick immune response is required due to infection of a deadly microbe, the patient is injected with

- A)** protein of pathogen **B)** inactivated or weakened pathogen
C) preformed antibodies **D)** vaccine

164.

Which of the following vaccine has been produced from yeast by recombinant DNA technology?

- A) Hepatitis A** **B) Hepatitis B**
C) Hib **D) Oral polio**

165.

B-lymphocytes are associated with

- A)** humoral immunity **B)** production of heparin
C) cell mediated immunity **D)** internal cleansing

166.

An important alkaloid which is present in Tobacco is

- A) Quinine** **B) Nicotine**
C) Narcotics **D) Reserpine**

167.

Mode of abuse of tobacco is by

- A) Smoking** **B) Chewing**
C) Snuffing **D) All**

168.

Read the statements about the effects of smoking

- i) It increases the CO level and reduces O_2 level in the blood**
- ii) Nicotine inhibits the adrenal glands to release adrenalin into blood**
- iii) Medullary hormones increases the B.P. and heart rate**
- iv) Smoking causes bronchitis and emphysema**

Which one of the above statements is wrong

- A) i**
- B) ii**
- C) iii**
- D) iv**

169.

The commonly abused drugs of the following are

- A) Opioids B) Cannabinoids
C) Coca alkaloids D) All

170.

The drug which is commonly used during holi festival and religious ceremonies is

- A) Bhang B) Heroin
C) Morphine D) Dopamine

171.

Receptors for morphine and heroin are present in our

- A) Gastro intestinal tract B) Central nervous system
C) P.N.S D) A and B

172.

Which of the following drug is formed due to the acetylation of morphine?

- A) Tetra acetyl morphine B) Acetyl salicylic acid
C) heroin D) Aspirin

173.

Chemical name of smack is

- A) Serotonin B) BHC
C) Diethyl carbamazone D) Diacetyl morphine

174.

The mode of abuse of smack is by

- A) Injection B) Snorting
C) Oral intake D) A & B

175.

The drug which is sedative, pain killer and used by patients after surgery is extracted from

- A) Pod of poppy plant B) Flower tops of hemp plant
C) Leaves of coca plant D) Bark of cinchona

176.

Which of the following is not cannabinoid

- A) Smack B) Crack
C) Coke D) All

177.

Intravenous drug abusers are Likely to acquire infections such as

- A) HIV B) HBV
C) A & B D) Kwashiorkar

178.

Abuse and addition to alcohol leads to

- A) Necrosis B) Neurosis
C) Cirrhosis D) Psychosis

179.

Two way matching

Drugs	Mode of action on human systems
A) Barbiturates	I) Depression and mental illness
B) Amphetamines	II) Tranquilizers
C) Benzodiazepines	III) Sleeping pills
D) Lysergic acid diethyl amide	IV) Sleeplessness

- A) A-4, B-3, C-2, D-1 B) A-3, B-4, C-2, D-1
C) A-1, B-2, C-3, D-4 D) A-1 , B-4, C-3, D-2

180.

Plants which produce drugs with hallucinogenic properties are

- A) Coca plant B) Datura
C) Atropa D) All

ANSWER KEY

Physics

1.	2	13.	4	25.	1	37.	3
2.	3	14.	3	26.	4	38.	4
3.	4	15.	4	27.	2	39.	2
4.	3	16.	4	28.	3	40.	1
5.	3	17.	3	29.	3	41.	1
6.	3	18.	2	30.	2	42.	4
7.	1	19.	3	31.	4	43.	2
8.	1	20.	2	32.	2	44.	4
9.	3	21.	4	33.	2	45.	3
10.	1	22.	4	34.	4		
11.	2	23.	3	35.	4		
12.	2	24.	2	36.	1		

Chemistry

46.	2	58.	2	70.	4	82.	4
47.	1	59.	3	71.	1	83.	3
48.	1	60.	4	72.	3	84.	4
49.	1	61.	3	73.	3	85.	1
50.	1	62.	3	74.	4	86.	1
51.	3	63.	1	75.	4	87.	4
52.	3	64.	1	76.	2	88.	2
53.	4	65.	2	77.	1	89.	4
54.	1	66.	1	78.	1	90.	3
55.	2	67.	4	79.	2		
56.	3	68.	3	80.	3		
57.	1	69.	1	81.	2		

Botany

91.	1	102.	1	113.	1	124.	3
92.	1	103.	1	114.	4	125.	1
93.	1	104.	1	115.	1	126.	2
94.	1	105.	1	116.	1	127.	1
95.	4	106.	3	117.	3	128.	1
96.	2	107.	4	118.	1	129.	1
97.	3	108.	4	119.	2	130.	1
98.	1	109.	1	120.	1	131.	1
99.	4	110.	1	121.	4	132.	2
100.	1	111.	3	122.	1	133.	1
101.	2	112.	2	123.	1	134.	3

135. 1

Zoology

136.	1	148.	4	160.	3	172.	3
137.	1	149.	4	161.	1	173.	4
138.	1	150.	2	162.	3	174.	4
139.	2	151.	4	163.	3	175.	1
140.	2	152.	3	164.	2	176.	4
141.	4	153.	2	165.	1	177.	3
142.	1	154.	1	166.	2	178.	3
143.	2	155.	4	167.	4	179.	2
144.	3	156.	4	168.	2	180.	4
145.	2	157.	3	169.	4		
146.	3	158.	2	170.	1		
147.	4	159.	3	171.	4		

SOLUTIONS

Q1.

Answer: B

Explanation:

Once the stone is released, the only force acting on it is gravity (ignoring air resistance). Thus, its acceleration is g downward, regardless of the balloon's acceleration or the stone's initial velocity.

Q2.

Answer: C

Explanation:

With air resistance, the net downward acceleration during ascent is $g + a_{air}$, and during descent it is $g - a_{air}$. Since the distance is the same and acceleration is greater during ascent, the time taken to go up T_1 is less than the time taken to come down T_2 .

Q3.

Answer: D

Explanation:

The speed of the tip is $v = r\omega = 1 \times \frac{2\pi}{60} = \frac{\pi}{30}$ cm/s. In 15 s, it rotates by 90° . The magnitude of the change in velocity is $\sqrt{v^2 + v^2} = v\sqrt{2} = \frac{\pi\sqrt{2}}{30}$ cm/s.

Q4.

Answer: C

Explanation:

The first drop takes 1 s to reach the ground. Since the third drop is just leaving the tap at that instant, the time interval between successive drops is 0.5 s. Thus, the second drop has fallen for 0.5 s, so its distance fallen is 1.25 m and its height above ground is $5 - 1.25 = 3.75$ m.

Q5.

Answer: C

Explanation:

Since the ball is released from rest, the distance fallen is proportional to t^2 . In time $\frac{T}{3}$, it falls $\frac{1}{9}$ of the total height h . Therefore, its height above the ground is $h - \frac{h}{9} = \frac{8h}{9}$.

Q6.

Answer: C

Explanation:

The ant moves on the surface of the cube, not through the interior. On unfolding the surfaces, the shortest path between opposite corners is $\sqrt{5}a$. Hence, the minimum time is $\frac{\sqrt{5}a}{u}$.

Q7.

Answer: A

Explanation:

According to the answer key for Level 2, Match the Columns Q1, the correct matching is (a) $\rightarrow r, s$, (b) $\rightarrow r, s$, (c) $\rightarrow p$, (d) $\rightarrow q$.

Q8.

Answer: A

Explanation:

In a v - t graph, the sign of velocity gives direction, and the slope gives acceleration. Speed increases when velocity and acceleration have the same sign, and decreases when they have opposite signs. According to the given graph and answer key, AB and BC correspond to motion in $+x$ with increasing speed, CD corresponds to motion in $+x$ with decreasing speed, and DE corresponds to motion in $-x$ with increasing speed.

Q9.

Answer: C

Explanation:

The maximum height is given by $H = \frac{u^2 \sin^2 \alpha}{2g}$. For complementary angles θ and $90^\circ - \theta$, the ratio of their maximum heights is $\frac{\sin^2 \theta}{\cos^2 \theta}$.

Q10.

Answer: A

Explanation:

The range is $R = \frac{u^2 \sin 2\theta}{g}$ and the maximum range is $R_{\max} = \frac{u^2}{g}$. Setting $R = \frac{1}{2} R_{\max}$ yields $\sin 2\theta = 0.5$, which gives $\theta = 15^\circ$.

Q11.

Answer: B

Explanation:

For maximum range, the projection angle is $\theta = 45^\circ$. The velocity at the highest point is the horizontal component $v = u \cos 45^\circ = 20 \times \frac{1}{\sqrt{2}} \approx 14.14 \text{ ms}^{-1}$.

Q12.

Answer: B

Explanation:

The horizontal component of velocity remains constant. Using $v \cos 30^\circ = u \cos 60^\circ$, we find $v = u/\sqrt{3}$, so new $KE = K/3$.

Q13.

Answer: D

Explanation:

For complementary angles θ and $(90^\circ - \theta)$, $T_1 \cdot T_2 = \frac{4u^2 \sin \theta \cos \theta}{g^2} = \frac{2R}{g}$, hence $R = \frac{1}{2} g T_1 T_2$.

Q14.

Answer: C

Explanation:

Maximum range $R_{\max} = \frac{v_0^2}{g}$ (at 45°). Rotating 360° sweeps a circle of radius $R_{\max}$, giving area $= \pi R_{\max}^2 = \frac{\pi v_0^4}{g^2}$.

Q15.

Answer: D

Explanation:

Maximum range gives $u = 4$ m/s. Horizontal speed
 $= u \cos 45^\circ = 2\sqrt{2}$ m/s. Distance in $10\sqrt{2}$ s
 $= 2\sqrt{2} \times 10\sqrt{2} = 40$ m.

Q16.

Answer: D

Explanation:

Complementary angles give the same range. If one angle is 60° , the other is 30° . The ratio of heights is $\sin^2 60^\circ : \sin^2 30^\circ = 3 : 1$, so $H_2 = 102/3 = 34$ m.

Q17.

Answer: C

Explanation:

Using vertical displacement equation $-70 = 25t - 5t^2$, we get $t^2 - 5t - 14 = 0$, giving $t = 7$ s.

Q18.

Answer: B

Explanation:

Average velocity $= \frac{\text{displacement}}{\text{time}}$. From start to highest point, displacement $= \frac{\sqrt{(u \cos \theta \cdot t)^2 + H^2}}{2}$ and time $= \frac{u \sin \theta}{g}$, yielding $\frac{u}{2} \sqrt{1 + 3 \cos^2 \theta}$.

Q19.

Answer: C

Explanation:

For horizontal projection, initial vertical velocity is zero.

Using $h = \frac{1}{2}gt^2$, we get $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{160}{10}} = 4$ s.

Q20.

Answer: B

Explanation:

Horizontal distance $= v_x \times t = 300 \times 4 = 1200$ m, since horizontal velocity remains constant and time of flight is 4 s.

Q21.

Answer: D

Explanation:

Since acceleration is only in y -direction, $a_x = 0$, so v_x is constant. Differentiating $y = \beta x^2$ twice and using $a_y = \alpha$ gives $v_x = \sqrt{\frac{\alpha}{2\beta}}$.

Q22.

Answer: D

Explanation:

Hitting the incline horizontally means impact occurs at the highest point. Computing the coordinates of the highest point and finding the distance along the incline gives

$$R = \frac{u^2 \sqrt{21}}{8g}.$$

Q23.

Answer: C

Explanation:

"Just clears" means the summit is at the highest point of the trajectory, which occurs at half the horizontal range.

$$\text{Thus } \tan \beta = \frac{H}{R/2} = \frac{\tan \alpha}{2}.$$

Q24.

Answer: B

Explanation:

Since both projectiles have the same gravitational acceleration, relative acceleration is zero. The relative motion is uniform, and the minimum distance is found by minimizing the separation using relative velocity.

Q25.

Answer: A

Q26.

Answer: D

Q27.

Answer: B

Q28.

Answer: C

Q29.

Answer: C

Q30.

Answer: B

Q31.

Answer: D

Q32.

Answer: B

Q33.

Answer: B

Q34.

Answer: D

Q35.

Answer: D

Q36.

Answer: A

Q37.

Answer: C

Q38.

Answer: D

Q39.

Answer: B

Q40.

Answer: A

Q41.

Answer: A

Q42.

Answer: D

Q43.

Answer: B

Q44.

Answer: D

Q45.

Answer: C

Q46.

Answer: B

Explanation:

The bond angle depends on the hybridization of the central nitrogen atom and the repulsion caused by lone pairs or surrounding atoms. NO_2^+ is sp hybridized with a linear geometry (180°). NO_2 is sp^2 hybridized with one unpaired electron ($\approx 134^\circ$). NO_3^- is sp^2 hybridized with a regular trigonal planar geometry (120°). NO_2^- is sp^2 hybridized with one lone pair, compressing the bond angle further ($\approx 115^\circ$).

Q47.

Answer: A

Explanation:

BF_3 and NH_4^+ are both symmetrical molecules with a regular geometry (D_{h3} trigonal planar and tetrahedral, respectively), resulting in a net dipole moment of zero ($\mu = 0$). NH_3 has a large dipole moment ($\approx 1.46 \text{ D}$) because the orbital dipole due to the lone pair and the bond dipoles of the three $\text{N} - \text{H}$ bonds act in the same direction. NF_3 has a smaller dipole moment ($\approx 0.23 \text{ D}$) than NH_3 because the bond dipoles of the three $\text{N} - \text{F}$ bonds (which are polarized towards fluorine) oppose the direction of the lone pair's orbital dipole, partially canceling it out.

Q48.

Answer: A

Explanation:

Using VSEPR theory, determine the steric number, number of bond pairs, and lone pairs for each species to find its molecular shape. Count how many species correspond to each geometry in List-I to match with List-II.

Q49.

Answer: A

Explanation:

Statements (B) and (C) are incorrect based on Molecular Orbital (MO) Theory. For F_2 , the last electron enters a π^* orbital, making its HOMO π -type rather than σ -type. For O_2^+ , removing an electron from an antibonding orbital increases the bond order (2.5 compared to 2 for O_2), thereby increasing the bond energy of O_2^+ .

Q50.

Answer: A

Explanation:

Boron has a very high ionization enthalpy and a small atomic size, making the formation of a simple B^{3+} gaseous cation energetically unfeasible. Consequently, it shares electrons to form covalent compounds. According to Fajan's rules, a cation with a high charge and small size (B^{3+}) exhibits a high polarizing power, distorting the electron cloud of the anion and heavily favoring covalency. Thus, both statements are true and Statement 2 correctly explains Statement 1.

Q51.

Answer: C

Explanation:

Lithium chloride (LiCl) is predominantly covalent due to the high polarizing power and small size of the Li^+ ion (Fajans' rules), which distorts the electron cloud of the chloride ion. However, the electronegativity difference between lithium and chlorine is actually quite large (roughly $3.16 - 0.98 = 2.18$), meaning the reason given is incorrect. Thus, the assertion is true and the reason is false.

Q52.

Answer: C

Explanation:

Molecules and ions that share the same hybridization and number of lone pairs on their central atoms possess identical molecular geometries (shapes). By determining the total electron pairs ($bp + lp$) for each species, we can successfully pair them up.

Q53.

Answer: D

Explanation:

The number of 90° bond angles depends on the geometry of the hybridized state. In an octahedral molecular geometry (sp^3d^2 hybridization), there are 12 such angles, which is the highest among the given options.

Q54.

Answer: A

Explanation:

A regular tetrahedral structure requires sp^3 hybridization of the central atom with four bonding pairs and zero lone pairs. Only the borofluoride ion (BF_4^-) meets these steric criteria.

Q55.

Answer: B

Explanation:

Bond length is inversely proportional to bond order. Since the nitrosonium ion (NO^+) has a higher bond order than the nitric oxide molecule (NO), it possesses a shorter bond length, meaning the bond length in NO is greater.

Q56.

Answer: C

Explanation:

A molecule or ion is diamagnetic if all of its electrons are paired in its molecular orbitals. Among the given options, only H_2 has a completely paired electron configuration.

Q57.

Answer: A

Explanation:

Lattice energy is governed by Coulombic forces of attraction between ions. It is directly proportional to the product of the ionic charges and inversely proportional to the sum of the ionic radii (sizes).

Q58.

Answer: B

Explanation:

As the central atom becomes less electronegative down the group, the bonding electron pairs shift further away from the central atom towards the hydrogen atoms, reducing bond pair-bond pair repulsions and allowing the lone pair to compress the bond angle more.

Q59.

Answer: C

Explanation:

SF_4 has a see-saw geometry derived from a trigonal bipyramidal arrangement (sp^3d hybridization). This geometry has both axial and equatorial bonds, which are not equal in length due to different steric repulsions.

Q60.

Answer: D

Explanation:

Though all three species have a bond order of 1, their stability decreases as the number of electrons in antibonding molecular orbitals increases. The actual stability order is $H_2 > Li_2 > B_2$, which is not listed in options A through D.

Q61.

Answer: C

Explanation:

The percentage of ionic character in a bond depends on the electronegativity difference (ΔEN) between the two bonded atoms. A larger difference results in a higher ionic character.

Q62.

Answer: C

Explanation:

Without $2s$ - $2p$ mixing, the energy of the σ_{2p_z} molecular orbital is lower than that of the degenerate π_{2p_x} and π_{2p_y} orbitals, which leads to unpaired electrons in the case of the C_2 molecule.

Q63.

Answer: A

Explanation:

In XeF_2 , Xenon is the central atom and is surrounded by 2 bond pairs and 3 lone pairs, resulting in a steric number of 5. This corresponds to sp^3d hybridisation, which involves a d -orbital. The other molecules (SO_2 , NH_4^+ , and CH_4) involve sp^2 or sp^3 hybridisation without any d -orbital contribution.

Q64.

Answer: A

Explanation:

In I_3^- , the central iodine atom has a steric number of 5 (2 bond pairs and 3 lone pairs), which corresponds to sp^3d hybridisation that explicitly includes a d -orbital contribution. In contrast, PCl_3 , NO_3^- , and H_2Se involve sp^3 or sp^2 hybridisation schemes without d -orbital participation.

Q65.

Answer: B

Explanation:

Species like I_3^- and N_3^- adopt a linear geometry due to steric arrangements involving lone pairs or multiple bonds that cancel out dipole effects or maintain a 180° bond angle. Specifically, I_3^- features a central iodine atom with 3 lone pairs in equatorial positions, giving a linear shape, and N_3^- is linear, whereas the others (NO_2^- , I_3^+ , and SO_2) are bent or non-linear.

Q66.

Answer: A

Explanation:

To find the total number of atoms in a zero oxidation state, we analyze the structure of each molecule. Terminal or bridging atoms bonded to identical atoms (like C in C_3O_2 or internal S atoms in polythionic acids) or specific oxidation state calculations reveal how many atoms possess an oxidation number of 0. Summing these values across all specified molecules gives the final answer of 6.

Q67.

Answer: D

Explanation:

Write the molecular orbital configurations for each diatomic species and count the number of unpaired electrons in their highest occupied molecular orbital (HOMO).

Q68.

Answer: C

Explanation:

The percentage ionic character of a polar diatomic molecule is determined by comparing its experimental dipole moment to the theoretical dipole moment calculated for a complete (100%) electronic charge separation.

Q69.

Answer: A

Explanation:

Calculate the lone pairs on the central atom of each individual chemical species using their valence electrons and covalent bond configurations, then sum the values together.

Q70.

Answer: D

Explanation:

A molecular species is diamagnetic if all of its electrons are completely paired in its molecular orbitals. By writing the molecular orbital electronic configurations for all nine species, we find that exactly six of them (H_2 , Li_2 , Be_2 , C_2 , N_2 , and F_2) contain no unpaired electrons and are diamagnetic.

Q71.

Answer: A

Q72.

Answer: C

Explanation:

In the BrF_3 molecule, the central bromine atom undergoes sp^3d hybridization with two lone pairs and three bond pairs, resulting in a T-shaped geometry. According to VSEPR theory, lone pairs occupy equatorial positions to minimize stronger repulsions, specifically lone pair-lone pair and lone pair-bond pair repulsions.

Q73.

Answer: C

Explanation:

OF contains one unpaired electron, making it paramagnetic, whereas F_2 has all paired electrons and is diamagnetic. Additionally, the bond order of OF is higher than that of F_2 , which means its bond energy is also higher, making OF more stable towards dissociation into atoms.

Q74.

Answer: D

Explanation:

Hydrogen peroxide (H_2O_2) adopts a non-planar open-book structure in the gas and solid phases to minimize repulsion between lone pairs on adjacent oxygen atoms and bond pairs, meaning it is both non-planar and non-linear.

Q75.

Answer: D

Explanation:

A higher bond order corresponds to a stronger and shorter chemical bond. For pair II, N_2 has a bond order of 3.0 while N_2^+ has 2.5. For pair III, NO^+ has a bond order of 3.0 while NO^- has 2.0. In both cases, the first species has a higher bond order and therefore a stronger bond. In pair I, O_2^{2-} has a bond order of 1.0 whereas O_2 has 2.0, meaning the stronger bond is in the second species. Thus, only pairs II and III satisfy the condition.

Q76.

Answer: B

Explanation:

The central atoms in CH_4 , NF_3 , NH_4^+ , and H_2O all undergo sp^3 hybridization, meaning their central atoms share the same hybridization state despite differences in the number of lone pairs, bond pairs, and bond angles.

Q77.

Answer: A

Explanation:

o-Nitrophenol forms intramolecular hydrogen bonding, which restricts intermolecular association between its molecules. On the other hand, p-nitrophenol and m-nitrophenol form extensive intermolecular hydrogen bonding, leading to association of molecules and higher boiling points. Due to chelation via intramolecular hydrogen bonding, o-nitrophenol has lower intermolecular attraction and thus higher volatility.

Q78.

Answer: A

Explanation:

The central chlorine atom in ClF_3 has 7 valence electrons, forms 3 single bonds with fluorine atoms, and contains 2 lone pairs. This gives a total of 5 electron pairs (sp^3d hybridization), which arrange in a trigonal bipyramidal geometry. To minimize lone pair-lone pair and lone pair-bond pair repulsions, the two lone pairs occupy the equatorial positions, resulting in a distorted T-shape geometry.

Q79.

Answer: B

Explanation:

A species is diamagnetic if all of its electrons are paired (having no unpaired electrons). By writing the molecular orbital electronic configurations, we can determine the presence of any unpaired electrons: O_2 has two unpaired electrons in its anti-bonding orbitals (making it paramagnetic). O_2^{2-} has a total of 18 electrons with a completely filled molecular orbital configuration and zero unpaired electrons, making it diamagnetic. N_2^{2+} and B_2 both contain unpaired electrons in their respective molecular orbitals, rendering them paramagnetic.

Q80.

Answer: C

Explanation:

The bond order of a species can be calculated by dividing the total number of bonds between the central atom and surrounding atoms by the number of surrounding groups (resonance structures can also be taken into account). For SO_2 and SO_3 , the bond order is 2. For SO_4^{2-} , the bond order is 1.5. For SO_3^{2-} , the bond order is 1.33. Thus, the correct decreasing order of bond order is $SO_2 = SO_3 > SO_4^{2-} > SO_3^{2-}$

Q81.

Answer: B

Explanation:

The molecular shapes and geometries can be determined using VSEPR theory by analyzing the number of bond pairs and lone pairs around the central atom: ClF_3 has 3 bond pairs and 2 lone pairs, forming a T-shaped structure. PCl_5 has 5 bond pairs and 0 lone pairs, forming a trigonal bipyramidal structure. IF_5 has 5 bond pairs and 1 lone pair, forming a square pyramidal structure. CCl_4 has 4 bond pairs and 0 lone pairs, forming a tetrahedral structure. XeF_4 has 4 bond pairs and 2 lone pairs, forming a square planar structure.

Q82.

Answer: D

Explanation:

The question asks for the correct matching sequence corresponding to three specific classes of chemical species: pseudohalide, polyhalide, and interhalogen. Pseudohalide ions (like OCN^-) are polyatomic analogues of halide ions that exhibit similar properties. Polyhalide ions (like BrI_2^-) are complex ions formed by the combination of halogen molecules with halide ions. Interhalogens (like IF_5) are compounds formed between different halogen atoms. Matching these sequentially to the requested categories yields option D.

Q83.

Answer: C

Explanation:

The type of carbon-carbon bonding varies with the saturation of the molecule and can be determined using structural valency and Molecular Orbital Theory (MOT).

Q84.

Answer: D

Explanation:

Bond enthalpy is directly proportional to the strength and multiplicity of the chemical bond. Symmetrical triple bonds have the highest enthalpies, while single bonds have lower enthalpies.

Q85.

Answer: A

Explanation:

While boiling points normally increase with molecular mass due to van der Waals forces, the exceptionally strong intermolecular hydrogen bonding in water causes it to have the highest boiling point in Group 16.

Q86.

Answer: A

Explanation:

Intramolecular hydrogen bonding occurs when the hydrogen atom is bonded to a highly electronegative atom and is in close spatial proximity to another electronegative atom within the same molecule.

Q87.

Answer: D

Explanation:

The net dipole moment of a molecule is determined by the vector sum of its polar bonds and lone pair contributions, which is strongly influenced by the electronegativity of the constituent atoms.

Q88.

Answer: B

Explanation:

Bond angles are dictated by the hybridization of the central atom and the repulsive forces of lone pairs, which act to compress adjacent bonding pairs.

Q89.

Answer: D

Explanation:

According to VSEPR theory, lone pair-lone pair (lp-lp) repulsions are the strongest electron-pair interactions. The molecule with the greatest number of lone pairs on its central atom will experience the most severe lp-lp repulsions.

Q90.

Answer: C

Explanation:

A molecule is non-polar when its geometry is highly symmetrical, allowing the individual polar bond dipoles to cancel each other out completely, yielding a net dipole moment of zero.

Q91.

Answer: A

Q92.

Answer: A

Q93.

Answer: A

Q94.

Answer: A

Q95.

Answer: D

Q96.

Answer: B

Q97.

Answer: C

Q98.

Answer: A

Q99.

Answer: D

Q100.

Answer: A

Q101.

Answer: B

Q102.

Answer: A

Q103.

Answer: A

Q104.

Answer: A

Q105.

Answer: A

Q106.

Answer: C

Q107.

Answer: D

Q108.

Answer: D

Q109.

Answer: A

Q110.

Answer: A

Q111.

Answer: C

Q112.

Answer: B

Q113.

Answer: A

Q114.

Answer: D

Q115.

Answer: A

Q116.

Answer: A

Q117.

Answer: C

Q118.

Answer: A

Q119.

Answer: B

Q120.

Answer: A

Q121.
Answer: D

Q122.
Answer: A

Q123.
Answer: A

Q124.
Answer: C

Q125.
Answer: A

Q126.
Answer: B

Q127.
Answer: A

Q128.
Answer: A

Q129.
Answer: A

Q130.
Answer: A

Q131.
Answer: A

Q132.
Answer: B

Q133.
Answer: A

Q134.
Answer: C

Q135.
Answer: A

Q136.
Answer: A

Q137.
Answer: A

Q138.
Answer: A

Q139.
Answer: B

Q140.
Answer: B

Q141.
Answer: D

Q142.
Answer: A

Q143.
Answer: B

Q144.
Answer: C

Q145.
Answer: B

Q146.
Answer: C

Q147.
Answer: D

Q148.
Answer: D

Q149.
Answer: D

Q150.
Answer: B

Q151.
Answer: D

Q152.
Answer: C

Q153.
Answer: B

Q154.
Answer: A

Q155.
Answer: D

Q156.
Answer: D

Q157.
Answer: C

Q158.
Answer: B

Q159.

Answer: C

Q160.

Answer: C

Q161.

Answer: A

Q162.

Answer: C

Q163.

Answer: C

Q164.

Answer: B

Q165.

Answer: A

Q166.

Answer: B

Q167.

Answer: D

Q168.

Answer: B

Q169.

Answer: D

Q170.

Answer: A

Q171.

Answer: D

Q172.

Answer: C

Q173.

Answer: D

Q174.

Answer: D

Q175.

Answer: A

Q176.

Answer: D

Q177.

Answer: C

Q178.

Answer: C

Q179.

Answer: B

Q180.

Answer: D