

1. Is it possible that a body be in accelerated motion under a force acting on the body, yet no work is being done by the force. Give example.
2. What is work done in holding a 15kg suitcase while waiting for a bus for 15 minutes?
3. If  $\vec{A}$ ,  $\vec{B}$  and  $\vec{C}$  are mutually perpendicular vectors, then find the value of  $\vec{A} \cdot (\vec{B} + \vec{C})$
4. When an air bubble rises in water, what happens to its potential energy?
5. For what value of  $\lambda$ , the vector  $\vec{A} = 2\hat{i} + 3\hat{j} - 6\hat{k}$  is perpendicular to  $\vec{B} = 3\hat{i} + \lambda\hat{j} - 6\hat{k}$ ?
6. Find the angle between force  $\vec{F} = 3\hat{i} + 4\hat{j} - 5\hat{k}$  and displacement  $\vec{d} = 5\hat{i} + 4\hat{j} + 3\hat{k}$  unit. Also find the projection of  $\vec{F}$  and  $\vec{d}$ .
7. Find the unit vector parallel to the resultant of the vectors  $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$  and  $\vec{B} = 3\hat{i} - 5\hat{j} + \hat{k}$ .
8. A force  $F = (10 + 0.50x)$  acts on a particle in x direction, where F is in newton and x is in metre. Find the work done by this force during a displacement from  $x = 0$  to  $x = 2\text{m}$ .
9. How high must a body be lifted to gain an amount of potential energy equal to the kinetic energy it has, when moving at speed 20m/s. The value of acceleration due to gravity at that place is  $g=9.8\text{m/s}^2$ . **(20.4m)**
10. A body of mass 4kg initially at rest is subject to a force 16N. What is the kinetic energy acquired by the body at the end of 10s? **(3200J)**
11. The linear momentum of a body is increased by 10%. What is the percentage change in kinetic energy? **(21%)**
12. The linear momentum of a body is increased by 50%. What is the percentage change in kinetic energy? **(125%)**
13. An icecream vendor applies a 20kg wt of force at an angle  $60^\circ$  with the horizontal. If the displacement is 20m, estimate the work done. **(2000J)**
14. A mass 1kg is thrown up with a K.E. of 50 joules. If 10% of the energy is lost in overcoming air resistance, find the height to which it will rise? **(4.5m)**

15. The length of a steel wire increases by 0.5cm when it is loaded with a weight of 5kg. Calculate 1) Force constant of the wire and 2) work done in stretching the wire.  
( $1 \times 10^4$  N/m, 0.125J)
16. A 16kg block moving on a frictionless horizontal surface with a velocity of 4m/s compresses an ideal spring and comes to rest. If the force constant of the spring be 100N/m, then how much is the spring compressed?  
(1.6m)
17. The potential energy of a spring when stretched through a distance  $x$  is 10J. What is the amount of work done on the same spring to stretch it through an additional distance  $x$ ?  
(30J)
18. A rubber ball falls on a floor from a height of 19.6m. Calculate the velocity with which it strikes the ground. To what height will the ball rebound if it loses 25% of its energy on striking the ground?  
(19.6 m/s , 14.7m)
19. A particle of mass 0.5kg travels in a straight line with a velocity  $v=(5x^{5/2})$ m/s. How much work is done by the net force during the displacement from  $x=0$  and  $x=2$ m?  
(200J)
20. A shot travelling at the rate of 100m/s is just able to pierce a plank 4cm thick. What velocity is required to just pierce a plank 9cm thick?
21. An elevator which can carry a maximum load of 1800kg (elevator + passengers) is moving up with a constant speed of 2m/s. The frictional force opposing the motion is 4000N. Determine the minimum power delivered by the motor to the elevator in watt and in horse power.  
(59 h.p)
22. A railway carriage of mass 10000kg moving with a speed of 15m/s strikes a stationary carriage of the same mass. After the collision, the carriages get coupled and move together. What is their common speed after collision?  
(7.5 m/s)