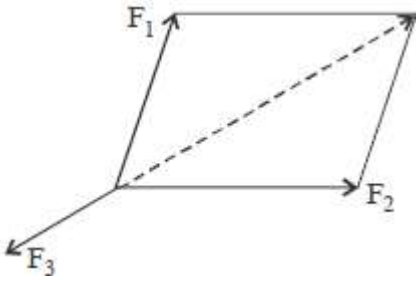
21. Match the column-I and column-II

| **Column I** | **Column II** |
|---|---|
| (A) Rocket's work | (1) Momentum |
| (B) F = ma | (2) Uniform accelerated motion |
| (C) Quantity of motion | (3) Conservation of momentum |
| (D) Constant force | (4) Newton's second law |

(1) (A) $\rightarrow$ (4); (B) $\rightarrow$ (1); C $\rightarrow$ (2); (D) $\rightarrow$ (3)
(2) (A) $\rightarrow$ (4); (B) $\rightarrow$ (3); C $\rightarrow$ (1); (D) $\rightarrow$ (2)
(3) (A) $\rightarrow$ (3); (B) $\rightarrow$ (4); C $\rightarrow$ (1); (D) $\rightarrow$ (2)
(4) (A) $\rightarrow$ (2); (B) $\rightarrow$ (4); C $\rightarrow$ (1); (D) $\rightarrow$ (3)

22. Which equation holds true for the given figure?



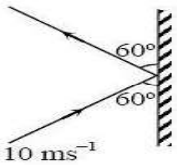

(1) $\vec{F}_1 - \vec{F}_2 = \vec{F}_3$ (2) $\vec{F}_1 + \vec{F}_2 = \vec{F}_3$ (3) $\vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 0$ (4) $\vec{F}_2 + \vec{F}_3 = \vec{F}_1$

23. Inertia is the property of a body linked to tendency of a body
(1) to change its position
(2) to change its direction
(3) to change the momentum
(4) to resist any change in its state

24. A particle moves in the xy-plane under the action of a force F such that the components of its linear momentum p at any time t are $p_x = 2\cos t, p_y = 2\sin t$. The angle between F and p at time t is
(1) 90° (2) 0° (3) 180° (4) 30°

25. A machine gun fires a bullet of mass 40 g with a velocity 1200 $ms^{-1}$. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can be fired per second at the most?
(1) Only one
(2) Three
(3) Can fire any number of bullets
(4) 144 $\times$ 48

26. A body of mass 3 kg hits a wall at an angle of 60° and returns at the same angle. The impact was 0.2 sec. the force excerted on the wall.




(1) $150\sqrt{3}$ N (2) $50\sqrt{3}$ N (3) 100 N (4) $75\sqrt{3}$ N

27. A body of mass 2 kg moving on a horizontal surface with an initial velocity of 4 m/sec comes to rest after 2 sec. If one wants to keep this body moving on the same surface with a velocity of 4 m/sec, the force required is
(1)8 N (2)4 N (3)Zero (4)2 N

28. The linear momentum p of a body moving in one dimension varies with time according to the equation $p = a + bt^2$ where a and b are positive constants. The net force acting on the body is
(1) A constant
(2) Proportional to $t^2$
(3) Inversely proportional to t
(4) Proportional to t

29. The average force necessary to stop a hammer with momentum p Ns in 0.5 s is

(1) 2p N (2) p N (3) 4p N (4) $\frac{p}{2}$ N

30. A sphere of mass 500 g starts moving with an acceleration of 10 m $s^{-2}$, on application of an impulsive force. The force acts on it for 0.5 s. Gain in momentum of sphere is

(1)2.5 kg $ms^{-1}$ (2) 5 kg $ms^{-1}$ (3)0.05 kg $ms^{-1}$ (4) 25 kg $ms^{-1}$