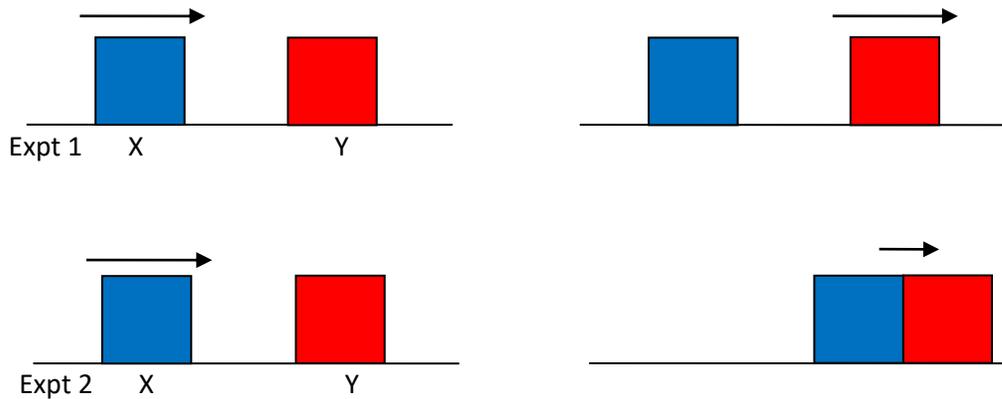# Teacher notes
Topic A

Maximum energy transfer

Block X approaches a stationary block Y of the same mass on a smooth surface.

In experiment 1, X collides with Y elastically so that after the collision X is brought to rest.

In experiment 2, X sticks to Y so they move together.

Expt 1   X   Y

Expt 2   X   Y

What is the ratio $\dfrac{K_1}{K_2}$, after the collision, of the kinetic energy of block Y in experiment 1 to the kinetic energy of block Y in experiment 2?

A 2   B 4   C 8   D 16

In experiment 1, Y has kinetic energy $K_1 = \dfrac{1}{2}mv^2$ since the collision is elastic. (Or using conservation of momentum: $mv + 0 = 0 + mu \Rightarrow u = v$ i.e. Y moves off with the same speed as X had to begin with. The kinetic energy of Y is then $K_1 = \dfrac{1}{2}mv^2$.)

In experiment 2, conservation of momentum gives $mv + 0 = 2mu \Rightarrow u = \dfrac{v}{2}$ so that $K_2 = \dfrac{1}{2}m(\dfrac{v}{2})^2 = \dfrac{1}{8}mv^2$.

Hence

$$\frac{K_1}{K_2} = \frac{\dfrac{1}{2}mv^2}{\dfrac{1}{8}mv^2} = 4$$