PHYSICS

BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

ATOMS MOLECULES AND CHEMICAL ARITHEMETIC

Wb Jee Workout Category 1 Single Option Correct Type 1 Mark

1. The velocity of a paritcle (v) at an instant t is given by $v = at + bt^2$. The dimesion of b is

A. $[L]$

B. $\left[LT^{-1}\right]$

C. $\left[LT^{-2}\right]$

D. $\left[LT^{-3}\right]$

Answer: D

▶ **Watch Video Solution**

2. Which of the following sets have different dimensions?

A. Pressure, Young's modulus, stress

B. Emf, potential difference, electric potential

C. Heat, work done, energy

D. Dipole moment, electric flux, electric field

Answer: D

▶ **Watch Video Solution**

3. If the length of a rectangular l = 10.5 cm, breath b = 2.1 cm and minimum possible measurement by scale = 0.1 cm then the area is

A. $22.0cm^2$

B. $22.1cm^2$

C. $22.05cm^2$

D. $22cm^2$

Answer: A

▶ Watch Video Solution

4. Position of a body with acceleration a is given by $x = Ka^m t^n$, here t is time Find demension of m and n.

    A. m= 1, n=1

    B. m=1,n=2

    C. m=2, n=1

    D. m=2, n=2

Answer: B

▶ **Watch Video Solution**

5. Which of the following is dimensionless?

A. $\dfrac{v^2}{rg}$

B. $\dfrac{v^2 g}{r}$

C. $\dfrac{vg}{r}$

D. $v^2 rg$

Answer: A

▶ **Watch Video Solution**

6. If the units of force and length are doubled, then the unit of energy will be

    A. same

    B. 2 times

    C. 4 times

    D. 8 times

Answer: C

▶ **Watch Video Solution**

7. E, m, L, G denote energy mass, angular momentum & gravitation constant respectively. The dimensions of $\dfrac{EL^2}{m^5G^2}$ will be that of :

    A. Stress

    B. Strain

    C. Young's modulus

    D. Impulse

Answer: B

▶ **Watch Video Solution**

8. The dimension of angular momentum is

A. $\left[M^0 L^1 T^{-1}\right]$

B. $\left[M^1 L^2 T^{-2}\right]$

C. $\left[M^1 L^2 T^{-1}\right]$

D. $\left[M^2 L^1 T^{-2}\right]$

Answer: C

▷ **Watch Video Solution**

9. The dimensional formula for coefficient of self induction is

A. $\left[ML^2T^{-2}A^{-2}\right]$

B. $\left[MLT^{-2}A^{-1}\right]$

C. $\left[ML^2T^2A^{-2}\right]$

D. $\left[ML^2T^{-2}A^{-1}\right]$

Answer: A

▶ **Watch Video Solution**

10. IF η denotes coefficient of viscosity and G denotes gravitational constant then, $G \times \eta$ yields the dimensions

A. $\left[M^2L^0T^{-3}\right]$

B. $\left[MLT^{-3}\right]$

C. $\left[ML^2T^{-2}\right]$

D. $\left[M^0L^2T^{-3}\right]$

Answer: D

▶ **Watch Video Solution**

11. A new unit of length is so chosen that the speed of light in vacuum is unity. What is the distance (in this new unit) between the sun and the earth if light takes 8 min and 20 second to reach the earth from the sun?

A. 300

B. 400

C. 500

D. 600

Answer: C

12. The length and breadth of a block are 2.00 cm and 3.50 cm. They are measured with the help of vernier callipers having least count 0.01 cm. The sum of the four sides of the block with estimated error is

A. (11.00 ± 0.00) cm

B. (11.00 ± 0.01) cm

C. (11.00 ± 0.02) cm

D. (11.00 ± 0.04) cm

Answer: D

▶ **View Text Solution**

---

13. In equation $\left(P + \dfrac{a}{V^2}\right)(V - b) = RT$, the dimensional formula of a is

A. $\left[ML^3T^{-2}\right]$

B. $\left[ML^{-5}T^{-2}\right]$

C. $\left[ML^5T^{-2}\right]$

D. $\left[ML^2T^{-2}\right]$

Answer: C

14. The atmospheric pressure is measured with a Fortin's barometer having a vernier scale. 20 divisions of the vernier scale coincide with 19 main scale divisions. Each division of the main scale is equal to 0.5 mm. Which of the

following correctly expresses the atmospheric pressure ?

A. 71.0000 cm of Hg

B. 71.000 cm of Hg

C. 71.00 cm of Hg

D. 71.0 cm of Hg

Answer: A

▶ View Text Solution

15. Let $[\varepsilon_0]$ denote the dimensional formula of the permittivity of vacuum. If M = mass, L = length, T= time and A= electric current, then

A. $[\varepsilon_0] = \left[M^{-1}L^2T^{-1}A\right]$

B. $[\varepsilon_0] = \left[M^{-1}L^{-3}T^2A\right]$

C. $[\varepsilon_0] = \left[M^{-1}L^{-3}T^4A^2\right]$

D. $[\varepsilon_0] = \left[M^{-1}L^2T^{-1}A^{-2}\right]$

Answer: C

▶ Watch Video Solution

16. If 3.8×10^{-6} is added to 4.2×10^{-5} giving due regard to significant figures, then the result will be

    A. 4.58×10^{-5}

    B. 4.6×10^{-5}

    C. 4.5×10^{-5}

    D. none of these

Answer: B

17. $\dfrac{E^2}{\mu_0}$ has the dimensions ($E =$ electric field, $\mu_0 =$ permeabililty of free space)

A. $\left[MLT^{-4}A^4\right]$

B. $\left[ML^2T^{-2}A^2\right]$

C. $\left[MLT^2A^{-2}\right]$

D. $\left[MLT^{-4}\right]$

Answer: D

18. How can we increase the relative accuracy of measurement by a screw gauge ?

    A. By increasing the size of pitch

    B. By increasing the number of divisions on the circular scale

    C. By taking large number of observations

    D. By having a device free of zero error.

Answer: B

▶ **Watch Video Solution**

19. The length of a strip measured with a meter rod is 10.0cm. Its width measured with a venier calipers is 1.00cm. The least count of the meter rod is 0.1 cm and that of vernier calipers 0.01cm. What will be error in its area?

    A. $\pm 0.01 cm^2$

    B. $\pm 0.1 cm^2$

    C. $\pm 0.11 cm^2$

    D. $\pm 0.2 cm^2$

Answer: D

20. The velocity v of a particle at time t is given by $v = at + \dfrac{b}{t+c}$, where a, b and c are constants. The dimensions of a, b, c are respectively :-

A. $[L], [LT]$ and $[LT^{-2}]$

B. $[LT^{-2}], [L]$ and $[T]$

C. $[L^2], [T]$ and $[LT^2]$

D. $[LT^2], [LT]$ and $[L]$

Answer: B

21. Which one of the following doesn't have a

derived unit?

    A. Frequency

    B. Planck's constant

    C. Electric current

    D. Charge

Answer: C

22. A student has measured the length of a wire equal to 0.04580 m. this value of length has the number of significant figures equal to

A. five

B. four

C. six

D. three

Answer: B

---

23. The time dependence of a physical quantity P is given by $P = P_0 \exp\left(-\alpha t^2\right)$, where α is a constant and t is time. The constant α

A. is dimensionless

B. has dimensions $\left[T^{-2}\right]$

C. has dimensions $\left[T^2\right]$

D. has dimensions of p.

Answer: B

24. Dimensions are not same for the pair

    A. Power and Strain

    B. Torque and Work

    C. Momentum and Impulse

    D. Pressure and Stress

Answer: A

25. If C is capacitance and q is charge, then the dimension of q^2/C is same as that of

    A. work

    B. angular momentum

    C. force

    D. momentum

Answer: A

26. Dimensions of $\dfrac{\text{Planck's cosntant}}{\text{Thermal diffusivity}}$ are denoted by

A. L

B. M

C. T

D. θ

Answer: B

27. If E = energy , G= gravitational constant, I =impulse and M=mass, then dimensions of $\dfrac{GIM^2}{E^2}$ are same as that of

A. time

B. mass

C. length

D. force.

Answer: A

▶ Watch Video Solution

28. From the following physical quantities, which is the only quantity which has negative dimensions of mass?

    A. angular momentum

    B. torque

    C. coefficient of thermal conductivity

    D. gravitational constant.

Answer: D

29. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is

A. zero

B. 0.01

C. 0.03

D. 0.06

Answer: D

▶ **Watch Video Solution**

30. a quantity X is given by $\varepsilon_0 L \dfrac{\Delta V}{\Delta t}$ where $\in_0$ is the permittivity of the free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensinal formula for X is the same as that of

A. electrical resistance

B. electric charge

C. electric voltage

D. electric current.

Answer: D

▶ **Watch Video Solution**

Wb Jee Workout Category 2 Single Option Correct Type 2 Marks

1. A physical quantity is given by $X = [M^a L^b T^c]$. The percentage error in measurement of M, L and T are α, β, γ respectively. Then the maximum % error in the quantity X is

   A. aalpha+b"beta+cgamma`

   B. aalpha+b"beta-cgamma`

   C. $\dfrac{a}{\alpha} + \dfrac{b}{\beta} + \dfrac{c}{\gamma}$

   D. none of these

Answer: A

2. A certain body weighs $22.42g$ and has a measured volumen of $4.7cc$. The possible error in the measurement of mass and volumen are $0.01g$ and $0.1cc$. Then, maximum error in the density will be

A. 0.22

B. 0.022

C. 0.002

D. 0.0002

Answer: B

3. Turpentine oil is flowing through a tube of length L and radius r. The pressure difference between the two ends of the tube is p , the viscosity of the coil is given by $\eta = \dfrac{p(r^2 - x^2)}{4vL}$, where v is the velocity of oil

at a distance x from the axis of the tube. From this relation, the dimensions of viscosity η are

A. $\left[M^0 L^0 T^0\right]$

B. $\left[MLT^{-1}\right]$

C. $\left[ML^2 T^{-2}\right]$

D. $\left[ML^{-1}T^{-1}\right]$

Answer: D

4. In a slide callipers, (m +1) number of vernier divisions is equal to m number of smallest main scale divisions. If d unit is the magnitude of the smallest main scale division, then the magnitude of the vernier constant is .

A. $\dfrac{d}{(m+1)}$ unit

B. $\dfrac{d}{m}$ unit

C. $\dfrac{md}{(m+1)}$ unit

D. $\dfrac{(m+1)d}{m}$ unit

Answer: A

5. In the following equation, x, 1 and F represent respectively, displacement, time and force.

$$F = a + bt + \frac{1}{c + d. x} + A\sin(\omega t + \phi).$$

The dimensional formula for A.d is

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

B. $\left[L^{-1}\right]$

C. $\left[M^{-1}\right]$

D. $\left[TL^{-1}\right]$

Answer: B

6. The length of a cylinder is measured with a metre rod having least count 0.1 cm. Its diameter is measured with vernier calliper having least count 0.01 cm. Given that length is 5.0 cm and radius is 2.00 cm. The percentage

error in the calculated value of the volume will

be

A. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: D

▶ Watch Video Solution

7. A beaker contains a fluid of density $\rho kg/m^3$, specific heat $SJ/kg°C$ and viscosity η. The beaker is filled up to height h. To estimate the rate of heat transfer per unit area (Q/A) by convection when beaker is put on a hot plate, a student proposes that it should depend on η, $\left(\dfrac{S\Delta\theta}{h}\right)$ and $\left(\dfrac{1}{\rho g}\right)$ when $\Delta\theta(in°C)$ is the difference in the temperature between the bottom and top of the fluid. In that situation the correct option for (Q/A) is

A. $\eta\dfrac{S\Delta\theta}{h}$

B. $\eta\left(\dfrac{S\Delta\theta}{h}\right)\left(\dfrac{1}{\rho g}\right)$

C. $\dfrac{S\Delta\theta}{\eta h}$

D. $\left(\dfrac{S\Delta\theta}{\eta h}\right)\left(\dfrac{1}{\rho g}\right)$

Answer: A

▶ **Watch Video Solution**

8. The circular divisions of the given screw gauge are 50. It moves 0.5 mm on main scale in one rotation. The diameter of the ball is

A. 2.25 mm

B. 2.20 mm

C. 1.20 mm

D. 1.25 mm

Answer: C

▶ **View Text Solution**

9. A physical quantity Q is found ot depend on observables x, y and z obeying relation

$Q = \dfrac{x^3 y^2}{z}$. The percentage error in the measurments of x, y and z are $1\%, 2\%$ and 4% respectively. What is percentage error in the quantity Q?

A. 0.11

B. 0.04

C. 1%0

D. 0.03

Answer: A

▶ Watch Video Solution

10. A student performs an experiment for determination of $g = \dfrac{4\pi^2 l}{T^2}$ and he commits an error of Δl. For that he takes the time of n oscillations with the stop watch of least count ΔT and the commits a human error of 0.1 sec. For which of he following data, the measurement of g will be most accurate?

A.

Δl	ΔT	n	Amplitude of oscillation
5mm	0.2s	10	5mm

B.

Δl	ΔT	n	Amplitude of oscillation
$5mm$	$0.2s$	20	$5mm$

C.

Δl	ΔT	n	Amplitude of oscillation
$5mm$	$0.1s$	20	$1mm$

D.

Δl	ΔT	n	Amplitude of oscillation
$1mm$	$0.1s$	50	$1mm$

Answer: D

▶ **Watch Video Solution**

11. L, C and R represent the physical quantities, inductance, capacitance and resistance respectively. The combination(s) which have the dimensions of frequency are

A. $\dfrac{1}{RC}$

B. $\dfrac{R}{L}$

C. $\dfrac{1}{\sqrt{LC}}$

D. $\dfrac{L}{R}$

Answer: D

▶ Watch Video Solution

12. If the capacitance of a nanocapacitor is measured in terms of a unit u made by combining the electric charge e, Bohr radius a_0, Planck's constant 'h' and speed of light 'c' then

A. $u = \dfrac{e^2 c}{h a_0}$

B. $u = \dfrac{e^2 h}{c a_0}$

C. $u = \dfrac{e^2 a_0}{hc}$

D. $u = \dfrac{hc}{e^2 a_0}$

Answer: C

13. The side of a cubical block when measured with a vernier callipers is 2.50 cm. The vernier constant is 0.01 cm. The maximum possible error in the area of the side of the block is

    A. $\pm 0.01 cm^2$

    B. $\pm 0.02 cm^2$

    C. $\pm 0.05 cm^2$

D. $\pm 0.10 cm^2$

Answer: C

14. Smallest division on the main scale of given Vernier calipers is 0.5 mm. Vernier scale has 25 divisions and these coincide with 24 main scale divisions. The least count of Vernier callipers is

A. 0.001 cm

B. 0.002 cm

C. 0.01 cm

D. 0.02 cm

Answer: B

▶ **Watch Video Solution**

15. The mass and volume of a body are found to be $5.00 \pm 0.05 kg$ and $1.00 \pm 0.05 m^3$ respectively. Then, the maximum possible percentage error in its density is

A. 0.06

B. 0.03

C. 0.1

D. 0.05

Answer: A

▶ **Watch Video Solution**

Wb Jee Workout Category 3 One Or More Than One Option Correct Type 2 Marks

1. If the energy (E), velocity (v) and force (F) are taken as fundamental quantities, then what is the dimensional formula for mass?

    A. a = 1, b =-2

    B. a = 1, b=2

    C. b = -2, c=-1

    D. c = 0, a=1

Answer: A::C

2. In terms of potential difference V, electric current I, permitivity ε_0, permeability μ_0 and speed of light c, the dimensionally correct equations (s) is (are) :

A. $\mu_0 I^2 = \varepsilon_0 V^2$

B. $\varepsilon_0 I = \mu_0 V$

C. $I = \varepsilon_0 c V$

D. $\mu_0 c I = \varepsilon_0 V$

Answer: A::C

▶ **Watch Video Solution**

3. The frequency of vibration of string depends on the length L between the nodes, the tension F in the string and its mass per unit length m. Guess the expression for its frequency from dimensional analysis.

A. $2l\sqrt{\dfrac{F}{m}}$

B. $\dfrac{1}{l}\sqrt{\dfrac{m}{F}}$

C. $\dfrac{1}{2l}\sqrt{\dfrac{m}{F}}$

D. $\dfrac{1}{2l}\sqrt{\dfrac{F}{m}}$

Answer: D

4. The velocity (v) of sound through a medium may be assumed to depend on the density (ρ) of the medium and modulus of elasticity (E). If the dimensions for elasticity (ratio of stress to strain) are $\left[ML^{-1}T^{-2}\right]$ then deduce by the method of dimensions the formula for the velocity of sound is

A. $v = \sqrt{E\rho}$

B. $v = \sqrt{\dfrac{E}{\rho}}$

C. $v = \sqrt{\dfrac{\rho}{E}}$

D. $v = \dfrac{1}{2}\sqrt{\dfrac{E}{\rho}}$

Answer: D

▶ **Watch Video Solution**

5. Consider a simple pendulum. The period of

oscillation of the simple pendulum depends

on its length and acceleration due to gravity.

Then the expression for its time period is

A. $t = kg\sqrt{l}$

B. $t = k\sqrt{lg}$

C. $t = k\sqrt{\dfrac{l}{g}}$

D. $t = k\dfrac{l}{\sqrt{g}}$

Answer: C

▶ **Watch Video Solution**

6. A student uses a simple pendulum of exactly $1m$ length to determine g, the acceleration due ti gravity. He uses a stop watch with the least count of $1 \sec$ for this and record $40 \sec onds$ for 20 oscillations for this observation, which of the following statement $(s) is (are)$ true?

A. Error ΔT in measuring T, the time period, is 0.05 seconds

B. Error ΔT in measuring, T the time period, is 1 second

C. Percentage error in the determination of g is 5%

D. Percentage error in the determination of g is 2.5%.

Answer: A::C

▶ **Watch Video Solution**

7. Let $[\,\epsilon_0\,]$ denote the dimensional formula of the permittivity of the vacuum and $[\mu_0]$ that of the permability of the vacuum.If $M = \text{mass}, L = \text{length}, T - \text{time}$ and $I = \text{electric current}$

A. $[\varepsilon_0] = [M^{-1}L^{-3}T^2]$

B. $[\varepsilon_0] = [M^{-1}L^{-3}T^4I^2]$

C. $[\mu_0] = [MLT^{-2}I^{-2}]$

D. $[\mu_0] = [ML^2T^{-1}I]$

Answer: B::C

8. The SI unit of inductance, the henry can be written as

A. weber/ampere

B. volt-sec/amp

C. joule/ $(\mathrm{ampere})^2$

D. ohm-second

Answer: A::B::C::D

▶

9. The dimensions of length are expressed as $G^x c^y h^z$, where G, c and h are the universal gravitational constant, speed of light and Planck's constant respectively, then :

A. x=(1/2), y=(1/2)

B. x = (1/2), z=(1/2)

C. y=(-3/2), z =(1/2)

D. y=(1/2), z = (3/2)

Answer: B::C

10. The velocity of water wave v 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. $v = k\sqrt{g\lambda}$

B. $v = k\dfrac{1}{\sqrt{g\lambda}}$

C. $v = kg\lambda$

D. $v = k\sqrt{\dfrac{g}{\lambda}}$

Answer:

▶ **Watch Video Solution**

1. The equation fo state of a gas is given by

$$\left(P + \dfrac{a}{V^3}\right)(V - b^2) = cT, \text{ where } P,V,T \text{ are}$$

pressure, volume and temperature respectively, and a,b,c are constants. The dimesions of a and b are respectively

A. $ML^{-8}T^{-2}$ and $L^{3/2}$

B. ML^5T^{-2} and L^3

C. ML^5T^{-2} and L^6

D. ML^6T^{-2} and $L^{3/2}$

Answer:

2. In which of the following pairs, the two physical quantities have different dimensions?

    A. Planck's constant and angular momentum.

    B. Impulse and linear momentum.

    C. Moment of inertia and moment of a force.

    D. Energy and torque.

Answer:

3. The quantity $[(nh)/(2\pi qB)]^{1/2}$ where n is a positive integer, h is Planck's constant q is charge and B is magnetic field has the dimensions of

    A. area

    B. length

    C. speed

    D. acceleration.

Answer:

▶ **Watch Video Solution**