Momentum 1

① It is technically possible, but only if the truck is moving very slowly.

Bullet	Truck
$p = mv$	$p = mv$
$= (0.0162)(1200)$	$= (2234)(0.0087)$
$= 19.44$ Kg·m/s	$= 19.44$ Kg·m/s

Note: The numbers above are based on real masses for a bullet and truck, plus the max speed of a typical rifle. Obviously, the speed of the truck (0.03 Km/h) is very slow, so the situation is unlikely.

② a) $p = mv = (0.5)(30) =$ **15 Kg·m/s [up]**

b) $p = mv = (2000)(10) =$ **20 000 Kg·m/s [S]**

c) $p = mv = (9.11 \times 10^{-31})(1 \times 10^{7}) =$ **9.11×10^{-24} Kg·m/s**

d) $p = mv = (6 \times 10^{24})(3 \times 10^{4}) =$ **1.79×10^{29} Kg·m/s**

③ $v = 115$ Km/h $= 31.9\overline{4}$ m/s

$p = mv = (1500)(31.9\overline{4}) =$ **47 917 Kg·m/s [East]**

④ $v = p/m = \frac{22}{7.3} =$ **3.01 m/s**

⑤ $m = p/v = \frac{4.5}{900} =$ **0.005 Kg**

⑥ $v = p/m = \frac{3 \times 10^4}{1800} = \boxed{16.\overline{6} \text{ m/s}}$

⑦ a) $p = mv = (109)(9.86) = \boxed{1074.74 \text{ Kg·m/s}}$

b) $m = 9.72 \text{g} = 0.00972 \text{ Kg}$

$p = mv = (0.00972)(728) = \boxed{7.08 \text{ Kg·m/s}}$

⑧ $m = 35.6 + 1.3 = 36.9 \text{ Kg}$

$p = mv = (36.9)(9.50) = \boxed{350.55 \text{ Kg·m/s}}$

⑨ Caddy $v = 32 \text{ Km/h} = 8.\overline{8} \text{ m/s}$

$p = mv = (1645)(8.\overline{8}) = 14\,622.2 \text{ Kg·m/s}$

Mazda $v = 47 \text{ Km/h} = 13.0\overline{5} \text{ m/s}$

$p = mv = (1061)(13.0\overline{5}) = 13\,851.9 \text{ Kg·m/s}$

The **Cadillac** has more momentum.

⑩ $v = p/m = \frac{18.8}{1.73} = \boxed{10.9 \text{ m/s}}$

(11) Jet $v = 960 \text{ km/h} = 266.\overline{6} \text{ m/s}$

$p = mv = (230\,000)(266.\overline{6}) = 61\,333\,333 \text{ kg·m/s}$

Shoe

$p = mv = (1.1)(11.3) = 12.43 \text{ kg·m/s}$

$\frac{61\,333\,333}{12.43} = \boxed{4\,934\,299}$

(12) $m = p/v = \frac{330}{5.3} = 66.0 \text{ kg}$

It is probably not an automobile since the mass is so small.

(13) a) $v = p/m = \frac{1.82 \times 10^{-26}}{9.11 \times 10^{-31}} = \boxed{19\,978 \text{ m/s}}$

b) $v = p/m = \frac{1.82 \times 10^{-26}}{1.67 \times 10^{-27}} = \boxed{10.9 \text{ m/s}}$