TAKSHILA®
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Test Code: A

TNTSE

Takshila's National Talent Scholarship Examination

For Students of Class XI ENGINEERING

This booklet contains 6 Pages

PHYSICS	:	**15 QUESTIONS**
CHEMISTRY	:	**15 QUESTIONS**
MATHEMATICS	:	**15 QUESTIONS**
REASONING	:	**15 QUESTIONS**

General Instructions:

Please do not write anything on question paper.

1. *The candidates will use their own ball point pens, HB pencils, erasers etc.*
2. *Candidates will find out the right answer of the question and will darken the appropriate circle completely with Blue or Black Pen Only.*
3. *Total No. of Question = 60*
4. *All questions carry equal marks. Physics, Chemistry, Mathematics & Reasoning are compulsory.*
5. *For each correct Answer = 2 marks, there is no negative marking.*
6. *Please bring separate sheet for Rough work.*
7. *Total Time : 1 Hour*
8. *Maximum Marks : 120*

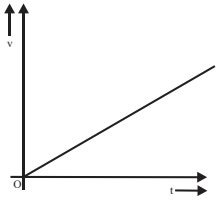
PHYSICS

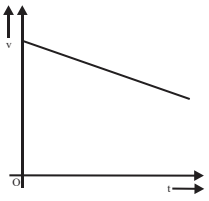
1. Which force is dissipative force ?
(a) Electrostatic force (b) Magnetic force
(c) Gravitational force (d) Frictional force

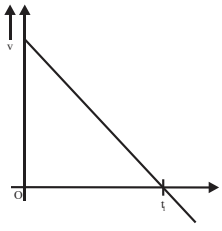
2. Assume that the mass of a nucleus is given by $M = Am_p$, where A is the mass number and radius of a nucleus $r = r_0 A^{1/3}$, where $r_0 = 1.2f$. Estimate the density of nuclear matter in $kg\,m^{-3}$. Given $m_p = 1.67 \times 10^{-27}$ kg :
(a) $2.3 \times 10^{17}\ kg\,m^{-3}$ (b) $5 \times 10^{19}\ kg\,m^{-3}$
(c) $7 \times 10^{12}\ kg\,m^{-3}$ (d) $4.2 \times 10^{17}\ kg\,m^{-3}$

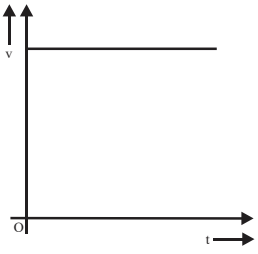
3. The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant figures is :
(a) 663.821 (b) 664
(c) 663.8 (d) 663.82

4. An object is moving in positive direction till time t_1 and then turns back with the same negative acceleration. The velocity – time graph which best describes the situation is :

(a) 

(b) 

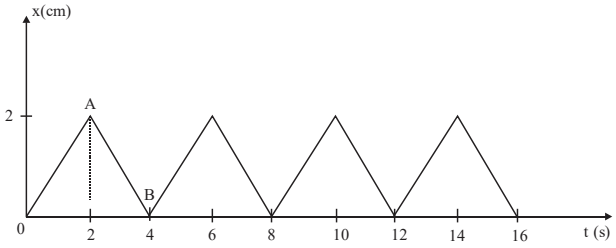
(c) 

(d) 

5. A car moving along a straight highway with speed of $126 kmh^{-1}$ is brought to a stop within a distance of 200m. What is the retardation of the car (assumed uniform), and how long does it take for the car to stop ?
(a) $3.27 ms^{-2}, 10.27s$ (b) $5.11 ms^{-2}, 6.8s$
(c) $3.06 ms^{-2}, 11.43s$ (d) $7.26 ms^{-2}, 12.26s$

6. The farthest objects (known as quasars) in our universe are so distant that light emitted by them takes billions of years to reach the earth. What is the distance in kms of quasars from which light takes 3.0 billion years to reach us :
(a) 2.84×10^{22} km (b) 7.59×10^{30} km
(c) 36.5×10^{20} km (d) 3×10^{22} km

7. Figure below shows the position – time graph of a body of mass 0.04 kg. What is the magnitude (in $kg\,ms^{-1}$) of each impulse ?

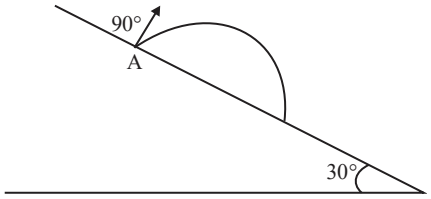


(a) 6×10^{-4} (b) 8×10^{-4}
(c) 10×10^{-4} (d) 2×10^{-4}

8. A body of mass 3 kg is under a force which causes a displacement in it given by $s = t^2/3$ (in m). Work done by force in 2s is :
(a) 2J (b) 3.8 J
(c) 5.2 J (d) 2.6 J

9. Fat supplies 3.8×10^7 J of energy per kilogram, which is converted to mechanical energy with a 20% efficiency rate. How much fat will the dieter use up ?
(a) $6.45 \times 10^{-3}\,kg$ (b) $9 \times 10^{-4}\,kg$
(c) $7 \times 10^{-2}\,kg$ (d) $10^{-3}\,kg$

10. A ball is projected from point A with velocity 10 ms^{-1} perpendicular to the inclined plane as shown in figure. Range of the ball on the inclined plane is:

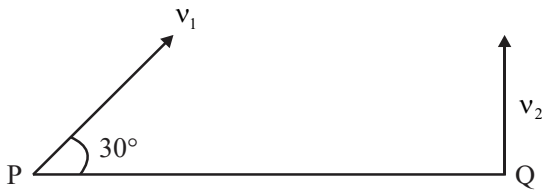


(a) $\frac{40}{3}$m (b) $\frac{20}{3}$m
(c) $\frac{12}{3}$m (d) $\frac{60}{3}$m

11. An insect of mass m = 3 kg is inside a vertical drum of radius 2 m that is rotating with an angular velocity of 5 rad s^{-1}. The insect does not fall off. Then, the minimum coefficient of friction required is :

(a) 0.5 (b) 0.4
(c) 0.2 (d) None of the above

12. A projectile A is thrown at an angle 30^0 to the horizontal from point P. At the same time, another projectile B is thrown with velocity v_2 upwards from the point Q vertically below the highest point A would reach. For B to collide with A the ratio $\frac{v_2}{v_1}$ should be :

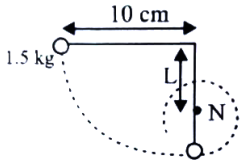


(a) $\frac{\sqrt{3}}{2}$ (b) 2
(c) $\frac{1}{2}$ (d) $\frac{2}{\sqrt{3}}$

13. A drunkard is walking along a straight road. He takes 5 steps forward and 3 steps backward and so on. Each step is 1 m long and takes 1 s. There is a pit on the road 13 m away from the starting point. The drunkard will fall into the pit after :
(a) 21 s (b) 29s
(c) 31 s (d) 37 s

14. A balloon with mass m is descending down with an acceleration a (where a < g). How much mass should be removed from it so that it starts moving up with an acceleration a :
(a) $\frac{2ma}{g+a}$ (b) $\frac{2ma}{g-a}$
(c) $\frac{ma}{g+a}$ (d) $\frac{ma}{g-a}$

15. A ball weighing 1.5 kg is tied to a string 10 cm long. Initially the ball is held in position such that the string is horizontal. The ball is now released. A nail N is situated vertically below the support at the distance L. The minimum value of L such that the string will be wound round the nail is :



(a) 2 cm (b) 4 cm
(c) 6 cm (d) 8 cm

CHEMISTRY

16. 20 mL of 0.1 M, 30 mL of 0.2 M and 30 mL of 0.3 M solutions of oxalic acid are mixed and the volume is made 100 mL. The molarity of the resulting solution is :
(a) 0.21 M (b) 8.51 M
(c) 5.67 M (d) 0.17 M

17. 8 g copper displaces 27 g silver from aqueous solution of $AgNO_3$. If equivalent weight of copper is 32 g, the equivalent weight of silver is :
(a) 320 g (b) 180 g
(c) 160 g (d) 108 g

18. 1 mol of oxygen at 273K and 1 mol of sulphur dioxide at 546 K are taken in two separate containers, then :
(a) K.E. of both are equal
(b) K.E. of O_2< K.E. of SO_2
(c) K.E. of O_2> K.E. of SO_2
(d) Not certain

19. If 'r' is the radius of first Bohr shell in an atom, calculate the de Broglie wavelength in 3rd shell :
(a) $\frac{2\pi r}{Z}$ (b) $\frac{4\pi r}{Z^2}$
(c) $\frac{6\pi r}{Z}$ (d) None of these

20. The maximum number of electrons that can have principal quantum number n = 3 and spin quantum number $m_s = -\frac{1}{2}$ is :
(a) 1 (b) 3
(c) 5 (d) 9

21. A solution of pH = 8 is diluted 100 times. pH of the final solution is :
(a) between 7 to 8 (b) 7
(c) 6 (d) 5

22. When element with atomic number 120 will be discovered, its group, period and IUPAC symbol from atomic number will be :
(a) 1, 7 Ubu (b) 2, 8 Ubn
(c) 2, 7 Ubn (d) 2, 8 Bbn

23. For one of the element various successive ionization enthalpies (in kj mol^{-1}) are given below

1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}
577.5	1810	2750	11580	14280

The element is :
(a) P (b) Mg
(c) Si (d) Al

24. Which one of the following pairs of species have the same bond order :
(a) O_2^- and CN^- (b) NO^+, CN^+
(c) CN^- and NO^+ (d) CN^- and CN^+

25. 1 Debye is equivalent to :
(a) 3.33×10^{-30} Cm (b) 1.602×10^{-27} Cm
(c) 10^{-20} Cm (d) 3.33×10^{-12} Cm

26. The percentage of p- character of the hybrid orbital in graphite and diamond are respectively :
(a) 33 and 25 (b) 50 and 75
(c) 67 and 75 (d) 33 and 75

27. Heat of neutralization of NaOH and HCl is -57.3 kJ mol^{-1}. The heat of ionization of water will be :
(a) -57.3kJ mol^{-1} (b) -114.6kJ mol^{-1}
(c) $+57.3$kJ mol^{-1} (d) $+114.6$kJ mol^{-1}

28. Based on the first law of thermodynamics, which one of the following is correct ?
(a) For an isochoric process : $\Delta U = -q$
(b) For an adiabatic process : $\Delta U = 0$
(c) For an isothermal process : $q = \Delta U$
(d) For a cyclic process : q = -w

29. The d – orbital involved in sp^3d hybridization is :
(a) $d_{x^2-y^2}$ (b) d_{xy}
(c) d_{z^2} (d) d_{zx}

30. Which of the following has unpaired electron in anti bonding MO ?
(a) C_2 (b) N_2
(c) O_2 (d) Both C_2 and N_2

MATHEMATICS

31. Let $f(x) = \frac{x-3}{x+1}, x \neq -1$. Then $f^{2010}(2014)$ (where $f^n(x) = fof\ldots of(x)$ (n times)) is :
(a) 2010 (b) 4020
(c) 4028 (d) 2014

32. The value of $S = \sum_{k=1}^{6}\left(\sin\frac{2\pi k}{7} - i\cos\frac{2\pi k}{7}\right)$ is :
(a) – 1 (b) 0
(c) – i (d) i

33. Let α and β be the roots of the equation $x^2 + x + 1 = 0$. The equation whose roots are α^{19}, β^7 is :
(a) $x^2 - x - 1 = 0$ (b) $x^2 - x + 1 = 0$
(c) $x^2 + x - 1 = 0$ (d) $x^2 + x + 1 = 0$

34. If tan 25º and tan 20º are roots of the quadratic equation $x^2 + 2px + q = 0$, then 2p – q is equal to :
(a) – 2 (b) – 1
(c) 0 (d) 1

35. Let L_1, L_2, L_3 be three distinct parallel lines in the XY-plane, p distinct the points are taken on each of the three lines. The maximum number of triangles than can be formed by these 3p points is :
(a) $p^2(4p - 3)$ (b) $p^3+3({}^pC_2)$
(c) $p^2(3p - 4)$ (d) $(p + 1)^3 - 1$

36. The expansion of $\left(x+\sqrt{x^3-1}\right)^5 + \left(x-\sqrt{x^3-1}\right)^5$ is a polynomial of degree :
(a) 5 (b) 6
(c) 7 (d) 8

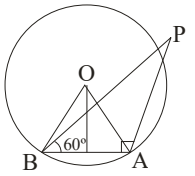
37. Sum to n terms of the series $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \ldots$ is :
(a) $\frac{n}{24}(n^2+9n+13)$ (b) $\frac{n}{24}(2n^2+7n+15)$
(c) $\frac{n}{24}(2n^2+9n+13)$ (d) $\frac{n}{24}(n^2+11n+11)$

38. If $\log_{10}2$, $\log_{10}(2^x - 1)$ and $\log_{10}(2^x + 3)$ are three consecutive terms of an A.P. for :
(a) no real x (b) exactly one real x
(c) exactly two real x (d) more than two real x

39. The number of solutions of the equation tan x + sec x = 2cos x, $x \in [0, 2\pi]$ is :
(a) 1 (b) 2
(c) 3 (d) 0

40. If $x = \sin\frac{2\pi}{7} + \sin\frac{4\pi}{7} + \sin\frac{8\pi}{7}$ and $y = \cos\frac{2\pi}{7} + \cos\frac{4\pi}{7} + \cos\frac{8\pi}{7}$, then $x^2 + y^2$ is :
(a) 1 (b) 2
(c) 3 (d) 4

41. A vertical pole stands at a point A on the boundary of a circular park of radius 2 km. an subtends an angle 60º at another point B on the boundary. If the chord AB subtends the same angle 60º at the centre of the park, the height of the pole is :



(a) $2\sqrt{3}$ km (b) $\sqrt{3}$ km
(c) $2/\sqrt{3}$ km (d) 1 km

42. The domain of the function $f(x)=\frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is :
(a) [1, 2] (b) [2, 3]
(c) [1, 3] (d) [1, 4]

43. Of the number of three athletic teams in a school, 21 are in the basketball team, 26 in hockey team and 29 in the football team, 14 play hockey and basketball, 15 play hockey and football, 12 play football and basketball and 8 play all the games. The total number of members is :
(a) 42 (b) 43
(c) 45 (d) none of these

44. The region of the XOY-plane represented by the inequalities $x \geq 6, y \geq 2, 2x + y \leq 10$ is :
(a) unbounded (b) a polygon
(c) exterior of a triangle (d) none of these

45. Let $P = \{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and $Q = \{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\}$ be two sets. Then :
(a) $P \subset Q$ and $Q - P \neq \phi$ (b) $Q \not\subset P$
(c) $P = Q$ (d) $P \not\subset Q$

REASONING

Q.46 Wine : Grapes : : Vodka : ?
(a) Potatoes (b) Apples
(c) Oranges (d) Flour

Q.47 Kinde : Burn : : Angry : _____?
(a) Annoyed (b) Determined
(c) Resentful (d) Furious

Q.48 Lotus : Cuticle : : Fish : ?
(a) Scales (b) Tills
(c) Tail (d) Surplus

Q.49 Income : Profit : : Expenditure : ?
(a) Balance (b) Loss
(c) Sale (d) surplus

Complete the following series :-

Q.50 c_b a a_a c a _c a c ab__a c a c__b c a
(a) a c b a a (b) b b c a a
(c) b c c a b (d) c b a a c

Q.51 J2Z, K4X, I7V, ? , H16R, M22P
(a) I11T (b) L11S
(c) L12T (d) L11T

Q.52 1, 1,2, 6, 24, __, 720.
(a) 100 (b) 104
(c) 108 (d) 120

Q.53 4, 10, __, 82, 244, 730.
(a) 24 (b) 28
(c) 77 (d) 218

There are 6 persons A, B, C, D, E and F. C is the sister of F. B is the brother of E's husband. D is the father of A and grandfather of F. There are 2 fathers, threebrother and a mother in the group.

Q.54 Who is the mother?
(a) A (b) B
(c) D (d) E

Q.55 Who is E's husband?
(a) B (b) C
(c) A (d) F

Q.56 How many male members are three in the group?
(a) One (b) Two
(c) Three (c) Four

Q.57 How is F related to E?
(a) Son (b) Uncle
(c) Husband (d) Daughter

According to a certain code.

(A) 'min fin bin gin' means 'trains are always late'
(B) 'gin din cin him' means 'drivers were always punished'
(C) 'bincin vin rin' means 'drivers stopped all trains'
(D) 'din kin fin vin' means 'all passengers were late'

Q.58 'Drivers were late' would be written as?
(a) mincin din (b) fin cin din
(c) fin din gin (d) gin hin min

Q.59 Which word is represented by 'vin'?
(a) all (b) late
(c) trains (d) drivers

Q.60 'hin min kin' would mean?
(a) Always late trains
(b) Passengers are punished
(c) All passenger trains
(d) Passengers are late