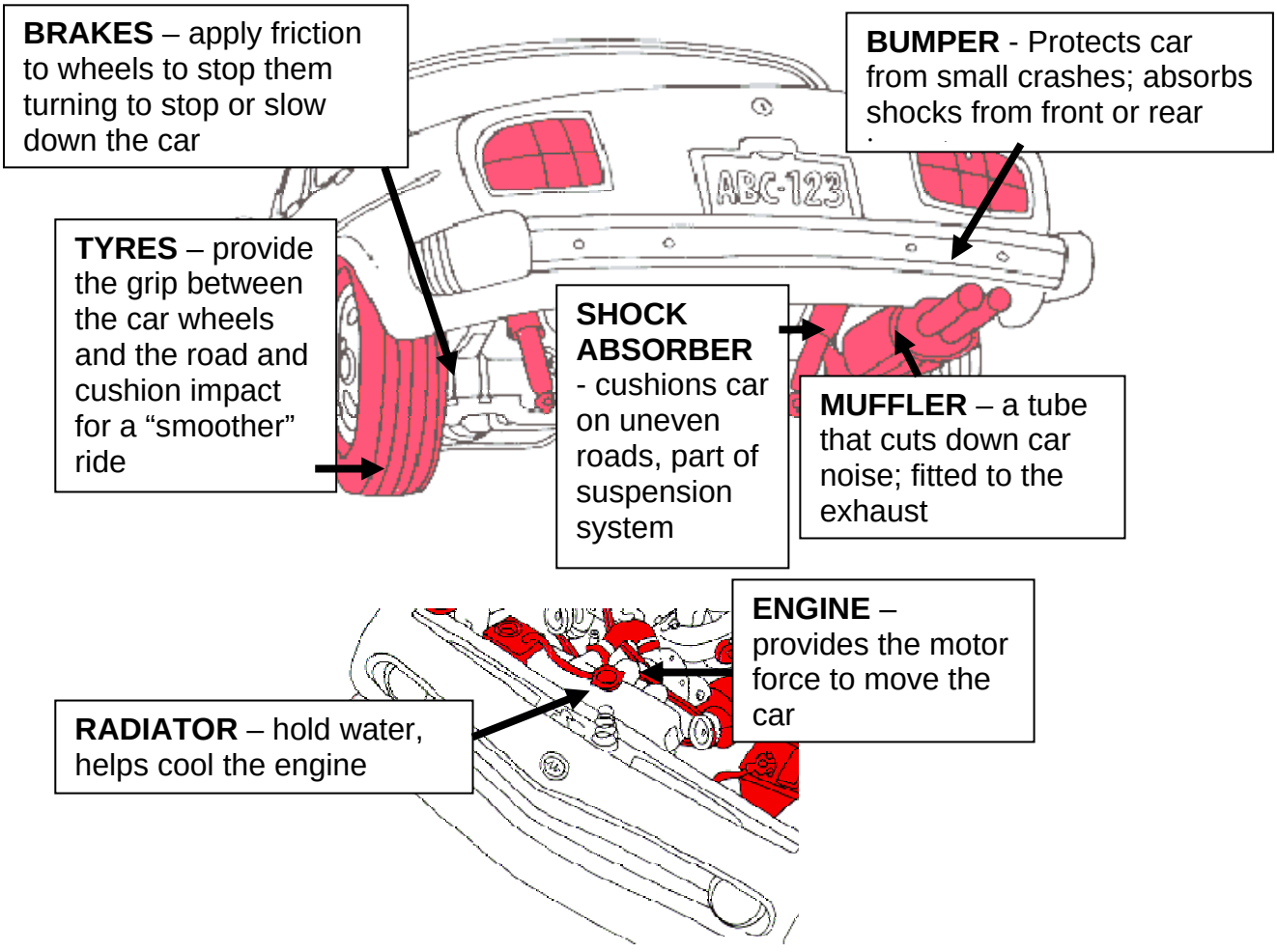
DEMONSTRATE KNOWLEDGE OF SCIENCE IN RELATION TO A VEHICLE

SCIENCE 18976 Version 2
Level 1, 2 Credits

element 1 Describe the main parts of a vehicle.
element 2 Calculate the speed of a vehicle.
element 3 Describe how factors influence stopping distance.

Main parts of the car



DRIVE SHAFT – takes the energy from the engine to the wheels by connecting the motor to the wheel axles

GEARS - increases or decreases the speed of rotation.

Speed

Speed is distance divided by time: **s = d / t**.
Sometimes we use the letter v for "speed": **v = d / t.**
Speed (s) and velocity (v) are not exactly the same but at this level we will assume they are.

Units of Speed

Speed has units like km/h (kilometers per hour) or km/s (kilometers per second) or m/s (metres per second)
Sometimes meters per second, m/s, is written as ms^{-1}, and km/h as kmh^{-1}. In this course you can use either but don't do them both eg km/s^{-1} is WRONG!

Example calculations

1. Two students had a bike race over 150 metres. Student A took 35 seconds and student B took 31 seconds. Who went the fastest?

Student B (as she did the 150m in less time than A)

2. Alan travels 100 km in 2.5 hours. Find his average speed in km/h.

v = d/t v = 100/2.5 v = 40 km/h

3. A cyclist covers 900 m and takes 60 seconds. Use v = d/t to find the speed of the bike.

v = d/t v = 900/60 v =15 m/s

Stopping Distances

Stopping distance = reaction distance + braking distance

Speed km/h	10	20	30	40	50	60	70	80	90	100
Reaction Distance (m)	2.7	5.5	8.3		13.8	16.6	19.4	22.2	25	27.7
Braking Distance (m)	0.8	2.5	5.2	9.5	15.5	21.4	29.1	38.3		59.8
Stopping Distance (m)	3.5	8		20.5	29	38	48.5	60.5	73	87.5

The stopping distance at 30 km/h is 8.3 + 5.2 = 13.5 m

The reaction distance at 40 km/h is 20.5 – 9.5 – 11 m

The braking distance at 90 km/h is 73 -25 = 48 m

Factors that influence stopping distance of a car are:

- **speed** – the faster a car is traveling, the longer it takes to stop.
- **reaction time** – the reaction times of some elderly people are slower; drugs including alcohol will also affect reaction times, making them slower. Stopping distances increase when reaction times are slow.
- **tyre tread** – since tread affects how well a tyre grips the road, worn tyres will mean that stopping distances are greater. More tread means shorter stopping distances.
- **surface** – some surfaces are more slippery (eg gravel road, or a wet or icy road) and stopping distances are increased on these surfaces as there is less friction.
- **mass** – the bigger the mass the more "momentum" an object has, and so a big car will taker longer to stop than a smaller one, even if all other things are the same.