Elastic and Inelastic Collision

21. A shell of mass *m* moving with velocity *v* suddenly breaks into 2 pieces. The part having mass *m*/4 remains stationary. The velocity of the other shell will be

(a) *v* (b) 2*v*

(c) $\frac{3}{4}v$ (d) $\frac{4}{3}v$

22. Two equal masses m_1 and m_2 moving along the same straight line with velocities + 3 *m*/*s* and – 5 *m*/*s* respectively collide elastically. Their velocities after the collision will be respectively

(a) + 4 *m*/*s* for both

(b) – 3 *m*/*s* and +5 *m*/*s*

(c) – 4 *m*/*s* and + 4 *m*/*s*

(d) – 5 *m*/*s* and + 3 *m*/*s*

23. A rubber ball is dropped from a height of 5 *m* on a planet where the acceleration due to gravity is not known. On bouncing, it rises to 1.8 *m*. The ball loses its velocity on bouncing by a factor of

(a) 16/25 (b) 2/5

(c) 3/5 (d) 9/25

24. A metal ball falls from a height of 32 *metre* on a steel plate. If the coefficient of restitution is 0.5, to what height will the ball rise after second bounce

(a) 2 *m* (b) 4 *m*

(c) 8 *m* (d) 16 *m*

25. At high altitude, a body explodes at rest into two equal fragments with one fragment receiving horizontal velocity of 10 *m*/*s*. Time taken by the two radius vectors connecting point of explosion to fragments to make 90° is

(a) 10 *s* (b) 4 *s*

(c) 2 *s* (d) 1 *s*

26. A ball of mass 10 *kg* is moving with a velocity of 10 *m*/*s*. It strikes another ball of mass 5 *kg* which is moving in the same direction with a velocity of 4 *m*/*s*. If the collision is elastic, their velocities after the collision will be, respectively

(a) 6 *m*/*s*, 12 *m*/s

(b) 12 *m*/s, 6 *m*/*s*

(c) 12 *m*/*s*, 10 *m*/*s*

(d) 12 *m*/s, 25 *m*/*s*

27. A body of mass 2 *kg* collides with a wall with speed 100 *m*/*s* and rebounds with same speed. If the time of contact was 1/50 second, the force exerted on the wall is

(a) 8 *N* (b) $2 \times 10^4 N$

(c) 4 *N* (d) $10^4 N$

28. A body falls on a surface of coefficient of restitution 0.6 from a height of 1 *m*. Then the body rebounds to a height of

(a) 0.6 *m* (b) 0.4 *m*

(c) 1 *m* (d) 0.36 *m*

29. A ball is dropped from a height *h*. If the coefficient of restitution be *e*, then to what height will it rise after jumping twice from the ground

(a) *eh*/2 (b) 2*eh*

(c) *eh* (d) $e^4 h$

30. A ball of weight 0.1 *kg* coming with speed 30 *m*/*s* strikes with a bat and returns in opposite direction with speed 40 *m*/*s*, then the impulse is (Taking final velocity as positive)

(a) $-0.1 \times (40) - 0.1 \times (30)$

(b) $0.1 \times (40) - 0.1 \times (-30)$

(c) $0.1 \times (40) + 0.1 \times (-30)$

(d) $0.1 \times (40) - 0.1 \times (20)$

31. A billiard ball moving with a speed of 5 *m*/*s* collides with an identical ball originally at rest. If the first ball stops after collision, then the second ball will move forward with a speed of

(a) $10ms^{-1}$ (b) $5ms^{-1}$

(c) $2.5ms^{-1}$ (d) $1.0ms^{-1}$

32. If two balls each of mass 0.06 *kg* moving in opposite directions with speed 4 *m*/*s* collide and rebound with the same speed, then the impulse imparted to each ball due to other is**]**

(a) 0.48 *kg-m*/*s* (b) 0.24*kg m*/*s*

(c) 0.81 *kg-m*/s (d) Zero

33. A ball of mass *m* falls vertically to the ground from a height h_1 and rebound to a height h_2. The change in momentum of the ball on striking the ground is

(a) $mg(h_1 - h_2)$

(b) $m(\sqrt{2gh_1} + \sqrt{2gh_2})$

(c) $m\sqrt{2g(h_1 + h_2)}$

(d) $m\sqrt{2g}(h_1 + h_2)$

34. A body of mass 50 *kg* is projected vertically upwards with velocity of 100 *m*/*sec*. 5 seconds after this body breaks into 20 *kg* and 30 *kg*. If 20 *kg* piece travels upwards with 150 *m*/*sec*, then the velocity of other block will be

(a) 15 *m*/*sec* downwards

(b) 15 *m*/*sec* upwards

(c) 51 *m*/*sec* downwards

(d) 51 *m*/*sec* upwards

35. A steel ball of radius 2 *cm* is at rest on a frictionless surface. Another ball of radius 4*cm* moving at a velocity of 81 *cm*/*sec* collides elastically with first ball. After collision the smaller ball moves with speed of

(a) 81 *cm*/*sec*

(b) 63 *cm*/*sec*

(c) 144 *cm*/*sec*

(d) None of these

36. A space craft of mass *M* is moving with velocity *V* and suddenly explodes into two pieces. A part of it of mass *m* becomes at rest, then the velocity of other part will be

(a) $\frac{MV}{M-m}$ (b) $\frac{MV}{M+m}$

(c) $\frac{mV}{M-m}$ (d) $\frac{(M+m)V}{m}$

37. A ball hits a vertical wall horizontally at 10*m*/*s* bounces back at 10 *m*/*s*

(a) There is no acceleration because

$$10\frac{m}{s} - 10\frac{m}{s} = 0$$

(b) There may be an acceleration because its initial direction is horizontal

(c) There is an acceleration because there is a momentum change

(d) Even though there is no change in momentum there is a change in direction. Hence it has an acceleration

38. A bullet of mass 50 *gram* is fired from a 5 *kg* gun with a velocity of 1*km*/*s*. the speed of recoil of the gun is

(a) $5m/s$ (b) $1 \rightleftarrows m/s$

(c) $0.5m/s$ (d) $10m/s$

39. A body falling from a height of 10m rebounds from hard floor. If it loses 20% energy in the impact, then coefficient of restitution is

(a) 0.89 (b) 0.56

(c) 0.23 (d) 0.18

40. A body of mass m_1 moving with a velocity 3 ms^{-1} collides with another body at rest of mass m_2. After collision the velocities of the two bodies are 2 ms^{-1} and 5ms^{-1} respectively along the direction of motion of m_1 The ratio m_1/m_2 is

(a) $\frac{5}{12}$ (b) 5

(c) $\frac{1}{5}$ (d) $\frac{12}{5}$