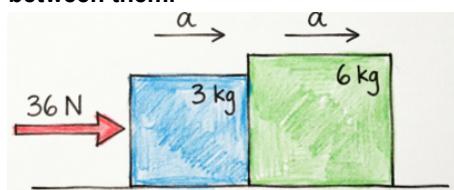


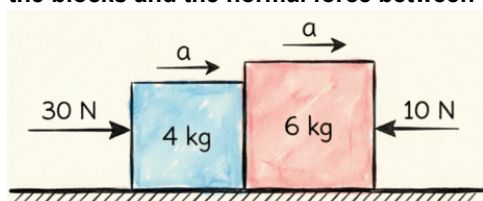
Physics

1. From the image given above, a horizontal force of 36 N is applied to the 3 kg block, which pushes the 6 kg block on a frictionless horizontal surface. Find the acceleration of the blocks and the normal force between them.



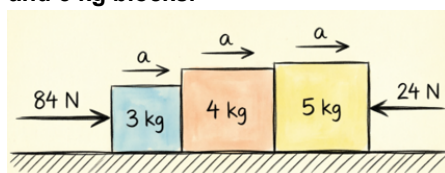
- A) $a = 6 \text{ m/s}^2$, $N = 18 \text{ N}$ B) $a = 4 \text{ m/s}^2$, $N = 12 \text{ N}$
 C) $a = 4 \text{ m/s}^2$, $N = 24 \text{ N}$ D) $a = 3 \text{ m/s}^2$, $N = 24 \text{ N}$

2. From the image given below, two blocks kept in contact on a frictionless horizontal surface are pushed from opposite sides. Find the acceleration of the blocks and the normal force between them.



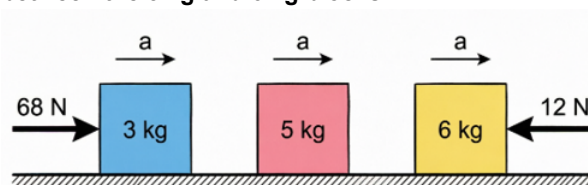
- A) $a = 3 \text{ m/s}^2$, $N = 25 \text{ N}$ B) $a = 4 \text{ m/s}^2$, $N = 26 \text{ N}$
 C) $a = 2 \text{ m/s}^2$, $N = 22 \text{ N}$ D) $a = 5 \text{ m/s}^2$, $N = 30 \text{ N}$

3. From the image given below, three blocks kept in contact on a frictionless horizontal surface are pushed from opposite sides. Find the acceleration of the blocks and the normal force between the 4 kg and 5 kg blocks.



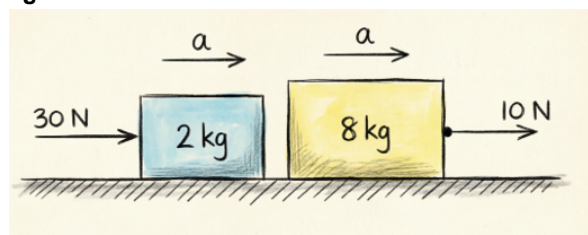
- A) $a = 4 \text{ m/s}^2$, $N = 44 \text{ N}$ B) $a = 5 \text{ m/s}^2$, $N = 49 \text{ N}$
 C) $a = 6 \text{ m/s}^2$, $N = 54 \text{ N}$ D) $a = 3 \text{ m/s}^2$, $N = 39 \text{ N}$

4. From the image given below, three blocks kept in contact on a smooth horizontal surface are pushed from opposite sides. Find the interaction force between the 5 kg and 6 kg blocks.



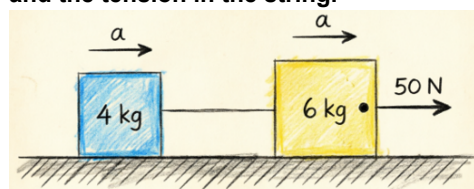
- A) 28 N B) 42 N
 C) 24 N D) 36 N

5. From the image given below, two blocks kept in contact on a smooth horizontal surface are acted upon by forces directed rightward: a pushing force on the left block and a pulling force on the right block. Find the contact force between the 2 kg and 8 kg blocks.



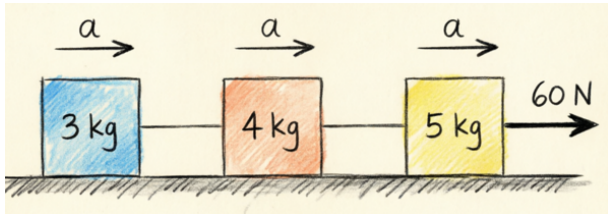
- A) 22 N B) 12 N
 C) 30 N D) 0 N

6. From the image given below, two blocks connected by a light inextensible string are placed on a smooth horizontal surface. A horizontal force is applied to the right block. Find the acceleration of each block and the tension in the string.



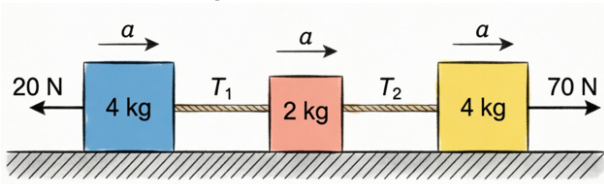
- A) $a = 8 \text{ m/s}^2$, $T = 32 \text{ N}$ B) $a = 10 \text{ m/s}^2$, $T = 25 \text{ N}$
 C) $a = 5 \text{ m/s}^2$, $T = 20 \text{ N}$ D) $a = 6 \text{ m/s}^2$, $T = 30 \text{ N}$

7. From the image given below, three blocks connected by light inextensible strings are placed on a smooth horizontal surface. A horizontal force is applied to the rightmost block. Find the acceleration of the system and the tensions T_1 and T_2 in the strings.



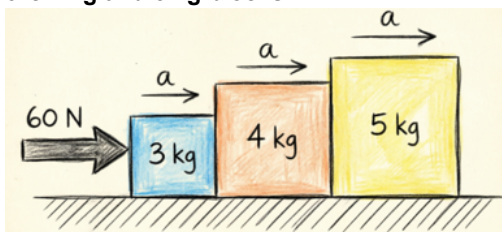
- A) $a = 8 \text{ m/s}^2, T_1 = 24 \text{ N}, T_2 = 40 \text{ N}$
 B) $a = 5 \text{ m/s}^2, T_1 = 15 \text{ N}, T_2 = 35 \text{ N}$
 C) $a = 6 \text{ m/s}^2, T_1 = 18 \text{ N}, T_2 = 42 \text{ N}$
 D) $a = 4 \text{ m/s}^2, T_1 = 30 \text{ N}, T_2 = 50 \text{ N}$

8. From the image given below, three blocks connected by light inextensible strings are placed on a smooth horizontal surface. Forces are applied to the outer blocks in opposite directions. Find the tensions T_1 and T_2 in the strings.



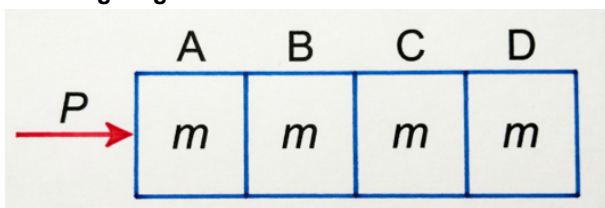
- A) $T_1 = 30 \text{ N}, T_2 = 60 \text{ N}$
 B) $T_1 = 50 \text{ N}, T_2 = 40 \text{ N}$
 C) $T_1 = 40 \text{ N}, T_2 = 50 \text{ N}$
 D) $T_1 = 45 \text{ N}, T_2 = 55 \text{ N}$

9. From the image given below, three blocks kept in contact on a smooth horizontal surface are pushed by a horizontal force applied to the leftmost block. Find the acceleration of the system and the contact forces between (i) the 3 kg and 4 kg blocks, and (ii) the 4 kg and 5 kg blocks.



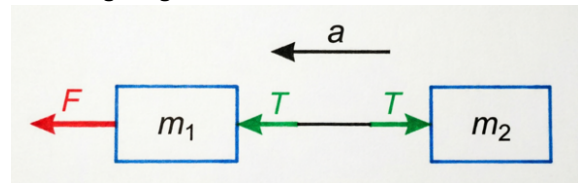
- A) $a = 4 \text{ m/s}^2, N_{34} = 36 \text{ N}, N_{45} = 20 \text{ N}$
 B) $a = 5 \text{ m/s}^2, N_{34} = 45 \text{ N}, N_{45} = 25 \text{ N}$
 C) $a = 6 \text{ m/s}^2, N_{34} = 42 \text{ N}, N_{45} = 30 \text{ N}$
 D) $a = 3 \text{ m/s}^2, N_{34} = 40 \text{ N}, N_{45} = 20 \text{ N}$

10. From the image given below Calculate : (i) a_{system} (ii) F_{CD} (iii) F_{BC} (iv) F_{AB} corresponding to the following diagram.



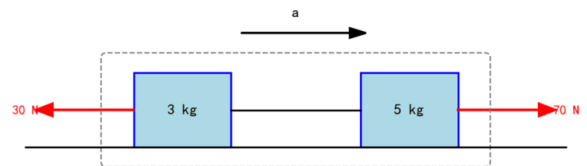
- A) $a_{\text{system}} = \frac{P}{4m}, F_{CD} = \frac{P}{4}, F_{BC} = \frac{P}{2}, F_{AB} = \frac{3P}{4}$
 B) $a_{\text{system}} = \frac{P}{3m}, F_{CD} = \frac{P}{3}, F_{BC} = \frac{2P}{3}, F_{AB} = \frac{3P}{4}$
 C) $a_{\text{system}} = \frac{P}{4m}, F_{CD} = \frac{P}{2}, F_{BC} = \frac{P}{3}, F_{AB} = \frac{3P}{4}$
 D) $a_{\text{system}} = \frac{P}{3m}, F_{CD} = \frac{P}{3}, F_{BC} = \frac{2P}{3}, F_{AB} = \frac{3P}{4}$

11. From the image given below Calculate T for the following diagram :



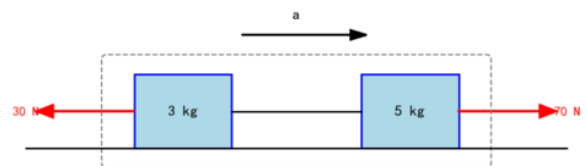
- A) $T = \frac{m_1 F}{m_1 + m_2}$
 B) $T = \frac{m_2 F}{m_1 + m_2}$
 C) $T = \frac{(m_1 + m_2) F}{m_1}$
 D) $T = \frac{F}{m_1 m_2}$

12. Two blocks of masses 3 kg and 5 kg connected by a string are pulled by forces 30 N to the left and 70 N to the right on a smooth horizontal surface. Find the acceleration of the system and the tension in the string connecting the blocks.



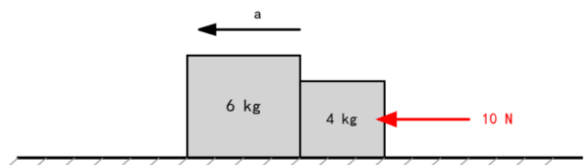
- A) Acceleration = 5 m/s^2 , Tension = 45 N
 B) Acceleration = 4 m/s^2 , Tension = 40 N
 C) Acceleration = 5 m/s^2 , Tension = 30 N
 D) Acceleration = 6 m/s^2 , Tension = 45 N

13. From the image given below, calculate the tension T in the string connecting the two blocks on a smooth horizontal surface.



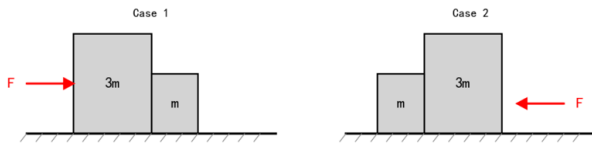
- A) 45 N
 B) 40 N
 C) 30 N
 D) 50 N

14. From the image given below, two blocks of mass 6 kg and 4 kg are placed in contact with each other on a frictionless horizontal surface. If a push of 10 N is applied on the lighter mass towards the heavier mass, the force exerted by the lighter mass on the heavier mass will be



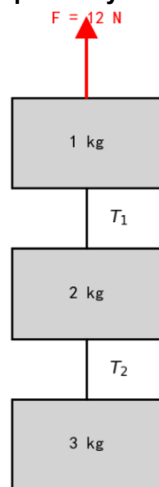
- A) 10 N
 B) 4 N
 C) 6 N
 D) 2 N

15. From the image given below, two blocks are in contact on a frictionless table; one has a mass m and the other $3m$ as shown in the figure. Force F is applied on mass $3m$, then the system moves towards the right. Now the same force F is applied on m . The ratio of the force of contact between the two blocks will be in the two cases respectively.



- A) 1 : 3
C) 1 : 1
B) 1 : 2
D) 3 : 1

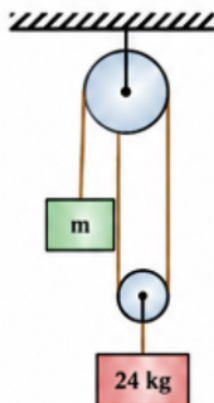
16. From the image given below, three blocks of masses 1 kg, 2 kg and 3 kg are connected to each other with light string and are then placed on a frictionless surface (or pulled vertically neglecting gravity) as shown in the figure. The system is pulled by a force



$F = 12 \text{ N}$, then tension $T_1 =$

- A) 2 N
C) 8 N
B) 4 N
D) 10 N

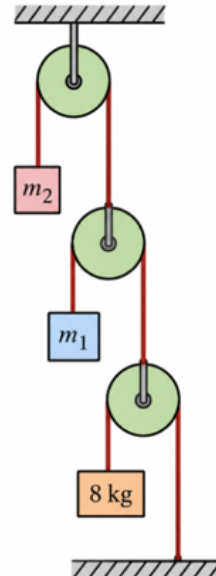
17. In the pulley system shown below, find the mass m if all masses are in equilibrium. Assume massless pulleys and a light, inextensible string, with a suspended mass of 24kg on the lower movable



pulley.

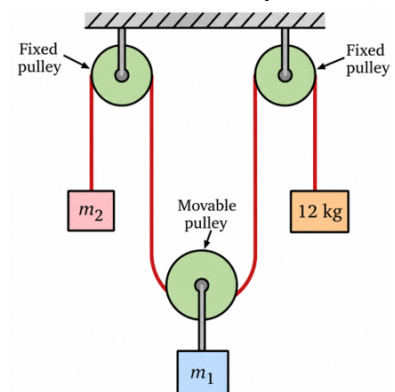
- A) 6kg
C) 12kg
B) 8kg
D) 16kg

18. In the pulley system shown, all pulleys and masses are in equilibrium. If the hanging mass at the bottom is 8kg, find the unknown masses m_1 and m_2 .



- A) $m_1 = 16\text{kg}, m_2 = 32\text{kg}$
C) $m_1 = 32\text{kg}, m_2 = 64\text{kg}$
B) $m_1 = 8\text{kg}, m_2 = 16\text{kg}$
D) $m_1 = 24\text{kg}, m_2 = 48\text{kg}$

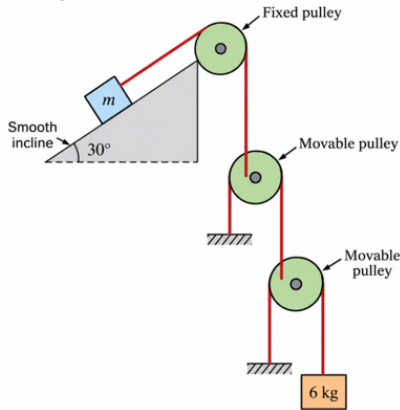
19. A pulley system consists of two fixed pulleys and one movable pulley. A 12kg mass hangs from one end of the rope passing around the movable pulley. The other end of this rope is fixed to the upper support. A second rope supports the movable pulley, with mass m_1 attached to the movable pulley and mass m_2 hanging from the other end of the second rope. If all masses are in equilibrium, find



m_1 and m_2 .

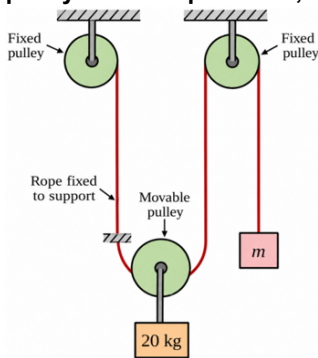
- A) $m_1 = 12\text{kg}, m_2 = 24\text{kg}$
C) $m_1 = 24\text{kg}, m_2 = 12\text{kg}$
B) $m_1 = 24\text{kg}, m_2 = 24\text{kg}$
D) $m_1 = 36\text{kg}, m_2 = 24\text{kg}$

20. From the pulley system shown, a mass of 6kg hangs from the lowest pulley system. The block of mass m is placed on a smooth inclined plane making an angle of 30° with the horizontal. If all masses and pulleys are in equilibrium, find m .



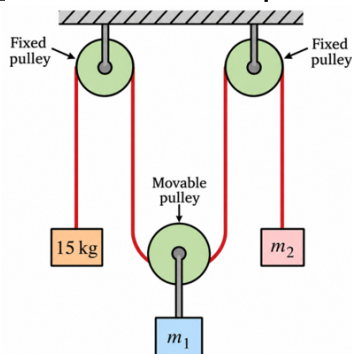
- A) 24kg
B) 36kg
C) 48kg
D) 60kg

21. In the pulley system shown, a 20kg load is attached to the movable pulley. The rope passes around the movable pulley, with one end fixed to the upper support and the other end passing over a fixed pulley and connected to a mass m . If all masses and pulleys are in equilibrium, find m .



- A) 5kg
B) 10kg
C) 15kg
D) 20kg

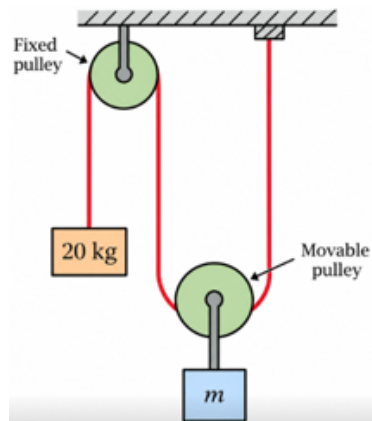
22. From the pulley system shown, a 15kg mass is attached to one end of a rope passing around a movable pulley. The other end passes over a fixed pulley and is connected to m_2 . The movable pulley is attached to m_1 . If all masses are in equilibrium,



find m_1 and m_2 .

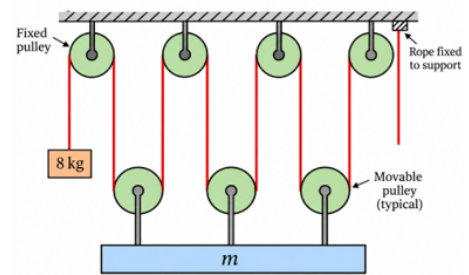
- A) $m_1 = 15\text{kg}, m_2 = 30\text{kg}$
B) $m_1 = 30\text{kg}, m_2 = 15\text{kg}$
C) $m_1 = 45\text{kg}, m_2 = 15\text{kg}$
D) $m_1 = 30\text{kg}, m_2 = 30\text{kg}$

23. From the pulley system shown, a 20kg mass is attached to one end of a light rope. The rope passes around a movable pulley and then over a fixed pulley. The movable pulley supports the unknown mass m . If all masses are in equilibrium, find m .



- A) 10kg
B) 20kg
C) 40kg
D) 60kg

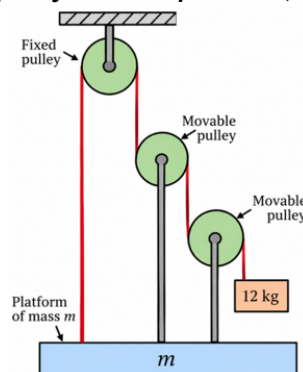
24. From the pulley system shown, a 8kg mass is attached to one end of the rope. The system contains four movable pulleys, all connected to the same horizontal platform of mass m . If all masses and pulleys are in equilibrium, find the unknown



mass m .

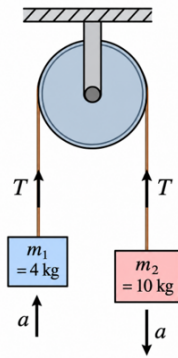
- A) 32kg
B) 48kg
C) 64kg
D) 80kg

25. From the pulley system shown, a 12kg mass is attached to the end of the lowest rope. Three movable pulleys are connected to the same horizontal platform of mass m . If all masses and pulleys are in equilibrium, find the unknown mass m .



- A) 72kg
B) 84kg
C) 96kg
D) 108kg

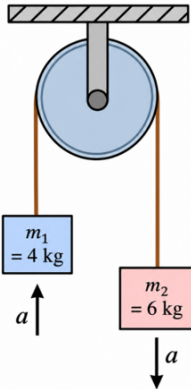
26. Two bodies of mass $m_1 = 4\text{kg}$ and $m_2 = 10\text{kg}$ are attached to the ends of a light, inextensible string passing over a smooth, massless pulley. Find the acceleration a of the system and the tension T in



the string.

- A) $a = \frac{3g}{7}$, $T = \frac{40g}{7}$ B) $a = \frac{3g}{7}$, $T = \frac{20g}{7}$
 C) $a = \frac{g}{2}$, $T = 4g$ D) $a = \frac{g}{7}$, $T = \frac{40g}{7}$

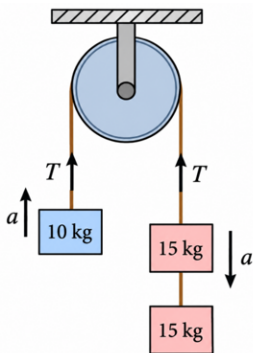
27. From the pulley system shown, two masses $m_1 = 4\text{kg}$ and $m_2 = 6\text{kg}$ are connected by a light, inextensible string passing over an ideal pulley. If the pulley is frictionless and all masses are released from rest, find the acceleration of each mass. Take



$g = 10\text{m/s}^2$.

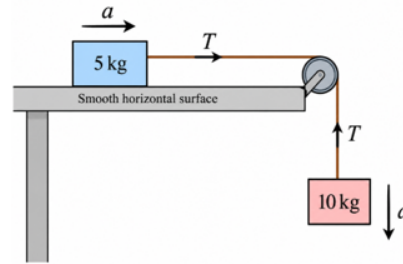
- A) 1m/s^2 B) 2m/s^2
 C) 4m/s^2 D) 5m/s^2

28. From the pulley system shown, find the acceleration a of the system and the string tension T for a 10kg mass on one side and two 15kg masses connected together on the other side. Take $g = 10\text{m/s}^2$ and assume the pulley and string are ideal.



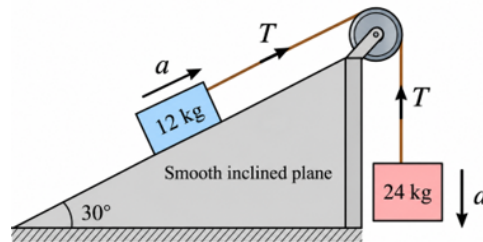
- A) $a = 3\text{m/s}^2$, $T = 130\text{N}$ B) $a = 4\text{m/s}^2$, $T = 140\text{N}$
 C) $a = 5\text{m/s}^2$, $T = 150\text{N}$ D) $a = 6\text{m/s}^2$, $T = 160\text{N}$

29. From the pulley system shown, find the acceleration a of the system and the string tension T when a 5kg block on a smooth horizontal surface is connected by a light string over an ideal pulley to a hanging 10kg block. Take $g = 10\text{m/s}^2$.



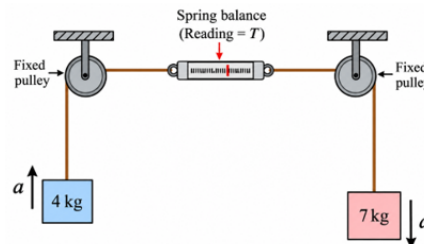
- A) $a = \frac{10}{3}\text{m/s}^2$, $T = \frac{50}{3}\text{N}$ B) $a = 5\text{m/s}^2$, $T = 25\text{N}$
 C) D) $a = 2\text{m/s}^2$, $T = 40\text{N}$
 $a = \frac{20}{3}\text{m/s}^2$, $T = \frac{100}{3}\text{N}$

30. From the pulley system shown, find the acceleration a of the system and the string tension T for a 12kg block on a smooth inclined plane of 30° connected to a hanging 24kg block. Assume the pulley and string are ideal. Take $g = 10\text{m/s}^2$.



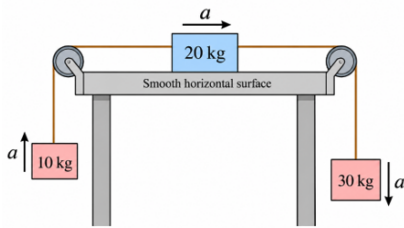
- A) $a = 4\text{m/s}^2$, $T = 108\text{N}$ B) $a = 5\text{m/s}^2$, $T = 120\text{N}$
 C) $a = 6\text{m/s}^2$, $T = 132\text{N}$ D) $a = 8\text{m/s}^2$, $T = 144\text{N}$

31. From the pulley system shown, find the acceleration a of the system and the spring balance reading T when a 4kg block and a 7kg block are connected by a light string over two fixed pulleys, with a spring balance placed in between. Take $g = 10\text{m/s}^2$.



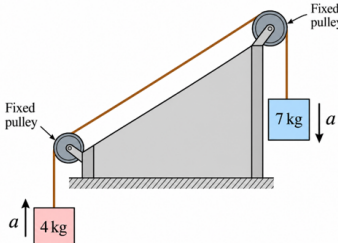
- A) $a = \frac{30}{11}\text{m/s}^2$, $T = \frac{560}{11}\text{N}$ B) $a = \frac{20}{11}\text{m/s}^2$, $T = \frac{480}{11}\text{N}$
 C) $a = 3\text{m/s}^2$, $T = 48\text{N}$ D) $a = 4\text{m/s}^2$, $T = 56\text{N}$

32. From the pulley system shown, find the acceleration a of the system consisting of a 10kg hanging block, a 20kg block on a smooth horizontal table, and a 30kg hanging block connected by strings over two ideal fixed pulleys. Take $g = 10\text{m/s}^2$.



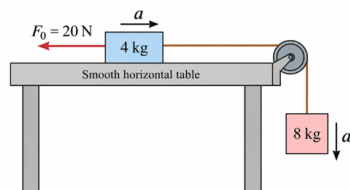
- A) 2m/s^2 B) $\frac{10}{3}\text{m/s}^2$
C) 4m/s^2 D) 5m/s^2

33. From the pulley arrangement shown, a 4kg hanging block and a 7kg hanging block are connected by a light, inextensible string passing over two fixed, ideal pulleys. Find the acceleration a of the system and the string tension T . Take $g = 10\text{m/s}^2$.



- A) $a = \frac{30}{11}\text{m/s}^2$, $T = \frac{560}{11}\text{N}$ B) $a = \frac{20}{11}\text{m/s}^2$, $T = \frac{480}{11}\text{N}$
C) $a = 3\text{m/s}^2$, $T = 40\text{N}$ D) $a = 4\text{m/s}^2$, $T = 56\text{N}$

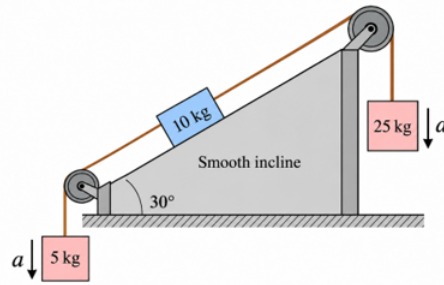
34. From the pulley system shown, find the acceleration a of the system where a 4kg block on a smooth horizontal table has an opposing force $F_0 = 20\text{N}$ and is connected to a hanging 8kg block. Take



$g = 10\text{m/s}^2$.

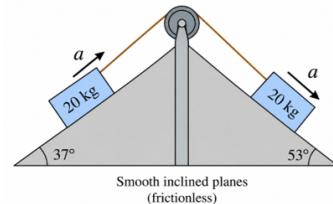
- A) $a = 3\text{m/s}^2$ B) $a = 4\text{m/s}^2$
C) $a = 5\text{m/s}^2$ D) $a = 6\text{m/s}^2$

35. From the pulley system shown, find the acceleration a of the system consisting of a 25kg hanging block, a 10kg block on a 30° smooth inclined plane, and a 5kg hanging block connected over ideal pulleys. Take $g = 10\text{m/s}^2$.



- A) $a = 2.50\text{m/s}^2$ B) $a = 3.75\text{m/s}^2$
C) $a = 4.25\text{m/s}^2$ D) $a = 5.00\text{m/s}^2$

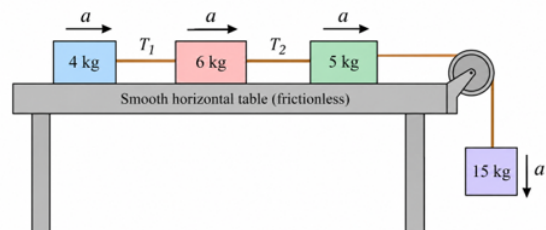
36. From the image given below, find the acceleration a of the system where two 20kg blocks are placed on opposite smooth inclined planes of 37° and 53° , connected by a light string over an ideal pulley at the top. Take $g = 10\text{m/s}^2$, $\sin 37^\circ = \frac{3}{5}$, and



$\sin 53^\circ = \frac{4}{5}$.

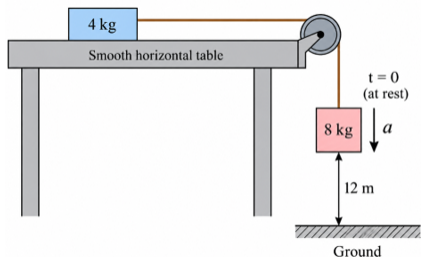
- A) $a = 1\text{m/s}^2$ B) $a = 2\text{m/s}^2$
C) $a = 3\text{m/s}^2$ D) $a = 4\text{m/s}^2$

37. From the pulley system shown, find the acceleration a of the system and the string tensions T_1 and T_2 for blocks of masses 4kg, 6kg, and 5kg placed on a smooth horizontal table and connected to a hanging 15kg block. Assume the strings and pulley are ideal. Take $g = 10\text{m/s}^2$.



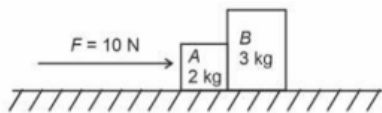
- A) $a = 4\text{m/s}^2$, $T_1 = 16\text{N}$, $T_2 = 40\text{N}$ B) $a = 4\text{m/s}^2$, $T_1 = 20\text{N}$, $T_2 = 50\text{N}$
C) $a = 6\text{m/s}^2$, $T_1 = 24\text{N}$, $T_2 = 60\text{N}$ D) $a = 6\text{m/s}^2$, $T_1 = 28\text{N}$, $T_2 = 70\text{N}$

38. From the pulley system shown, find the time when the 8kg block strikes the ground if it starts from rest at a height of 12m and is connected to a 4kg block on a smooth horizontal table. Take $g = 10\text{m/s}^2$.



- A) $t = \sqrt{\frac{6}{5}}\text{s}$ B) $t = \sqrt{\frac{18}{5}}\text{s}$
 C) $t = \sqrt{\frac{24}{5}}\text{s}$ D) $t = \sqrt{\frac{30}{5}}\text{s}$

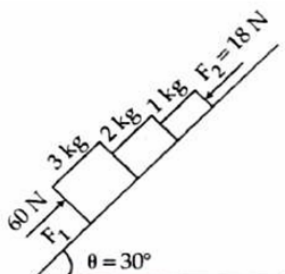
39. A horizontal force 10N is applied to a block A as shown in figure. The mass of blocks A and B are 2kg and 3 kg respectively. The blocks slide over a frictionless surface. The force exerted by block A on



block B is :

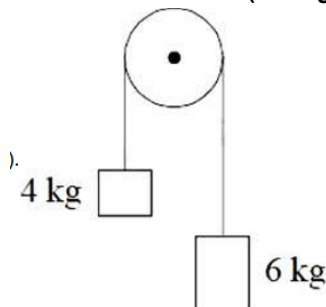
- A) Zero B) 4N
 C) 6N D) 10N

40. In the diagram shown, the normal reaction force between 2 kg and 1 kg is (Consider the surface, to be smooth) : Given $g = 10\text{ m/s}^2$



- A) 10N B) 25N
 C) 39N D) 6N

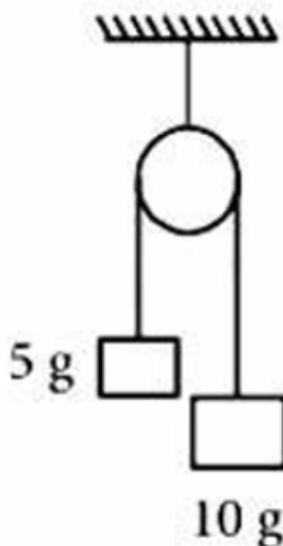
41. Two bodies of mass 4kg and 6kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure).



The acceleration of the system in terms of acceleration due to gravity (g) is:

- A) $g/2$ B) $g/5$
 C) $g/10$ D) g

42. Two masses as shown in the figure are suspended from a massless pulley. The acceleration of the system when masses are left free is.



- A) $2g/3$ B) $g/3$
 C) $g/9$ D) $g/7$

43. A box of mass 5 kg is pulled by a cord, up along a frictionless plane inclined at 30° with the horizontal. The tension in the cord is 30N. The acceleration of the box is (Take $g = 10\text{ m/s}^2$).

- A) 2 m/s^2 B) Zero
 C) 0.1 m/s^2 D) 1 m/s^2

44. A body, under the action of a force

$\vec{F} = 6i - 8j + 10k$, acquires an acceleration of 1 m/s^2 . The mass of this body must be.

- A) 10 kg B) 20 kg
 C) $10\sqrt{2}\text{ kg}$ D) $2\sqrt{10}\text{ kg}$

45. A 10N force is applied on a body produce in it an acceleration of 1 m/s^2 . The mass of the body is

- A) 15 kg B) 20 kg
 C) 10 kg D) 5 kg

Chemistry

46. Which of the following orders of ionic radii is correctly represented?

- A) $H^- > H^+ > H$ B) $Na^+ < F^- < O^{2-}$
 C) $F^- > O^{2-} > Na^+$ D) $Al^{3+} > Mg^{2+} > N^{3-}$

47. Acidity of diprotic acids in aqueous solutions increases in the order:

- A) $H_2S < H_2Se < H_2Te$ B) $H_2Se < H_2S < H_2Te$
 C) $H_2Te < H_2S < H_2Se$ D) $H_2Se < H_2Te < H_2S$

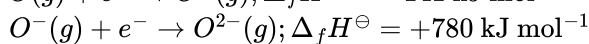
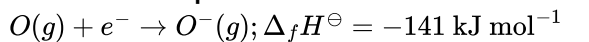
48. The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?

- A) $Ca^{2+} < Ar < K^+$ B) $Ca^{2+} < K^+ < Ar$
 C) $K^+ < Ar < Ca^{2+}$ D) $Ar < K^+ < Ca^{2+}$

49. The number of d-electrons in Fe^{2+} ($Z = 26$) is not equal to the number of electrons in which one of the following?

- A) p-electrons in Cl ($Z = 17$)
B) d-electrons in Fe ($Z = 26$)
C) p-electrons in Ne ($Z = 10$)
D) s-electrons in Mg ($Z = 12$)

50. The formation of the oxide ion, $O^{2-}(g)$, from oxygen atom requires first an exothermic and then an endothermic step as shown below:



Thus process of formation of O^{2-} in gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that:

- A) Oxygen is more electronegative
B) Addition of electron in oxygen results in larger size of the ion
C) Electron repulsion outweighs the stability gained by achieving noble gas configuration
D) O^- ion has comparatively smaller size than oxygen atom

51. In which of the following options the order of arrangement does not agree with the variation of property indicated against it? (1) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size) (2) $B < C < N < O$ (increasing first ionisation enthalpy) (3) $I < Br < Cl < F$ (increasing electron gain enthalpy) (4) $Li < Na < K < Rb$ (increasing metallic radius)

- A) (1)
B) (2) and (3)
C) (2)
D) (3)

52. The correct order of atomic radii in group 13 elements is:

- A) $B < Al < In < Ga < Tl$
B) $B < Al < Ga < In < Tl$
C) $B < Ga < Al < Tl < In$
D) $B < Ga < Al < In < Tl$

53. Which of the following is an amphoteric hydroxide?

- A) $Sr(OH)_2$
B) $Ca(OH)_2$
C) $Mg(OH)_2$
D) $Be(OH)_2$

54. Match the oxide given in column A with its property given in column B:

Column-A

(i) Na_2O

(ii) Al_2O_3

(iii) N_2O

(iv) Cl_2O_7

Column-B

(a) Neutral

(b) Basic

(c) Acidic

(d) Amphoteric

Which of the following options has all correct pairs?

- A) (i)-(b), (ii)-(a), (iii)-(d), (iv)-(c)
B) (i)-(c), (ii)-(b), (iii)-(a), (iv)-(d)
C) (i)-(a), (ii)-(d), (iii)-(b), (iv)-(c)
D) (i)-(b), (ii)-(d), (iii)-(a), (iv)-(c)

55. Identify the incorrect match:

Name	IUPAC Official Name
(a) Unnilunium	(i) Mendelevium
(b) Unniltrium	(ii) Lawrencium
(c) Unnilhexium	(iii) Seaborgium
(d) Unununnium	(iv) Darmstadtium

- A) (d), (iv)
B) (a), (i)
C) (b), (ii)
D) (c), (iii)

56. Match the element in column I with that in column II.

Column-I

(a) Copper

(b) Fluorine

(c) Silicon

(d) Cerium

Column-II

(i) Non-metal

(ii) Transition metal

(iii) Lanthanoid

(iv) Metalloid

Identify the correct match:

- A) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
B) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
C) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
D) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

57. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it?

- A) $HF < HCl < HBr < HI$: Increasing acidic strength
B) $H_2O < H_2S < H_2Se < H_2Te$: Increasing pK_a values
C) $NH_3 < PH_3 < AsH_3 < SbH_3$: Increasing acidic character
D) $SiO_2 < SnO_2 < PbO_2$: Increasing oxidizing power

58. If first ionization enthalpies of element X and Y are 419 kJ mol^{-1} and 590 kJ mol^{-1} , respectively and second ionization enthalpies of X and Y are 3069 kJ mol^{-1} and 1145 kJ mol^{-1} , respectively. Then correct statement is:

- A) X is an alkali metal and Y is an alkaline earth metal.
B) X is an alkaline earth metal and Y is an alkali metal.
C) Both X and Y are alkali metals.
D) Both X and Y are alkaline earth metals.

59. The correct order of first ionization enthalpy for the given four elements is:

- A) $C < N < F < O$
B) $C < N < O < F$
C) $C < O < N < F$
D) $C < F < N < O$

60. Which of the following is correctly matched?

- A) Basic oxides: In_2O_3, K_2O, SnO_2
B) Neutral oxides: CO, NO_2, N_2O
C) Acidic oxides: Mn_2O_7, SO_2, TeO_3
D) Amphoteric oxides: BeO, Ga_2O_3, GeO

61. The correct sequence given below containing neutral, acidic, basic and amphoteric oxide each, respectively, is:

- A) NO, ZnO, CO_2, CaO B) ZnO, NO, CaO, CO_2
C) NO, CO_2, ZnO, CaO D) NO, CO_2, CaO, ZnO

62. Arrange the following elements in increasing order of electronegativity: N, O, F, C, Si. Choose the correct answer from the options given below:

- A) $Si < C < N < O < F$ B) $Si < C < O < N < F$
C) $O < F < N < C < Si$ D) $F < O < N < C < Si$

63. Arrange the following elements in increasing order of first ionization enthalpy: Li, Be, B, C, N. Choose the correct answer from the options given below:

- A) $Li < Be < B < C < N$ B) $Li < B < Be < C < N$
C) $Li < Be < C < B < N$ D) $Li < Be < N < B < C$

64. The correct decreasing order of atomic radii (pm) of Li, Be, B and C is:

- A) $Be > Li > B > C$ B) $Li > Be > B > C$
C) $C > B > Be > Li$ D) $Li > C > Be > B$

65. Match List-I with List-II:

List-I
(Block/group in periodic table)

- (A) Lanthanoid
(B) d-block element
(C) p-block element
(D) s-block element

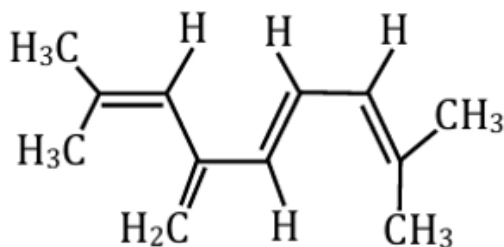
List-II
(Element)

- I. Ce
II. As
III. Cs
IV. Mn

Choose the correct answer from the options given below:

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

66. The total number of π -bond electrons in the following structure is:



- A) 8 B) 12
C) 16 D) 4

67. Decreasing order of stability of O_2 , O_2^- , O_2^+ , and O_2^{2-} is:

- A) $O_2 > O_2^+ > O_2^{2-} > O_2^-$ B) $O_2^- > O_2^{2-} > O_2^+ > O_2$
C) $O_2^+ > O_2 > O_2^- > O_2^{2-}$ D) $O_2^{2-} > O_2^- > O_2 > O_2^+$

68. Predict the correct order of repulsion among the following:

- A) lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
B) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
C) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
D) lone pair - bond pair > bond pair - bond pair > lone pair - lone pair

69. Match the compounds given in Column-I with the hybridisation and shape given in Column-II and mark the correct option:

Column-I		Column-II	
(a)	XeF_6	(i)	Distorted octahedral
(b)	XeO_3	(ii)	Square planer
(c)	$XeOF_4$	(iii)	Pyramidal
(d)	XeF_4	(iv)	Square pyramidal

- A) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii) B) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)
C) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii) D) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

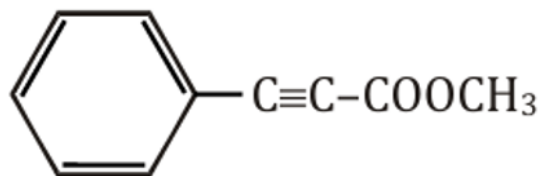
70. Among CaH_2 , BeH_2 , and BaH_2 , the order of ionic character is:

- A) $BeH_2 < CaH_2 < BaH_2$ B) $CaH_2 < BeH_2 < BaH_2$
C) $BeH_2 < BaH_2 < CaH_2$ D) $BaH_2 < BeH_2 < CaH_2$

71. Which of the following is the correct order of dipole moment?

- A) $NH_3 < BF_3 < NF_3 < H_2CO < NF_3 < NH_3 < H_2O$
B) $NH_3 < BF_3 < NF_3 < H_2CO < NF_3 < NH_3 < H_2O$
C) $BF_3 < NH_3 < NF_3 < H_2CO < NF_3 < NH_3 < BF_3$
D) $BF_3 < NH_3 < NF_3 < H_2CO < NF_3 < NH_3 < BF_3$

72. How many (i) sp^2 hybridised carbon atoms and (ii) π bonds are present in the compound?



- A) 7, 5 B) 8, 6
C) 7, 6 D) 8, 5

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

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

74. Intermolecular forces are forces of attraction and repulsion between interacting particles that will include: A. dipole - dipole forces B. dipole - induced dipole forces C. hydrogen bonding D. covalent bonding E. dispersion forces

- A) A, B, C, D are correct B) A, B, C, E are correct
C) A, C, D, E are correct D) B, C, D, E are correct

75. Amongst the given options which of the following molecules/ion acts as a Lewis acid?

- A) H_2O B) BF_3
C) OH^- D) NH_3

76. 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) $NH_3 > H_2S > CH_4 > HF$

77. Identify the correct answer:

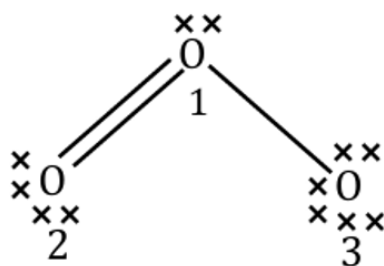
- A) Three resonance structures can be drawn for ozone B) BF_3 has non-zero dipole moment
C) Dipole moment of NF_3 is greater than that of NH_3 D) Three canonical forms can be drawn for CO_3^{2-} ion

78. 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

- 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

79. Given below are two statements: Statement-I: The correct Lewis structure of O_3 may be as



Statement-II:

In O_3 , the formal charges on atom 1, 2, and 3 are +1, 0, and -1 respectively.

- A) Statement-I is incorrect and II is correct B) Statement-I is correct while II is incorrect
C) Statement-I and II both are correct D) Both Statement-I and II are incorrect

80. In which of the following molecule/ion hybridisation of central atom is sp^3d ? (A) I_3^- , (B) I_3^+ , (C) ClF_3 , (D) IF_5

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

81. Which of the following species do not exist? (A)

PH_5 , (B) KHF_2 , (C) BF_5^{2-} , (D) BeF_4^{2-}

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

82. Which of the following combination leads to formation of π bond (Molecular axis is z axis)? (A)

$p_y + p_y$, (B) $d_{yz} + d_{yz}$, (C) $p_x + d_{zx}$, (D) $d_{xy} + d_{yz}$

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

83. Which of the following molecules exhibit intramolecular hydrogen bonding? (A) chloral hydrate, (B) p-nitrophenol, (C) salicylaldehyde, (D) acetic acid

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

84. Which of the following gives only SO_2 gas on thermal decomposition? (A) $ZnSO_4$, (B) $CaSO_3$, (C) $Fe_2(SO_4)_3$, (D) $BaSO_3$

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

85. Which of the following order of solubility in water is correct? (A) $AgF > AgCl > AgBr > AgI$ (B) $BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$ (C) $LiOH > NaOH > KOH > RbOH > CsOH$ (D) $SnCl_4 > SnCl_2$

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

86. Which of the following gives paramagnetic gas on heating? (A) $LiNO_3$, (B) $CaCO_3$, (C) $NaNO_3$, (D) NH_4NO_2

- A) A, B and C options are correct B) A & B both are correct
C) B & D both are correct D) A & C both are correct

87. Match Column-I with Column-II:

Column-I		Column-II	
(i)	ClF_3	(a)	Non-planar and non-polar
(ii)	XeF_4	(b)	Non-planar & polar
(iii)	NF_3	(c)	Planar and polar
(iv)	PCl_5	(d)	Planar and non-polar

- A) i-a, ii-b, iii-c, iv-d
 B) i-c, ii-d, iii-b, iv-a
 C) i-c, ii-d, iii-a, iv-b
 D) i-d, ii-a, iii-b, iv-c

88. Which of the following molecule(s) is polar? (A) CHCl_3 , (B) CF_4 , (C) O_2F_2 , (D) C_2F_2

- A) A, B and C options are correct
 B) A & B both are correct
 C) B & D both are correct
 D) A & C both are correct

89. Given below are two statements; one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A): AgCl is more covalent than NaCl . Reason (R): Polarising power of Ag^+ is greater than Na^+ ion.

- A) (A) & (R) both are incorrect
 B) If (A) & (R) both are correct and (R) is the correct explanation of (A)
 C) If (A) & (R) both are correct but (R) is not the correct explanation of (A)
 D) (A) is correct but (R) is incorrect

90. Given below are two statements: Statement-I: In the periodic table, the highly electronegative Halogens and the highly electropositive alkali metals are separated by the noble gases. Statement-II: Formation of an anion from a halogen atom and formation of a cation from an alkali metal are stabilized by electrostatic attraction.

- A) Statement-I is incorrect and II is correct
 B) Statement-I and II both are correct
 C) Statement-I is correct while II is incorrect
 D) Both Statement-I and II are incorrect

Botany

91. Which of the following is the characteristic feature of dicotyledonous plants regarding their root system?

- A) Fibrous root system
 B) Taproot system
 C) Adventitious root system
 D) Prop roots

92. In monocotyledonous plants, the primary root is short-lived and replaced by a large number of roots. These roots originate from:

- A) The radicle
 B) The base of the stem
 C) The lower nodes of the stem
 D) The cortex of the root

93. Roots developed from parts of the plant other than the radicle are called:

- A) Taproots
 B) Fibrous roots
 C) Adventitious roots
 D) Secondary roots

94. Identify the plant that possesses adventitious roots:

- A) Mustard
 B) Wheat
 C) Monstera
 D) Sunflower

95. The region of the root responsible for the growth of the root in length is the:

- A) Region of maturation
 B) Region of elongation
 C) Region of meristematic activity
 D) Root cap

96. Root hairs develop from the region of:

- A) Elongation
 B) Maturation
 C) Meristematic activity
 D) Root cap zone

97. The primary function of the root cap is to:

- A) Absorb water and minerals
 B) Protect the tender apex of the root
 C) Fix the plant firmly in the soil
 D) Store food reserves

98. Which region of the root consists of very small, thin-walled cells with dense protoplasm?

- A) Region of elongation
 B) Region of maturation
 C) Region of meristematic activity
 D) Root hair zone

99. Taproots of which of the following plants get swollen and store food?

- A) Sweet potato
 B) Turnip
 C) Asparagus
 D) Maize

100.

Adventitious roots of which plant get swollen to store food?

- A) Carrot
 B) Radish
 C) Sweet potato
 D) Turnip

101.

Pneumatophores are found in plants growing in:

- A) Sandy areas
 B) Swampy areas
 C) Saline deserts
 D) Dry hilly terrains

102.

An example of a plant showing pneumatophores is:

- A) Rhizophora
 B) Banyan
 C) Pandanus
 D) Monstera

103.

Stilt roots arise from the lower nodes of the stem in:

- A) Banyan tree
 B) Maize and Sugarcane
 C) Carrot and Turnip
 D) Sweet potato

104.

Select the correct statement regarding root modifications:

- | | |
|---|---|
| A) Turnip has adventitious roots for food storage. | B) Prop roots are meant for respiration. |
| C) Rhizophora possesses negatively geotropic roots. | D) Stilt roots arise from the upper branches of a tree. |

105.

Which of the following parts of the root absorbs water and minerals?

- | | |
|---------------|-------------------------|
| A) Root cap | B) Region of elongation |
| C) Root hairs | D) Meristematic zone |

106.

The taproot system is structurally formed by the elongation of the:

- | | |
|--------------|-------------|
| A) Plumule | B) Radicle |
| C) Hypocotyl | D) Epicotyl |

107.

Fasciculated roots for storage are found in:

- | | |
|-------------------------|------------------------|
| A) Dahlia and Asparagus | B) Radish and Carrot |
| C) Maize and Sugarcane | D) Ginger and Turmeric |

108.

The stem develops from the _____ of the embryo of a germinating seed.

- | | |
|--------------|--------------|
| A) Radicle | B) Plumule |
| C) Cotyledon | D) Hypocotyl |

109.

The region of the stem where leaves are born are called _____, while portions between them are called _____.

- | | |
|----------------------|----------------------|
| A) Internodes, nodes | B) Nodes, internodes |
| C) Axils, petioles | D) Buds, scars |

110.

Stems can be distinguished from roots because stems bear:

- | | |
|-------------------------|--------------------------------|
| A) Endodermis | B) Root hairs |
| C) Nodes and internodes | D) Positive geotropic movement |

111.

Axillary buds develop from the cells remaining behind from the:

- | | |
|-------------------------|--------------------------|
| A) Root apical meristem | B) Shoot apical meristem |
| C) Lateral meristem | D) Intercalary meristem |

112.

Underground stems of potato, ginger, turmeric, zaminkand, and colocasia are modified to:

- | | |
|--|-----------------|
| A) Perennate through unfavourable conditions | B) Store food |
| C) Perform photosynthesis | D) Both A and B |

113.

Which of the following is an underground stem modification?

- | | |
|-----------------|-----------|
| A) Sweet potato | B) Potato |
| C) Carrot | D) Radish |

114.

Stem tendrils develop from _____ and help plants to climb.

- | | |
|----------------------|------------------|
| A) Terminal buds | B) Axillary buds |
| C) Adventitious buds | D) Radical buds |

115.

Stem tendrils are found in:

- | | |
|--------------------------|------------------------------|
| A) Cucumber and Pumpkins | B) Grapevines and Watermelon |
| C) Peas | D) Both A and B |

116.

Thorns are hard, woody, and pointed structures modified from:

- | | |
|------------------|-------------|
| A) Leaves | B) Stipules |
| C) Axillary buds | D) Roots |

117.

Thorns protect plants from browsing animals. Which pair of plants exhibits thorns?

- | | |
|-----------------------------|-------------------------|
| A) Citrus and Bougainvillea | B) Cucumber and Pumpkin |
| C) Opuntia and Euphorbia | D) Aloe and Agave |

118.

In arid regions, some plants modify their stems into flattened or fleshy cylindrical structures containing chlorophyll to carry out photosynthesis. These are called:

- | | |
|--------------|-----------------|
| A) Phyllodes | B) Phylloclades |
| C) Cladodes | D) Tendrils |

119.

A flattened photosynthetic stem is found in:

- | | |
|--------------|------------------|
| A) Euphorbia | B) Opuntia |
| C) Citrus | D) Bougainvillea |

120.

Underground stems of some plants spread to new niches, and when older parts die, new plants are formed. This occurs in:

- | | |
|--------------------------|--------------------------------|
| A) Grass and Strawberry | B) Mint and Jasmine |
| C) Pistia and Eichhornia | D) Chrysanthemum and Pineapple |

121.

A slender lateral branch arises from the base of the main axis and after growing aurally for some time arches downwards to touch the ground. This runner-like growth (Stolon) is seen in:

- | | |
|--------------------------|----------------------|
| A) Grass and Clover | B) Mint and Jasmine |
| C) Pistia and Eichhornia | D) Banana and Ginger |

122.

A lateral branch with short internodes and each node bearing a rosette of leaves and a tuft of roots is found in aquatic plants like:

- A) Hydrilla and Vallisneria B) Pistia and Eichhornia
C) Mint and Jasmine D) Chrysanthemum and Pineapple

123.

The lateral branches originate from the basal and underground portion of the main stem, grow horizontally beneath the soil and then come out obliquely upward giving rise to leafy shoots. These are called suckers, found in:

- A) Banana, Pineapple, and Chrysanthemum B) Mint, Jasmine, and Strawberry
C) Colocasia, Zaminkand, and Ginger D) Pistia, Eichhornia, and Lemna

124.

Match the following columns and select the correct option: p. Rhizome — i. Colocasia q. Corm — ii. Ginger r. Stem Tuber — iii. Potato

- A) p-ii, q-i, r-iii B) p-i, q-ii, r-iii
C) p-iii, q-i, r-ii D) p-ii, q-iii, r-i

125.

The edible part of a potato is a:

- A) Root modification B) Stem modification
C) Leaf modification D) Inflorescence

126.

The 'eyes' of a potato tuber represent:

- A) Root scars B) Axillary buds
C) Lenticels D) Adventitious roots

127.

Statement I: The primary root is the direct elongation of the radicle. Statement II: In fibrous root systems, roots originate from the upper nodes of the stem.

- A) Both Statement I and Statement II are correct. B) Both Statement I and Statement II are incorrect.
C) Statement I is correct but Statement II is incorrect. D) Statement I is incorrect but Statement II is correct.

128.

Assertion (A): Rhizophora grows in swampy areas and has respiratory roots. Reason (R): These roots grow vertically downwards to absorb excess water from the swamp.

- A) Both A and R are true and R is the correct explanation of A. B) Both A and R are true but R is NOT the correct explanation of A.
C) A is true but R is false. D) Both A and R are false.

129.

Statement I: Sweet potato is a modified stem for food storage. Statement II: Potato is an underground stem modified for food storage.

- A) Both Statement I and Statement II are correct. B) Both Statement I and Statement II are incorrect.
C) Statement I is correct but Statement II is incorrect. D) Statement I is incorrect but Statement II is correct.

130.

Assertion (A): Stem tendrils and thorns in Bougainvillea are homologous structures. Reason (R): Both arise from the axillary buds and perform identical functions.

- A) Both A and R are true and R is the correct explanation of A. B) Both A and R are true but R is NOT the correct explanation of A.
C) A is true but R is false. D) Both A and R are false.

131.

Which of the following is NOT a function of the stem?

- A) Conducting water, minerals, and photosynethates B) Storage of food and support
C) Absorption of water and minerals from deep soil D) Vegetative propagation

132.

A modification of stem that reduces the rate of transpiration in xerophytic plants is:

- A) Tendrils B) Thorns
C) Spine formation on phylloclade D) Runner

133.

Select the odd one out with respect to underground stem modifications:

- A) Ginger B) Turnip
C) Zaminkand D) Colocasia

134.

In grass, vegetative propagation occurs through:

- A) Runner B) Stolon
C) Offset D) Sucker

135.

Identify the correct match:

- A) Pistia — Stolon B) Jasmine — Offset
C) Pineapple — Sucker D) Strawberry — Corm

Zoology

136.

The flightless bird with forelimbs modified as paddle-like structures suited for swimming is known as:

- A) Struthio B) Neophron
C) Aptenodytes D) Psittacula

A) (a)-(iv) (b)-(iii) (c)-(i) (d)-(ii)
B) (a)-(iii) (b)-(iv) (c)-(i) (d)-(ii)
C) (a)-(iii) (b)-(iv) (c)-(ii) (d)-(i)
D) (a)-(iv) (b)-(i) (c)-(ii) (d)-(iii)

147.

Which of the following statements are true for the phylum-Chordata? (i) In Urochordata notochord extends from head to tail and it is present throughout their life. (ii) In Vertebrata notochord is present during the embryonic period only. (iii) Central nervous system is dorsal and hollow. (iv) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.

- A) (iii) and (i) B) (i) and (ii)
C) (ii) and (iii) D) (i) and (iii)

148.

Match the following organisms with their respective characteristics:

(A) Pila	(i) Flame cells
(B) Bombyx	(ii) Comb plates
(C) Pleurobrachia	(iii) Radula
(D) Taenia	(iv) Malpighian tubules

Select the correct option from the following: (a) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv) (b) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i) (c) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i) (d) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

- A) (a) B) (b)
C) (c) D) (d)

149.

Which of the following characteristic features always holds true for the corresponding group of animals? (a) Possess a mouth with an upper and a lower jaw — Chordata (b) chambered heart with one incompletely divided ventricle — Reptilia (c) Cartilaginous endoskeleton — Chondrichthyes (d) Viviparous — Mammalia

- A) (a) B) (b)
C) (c) D) (d)

150.

Which group of animals belong to the same phylum?

- A) Prawn, Scorpion, Locusta B) Sponge, Sea anemone, Starfish
C) Malarial parasite, Amoeba, Mosquito D) Earthworm, Pinworm, Tapeworm

151.

Choose the correct statements regarding frog's anatomy: A. Hepatic portal system is the special venous connection between liver and intestine. B. There are twelve pairs of cranial nerves arising from the brain. C. The ureters and oviducts open separately into the cloaca in female frogs. D. Hind-brain consists of cerebellum, medulla oblongata and optic lobes. E. Sinus venosus joins the right atrium of heart. Choose the correct answer from the options given below:

- A) A, B and C only B) B and D only
C) B and C only D) A, C and E only

152.

Male frogs can be distinguished from female frogs due to the presence of: A. Bulging eyes B. Vocal sacs C. Webbed digits in feet D. Copulatory pad on first digit of fore limbs E. Olive green-coloured skin with dark irregular spots

- A) B and C only B) C and E only
C) A and B only D) B and D only

153.

In frogs, the number of pairs of cranial nerves arising from the brain are _____

- A) 12 B) 6
C) 9 D) 10

154.

While trying to find out the characteristic of a newly found animal, a researcher did the histology of adult animal and observed a cavity with presence of mesodermal tissue towards the body wall but no mesodermal tissue was observed towards the alimentary canal. What could be the possible coelome of that animal?

- A) Schizocoelomate B) Spongocoelomate
C) Acoelomate D) Pseudocoelomate

155.

Match List I with List II.

List I	List II
A. Taenia	I. Nephridia
B. Paramoecium	II. Contractile vacuole
C. Periplaneta	III. Flame cells
D. Pheretima	IV. Urecose gland

Choose the correct answer from the options given below:

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

156.

Match List I (Drug) with List II (Effect)

List I (Drug)	List II (Effect)
A. Nicotine	I. Causes sense of euphoria and increased energy
B. Morphine	II. Stimulates adrenal gland to release catecholamines into blood circulation
C. Heroin	III. Effective sedative and painkiller
D. Cocaine	IV. A depressant; slows down body function

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

157.

The following are the stages of the life cycle of Plasmodium. Arrange the stages in the proper order:

A. The parasites reproduce asexually in RBCs, bursting the cells. B. The parasites reproduce asexually in liver cells, bursting the cells and releasing into blood. C. Gametocytes develop in RBCs. D. Sporozoites reach the liver through the blood. E. Female mosquito injects sporozoites into humans during bite.

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

158.

Which of the following are secondary lymphoid organs? (a) Bone marrow (b) Tonsils (c) Spleen (d) Thymus (Choose the correct answer from the options given below)

- A) (a) and (d) only B) (a) and (b) only
C) (b) and (c) only D) (b) and (d) only

159.

Which of the following statements is correct about Plasmodium?

- A) Fertilization takes place in mosquito gut B) Reproduces sexually in liver cells
C) Reproduces sexually in RBCs D) Gametocytes develop in mosquito gut

160.

Colostrum, secreted by mother during initial days of lactation, is abundant in ____.

- A) IgD B) IgG
C) IgM D) IgA

161.

Which of the following is used as an effective sedative and painkiller for treating post-surgery patients?

- A) Anti-retroviral drugs B) Interferon
C) Antibiotics D) Morphine

162.

Match List-I with List-II:

	List - I		List - II
A	Emphysema	I	Rapid spasms in muscle due to low Ca^{++} in body fluid
B	Angina Pectoris	II	Damaged alveolar walls and decreased respiratory surface
C	Glomerulonephritis	III	Acute chest pain when not enough oxygen is reaching to heart muscle
D	Tetany	IV	Inflammation of glomeruli of kidney

Choose the correct answer from the options given below:

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

163.

Identify the statement that is NOT correct.

- A) Antigen binding site is located at C-terminal region of antibody molecules. B) Constant region of heavy and light chains are located at C-terminus of antibody molecules.
C) Each antibody has two light and two heavy chains. D) The heavy and light chains are held together by disulfide bonds.

164.

Which of the following type of immunity is present at the time of birth and is a non-specific type of defence in the human body?

- A) Cell-mediated Immunity B) Humoral Immunity
C) Acquired Immunity D) Innate Immunity

165.

After maturation, in primary lymphoid organs, the lymphocytes migrate for interaction with antigens to secondary lymphoid organ(s) / tissue(s) like A. thymus B. bone marrow C. spleen D. lymph nodes E. Peyer's patches Choose the correct answer from the options given below

- A) E, A, B only B) C, D, E only
C) B, C, D only D) A, B, C only

166.

Which are correct: A. Computed tomography and magnetic resonance imaging detect cancers of internal organs. B. Chemotherapeutics drugs are used to kill non-cancerous cells. C. α -interferon activate the cancer patients' immune system and helps in destroying the tumour. D. Chemotherapeutic drugs are biological response modifiers. E. In the case of leukaemia blood cell counts are decreased. Choose the correct answer from the options given below:

- A) C and D only B) A and C only
C) B and D only D) D and E only

167.

Neoplastic characteristics of cells refer to: A. A mass of proliferating cell B. Rapid growth of cells C. Invasion and damage to the surrounding tissue D. Those confined to original location Choose the correct answer from the options given below:

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

168.

Match List I with List II :

	List-I		List-II
A.	Typhoid	I.	Fungus
B.	Leishmaniasis	II.	Nematode
C.	Ringworm	III.	Protozoa
D.	Filariasis	IV.	Bacteria

Choose the correct answer from the options given below:

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

169.

Match List I with List II :

	List-I		List-II
A.	Common cold	I.	Plasmodium
B.	Haemoglobin	II.	Rhinoviruses
C.	Widal test	III.	Rhinoviruses
D.	Allergy	IV.	Dust mites

Choose the correct answer from the options given below :

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

170.

Match List I with List II:

List I	List II
A. Ringworm	I. Haemophilus influenzae
B. Filariasis	II. Trichophyton
C. Malaria	III. Wuchereria bancrofti
D. Pneumonia	IV. Plasmodium vivax

Choose the correct answer from the options given below:

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

171.

Match List I with List II.

List I	List II
A. Heroin	I. Effect on cardiovascular system
B. Marijuana	II. Slow down body function
C. Cocaine	III. Painkiller
D. Morphine	IV. Interfere with transport of dopamine

Choose the correct answer from the options given below:

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

172.

Match List - I with List - II:

List - I	List - II
(a) Cellular barrier	(i) Interferons
(b) Cytokine barrier	(ii) Mucus
(c) Physical barrier	(iii) Neutrophils
(d) Physiological barrier	(iv) HCl in gastric juice

Choose the correct answer from the options given:

- A) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv) B) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
C) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv) D) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

173.

Select the incorrect statement with respect to acquired immunity.

- A) Primary response is produced when our body encounters a pathogen for the first time. B) Anamnestic response is elicited on subsequent encounters with the same pathogen.
C) Anamnestic response is due to memory of first encounter. D) Acquired immunity is non-specific type of defense present at the time of birth.

174.

Which of the following immune responses is responsible for rejection of kidney graft?

- A) Humoral immune response B) Inflammatory immune response
C) Cell-mediated immune response D) Auto-immune response

175.

MALT constitutes about _____ percent of the lymphoid tissue in human body.

- A) 20% B) 70%
C) 10% D) 50%

176.

Which is the particular type of drug that is obtained from the plants whose one flowering branch is



shown below?

- A) Hallucinogen B) Depressant
C) Stimulant D) Pain-Killer

177.

Infection of Ascaris usually occurs by

- A) Tse-tse fly B) mosquito bite
C) drinking water containing eggs of Ascaris D) eating imperfectly cooked pork.

178.

Identify the site where Wuchereria bancrofti is normally found in human body.

- A) Muscles of the legs B) Blood vessels of the thigh region
C) Skin between the fingers D) Lymphatic vessels of the lower limbs

179.

Motile zygote of Plasmodium occurs in

- A) gut of female Anopheles B) salivary glands of Anopheles
C) human RBCs D) human liver

180.

Widal test is carried out to test

- | | |
|--------------------|-----------------------------|
| A) malaria | B) diabetes mellitus |
| C) HIV/AIDS | D) typhoid fever |

ANSWER KEY

Physics

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

Chemistry

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

Botany

91.	2	103.	2	115.	4	127.	3
92.	2	104.	3	116.	3	128.	3
93.	3	105.	3	117.	1	129.	4
94.	3	106.	2	118.	2	130.	3
95.	2	107.	1	119.	2	131.	3
96.	2	108.	2	120.	1	132.	3
97.	2	109.	2	121.	2	133.	2
98.	3	110.	3	122.	2	134.	1
99.	2	111.	2	123.	1	135.	3
100.	3	112.	4	124.	1		
101.	2	113.	2	125.	2		
102.	1	114.	2	126.	2		

Zoology

136.	3	138.	4	140.	4	142.	4
137.	2	139.	2	141.	4	143.	3

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

SOLUTIONS

Q1.

Answer: C

Explanation:

Since the surface is frictionless and the blocks move together, the applied force accelerates the combined mass, giving $a = \frac{F}{m_1 + m_2} = \frac{36}{9} = 4 \text{ m/s}^2$. The contact (normal) force between the blocks is the only horizontal force on the 6 kg block, so $N = m_2 a = 6 \times 4 = 24 \text{ N}$.

Q2.

Answer: C

Explanation:

The net external force on the two-block system is $F_{\text{net}} = 30 - 10 = 20 \text{ N}$ acting on a total mass of $4 + 6 = 10 \text{ kg}$, giving $a = 20/10 = 2 \text{ m/s}^2$. Isolating the 6 kg block, the contact force N pushes it forward while the 10 N force opposes it, so $N - 10 = 6a$, giving $N = 10 + 12 = 22 \text{ N}$.

Q3.

Answer: B

Explanation:

The net external force on the three-block system is $F_{\text{net}} = 84 - 24 = 60 \text{ N}$ acting on a total mass of $3 + 4 + 5 = 12 \text{ kg}$, giving $a = 60/12 = 5 \text{ m/s}^2$. Isolating the 5 kg block, the contact force N from the 4 kg block pushes it forward while the 24 N force opposes it, so $N - 24 = 5a = 25$, giving $N = 49 \text{ N}$.

Q4.

Answer: D

Explanation:

The net external force on the three-block system is $F_{\text{net}} = 68 - 12 = 56 \text{ N}$ acting on a total mass of $3 + 5 + 6 = 14 \text{ kg}$, giving $a = 56/14 = 4 \text{ m/s}^2$. Isolating the 6 kg block, the contact force N from the 5 kg block pushes it forward while the 12 N force opposes it, so $N - 12 = 6a = 24$, giving $N = 36 \text{ N}$.

Q5.

Answer: A

Explanation:

Both applied forces act rightward, so the net force on the system is $F_{\text{net}} = 30 + 10 = 40 \text{ N}$ acting on a total mass of $2 + 8 = 10 \text{ kg}$, giving $a = 40/10 = 4 \text{ m/s}^2$. Isolating the 2 kg block, the applied 30 N force pushes it forward while the contact force N from the 8 kg block pushes back, so $30 - N = 2a = 8$, giving $N = 22 \text{ N}$.

Q6.

Answer: C

Explanation:

The only external horizontal force on the two-block system is the 50 N pull acting rightward on the 6 kg block. The total mass is $4 + 6 = 10 \text{ kg}$, so the common acceleration is $a = 50/10 = 5 \text{ m/s}^2$. Isolating the 4 kg block, the only horizontal force on it is the string tension T pulling it rightward, so $T = 4a = 20 \text{ N}$.

Q7.

Answer: B

Explanation:

The only external horizontal force on the three-block system is the 60 N pull acting rightward on the 5 kg block. The total mass is $3 + 4 + 5 = 12 \text{ kg}$, so the common acceleration is $a = 60/12 = 5 \text{ m/s}^2$. The tension T_1 pulls only the 3 kg block, giving $T_1 = 3a = 15 \text{ N}$. The tension T_2 pulls the combined 3 kg plus 4 kg subsystem, giving $T_2 = (3 + 4)a = 35 \text{ N}$.

Q8.

Answer: C

Explanation:

The net external force on the three-block system is $F_{\text{net}} = 70 - 20 = 50 \text{ N}$ acting rightward on a total mass of $4 + 2 + 4 = 10 \text{ kg}$, giving a common acceleration $a = 50/10 = 5 \text{ m/s}^2$. Isolating the left 4 kg block gives $T_1 - 20 = 4a = 20$, so $T_1 = 40 \text{ N}$. Isolating the right 4 kg block gives $70 - T_2 = 4a = 20$, so $T_2 = 50 \text{ N}$.

Q9.

Answer: B

Explanation:

The net external force on the system is 60 N rightward, acting on a total mass of 12 kg, so $a = 5 \text{ m/s}^2$. The contact force N_{34} accelerates the $(4 + 5) \text{ kg}$ subsystem, giving $N_{34} = 9 \times 5 = 45 \text{ N}$. The contact force N_{45} accelerates the 5 kg block alone, giving $N_{45} = 5 \times 5 = 25 \text{ N}$.

Q10.

Answer: A

Explanation:

The total mass of the system is $4m$. According to Newton's Second Law, the acceleration of the entire system is $a = \frac{F_{\text{net}}}{M_{\text{total}}} = \frac{P}{4m}$. The contact force between any two blocks is equal to the force required to accelerate the blocks remaining in front of that contact point.

Q11.

Answer: B

Explanation:

The two blocks m_1 and m_2 are connected by a string and move together with the same acceleration a under the action of the external force F . The tension T in the string is the force responsible for accelerating the block m_2 .

Q12.

Answer: A

Explanation:

The net force on the system determines the acceleration, and the tension can be found by analyzing the forces on either individual block. Since the surface is smooth, there is no friction.

Q13.

Answer: A

Explanation:

The system consists of two blocks connected by a string on a frictionless surface with opposing external forces. The net force determines the common acceleration, and the tension is found by applying Newton's Second Law to one of the blocks.

Q14.

Answer: C

Explanation:

When a force is applied to one block in a system of contacting blocks on a frictionless surface, both blocks accelerate together with the same acceleration. The contact force between them is the force responsible for accelerating the block that is not directly being pushed by the external force.

Q15.

Answer: A

Explanation:

The acceleration of the system remains the same in both cases because the total mass and the net external force are unchanged. However, the contact force depends on which block is being pushed, as it must accelerate the remaining mass of the system.

Q16.

Answer: D

Explanation:

The three blocks move together as a single system with a common acceleration determined by the total mass and the applied force. The tension T_1 is the force responsible for accelerating the blocks below the first string.

Q17.

Answer: C

Explanation:

In equilibrium, the tension in the string is the same throughout. The lower movable pulley is supported by two vertical segments of the string, so the upward force is twice the tension, balancing the weight of the 24kg mass.

Q18.

Answer: A

Explanation:

For equilibrium, the tension in a rope supporting a movable pulley is twice the tension on either side of that pulley. For the bottom pulley: $T_3 = 8g$ For the middle pulley: $T_2 = 2T_3 = 16g$ Thus, $m_1g = T_2 = 16g \Rightarrow m_1 = 16\text{kg}$ For the top pulley: $T_1 = 2T_2 = 32g$ Thus, $m_2g = T_1 = 32g \Rightarrow m_2 = 32\text{kg}$

Q19.

Answer: B

Explanation:

The 12kg mass produces a rope tension of $T = 12g$. The movable pulley is supported by two tensions, so $m_1g = 2T = 24g$ Thus, $m_1 = 24\text{kg}$. The second rope must also provide the same supporting force to the movable pulley: $m_2g = 2T = 24g$ Therefore, $m_2 = 24\text{kg}$.

Q20.

Answer: C

Explanation:

For the 6kg mass: $T_1 = 6g$ Each movable pulley doubles the supporting tension: $T_2 = 2T_1 = 12g$ $T_3 = 2T_2 = 24g$ For the block m on the 30° incline: $mg \sin 30^\circ = T_3$ $mg \left(\frac{1}{2}\right) = 24g$ Therefore, $m = 48\text{kg}$

Q21.

Answer: B

Explanation:

For the hanging mass m , $T = mg$ The movable pulley is supported by two upward tensions, so $2T = 20g$ Thus, $2mg = 20g$ $m = 10\text{kg}$

Q22.

Answer: B

Explanation:

The tension in the rope is determined by the 15kg mass: $T = 15g$ The movable pulley is supported by two sections of the rope: $m_1g = 2T = 30g$ Therefore, $m_1 = 30\text{kg}$ Since m_2 is also attached to the same rope, $m_2g = T = 15g$ Therefore, $m_2 = 15\text{kg}$

Q23.

Answer: C

Explanation:

The tension in the rope is determined by the 20kg mass: $T = 20g$ The movable pulley is supported by two sections of the rope, so the upward force is $2T = 40g$ For equilibrium, $mg = 2T$ Therefore, $m = 40\text{kg}$

Q24.

Answer: C

Explanation:

The tension in the first rope is $T = 8g$ Each movable pulley is supported by two sections of rope, producing an upward force of $2T = 16g$ Since there are four movable pulleys attached to the platform, the total upward force is $4(16g) = 64g$ For equilibrium, $mg = 64g$ Therefore, $m = 64\text{kg}$

Q25.

Answer: B

Explanation:

Starting from the 12kg mass, the tensions double at each movable pulley: $T_1 = 12g$ $T_2 = 2T_1 = 24g$ $T_3 = 2T_2 = 48g$ The platform is supported by the three tensions T_1, T_2, T_3 : $mg = T_1 + T_2 + T_3$ $mg = 12g + 24g + 48g = 84g$ Therefore, $m = 84\text{kg}$.

Q26.

Answer: A

Explanation:

Since $m_2 > m_1$, m_2 moves downward and m_1 moves upward. The acceleration is $a = \frac{m_2 - m_1}{m_1 + m_2}g = \frac{10 - 4}{10 + 4}g = \frac{3g}{7}$ The tension is $T = \frac{2m_1m_2}{m_1 + m_2}g = \frac{2(4)(10)}{14}g = \frac{40g}{7}$

Q27.

Answer: B

Explanation:

Since $m_2 > m_1$, the 6kg mass moves downward and the 4kg mass moves upward. Using the Atwood machine formula,

$$a = \frac{m_2 - m_1}{m_1 + m_2} g = \frac{6 - 4}{6 + 4} (10) = 2 \text{ m/s}^2$$

Q28.

Answer: C

Explanation:

The total mass on the heavier side is $M = 15 + 15 = 30 \text{ kg}$

Using the Atwood-machine equation, $a = \frac{30 - 10}{30 + 10} g$

$$a = \frac{20}{40} (10) = 5 \text{ m/s}^2 \text{ For the 10kg mass, } T - 10g = 10a$$

$$T = 10(10 + 5) = 150 \text{ N}$$

Q29.

Answer: C

Explanation:

For the 5kg block on the horizontal surface: $T = 5a$ For the 10kg hanging block: $10g - T = 10a$ Substituting $T = 5a$: $10g = 15a$

$$a = \frac{2g}{3} = \frac{20}{3} \text{ m/s}^2 \quad a = \frac{20}{3} \text{ m/s}^2 \text{ Then,}$$

$$T = 5a = 5 \left(\frac{20}{3} \right) = \frac{100}{3} \text{ N.}$$

Q30.

Answer: B

Explanation:

For the 12kg block, the component of weight down the incline is $12g \sin 30^\circ = 60 \text{ N}$ For the 24kg hanging block, $24g - T = 24a$

For the block on the incline, $T - 60 = 12a$ Solving gives

$$a = 5 \text{ m/s}^2, \quad T = 120 \text{ N}$$

Q31.

Answer: A

Explanation:

The 7kg block moves downward and the 4kg block moves

upward. $a = \frac{7-4}{7+4} g = \frac{30}{11} \text{ m/s}^2$ For the 4kg block, $T - 4g = 4a$

$$\text{Therefore, } T = 4(10) + 4 \left(\frac{30}{11} \right) = \frac{560}{11} \text{ N.}$$

Q32.

Answer: B

Explanation:

The 30kg block is heavier than the 10kg block, so it moves downward and the 10kg block moves upward. The net driving force is $30g - 10g = 20g$ The total mass is

$$10 + 20 + 30 = 60 \text{ kg} \text{ Therefore, } a = \frac{20g}{60} = \frac{g}{3} = \frac{10}{3} \text{ m/s}^2$$

Q33.

Answer: A

Explanation:

Since $7 \text{ kg} > 4 \text{ kg}$, the 7kg block moves downward and the 4kg block moves upward. For the complete system, $a = \frac{(7-4)g}{7+4}$

$$a = \frac{30}{11} \text{ m/s}^2 \text{ For the 4kg block, } T - 4g = 4a \text{ Therefore,}$$

$$T = 4g + 4a = \frac{560}{11} \text{ N.}$$

Q34.

Answer: C

Explanation:

The driving force due to the hanging mass is $8g = 80 \text{ N}$. The opposing force is 20 N , so the net driving force is $80 - 20 = 60 \text{ N}$. The total mass is $8 + 4 = 12 \text{ kg}$. Therefore, $a = \frac{60}{12} = 5 \text{ m/s}^2$.

Q35.

Answer: B

Explanation:

The 25kg block provides the driving force: $25g = 250 \text{ N}$ The

opposing forces are the weight of the 5kg block and the component of the 10kg block down the incline: $5g = 50 \text{ N}$

$$10g \sin 30^\circ = 50 \text{ N} \text{ Therefore, } a = \frac{250 - 50 - 50}{25 + 10 + 5}$$

$$a = \frac{150}{40} = 3.75 \text{ m/s}^2$$

Q36.

Answer: A

Explanation:

The components of weight along the inclines are

$$F_1 = 20g \sin 37^\circ = 20(10) \left(\frac{3}{5} \right) = 120 \text{ N}$$

$$F_2 = 20g \sin 53^\circ = 20(10) \left(\frac{4}{5} \right) = 160 \text{ N} \text{ Net driving force:}$$

$$F_{\text{net}} = 160 - 120 = 40 \text{ N} \text{ Total mass: } M = 20 + 20 = 40 \text{ kg}$$

$$\text{Therefore, } a = \frac{40}{40} = 1 \text{ m/s}^2$$

Q37.

Answer: B

Explanation:

Total mass: $M = 4 + 6 + 5 + 15 = 30 \text{ kg}$ The driving force is

the weight of the hanging block: $F = 15g = 150 \text{ N}$ Therefore,

$$a = \frac{150}{30} = 5 \text{ m/s}^2 \text{ For the first block: } T_1 = 4a = 20 \text{ N} \text{ For the}$$

$$\text{first two blocks together: } T_2 = (4 + 6)a = 50 \text{ N}$$

Q38.

Answer: B

Explanation:

The acceleration of the system is $a = \frac{8g}{4+8} = \frac{20}{3} \text{ m/s}^2$ Since the block starts from rest, $s = \frac{1}{2} at^2$ $12 = \frac{1}{2} \left(\frac{20}{3} \right) t^2$ Therefore,

$$t = \sqrt{\frac{18}{5}} \text{ s.}$$

Q39.

Answer: C

Explanation:

$$F = (M_1 + M_2)a; a = \frac{10}{2+3} = 2 \text{ m s}^{-2};$$

$$F' = M_2(2) = 3 \times 2 \text{ N} = 6 \text{ N.}$$

Q40.

Answer: B

Explanation:

$$a = \frac{\text{Net pulling force}}{M_{\text{total}}} = \frac{60 - 18 - (3+2+1)g \sin 30^\circ}{3+2+1} = \frac{12}{6} = 2 \text{ m/s}^2. \text{ By}$$

taking F.B.D. of 1kg:

$$ma = N - 18 - 1 \times 10 \times \frac{1}{2} \implies 2 = N - 23 \implies N = 25 \text{ N}$$

.



Q41.

Answer: B

Explanation:

$$\text{Acceleration of the system, } a = \frac{(m_2 - m_1)g}{(m_1 + m_2)}. \therefore a = \frac{(6-4)g}{6+4} = \frac{g}{5}.$$

Q42.

Answer: B

Explanation:

The force equations are $T - 5g = 5a$ and $10g - T = 10a$.



Q43.

Answer: D

Explanation:

$$T - Mg \sin 30 = Ma; 30 - 5 \times 10 \times \frac{1}{2} = 5a; a = 1 \text{ m/s}^2$$

.

Q44.

Answer: C

Explanation:

$$\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k};$$
$$|\vec{F}| = \sqrt{36 + 64 + 100} = \sqrt{200}N = 10\sqrt{2}N. \text{ Mass}$$
$$M = \frac{10\sqrt{2}}{1} = 10\sqrt{2} \text{ kg.}$$

Q45.

Answer: C

Explanation:

Force (F) = 10N and acceleration (a) = 1 m/s^2 . Mass (m) = $\frac{F}{a} = \frac{10}{1} = 10 \text{ kg}$.

Q46.

Answer: B

Explanation:

Na^+ , F^- , and O^{2-} are isoelectronic species with 10 electrons each. For isoelectronic ions, the ionic radius increases as the nuclear charge Z decreases ($Z_{\text{Na}} = 11$, $Z_{\text{F}} = 9$, $Z_{\text{O}} = 8$).

Q47.

Answer: A

Explanation:

Down Group 16, as the size of the central atom increases ($S < Se < Te$), the $H - E$ bond length increases and bond dissociation enthalpy decreases, making it easier to release H^+ ions.

Q48.

Answer: B

Explanation:

Ca^{2+} , K^+ , and Ar are isoelectronic species with 18 electrons each. The radius decreases with increasing nuclear charge ($Z_{\text{Ca}} = 20$, $Z_{\text{K}} = 19$, $Z_{\text{Ar}} = 18$).

Q49.

Answer: A

Explanation:

Fe^{2+} has 6 d -electrons. Chlorine (Cl) has 11 p -electrons ($2p^6 3p^5$), which is not equal to 6.

Q50.

Answer: C

Explanation:

Adding a second electron to the negatively charged O^- ion requires overcoming strong electrostatic repulsion between like charges, which requires a large input of energy.

Q51.

Answer: B

Explanation:

Option (2) is incorrect because N ($2p^3$, half-filled) has a higher IE_1 than O ($2p^4$). Option (3) is incorrect because Cl has a more negative electron gain enthalpy than F due to F 's compact 2psubshell.

Q52.

Answer: D

Explanation:

Gallium (Ga) has a smaller atomic radius than Aluminium (Al) because the poor shielding by the ten 3d electrons increases the effective nuclear charge (Z_{eff}) in Ga.

Q53.

Answer: D

Explanation:

Beryllium hydroxide, $Be(OH)_2$, is amphoteric because of Beryllium's small size and high polarization power, allowing it to react with both acids and strong bases.

Q54.

Answer: D

Explanation:

Na_2O is a strongly basic oxide, Al_2O_3 is amphoteric, N_2O is neutral, and Cl_2O_7 is strongly acidic.

Q55.

Answer: A

Explanation:

Unununnium corresponds to atomic number 111, whose official IUPAC name is Roentgenium (Rg). Darmstadtium (Ds) has atomic number 110 (Ununnilium).

Q56.

Answer: B

Explanation:

Copper (Cu) is a transition metal, Fluorine (F) is a non-metal halogen, Silicon (Si) is a metalloid, and Cerium (Ce) is a 4f lanthanoid.

Q57.

Answer: B

Explanation:

Down Group 16, acid strength increases ($H_2O < H_2S < H_2Se < H_2Te$), which means K_a increases and pK_a values decrease ($pK_a = -\log K_a$).

Q58.

Answer: A

Explanation:

Element X has a low IE_1 (419) and a huge jump to IE_2 (3069), indicating 1 valence electron (alkali metal). Element Y has a moderate IE_1 (590) and IE_2 (1145), indicating 2 valence electrons (alkaline earth metal).

Q59.

Answer: C

Explanation:

Across Period 2, IE_1 generally increases ($C < O < N < F$). Nitrogen ($2p^3$) has a higher IE_1 than Oxygen ($2p^4$) due to its extra stability from a half-filled p -subshell.

Q60.

Answer: C

Explanation:

Mn_2O_7 (highest oxidation state +7), SO_2 , and TeO_3 are all non-metal or high oxidation-state metal acidic oxides.

Q61.

Answer: D

Explanation:

NO is a neutral oxide, CO_2 is an acidic oxide, CaO is a basic metal oxide, and ZnO is an amphoteric oxide.

Q62.

Answer: A

Explanation:

Electronegativity increases across a period from left to right ($C < N < O < F$) and decreases down a group ($Si < C$).

Q63.

Answer: B

Explanation:

Generally, IE_1 increases across Period 2. However, Be ($2s^2$, fully filled) has a higher IE_1 than B ($2p^1$), placing B before Be.

Q64.

Answer: B

Explanation:

Across a period from left to right, as atomic number increases, effective nuclear charge (Z_{eff}) increases, causing atomic radius to decrease continuously ($Li > Be > B > C$).

Q65.

Answer: C

Explanation:

Cerium (Ce , $Z = 58$) is a 4f lanthanoid, Manganese (Mn , $Z = 25$) is a 3d transition metal, Arsenic (As , $Z = 33$) belongs to p -block (Group 15), and Caesium (Cs , $Z = 55$) is an s -block alkali metal.

Q66.

Answer: A

Explanation:

Each double bond ($C = C$) contains 1 σ -bond and 1 π -bond. Since a π -bond consists of 2 shared electrons, a molecule with 4 double bonds contains 8 π -electrons in total.

Q67.

Answer: C

Explanation:

Molecular stability is directly proportional to bond order. Higher bond orders indicate stronger and more stable molecular bonds.

Q68.

Answer: A

Explanation:

According to VSEPR theory, lone pairs are localized closer to the central atom and occupy more space, leading to the repulsion order: $lp-lp > lp-bp > bp-bp$.

Q69.

Answer: A

Explanation:

Central Xenon hybridization and lone pair arrangement dictate the molecular geometry: XeF_6 ($6\sigma + 1lp \Rightarrow$ Distorted octahedral), XeO_3 ($3\sigma + 1lp \Rightarrow$ Pyramidal), $XeOF_4$ ($5\sigma + 1lp \Rightarrow$ Square pyramidal), and XeF_4 ($4\sigma + 2lp \Rightarrow$ Square planar).

Q70.

Answer: A

Explanation:

Down Group 2, cationic radius increases ($Be^{2+} < Ca^{2+} < Ba^{2+}$). According to Fajan's rules, larger cations have lower polarizing power, leading to higher ionic character.

Q71.

Answer: B

Explanation:

BF_3 is symmetrical ($\mu = 0$). In NF_3 , bond dipoles oppose the lone pair dipole, making it less polar than NH_3 where bond dipoles reinforce the lone pair dipole. H_2O has two highly polar bonds and two lone pairs, giving the highest dipole moment.

Q72.

Answer: C

Explanation:

The phenyl ring (C_6H_5-) contains 6 sp^2 carbons and 3 π -bonds. The triple bond ($-C \equiv C-$) contains 2 sp carbons and 2 π -bonds. The ester group ($-COOCH_3$) contains 1 sp^2 carbonyl carbon ($C=O$) with 1 π -bond, and 1 sp^3 methyl carbon.

Q73.

Answer: A

Explanation:

Bond angles depend on central atom hybridization and lone pair repulsions: H_2O (2lp, 104.5°), NH_3 (1lp, 107°), NH_4^+ (0lp, 109.5°), and CO_2 (sp , 180°).

Q74.

Answer: B

Explanation:

Intermolecular forces act between separate molecules and include dipole-dipole, dipole-induced dipole, hydrogen bonding, and dispersion forces. Covalent bonding is an intramolecular chemical bond within a molecule.

Q75.

Answer: B

Explanation:

A Lewis acid is an electron-pair acceptor. Boron trifluoride (BF_3) has an incomplete octet (6 valence electrons) around the central Boron atom, allowing it to accept an electron pair.

Q76.

Answer: D

Explanation:

CH_4 is non-polar ($\mu = 0$). H_2S has a small dipole moment ($\mu = 0.95$ D). NH_3 has a reinforced dipole moment ($\mu = 1.47$ D). HF has the highest electronegativity difference, producing the maximum dipole moment ($\mu = 1.91$ D).

Q77.

Answer: D

Explanation:

The carbonate ion (CO_3^{2-}) undergoes resonance among 3 equivalent canonical structures where the double bond is delocalized over the three Oxygen atoms.

Q78.

Answer: D

Explanation:

Bond enthalpy increases with bond multiplicity: N_2 (triple bond) has the highest enthalpy ($946.0 \text{ kJ mol}^{-1}$), O_2 (double bond) is 498 kJ mol^{-1} , H_2 is $435.8 \text{ kJ mol}^{-1}$, and HCl is $431.0 \text{ kJ mol}^{-1}$.

Q79.

Answer: C

Explanation:

Using the formal charge formula $FC = V - L - \frac{1}{2}B$, the central oxygen atom (1) forming 3 bonds has $FC = +1$, the double-bonded oxygen (2) has $FC = 0$, and the single-bonded oxygen (3) has $FC = -1$.

Q80.

Answer: D

Explanation:

I_3^- ($2\sigma + 3lp = 5 \implies sp^3d$) and ClF_3 ($3\sigma + 2lp = 5 \implies sp^3d$) are sp^3d hybridized. I_3^+ is sp^3 ($2\sigma + 2lp = 4$) and IF_5 is sp^3d^2 ($5\sigma + 1lp = 6$).

Q81.

Answer: C

Q82.

Answer: A

Explanation:

When the z-axis is the internuclear axis, lateral (sideways) overlap of $p_y + p_y$, $d_{yz} + d_{yz}$, and $p_x + d_{zx}$ orbitals forms π -molecular orbitals. $d_{xy} + d_{yz}$ leads to zero overlap due to symmetry mismatch.

Q83.

Answer: D

Explanation:

Chloral hydrate [$CCl_3CH(OH)_2$] and salicylaldehyde form stable 5/6-membered chelate rings via intramolecular hydrogen bonding. p-nitrophenol and acetic acid form intermolecular hydrogen bonds.

Q84.

Answer: C

Explanation:

Sulfites ($CaSO_3$, $BaSO_3$) decompose on heating to release only SO_2 gas: $MSO_3 \xrightarrow{\Delta} MO + SO_2 \uparrow$. Heavy metal sulfates ($ZnSO_4$, $Fe_2(SO_4)_3$) decompose to yield SO_3 or a mixture of $SO_2 + O_2$.

Q85.

Answer: B

Explanation:

AgF is highly soluble due to high hydration energy of small F^- . Group 2 sulfates decrease in solubility down the group because lattice energy dominates as hydration energy drops rapidly.

Q86.

Answer: D

Explanation:

$LiNO_3$ and $NaNO_3$ decompose on strong heating to release paramagnetic Oxygen gas (O_2 , 2 unpaired electrons) and NO_2 gas (paramagnetic odd-electron molecule).

Q87.

Answer: B

Explanation:

ClF_3 is T-shaped (planar, polar $\mu \neq 0$), XeF_4 is square planar (planar, non-polar $\mu = 0$), NF_3 is trigonal pyramidal (non-planar, polar $\mu \neq 0$), and PCl_5 is trigonal bipyramidal (non-planar, non-polar $\mu = 0$).

Q88.

Answer: D

Explanation:

$CHCl_3$ (distorted tetrahedral) and O_2F_2 (non-planar open-book structure) have asymmetric bond dipole arrangements ($\mu \neq 0$). CF_4 and C_2F_2 ($F-C \equiv C-F$) are symmetrical non-polar molecules ($\mu = 0$).

Q89.

Answer: B

Explanation:

Ag^+ has a pseudo-noble gas configuration (18 outer shell electrons), which shields the nuclear charge poorly and gives it a higher polarizing power than Na^+ (8 outer shell electrons). Thus, AgCl is more covalent than NaCl.

Q90.

Answer: B

Explanation:

Halogens (Group 17) and Alkali metals (Group 1) are separated across the periodic table boundary by Noble gases (Group 18). Cation and anion formation results in stable ionic lattice structures bound by strong electrostatic attractions.

Q91.

Answer: B

Q92.

Answer: B

Q93.

Answer: C

Q94.

Answer: C

Q95.

Answer: B

Q96.

Answer: B

Q97.

Answer: B

Q98.

Answer: C

Q99.

Answer: B

Q100.

Answer: C

Q101.

Answer: B

Q102.

Answer: A

Q103.

Answer: B

Q104.

Answer: C

Q105.

Answer: C

Q106.

Answer: B

Q107.

Answer: A

Q108.

Answer: B

Q109.

Answer: B

Q110.

Answer: C

Q111.

Answer: B

Q112.

Answer: D

Q113.

Answer: B

Q114.

Answer: B

Q115.

Answer: D

Q116.

Answer: C

Q117.

Answer: A

Q118.
Answer: B

Q119.
Answer: B

Q120.
Answer: A

Q121.
Answer: B

Q122.
Answer: B

Q123.
Answer: A

Q124.
Answer: A

Q125.
Answer: B

Q126.
Answer: B

Q127.
Answer: C

Q128.
Answer: C

Q129.
Answer: D

Q130.
Answer: C

Q131.
Answer: C

Q132.
Answer: C

Q133.
Answer: B

Q134.
Answer: A

Q135.
Answer: C

Q136.
Answer: C

Q137.
Answer: B

Q138.
Answer: D

Q139.
Answer: B

Q140.
Answer: D

Q141.
Answer: D

Q142.
Answer: D

Q143.
Answer: C

Q144.
Answer: C

Q145.
Answer: A

Q146.
Answer: C

Q147.
Answer: C

Q148.
Answer: B

Q149.
Answer: C

Q150.
Answer: A

Q151.
Answer: D

Q152.
Answer: D

Q153.
Answer: D

Q154.
Answer: D

Q155.
Answer: B

Q156.
Answer: C

Q157.
Answer: A

Q158.

Answer: C

Q159.

Answer: A

Q160.

Answer: D

Q161.

Answer: D

Q162.

Answer: B

Q163.

Answer: A

Q164.

Answer: D

Q165.

Answer: B

Q166.

Answer: B

Q167.

Answer: D

Q168.

Answer: B

Q169.

Answer: C

Q170.

Answer: D

Q171.

Answer: D

Q172.

Answer: A

Q173.

Answer: D

Q174.

Answer: C

Q175.

Answer: D

Q176.

Answer: A

Q177.

Answer: C

Q178.

Answer: D

Q179.

Answer: A

Q180.

Answer: D