Conservation of Energy and Momentum

61. A particle of mass m at rest is acted upon by a force *F* for a time *t*. Its Kinetic energy after an interval *t* is

(a) $\frac{F^2t^2}{m}$ (b) $\frac{F^2t^2}{2m}$

(c) $\frac{F^2t^2}{3m}$ (d) $\frac{Ft}{2m}$

62. The potential energy of a weight less spring compressed by a distance a is proportional to

(a) a (b) a^2

(c) a^{-2} (d) a^0

63. Two identical blocks *A* and *B*, each of mass '*m*' resting on smooth floor are connected by a light spring of natural length *L* and spring constant K, with the spring at its natural length. A third identical block '*C*' (mass *m*) moving with a speed *v* along the line joining *A* and *B* collides with *A*. the maximum compression in the spring is

(a) $v\sqrt{\frac{m}{2k}}$ (b) $m\sqrt{\frac{v}{2k}}$

(c) $\sqrt{\frac{mv}{k}}$ (d) $\frac{mv}{2k}$

64. Two bodies of masses *m* and 4 m are moving with equal K.E. The ratio of their linear momentums is

(a) 4 : 1 (b) 1 : 1

(c) 1 : 2 (d) 1 : 4

65. A stationary particle explodes into two particles of a masses m_1 and m_2 which move in opposite directions with velocities v_1 and v_2. The ratio of their kinetic energies $E_1/E_2$is

(a) m_1/m_2 (b) 1

(c) m_1v_2/m_2v_1 (d) m_2/m_1

66. The kinetic energy of a body of mass 3 *kg* and momentum 2 *Ns* is

(a) 1 *J* (b) $\frac{2}{3}J$

(c) $\frac{3}{2}J$ (d) 4 *J*

67. A bomb of mass 3.0 *Kg* explodes in air into two pieces of masses 2.0 *kg* and 1.0 *kg*. The smaller mass goes at a speed of 80 *m/s*.The total energy imparted to the two fragments is

(a) 1.07 *kJ* (b) 2.14 *kJ*

(c) 2.4 *kJ* (d) 4.8 *Kj*

68. A bullet moving with a speed of 100 ms^{-1} can just penetrate two planks of equal thickness. Then the number of such planks penetrated by the same bullet when the speed is doubled will be

(a) 4 (b) 8

(c) 6 (d) 10

69. A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum but their different kinetic energies are E_1 and E_2 respectively. If $m_1 > m_2$ then

(a) $E_1 < E_2$ (b) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$

(c) $E_1 > E_2$ (d) $E_1 = E_2$

70. A ball of mass 2*kg* and another of mass 4*kg* are dropped together from a 60 *feet* tall building. After a fall of 30 *feet* each towards earth, their respective kinetic energies will be in the ratio of

(a) $\sqrt{2}:1$ (b) $1:4$

(c) $1:2$ (d) $1:\sqrt{2}$

71. Four particles given, have same momentum which has maximum kinetic energy

(a) Proton (b) Electron

(c) Deutron (d) α particles

72. A body moving with velocity *v* has momentum and kinetic energy numerically equal. What is the value of *v*

(a) 2*m/s* (b) $\sqrt{2} m/s$

(c) 1*m/s* (d) $0.2\ m/s$

73. If a man increase his speed by 2 *m/s* , his K.E. is doubled, the original speed of the man is

(a) $(1 + 2\sqrt{2})\ m/s$

(b) 4 *m/s*

(c) $(2 + 2\sqrt{2}) m/s$

(d) $(2 + \sqrt{2})\ m/s$

74. An object of mass 3*m* splits into three equal fragments. Two fragments have velocities $v\hat{j}$ and $v\hat{\imath}$. The velocity of the third fragment is

(a) $v(\hat{j} - \hat{\imath})$ (b) $v(\hat{\imath} - \hat{j})$

(c) $-v(\hat{\imath} + \hat{j})$ (d) $\frac{v(\hat{\imath}+\hat{j})}{\sqrt{2}}$

75. A bomb is kept stationary at a point. It suddenly explodes into two fragments of masses 1 g and $3\ g$. The total K.E. of the fragments is $6.4 \times 10^4 J$. What is the K.E. of the smaller fragment

(a) $2.5 \times 10^4 J$ (b) $3.5 \times 10^4 J$

(c) $4.8 \times 10^4 J$ (d) $5.2 \times 10^4 J$

76. Which among the following, is a form of energy

(a) Light (b) Pressure

(c) Momentum (d) Power

77. A body is moving with a velocity *v*, breaks up into two equal parts. One of the part retraces back with velocity *v*. Then the velocity of the other part is

(a) *v* in forward direction

(b) 3*v* in forward direction

(c) *v* in backward direction

(d) 3*v* in backward direction

78. If a shell fired from a cannon, explodes in mid air, then

(a) Its total kinetic energy increases

(b) Its total momentum increases

(c) Its total momentum decreases

(d) None of these

79. A particle of mass *m* moving with velocity V_0 strikes a simple pendulum of mass $m$and sticks to it. The maximum height attained by the pendulum will be

(a) $h = \frac{V_0^2}{8g}$ (b) $\sqrt{V_0 g}$

(c) $2\sqrt{\frac{V_0}{g}}$ (d) $\frac{V_0^2}{4g}$

80. Masses of two substances are 1 *g* and 9 *g* respectively. If their kinetic energies are same, then the ratio of their momentum will be

(a) 1 : 9 (b) 9 : 1

(c) 3 : 1 (d) 1 : 3

81. A body of mass 5 *kg* is moving with a momentum of 10 *kg-m/s*. A force of 0.2 *N* acts on it in the direction of motion of the body for 10 *seconds*. The increase in its kinetic energy is

(a) 2.8 *Joule* (b) 3.2 *Joule*

(c) 3.8 *Joule* (d) 4.4 *Joule*

82. If the momentum of a body increases by 0.01%, its kinetic energy will increase by

(a) 0.01% (b) 0.02%

(c) 0.04% (d) 0.08%

83. 1 *a.m.u.* is equivalent to

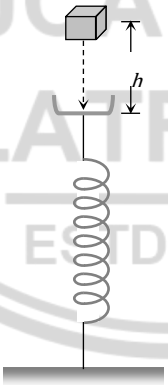
(a) $1.6 \times 10^{-12} Joule$

(b) $1.6 \times 10^{-19} Joule$

(c) $1.5 \times 10^{-10} Joule$

(d) $1.5 \times 10^{-19} Joule$

84. A block of mass *m* initially at rest is dropped from a height *h* on to a spring of force constant *k*. the maximum compression in the spring is *x* then



(a) $mgh = \frac{1}{2}kx^2$

(b) $mg(h + x) = \frac{1}{2}kx^2$

(c) $mgh = \frac{1}{2}k(x + h)^2$

(d) $mg(h + x) = \frac{1}{2}k(x + h)^2$

85. A spherical ball of mass 20 *kg* is stationary at the top of a hill of height 100 *m*. It slides down a smooth surface to the ground, then climbs up another hill of height 30 *m* and finally slides down to a horizontal base at a height of 20 *m* above the ground. The velocity attained by the ball is

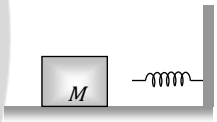
(a) 10 *m/s* (b) $10\sqrt{30} m/s$

(c) 40 *m/s* (d) 20 *m/s*

86. The block of mass *M* moving on the frictionless horizontal surface collides with the spring of spring constant *K* and compresses it by length *L*. The maximum momentum of the block after collision is

(a) Zero

(b) $\frac{ML^2}{K}$



(c) $\sqrt{MKL}$

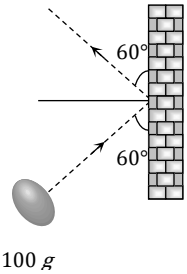
(d) $\frac{KL^2}{2M}$

87. A bomb of mass $30kg$ at rest explodes into two pieces of masses $18kg$ and $12kg$. The velocity of $18kg$ mass is $6ms^{-1}$. The kinetic energy of the other mass is

(a) 256 *J* (b) 486*J*

(c) 524 *J* (d) 324 *J*

88. A mass of 100*g* strikes the wall with speed 5*m*/*s* at an angle as shown in figure and it rebounds with the same speed. If the contact time is $2 \times 10^{-3} sec$, what is the force applied on the mass by the wall



(a) $250\sqrt{3}N$ to right

(b) 250 *N* to right

(c) $250\sqrt{3}N$ to left

(d) 250 *N* to left