8.4.3 ENERGY AND WORK

Moving vehicles have kinetic energy, and energy transformations are an important aspect in understanding motion

3.1 Identify that a **moving object possesses kinetic energy** and that **work done** on that object can **increase that energy**

- **Kinetic energy** – form of energy associated with **motion** of an object, capacity to do work
  - $\boldsymbol{KE = \frac{1}{2}mv^2}$ (KE is kinetic energy (j), m is mass (kg), v is velocity (ms^{-1})
- **Work** - when an object moves in **direction of a force** is applied to it
  - If object moves, work must be done on that object
  - Positive work – force used to accelerate vehicle, negative work – force used to decelerate vehicle
  - **W = Fs** (F is force, s is distance)

3.2 Describe the **energy transformations** that occur in **collisions**

- Collisions may be **elastic**, where total KE is conserved and continue moving, or **inelastic**:
- Vehicles colliding causes **transformation of kinetic energy to other forms** of energy
  - Potential energy of **deformation** – energy stored because **shape changes**
  - **Sound** energy and **Heat** energy – transmitted in air

3.3 Define the **law of conservation of energy**

- Closed system – energy cannot leave or enter, it can only be **transformed or transferred**
  - Total energy in a closed system **does not change**

Practical section in construction!

- Solve problems and analyse information to determine the kinetic energy of a vehicle and the work done using the formulae: $E_k = \frac{1}{2}mv^2$ and $W = Fs$
- Analyse information to trace the energy transfers and transformation in collisions leading to irreversible distortions
  - Energy can be transformed into **potential energy** stored in an object due to change in shape
  - Can cause irreversible distortions, e.g. potential energy is difficult to transform again
    - Example: panels of a car deforming