DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 8

Topic :- WORK ENERGY AND POWER

1 **(c)**

Friction is a non-conservative force. Work done by a non-conservative force over a closed path is not zero. Hence, option (c) is a false statement

2 **(b)**

Initial velocity of particle, $v_i = 20$ ms^{-1}

Final velocity of the particle, $v_f = 0$

According to work-energy theorem,

$W_{\text{net}} = \Delta\text{KE} = K_f - K_i$

$= \frac{1}{2}m(v_f^2 - v_i^2)$

$= \frac{1}{2} \times 2(0^2 - 20^2)$

$= -400$ J

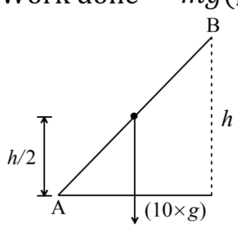
3 **(a)**

Work = Force × Displacement (length)

If unit of force and length be increased by four times then the unit of energy will increase by 16 times

4 **(b)**

Work done $= mg(\text{h}/2)$



$100 = \frac{10 \times 10 \times \text{h}}{2}$

$\Rightarrow h = 2.0\ m$

5 **(c)**

When a force of constant magnitude which is perpendicular to the velocity of particle acts on a particle, work done is zero and hence change in kinetic energy is zero

6 **(a)**

Power of gun $=\frac{\text{Total K.E. of fired bullet}}{\text{time}}$

$$=\frac{n\times\frac{1}{2}mv^2}{t}=\frac{360}{60}\times\frac{1}{2}\times 2\times 10^{-2}\times(100)^2=600\ W$$

7 **(a)**

Power of motor initially $=p_0$

Let, rate of flow of motor $=(x)$

Since, power, $p_0=\frac{work}{time}=\frac{mgy}{t}=mg\left(\frac{y}{t}\right)$,

$\frac{y}{t}=x=$ rate of flow of water

$=mgx$ ....(i)

If rate of flow of water is increased by n times, *i.e.*, (nx)

Increased power, $p_1=\frac{mgy'}{t}=mg\left(\frac{y'}{t}\right)$,

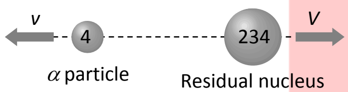
$=nmgx$ ....(ii)

The ratio of power

$$\frac{p_1}{p_0}=\frac{n\,mgx}{mgx}=\frac{n}{1}\Rightarrow p_1{:}p_0\Rightarrow n{:}1$$

8 **(a)**

Initially ^{238}U nucleus was at rest and after decay its part moves in opposite direction



According to conservation of momentum

$$4v+234V=238\times 0\Rightarrow V=-\frac{4v}{234}$$

9 **(d)**

Condition for vertical looping

$$h=\frac{5}{2}r=5cm\ \therefore r=2\ cm$$

10 **(c)**

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

As both balls are falling through same height therefore the possess same velocity

But $KE\propto m$ [If $v=$ constant]

$$\therefore\frac{(KE)_1}{(KE)_2}=\frac{m_1}{m_2}=\frac{2}{4}=\frac{1}{2}$$

11 **(b)**

Power delivered to body

P=F $\cdot\, v$

$=mav$

$=ma(0+gt)$ $(\because u=o)$

$=magt$

Or $P\propto t$

13 **(b)**

When particle moves away from the origin then at position $x = x_1$ force is zero and at $x > x_1$, force is positive (repulsive in nature) so particle moves further and does not return back to original position

i.e. the equilibrium is not stable

Similarly at position $x = x_2$ force is zero and at $x > x_2$, force is negative (attractive in nature)

So particle return back to original position *i.e.* the equilibrium is stable

14 **(a)**

By conservation of momentum, $mv + M \times 0 = (m + M)V$

Velocity of composite block $V = \left(\frac{m}{m+M}\right)v$

K.E. of composite block $= \frac{1}{2}(M+m)V^2$

$$= \frac{1}{2}\ (M+m)\left(\frac{m}{M+m}\right)^2 v^2 = \frac{1}{2}\ mv^2\left(\frac{m}{m+M}\right)$$

15 **(d)**

Work done by the gun

=Total kinetic energy of the bullets

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

$$= 240 \times \frac{1}{2} \times 10 \times 10^{-3}(600)^2$$

$$= 120 \times \frac{1}{2} \times 10 \times 10^{-3} \times 600 \times 600$$

$$\therefore \quad Power\ of\ gun = \frac{work\ done}{time\ taken}$$

$$= \frac{120 \times 10 \times 10^{-3} \times 600 \times 600}{1min}$$

$$= \frac{120 \times 10 \times 360}{60} = 120 \times 10 \times 6w$$

$$\frac{120 \times 10 \times 6}{1000} kW = 7.2kW$$

16 **(a)**

K.E. acquired by the body = work done on the body

$K.E. = \frac{1}{2}mv^2 = Fs$ *i.e.* it does not depend upon the mass of the body although velocity depends upon the mass

$v^2 \propto \frac{1}{m}$ [If F and s are constant]

17 **(c)**

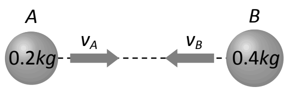
$P = \sqrt{2mE}\ \therefore P \propto \sqrt{m}$ (if $E =$ const) $\therefore \frac{P_1}{P_2} = \sqrt{\frac{m_1}{m_2}}$

18 **(a)**

$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2 + \frac{1}{2}mv^2 = mv^2$$

$$x = \sqrt{\frac{2mv^2}{k}}$$

19 **(c)**



Initial linear momentum of system $= m_A\vec{v}_A + m_B\vec{v}_B$

$= 0.2 \times 0.3 + 0.4 \times v_B$

Finally both balls come to rest

$\therefore$ final linear momentum $= 0$

By the law of conservation of linear momentum

$0.2 \times 0.3 + 0.4 \times v_B = 0$

$$\therefore v_B = -\frac{0.2 \times 0.3}{0.4} = -0.15\ m/s$$

20 **(c)**

As the ball bounces back with same speed so change in momentum $= 2\ mv$

And we know that force = rate of change of momentum

i.e. force will act on the ball so there is an acceleration

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