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1\.

$m = 15 \text{ tonnes} = 15{,}000\,kg$

$V = 850\,km/h \left(\frac{1000\,m}{1\,km}\right)\left(\frac{1\,h}{3600\,s}\right) = 236.1\,m/s$

$E_k = \frac{1}{2} m V^2 = \frac{1}{2}(15{,}000\,kg)(236.1\,m/s)^2$

$\boxed{E_k = 4.18 \times 10^{8}\,J}$

2\.

e^-

$m = 9.11 \times 10^{-31}\,kg$

$V = 2.0 \times 10^{6}\,m/s$

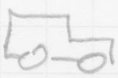
$E_k = \frac{1}{2} m v^2 = \frac{1}{2}(9.11 \times 10^{-31}\,kg)(2.0 \times 10^{6}\,m/s)^2$

$\boxed{E_k = 1.92 \times 10^{-18}\,J}$

3\.

$m_1 = 900\,kg$
$V_1 = 100\,km/h$
$V_1 = 27.78\,m/s$

$E_{k1} = \frac{1}{2} m_1 V_1^2$
$= \frac{1}{2}(900\,kg)(27.78\,m/s)^2$
$E_{k1} = 347{,}222\,J$



$m_2 = 1800\,kg$
$V_2 = 50\,km/h$
$V_2 = 13.89\,m/s$

$E_{k2} = \frac{1}{2} m_2 V_1^2$
$= \frac{1}{2}(1800\,kg)(13.89\,m/s)^2$
$E_{k2} = 173{,}611\,J$

Car 1 has more kinetic Energy.

4.

$m = 0.200\,kg$

$E_K = 10.0\,J$

$V = ?$

$$E_K = \tfrac{1}{2} m V^2$$

$$V = \pm\sqrt{\frac{2E_K}{m}}$$ Choose positive root.

$$V = \sqrt{\frac{2(10.0\,J)}{0.200\,kg}} = 10\,m/s$$

$$\boxed{V = 10\,m/s}$$

5.

$V = 15.0\,m/s$

$E_K = 48.4\,J$

$m = ?$

$$E_K = \tfrac{1}{2} m V^2 \qquad m = \frac{2E_K}{V^2}$$

$$m = \frac{2(48.4\,J)}{(15.0\,m/s)^2} = 0.43\,kg$$

$$\boxed{m = 0.43\,kg}$$

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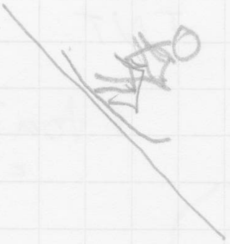
6.



$m = 75.0 kg$

$V_i = 20.0 m/s$

$E_{kf} = 2E_{ki}$

$\frac{1}{2} m V_f^2 = 2(\frac{1}{2} m V_i^2)$

$V_f^2 = 2 V_i^2$

$V_f = \sqrt{2}\, V_i = \sqrt{2}(20.0 m/s)$

$\boxed{V_f = 28.3 m/s}$

7.

$d = 1.0 km = 1000 m$ $v = 20,000 m/s$

radius, $r = 500 m$ $\rho = \frac{3g}{cm^3}$

Volume $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (500 m)^3$

$V = 5.236 \times 10^8 m^3 \left(\frac{100 cm}{1 m}\right)^3 = 5.236 \times 10^{14} cm^3$

mass, $m = V \cdot \rho = 5.236 \times 10^{14} cm^3 \left(\frac{3g}{cm^3}\right)$

$m = 1.57 \times 10^{15} g \left(\frac{1 kg}{1000 g}\right) = 1.57 \times 10^{12} kg$

$E_k = \frac{1}{2} m V^2 = \frac{1}{2}(1.57 \times 10^{12} kg)(20,000 m/s)^2$

$E_k = 3.14 \times 10^{20} J$

The bomb dropped on Hiroshima was rated at 15 k tons TNT

$$E = 15{,}000 \text{ tons TNT}$$

1 ton TNT $= 4.184 \times 10^9$ J

$$= 15{,}000 \text{ ton TNT} \left(\frac{4.184 \times 10^9 \text{ J}}{1 \text{ ton TNT}}\right)$$

$$E = 6.276 \times 10^{13} \text{ J}$$

The meterite in this problem has as much energy as many such bombs

$$\#\text{of Bombs} = \frac{E_{meterite}}{E_{Hiroshima}} = \frac{3.14 \times 10^{20} \text{ J}}{6.276 \times 10^{13} \text{ J}}$$

Over 5,000,000 Hiroshima bombs