JEE MAIN : CHAPTER WISE TEST-1

SUBJECT :- PHYSICS **DATE.....**

CLASS :- 11th **NAME.....**

CHAPTER :- PHYSICAL WORLD, UNIT & MEASURMENT **SECTION.....**

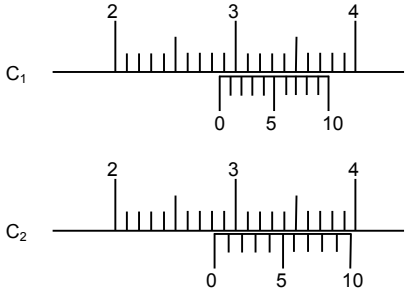
(SECTION A)

1. Which of the following sets can't enter into the list of fundamental quantities in any system of units?
(A) length, mass and velocity
(B) length, time and velocity
(C) mass, time and velocity
(D) length, time and mass

2. In an experiment the angles are required to be measured using an instrument. 29 divisions of the main scale exactly coincide with the 30 divisions of the vernier scale. If the smallest division of the main scale is half-a-degree (0.5°), then the least count of the instrument is:
(A) half minute (B) one degree
(C) half degree (D) one minute

3. The velocity of water waves may depend on their wavelength λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities as
(A) $v^2 = k\lambda^{-1} g^{-1} \rho^{-1}$ (B) $v^2 = k g \lambda$
(C) $v^2 = k g \lambda \rho$ (D) $v^2 = k \lambda^3 g^{-1} \rho^{-1}$
where k is a dimensionless constant

4. There are two Vernier calipers both of which have 1 cm divided into 10 equal divisions on the main scale. The Vernier scale of one of the calipers (C_1) has 10 equal divisions that correspond to 9 main scale divisions. The Vernier scale of the other caliper (C_2) has 10 equal divisions that correspond to 11 main scale divisions. The readings of the two calipers are shown in the figure. The measured values (in cm) by calipers C_1 and C_2, respectively, are



(A) 2.87 and 2.87 (B) 2.87 and 2.86
(C) 2.87 and 2.83 (D) 2.85 and 2.82

5. The value of G = 6.67×10^{-11} N m^2 $(kg)^{-2}$. Its numerical value in CGS system will be :
(A) 6.67×10^{-8} (B) 6.67×10^{-6}
(C) 6.67 (D) 6.67×10^{-5}

6. In a Searle's experiment for determination of Young's Modulus, when a load of 50 kg is added to a 3 meter long wire micrometer screw having pitch 1 mm needs to be given a quarter turn in order to restore the horizontal position of spirit level. Young's modulus of the wire if its cross sectional area is 10^{-5} m^2 is
(A) $6 \times 10^{11} N/m^2$ (B) 1.5×10^{11} N/m^2
(C) 3×10^{11} N/m^2 (D) None

7. Force F is given in terms of time t and distance x by
F = A sin C t + B cos D x
Then the dimensions of $\frac{A}{B}$ and $\frac{C}{D}$ are given by
(A) MLT^{-2}, $M^0L^0T^{-1}$
(B) MLT^{-2}, $M^0L^{-1}T^0$
(C) $M^0L^0T^0$, $M^0L^1T^{-1}$
(D) $M^0L^1T^{-1}$, $M^0L^0T^0$

8. Vernier callipers has 20 divisions on its vernier scale which coincide with 19 divisions on the main scale. Least count of the instrument is 0.1 mm. The main scale division is :
(A) 0.5mm (B) 1mm
(C) 2mm (D) 0.25 mm

9. An unknown quantity "α" is expressed as
$$\alpha = \frac{2ma}{\beta} \log\left(1+\frac{2\beta\ell}{ma}\right)$$
where m = mass, a = acceleration, ℓ = length
The unit of α should be
(A) meter (B) m/s
(C) m/s^2 (D) s^{-1}

10. One digital watch 'A' was showing 1:12:32 and an old clock 'B', not having seconds hand was showing 1:10, at the moment actual time was 1:10:15
(A) A is more precise but less accurate than B
(B) A is less precise but more accurate than B
(C) A is both more accurate and precise
(D) B is both more accurate and precise

11. Match List I with List II and select the correct answer using the codes given below the lists :

List I	**List I**
P. Boltzmann constant	1. $[ML^2T^{-1}]$
Q. Coefficient of viscosity	2. $[ML^{-1}T^{-1}]$
R. Planck constant	3. $[MLT^{-3}K^{-1}]$
S. Thermal conductivity	4. $[ML^2T^{-2}K^{-1}]$

Codes :

	P	Q	R	S
(A)	3	1	2	4
(B)	3	2	1	4
(C)	4	2	1	3
(D)	4	1	2	3

12. A student is calculating the thickness of a single sheet of paper. She measures the thickness of a stack of 80 sheets with vernier calipers, and finds the thickness to be l = 1.27 cm. To calculate the thickness of a single sheet she divides the total thickness of sheets with number of sheets. Which of the following answer has the correct number of significant digits?
(A) 0.15875 mm (B) 0.159 mm
(C) 0.16 mm (D) 0.2 mm

13. The dimension of magnetic field in M, L, T and C (Coulomb) is given as
(A) MT^2C^{-2} (B) $MT^{-1}C^{-1}$
(C) $MT^{-2}C^{-1}$ (D) $MLT^{-1}C^{-1}$

14. Calculate z for the following case.
z = (x – 2.5 y + w) for x = (4.72 ± 0.12) m, y = (4.4 ± 0.2) m, w = (15.63 ± 0.16) m.
(A) 9.35 ± 0.78 (B) 9.3 ± 0.8
(C)9.4 ± 0.8 (D) 9.30 ± 0.80

15. Let $[\in_0]$ denote the dimensional formula of the permittivity of vacuum. If M = mass, L = length, T = time and A = electric current, then :
(A) $[\in_0] = [M^{-1} L^{-3} T^2 A]$
(B) $[\in_0] = [M^{-1} L^{-3} T^4 A^2]$
(C) $[\in_0] = [M^{-1} L^2 T^{-1} A^{-2}]$
(D) $[\in_0] = [M^{-1} L^2 T^{-1} A]$

16. When the gap is closed without placing any object in the screw gauge whose least count is 0.005 mm, the 5th division on its circular scale and when a small sphere is placed, reading on main scale advances by 4 divisions, whereas 25th division on its circular scale coincides with the reference line on main scale. There are 200 division on the circular scale. The radius of the sphere measured is
(A) 4.10 mm (B) 4.05 mm
(C) 2.10 mm (D) 2.05 mm

17. Which of the following units denotes the dimensions ML^2/Q^2, where Q denotes the electric charge?
(A) H/m^2 (B) Weber (Wb)
(C) Wb/m^2 (D) Henry (H)

18. An approximate value of number of seconds in an year is $\pi \times 10^7$. Determine the % error in this value.
(A) 0.5 % (B) 8%
(C) 4% (D) 15 %

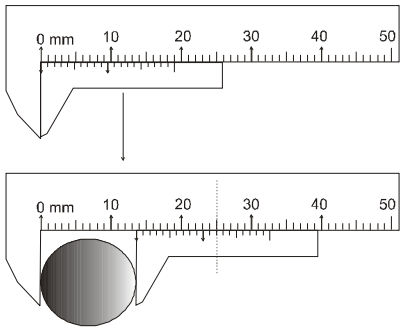
19. $M^{-1}L^{-2}T^3\theta$ are dimensions of
(A) coefficient of thermal conductivity
(B) coefficient of viscosity
(C) modulus of rigidity
(D) thermal resistance

20. The vernier of a circular scale is divided in to 30 divisions, which coincides with 29 main scale divisions. If each main scale division is (1/2)°, the least count of the instrument is
(A) 0.1' (B) 1' (C) 10' (D) 30'

(SECTION B)

21. To find the distance d over which a signal can be seen clearly in foggy conditions, a railways engineer uses dimensional analysis and assumes that the distance depends on the mass density ρ of the fog, intensity (power/area) S of the light from the signal and its frequency f. The engineer find that d is proportional to $S^{1/n}$. The value of n is:

22. Find the reading of special type of vernier shown in the diagram. 20 division of vernier scale are matching with 19 divisions of main scale.



23. A man grows into a giant such that his linear dimensions increase by a factor of 9. Assuming that his density remains same, the stress in the leg will change by factor of :

24. The density of a solid ball is to be determined in an experiment. The diameter of the ball is measured with a screw gauge, whose pitch is 0.5 mm and there are 50 divisions on the circular scale. The reading on the main scale is 2.5 mm and that on the circular scale is 20 divisions. If the measured mass of the ball has a relative error of 2%, the relative percentage error in the density is

25. A quantity A appears in an equation.

$$\text{Pressure} = \frac{Ae^{-Af/kT}}{B}$$

T represent temperature, ' f ' frequency & 'k' boltzmann constant. What is the dimension of B in length ?

26. A scientist measure the initial velocity of an object to be 12.376 m/s, its acceleration (constant) to be 1.82 m/s2. He is to find the velocity after 2.00 sec. How many significant digits are there in the answer?

27. The time period of oscillation of a body is given by

$$T = 2\pi\sqrt{\frac{mgA}{K}}$$

K : Represents the kinetic energy, m mass, g acceleration due to gravity and A is unknown.
If $[A] = M^xL^yT^z$
Then what is the value of x + y + z.

28. The sides of a rectangle are measured to be 2.43 cm and 4.1 cm. The number of significant digits in the perimeter is _____.

29. The units of three physical quantities x, y and z are gm cm^2s^{-5}, gm s^{-1} and cm s^{-2} respectively. The relation between x, y and z is $x = yz^n$. Find value of n.

30. The external and internal radius of a hollow sphere are measured to be (4.23 ± 0.01) cm and (3.89 ± 0.01) cm. Maximum percentage error in the measurement of volume will be_____. Round off to neareast integer.