



SET-A

## QUANTUM POTENTIAL TEST

[Quality Nurturer & Mind Utilizer Test for Potential Enhancement]

(IPEC Scholarship-Cum-Admission Test)

For

CLASS-XI

(For XI to XII Moving Students)

Time : 2 Hrs.]

[Maximum Marks : 180

[PAPER-1]

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

### INSTRUCTIONS

1. The booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilator.
2. Blank spaces and blank pages are provided in the question paper for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers and electronic gadgets are **NOT** allowed inside the examination hall.
4. The answer sheet, a machine-readable Optical Response Sheet (**ORS**), is provided separately.
5. On breaking the seal of the booklet check that it contains **14** pages and all the **60** questions.
6. A candidate has to write his / her answers in the ORS sheet by darkening the appropriate bubble with the help of **Black ball point pen** as the correct answer of the question attempted.

#### 7. Question Paper Format :

This question paper consists of **Three Parts**:

**Part-I:** (Physics) - 20 Questions.

**Part-II:** (Chemistry) - 20 Questions.

**Part-III:** (Mathematics) - 20 Questions.

#### 8. Marking Scheme :

All **Questions** carries **+3** marks for correct answer and **-1** for wrong answer

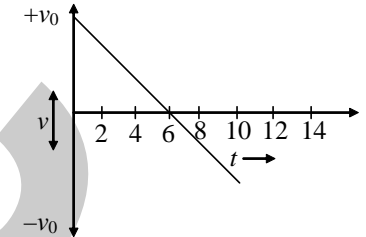
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## PART -I [Physics]

## [SINGLE CORRECTTYPE]

Each question has four choices (A), (B), (C) and (D) out of which only one is correct.

1. Consider the given velocity-time graph. It represents the motion of
- 
- (A) a projectile projected vertically upward, from a point  
 (B) an electron in the hydrogen atom  
 (C) a bullet fired horizontally from the top of a tower  
 (D) an object in the positive direction with decreasing speed
2. The retardation of a particle moving in a straight line is proportional to its displacement (proportionality constant being unity). Initial velocity of the particle is  $v_0$ . Find the total displacement of the particle till it comes to rest.
- (A)  $\frac{v_0}{2}$                       (B)  $v_0$                       (C)  $\frac{v_0}{3}$                       (D)  $\frac{v_0^2}{4}$
3. At what angle to the horizontal should an object be projected so that the maximum height reached is equal to the horizontal range?
- (A)  $\tan \theta = 2$                       (B)  $\tan \theta = 4$                       (C)  $\tan \theta = 2/3$                       (D)  $\theta = 3$
4. A 150 m long train is moving to north at a speed of 10 m/s. A parrot is flying towards south with a speed of 5 m/s crosses the train. The time taken by the parrot to cross the train would be
- (A) 30 s                      (B) 15 s                      (C) 8 s                      (D) 10 s
5. A projectile is fired horizontally with a initial speed of 20 m/s. Its horizontal speed 3 sec later will be
- (A) 20 m/s                      (B) 6.67 m/s                      (C) 60 m/s                      (D) 29.4 m/s
6. A projectile has the same range R for two angles of projection. If  $T_1$  and  $T_2$  be the times of flight in the two cases, then R is
- (A)  $T_1 T_2 g$                       (B)  $\frac{T_1 T_2 g}{2}$                       (C)  $(T_1^2 + T_2^2)g$                       (D)  $\frac{T_1^2 + T_2^2}{2} g$
7. A particle located at  $x = 0$  at time  $t = 0$ , starts moving along the positive x-direction with a velocity 'v' that varies as  $v = \alpha\sqrt{x}$ . The displacement of the particle varies with time as
- (A)  $t^3$                       (B)  $t^2$                       (C)  $t$                       (D)  $t^{1/2}$
8. Velocity of a particle moving along x-axis is proportional to square root of its displacement. The acceleration of the particle is
- (A) increasing                      (B) decreasing                      (C) zero                      (D) constant

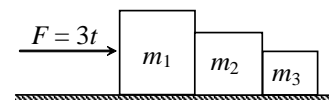
(Space for rough work)

9. The coordinates of a moving particle at any time 't' are given by  $x = t^3$  and  $y = 4t^2$ , where x and y are in metre and t in second. The acceleration of the particle at time  $t = 1$  s is given by  
 (A)  $6 \text{ ms}^{-2}$  (B)  $8 \text{ ms}^{-2}$  (C)  $10 \text{ ms}^{-2}$  (D)  $14 \text{ ms}^{-2}$
10. A particle is moving east-wards with a velocity of 4 m/s. In 5 seconds the velocity changes to 3 m/s northwards. The average acceleration in this time interval is

- (A)  $\frac{1}{2} \text{ m/s}^2$  towards north-east (B)  $1 \text{ m/s}^2$  towards north-west  
 (C)  $\frac{1}{\sqrt{2}} \text{ m/s}^2$  towards north-east (D)  $\frac{1}{2} \text{ m/s}^2$  towards north-west

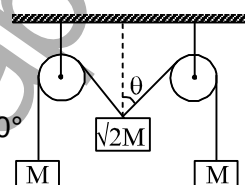
11. A body of mass 2 kg moves vertically downwards with an acceleration  $a = 19.6 \text{ m/s}^2$ . The force acting on the body simultaneously with the force of gravity is ( $g = 9.8 \text{ m/s}^2$ , neglect air resistance)  
 (A) 19.6 N (B) 19.2 N (C) 59.2 N (D) 58.8 N

12. A time dependent force  $F = 3t$  (F in Newton and t in second) acts on three blocks  $m_1$ ,  $m_2$  and  $m_3$  kept in contact on a rough ground as shown. Co-efficient of friction between blocks and ground is 0.4. If  $m_1$ ,  $m_2$  and  $m_3$  are 3 kg, 2 kg and 1 kg respectively, the time after which the blocks started to move is ( $g = 10 \text{ ms}^{-2}$ )

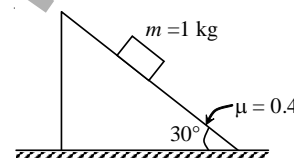


- (A) 4 sec (B) 8 sec (C)  $\frac{8}{3}$  sec (D)  $\frac{4}{3}$  sec

13. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle  $\theta$  should be:  
 (A)  $0^\circ$  (B)  $30^\circ$  (C)  $45^\circ$  (D)  $60^\circ$

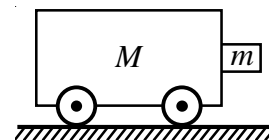


14. A block of mass 1 kg is placed on a rough incline as shown. The coefficient of friction between block and incline is 0.4. The acceleration of block is ( $g = 10 \text{ ms}^{-2}$ ,  $\sqrt{3} = 1.7$ )



- (A) zero (B)  $1.6 \text{ ms}^{-2}$   
 (C)  $6.5 \text{ ms}^{-2}$  (D)  $5 \text{ ms}^{-2}$

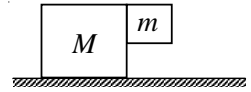
15. A wagon of mass M has a block of mass m attached to it as shown in the figure. The coefficient of friction between the block and wagon is  $\mu$ . The minimum acceleration of the wagon so that the block m does not fall is



- (A)  $\frac{g}{\mu}$  (B)  $\frac{\mu}{g}$  (C)  $mg$  (D)  $\frac{M\mu g}{m}$

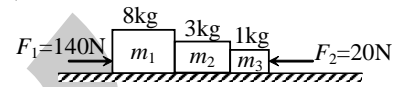
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16. With what minimum acceleration mass  $M$  must be moved on frictionless surface so that  $m$  remains stick to it as shown. The co-efficient of friction between  $M$  &  $m$  is  $\mu$ .



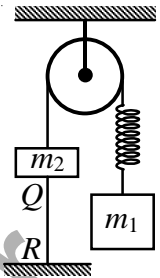
- (A)  $\mu g$                       (B)  $\frac{g}{\mu}$                       (C)  $\frac{\mu mg}{M + m}$                       (D)  $\frac{\mu mg}{M}$

17. Three blocks  $m_1$ ,  $m_2$  and  $m_3$  of masses 8 kg, 3 kg and 1 kg are placed in contact on a smooth surface. Forces  $F_1 = 140$  N and  $F_2 = 20$  N are acting on blocks  $m_1$  and  $m_3$  respectively as shown. The reaction between blocks  $m_2$  and  $m_3$  is



- (A) 2.5 N                      (B) 7.5 N                      (C) 22.5 N                      (D) 30 N

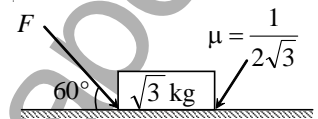
18. In the shown system,  $m_1 > m_2$ . Thread QR is holding the system. If this thread is cut, then just after cutting.



- (A) acceleration of mass  $m_1$  is zero and that of  $m_2$  is directed upward  
 (B) acceleration of mass  $m_2$  is zero and that of  $m_1$  is directed downward  
 (C) acceleration of both the blocks will be same

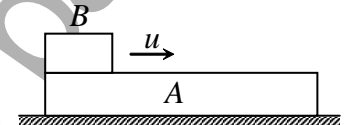
- (D) acceleration of system is given by  $\left(\frac{m_1 - m_2}{m_1 + m_2}\right)kg$ , where  $k$  is a spring factor.

19. What is the maximum value of the force  $F$  such that the block shown in the arrangement, does not move



- (A) 20 N                      (B) 10 N  
 (C) 12 N                      (D) 15 N

20. A long block  $A$  is at rest on a smooth horizontal surface. A small block  $B$ , whose mass is half of  $A$ , is placed on  $A$  at one end and projected along  $A$  with velocity  $u$ . The coefficient of friction between the blocks is  $\mu$ . Which of following statement is incorrect?



- (A) the blocks will reach a final common velocity  $\frac{u}{3}$ .  
 (B) the work done against friction is two-thirds of the initial kinetic energy of  $B$ .  
 (C) before the blocks reach a common velocity, the acceleration of  $A$  relative to  $B$  is  $\frac{2}{3}\mu g$ .  
 (D) before the blocks reach a common velocity, the acceleration of  $A$  relative to  $B$  is  $\frac{3}{2}\mu g$ .

(Space for rough work)

## PART -II [Chemistry]

## [SINGLE CORRECTTYPE]

Each question has four choices (A), (B), (C) and (D) out of which only one is correct.

21. Which of the following halogen can be purified by sublimation?  
 (A)  $F_2$  (B)  $Cl_2$  (C)  $Br_2$  (D)  $I_2$
22. Which of the following is/are elements?  
 (i)  $H_2O$  (ii) Sand (iii) Clay (iv) Graphite (v) Rhombic Sulphur  
 (A) all except (iv) and (v) (B) only (v)  
 (C) all except (i), (ii) and (iii) (D) all except (i) and (iii)
23. n g of substance X reacts with m g of substance Y to form p g of substance R and q g of substance S. This reaction can be represented as,  $X + Y = R + S$ . The relation which can be established in the amounts of the reactants and the products will be  
 (A)  $n - m = p - q$  (B)  $n + m = p + q$  (C)  $n = m$  (D)  $p = q$
24. 100 mL of  $PH_3$  on decomposition produced phosphorus and hydrogen. The change in volume is  
 (A) 50 mL increase (B) 500 mL decrease (C) 900 mL decrease (D) Nil.
25. Which of the following is wrong -  
 (A)  $NH_3 < PH_3 < AsH_3 \Rightarrow$  Acidic character  
 (B)  $Li < Be < B < C \Rightarrow IE_1$   
 (C)  $Al_2O_3 < MgO < Na_2O < K_2O \Rightarrow$  Basic character  
 (D)  $Li^+ < Na^+ < K^+ < Cs^+ \Rightarrow$  Ionic radius
26. The second ionization potentials in electron volts of oxygen and fluorine atoms are respectively given by -  
 (A) 35.1, 38.3 (B) 38.3, 38.3 (C) 38.3, 35.1 (D) 35.1, 35.1
27. A sudden large jump between the values of 2<sup>nd</sup> and 3<sup>rd</sup> IP of an element would be associated with the electronic configuration-  
 (A)  $1s^2, 2s^2 2p^6, 3s^1$  (B)  $1s^2, 2s^2 2p^6, 3s^2 3p^5$   
 (C)  $1s^2, 2s^2 2p^6, 3s^2 3p^2$  (D)  $1s^2, 2s^2 2p^6 3s^2$
28. The set representing the correct order of first ionization potential is-  
 (A)  $K > Na > Li$  (B)  $Be > Mg > Ca$  (C)  $B > C > N$  (D)  $Ge > Si > C$

(Space for rough work)

29. Identify the correct order of acidic strengths of  $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{CuO}$ ,  $\text{CaO}$ ,  $\text{H}_2\text{O}$  –  
 (A)  $\text{CaO} < \text{CuO} < \text{H}_2\text{O} < \text{CO}_2$  (B)  $\text{H}_2\text{O} < \text{CuO} < \text{CaO} < \text{CO}_2$   
 (C)  $\text{CaO} < \text{H}_2\text{O} < \text{CuO} < \text{CO}_2$  (D)  $\text{H}_2\text{O} < \text{CO}_2 < \text{CaO} < \text{CuO}$
30. The longest wavelength of  $\text{He}^+$  in Paschen series is "m", then shortest wavelength of  $\text{Be}^{+3}$  in Paschen series is (in terms of m) :  
 (A)  $m/36$  m (B)  $64/7$  m (C)  $53/8$  m (D)  $7/64$  m
31. Which of the following pair of metal form nitride on reaction with nitrogen?  
 (A) Li, Mg (B) Mg, Na (C) Al, K (D) Al, Na
32. In which of the following pairs of molecules have bond order three and are isoelectronic?  
 (A)  $\text{NO}^+$ ,  $\text{CO}^+$  (B)  $\text{CN}^-$ ,  $\text{CO}$  (C)  $\text{CN}^-$ ,  $\text{O}_2^+$  (D)  $\text{CO}$ ,  $\text{O}_2^+$
33. 34.1 gm  $\text{Pb}_3\text{O}_4$  is dissolved in 500 ml of 4M  $\text{HNO}_3$ , then ( $M_{\text{pb}} = 206$  gm/mole). Which of the following is incorrect?  
 (A) The weight of residue is 11.9 gm  
 (B) 300 ml of 6 M  $\text{NaOH}$  is required to neutralize excess of  $\text{HNO}_3$   
 (C) Total 2.2 moles of  $\text{NaOH}$  are used after reaction of  $\text{Pb}_3\text{O}_4$  with  $\text{HNO}_3$   
 (D) The weight of residue is 9 gm.
34. Critical temperature ( $T_c$ ) for 2 gases X and Y is  $T_{c1}$  and  $T_{c2}$  respectively, so the radius of X and Y related as follow of  $T_{c1} > T_{c2}$   
 (A)  $r_x > r_y$  (B)  $r_y > r_x$  (C)  $r_y = r_x$  (D)  $r_x + r_y = 0$
35. Calculate relative rate of effusion of  $\text{O}_2$  to  $\text{CH}_4$  through a container containing  $\text{O}_2$  and  $\text{CH}_4$  in 3 : 2 mass ratio.  
 (A)  $\frac{3\sqrt{2}}{4}$  (B)  $\frac{3}{4\sqrt{2}}$  (C)  $\frac{3}{2\sqrt{2}}$  (D) None of these
36. The number of lp-bp repulsion present in  $\text{ClF}_3$  at nearly  $90^\circ$  angle.  
 (A) 1 (B) 2 (C) 3 (D) 4
37. The number of P–O–P bonds in tricyclic metaphosphoric acid is  
 (A) zero (B) two (C) three (D) four
38. In  $\text{NO}_3^-$  ion number of bond pair and lone pair of electrons on nitrogen atom are  
 (A) 2, 2 (B) 3, 1 (C) 1, 3 (D) 4, 0
39. Which of the following arrangements is correct on the basis of the increasing p-character of the hybrid orbitals of the central atoms in the following:  
 (i)  $\text{ClO}_2^-$  (ii)  $\text{CS}_2$  (iii)  $\text{SnCl}_2$   
 (A) I > III > II (B) II > I > III (C) I > II > III (D) III > I > II

(Space for rough work)

40. An ionic bond  $A^+B^-$  is most likely to be formed when:
- (A) the ionization energy of A is high and the electron affinity of B is low  
 (B) the ionization energy of A is low and the electron affinity of B is high  
 (C) the ionization energy of A and the electron affinity of B is high  
 (D) the ionization energy of A and the electron affinity of B is low

## PART -III [Mathematics]

## [SINGLE CORRECTTYPE]

Each question has four choices (A), (B), (C) and (D) out of which only one is correct.

41. The period of  $\sin^2 \theta$  is
- (A)  $\pi^2$  (B)  $\pi$  (C)  $2\pi$  (D)  $\frac{\pi}{2}$
42. Let  $R = \{(1,3), (4,2), (2,4), (2,3), (3,1)\}$  be a relation on the set  $A = \{1, 2, 3, 4\}$ . The relation R is
- (A) a function (B) transitive (C) not symmetric (D) reflexive
43. If A, B and C are three sets such that  $A \cap B = A \cap C$  and  $A \cup B = A \cup C$ , then
- (A)  $A = C$  (B)  $B = C$  (C)  $A \cap B = \phi$  (D)  $A = B$
44. The number of real roots of  $3^{2x^2-7x+7} = 9$  is
- (A) 0 (B) 2 (C) 1 (D) 4
45. If  $(1-p)$  is a root of quadratic equation  $x^2 + px + (1-p) = 0$ , then its roots are
- (A) 0,1 (B) -1,1 (C) 0,-1 (D) -1,2
46. 5th term of a GP is 2, then the product of its 9 terms is
- (A) 256 (B) 512 (C) 1024 (D) None of the above
47. If  $\tan \theta = \frac{-4}{3}$ , then  $\sin \theta$  is
- (A)  $-\frac{4}{5}$  but not  $\frac{4}{5}$  (B)  $-\frac{4}{5}$  or  $\frac{4}{5}$  (C)  $\frac{4}{5}$  but not  $-\frac{4}{5}$  (D) None of these

(Space for rough work)



48. The expression  $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A}$  can be written as  
(A)  $\sin A \cos A + 1$  (B)  $\sec A \operatorname{cosec} A + 1$  (C)  $\tan A + \cot A$  (D)  $\sec A + \operatorname{cosec} A$
49. A triangle with vertices  $(4, 0), (-1, -1), (3, 5)$  is  
(A) isosceles and right angled (B) isosceles but not right angled  
(C) right angled but not isosceles (D) neither right angled nor isosceles
50. If the line  $2x + y = k$  passes through the point which divides the line segment, joining the points  $(1, 1)$  and  $(2, 4)$  in the ratio 3:2, then  $k$  is equal to  
(A)  $\frac{29}{5}$  (B) 5 (C) 6 (D)  $\frac{11}{5}$
51. The graph of the function  $y = f(x)$  is symmetrical about the line  $x = 2$ , then  
(A)  $f(x+2) = f(x-2)$  (B)  $f(2+x) = f(2-x)$   
(C)  $f(x) = f(-x)$  (D)  $f(x) = -f(-x)$
52. Let  $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$  be a relation on the set  $A = \{3, 6, 9, 12\}$ . The relation is  
(A) reflexive and symmetric only (B) an equivalence relation  
(C) reflexive only (D) reflexive and transitive only
53. Let  $T_r$  be the  $r$ th term of an AP whose first term is  $a$  and common difference is  $d$ . If for some positive integers  $m, n, m \neq n, T_m = \frac{1}{n}$ , and  $T_n = \frac{1}{m}$ , then  $a - d$  is equal to  
(A) 0 (B) 1 (C)  $\frac{1}{mn}$  (D)  $\frac{1}{m} + \frac{1}{n}$
54. The value of  $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$  is  
(A) 1 (B)  $\sqrt{3}$  (C)  $\frac{\sqrt{3}}{2}$  (D) 2

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(Space for rough work)

55. Let  $\cos(\alpha + \beta) = \frac{4}{5}$  and  $\sin(\alpha - \beta) = \frac{5}{13}$ , where  $0 \leq \alpha, \beta \leq \frac{\pi}{4}$ . Then,  $\tan 2\alpha$  is equal to
- (A)  $\frac{25}{16}$                       (B)  $\frac{56}{33}$                       (C)  $\frac{19}{12}$                       (D)  $\frac{20}{7}$
56. If a vertex of a triangle is (1,1) and the mid-points of two sides through this vertex are (-1,2) and (3,2), then the centroid of the triangle is
- (A)  $\left(\frac{1}{3}, \frac{7}{3}\right)$                       (B)  $\left(1, \frac{7}{3}\right)$                       (C)  $\left(-\frac{1}{3}, \frac{7}{3}\right)$                       (D)  $\left(-1, \frac{7}{3}\right)$
57. A straight line through the point  $A(3,4)$  is such that its intercept between the axes is bisected at A. Its equation is
- (A)  $3x - 4y + 7 = 0$                       (B)  $4x + 3y = 24$                       (C)  $3x + 4y = 25$                       (D)  $x + y = 7$
58. The perpendicular bisector of the line segment joining  $P(1,4)$  and  $Q(k,3)$  has y intercept  $-4$ . Then, a possible value of k is
- (A)  $-4$                       (B)  $1$                       (C)  $2$                       (D)  $-2$
59. If  $x + y + z = 6$ ,  $x - y + z = 2$ ,  $2x + y - z = 1$ , then x,y and z are respectively
- (A) 3,2 and 1                      (B) 2,1 and 3                      (C) 1,2 and 3                      (D) None of these
60. If  $X = \{4^n - 3n - 1; n \in N\}$  and  $Y = \{9(n-1); n \in N\}$ ; where N is the set of natural numbers, then  $X \cup Y$  is equal to
- (A) N                      (B)  $Y - X$                       (C) X                      (D) Y

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(Space for rough work)



**SET-A**

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[Quality Nurturer & Mind Utilizer Test for Potential Enhancement]

(IPEC Scholarship-Cum-Admission Test)

For

CLASS-XI

**(For XI to XII Moving Students)**

Time : 2 Hrs.]

[Maximum Marks : 180

[PAPER-1]

### (SAMPLE PAPER) ANSWER KEY

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (A)  | 2. (B)  | 3. (B)  | 4. (D)  | 5. (A)  |
| 6. (B)  | 7. (B)  | 8. (D)  | 9. (C)  | 10. (B) |
| 11. (A) | 12. (B) | 13. (C) | 14. (B) | 15. (A) |
| 16. (B) | 17. (D) | 18. (A) | 19. (A) | 20. (C) |
| 21. (D) | 22. (C) | 23. (B) | 24. (A) | 25. (B) |
| 26. (C) | 27. (D) | 28. (B) | 29. (A) | 30. (D) |
| 31. (A) | 32. (B) | 33. (D) | 34. (B) | 35. (B) |
| 36. (D) | 37. (C) | 38. (D) | 39. (A) | 40. (B) |
| 41. (B) | 42. (C) | 43. (B) | 44. (B) | 45. (C) |
| 46. (B) | 47. (B) | 48. (B) | 49. (A) | 50. (C) |
| 51. (B) | 52. (D) | 53. (A) | 54. (C) | 55. (B) |
| 56. (B) | 57. (B) | 58. (A) | 59. (C) | 60. (D) |