PHYSICS

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PHYSICS

TOPICS :

UNITS & DIMENSIONS

SCALARS &VECTORS

STATICS

EARTH’S ATOMOSPHERE

& ASTROPHYSICS

PHYSICS

1) A Vernier calliper has 20 divisions on the Vernier scale Which coincide with 19 on the main scale. The least counts o f the instrument is 0.1mm. The main scale divisions are of,

1) 0.5mm 2) 1mm

3) 2mm 4) ¼ mm

KEA

PHYSICS

Least count = 1 M S D / Number Vernier divisions

$\therefore$ 0.1 mm = 1 M S D / 20

$\therefore$ 1 M S D = 20 × 0.1 = 2 mm

ANS : 3

PHYSICS

2) A pressure of 10^6 dynes/cm^2 is equivalent to:

1) 10^5 N/m^2

2) 10^4 N/m^2

3) 10^6 N/m^2

4) 10^7 N/m^2

PHYSICS

$$\text{Pressure (p)} = \frac{10^6 \text{ dynes}}{1 \text{ Cm}^2}$$

$$= \frac{10^6 \times 10^{-5} \text{ N}}{10^{-4} \text{m}^2} = 10^5 \text{ N/m}^2$$

ANS : 1

PHYSICS

3) If C and L denote the capacitance and inductance, then the units of LC are:

1) $M^0L^0T^2$ 2) $M^0 L^2 T^{-2}$

3) $M L T^{-2}$ 4) $M^0 L^0 T$

PHYSICS

We have,

$$F = 1 / 2\pi\sqrt{LC}$$

$$F^2 = 1 / 4\pi^2 LC$$

$$LC = 1 / 4\pi^2 F^2$$

$$LC = 1 / (T^{-1})^2 = T^2 = [M^0 L^0 T^2]$$

ANS : 1

PHYSICS

4) Force F is given in terms of time (t)and distance (x) by F= A sin Ct + B cos DX .Then dimensions of A/B and C/D are:

1) $[M\ L\ T^{-2}],[M^0\ L^0\ T^{-2}]$
2) $[M\ L\ T^{-2}],\ [M^0\ L^{-1}\ T^0]$
3) $[M^0\ L\ ^0T^0],\ [M^0\ L\ T^{-1}]$
4) $[M^0\ L\ T^{-1}\ ],\ [\ M^0\ L\ ^0T^0\ ]$

PHYSICS

$(A/B) = (\text{force}/\text{force}) = [M^0 L^0 T^0]$

$Ct = \text{angle}$ $\quad C = \text{angle} / \text{time}$

$C = (1/T) = T^{-1}$

$Dx = \text{angle}$ $\quad D = \text{angle} / \text{length}$

$D = (1/L) = L^{-1}$

$(C/D) = T^{-1} / L^{-1} = [M^0 L T^{-1}]$

ANS : 3

PHYSICS

5) The velocity v of a particle is given in terms of time t by the equation $V = at + b / t+c$. The dimensions of a, b and c are:

1) L^2 ,T, LT^2
2) LT^2, LT ,L
3) LT^{-2} , L , T
4) L, LT , T^2

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By principle of homogeneity,

$$\dim(at) = \dim(v) = L\,T^{-1}$$

$$a = (L\,T^{-1} / T) = [L\,T^{-2}]$$

$$\dim(c) = \dim(t) = [T]$$

$$(b / \text{time}) = \text{Velocity}$$

$$b = \text{Velocity} \times \text{time} = L\,T^{-1} \times T = [L]$$

ANS : 3

PHYSICS

6) The dimensional formula for thermal conductivity is :

1) $[M\ L\ T^{-3}\ K^{-1}]$ 2) $[M\ L^{2}\ T^{-2}\ K^{-1}]$

3) $[M\ L^{2}\ T^{-3}\ K^{-1}]$ 4) None of these

PHYSICS

We have,

Thermal conductivity = Heat × distance / area × temperature × time

$= [M L^2 T^{-2}] [L] \ / \ [L^2] [K] [T]$

$= [M L T^{-3} K^{-1}]$

ANS : 1

PHYSICS

7) Choose the physical quantity that is different from others.

1) Moment of inertia
2) Electric current
3) Pressure energy
4) Rate of change of velocity

PHYSICS

Rate of change of velocity is equal to acceleration which is a vector quantity and all others are scalar quantities

ANS : 4

PHYSICS

8) If the relation $V = \dfrac{\pi P r^4}{8 n l}$,

Where the letters have their usual meanings, the dimensions of V are :

1) $M^0 L^3 T^0$

2) $M^0 L^3 T^{-1}$

3) $M^0 L^{-3} T^{-1}$

4) $M^1 L^3 T^0$

PHYSICS

Since , V is the volume of liquid flowing per unit time , then dim (V) = [M^0 L^3 T^{-1}]

ANS : 2

PHYSICS

9) The dimensions of gravitational constant G are:

1) $[M L^2 T^{-2}]$

2) $[M L^3 T^{-2}]$

3) $[M^{-1} L T^{-2}]$

4) $[M^{-1} L^3 T^{-2}]$

PHYSICS

We have ,

$$F = G m_1 m_2 / d^2$$

$$G = F d^2 / m_1 m_2$$

$$G = [M L T^{-2}] [L^2] / [M] [M]$$

$$G = [M^{-1} L^3 T^{-2}]$$

ANS : 1

PHYSICS

10) The unit of reduction factor of a tangent galvanometer is:

1) ampere
2) gauss
3) radian
4) None of these

PHYSICS

Since $I = K \tan \theta$, therefore K has same unit as that of current i.e ampere

ANS : 1

PHYSICS

11) The dimensions of intensity of wave are:

1) $[M L^2 T^{-3}]$

2) $[M L^0 T^{-3}]$

3) $[M L^{-2} L^{-3}]$

4) $[M L^2 L^3]$

PHYSICS

) Intensity of wave = energy / area × time

$= [M L^2 T^{-2}] / [L^2] [T]$

$= [M L^0 T^{-3}]$

ANS : 2

PHYSICS

12) What is the dimensional formula of power?

1) $[M L^{-2} T^{2}]$ 2) $[M^{0} L^{2} T^{-2}]$

3) $[M^{1} L^{2} T^{-3}]$ 4) $[M L^{2} T^{-2}]$

PHYSICS

We have ,

Power = work done / time

$= [\,M\,L^{2}\,T^{-2}\,] / [\,T\,]$

$= [\,M\,L^{2}\,T^{-3}\,]$

ANS : 3

PHYSICS

13) A gas bubble from an explosion under water oscillates with a period proportional to P, d, E, where P is the static pressure , d is the density of water and E is the energy of explosion. Then a,b,c are respectively:

1) 1,1,1 2) 1/3,1/2,-5/6

3) -5/6, 1/2 ,1/3 4) ½, -5/6, ,1/3

PHYSICS

Let $T = P^a d^b E^c$

Writing dimensions on both sides,

$[M^0 L^0 T] = [M L^{-1} T^{-2}]^a [M L^{-3}]^b [M L^2 T^{-2}]^C$

$[M^0 L^0 T] = [M^{a+b+c} \quad L^{-a-3b+2c} \quad T^{-2a-2c}]$

Thus $a+b+c = 0$, $-a-3b+2c = 0$, $-2a-2c = 1$

On solving these equations, we get

$a = -5/6$, $b = 1/2$ & $c = 1/3$

ANS : 3

PHYSICS

14) The dimensional formula for coefficient of restitution is:

1) $M L T^{-2}$

2) $M^0 L^1 T^{-1}$

3) $M^0 L^2 T^{-1}$

4) $M^0 L^0 T^0$

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It is the ratio of relative velocity of the colliding bodies after collision to the relative velocity before collision. Therefore the dimensional formula is $[M^0 L^0 T^0]$

ANS : 4

PHYSICS

15) Unit of permittivity of free space ε_0 is :

1) $Nm^2\ C^{-2}$

2) $C^2\ N^{-1}\ m^{-2}$

3) $C^2\ (Nm)^{-2}$

4) $C\ N^{-1}\ m^{-1}$

PHYSICS

We have,

$$F = (1 / 4\pi\varepsilon_0) \times q_1\, q_2 \;/\; d^2$$

$$\varepsilon_0 = (1 / 4\pi)\; q_1\, q_2 \;/\; d^2 \times F$$

$$\varepsilon_0 = C \times C \;/\; m^2\, N = C^2\, m^{-2}\, N^{-1}$$

ANS : 2

PHYSICS

16) Which of the following systems of units is not base on units of mass, length and time alone?

1) S I
2) MKS
3) FPS
4) CGS

PHYSICS

It’s S I system as it contains seven fundamental units

ANS : 1

PHYSICS

17) Out of following pairs which one does NOT have identical dimensions?

1) angular momentum and planck's constant
2) impulse and momentum
3) momentum of inertia and moment of force
4) Work and torque

PHYSICS

It's moment of inertia and moment of force .

ANS : 3

PHYSICS

18) Dimensions of $(1/\mu_0 \varepsilon_0)$, where symbols have their usual meanings are:

1) $[L^{-1} T]$ 2) $[L^{-2} T^2]$

3) $[L^2 T^{-2}]$ 4) $[L T^{-1}]$

PHYSICS

We have ,

Speed of light $C = 1 / \sqrt{\varepsilon_0 \mu_0}$

$C^2 = 1 / \varepsilon_0 \mu_0$

$(L T^{-1})^2 = 1 / \varepsilon_0 \mu_0$

$(1 / \varepsilon_0 \mu_0) = L^2 T^{-2}$

ANS : 3

PHYSICS

19) A force of $10\hat{i} + 2\hat{j}$ newton displaces a body through $3\hat{i} + 6\hat{k}$ metre . The work done is :

1) 0 J 2) 12 J 3) 42 J 4) 30 J

PHYSICS

Work done = $\mathbf{F} \cdot \mathbf{S} = (10\hat{i} + 2\hat{j}) \cdot (3\hat{i} + 6\hat{k})$

$= 10 \times 3 + 0$

$= 30\ J$

ANS : 4

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PHYSICS

20) Given **A** =2î –ĵ +2κ and **B** = -î-2ĵ+ 2κ .
The unit vector of **A – B** is :

1) κ /√10 2) 3î / √10

3) 3î + ĵ /√10 4) -3î-κ / √10

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A – B = (2î - ĵ + 2 κ) – (- î - 2 ĵ + 2κ)
= 3 î + ĵ

n = **A – B /| A - B|**
= 3 î + ĵ / √9 + 1
= 3 î + ĵ / √10

ANS : 3

PHYSICS

21) If A.B = O then magnitude of | A × B| is:

1) zero
2) 1
3) √**AB**
4) |**A**||**B**|

PHYSICS

$\mathbf{A} \cdot \mathbf{B} = 0$

$AB \cos\theta = 0$

i.e $\theta = \pi/2$

$|\mathbf{A} \times \mathbf{B}| = AB \sin \pi/2$

$= |A|\,|B|$

ANS : 4

PHYSICS

22) The magnitude of the vector product of two vectors is √3 times their scalar product.The angle between the vectors is:

1) π /2
2) π / 6
3) π /3
4) π /4

PHYSICS

$$A \times B = \sqrt{3}\, A \cdot B$$

$$AB \sin\theta = \sqrt{3}\, AB \cos\theta$$

$$\sin\theta = \sqrt{3} \cos\theta$$

$$\tan\theta = \sqrt{3}$$

i.e $\theta = \pi / 3$

ANS : 3

PHYSICS

23) A boat is sent across the river with a velocity 8 km/hr in a direction perpendicular to the flow of river. If resultant velocity of boat is10 km/hr, then velocity of river flow is:

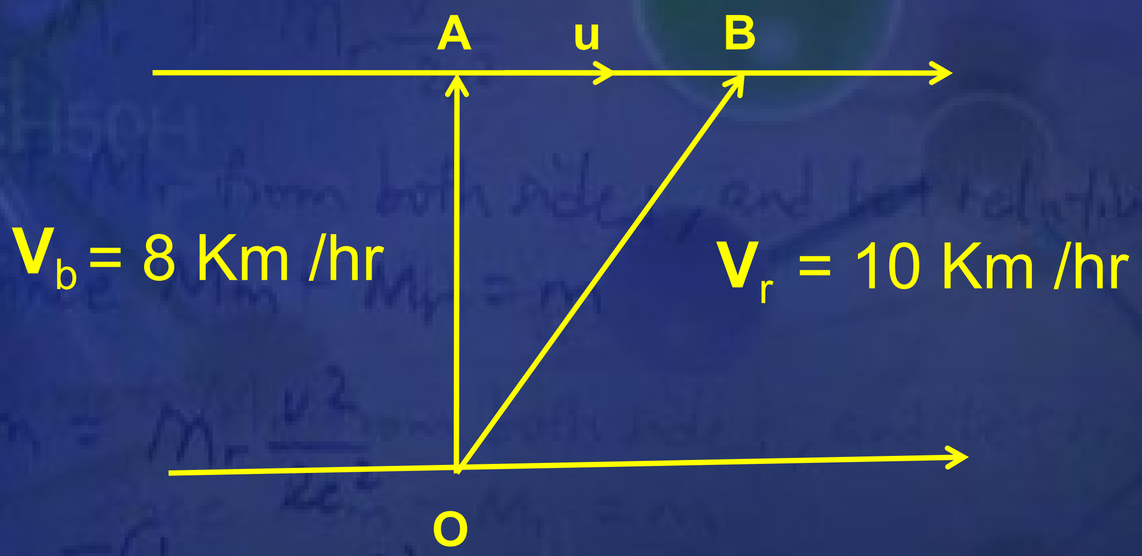
1) 18km/hr

2) 2 km/hr

3) 6 km/hr

4) None of these

PHYSICS



From Fig. $V_r^2 = V_b^2 + u^2$

$$u^2 = V_r^2 - V_b^2$$

= 100 – 64 = 36

u = 6 Km /hr

ANS : 3

PHYSICS

24) The resultant of two forces, each having equal magnitude F acting at an angle θ is :

1) 2F sin θ/2
2) 2F cos θ
3) 2F cos θ/2
4) None of these

PHYSICS

$$F_r^2 = F_1^2 + F_2^2 + 2F_1 F_2 \text{Cos}\theta$$

Since $F_1 = F_2 = F$

$$F_r^2 = 4F^2(\text{Cos}^2 \theta/2)$$

$$F_r = 2F\ (\text{Cos}\ \theta/2)$$

ANS : 3

PHYSICS

25) Two forces each = F/2, act at right angles. Their effect may neutralized by a third force acting along their bisector in the opposite direction with a magnitude of :

1) F 2) $F/\sqrt{2}$ 3) $\sqrt{2}$ F 4) F/ 2

PHYSICS

$F_r = 2F (\cos \theta/2)$

Since , $\theta = 90°$ & $F = F/2$

$F_r = 2F/2 (\cos 90°/2)$

$F_r = F / \sqrt{2}$

ANS : 2

PHYSICS

26) The resultant of two forces is 20N when one of force is $20\sqrt{3}$ N and angle between two forces is 30^0 then what is value of second force?

1) 10 N
2) 20 N
3) $20\sqrt{3}$
4) $10\sqrt{3}$

PHYSICS

$F_r^2 = F_1^2 + F_2^2 + 2F_1 F_2 Cos\theta$

Since $F_r = 20N$

$F_1 = 20\sqrt{3}N$, $\theta = 30°$

By Substituting we get

$F_2^2 + 60 F_2 + 800 = 0$

By Solving the quadratic equation we get

$F_2 = 20$ N

ANS : 2

B

PHYSICS

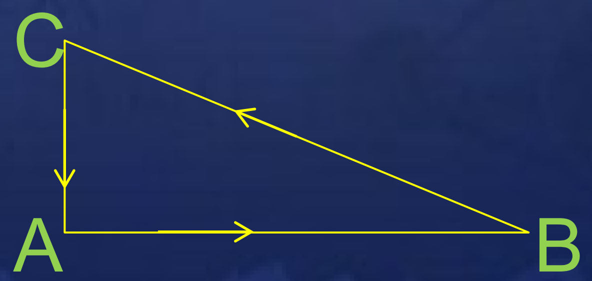
27) Three forces start acting simultaneously on a particle moving with velocity, **v**. These forces are represented in magnitude and direction by the three sides of a triangle ABC. The particle will now move with velocity :

1) v, remaining unchanged

2) less than **v**

3) greater than

4)| **v |** in the direction of the largest force BC



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Since the forces act on a particle are represented as a sides of a triangle.

Therefore the forces are in equilibrium

Hence they produce no change in Velocity

ANS : 2

PHYSICS

28) Insolation is due to ,

1) Radiations from the stars
2) Radiations from the sun
3) Radiations from the neutron
4) Radiations from the red giant

ANS : 2

PHYSICS

29) Ionosphere is formed by the absorption of

1) IR and gamma rays
2)Gamma rays and X rays
3) UV rays and IR rays
4) UV rays and X rays

ANS : 4

PHYSICS

30) Auroral displays are seen only in regions

1) Around Earth's magnetic South and North poles
2) Near the Earth's equator
3) Around the Earth's 30º latitude
4) Near oceans

ANS : 1

PHYSICS

31) H – R diagrams are graphs representing the relation between

1)Luminosity and surface temperature
2)Luminosity and mass of the star
3)Luminosity and size of the star
4)Luminosity and distance of the star from the earth

ANS : 1

PHYSICS

32) Which of the following is a main sequence star ?

1) Sirius
2) Antares
3) polaris
4) sun

ANS : 4

PHYSICS

Thank you

All the Best……