2 **(a)** Define

   (i) *force*,

   ....

   ....[1]

   (ii) *work done*.

   ....

   ....[1]

(b) A force F acts on a mass m along a straight line for a distance s. The acceleration of the mass is a and the speed changes from an initial speed u to a final speed v.

   (i) State the work W done by F.

   [1]

   (ii) Use your answer in **(i)** and an equation of motion to show that kinetic energy of a mass can be given by the expression

   $$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{speed})^2.$$

   [3]

(c) A resultant force of 3800 N causes a car of mass of 1500 kg to accelerate from an initial speed of 15 m s^{-1} to a final speed of 30 m s^{-1}.

   (i) Calculate the distance moved by the car during this acceleration.

   distance = ... m [2]

   (ii) The same force is used to change the speed of the car from 30 m s^{-1} to 45 m s^{-1}. Explain why the distance moved is not the same as that calculated in **(i)**.

   ....

   ....

   ....[1]