Energy

3. Work

CONCEPT 1

LESSON GUIDE

DOING WORK

PRECISE LEARNING POINTS

KNOW

I know what work is done when a force is applied to move an object over a certain distance.

APPLY

I can apply my knowledge of work to explain why the amount of work can change.

EXTEND

I can extend my knowledge of work to use an equation to calculate work done, force and distance.

NOTES

A force can transfer energy. If you were pulling a heavy load along, you would need to use a large force. Energy stored in your body would be transferred to the kinetic energy store of the object and some energy is transferred to the surroundings by heating. **Work** is done when a force is used to transfer energy. You would be doing work, for example, if you squashed a piece of foam rubber. The **deformation** of the material involves a transfer or energy.

The work done is equal to the energy transferred, and is measured in joules (J).

If you push a trolley around a supermarket you are, scientifically speaking, doing work. Energy is being transferred from you. The amount of work you do will be affected by a number of factors. Choosing a trolley with rusty wheels will need more force to push it and if you stack the trolley up with shopping that will increase the force needed as well.

The amount of work also depends on the distance covered. If the distance from the entrance of the supermarket to the check-outs is greater, that will increase the work done as well. So the amount of work done depends upon the force applied and the distance moved. We have to be careful with measuring the distance, though.

The further you pull or push a load, the more work you do. If two people were pushing identical boxes along a floor but one person pushes their box twice the distance, that person will do twice as much work. Or if one box is much heavier and needs double the force to push, then double the amount of work will be done for the same distance.

Work is only done when an object is moved along a distance **in the same direction** as the force.

If you pushed a wheelbarrow in the same direction as you are moving then you will have done work.

If you pushed against a wall with a force but the wall does not move then you will not have done work. You have expended energy because you have applied a force, but the energy you have used has not been transferred to the kinetic stores of the wall, but rather to the thermal stores of the wall and you. You will get hot and tired

We use an equation to calculate work done: **work done = force x distance**

work done is measured in joules, J

force is measured in newtons, N

distance is measured in metres, m