DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 7

Topic :- WORK ENERGY AND POWER

1 **(b)**

$KE = \frac{1}{2}mv^2$

Given, $v_2 = (v_1 + 2)$

$\frac{K_1}{K_2} = \left(\frac{v_1}{v_2}\right)^2$

$\frac{1}{2} = \frac{v_1^2}{(v_1+2)^2}$ $\quad (\because k_2 = 2k_1)$

$v_1^2 + 4v_1 + 4 = 2v_1^2$

$v_1^2 - 4v_1 - 4 = 0$

$v_1 = \frac{4 \pm \sqrt{16+16}}{2}$

$v_1 = \frac{4+\sqrt{32}}{2} = 2(\sqrt{2}+1)\text{ms}^{-1}$

2 **(c)**

$E = \frac{1}{2}mg^2t^2$

$\frac{E_1}{E_2} = \frac{\frac{1}{2}mg^2 \times 3^2}{\frac{1}{2}mg^2(6^2 - 3^2)} = \frac{9}{9 \times 3} = \frac{1}{3}$

3 **(d)**

Initially mass 10 gm moves with velocity 100 cm/s

$\therefore$ Initial momentum $= 10 \times 100 = 1000\frac{gm \times cm}{sec}$

After collision system moves with velocity $v_{\text{sys.}}$ then

Final momentum $= (10 + 10) \times v_{\text{sys.}}$

By applying in conservation of momentum

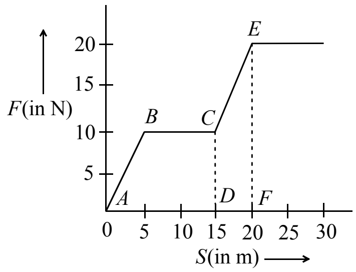
$1000 = 20 \times v_{\text{sys.}}$

$\Rightarrow v_{\text{sys.}} = 50\ cm/s$

If system rises upto height h then

$\text{h} = \frac{v_{\text{sys.}}^2}{2g} = \frac{50 \times 50}{2 \times 1000} = \frac{2.5}{2} = 1.25\ cm$

4 **(b)**



Work done $W =$ area under F - S graph

= area of trapezium $ABCD +$ area of trapezium $CEFD$

$= \frac{1}{2} \times (10 + 15) \times 10 + \frac{1}{2} \times (10 + 20) \times 5$

$= 125 + 75 = 200\ J$

5 **(d)**

$s = 10\text{m}, F = 5\text{ N}, W = 25\text{ J}, \theta = ?$

$\cos\theta = \frac{W}{Fs} = \frac{25}{5 \times 10} = \frac{1}{2} \quad \therefore \theta = 60°$

6 **(d)**

Work done in raising water=mgh

$or\ W = (\text{volume} \times \text{density})gh$

$= (9 \times 1000) \times 10 \times 10$

Or $W = 9 \times 10^5\text{J}$

$\therefore$ Useful power $= \frac{\text{work}}{\text{t}} = \frac{9 \times 10^5}{5 \times 60} = 3\text{kW}$

Hence, efficiency=$\frac{\text{useful power}}{\text{consuming power}}$

$= \frac{3}{10} = 30\%$

7 **(c)**

Kinetic energy at highest point

$(\text{KE})_H = \frac{1}{2} mv^2 \cos 2\,\theta$

$= K \cos^2\theta$

$= K(\cos 60°)^2$

$= \frac{K}{4}$

8 **(b)**

Loss in kinetic energy

$= \frac{1}{2} \frac{m_1 m_2 (u_1 - u_2)^2}{(m_1 + m_2)}$

$$= \frac{1}{2} \; \frac{m.m(u_1 - u_2)^2}{(m + m\,)}$$

$$= \frac{m}{4}(u_1 - u_2)^2$$

9 **(c)**

Change in momentum = Impulse

= Area under force-time graph

$\therefore mv =$ Area of trapezium

$$\Rightarrow mv = \frac{1}{2}\left(T + \frac{T}{2}\right)F_0 \Rightarrow mv = \frac{3T}{4}F_0 \Rightarrow F_0 = \frac{4mu}{3T}$$

11 **(c)**

Kinetic energy $= \frac{1}{2}mv^2$

$\therefore$ K.E. $\propto v^2$

If velocity is doubled then kinetic energy will become four times

12 **(a)**

$$p = \frac{mg\text{h}}{t} = \frac{200 \times 10 \times 200}{10} = 40\ kW$$

13 **(c)**

$$E_1 = \frac{1}{2}mv^2$$

$$E_2 = \frac{1}{2}m(v + 1)^2$$

$$\frac{(E_2 - E_1)}{E_1} = \frac{\frac{1}{2}m[(v + 1)^2 - v^2]}{\frac{1}{2}mv^2} = \frac{44}{100}$$

On solving, we get $v = 5\text{ms}^{-1}$

14 **(b)**

Gravitational field is a conservative force field. In a conservative force field work done is path independent.

$\therefore \qquad W_1 = W_2 = W_3$

15 **(c)**

Useful work $= \frac{75}{100} \times 12\text{ J} = 9\text{J}$

Now, $\frac{1}{2} \times 1 \times v^2 = 9$ or $v = \sqrt{18}\ \text{ms}^{-1}$

16 **(b)**

Momentum of third part will be equal to the resultant of momenta of two part

$$P_3^2 = P_1^2 + P_2^2$$

Or $p_3 = \sqrt{P_1^2 + P_2^2}$

Or $3mv_3 = \sqrt{(m \times 30)^2 + (m \times 30)^2}$

Or $v_3 = \frac{30\sqrt{2}}{3}10\sqrt{2}ms^{-1}$

17 **(c)**

Power given to turbine $= \frac{mg\text{h}}{t}$

$P_{in} = \left(\frac{m}{t}\right) \times g \times h \Rightarrow P_{in} = 15 \times 10 \times 60$

$\Rightarrow P_{in} = 9000\ W \Rightarrow P_{in} = 9\ kW$

As efficiency of turbine is 90% therefore power generated = 90% of 9 kW

$P_{out} = 9 \times \frac{90}{100} \Rightarrow P_{out} = 8.1\ kW$

18 **(a)**

In an inelastic collision, only momentum is conserved whereas in elastic collision both momentum and kinetic energy are conserved

19 **(c)**

When the ball is released from the top of tower then ratio of distances covered by the ball in first, second and third second

h_I:h_{II}:h_{III} = 1:2:3[Because $h_n \propto (2_n - 1)$]

$\therefore$ *Ratio of work done*

mgh_I:mgh_{II}:$mgh_{III} = 1:3:5$

20 **(a)**

$\vec{\mathbf{F}}.d\vec{\mathbf{F}} = (x\hat{\mathbf{i}} + y\hat{\mathbf{j}}).(dx\hat{\mathbf{i}} + dy\hat{\mathbf{j}})$

$= xdx + ydy$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	C	D	B	D	D	C	B	C	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	A	C	B	C	B	C	A	C	A