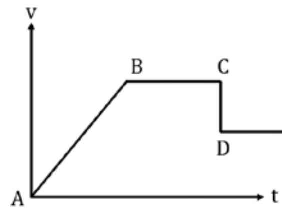
Work-Energy Theorem

Q.1 The displacement x of a particle of mass m kg moving in one dimension under the action of a force is related to the time t by the equation $t = 4x + 3$ where x is in meters and t is in second the work done by the force in the first six second in joules (J) is.

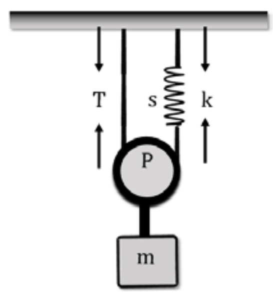
(A) 0 (B) 3 (C) 6 (D) 9

Q.2 The diagram below shows the velocity versus time plot for a particle. The work done by the force on the particle is positive from.



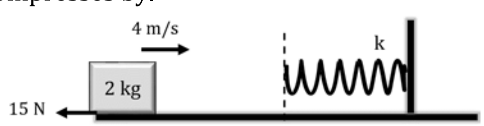
(A) A to B (B) B to C (C) C to D (D) D to E

Q.3 Consider the situation shown in figure. Initially, the spring is upstretched when the mass m is released from rest. Assuming no friction in the pulley, find the maximum extension in the spring.



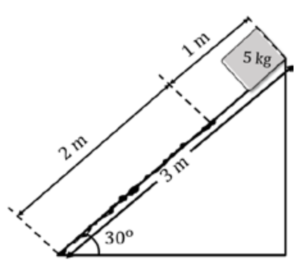
(A) $\frac{mg}{k}$ (B) $\frac{mg}{2k}$ (C) $\frac{2mg}{k}$ (D) $\frac{4mg}{k}$

Q.4 A 2 kg block slides on a horizontal floor with a speed of 4 m/s it strikes an uncompressed spring and compresses it till the block is motionless. The kinetic friction force is 15 N and spring constant is 10000 N/m. The spring compresses by.



(A) 5.5 cm (B) 2.5 cm (C) 11.0 cm (D) 8.5 cm

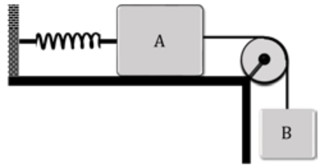
Q.5 A block of mass 5.0 kg slides down from the top of an inclined plane of length 3 m. The first 1 m of the plane is smooth and the next 2 m is rough. The block is released from rest and again comes to rest at the bottom of the plane. If the plane is inclined at 30° with the horizontal, find the coefficient of friction on the rough portion



(A) $\sqrt{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{\sqrt{3}}{4}$ (D) $\frac{\sqrt{3}}{5}$

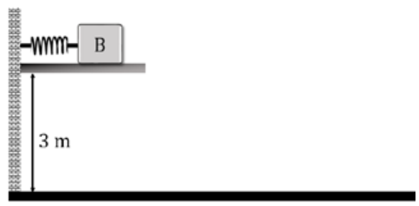
Conservation of M.E.

Q.6 In the figure given below, block A is of mass m and block B is of mass 2 m.The spring has force constant k. All the surfaces are smooth, and the system is released from rest with the spring upstretched. Maximum extension in the spring is.



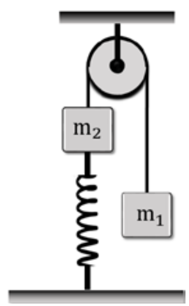
(A) $\frac{mg}{2k}$ **(B)** $\frac{4mg}{k}$ **(C)** $\frac{2mg}{k}$ **(D)** $\frac{mg}{4k}$

Q.7 A small block of mass 200 g is pressed against a horizontal spring fixed at one and to compress the spring through 5 cm The spring constant is 100 N/m The spring is located on a frictionless horizontal plank located at a height of 3 m from the ground. When the block is released, what horizontal distance will it travel (after leaving the plank) before it hits the ground. (Take $g = 10\ m/s^2$)



(A) 1 m **(B)** 0.90 m **(C)** 0.85 m **(D)** 1.2 m

Q.8 In an ideal pulley particle system, mass m_2 ($> m_1$) is connected with a vertical spring of stiffness k. if mass m_2 is released from rest, when the spring is unreformed, find the maximum compression of the spring

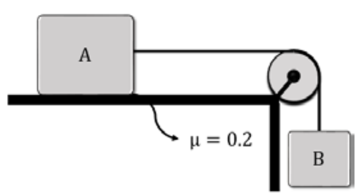


(A) $x = \frac{2(m_2 - m_1)}{k}$ **(B)** $x = \frac{2(m_2)g}{k}$ **(C)** $x = \frac{2(m_2 + m_1)g}{k}$ **(D)** $x = \frac{(m_2 - m_1)g}{k}$

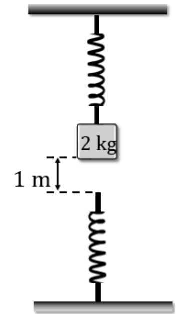
Work-Energy Theorem

Q.9 In the arrangement shown in figure, $m_A = 1\ kg, m_B = 4\ kg$ String is light and inextensible while pulley is smooth. Coefficient of friction between block A and the table is $\mu = 0.2$. Find the speed of both the blocks when block B has descended by a height $h = 1$ m. (Take $g = 10\ m/s^2$)

(A) 3.5 m/s **(B)** 3.9 m/s **(C)** 4.5 m/s **(D)** 3.6 m/s



Q.10 A block of mass 2 kg is suspended by a spring of force constant k = 10 N/m.Another identical spring is fixed below 1 m from mass 2 kg. Initially, both the springs are unscratched and the mass is released from rest. Then, which of the following options are correct (Take $g = 10\ m/s^2$)



(A) Maximum extension in the upper spring is 2.82
(B) Maximum extension in the upper spring is 1.41
(C) Equilibrium position of the block from initial released position is 0.75
(D) Equilibrium position of the block from initial released position is 1.5

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(A)	(A)	(A)	(B)	(B)	(C)	(A)	(B)	(A,D)