DYNAMICS – 2

1. Consider a car moving along a straight horizontal road with a speed of 72 km/h. If the coefficient of static friction between road and tyres is 0.5, the shortest distance in which the car can be stopped is :

(a) 30 m (b) 40 m

(c) 72 m (d) 20 m

2. Fast neutrons can easily be slowed down by :

(a) the use of lead shield

(b) passing them through water

(c) elastic collision with heavy nuclei

(d) applying a strong electric field

3. A force $\left(\frac{mv^2}{r}\right)$ is acting on a body of mass m moving with a velocity v in a circle of radius r. What is the work done by the force in moving the body over half the circumference of the circle :

(a) $\frac{mv^2}{r} \times \pi r$ (b) zero

(c) $\frac{mv^2}{r^2}$ (d) $\frac{\pi r^2}{mv^2}$

4. A boy pushes a toy box 2.0 m along the floor by means of a force of 10 N directed downwards at an angle of 60^o to the horizontal. The work done by the boy is :

(a) 6 J (b) 8 J

(c) 10 J (d) 12 J

5. A body, constrained to move in y–direction is subject to a force $\vec{F} = (-2\hat{i} + 15\hat{j} + 6\hat{k})N$. What is the work done by this force in moving the body through a distance of 10 m along the y–axis :

(a) 20 J (b) 150 J

(c) 160 J (d) 190 J

6. If a force $\vec{F}$ applied on a body moves it with a velocity $\vec{v}$, then power will be :

(a) $\frac{\vec{F}}{\vec{v}}$ (b) $\frac{F}{\vec{v}}$

(c) $F\vec{v}$ (d) $\vec{F}.\vec{v}$

7 An inelastic ball is dropped from a height of 100 m. Due to various reasons, it loses 20% of its energy. To what height will the ball rebound?

(a) 80 m (b) 40 m

(c) 60 m (d) 20 M

8. A ball is dropped from height 10 m. It is embedded in sand 1 m and stops :

(a) only momentum remains conserved

(b) only K.E. remains conserved

(c) both momentum and K.E. are conserved

(d) neither momentum nor K.E. is conserved

9. The earth's radius R and ac(c) due to gravity at its surface is g. If a body of mass m falls from a height h = $\frac{R}{5}$ from earth's surface, its potential energy decreases by :

(a) mgh (b) $\frac{4}{5}$mgh

(c) $\frac{5}{6}$mgh (d) $\frac{6}{7}$mgh

10. 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) $e\frac{h}{2}$ (b) 2 e h

(c) e h (d) e^4 h

11. In which case does the potential energy decrease:

(a) on compressing the spring

(b) on stretching a spring

(c) on moving a body against gravitational pull

(d) on the raising of an air bubble in water

12. An object of mass 40 kg and having velocity 4 m/s collides with another object of mass 60 kg, having velocity 2 m/s. The loss of energy when the collision is perfectly inelastic is :

(a) 392 J (b) 440 J

(c) 48 J (d) 110 J

13. A 120 gram mass has a velocity $\vec{v} = (2\hat{i} + 5\hat{j})$ m/s at a certain instant. Its K.E. is :

(a) 3.0 J (b) 4.0 J

(c) 5.0 J (d) 1.74 J

14. A 4 kg mass and a 1 kg mass are moving with equal kinetic energies. The ratio of their momenta is :

(a) 1 : 2 (b) 1 : 1

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

15. Which of the following is not conserved in inelastic collision :

(a) momentum

(b) K.E.

(c) both, momentum and K.E.

(c) neither K.E. nor momentum

16. A car moving with a speed of 40 km/h can be stopped by applying brakes after atleast 2 m. If the same car is moving with a speed of 80 km/h, what is the minimum stopping distance :

(a) 8 m (b) 6 m

(c) 4 m (d) 2 m

17. A ball of mass m moving with a constant velocity strikes against a ball of same mass at rest. If e = coefficient of restitution, then what will be the ratio of velocity of two balls after collision :

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

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

18. Particle A makes a perfectly elastic collision with another particle B at rest. They fly apart in opposite directions with equal speeds. The ratio of their masses $\frac{m_A}{m_B}$ is :

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

(c) $\frac{1}{4}$ (d) $\frac{1}{\sqrt{3}}$

19. The K.E. of a light and a heavy object is same. Which object has more momentum :

(a) light object

(b) heavy object

(c) both have same momentum

(d) data is not sufficient

20. A constant force F is applied to keep particle moving with uniform velocity V. Then power required is :

(a) $\frac{1}{2}FV^2$ (b) FV^2

(c) FV (d) $\frac{F}{V}$

21. It is easier to draw up a wooden block along an inclined plane than have it up vertically, principally because :

(a) the mass becomes smaller

(b) g becomes smaller

(c) the friction is reduced

(d) only a part of wt. has to be overcome

22. A body moves a distance of 10 m along a st. line under action of a force of 5 N. If work done is 25 J, the angle which force makes with direction of motion of body is :

(a) 60^o (b) 90^o

(c) 0^o (d) 30^o

23. A car drives along straight level frictionless road by an engine delivering constant power. Then velocity is directly proportional to :

(a) t (b) $\frac{1}{\sqrt{t}}$

(c) $\sqrt{t}$ (d) none

24. A bullet is fired from a rifle. If rifle recoils freely, the K.E. of rifle is :

(a) greater than that of bullet

(b) less than that of bullet

(c) equal to bullet

(d) none of these

25. In a gravitational field, the work done in transporting mass from one point to another depends on :

(a) end positions

(b) distance between them

(c) actual path of motion

(d) velocity of transport

26. A force of $(10\hat{i} - 3\hat{j} + 6\hat{k})$ N acts on a body of 5 kg and displaces it from $(6\hat{i} + 5\hat{j} - 3\hat{k})$ m to $(10\hat{i} - 2\hat{j} + 7\hat{k})$ m. The work done is :

(a) 100 J (b) 0

(c) 121 J (d) none

27. A force acts on a 3 g particle in such a way that position of particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where x is in metre and t is in se(c) The work done during first 4 s is :

(a) 570 m J

(b) 450 m J

(c) 490 m J

(d) 528 m J

28. Two equal masses m_1 and m_2 moving along same straight line with velocities + 3 m/s and –5 m/s respectively collide elastically. Their velocities after 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

29. Which of the following is not a perfectly inelastic collision :

(a) striking of two glass balls

(b) a bullet striking a bag and sand

(c) an electron captured by a proton

(d) a man jumping onto a moving cart

30. A body of mass 3 kg is under a force which causes a displacement in it, given by $S = \frac{t^2}{3}$ (in m). Find work done by force in 2 sec :

(a) 2 J (b) 3.8 J

(c) 5.2 J (d) 2.6 J

31. A car of mass m is driven with acceleration a along a st. level road against a constant external resistive force R. When velocity of the car is V, the rate at which engine of car is doing work will be :

(a) RV (b) ma V

(c) (R + ma) V (d) (ma – R) V

32. A particle of mass m moving with velocity v strikes a stationary particle of mass 2m and sticks to it the speed of system will be :

(a) $\frac{v}{2}$ (b) 2 v

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

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

(a) 10 m/s (b) 5 m/s

(c) 2.5 m/s (d) 1 m/s

34. A body of mass 100 g is rotating in a circular path of radius r with constant speed. The work done in one complete revolution is :

(a) 100 r J (b) $\left(\frac{r}{100}\right)$J

(c) $\left(\frac{100}{r}\right)$J (d) zero

35. The kinetic energy of a body of mass 2 kg and momentum of 2 Ns is :

(a) 1 J (b) 2 J

(c) 3 J (d) 4 J

36. If a body of mass 3 kg is dropped from top of a tower of height 250.25 m, then its kinetic energy after 3 se(c) will be :

(a) 1126 J (b) 1048 J

(c) 735 J (d) 1296.5 J

37. If two balls, each of mass 0.06 kg, moving in opposite directions with speed 4 m/s, collide and rebound with same speed, then 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

38. A bullet of mass A and velocity B is fired into a block of mass C and sticks to it. The final velocity of system equals :

(a) $\frac{B}{A+B}B$

(b) $\frac{A}{A+C}B$

(c) $\frac{A+B}{C}A$

(d) $\frac{A+C}{B}$

39. An object of mass 2 kg is moving with a velocity of 3 m/s and collides head on with an object B of mass 1 kg moving in the opposite direction with a velocity of 4 m/s. After collision, both objects coalesce so that they move with a common velocity v equal to :

(a) $\frac{2}{3}$ m/s

(b) 1 m/s

(c) 2 m/s

(d) 3 m/s

40. The P.E. function of a particle executing linear simple harmonic motion is given by $V(x) = \frac{1}{2}kx^2$, where k force const. of oscillator is equal to 0.5 N/m. The amplitude of particle when its total energy is 1 J is equal to :

(a) $2\sqrt{2}$ m (b) 2 m

(c) $\sqrt{2}$ m (d) None

41. If water falls from a dam into a turbine wheel 19.6 m below, then velocity of water at turbine, is

(Take g = 9.8 m/s^2) :

(a) 9.8 m/s

(b) 19.6 m/s

(c) 39.2 m/s

(d) 98.0 m/s

42. A bullet is fired from a rifle. If rifle recoils freely, then kinetic energy of bullet, is :

(a) less than hat of rifle

(b) more than that of rifle

(c) same as that of rifle

(d) equal or less than that of rifle

43. If K.E., of a body becomes four times of initial value, then new momentum will :

(a) become twice its initial value

(b) become three times its initial value

(c) become four times its initial value

(d) remains constant

44. A light body A and a heavy body B have equal linear momentum. Then K.E. of body A :

(a) is equal to that of B

(b) is greater than that of B

(c) is smaller than that of B

(d) is zero

45. Two bodies with kinetic energies in ratio of 4 : 1 are moving with equal linear momentum. The ratio of their masses is :

(a) 1 : 2 (b) 1 : 1

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

46. A body of mass 5 m initially at rest explodes into 3 fragments with mass ratio 3 : 1 : 1. Two of fragments each of mass m are found to move with a speed 60 m/s in mutually perpendicular directions. The velocity of third fragment is :

(a) $60\sqrt{2}$ (b) $20\sqrt{3}$

(c) $10\sqrt{2}$ (d) $20\sqrt{2}$

47. A shell of mass m moving with velocity v suddenly breaks into 2 pieces. The part having mass $\frac{m}{4}$ remains stationary. The velocity of other part will be :

(a) v (b) 2 v

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

48. A rod elongates by l when a body of mass M is suspended from it. The work done is :

(a) M gl (b) $\frac{1}{2}$M gl

(c) 2 M gl (d) zero

49. 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 direction of motion of body for 10 se(c) The increase in its kinetic energy is :

(a) 2.8 J (b) 3.2 J

(c) 3.8 J (d) 4.4 J

50. If momentum of a body increases by 50% its kinetic energy will increase by :

(a) 50% (b) 100%

(c) 125% (d) 150%

ANSWERS KEY

1	C	11	A	21	D	31	C	41	B
2	D	12	A	22	A	32	C	42	B
3	C	13	B	23	C	33	B	43	A
4	B	14	D	24	B	34	D	44	B
5	B	15	C	25	A	35	A	45	D
6	B	16	C	26	C	36	D	46	D
7	C	17	D	27	D	37	A	47	D
8	D	18	B	28	D	38	B	48	B
9	D	19	B	29	D	39	B	49	D
10	B	20	C	30	D	40	B	50	C