VISWASAI MEDICAL ACADEMY

NELLORE & TIRUPATI

Work sheet- 2 | *(Units & Dimensions* | PHYSICS

LONG TERM | *Motion in a Straight line)* | Date: 06-02-20

1 The dimensions of $\frac{a}{b}$ in the equation P = $\frac{a-t^2}{bx}$ where P is pressure, x is distance and t is time, are.

1) $M^2 LT^{-3}$ *2) MT^{-2} 3) LT^{-3} 4) ML^3T^{-1}

2 Taking velocity of light C, volume V and pressure P as fundamental quantities, the dimensional formula for power is

1) CVP *2) $CV^{2/3}P$ 3) $C^{-1}V^{2/3}P$ 4) $C^{-1}VP$

3 The Velocity v (in m/s) of a particle is given in terms of time t (in second) by the equation $v = at + \frac{b}{(t+c)}$. The dimensions of a, b, c are. The correct match is

	a	b	c		a	b	c
1)	L	T	LT^{-2}	2)	LT^{-2}	LT	LT^2
*3)	LT^{-2}	L	T	4)	L^2	LT	T^2

4 The potential energy of a particle varies with distance x from a fixed origin as $U = \frac{A\sqrt{x}}{x+B}$, where A and B are constants then the dimensional formula of A is

*1) $ML^{5/2}T^{-2}$ 2) ML^2T^{-2} 3) $M^{3/2}L^{3/2}T^{-2}$ 4) $ML^{7/2}T^{-2}$

5 If $10^6 N, 3\times10^8 m$, 1minute are taken as units of force, length and time respectively then the unit of mass is

*1. 12kg 2. $\frac{1}{12}kg$ 3. 300kg 4. $\frac{1}{300}kg$

6. A force of 90N acts on a body. If the units of mass and length are tripled and the unit of time is doubled, then the force in the new system becomes

1) 90 N 2)0 new units *3) $\frac{160}{9}$ new units 4) $\frac{160}{9}$ N

7 If the velocity of a particle is $V=At+Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is

1) (3/2)A +4B 2) 3A+7B *3) (3/2)A + (7/3)B 4) A/2 +B/3

8 Velocity of a particle is $V(x) = \beta X^{-2n}$, acceleration of the particle as a functionof position x is given by

1) $-2n\beta^2 e^{-4n+1}$ 2) $-2n\beta^2 e^{-2n-1}$ *3) $-2n\beta^2 e^{-4n-1}$ 4) $-2\beta^2 e^{-2n+1}$

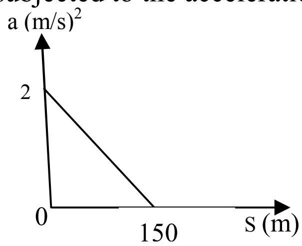
9 A jet plane starts from rest at S=0 and is subjected to the acceleration shown. Final speed at S=150m is

*1) $10\sqrt{3}$ m/s

2) $5\sqrt{6}$ m/s

3) $5\sqrt{7}$ m/s

4) $5\sqrt{3}$ m/s



10 For a given linear motion, the relation between time t and distance x is $x=6t^2+2t$. The acceleration is

*1) 12 2) 10 3) 6 4)8

11 The acceleration of a particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_o. The distance travelled by the particle in time t will be

1) $v_0t + \frac{1}{3}bt^2$ 2) $v_0t + \frac{1}{2}bt^2$ 3) $v_0t + \frac{1}{6}bt^3$ *4) $v_0t + \frac{1}{3}bt^3$

12 A particle moves a distance 'x' in time 't' according to the equation $x = (t+5)^{-1}$. The acceleration of the particle is proportional to

1) $(Velocity)^{2/3}$ *2) $(velocity)^{3/2}$ 3) $(Distance)^{2}$ 4) $(Distance)^{-2}$

13 A body is thrown vertically upwards with initial velocity 'u' reaches maximum height in 6 seconds. The ratio of distance travelled by the body in the first second and seventh second is

1) 1:1 *2) 11:1 3) 1:2 4)1:11

14 A ball is projected from the bottom of a tower and is found to go above the tower and is caught by the thrower at the bottom of the tower after a time interval t_1. An observer at the top of the tower sees the same ball go up above him and then come back at this level in a time interval t_2. The height of the tower is

1) $\frac{1}{2}gt_1t_2$ 2) $\frac{gt_1t_2}{8}$ *3) $\frac{g}{8}\left(t_1^2-t_2^2\right)$ 4) $\frac{g}{2}\left(t_1-t_2\right)^2$

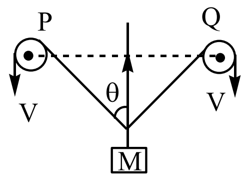
15. A lift in which a man is standing, is moving upwards with a speed of $10ms^{-1}$. The man drops a coin from a height of 4.9 metre and if g = $9.8ms^{-2}$, then the coin reaches the floor of the lift after a time

1) $\sqrt{2}s$ *2) 1 s 3) 1/2 4) $1/\sqrt{2}$

16 A stone is dropped from a height of 10cm above the top of a window 80cm high, The time taken by the stone to cross the window ($g=9.8ms^{-2}$)

1) $\frac{1}{7}$s 2) $\frac{3}{7}$s *3) $\frac{2}{7}$s 4) $\frac{4}{7}$s

17 In the arrangement as shown below the strings P, Q are being pulled downward with a speed 'V' each. If the pulleys are fixed, the mass M moves upward with a velocity of



1) $V\cos\theta$ * 2) $\frac{V}{\cos\theta}$ 3) $2V\cos\theta$ 4) $\frac{2V}{\cos\theta}$

18 A person walks up a stationary escalator in time t_1. If he remains stationary on the escalator, then it can take him up in time t_2. How much time would it take him to walk up the moving escalator?

*1) $\frac{t_1t_2}{t_1+t_2}$ 2) $\frac{t_1t_2}{t_1-t_2}$ 3) $\frac{t_1+t_2}{t_1t_2}$ 4) $\frac{t_1-t_2}{t_1t_2}$

19 One of the rectangular components of a velocity of 20 ms^{-1}. is $10ms^{-1}$ Find the other component.

*1) 10 $\sqrt{3}$ ms^{-1} 2) 20 $\sqrt{3}$ ms^{-1} 3) 5 $\sqrt{3}$ ms^{-1} 4) 35 $\sqrt{3}$ ms^{-1}

20 Assertion (A): $\frac{1}{\sqrt{2}}\hat{i}+\frac{1}{\sqrt{2}}\hat{j}$ is a unit vector

Reason (R): The component vectors of a unit vector need not be unit vectors

1) Both A and R are correct and R is the correct explanation of A.

*2) Both A and R are correct but R is not the correct explanation of A.

3) A is true but R is False. 4) R is true but A is False

21 'A' and 'B' are the two pegs seperated by 13cm. A body of 169Kgwt is suspended by thread of 17cm connecting to A &B, such that the two segments of strings are perpendicular. Then tensions in shorter and longer parts of string having are

1) 100 kgwt, 69 kgwt 2) 65 kgwt, 156 kgwt *3) 156 kgwt, 65 kgwt 4) 69 kgwt, 100 kgwt

22 $\vec{A}$ and $\vec{B}$ are two vectors $(\vec{A}+\vec{B})\times(\vec{A}-\vec{B})$ can be expressed as

1) $\vec{B}\times\vec{A}$ *2) $2(\vec{B}\times\vec{A})$ 3) $2(\vec{A}\times\vec{B})$ 4) zero

23 A boat which has a velocity of 12 km/hr in still water is rowed straight across a river of width 240 metre flowing at 5 km/hr. The distance traveled by the boat while crossing the river in metre is

1) 240 m *2) 260 m 3) 100 m 4) None

24 Velocity of boat in still water of a river of width 80 m is 10m/s. A person can save 2 sec while moving in shortest time compared to shortest path. The velocity of the river is

1) 4 m/s *2) 6 m/s 3) 8 m/s 4) 10 m/s

25 A swimmer crosses a flowing stream of width 'd' to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. If t_3 is the time the swimmer would take to swim a distance 2d in still water, then

*1) $t_1=\sqrt{t_2t_3}$ 2) $t_2=\sqrt{t_1t_3}$ 3) $t_3=\sqrt{t_2t_1}$ 4) $t_3=\sqrt{t_2+t_1}$

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Work sheet- 3 | (*Thermal Properties of Matter*) | PHYSICS

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1 A metallic solid sphere is rotating about its diameter as axis of rotation. If the temperature is increased by $200^{o}C$, the percentage increases in its moment of inertia is: [Coefficient of linear expansion of the metal $=10^{-5}/^{o}C$]

1) 0.1 2) 0. 2 3) 0. 3 *4) 0.4

2 Two marks on a glass rod 10 cm apart are found to increase their distance by 0.08 mm when the rod is heated from $0^{o}C$ to $100^{o}C$. A flask made of the same glass as that rod measures a volume of 1000 c.c. at $0^{o}C$. The volume it measures at $100^{o}C$ in c.c. is

*1) 1002.4 2) 1004.2 3) 1006.4 4) 1008.2

3 A pendulum clock is 5 seconds fast at a temperature of $15^{o}C$ and 10 seconds slow at a temperature of $30^{o}C$. The temperature at which it gives the correct time is

1) $18^{o}C$ *2) $20^{o}C$ 3) $22^{o}C$ 4) $25^{o}C$

4 A sphere of coefficient of linear expansion , mass 'm' and radius 'r' is spinning about an axis through its diameter with an angular velocity " when it is heated such that its temperature increases by , the angular velocity becomes ....

5 A piece of copper wire has a length of 2 m at $10^{o}C$. Its length at $100^{o}C$ is (Coefficient of linear expansion of copper $=17 \times 10^{-6}\ /^{o}C$)

1) 20.00306 m 2)2.00306 m 3) 4.000306 m 4) 15.000306 m

6 A piece of steel has a length of 30 cm at $15^{o}C$. At $90^{o}C$ its length increases by 0.027 cm. Its coefficient of linear expansion is

1) $15 \times 10^{-6}/^{o}C$ 2) $12 \times 10^{-6}/^{o}C$ 3) $15 \times 15^{-6}/^{o}C$ 4) $20 \times 10^{-6}/^{o}C$

7 A brass meter bar is correct at $20^{o}C$. The length of a rod as measured by it at $35^{o}C$ is 50 cm. The true length of the rod at $35^{o}C$ is (coefficient of linera expansion of brass is $19 \times 10^{-6}/^{o}C$)

1) 40.01 m 2) 25.02m 3) 50.01m 4) 45.01 m

8 The sum and difference of coefficient of real and apparent expansions of a liquid are in the ratio 2 : 1. The ratio of ciefficient of real expansion and apparent expasnions must be

1) 1 : 1 2) 2 : 3 3) 3 : 1 4) 6 : 5

9 A vessel of volume 1 liter is filled with a liquid whose coefficient of volume expansion is 20 times as that of the vessel. At all temperatures if volume of air above the liquid is constant the volume of that empty space is

1) 950 cc 2) 50 c.c. 3) 1000 cc 4) 500 c.c.

10 The pressure of a gas at $0^{o}C$ is 50 cm of Hg at constant volume it is heated to $80^{o}C$, then pressure is 64 cm of Hg the pressure coefficient of gas

1) $0.0035/^{o}C$ 2) $0.035/^{o}C$ 3) $0.00035/^{o}C$ 4) $0.000035/^{o}C$

11 A given of gas occupies a volume of 100 cc at one atmospheric and at $100^{o}C$. At the same temperature, how much volume the same gas occupies at 4 atmospheric pressure?

1) 25 c 2) 15 cc 3) 35 cc 4) 10 cc

12 The apparent change in volume of a liqudi per $100^{o}C$ is 8%. Then coefficient of apparent expansion of liquid is

*1) $8 \times 10^{-4}\ /^{o}C$ 2)$16 \times 10^{-6}\ /^{o}C$ 3) $10 \times 10^{-6}/^{o}C$ 4) $15 \times 10^{-6}/^{O}c$

13 A correct thermometer in Fahrenheit is introduced in a water bath along with a Celsius thermometer. The reading observed are $86^{o}F$ and $32^{o}C$. The correction to be made to the Celsius reading will be

1) $2.5^{o}C$ *2) $2^{o}C$ 3) $1.5^{o}C$ 4) $3^{o}C$

14. An iron sphere is heated to a temperature of $500^{0}C$ and suspended in vaccum to cool. The rate of loss of heat is found to be 6 J/s . If the same sphere were cut about three mutually perpendicular diameters, and all the

pieces are initially at same 500^0C temperature are now suspended in vacuum, then the rate of loss of heat will be

*1) 15 J/s 2) 6J/s 3) 9 J/s 4) 12 J/s

15 A sphere and a cube both made of copper have equal volumes and are blackened. These are heated to same temperature and are allowed to cool under same surroundings. The ratio of their rates of loss of heat is

1. 1:1 *2. $(\pi/6)^{1/3}$ 3. $(6/\pi)^{1/3}$ 4. $(\pi/6)^{1/2}$

16 A black body at 2000 K emits radiation with λ_m = 12500 Å. A star Sirius emits radiations with maximum intensity at 710 Å. Assuming Sirius behaves like a black body, its surface temperature will be around

1) 3,500 K *2) 35,000 K 3) 350 K 4) 3, 50,000 K

17 Two spheres made of same material have radii 1 *cm* and 4 *cm* and temperatures 1200 K and 600 K respectively. The energies radiated by them in one second are in the ratio of

1) 1 : 2 2) 2 : 1 *3) 1 : 1 4) 4 : 1

18 A copper calorimeter contains 100 g of water at $16°C$. When 15g of ice is added to it, the resultant temperature of the mixture is $4°C$, water equivalent of the calorimeter is

1) 10 g 2) 20 g *3) 5 g 4) 25 g

19 Three grams of steam at 100^0C is mixed with 30 gm of ice at 0^0C. The mixture consists of

1) 33 gm of water at 10^0C 2) 33 gm of water at 0^0C

3) 18 gm of water at 15 gm of ice at 0^0C *4) 27 gm of water and 6 gm of ice at 0^0C

20 2 Kg of ice at -20^0C is mixed with 5 Kg of water at 20^0C in an insulating vessel having negligible heat capacity. The final mass of water in the vessel is

1) 5 Kg 2) 5.5 Kg *3) 6 Kg 4) 7 Kg

21 190 gm of water is contained in a copper calorimeter of mass 100 gm at 30^0C. A copper ball of mass 40 gm is heated to a constant temperature in a furnace and dropped in the calorimeter. The resultant temperature is found to be 40^0C. The temperature of the furnace is (specific heat of calorimeter = 0.1 cal /gm/^{0}C)

*1) 540^0 C 2) 500^0C 3) 340^0C 4) 400^0C

22 If the time taken to increase the thickness of ice on ponds from 0 to x is t, then the time taken for the ice to grow the thickness from x to 2x is

1) t 2) 4t *3) 3t 4) t/4

23 A wall is of two layers P and Q each made of different material s. Both the layers have same thickness. The thermal conductivity of the material P is twice that of Q. under thermal equilibrium, the temperature difference across the walls is 36^0C. What is the temperature difference across the layer P?

1. 36^oC 2. 12^oC 3. 16^oC 4. 18 ^{o}C

24 The total radiant energy per unit area , normal to the direction of incidence, received at a distance R from the centre of a star of radius r , whose outer surface radiates as a black body at a temperature TK is given by

*1) $\frac{\sigma r^2 T^4}{R^2}$ 2) $\frac{\sigma r^2 T^4}{4\pi R^2}$ 3) $\frac{\sigma r^4 T^4}{R^4}$ 4) $\frac{4\pi\sigma^2 T^4}{R^2}$

25 Two electric bulbs have filaments of lengths L and 2L, diameters 2d and d and emissivities 3e and 4e. If their temperatures are in the ratio 2 : 3 their emissive powers will be in the ratio of

1) 8 : 27 2) 8 : 3 *3) 4 : 27 4) 4 : 9

26 A solid sphere is at a temperature T. The sphere is cut into two halves. The fraction of energy emitted per second by the half sphere to that by complete sphere is

1) 1/2 2) 1/4 *3) 3/4 4)1/16

27 A body cools in 7 minutes from 60^0C to 40^0C. The time (in minutes) taken by it to cool from 40^0C to 28^0C is , if surrounding temperature is 10^0C

1) 3.5 2) 14 *3) 7 4) 10