Elastic and Inelastic Collision

1. The coefficient of restitution e for a perfectly elastic collision is

(a) 1 (b) 0

(c) ∞ (d) – 1

2. The principle of conservation of linear momentum can be strictly applied during a collision between two particles provided the time of impact is

(a) Extremely small

(b) Moderately small

(c) Extremely large

(d) Depends on a particular case

3. A shell initially at rest explodes into two pieces of equal mass, then the two pieces will

(a) Be at rest

(b) Move with different velocities in different directions

(c) Move with the same velocity in opposite directions

(d) Move with the same velocity in same direction

4. A sphere of mass m moving with a constant velocity u hits another stationary sphere of the same mass. If e is the coefficient of restitution, then the ratio of the velocity of two spheres after collision will be

(a) $\frac{1-e}{1+e}$ (b) $\frac{1+e}{1-e}$

(c) $\frac{e+1}{e-1}$ (d) $\frac{e-1}{e+1}t^2$

5. Two solid rubber balls A and B having masses 200 and 400 gm respectively are moving in opposite directions with velocity of A equal to 0.3 m/s. After collision the two balls come to rest, then the velocity of B is

(a) 0.15 m/sec

(b) 1.5 m/sec

(c) – 0.15 m/sec

(d) None of the above

6. Two perfectly elastic particles P and Q of equal mass travelling along the line joining them with velocities 15 m/sec and 10 m/sec. After collision, their velocities respectively (in m/sec) will be

(a) 0, 25 (b) 5, 20

(c) 10, 15 (d) 20, 5

7. A cannon ball is fired with a velocity 200 *m/sec* at an angle of 60° with the horizontal. At the highest point of its flight it explodes into 3 equal fragments, one going vertically upwards with a velocity 100 *m/sec*, the second one falling vertically downwards with a velocity 100 *m/sec*. The third fragment will be moving with a velocity

(a) 100 *m/s* in the horizontal direction

(b) 300 *m/s* in the horizontal direction

(c) 300 *m/s* in a direction making an angle of 60° with the horizontal

(d) 200 *m/s* in a direction making an angle of 60° with the horizontal

8. A lead ball strikes a wall and falls down, a tennis ball having the same mass and velocity strikes the wall and bounces back. Check the correct statement

(a) The momentum of the lead ball is greater than that of the tennis ball

(b) The lead ball suffers a greater change in momentum compared with the tennis ball

(c) The tennis ball suffers a greater change in momentum as compared with the lead ball

(d) Both suffer an equal change in momentum

9. When two bodies collide elastically, then

(a) Kinetic energy of the system alone is conserved

(b) Only momentum is conserved

(c) Both energy and momentum are conserved

(d) Neither energy nor momentum is conserved

10. Two balls at same temperature collide. What is conserved

(a) Temperature

(b) Velocity

(c) Kinetic energy

(d) Momentum

11. A body of mass 5 *kg* explodes at rest into three fragments with masses in the ratio 1 : 1 : 3. The fragments with equal masses fly in mutually perpendicular directions with speeds of 21 *m/s*. The velocity of the heaviest fragment will be

(a) 11.5 *m/s* (b) 14.0 *m/s*
(c) 7.0 *m/s* (d) 9.89 *m/s*

12. A heavy steel ball of mass greater than 1 *kg* moving with a speed of $2m\,sec^{-1}$ collides head on with a stationary ping-pong ball of mass less than 0.1 gm. The collision is elastic. After the collision the ping-pong ball moves approximately with speed
(a) $2m\,sec^{-1}$
(b) $4m\,sec^{-1}$
(c) $2\times10^{4}m\,sec^{-1}$
(d) $2\times10^{3}m\,sec^{-1}$

13. A body of mass 'M' collides against a wall with a velocity *v* and retraces its path with the same speed. The change in momentum is (take initial direction of velocity as positive)
(a) Zero (b) 2M*v*
(c) M*v* (d) – 2 M*v*

14. A gun fires a bullet of mass 50 gm with a velocity of $30m\,sec^{-1}$. Because of this the gun is pushed back with a velocity of $1m\,sec^{-1}$. The mass of the gun is
(a) 15 *kg* (b) 30 *kg*
(c) 1.5 *kg* (d) 20 *kg*

15. In an elastic collision of two particles the following is conserved
(a) Momentum of each particle
(b) Speed of each particle
(c) Kinetic energy of each particle
(d) Total kinetic energy of both the particles

16. A $238U$ nucleus decays by emitting an alpha particle of speed vms^{-1}. The recoil speed of the residual nucleus is (in ms^{-1})
(a) $-4v/234$ (b) $v/4$
(c) $-4v/238$ (d) $4v/238$

17. A smooth sphere of mass *M* moving with velocity *u* directly collides elastically with another sphere of mass *m* at rest. After collision their final velocities are *V* and *v* respectively. The value of *v* is
(a) $\frac{2uM}{m}$ (b) $\frac{2um}{M}$
(c) $\frac{2u}{1+\frac{m}{M}}$ (d) $\frac{2u}{1+\frac{M}{m}}$

18. A body of mass *m* having an initial velocity *v*, makes head on collision with a stationary body of mass *M*.

After the collision, the body of mass *m* comes to rest and only the body having mass *M* moves. This will happen only when

(a) $m >> M$ (b) $m << M$

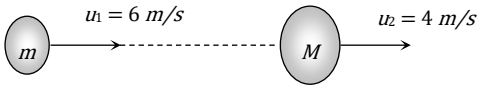
(c) $m = M$ (d) $m = \frac{1}{2}M$

19. A particle of mass *m* moving with a velocity $\vec{V}$ makes a head on elastic collision with another particle of same mass initially at rest. The velocity of the first particle after the collision will be

(a) $\vec{V}$ (b) $-\vec{V}$

(c) $-2\vec{V}$ (d) Zero

20. A particle of mass m moving with horizontal speed 6 *m/sec* as shown in figure. If $m << M$ then for one dimensional elastic collision, the speed of lighter particle after collision will be



(a) 2*m/sec* in original direction

(b) 2 *m/sec* opposite to the original direction

(c) 4 *m/sec* opposite to the original direction

(d) 4 *m/sec* in original direction