PRAGYAN

Class – X (Going to XI)
Duration : 2 hrs. | Maximum Marks : 180


IMPORTANT INSTRUCTIONS

1. This Booklet is your Question Paper. DO NOT break seal of Booklet until the invigilator instructs to do so.

2. Fill your APRE Roll No. & Answer Sheet No. in the space provided on the cover page.

3. Please make sure that paper you received is of your class only.

4. The Answer Sheet is provided to you separately which is a machine readable Optical Response Sheet (ORS).

   You have to mark your answers in the ORS by darkening bubble, as per your answer choice, by using black or blue ball point pen.

5. After breaking the Question Paper seal, check there are 11 pages in the booklet. This Question Paper contains 60 MCQs with 4 choices (Subjects: Physics: 20, Chemistry: 20, Maths: 20)

6. Think wisely before darkening bubble as there is negative marking for wrong answer. Answer once marked by pen cannot be cancelled.

7. Marking Scheme:
   a. If darkened bubble is RIGHT answer: 3 Marks.
   b. If darkened bubble is WRONG answer: 1 Mark (Minus One Mark).
   c. If no bubble is darkened in any question: No Mark.

8. If you are found involved in cheating or disturbing others, then your ORS will be cancelled.

9. Do not put any stain on ORS and hand. It over back properly to the invigilator.

Name of the Candidate: _____


Registration Number: _____

PHYSICS

1. Given that T stands for time period and l stands for the length of simple pendulum. If g is the acceleration due to gravity, then which of the following statements about the relation $T^2 = (l/g)$ is correct?
   (A) It is correct both dimensionally as well as numerically
   (B) It is netiher dimensionally correct nor numerically
   (C) It is demensionally correct but not numerically
   (D) It is numerically correct but not dimensionally.

2. In the relation $\dfrac{dy}{dt} = 2\omega \sin(\omega t + \phi_0)$, the dimensional formula for $\omega t + \phi_0$ is

   (A) MLT   (B) MLT^0 (C) ML^0T^0 (D) $M^0L^0T^0$

3. If freqnecy F, velocity V, and density D are considered fundamental units the dimensional formula for momentum will be
   (A) DVF^2 (B) DV^2F^{-1} (C) $D^2V^2F^2$ (D) DV^4F^{-3}

4. From figure, the correct relation is
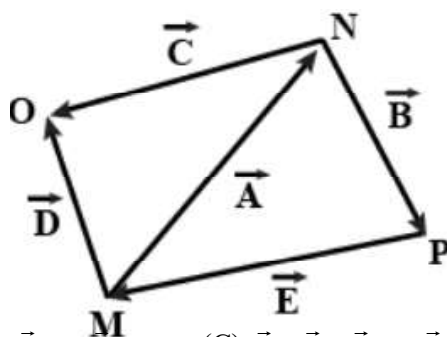
   (A) $\vec{A} + \vec{B} + \vec{E} = \vec{0}$ (B) $\vec{C} - \vec{D} = -\vec{A}$ (C) $\vec{B} + \vec{E} - \vec{C} = -\vec{D}$ (D) All of the above

5. The vector sum of two forces is perpendicular to their vector difference. The forces are
(A) Equal to each other
(B) Equal to each other in magnitude
(C) Not equal to each other in magnitude
(D) Cannot be predicted

6. A ball is released from the top of a tower of height h. It takes time T to reach the ground. What is the position of the ball (from ground) after time T/3?
(A) h/9 m
(B) 7h/9 m
(C) 8h/9 m
(D) 17h/18 m

7. The velocity acquired by a body moving with uniform acceleration is 30 ms^{-1} in 2 s and 60 ms^{-1} in 4s. The initial velocity is
(A) zero
(B) 2 ms^{-1}
(C) 3 ms^{-1}
(D) 10 ms^{-1}

8. The relation between time t and distance x is t $= \alpha x^2 + \beta x$ where α and β are constants. The retardation is
(A) $2\alpha v^3$
(B) $2\beta v^3$
(C) $2\alpha\beta v^3$
(D) $2\beta^2 v^3$

9. A drunkard is walking along a straight road. He takes five steps forward and three steps backward and so on. Each step is 1 m long and takes 1s. There is a pit on the road 11 m away from the starting point. The drunkard will fail into the pit will be
(A) 29 s
(B) 21 s
(C) 37 s
(D) 31 s

**10.** The velocity – time graph of a body is shown in figure. The displacement of the body in 8 s is
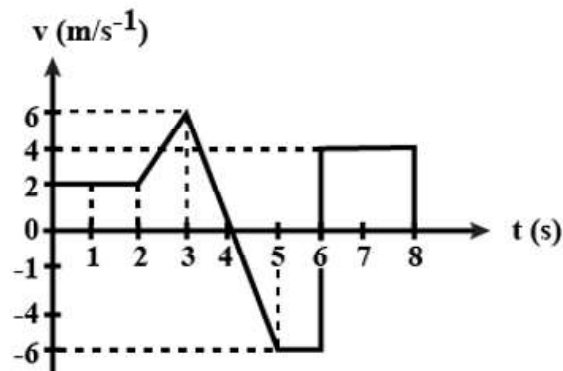
(A) 9 m
(B) 12 m
(C) 10 m
(D) 28 m

11. A ball is thrown at different angles with the same speed u and from the same point and it has the same range in both the cases. If y_1 and y_2 are the heights attained in the two cases, then $y_1 + y_2$ is equal to

(A) $\dfrac{u^2}{g}$ (B) $\dfrac{2u^2}{g}$ (C) $\dfrac{u^2}{2g}$ (D) $\dfrac{u^2}{4g}$

12. Two paper screens A and B are separated by 150 m. A bullet pierces A and B. The hole in B is 15 cm below the hole is A. If the bullet is travelling horizontally at the time of hitting A, then the velocity of the bullet at A is $(g = 10 \text{ ms}^{-2})$

(A) $100\sqrt{3}\text{ ms}^{-1}$ (B) $200\sqrt{3}\text{ ms}^{-1}$ (C) $300\sqrt{3}\text{ ms}^{-1}$ (D) $500\sqrt{3}\text{ ms}^{-1}$

13. Ship A is travelling with a velocity of 5 km h^{-1} due east. A second ship is heading 30° east of north. What should be the speed of second ship if it is to remain always due north with respect to the first ship?

(A) 10 km h^{-1} (B) 9 km h^{-1} (C) 8 km h^{-1} (D) 7 km h^{-1}

14. A plumb bob is hung from the ceiling of a train compartment. The train moves on an inclined track of inclination 30° with horizontal. The acceleration of train up the plane is a = g/2. The angle which the string supporting the bob makes with normal to the ceiling in equilibrium is

(A) 30° (B) $\tan^{-1}\left(2/\sqrt{3}\right)$ (C) $\tan^{-1}\left(\sqrt{3}/2\right)$ (D) $\tan^{-1}(2)$

15. Three blocks A, B and C are suspended as shown in figure. Mass of each of blocks A and B is m. If the system is in equilibrium, and mass of C is M, then
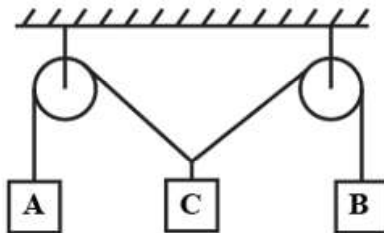
(A) M > 2 m (B) M = 2 m (C) M < 2 m (D) None of these

16. The system shown in figure is released from rest. The spring gets elongated
(Neglect the friction and masses of pulley, string, spring)
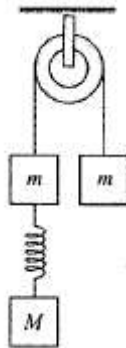
(A) If M > m   (B) If M > 2m   (C) If M > m/2   (D) For any value of M

17. The upper half of an inclined plane with inclination ϕ is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if the coefficient of friction for the lower half is given by

(A) 2 tan ϕ (B) tan ϕ (C) 2 sin ϕ (D) 2 cos ϕ

18. A block of mass M is being pulled along rough horizontal surface. The coefficient of friction between the block and the surface is μ. If another block of mass M/2 is placed on the block and it is again pulled on the surface, the coefficient of friction between the block and the surface will be

(A) μ (B) $\dfrac{3\mu}{2}$ (C) 2μ (D) $\dfrac{5\mu}{2}$

19. Which of the following statements is correct?
(A) Kinetic energy of a system can be changed without changing its momentum
(B) Kinetic energy of a system cannot be changed without changing its momentum
(C) Momentum of a system cannot be changed without changing its kinetic energy
(D) A system cannot be have energy without having momentum.

20. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain n times water from the same pipe in the same time, by what amount should the power of the motor be increased?
(A) n^2 times   (B) n^3 times   (C) n times   (D) $n^{3/2}$ times

CHEMISTRY

21. There are two common oxides of Sulphur, one of which contains 50% O_2 by weight, the other almost exactly 60%. The weights of sulphur which combine with 1 g of O_2 (fixed) are in the ratio of -

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

22. When 10 ml of propane (gas) is combusted completely, volume of $CO_2(g)$ obtained in similar condition is -

(A) 10 ml   (B) 20 ml   (C) 30 ml   (D) 40 ml

23. Which have non-integral bond order -

(A) O_2^+ (B) O_2^- (C) NO   (D) All of these

24. Every H_2O molecule is surrounded by maximum how many H_2O molecule -

(A) 2   (B) 3   (C) 4   (D) 6

25. The bond between carbon atom (1) and carbon atom (2) in compound, $N\equiv \underset{(1)}{C}-\underset{(2)}{CH}=CH_2$ involves the hybrid as-

(A) sp and sp^2 (B) sp^2 and sp^3 (C) sp and sp^3 (D) sp and sp

26. The dipole moments of the given molecules are such that -

(A) $BF_3 > NF_3 > NH_3$ (B) $NF_3 > BF_3 > NH_3$ (C) $NH_3 > NF_3 > BF_3$ (D) $NH_3 > BF_3 > NF_3$

27. Predict shape of SbX_6^{3-}, TeX_6^{2-} (where X = Cl, Br or I) and BrF_6^- -

(A) Octahedral   (B) Pentagonal pyramidal

(C) Trigonal bipyramidal   (D) None of these

28. The frequency of first line of Balmer series in hydrogen atom is ν_0. The frequency of corresponding line emitted by singly ionised helium atom is -

(A) $2\nu_0$ (B) $4\nu_0$ (C) $\nu_0/2$ (D) $\nu_0/4$

29. In two H atoms X and Y the electrons move around the nucleus in circular orbits of radius r and 4r respectively. The ratio of the times taken by them to complete one revolution is -

(A) 1 : 4   (B) 1 : 2   (C) 1 : 8   (D) 2 : 1

30. An electron, a proton and an alpha particle have kinetic energies of 16E, 4E and E respectively. What is the qualitative order of their de-Broglie wavelengths ?

(A) $\lambda_e > \lambda_p = \lambda_\alpha$ (B) $\lambda_p = \lambda_\alpha > \lambda_e$ (C) $\lambda_p > \lambda_e > \lambda_\alpha$ (D) $\lambda_\alpha < \lambda_e >> \lambda_p$

31. In $Fe_4\left[Fe(CN)_6\right]_3$ the O.N. of the complexed iron is -

(A) $+3$ (B) $+2$ (C) $+4$ (D) $+6$

32. What weight of nitrate ion (calculated as HNO_3) is needed to convert 5g of iodine into iodic acid according to the reaction -

$$I_2 + HNO_3 \longrightarrow HIO_3 + NO_2 + H_2O$$

(A) 12.4 g   (B) 24.8 g   (C) 0.248 g   (D) 49.6 g

33. 25 ml of a 0.1 (M) solution of a stable cation of transition metal z reacts exactly with 25 ml of 0.04 (M) acidified $KMnO_4$ solution. Which of the following is most likely to represent the change in oxidation state of z correctly?

(A) $Z^+ \longrightarrow Z^{2+}$ (B) $Z^{2+} \longrightarrow Z^{3+}$ (C) $Z^{3+} \longrightarrow Z^{4+}$ (D) $Z^{2+} \longrightarrow Z^{4+}$

34. When we move from left to right in a period electropositive character -
    (A) Increases   (B) Decreases
    (C) No change   (D) First increases then decreases

35. The correct order of increasing atomic radius of the following elements is -
    (A) S < O < Se < C   (B) O < C < S < Se   (C) O < S < Se < C   (D) C < O < S < Se

36. The ratio of the energy of a photon of 2000 Å wavelength radiation to that of 4000 Å radiation is
    (A) 1 / 4   (B) 4   (C) 1 / 2   (D) 2

37. The shortest wavelength of He atom in Balmer series is x, then longest wavelength in the Paschene series of Li^{+2} is

    (A) $\dfrac{36x}{5}$ (B) $\dfrac{16x}{7}$ (C) $\dfrac{9x}{5}$ (D) $\dfrac{5x}{9}$

38. Electron affinities of O,F,S and Cl are in the order.
    (A) O < S < Cl < F   (B) O < S < F < Cl   (C) S < O < Cl < F   (D) S < O < F < Cl

39. PCl_5 exists but NCl_5 does not because :
    (A) Nitrogen has no vacant $2d$-orbitals   (B) NCl_5 is unstable
    (C) Nitrogen atom is much smaller than P   (D) Nitrogen is highly inert

40. Oxidation number of C in CH_2Cl_2 is -
    (A) +2   (B) + 4   (C) − 4   (D) 0

MATHEMATICS

41. Two finite sets have 'm' and 'n' elements, and total numbers of subsets of the first set is 56 more than the total number of subsets of the second. The values of 'm' and 'n' are :

(A) 7, 6   (B) 6, 3   (C) 5, 1   (D) 8, 7

42. If A= $\{\varphi,\{\varphi\}\}$, then power set of A is

(A) A   (B) $\{\varphi,\{\varphi\},\{\{\varphi\}\},A\}$ (C) $\{\varphi,\{\varphi\},A\}$ (D) None of these

43. The smallest set A such that $A \cup \{1,2\} = \{1,2,3,5,9\}$ is

(A) {2, 3, 5}   (B) {3, 5, 9}   (C) {1, 2, 5, 9}   (D) None of these

44. If a cos θ + b sin θ = 3 & a sin θ – b cos θ = 4 then $a^2 + b^2$ has the value =

(A) 25   (B) 14   (C) 7   (D) None of these

45. cos (540º – θ) – sin (630º – θ) is equal to

(A) 0   (B) 2 cos θ   (C) 2 sin θ   (D) sinθ – cosθ

46. If 3 sin α = 5 sin β, then $\dfrac{\tan\dfrac{\alpha+\beta}{2}}{\tan\dfrac{\alpha-\beta}{2}}$ is equal to

(A) 1   (B) 2   (C) 3   (D) 4

47. The value of $\cot x + \cot(60º + x) + \cot(120º + x)$ is equal to

(A) cos 3x   (B) tan 3x   (C) 3 tan 3x   (D) $\dfrac{3 - 9\tan^2 x}{3\tan x - \tan^3 x}$

48. The ratio in which the line joining the points (3, –4) and (–5, 6) is divided by x-axis
(A) 2 : 3   (B) 6 : 4   (C) 3 : 2   (D) none of these

49. There are n A.M's between 3 and 54, such that the 8th mean : $(n-2)^{th}$ mean : : 3 : 5. The value of n is.
(A) 12   (B) 16   (C) 18   (D) 20

50. The angle between the lines y – x + 5 = 0 and $\sqrt{3}x - y + 7 = 0$ is
(A) 15º   (B) 60º   (C) 45º   (D) 75º

51. The area of triangle formed by the lines x + y – 3 = 0, x – 3y + 9 = 0 and 3x – 2y + 1 = 0
(A) $\dfrac{16}{7}$ sq. units   (B) $\dfrac{10}{7}$ sq. units   (C) 4 sq. units   (D) 9 sq. units

52. The line x + 3y – 2 = 0 bisects the angle between a pair of straight lines of which one has equation x – 7y + 5 = 0. The equation of the other line is
(A) 3x + 3y – 1 = 0   (B) x – 3y + 2 = 0   (C) 5x + 5y – 3 = 0   (D) none

53. If $a_1, a_2, a_3,........$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + ...+ a_{23} + a_{24}$ is equal to
(A) 909   (B) 75   (C) 750   (D) 900

54. The sum to 10 terms of the series $\sqrt{2} + \sqrt{6} + \sqrt{18} + \sqrt{54} + ...$ is
(A) $121\,(\sqrt{6} + \sqrt{2})$ (B) $\dfrac{121}{2}(\sqrt{3} + 1)$ (C) $243\,(\sqrt{3} + 1)$ (D) $243\,(\sqrt{3} - 1)$

55. The sum of those integers from 1 to 100 which are not divisible by 3 or 5 is
(A) 2489   (B) 4735   (C) 2317   (D) 2632

56. The value of $\left(1+\cos\dfrac{\pi}{9}\right)\left(1+\cos\dfrac{3\pi}{9}\right)\left(1+\cos\dfrac{5\pi}{9}\right)+\left(1+\cos\dfrac{7\pi}{9}\right)$ is

(A) $\dfrac{10}{16}$ (B) $\dfrac{9}{16}$ (C) $\dfrac{5}{16}$ (D) $\dfrac{12}{16}$

57. A line L passes through the points $(1, 1)$ and $(2, 0)$ and another line M which is perpendicular to L passes through the point $(1/2, 0)$. The area of the triangle formed by the lines with y axis is

(A) 25/8   (B) 25/16   (C) 25/4   (D) None

58. If a set A has n elements then the total number of subsets of A is

(A) 2n   (B) n   (C) 2^n (D) n^2

59. Let R be the relation on N defined as by $x + 2y = 8$. Then domain of R is

(A) {2,4,6,8}   (B) {2,4,8}   (C) {1,2,3,4}   (D) {2,4,6}

60. $\cos 75° = ?$

(A) $\dfrac{(\sqrt{2}-1)}{2\sqrt{2}}$ (B) $\dfrac{(\sqrt{2}+1)}{2\sqrt{2}}$ (C) $\dfrac{(\sqrt{3}+1)}{2\sqrt{2}}$ (D) $\dfrac{(\sqrt{3}-1)}{2\sqrt{2}}$

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