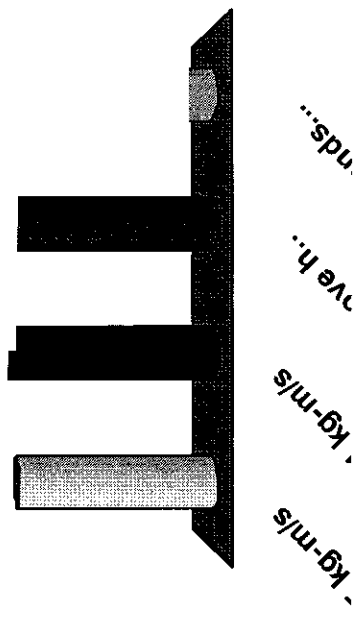


If a 500 kg artillery shell explodes into fragments as it approaches its target with a speed of 720 km/hr, the total momentum of all its fragments will be equal in magnitude to:

1. 1.0×10^5 kg-m/s
2. 3.6×10^4 kg-m/s
3. Neither of the above has correct units for momentum.
4. The answer depends upon the energy of the explosion.



Answer #1, 10^5 kg-m/s, is correct because

- A) Total momentum is conserved during the short interval of the explosion. Therefore the momentum of the projectile just before it explodes equals the total momentum of all of its fragments, independent of the details of the explosion.
- B) The momentum of the projectile is
$$P^{\text{TOT}} = Mv = (500\text{kg}) \cdot (720 \times 10^3 \text{m}) / 3600\text{s}$$
$$= (500 \cdot 200) = 1.0 \times 10^5 \text{ kg-m/s,}$$
in the direction of the projectile velocity.
- C) The units, kg-m/sec, are correct for momentum.