BIPC **PHYSICS**

Thermal Properties of Matter
Projectile & Motion in a Plane

WORK SHEET - 1

1 A piece of metal floats on mercury the coefficient of volume expansion of the metal and mercury are γ_1 *and* γ_2 respectively. If the temperature of both mercury and metal are increased by an amount ΔT, the fraction of volume of the metal submerged in mercury changes by the factor

1) $\frac{1}{(\gamma_2 - r_1)\Delta T}$ 2) $\frac{1}{(r_1 - r_2)\Delta T}$

3) $(r_1 - r_2)\Delta T$ 4) $(r_2 - r_1)\Delta T$

2 A bubble rises from the bottom of a lake 90 m deep on reaching the surface, its volume becomes (take atmospheric pressure as 10 m of water)

1) 4 times 2) 8 times
*3) 10 times 4) 3 times

3 To decrease the pressure of the gas by 10% at constant temperature then change in volume should be

1) 10% decrease 2) 10% increase
*3) 11.11% increase 4) 9.1% increase

4 A gas is heated through 1°C in a closed vessel. Its pressure is increased by 0.4%. The initial temperature of the gas is

1) 250°C 2) 100°C 3) 75°C *4) –23°C

5 A given amount of a gas heated till the volume and pressure are each increased by 1%, then temperature increases by

1) 0.5% 2) 1% *3) 2% 4) 4%

6 Mass of 1 litre of air at N.T.P. is 1.293 g. The mass of 10 litres of air at 273°C and 57cm of mercury pressure is

1) 4.489 gm *2) 4.849 gm
3) 4.4 gm 4) 4.9 gm

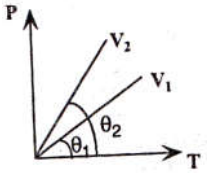
7 A vessel containign 10 lit of air at atmospheric pressure (760 mm of Hg) is connected with an evacuated 9 litre vessel. The resultant air pressure will be

1) 1440 mm of Hg 2) 760 mm of Hg
*3) 400 mm of Hg 4) 40 mm of Hg

8 A vessel contains 8 gm of a gas at a pressure P and temperature 500 K. The gas leaves through a small hole. The mass of the gas leaked out when the pressure is P/2 and temperature is 400 K is

1) 5 gm *2) 3 gm 3) 4 gm 4) 6 gm

9 From the following P - T diagram, the indeference drawn is



1) $V_2 > V_1$ 2) $V_2 < V_1$
3) $V_1 = V_2$ 4) None of these

TRACK 1

10 The speed of a projectile at the maximum height is half of its initial speed. Its horizontal range is

1) $\frac{u^2}{\sqrt{3g}}$ 2) $\frac{2u^2}{\sqrt{3g}}$ *3) $\frac{\sqrt{3}}{2}\cdot\frac{u^2}{g}$ 4) $\frac{\sqrt{3}u^2}{g}$

11 A ball is thrown with a velocity of 8 m/s making an angle of 60^0 with the horizontal. Its velocity will be perpendicular to the initial velocity of projection after a time of ($g=10\ m/s^2$)

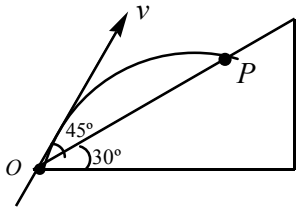
*1) $\frac{1.6}{\sqrt{3}}$ s 2) $\frac{4}{\sqrt{3}}$ s 3) 0.6 s. 4) $1.6\sqrt{3}$ s

12 A projectile is thrown into air with velocity u at an angle θ to the horizontal. The average velocity of the particle between its point of projection and heighest point of it's trajectory is

1) $u\sqrt{\frac{1+\cos^2\theta}{2}}$ *2) $\frac{u}{2}\sqrt{1+3\cos^2\theta}$

3) $\frac{u}{2}\sqrt{1-3\cos^2\theta}$ 4) $u\sqrt{\frac{1-\cos^2\theta}{2}}$

13 A body projected with 45º with the plane of the inclined plane and angle of inclined plane is 30º. Find the range 'OP' on the inclined plane u.

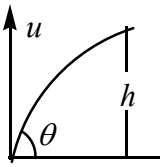


*1) $\frac{2v^2}{3g}$ 2) $\frac{v^2}{\sqrt{3}g}$ 3) $\frac{\sqrt{2}}{\sqrt{2}+1}\frac{V^2}{g}$ 4) $\frac{V^2}{2\sqrt{2}g}$

14 A particle projected from the level ground just clears in its ascent a wall 30 m high and $120\sqrt{3}$ away measured horizontally. The time since projection to clear the wall is two second. It will strike the ground in the same horizontal plane from the wall on the other side at a distance of

1) $150\sqrt{3}$ m *2) $180\sqrt{3}$ m
3) $120\sqrt{3}$ m 4) $210\sqrt{3}$ m

15 If a stone is to hit at a point which is at a distance d away and at a height h above the point from where the stone starts, then what is the value of initial speed u if the stone is launched at an angle θ?



1) $\frac{g}{Cos\theta}\sqrt{\frac{d}{2(dTan\theta-h)}}$

*2) $\frac{d}{Cos\theta}\sqrt{\frac{g}{2(dTan\theta-h)}}$

3) $\sqrt{\frac{gd^2}{hCos^2\theta}}$ 4) $\sqrt{\frac{gd^2}{(d-h)}}$

16 When a projectile is fired at an angle θ with the horizontal with velocity u, The projectile motion is given as $y = Ax - Bx^2$, The value of 'B' is

1) $\frac{g}{u^2Cos^2\theta}$ 2) $Tan\theta$
3) $\frac{g}{2u^2Cos\theta}$ *4) $\frac{g}{2u^2Cos^2\theta}$

17 From the top of a tower of height 'h ' a body is projected horizontally with velocity 'u ' . On reaching the ground , magnitude of change in its velocity is

1) $\sqrt{u^2+2gh}$ *2) $\sqrt{2gh}$
3) $u-\sqrt{2gh}$ 4) $u+\sqrt{2gh}$

18. A tube of length L if filled completely with an incompressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is :

*1) $\frac{ML\omega^2}{2}$ 2) $ML\omega^2$ 3) $\frac{ML\omega^2}{4}$ 4) $\frac{ML^2\omega^2}{2}$

19 A stationary wheel starts rotating about its own axis at uniform angular acceleration 8 rad/s^2. The time taken by it to complete 77 rotations is

1. 5.5 sec 2. 7sec *3. 11sec 4. 14 sec

20 A point moves along a circle of radius 20cm with constant tangential acceleration of 5cm s^{-2}. The time after which the normal acceleration of the point will be equal to tangential acceleration is

1. 1s *2. 2s 3. 4s 4. 6s

21 A car of mass 1000kg is moving with a speed of 40 ms^{-1} on a circular path of radius 400m. If its speed is increasing at the rat e of 3 ms^{-1} the total force acting on the car is

1. 3000N 2. 4000N *3. 5000N 4. 7000N

22 A car is moving with speed 30m/sec on a circular path of radius 500m. Its speed is increasing at the rate of $2m/\sec^2$. What is the acceleration of the car

1) $2m/\sec^2$ *2) $2.7m/\sec^2$
3) $1.8m/\sec^2$ 4) $9.8m/\sec^2$

23 Ship A is 10km due west of ship B. Ship A is heading directly north at a speed of 30 kmph while ship B is heading in a direction 60^0 west of north at a speed 20 kmph. Their closest distance of approach will be……..

*1) 7.56 km 2) 7.56 m 3) 75.6 km 4) 756 m

24 The trajectory of a particle is given by $Y= 9X^2$ and the X- component of its velocity is(1/3) m/ s always. Then the acceleration,

1) 1 *2) 2 3) ½ 4) 1/3

25 From the top of a ball is projected horizontally with a velocity u . If the magnitudes of the horizontal and verticle displacements of the ball are to be equal during the motion of the ball , what should be the minimum height of the tower (g is acceleration due to gravity)

1) $\frac{u^2}{2g}$ 2) $\frac{u^2}{g}$ *3) $\frac{2u^2}{g}$ 4) $\frac{u^2}{4g}$