PHYSICS

BOOKS - NCERT PHYSICS (HINGLISH)

UNITS AND MEASUREMENTS

Multiple Choice Questions Mcqs

1. The number of significant figures in 0.06900 is

A. 5

B. 4

C. 2

D. 3

Answer: B

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2. 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

Answer: B

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3. The mass and volume of a body are 4.237 g

and $2.5cm^3$ respectively. The density of the

material of the body in correct significant figures is

A. $1.6048 gcm^{-3}$

B. $1.69 gcm^{-3}$

C. $1.7 gcm^{-3}$

D. $1.695 gcm^{-3}$

Answer: C

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4. The numbers 2.745 and 2.735 on rounding off to 3 significant figures will give

A. 2.75 and 2.74

B. 2.74 and 2.73

C. 2.75 and 2.73

D. 2.74 and 2.74

Answer: D

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5. The length and breadth of a rectangular sheet are 16.2 cm and 10.1cm, respectively. The area of the sheet in appropriate significant figures and error is

A. $164 \pm 3cm^2$

B. $163.62 \pm 2.6cm^2$

C. $163.6 \pm 2.6cm^2$

D. $163.62 \pm 3cm^2$

Answer: A

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6. Which of the following pairs of physical quantites does not have same dimensional formula ?

A. Work and torque

B. Angular momentum and Planck's constant

C. Tension and surface tension

D. Impulse and linear momentum

Answer: C

7. Measure of two quantities along with the precision of respective measuring instrument is $A = 2.5ms^{-1} \pm 0.5ms^{-1}$,B=0.10s+-0.01s`. The value of AB will be

A. $(0.25 \pm 0.08)m$

B. $(0.25 \pm 0.5)m$

C. $(0.25 \pm 0.05)m$

D. $(0.25 \pm 0.135)m$

Answer: A

8. You measure two quantities as $A = 1.0m \pm 0.2m, B = 2.0m \pm 0.2m.$ We should report correct value for $\sqrt{AB}$ as

A. $1.4m \pm 0.4m$

B. $1.41m \pm 0.15m$

C. $1.4m \pm 0.3m$

D. $1.4m \pm 0.2m$

Answer: D

9. Which of the following measurement is most precise?

A. $5.00mm$

B. $5.00cm$

C. $5.00m$

D. $5.00km$

Answer: A

10. The mean length of an object is 5 cm. Which of the following measurements is most accurate?

A. $4.9 cm$

B. $4.805 cm$

C. $5.25 cm$

D. $5.4 cm$

Answer: A

11. Young's modulus of steel is $1.9 \times 10^{11} N/m^2$ When expressed is CGS units of $dynes/cm^2$ it will be equal to $\left(1N = 10^5 dyne, 1m^2 = 10^4 cm^2\right)$

    A. 1.9×10^{10}

    B. 1.9×10^{11}

    C. 1.9×10^{12}

D. 1.9×10^{13}

Answer: C

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12. If momentum (p), area (A) and time$(t)$are taken to be fundamental quantities then energy has the dimensional formula

A. $\left[pA^{-1}T^{-1}\right]$

B. $\left[P^2AT\right]$

C. $\left[pA^{-1/2}T\right]$

D. $\left[pA^{1/2}T^{-1}\right]$

Answer: D

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13. On the basis of dimensions, decide which of the following relation for the displacement of a particle undergoing simple harmonic motion is not correct :

A. $y = a \sin 2\pi t / T$

B. $y = a \sin vt$

C. $y = \dfrac{a}{T} \sin\left(\dfrac{t}{a}\right)$

D. $y = a\sqrt{2}\left(\sin. \dfrac{2\pi t}{T} - \cos. \dfrac{2\pi t}{T} \right)$

Answer: B::C

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14. If P, Q, R are physical quantities, having different dimensions, which of the following

combinations can never be a meaningful quantity ?

A. $(P-Q)/R$

B. $PQ-R$

C. PQ/R

D. $(R+Q)/P$

Answer: A::D

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15. Photon is quantum of radiation with energy E =hv where v is frequency and h is Planck's constant. The dimensions of h are the same as that of

    A. linear impulse

    B. angular impulse

    C. linear momentum

    D. angular momentum

Answer: B::D

16. If Planck's constant (h) and speed of light in vacuum (c) are taken as two fundamental quantites, which on of the following can, in addition, be taken to express length, mass and time in terms of the three chosen fundamental quantities ?

    A. Mass of electrom(m_e)

    B. Universal gravitational constant (G)

    C. Charge of electron (e)

D. Mass of proton (m_p)

Answer: A::B::D

17. Which of the following ratios express pressure?

A. Force/Area

B. Energy/Volume

C. Energy/Area

D. Force/Volume

Answer: A::B

18. Which of the following are not a unit of time ?

A. Second

B. Parsec

C. Year

D. Light year

Answer: B::D

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Very Short Answer Type Questions

1. Why do we have different units for same physical quantity?

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2. The radius of atom is of the order of 1 Å and radius of nucleus is of the order of fermi. How many magnitudes higher is the volume of atom as compared to the volume of nucleus ?

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3. A device used for measuring the rate of flow of liquid through pipes is called…………

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4. Express unified atomic mass unit in kg.

5. A function $f(\theta)$ is defined as :

$$f(\theta) = 1 - \theta + \frac{\theta^2}{2!} - \frac{\theta^3}{3!} + \frac{\theta^4}{4!} \ldots \ldots \quad \text{why is it}$$

necessary for θ to be a dimensionless quantity

?

6. Why length, mass and time are chosen as base quantities in mechanics ?

Short Answer Type Questions

1. (a) The earth- moon distance is about 60 earth radius. What wil be the diameter of the earth (approximately in degress) as seen from the moon ? (b) Moon is seen to be of $(1/2)^{\circ}$

diameter from the earth. What must be the relative size compared to the earth ? (c) From parallax measurement, the sun is found to be at a distance of about 400 times the earth. moon distance. Estimate the ratio of sun-earth diameters.

2. Which of the following time measuring devices is most precise ? (a) A wall clock. (b) A

stop watch. (c) A digital watch. (d) An atomic clock. Give reason for you answer.

3. The distance of a galaxy is of the order of 10^{25}m. Calculate the order of magnitude of time taken by light to reach us from the galaxy.

4. The vernier scale of a travelling microscope has 50 divisions which coincide with 49 main scale divisions. If each main scale division is $0.5mm$, the minimum inaccuracy in the measurement of distance is

5. During a total solar ecilpse the moon almost entirely covers the sphere of the sun. Write

the relation between the distances and sizes of the sun and moon.

6. If the unit of force is 100 N, unit of length is 10m and unit of time is 100 s, what is the unit of mass in this system of units ?

7. Give an example of (a) a physical quantiy which has a unit but no dimensions. (b) a physical quantity which has neither unit no dimensions. (c) a constant which has a unit. (d) a constant which has no unit.

8. Calculate the length of the arc of a circle of radius 31.0 cm which subtands and angle of $\dfrac{\pi}{6}$ at the centre.

9. Calculate the solid angle subtended by the periphery of an area of $1cm^2$ at a point situated symmetrically at a distance of 5 cm from the area.

10. The displacement of a progressive wave is represented by $y = A\sin(\omega t - kx)$, where x

is distance and t is time. Write the dimensional formula of (i) w and (ii) k.

11. Time for 20 oscillations of a pendulum is measured as

$t_1 = 39.6s, t_2 = 39.9s, t_3 = 39.5$. What is the precision in the measurements ? What is the accuracy of the measurement ?

1. A new system of units is proposed in which unit of mass is $\alpha kg,$ unit of length β m and unit of time $\lambda s.$ How much will 5 J measure in this new system ?

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2. The volume of a liquied following out per second of a pipe of length I and radius r is written by a student as $v = \dfrac{\pi}{8} \dfrac{Pr^4}{\eta I}$ where P is

the pressure difference between the two ends of the pipe and η is coefficient of viscosity of the liquid having dimensioal formula $ML^{-1}T^{-1}$. Check whether the equation is dimensionally correct.

3. A physcial quantity X is related to four measurable quantites a, b, c and d as follows :

$X = a^2b^3c^{5/2}d^{-2}$ The percentage error in the measurement of a, b, c and d are 1% , 2%, 3%

and 4%, respectively. What is the percentage error in quantity X ? if the value of X calculated on the basis of the above relation is 2.763, to what value should you round off the result ?

4. In the expression $P = EI^2 m^{-5} G^{-2}$, E, m, I and G denote energy, mass, angular momentum and gravitational constant,

respectively. Show that P is a dimensionless quantity.

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5. If velocity of light c, Planck's constant h ,Gravitational constant G are taken as fundamental quantites, then express mass, length and time in terms of dimensions of these quantites.

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6. An artificial satellite is revolving around a planet of mass M and radius R, in a circular orbit of radius r. From Kelper's Third law about the period of a satellite around a common central body, square of the period of revolution T is proportional to the cube of the radius of the orbit r. Show usnig dimensional analysis, that $T = \dfrac{k}{R}\sqrt{\dfrac{r^3}{g}}$, Where k is a dimensionless constant and g is acceleration due to gravity.

7. In an experiment to estimate the size of a molecule of oleic acid 1 mL of oleic acid is dissolved in 19 mL of alcohol. Then 1 mL of this solution is diluted to 20 mL by adding alcohol. Now, 1 drop of this diluted solution is placed on water in a shallow trough. The solution spreads over the surface of water forming one molecule thick layer. Now, lycopodium powder is sprinkled evenly over the film and its diameter is measured. Knowing the volume of the drop and area of the film we can calculate the thickness of the film which will give us the

size of oleic acid molecule.

Read the passage carefully and answer the following questions

(a) Why do we dissolve oleic acid in alcohol ?

(b) What is the role of lycopodium powder?

(c) What would be the volume of oleic acid in each mL of solution prepared?

(d) How will you calculate the volume of n drops of this solution of oleic acid ?

(e) What will be the volume of oleic acid in one drop of this solution ?

8. (a) The earth- moon distance is about 60 earth radius. What wil be the diameter of the earth (approximately in degress) as seen from the moon ? (b) Moon is seen to be of $(1/2)^{\circ}$ diameter from the earth. What must be the relative size compared to the earth ? (c) From parallax measurement, the sun is found to be at a distance of about 400 times the earth. moon distance. Estimate the ratio of sun-earth diameters.

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9. Einstein's mass - energy relation emerging out of his famous theory of relativity relates mass (m) to energy $(E) as E = mc^2$, where c is speed of light in vacuum. At the nuclear level, the magnitudes of energy are vary small. The energy at nuclear level is usually measured in MeV, where $1 MeV = 1.6 \times 10^{-13} J$, the masses are measured in unified mass unit (u) where $1u = 1.67 \times 10^{-27} kg$. (a) Show that the energy equivalent of 1u is 931.5 MeV. (b) A student writes the relation as 1 u = 931.5 MeV.

The teacher points out that the relation is dimensionally incorrect. Write the correct relation.

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