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CLASS: XI- PHYSICS

1. A body of mass 0.5 kg travels in a straight line with velocity $v = a\,x^{3/2}$ where $a = 5\ \mathrm{m}^{-1/2}\mathrm{s}^{-1}$. Find the work done by the net force during itsdisplacement from $x = 0$ to $x = 2$ m .

2. A mass of 5 kg is moving along a circular path of radius 1 m. If the mass moves with 300 revolutions per minute, find its kinetic energy.

3. A block of mass 1 kg is pushed up a surface inclined to horizontal at an angle of 30° by a force of 10 N parallel to the inclined surface .The coefficient of friction between block and the incline is 0.1. If the block is pushed up by 10 m along the incline, calculate

(a) work done against gravity

(b) work done against force of friction

(c) increase in potential energy

(d) increase in kinetic energy

(e) work done by applied force.

3. A raindrop of mass 1.00 g falling from a height of 1 km hits the ground with a speed of 50 m/s. Calculate

(a) the loss of P.E. of the drop.

(b) the gain in K.E. of the drop.

(c) Is the gain in K.E. equal to loss of P.E.? If not, why? Take $g = 10\ \mathrm{m\ s^{-2}}$

4. A body is moving unidirectionally under the influence of a source of constant power supplying energy. Draw a graph which correctly shows the displacement-time curve for its motion?

5. Draw a graph which correctly shows the variation in kinetic energy of the earth as it moves once around the sun in its elliptical orbit?

6. In a shotput event an athlete throws the shotput of mass 10 kg with an initial speed of $1\mathrm{m\ s^{-1}}$ at 45° from a height 1.5 m above ground. Assuming air resistance to be negligible and acceleration due to gravity to be $10\ \mathrm{m\ s^{-2}}$, Find the kinetic energy of the shotput when it just reaches the ground?

7. A cricket ball of mass 150 g moving with a speed of 126 km/h hits at the middle of the bat, held firmly at its position by the batsman. The ball moves straight back to the bowler after hitting the bat. Assuming that collision between ball and bat is completely elastic and the two remain in contact for 0.001s, calculate the force that the batsman had to apply to hold the bat firmly at its place?

8. A man, of mass *m*, standing at the bottom of the staircase, of height *L* climbs it and stands at its top. Which of the following statements are correct?

(a) Work done by all forces on man is equal to the rise in potential energy *mgL*.

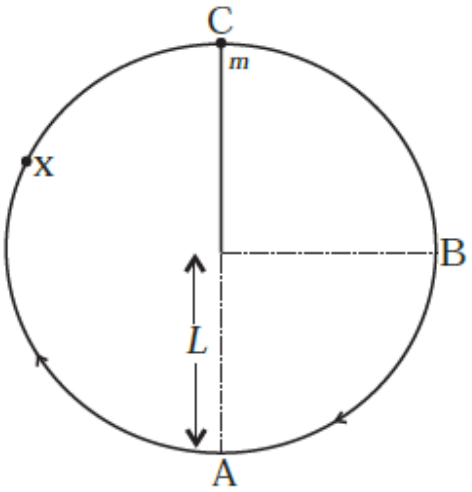
(b) Work done by *all* forces on man is zero.

(c) Work done by the gravitational force on man is *mgL*.

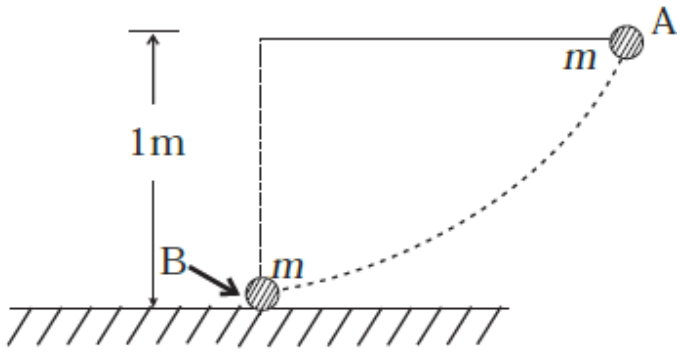
(d) The reaction force from a step does not do work because the point of application of the force does not move while the force exists.

9. A bullet of mass *m* fired at 30° to the horizontal leaves the barrel of the gun with a velocity *v*. The bullet hits a soft target at a height *h*above the ground while it is moving downward and emerges outwith half the kinetic energy it had before hitting the target.Which of the following statements are correct in respect of bullet after it emerges out of the target?

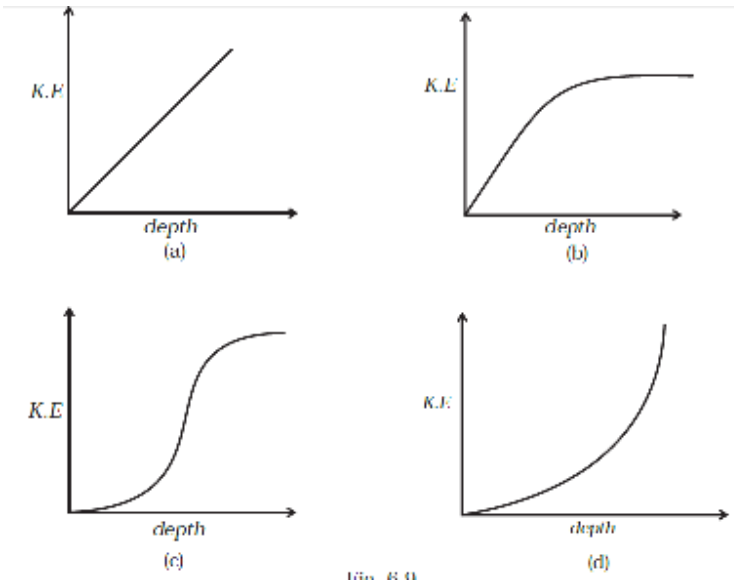
(a) The velocity of the bullet will be reduced to half its initial value.
(b) The velocity of the bullet will be more than half of its earlier velocity.
(c) The bullet will continue to move along the same parabolic path.
(d) The bullet will move in a different parabolic path.
(e) The bullet will fall vertically downward after hitting the target.
(f) The internal energy of the particles of the target will increase.
10. The average work done by a human heart while it beats once is 0.5 J. Calculate the power used by heart if it beats 72 times in a minute.
11. A bob of mass *m* suspended by a light string of length *L* is whirled into a vertical circle as shown in Fig. What will be the trajectory of the particle if the string is cut at
(a) Point B?
(b) Point C?
(c) Point X?



12. The bob A of a pendulum released from horizontal to the vertical hits another bob B of the same mass at rest on a table as shown in Fig. If the length of the pendulum is 1m, calculate
(a) the height to which bob A will rise after collision.
(b) the speed with which bob B starts moving.
Neglect the size of the bobs and assume the collision to be elastic.



13. Suppose the average mass of raindrops is 3.0 × 10-5kg and their average terminal velocity 9 m s^{-1}. Calculate the energy transferred by rain to each square metre of the surface at a place which receives 100 cm of rain in a year.
14. Which of the diagrams in Fig. correctly shows the change in kinetic energy of an iron sphere falling freely in a lake having sufficient depth to impart it a terminal velocity?



15.A body is moved along a closed loop. Is the work done in moving the body necessarily zero? If not, state the condition under which work done over a closed path is always zero.