Work Done

Q.1 A block of mass m is sliding down on a fixed inclined plane with velocity of 2 m/s for a distance of 2 m. angel of inclined plane is 35°. Calculate the work done by normal reaction on the block.

(A) 0.5 mg sin 35° **(B)** 0.5 mg cos 35° **(C)** 2 mg **(D)** Zero

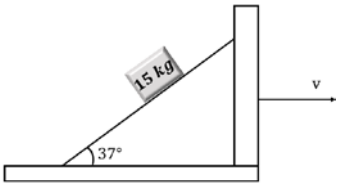
Q.2 On a certain planet a stone weight 2 Kg is thrown vertically downwards with a velocity d 5 m/s from a height of 30 m. it took 4 s to reach the ground calculate the work done by gravity.

(A)–75 J **(B)**60 J **(C)**–60 J **(D)**75 J

Q.3 A body of mass 2 Kg initially at rest moves under the action of an applied horizontal force of 7 N on a table with coefficient of kinetic friction,$\mu_k = 0.1$. Calculate the work done by kinetic friction in 10 sec. ($g = m/s^2$)

(A)246.96 J **(B)**–246.96 J **(C)**882 J **(D)**–882 J

Q.4 A man pushes a 15 Kg box of book 2.0 m up a 37° incline in to the back of a moving van. The box moves at a constant velocity if you push it with a force of 95 N. find the work done by gravity on the box. Take ($g = 10\ m/s^2$)



(A) –180 J **(B)**–120 J **(C)**180 J **(D)**Zero

Q.5 A spring 40 mm long is stretched by the application of a force. If 10 N force required to stretch the spring through 1mm, then work done in stretching the spring through 40 mm is.

(A)84 J **(B)**68 J **(C)**24 J **(D)**8 J

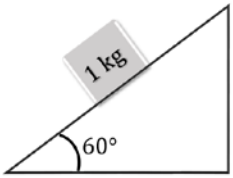
Q.6 A block of mass 2 Kg is being brought down by a string. If the block acquires a speed of 1m/s in dropping down 25 cm, find the work done by the tension in the process.

(A)–16 J **(B)**4 J **(C)**– 4 J **(D)**–4.5 J

Q.7 A 10 Kg block placed on a rough horizontal floor is being pulled by a constant force F = 100 N acting at angel 37°. Coefficient of kinetic friction between the block and the floor is 0.4 find the total work done due to force F acting on the block over displacement of 5m.

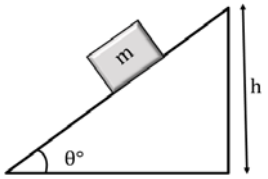
(A)480 J **(B)**360 J **(C)**320 J **(D)**400 J

Q.8 A block of mass 1 Kg slides down on a rough inclined plane of inclination 60° starting from its top. If the coefficient of kinetic friction is 0.5 and length of the plane is 1 m, then work done against friction is (take $g = 9.8\ m/s^2$)



(A)9.82 J **(B)**4.94 J **(C)**2.45 J **(D)**1.96 J

Q.9 A block of mass m is moving dawn with constant velocity along an inclined plane of inclination θ. What is the done by external force (applied parallel to the inclined plane) in pulling the block up the inclined plane through a height 'h' with constant velocity.



(A)3 mgh **(B)**mgh **(C)**mgh sin θ **(D)**2 mgh

Q.10 A force acts on a 3 gm particle in such a way that the position of the particle as a function of time is gravity by $x = 3t - 4t^2 + t^3$ where x is in meters and t is in second. The work done during the first 4 second is.

(A)576 mJ **(B)**450 mJ **(C)**490 mJ **(D)**528 mJ

WORK SHEET

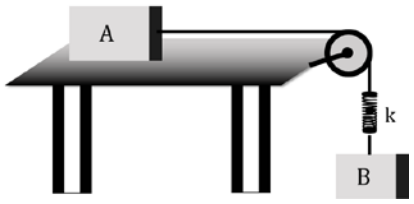
Torque

Q.11 A force $\vec{F} = \hat{\imath} - 3\hat{\jmath} - 5\hat{k}$ acts at a point $\vec{r} = 4\hat{\imath} + 8\hat{\jmath} + a\hat{k}$ from the origin what should be the value of 'a' so that the resulting torque will be maximum? What is the magnitude of the resulting maximum torque?

(A) $-4, \sqrt{3360}\text{N} - \text{m}$ **(B)** $4, \sqrt{3360}\text{N} - \text{m}$ **(C)** $-4, \sqrt{360}\text{N} - \text{m}$ **(D)** $-5, \sqrt{3350}\text{N} - \text{m}$

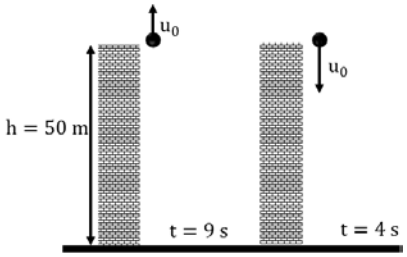
Spring Constant

Q.12 Two blocks A of mass 10 Kg and block B are connected to each other as shown in the figure.The pulley is frictionless. The coefficient of friction between the surfaces is 0.3. If the spring is stretched by 1 cm and friction is maximum, calculate the spring constant (K) of the spring shown in the figure.



(A) 2000 N/m **(B)** 3000 N/m **(C)** 2500 N/m **(D)** 3500 N/m

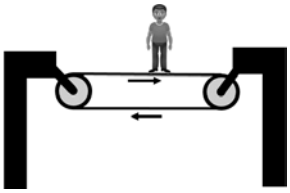
Q.13 A ball thrown vertically upwards at a certain speed from the top of a tower of height 50 m reaches the ground after 9 second Another ball thrown vertically downwards with same speed from the same tower reaches the ground in 4 second How much time will the ball if it is just dropped from the tower?



(A) 6 s **(B)** 7 s **(C)** 5 s **(D)** 8 s

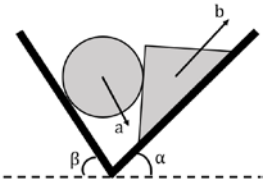
Acceleration

Q.14 Figure shows a man standing stationary with respect to a horizontal conveyor belt. If the coefficient of static friction between the man's shoes and the belt is 0.2, up to what acceleration of the belt can the man continue to be stationary relative to the belt? Mass of the man = 65 kg. Take ($g = 10\text{m/s}^2$)



(A) $10\ \text{m/s}^2$ **(B)** 5m/s^2 **(C)** $4\ \text{m/s}^2$ **(D)** $2\ \text{m/s}^2$

Q.15 Find the relation between acceleration of sphere (a) and acceleration of wedge (b) in the figure show.



(A) $a = \frac{b\cos\alpha}{\cos\beta}$ **(B)** $a = \frac{b\cos\beta}{\cos\alpha}$ **(C)** $a = \frac{b\cos^2\beta}{\sin\alpha}$ **(D)** $a = \frac{b\sin^2\beta}{\cos\alpha}$

Distance

Q.16 A gun mounted on a car moving at a speed of 25 m/s fires at an angle of 60° with the horizontal and a velocity 200 m/s relative to the gun in the direction of motion of car. Find the distance between the gun and the bullet when the bullet hits the ground.

(A) 2000 m **(B)** 2500 m **(C)** $2000\sqrt{3}$ m **(D)** $500\sqrt{3}$ m

Banking angle

Q.17 On a highway, the maximum speed of vehicles is 25 m/s the material of the road provides a coefficient of friction of 0.2. If the highway has a turn with a radius of curvature of 50 m, then what should be the banking angle for this turn to ensure the safety of the drivers?

(A) $\sin^{-1}(0.2)$ **(B)** $\cos^{-1}(0.5)$ **(C)** $\tan^{-1}(1.4)$ **(D)** $\tan^{-1}(1.2)$

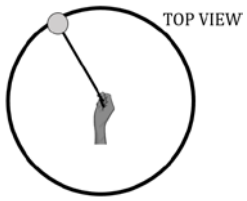
Angular velocity

Q.18 A particle is moving in a circular path with a angular velocity of 2 rad/s and an angular acceleration of $\alpha = \frac{5}{2}\omega$, where $\omega$is the angular velocity at any particular instant. Find the angular velocity after the particle has moved through an angle 3π.

(A) 20.64rad/s **(B)** 15.52rad/s **(C)** 25.56rad/s **(D)** 1.28.25rad/s

Acceleration

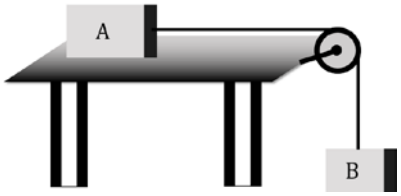
Q.19 A stone is tied to a rope of length 2 m and is whirled above his head horizontally by a man at a height of 9 m from the ground. The stone covers a horizontal distance of 20 m when the rope breaks. What is the magnitude of the centripetal acceleration when the stone was in the circular motion?



(A) $11.11 m/s^2$ **(B)** $123.5 m/s^2$ **(C)** $99.25 m/s^2$ **(D)** $61.72 m/s^2$

Distance

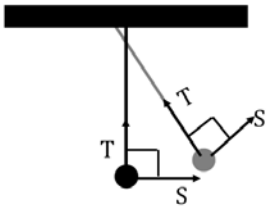
Q.20 A block A of mass 5 Kg is placed on a table and connected to another block B of mass 3 Kg with a light string passing over a frictionless pulley. The coefficient of friction between the tables the block A is 0.4.The block B is suddenly dropped and the string breaks after 3 second. What is the total distance covered by block A?



(A) 5.625 m **(B)** 1.72 m **(C)** 7.375 m **(D)** 6.75 m

Work Done

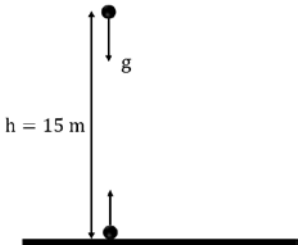
Q.21 What is work done by the force of tension (T) in the string of a simple pendulum?



(A) $\frac{TL}{4}$ **(B)** $\frac{TL}{2}$ **(C)** TL **(D)** Zero

Work done

Q.22 A ball is thrown vertically upwards. Determine the work done by gravity when the ball up to a height of 15 m. mass of the ball = 1 kg. Acceleration due to gravity ($g = 10 m/s^2$)



(A) 150 J **(B)** 100 J **(C)** –150 J **(D)** Zero

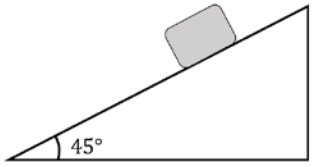
Q.23 Natural length of a massless spring (of spring constant K) is x. It is slowly stretched by applying an external force. What is the work done in slowly increasing its extension from 3x to 4x?

(A) $1.5kx^2$ **(B)** $2.5kx^2$ **(C)** $-3.5kx^2$ **(D)** $3.5kx^2$

Q.24 An object of mass 5 = – 5kg is being pulled up a rough inclined plane which is at 45° to the horizontal. The object is moving at an acceleration of 2 m/s^2 along the inclined plane. The coefficient of kinetic friction between the object and the plane is 0.2. Calculate the total work in pulling the block by 0.5. ($g = 10\ m/s^2$)

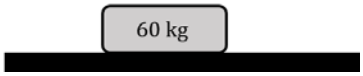
(A) 7 J **(B)** 10 J **(C)** 5 J **(D)** Zero

Q.25 An object of mass m = 5 Kg is being pulled up a rough inclined plane which is at 45° ° to the horizontal. The object is pulled at a constant speed of 0.8 m/s by a force which acts parallel to the inclined plane. The coefficient of kinetic friction between the object and the plane is 0.2. Calculate the work done by the force in pulling the block by 0.5 m. ($g = 10\ m/s^2$)



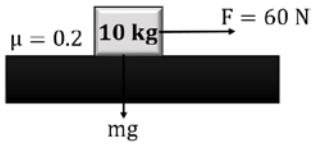
(A) 21.2 J **(B)** 23.2J **(C)** Zero **(D)** 17.68 J

Q.26 A 60 Kg weight is dragged on a horizontal surface by a rope up to 2 m with constant speed. If coefficient of friction is $\mu = 0.5$the angle of rope with the surface is 60° and $g = 9.8\ m/sec^2$then work done by rope on the block is.



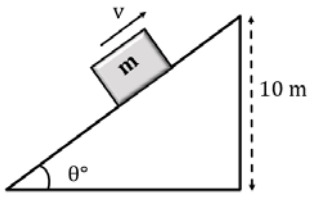
(A) 294 J **(B)** 315 J **(C)** 588 J **(D)** 197 J

Q.27 A block of mass 10 kg lies on rough plane as shown in figure. A constant force F is applied for 10 second find out the value of work done by the force F.



(A) 12000 J **(B)** 10000 J **(C)** – 6000 J **(D)** 0 J

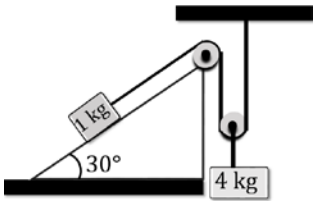
Q.28 300 J of work done in sliding a 2 kg block up the inclined plane of height 10 m with constant velocity. The work done against friction is (Take g = 10 m/s^2)



(A)100 J **(B)**0 J **(C)**200 J **(D)**500 J

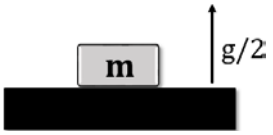
Q.29 Find the work done by tension (in J) on 1 kg block when 4 kg block moves down by 20 cm after the system is released. All surface are functionless.

(A) 4 J **(B)** 6 J **(C)** 5 J **(D)** Zero

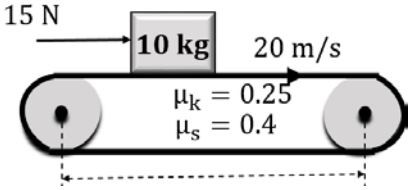


Q.30 A block of mass m is kept on a platform which starts from rest with constant acceleration $\frac{g}{2}$upwards as shown in figure. Work done by normal reaction on block in time t is.

(A)$\frac{mg^2t^2}{8}$ **(B)**$\frac{3mg^2t^2}{8}$ **(C)**0 **(D)**$-\frac{mg^2t^2}{8}$



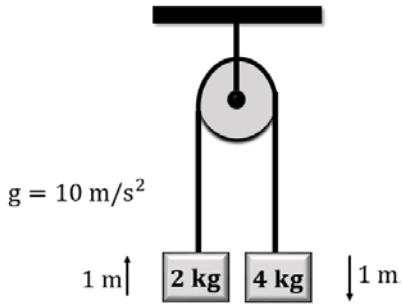
Q.31 A block of mass 10 kg is put gently on a belt-conveyor system of infinite length at t = 0 which is moving with constant speed 20 m/s towards right at all time. A constant force of magnitude 15 N is applied on the block continuously during its motion. Work done by the kinetic friction on the block of mass 10 Kg is.



(A)2500 J **(B)**–2500 J **(C)**1250 J **(D)**– 1250 J

Q.32 In the figure as shown two blocks are connected by a string over a pulley. Calculate the total work done by tension force on the system for 1 m distance covered..

(A) $\frac{80}{3}$ N **(B)** $-\frac{80}{3}$ N **(C)** Zero **(D)** None



ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(D)	(B)	(A)	(D)	(C)	(C)	(C)	(D)	(D)
WORK SHEET										
Q.	11	12	13	14	15	16	17	18	19	20
Sol.	(A)	(B)	(A)	(D)	(A)	(C)	(C)	(C)	(A)	(C)
Q.	21	22	23	24	25	26	27	28	29	30
Sol.	(D)	(C)	(C)	(C)	(A)	(B)	(A)	(A)	(D)	(B)
Q.	31	32								
Sol.	(C)	(C)								