Work, Energy and Power

Numerical value type questions.

Answer to each question should be rounded up to two decimal places wherever required.

1. A bomb of mass 9 kg at rest explodes into two pieces. A piece of mass 3 kg flies off with a velocity of 16 ms^{-1}. Kinetic energy of the other piece is _____ J.

2. A bomb of mass *M* at rest explodes into three fragments in the mass ratio 1 : 1 : 2. The lighter fragments are thrown off in perpendicular directions with respective velocities 3ms^{-1} and 4ms^{-1}. Velocity of the third piece after the explosion is ____ ms^{-1}.

3. A body of mass m strikes another body of mass $m/9$ at rest. Assuming the impact to be perfectly inelastic, the fraction of initial K.E transformed into heat energy is ____

4. A body of mass 4 kg is moving on a smooth horizontal surface under the action of time dependent force given by the relation $F = 6t^2$. Work done by the force in the first 2 seconds is ____ J

5. Potential energy of a spring, when stretched from its natural length through a distance 0.3m is 10J. The amount of work that must be done to stretch it through an additional distance of 0.15m will be _____ J

6. A body is projected vertically up. At a point P in its path, ratio of its potential energy to kinetic energy is 2 : 3. If the body is projected vertically up with double the previous velocity then ratio of its potential energy to kinetic energy at the same point P is 1: n where *n* is ____

7. A bomb of mass 16kg at rest explodes into two pieces of masses 4kg and 12kg . Velocity of the 12kg mass is 4ms^{-1}. Kinetic energy of the other mass is ____ J.

8. A bullet fired into a fixed target loses half of its velocity after penetrating 3cm . Further distance through which it penetrates before coming to rest (assuming constant resistance) is ___ cm

9. A body of mass 0.5kg travels in straight line with velocity $v = ax^{3/2}$ where $a = 5m^{1/2}s^{-1}$. Work done by the net force during its displacement $x = 0$ to $x = 2$ from is ___ J

10. A pump ejects 12,000 Kg of water at a speed of 4ms^{-1} in 40s. Average rate at which work is done by the pump is _____ kW

11. A 1kW motor pumps out water from a well 10m deep . Calculate the quantity of water pumped out per second is _____ kg

12. A ball is dropped from a height H. It bounces off the ground with a speed that is 80 percent of the speed with which it hit the ground. Maximum height reached by the ball after first rebound is nearly nH. That value of *n* is _____.

13. In a collinear collision a particle with an initial speed v_o strikes a stationary particle of the same mass. If the final total kinetic energy is 50% greater than the original kinetic energy, the magnitude of the relative velocity between the two particles after collision is $(n)^{1/2}\, v_o$. The value of *n* is _____.

14. A block of mass 0.50 kg is moving with a speed of 2.0 ms^{-1} on a smooth horizontal surface. It strikes another block mass of 1.00 kg at rest and then they move together as a single body. Energy lost due to the collision is _____ J.

15. A ball is projected vertically down from a height of 20m on to a horizontal floor. During the impact, it loses 50% of its energy and rebounds to the same height. Initial velocity of its projection of the ball is ____ ms^{-1} (g = 10 ms^{-2})

Answers

1. 192
2. 2.50
3. 0.10
4. 8.00
5. 12.50
6. 9
7. 288
8. 1
9. 50
10. 2.4
11. 10.21
12. 0.64
13. 2
14. 0.67
15. 20