



# SAMPLE PAPER

## MENTORS TALENT SEARCH EXAMINATION

FOR STUDENTS IN CLASS XI AND GOING TO CLASS XII

Duration: 3 Hours.

Maximum Marks: 480

[Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.]

### INSTRUCTIONS

#### A. Question paper format:

1. The question paper consists of **THREE** parts (**Physics, Chemistry & Biology**). Each part containing 2 sections (**Section-A and Section-B**).
2. This Question Paper contains 17 pages, other than the OMR.
3. **Part-I** contains **Physics** questions. **Section A** of **Part I** contains **30** multiple choice questions and **Section B** of **Part I** contains **10 Assertion-Reason** questions.
4. **Part-II** contains **Chemistry** questions. **Section A** of **Part II** contains **30** multiple choice questions and **Section B** of **Part II** contains **10 Assertion-Reason** questions.
5. **Part-III** contains **Biology** questions. **Section A** of **Part III** contains **30** multiple choice questions and **Section B** of **Part III** contains **10 Assertion-Reason** questions.
6. This booklet also contains the OMR answer sheet (i.e., A machine gradable response sheet).

#### B. Answering on the OMR:

7. Each question will have 4 choices in both the sections, out of which only **one choice is correct**.
8. Fill the bubble with **Ball Pen (Blue or Black) ONLY**.

#### C. Filling – Name and Registration No.

9. On the **OMR sheet**, write your Name and Registration No. using ball pen. Also, put your signature in the appropriate box using ball pen.

#### D. Marking Scheme:

10. (a) For each question, you will be awarded **4 marks** if you have darkened only one bubble corresponding to the right answer.  
(b) In case you have not darkened any bubble, you will be awarded 0 mark for that question.  
(c) In all other cases, you will be awarded **-1 mark**.

Name : .....

Registration No.:

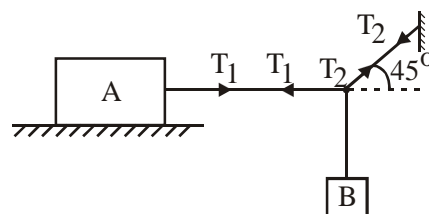
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## PART-I: PHYSICS

### SECTION - A

#### (OBJECTIVE TYPE QUESTIONS)

- From a point on the ground at a distance of 2 m from the foot of a vertical wall, a ball is thrown at an angle of  $45^\circ$  which just clears the top of the wall and then strikes the ground at a distance of 4 m from the foot of the wall on the other side. The height of the wall is  
 (A)  $\frac{3}{2}$  m                      (B)  $\frac{2}{3}$  m                      (C)  $\frac{3}{4}$  m                      (D)  $\frac{4}{3}$  m
- A ball of mass  $m$  hits a floor with a speed  $v$  making an angle of inclination  $\alpha$  with the normal to the floor. The coefficient of restitution is  $e$ . Find the speed of the rebounded ball.  
 (A)  $v\sqrt{\sin^2 \alpha + e^2 \cos^2 \alpha}$                       (B)  $v\sqrt{\sin^2 \alpha - e^2 \cos^2 \alpha}$   
 (C)  $v\sqrt{\cos^2 \alpha + e^2 \sin^2 \alpha}$                       (D)  $v\sqrt{\cos^2 \alpha - e^2 \sin^2 \alpha}$
- An automobile of mass  $m$  accelerates, starting from rest when the engine supplies a constant power  $P$ . Find its velocity and displacement as a function of time.  
 (A)  $\left(\frac{2Pt}{m}\right)^{1/2}, \left(\frac{8P}{9m}\right)^{1/2} t^{3/2}$                       (B)  $\left(\frac{2Pt}{m}\right)^{1/2}, \left(\frac{4P}{3m}\right)^{1/2} t^{3/2}$   
 (C)  $\left(\frac{Pt}{m}\right)^{1/2}, \left(\frac{4P}{3m}\right)^{1/2} t^{3/2}$                       (D)  $\left(\frac{Pt}{m}\right)^{1/2}, \left(\frac{2P}{3m}\right)^{1/2} t^{3/2}$
- A stone is dropped from a height of 5 m and after 1 sec. a projectile is thrown horizontally from the same point. The path of projectile as seen by stone is ( $g = 10\text{m/s}^2$ )  
 (A) st. line upwards                      (B) st. line down wards  
 (C) parabola upwards                      (D) parabola downwards
- The block A in the figure weighs 100 N. The coefficient of static friction between the block and the table is 0.25. The weight of the block B is maximum for the system to be in equilibrium. The value of weight of B is.



- (A) 0.25 N                      (B) 25 N                      (C) 100 N                      (D) 100.25 N
- The following relations can be derived by the method of dimensional analysis  
 (i)  $Q = Q_0 e^{-t/RC}$                       (ii)  $y = A \cos \frac{2\pi}{\lambda} (ct - x)$   
 (iii)  $K = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$                       (iv)  $V = \frac{\pi pr^4}{8\eta l}$   
 (A) (i) and (ii)                      (B) (ii) and (iii)                      (C) (iii) and (iv)                      (D) none

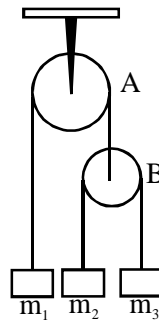
7. A person fires a bullet directly towards a monkey sitting on a tree. Just when the bullet leaves the gun, the monkey starts falling freely. The monkey falls in the range of the bullet. The bullet
- (A) Will go above the monkey (B) Will hit the monkey  
 (C) Will go below the monkey (D) Data insufficient
8. In the arrangement, shown in figure, pulleys are massless and frictionless and threads are inextensible. Block of mass  $m_1$  will remain at rest if

(A)  $\frac{1}{m_1} = \frac{1}{m_2} + \frac{1}{m_3}$

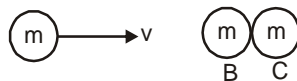
(B)  $\frac{4}{m_1} = \frac{1}{m_2} + \frac{1}{m_3}$

(C)  $m_1 = m_2 + m_3$

(D)  $\frac{1}{m_3} = \frac{2}{m_2} + \frac{3}{m_1}$



9. Consider the situation shown in figure below. If collision is elastic, then after the collision which of these will be correct ?



(A)  $\begin{matrix} m \\ A \end{matrix} \rightarrow v/3$      $\begin{matrix} m \\ B \end{matrix} \rightarrow v/3$      $\begin{matrix} m \\ C \end{matrix} \rightarrow v/3$

(B)  $\begin{matrix} m \\ A \end{matrix} \rightarrow v=0$      $\begin{matrix} m \\ B \end{matrix} \rightarrow v/2$      $\begin{matrix} m \\ C \end{matrix} \rightarrow v/2$

(C)  $\begin{matrix} m \\ A \end{matrix} \rightarrow v=0$      $\begin{matrix} m \\ B \end{matrix} \rightarrow v/3$      $\begin{matrix} m \\ C \end{matrix} \rightarrow 2v/3$

(D)  $\begin{matrix} m \\ A \end{matrix} \rightarrow v=0$      $\begin{matrix} m \\ B \end{matrix} \rightarrow v=0$      $\begin{matrix} m \\ C \end{matrix} \rightarrow v$

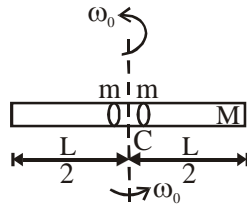
10. The angular speed of a body changes from  $\omega_1$  to  $\omega_2$  without applying a torque but due to changes in moment of inertia. The ratio of radii of gyration in two cases is

(A)  $\sqrt{\omega_2} : \sqrt{\omega_1}$     (B)  $\sqrt{\omega_1} : \sqrt{\omega_2}$     (C)  $\sqrt{\omega_2^2} : \sqrt{\omega_1^2}$     (D)  $\sqrt{\omega_2^3} : \sqrt{\omega_1^3}$

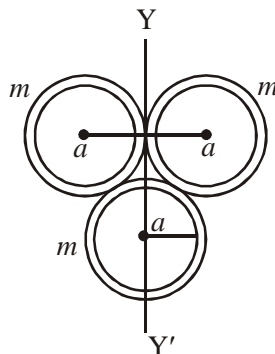
11. A heavy weight is suspended from the spring. A person raises the weight till the spring becomes slack. The work done by him is W. The energy stored in the stretched spring was E. What will be the gain in gravitational potential energy ?

(A)  $W + E$     (B)  $W - E$     (C)  $W$     (D)  $E$

12. A smooth uniform rod of length  $L$  and mass  $M$  has two identical beads of negligible size, each of mass  $m$ , which can slide freely along the rod. Initially the two beads are at the centre of the rod and the system is given an angular velocity  $\omega_0$  about an axis perpendicular to rod and passing through the mid point of rod (As shown in figure). There are no external forces. When the beads reach the ends of the rod the angular velocity of the system becomes

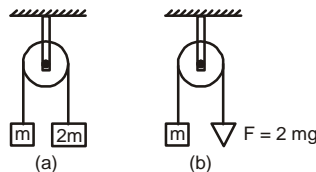


- (A)  $\frac{M}{M+3m}\omega_0$       (B)  $\frac{M}{M+6m}\omega_0$       (C)  $\frac{M+6m}{M}\omega_0$       (D)  $\omega_0$
13. Let  $g$  be acceleration due to gravity on the surface of earth and  $T$  be the rotational kinetic energy of earth. Suppose the earth's radius decreases by 2% due to internal forces. Then
- (A)  $g$  decreases by 2% and  $T$  decreases by 4%  
 (B)  $g$  decreases by 4% and  $T$  decreases by 2%  
 (C)  $g$  increases by 4% and  $T$  increases by 4%  
 (D)  $g$  increases by 4% and  $T$  decreases by 4%
14. Three rings each of mass  $m$  kg and radius  $a$  are arranged as shown in figure. The moment of inertia of the arrangement about  $y y'$  axis will be

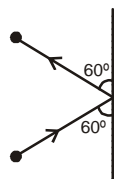


- (A)  $\frac{3}{2}ma^2$       (B)  $\frac{7}{2}ma^2$       (C)  $\frac{2}{7}ma^2$       (D)  $\frac{2}{5}ma^2$
15. If the rate of change of magnitude of velocity is  $a$  and the magnitude of rate of change of velocity is  $b$  then in a uniform circular motion
- (A)  $a \neq 0, b \neq 0$       (B)  $a = 0, b \neq 0$       (C)  $a = 0, b = 0$       (D)  $a \neq 0, b = 0$
16. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces
- (A) cannot be predicted      (B) are equal to each other  
 (C) are equal to each other in magnitude      (D) are not equal to each other in magnitude
17. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically). If  $V_A$  and  $V_B$  are their respective velocities on reaching the ground, then
- (A)  $V_A > V_B$       (B)  $V_A = V_B$   
 (C)  $V_A < V_B$       (D) their velocities depends on their masses

18. A ball is released from the top of a tower of height  $h$  meters. It takes  $T$  seconds to reach the ground. What is the position of the ball at  $T/3$  second?
- (A)  $\frac{8h}{9}$  meter from the ground                      (B)  $\frac{7h}{9}$  meter from the ground
- (C)  $\frac{h}{9}$  meter from the ground                      (D)  $\frac{17h}{18}$  meter from the ground
19. A particle moves in a circular path of radius 25 cm at two revolutions per second. The acceleration of the particle in meter per second<sup>2</sup> is
- (A)  $p^2$                       (B)  $8p^2$                       (C)  $4p^2$                       (D)  $2p^2$
20. The potential energy of a certain particle is given by  $U = \frac{1}{2}(x^2 - z^2)$ . The force on it is
- (A)  $-x\hat{i} + z\hat{k}$                       (B)  $x\hat{i} + z\hat{k}$                       (C)  $\frac{1}{2}(x\hat{i} + z\hat{k})$                       (D)  $\frac{1}{2}(x\hat{i} - z\hat{k})$
21. Two pulley arrangements of figure given are identical. The mass of the rope is negligible. In fig (a), the mass  $m$  is lifted by attaching a mass  $2m$  to the other end of the rope. In fig (b),  $m$  is lifted up by pulling the other end of the rope with a constant downward force  $F = 2mg$ . The acceleration of  $m$  in the two cases are respectively

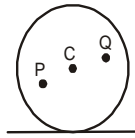


- (A)  $3g, g$                       (B)  $g/3, g$                       (C)  $g/3, 2g$                       (D)  $g, g/3$
22. A 3 kg ball strikes a heavy rigid wall with a speed of 10 m/s at an angle of  $60^\circ$ . It gets rebounded with the same speed and angle as shown here. If the ball is in contact with the wall for 0.20 s, what is the average force exerted on the ball by the wall ?

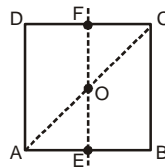


- (A) 150 N                      (B) zero                      (C)  $150\sqrt{3}$  N                      (D) 300 N

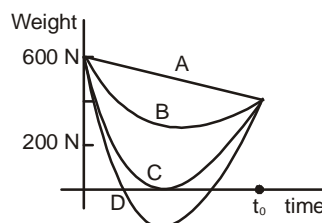
23. A disc is rolling (without slipping) on a horizontal surface. C is its centre and Q and P are two points equidistant from C. Let  $V_P$ ,  $V_Q$  and  $V_C$  be the magnitude of velocities of points P, Q and C respectively, then



- (A)  $V_Q > V_C > V_P$       (B)  $V_Q < V_C < V_P$       (C)  $V_Q = V_P$ ,  $V_C = \frac{1}{2}V_P$       (D)  $V_Q < V_C > V_P$
24. For the given uniform square lamina ABCD, whose centre is O, I represents moment of inertia about axis represented, then

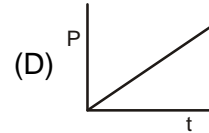
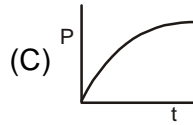
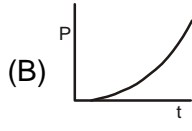
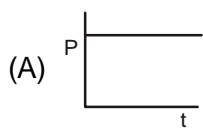


- (A)  $I_{AC} = \sqrt{2}I_{EF}$       (B)  $\sqrt{2}I_{AC} = I_{EF}$       (C)  $I_{AD} = 3I_{EF}$       (D)  $I_{AC} = I_{EF}$
25. Suppose, the acceleration due to gravity at the Earth's surface is  $10 \text{ m s}^{-2}$  and at the surface of Mars it is  $4.0 \text{ m s}^{-2}$ . A 60 kg passenger goes from the Earth to the Mars in a spaceship moving with a constant velocity. Neglect all other objects in the sky. Which part of figure best represents the weight (net gravitational force) of the passenger as a function of time?



- (A) A      (B) B      (C) C      (D) D
26. Two masses  $m_1$  and  $m_2$  ( $m_1 < m_2$ ) are released from rest from a finite distance. They start to move under their mutual gravitational attraction towards each other. Now,
- (A) acceleration of  $m_1$  is more than that of  $m_2$ .  
 (B) acceleration of  $m_2$  is more than that of  $m_1$ .  
 (C) centre of mass of system will remain at rest in all the reference frame  
 (D) total energy of system does not remain constant
27. What is the fractional error in  $g$  calculated from  $T = 2\pi\sqrt{\ell/g}$ ?
- Given fractional error in  $T$  and  $\ell$  are  $\pm x$  and  $\pm y$  respectively
- (A)  $x + y$       (B)  $x - y$       (C)  $2x + y$       (D)  $2x - y$

28. The circular motion of a particle with constant speed is  
 (A) periodic but not simple harmonic (B) simple harmonic but not periodic  
 (C) periodic and simple harmonic (D) neither periodic nor simple harmonic
29. A motor drives a body along a straight line with a constant force. The power  $P$  developed by the motor must vary with time  $t$  according to



30. The mass of the liquid flowing per second per unit area of cross-section of the tube is proportional to (pressure difference across the ends)<sup>n</sup> and (average velocity of the liquid)<sup>m</sup>. Which of the following relations between  $m$  and  $n$  is correct.  
 (A)  $m = n$  (B)  $m = -n$  (C)  $m^2 = n$  (D)  $m = -n^2$

### SECTION - B

#### (ASSERTION & REASON TYPE QUESTIONS)

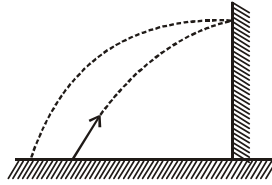
In the questions given below, two statements—an Assertion and a Reason are given. Give the appropriate response as:

- (A) Both Assertion and Reason are true and Reason is correct explanation of Assertion.  
 (B) Both Assertion and Reason are true but Reason is not correct explanation of Assertion.  
 (C) Assertion is true, Reason is false.  
 (D) Assertion is false, Reason is true.
31. **Assertion** : A football player having mass  $m$  moving with velocity  $v$  will cause more injury to the player having mass  $2m$  and moving with velocity  $v/2$ .  
**Reason** : Both have equal momentum.
32. **Assertion** : A fat man is standing on a light plank (floating on a calm lake). The person moves from one end of the plank to the other. A person standing on the shore finds he has hardly moved any distance.  
**Reason** : Momentum shall remain conserved.
33. **Assertion** : An athlete when throws a javelin, work is done by the athlete on the javelin.  
**Reason** : Javelin does a negative work (on the athlete).
34. **Assertion** : The work done by the gravitational force on lifting a book from the table is negative.  
**Reason** : The displacement is opposite to the weight.
35. **Assertion** : Angle between  $\hat{i} + \hat{j}$  and  $\hat{i}$  is  $45^\circ$   
**Reason** :  $\hat{i} + \hat{j}$  is equally inclined to both  $\hat{i}$  and  $\hat{j}$  and the angle between  $\hat{i}$  and  $\hat{j}$  is  $90^\circ$ .
36. **Assertion** : When the range of projectile is maximum, the time of flight is the largest.  
**Reason** : Range is maximum when angle of projection is  $45^\circ$

37. **Assertion** : KE of system after the collision can never be greater than KE of system before collision.

**Reason** : KE is lost due to presence of non conservative forces

38. **Assertion** : A projectile, launched from ground, collides with a vertical wall and returns to ground. The total time of flight is same had there been no collision.



**Reason** : The collision changes only the horizontal component of velocity.

39. **Assertion** : A series of small speed breakers are more effective than a single large speed breaker.

**Reason** : The frequency of natural oscillation of vehicle due to shock absorber may be equal to the natural frequency of oscillations due to series of breakers and may lead to resonance which can produce abrupt bounce of vehicle.

40. **Assertion** : In non-uniform circular motion velocity vector and acceleration vector are not perpendicular to each other.

**Reason** : In non-uniform circular motion particle has normal as well as tangential acceleration.



## PART-II: CHEMISTRY

## SECTION - A

## (OBJECTIVE TYPE QUESTIONS)

41. The  $\text{BCl}_3$  is a planar molecule whereas  $\text{NCl}_3$  is pyramidal because  
 (A) Nitrogen atom is smaller than boron atom  
 (B)  $\text{BCl}_3$  has no lone pair but  $\text{NCl}_3$  has a lone pair of electrons  
 (C) B – Cl bond is more polar than N – Cl bond  
 (D) N – Cl bond is more covalent than B – Cl bond
42. Which of the following species is paramagnetic ?  
 (A) CO (B)  $\text{CN}^-$  (C)  $\text{O}_2^{2-}$  (D) NO
43. The molar heat capacity of water at constant pressure,  $C_p$ , is  $75 \text{ JK}^{-1} \text{ mol}^{-1}$ . When 1.0 kJ of heat is supplied to 100 g of water which is free to expand, the increase in temperature of water is  
 (A) 1.2 K (B) 2.4 K (C) 4.8 K (D) 6.6 K
44. In  $\text{PO}_4^{3-}$  ion, the formal charge of each oxygen atom and P – O bond order respectively are  
 (A)  $-0.75$ , 1.25 (B)  $-0.75$ , 1.0 (C)  $-0.75$ , 0.6 (D)  $-3$ , 1.25
45. Which of the following has  $p\pi - d\pi$  bonding ?  
 (A)  $\text{NO}_3^-$  (B)  $\text{SO}_3^{2-}$  (C)  $\text{BO}_3^{3-}$  (D)  $\text{CO}_3^{2-}$
46. The state of hybridization of  $\text{C}_2, \text{C}_3, \text{C}_5$  and  $\text{C}_6$  of the hydrocarbon,  

$$\begin{array}{ccccccc} & \text{CH}_3 & & & \text{CH}_3 & & \\ & | & & & | & & \\ \text{CH}_3 & - \text{C} & - \text{CH} & = & \text{CH} & - \text{CH} & - \text{C} \equiv \text{CH} \\ & | & & & | & & \\ & \text{CH}_3 & & & & & \end{array}$$
 is in the following sequence  
 (A)  $sp, sp^2, sp^3$  and  $sp^2$  (B)  $sp, sp^3, sp^2$  and  $sp^3$   
 (C)  $sp^3, sp^2, sp^2$  and  $sp$  (D)  $sp, sp^2, sp^2$  and  $sp^3$
47. Which one of the following species does not exist under normal conditions ?  
 (A)  $\text{Li}_2$  (B)  $\text{Be}_2^+$  (C)  $\text{Be}_2$  (D)  $\text{B}_2$
48. The average kinetic energy of an ideal gas, per molecule in S.I. units, at  $25^\circ\text{C}$  will be  
 (A)  $6.17 \times 10^{-20} \text{ J}$  (B)  $7.16 \times 10^{-20} \text{ J}$  (C)  $61.7 \times 10^{-21} \text{ J}$  (D)  $6.17 \times 10^{-21} \text{ J}$
49. The conjugate base of  $\text{NH}_3$  is -  
 (A)  $\text{NH}_4\text{OH}$  (B)  $\text{NH}_2^-$  (C)  $\text{NH}^{2-}$  (D)  $\text{N}_2\text{H}_2$

50. For preparing 0.1 N solution of a compound from its impure sample of which the percentage purity is known, the weight of the substance required will be  
 (A) less than the theoretical weight (B) more than the theoretical weight  
 (C) same as the theoretical weight (D) none of these
51. Ratio of energy of photon of wavelength 3000Å and 6000Å is  
 (A) 3 : 1 (B) 2 : 1 (C) 1 : 2 (D) 1 : 3
52.  $N_2$  and  $O_2$  are converted into monocations,  $N_2^+$  and  $O_2^+$  respectively. Which of the following is wrong ?  
 (A) In  $N_2^+$ , N – N bond weakens (B) In  $O_2^+$ , the O – O bond order increases  
 (C) In  $O_2^+$ , paramagnetism decreases (D)  $N_2^+$  becomes diamagnetic
53. X ml of  $H_2$  gas effuse through a hole in a container in 5 seconds. The time taken for the effusion of the same volume of the gas specified below under identical conditions is  
 (A) 10 seconds : He (B) 20 seconds :  $O_2$   
 (C) 25 seconds : CO (D) 55 seconds :  $CO_2$
54. The oxidation number of sulphur in  $S_8$ ,  $S_2F_2$ ,  $H_2S$  respectively, are  
 (A) 0, +1 and –2 (B) +2, +1 and –2 (C) 0, +1 and +2 (D) –2, +1 and –2
55. The following equilibria are given :  

$$N_2 + 3H_2 \rightleftharpoons 2NH_3 \quad K_1$$

$$N_2 + O_2 \rightleftharpoons 2NO \quad K_2$$

$$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O \quad K_3$$
- The equilibrium constant of the reaction  $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$  in terms of  $K_1, K_2$  and  $K_3$  is  
 (A)  $\frac{K_1 K_2}{K_3}$  (B)  $\frac{K_1 K_3^2}{K_2}$  (C)  $\frac{K_2 K_3^3}{K_1}$  (D)  $K_1 K_2 K_3$
56. The pH of blood does not appreciably change by a small addition of acid or base because blood  
 (A) contains serum protein which acts as buffer  
 (B) contains iron as a part of the molecule  
 (C) can be easily coagulated  
 (D) is body fluid
57. AB,  $A_2$  and  $B_2$  are diatomic molecules. If the bond enthalpies of  $A_2$ , AB and  $B_2$  are in the ratio 1 : 1 : 0.5 and enthalpy of formation of AB from  $A_2$  and  $B_2$  is  $-100 \text{ kJ mol}^{-1}$ . What is the bond energy of  $A_2$  :  
 (A)  $200 \text{ kJ mol}^{-1}$  (B)  $100 \text{ kJ mol}^{-1}$  (C)  $300 \text{ kJ mol}^{-1}$  (D)  $400 \text{ kJ mol}^{-1}$

58. Which of the following condition favours the reduction of a metal oxide to metal ?  
(A)  $\Delta H = +ve, T\Delta S = +ve$  at low temperature (B)  $\Delta H = +ve, T\Delta S = -ve$  at any temperature  
(C)  $\Delta H = -ve, T\Delta S = -ve$  at high temperature (D)  $\Delta H = -ve, T\Delta S = +ve$  at any temperature
59. Consider the following statements  
I. The radius of an anion is larger than that of the parent atom.  
II. The ionization energy generally increases with increasing atomic number in a period.  
III. The electronegativity of an element is the tendency of an isolated atom to attract an electron.  
Which of the above statements is/are correct?  
(A) I alone (B) II alone (C) I and II (D) II and III
60. The order of solubility of lithium halides in non polar solvents follows the order :  
(A)  $LiI > LiBr > LiCl > LiF$  (B)  $LiF > LiI > LiBr > LiCl$   
(C)  $LiCl > LiF > LiI > LiBr$  (D)  $LiBr > LiCl > LiF > LiI$
61. The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order.  
 $K_2CO_3$  (I)                       $MgCO_3$  (II)                       $CaCO_3$  (III)                       $BeCO_3$  (IV)  
(A)  $I < II < III < IV$  (B)  $IV < II < III < I$  (C)  $IV < II < I < III$  (D)  $II < IV < III < I$
62.  $BCl_3$  does not exist as dimer but  $BH_3$  exists as dimer ( $B_2H_6$ ) because  
(A) Chlorine is more electronegative than hydrogen  
(B) there is  $p\pi - p\pi$  back bonding in  $BCl_3$  but  $BH_3$  does not contain such multiple bonding  
(C) large sized hydrogen atoms get fitted in between boron atoms  
(D) none of the above
63. In a hydrocarbon, mass ratio of hydrogen and carbon is 1:3, the empirical formula of hydrocarbon is  
(A)  $CH_4$  (B)  $CH_2$  (C)  $C_2H$  (D)  $CH_3$
64. Which of the following has the smallest size ?  
(A)  $Al^{3+}$  (B)  $F^-$  (C)  $Na^+$  (D)  $Mg^{2+}$
65. Which one of the following is correct order of the size of iodine species ?  
(A)  $I^+ > I^- > I$  (B)  $I^- > I > I^+$  (C)  $I > I^- > I^+$  (D)  $I > I^+ > I^-$
66. The first ionization potentials (eV) of Be and B respectively are  
(A) 8.29, 8.29 (B) 9.32, 9.32 (C) 8029, 9.32 (D) 9.32, 8.29
67. Which statement is wrong ?  
(A) Bond energy of  $F_2 > Cl_2$  (B) Electronegativity of  $F > Cl$   
(C)  $F_2$  is more oxidizing than  $Cl_2$  (D) Electron affinity of  $Cl > F$

68. Correct order of 1st ionization potential among following elements Be, B, C, N, O is  
 (A)  $B < Be < C < O < N$  (B)  $B < Be < C < N < O$   
 (C)  $Be < B < C < O < N$  (D)  $Be < B < C < O < N$
69. An atom has electronic configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$ , you will place in the which group of periodic table ?  
 (A) Fifth (B) Fifteenth (C) Second (D) Third
70. The ions  $O^{2-}$ ,  $F^-$ ,  $Na^+$ ,  $Mg^{2+}$  and  $Al^{3+}$  are isoelectronic. Their ionic radii show  
 (A) A significant increases from  $O^{2-}$  to  $Al^{3+}$   
 (B) A significant decrease from  $O^{2-}$  to  $Al^{3+}$   
 (C) An increase from  $O^{2-}$  to  $F^-$  and then decrease from  $Na^+$  to  $Al^{3+}$   
 (D) An increase from  $O^{2-}$  to  $F^-$  and then increases from  $Na^+$  to  $Al^{3+}$

### SECTION - B

#### (ASSERTION & REASON TYPE QUESTIONS)

In the questions given below, two statements—an Assertion and a Reason are given. Give the appropriate response as:

- (A) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.  
 (B) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.  
 (C) If Assertion is true but Reason is false.  
 (D) If both Assertion and Reason are false.
71. **Assertion** : A tube light emits white light.  
**Reason** : Emission of light in a tube takes place at a very high temperature.
72. **Assertion** : For Balmer series of hydrogen spectrum, the value of  $n_1 = 2$  and  $n_2 = 3, 4, 5$ .  
**Reason** : The value of  $n$  for a Balmer series line of hydrogen spectrum having the highest wave length is 4 and 6.
73. **Assertion** : Ionisation potential of Be (atomic no. 4) is less than that of B (atomic no. 5).  
**Reason** : The first electron released from Be is of p-orbital but that from B is of s-orbital.
74. **Assertion** : Diamond is a bad conductor.  
**Reason** : Graphite is a good conductor.
75. **Assertion** :  $B_2$  molecule is diamagnetic.  
**Reason** : The highest occupied molecular orbital is of  $\sigma$ -type.
76. **Assertion** : For an ideal gas, at constant temperature and no. of mole the product of the pressure and volume is a constant.  
**Reason** : The mean square velocity of the molecules is inversely proportional to molecular mass.

77. **Assertion** : Angular momentum of an electron in any orbit is given by  $mvr = \frac{n \cdot h}{2\pi}$ , where  $n$  is the principal quantum number.  
**Reason** : The principal quantum number,  $n$ , can have any integral value.
78. **Assertion** : LiCl is predominantly a covalent compound.  
**Reason** : Electronegativity difference between Li and Cl is too small.
79. **Assertion** : Many endothermic reactions that are not spontaneous at room temperature become spontaneous at high temperature.  
**Reason** : Entropy of the system increases with increase in temperature at constant volume.
80. **Assertion** : A spectral line will be seen for a  $2p_x \rightarrow 2p_y$  transition.  
**Reason** : Energy is released in the form of waves of light when the electron drops from  $2p_x$  to  $2p_y$  transition.

**PART-III: BIOLOGY****SECTION - A****(OBJECTIVE TYPE QUESTIONS)**

81. Mark the odd one out according to symmetry  
 (A) Pea (B) *Cassia* (C) Gulmohar (D) *Datura*
82. Which of the following flower is asymmetrical ?  
 (A) Bean (B) *Cassia* (C) *Canna* (D) Pea
83. Mark the odd one out according to position of ovary  
 (A) Mustard (B) Brinjal (C) Chaina rose (D) Peach
84. When sepals are united the condition is called  
 (A) Gamosepalous (B) Polysepalous (C) Trimerous (D) Tetramerous
85. Mark the incorrect according to aestivation  
 (A) Valvate - *Calotropis* (B) Twisted - Glumohar  
 (C) Vexillary - Bean (D) Imbricate - China rose
86. Ovary is one chambered but becomes two chambered due to formation of false septum is seen in  
 (A) *Argemone* (B) Mustard (C) *Dainthus* (D) Both (A) and (B)
87. Five sepals and five petals are feature of  
 (A) Fabaceae (B) Solanaecae (C) Liliaceae (D) Both (A) and (B)
88. Tomato, brinjal, chilly plants belong to a family with  
 (A) Five stamens with epipetalous condition (B) Six stamen (3 + 3)  
 (C) Bicarpellary syncarpus ovary (D) Both (A) and (C)
89. Mark the incorrect statements  
 (A) Fall in GFR activate Jga cells to release renin  
 (B) JGA is a special modification of cells in DCT  
 (C) Reabsorption of water occurs passively in last segment of Nephron  
 (D) All of these
90. If a diploid cell is treated with colchicine then it becomes  
 (A) Triploid (B) Tetraploid (C) Diploid (D) Monoploid
91. Syngenesious condition is found in  
 (A) Asteraceae (B) Labiate (C) Solanaceae (D) Fabaceae
92. During the conduction of an impulse, electrical potential on inside axolemma changes from  
 (A) Negative to positive and remains positive (B) Positive to negative and again positive  
 (C) Negative to positive and again negative (D) Positive to negative and remains negative

93. Ectophloic siphonostele is found in  
(A) *Osmunda* and *Equisetum* (B) *Marsilea* and *Botrychium*  
(C) *Adiantum* and *Cucurbitaceae* (D) *Dicksonia* and *Maiden hair fern*
94. If a cell A with DPD 4 bars is connected to cell B, C, D whose OP and TP are respectively 4 and 4, 10 and 5 and 7 and 3 bars, the flow of water will be  
(A) A and D to B and C (B) A to B, C and D  
(C) B to A/D to C (D) C to A, B and D
95. The size of chlorophyll molecule is  
(A) Head  $15 \times 15 \text{ \AA}$ , tail  $25 \text{ \AA}$  (B) Head  $20 \times 20 \text{ \AA}$ , tail  $25 \text{ \AA}$   
(C) Head  $15 \times 15 \text{ \AA}$ , tail  $20 \text{ \AA}$  (D) Head  $10 \times 12 \text{ \AA}$ , tail  $25 \text{ \AA}$
96. Terminal cytochrome of respiratory chain which donates electrons to oxygen is  
(A) Cyt. b (B) Cyt. c (C) Cyt.  $a_1$  (D) Cyt.  $a_3$
97. An ovule which becomes curved so that the nucellus and embryo sac lie at right angles to the funicle is  
(A) Hemitropous (B) Campylotropous (C) Anatropous (D) Orthotropous
98. Which of the following movement is not related to auxin level  
(A) Bending of shoot towards light (B) Movement of root towards soil  
(C) Nyctinastic leaf movements (D) Movement of sunflower head tracking the sun
99. An interesting modification of flower shape for insect pollination occurs in some orchids in which a male insect mistakes the pattern on the orchid flower for the female of his species and tries to copulate with it, thereby pollinating the flower. This phenomenon is called  
(A) Mimicry (B) Pseudopollination  
(C) Pseudocopulation (D) Pseudoparthenocarpy
100. The most common indicator organisms that represents polluted water is  
(A) *E. coli* (B) *P. typhi* (C) *C. vibrio* (D) *Entamoeba*
101. In order to obtain virus-free plants through tissue culture the best method is  
(A) Embryo rescue (B) Anther culture (C) Meristem culture (D) Protoplast culture
102. Which one among the following chemicals is used for causing defoliation of forest trees?  
(A) Phosphon-D (B) Malic hydrazide  
(C) 2,4 Dichlorophenoxy acetic acid (D) Amo- 1618
103. Which of the following is **not** true for a species?  
(A) Members of a species can interbreed  
(B) Gene flow does not occur between the populations of a species  
(C) Each species is reproductively isolated from every other species  
(D) Variations occur among members of a species

104. The catalytic efficiency of two different enzymes can be compared by the  
 (A) formation of the product (B) pH optimum value  
 (C)  $K_m$  value (D) molecular size of the enzyme
105. Fire bellied toad is  
 (A) *Amphiuma* (B) *Discoglossus* (C) *Necturus* (D) *Salamandra*
106. American water plant that has become a troublesome water weed in India is  
 (A) *Cyperus rotundus* (B) *Eichhornia crassipes*  
 (C) *Trapa iatifolia* (D) *Trapa bispinosa*
107. Characteristics of smooth muscle fibres are  
 (A) Spindle-shaped, unbranched, unstriated, uninucleate and involuntary  
 (B) Spindle shaped, unbranched, unstriped, multinucleate and involuntary  
 (C) Cylindrical, unbranched, unstriped, multinucleate and involuntary  
 (D) Cylindrical, unbranched, striated, multinucleate and voluntary
108. An adolescent human below 17 years of age normally has dental formula as  
 (A)  $\frac{2,1,3,2}{2,1,3,2}$  (B)  $\frac{2,2,3,2}{2,2,3,2}$  (C)  $\frac{2,1,2,0}{2,1,2,0}$  (D)  $\frac{2,1,2,2}{2,1,2,2}$
109. In alveoli of the lungs, the air at the site of gas exchange, is separated from the blood by  
 (A) alveolar epithelium only  
 (B) alveolar epithelium and capillary endothelium  
 (C) alveolar epithelium, capillary endothelium and tunica adventitia  
 (D) alveolar epithelium, capillary endothelium, a thin layer of tunica media and tunica adventitia
110. Splenic artery arises from  
 (A) Anterior mesenteric artery (B) Coeliac artery  
 (C) Posterior mesenteric artery (D) Intestinal artery

### SECTION - B

#### (ASSERTION & REASON TYPE QUESTIONS)

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 (D) If both Assertion and Reason are false.

111. **Assertion** : Viruses are not considered organisms.

**Reason** : Viruses are nucleoproteins and lack cell organelle, etc.



112. **Assertion** : TMV is a virus which causes tobacco mosaic disease.  
**Reason** : TMV has RNA as genetic material.
113. **Assertion** : Yeasts such as *Saccharomyces cerevisiae* are used in baking industry.  
**Reason** : Carbon dioxide produced during fermentation causes bread dough to rise by thermal expansion.
114. **Assertion** : Blood and lymph are fibrous connective tissues of the body.  
**Reason** : Lymph has more WBC than blood.
115. **Assertion** : 12 - 16 gm of haemoglobin is present in every 100 ml of blood.  
**Reason** : Haemoglobin is present in Erythrocytes.
116. **Assertion** : Neutrophils and monocytes are phagocytic.  
**Reason** : Both cells destroys foreign cells entering in body.
117. **Assertion** : Mango Dipped in concentrated sodium chloride solution will contract.  
**Reason** : Water goes out due to exosmosis in hypertonic solution.
118. **Assertion** : Nissl Granules that are basophilic are present in the Cyton.  
**Reason** : They are composed of RNA
119. **Assertion** : Phycobilins are destroyed by heat.  
**Reason** : The are protein linked and proteins are denatured due to heat.
120. **Assertion** : The inner serosa coat has innumerable finger like projections.  
**Reason** : Absorption decreases due to infolds.