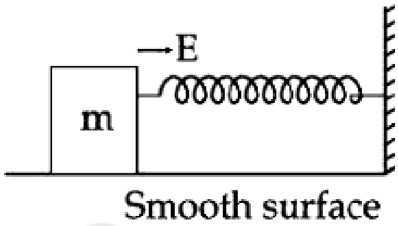
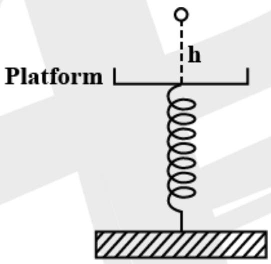
DPP – 4

Work power energy

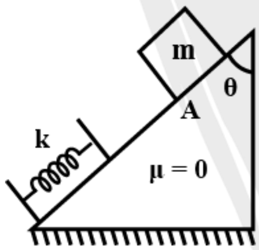
Q.1 A block of mass ' m ' (as shown in figure) moving with kinetic energy E composes a spring through a distance 25 cm when, its speed is halved. The value of spring constant of used spring will be nE N m^{-1} for n =



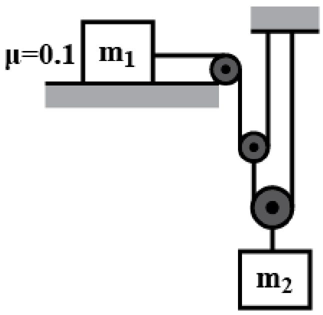
Q.2 A ball of mass 100 g is dropped from a height h = 10 cm on a platform fixed at the top of a vertical spring (as shown in figure). The ball stays on the platform and the platform is depressed by a distance $\frac{h}{2}$. The spring constant is Nm^{-1}. (Use $g = 10\ m\ s^{-2}$)



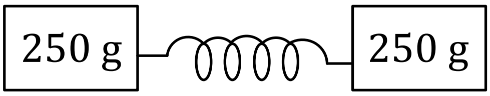
Q.3 A block of mass m is released from rest at point A. The compression in spring (force constant k) when the speed of block is maximum is found to be nmgcos $\theta/4k$. What should be the value of n ?



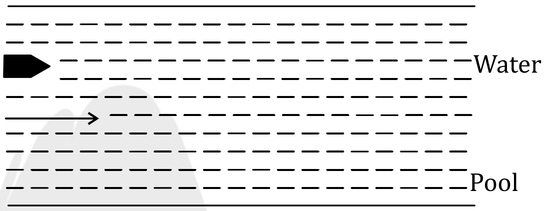
Q.4 In Fig. find the velocity of m_1 in ms^{-1} when m_2 falls by 9 m. Given $m_1 = m; m_2 = 2m$ (take $g = 10\ ms^{-2}$).



Q.5 As per the given figure, two blocks each of mass 250 g are connected to a spring of spring constant 2 N m^{-1}. If both are given velocity v in opposite directions, then maximum elongation of the spring is



Q.6 A bullet of mass 200 g having initial kinetic energy 90 J is shot inside a long swimming pool as shown in the figure. It's kinetic energy reduces to 40 J within 1 s, the minimum length of the pool, the bullet has to travel so that it completely comes to rest is



(A) 45 m (B) 90 m (C) 125 m (D) 25 m

Q.7 A spring whose unstretched length is l has a force constant k. The spring is cut into two pieces of unstretched length l_1 and l_2 where, $l_1 = nl_2$ and n is an integer. The ratio k_1/k_2 of the corresponding force constants, k_1 and k_2 will be

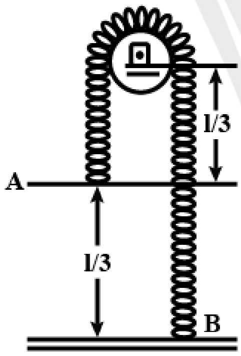
(A) $\frac{1}{n^2}$

(B) n^2

(C) n

(D) $\frac{1}{n}$

Q.8 Two ends A and B of a smooth chain of mass m and length l are situated as shown in Fig. If an external agent pulls A till it comes to same level of B, work done by external agent is



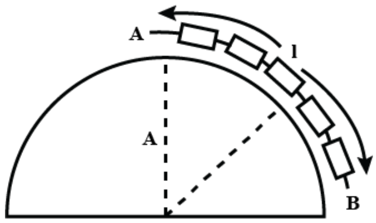
(A) $\frac{mgl}{36}$

(B) $\frac{mgl}{15}$

(C) $\frac{mgl}{9}$

(D) None of the above

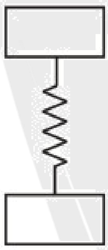
Q.9 A uniform chain AB of mass m and length l is placed with one end A at the highest point of a hemisphere of radius R. Referring to the top of the hemisphere as the datum level, the potential energy of the chain is (given that given that $l < \frac{\pi R}{2}$)



(A) $\frac{mR^2g}{l}\left(\frac{l}{R} - \sin\frac{l}{R}\right)$ (B) $\frac{mR^2g}{2l}\left(\frac{l}{R} - \sin\frac{l}{R}\right)$

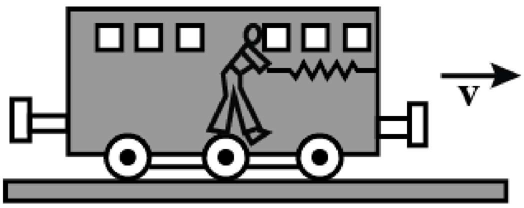
(C) $\frac{mR^2g}{2l}\left(\sin\frac{l}{R} - \frac{l}{R}\right)$ (D) $\frac{mR^2g}{l}\left(\sin\frac{l}{R} - \frac{l}{R}\right)$

Q.10 Two disc each having mass m, are attached rigidly to the ends of a vertical spring. One of the discs rests on a horizontal surface and the other produces a compression x_0 on the spring when it is in equilibrium. How much further must the spring be compressed so that when the force causing compression is removed, the extension of the spring will be able to lift the lower disc off the table?



(A) x_0 (B) $2x_0$ (C) $3x_0$ (D) $1.5x_0$

Q.11 A moving railway compartment has a spring of constant k fixed to its front wall. A boy stretches this spring by distance x and in the mean time the compartment moves by a distance s. The work done by boy w.r.t. earth is



(A) $\frac{1}{2}kx^2$ (B) $\frac{1}{2}(kx)(s + x)$ (C) $\frac{1}{2}kxs$ (D) $\frac{1}{2}kx(s + x + s)$

ANSWER KEY

1.	(24)	**2.**	(120)	**3.**	4	**4.**	16	**5.**	(B)	**6.**	(A)	**7.**	(D)
8.	(A)	**9.**	(D)	**10.**	(B)	**11.**	(A)						