Evolution of Kinetic Energy calculations

1. A 2 kg ball moves at 3 m/s. Find its kinetic energy.	**K.E. = ½ m v²** $KE = \frac{1}{2} \times 2 \times 3^2 KE = 1 \times 9$ $= 9\,J$	**kg x (m/s)²** **= kg m² / s²** **= J**
2. A 5 kg cart moves at 4 m/s. What is its kinetic energy?	**K.E. = ½ m v²** $KE = \frac{1}{2} \times 5 \times 4^2 KE = 2.5 \times 16 K$	**kg x (m/s)²** **= kg m² / s²** **= J**
3. A 20 kg dog runs at 6 m/s. What is its kinetic energy?	**K.E. = ½ m v²** $KE = \frac{1}{2} \times 20 \times 6^2 KE = 10 \times 36 K$	**kg x (m/s)²** **= kg m² / s²** **= J**
4. A 1000 g remote controlled toy car travels at 1m/s. What is its kinetic energy?	**K.E. = ½ m v²** $1000\text{g}/1000 = 1\text{ kg}$ $KE = \frac{1}{2} \times 1 \times 1^2 KE = 0.5\,x\,1$	**g □ kg** **kg x (m/s)²** **= kg m² / s²** **= J**
5. A 1002 kg car travels at 8 m/s. What is its kinetic energy? Express your answer to 3 significant figures.	**K.E. = ½ m v²** $KE = \frac{1}{2} \times 1002 \times 8^2 KE = 501 \times 64 KE = 32,064\,J$ $= 32{,}100\text{ J}$ OR $= 3.21 \times 10^4$ J OR $= 32.1$ kJ	**kg x (m/s)²** **= kg m² / s²** **= J** **Rounding up to third s.f.** **Using scientific notation** **1000 J = 1 kJ**
Rearranging: 6. A 7. 4 kg object has kinetic energy of 200 J. What is its velocity?	**K.E. = ½ m v²** $200 = \frac{1}{2} \times 4 \times v^2 200 = 2v^2 v^2 =$	
Challenge 2: A 1,200 kg car travels at 5m/s. If it increases its speed to 10m/s, by what factor will its kinetic energy increase? *(15,000 J, 60,000 J, so a factor of 4)*		

Evolution of Potential Energy calculations

Use gravitational field strength (g) as 9.8m/s^2.
Give answer to 3 s.f.

1. A 2 kg ball is raised 3m above the ground. What is its gravitational potential energy (GPE)?	**GPE = m x g x h** $GPE = 2 \times 9.8 \times 3 GPE = 58.$	**kg x m/s² x m** **= kg m² / s²** **= J**
2. A 50 kg person climbs 4 m. Find the GPE.	**GPE = m x g x h** $GPE = 50 \times 9.8 \times 4 GPE = 50 \times 3$	**kg x m/s² x m** **= kg m² / s²** **= J**
3. 1000 kg car lifted 1.5 m. Find the GPE.	**GPE = m x g x h** $GPE = 1000 \times 9.8 \times 1.5 GPE =$	**kg x m/s² x m** **= kg m² / s²** **= J**
4. A 5000 g box is at the top of a hill 7m high. What is its GPE?	**GPE = m x g x h** **5000/1000 = 5 kg** $GPE = 5 \times 9.8 \times 7 GPE = 5 \times 6$	**g □ kg** **kg x m/s² x m** **= kg m² / s²** **= J**
Challenge 1 Rearranging 5. GPE = 600 J, mass = 5 kg. What is the height?	**GPE = m x g x h** $600 = 5 \times 9.8 \times h 600 = 49 hh =$	

Q. At an archery competition, a 300 **g** arrow has struck the target and is suspended 0.9 m above the ground. The gravitational field strength (g) is 9.8 N/kg (N/kg is another way of writing m/s^2).

Calculate the gravitational potential energy (GPE) store of the arrow.

GPE = m x g x h

GPE = 300/1000 x 9.8 x 0.9

= 2.646 J

= 2.65 J to 3s.f.

NOTE: 9.8 N/kg means that 1 kg of mass experiences 9.8 Newtons of force (weight).

1N = 1 kg x 1 m/s^2 (from F = m x a)

N / kg = kg m/s^2 / kg = m/s^2