Examples of the electrically propelled and hybrid vehicles that are currently available

Figure 2.3 Two wheel moped/scooters

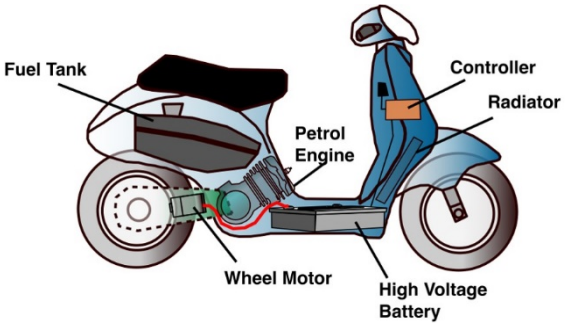


Figure 2.4 Cars

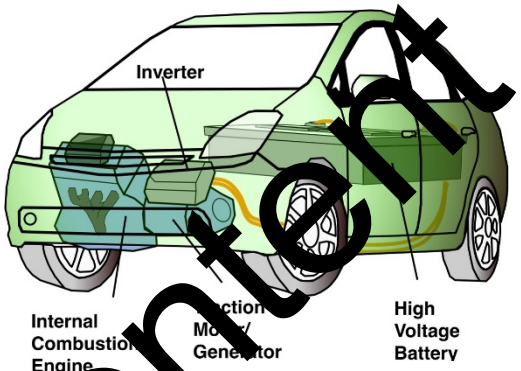


Figure 2.5 Commercial vehicles

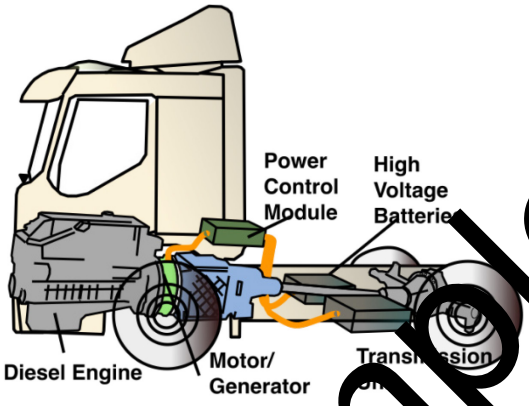
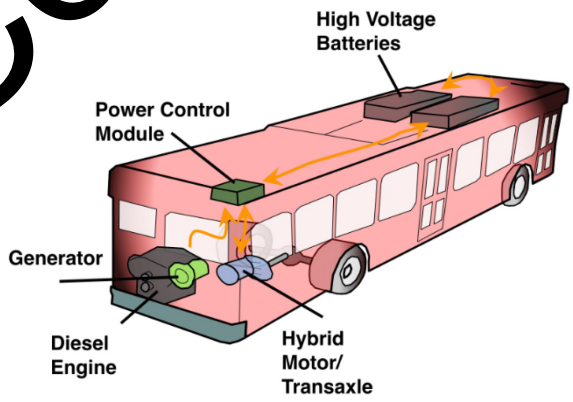


Figure 2.6 Passenger transport



All electric vehicles (EV)

An all-electric vehicle is one where its main source of power for propulsion comes from high voltage batteries and motors. These types of vehicles are sometimes known as battery electric vehicles or BEV's, and because they are often charged from mains electricity they are also called 'plug-in'.

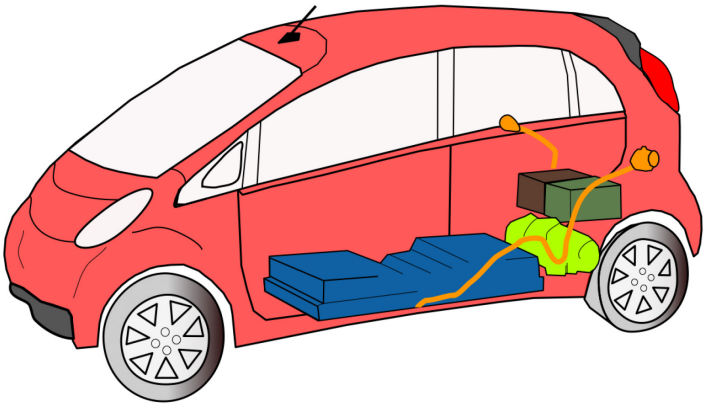


Figure 2.7 A battery electric 'plug-in' vehicle

- ✓ List three hazards associated with vehicle high voltage systems.
- ✓ With hybrid and electric drive vehicles, in the event of an accident, who might be harmed?
- ✓ What colour is the insulation of high voltage cabling?

Hybrid vehicles

A hybrid vehicle is one where the main source of power for propulsion is provided by a combination of internal combustion engine and electric **traction motor**. The engine and electric motor can be connected in three main formats to provide drive:

Series

Parallel

Combination (series parallel)

Many modern hybrid vehicles are of the parallel or combination type and are made up of the following components:

- batteries
- traction motors/generators
- cabling
- control unit
- circuit protection

Traction motor - a powerful electric motor used to provide the driving force in hybrid and electric vehicles.

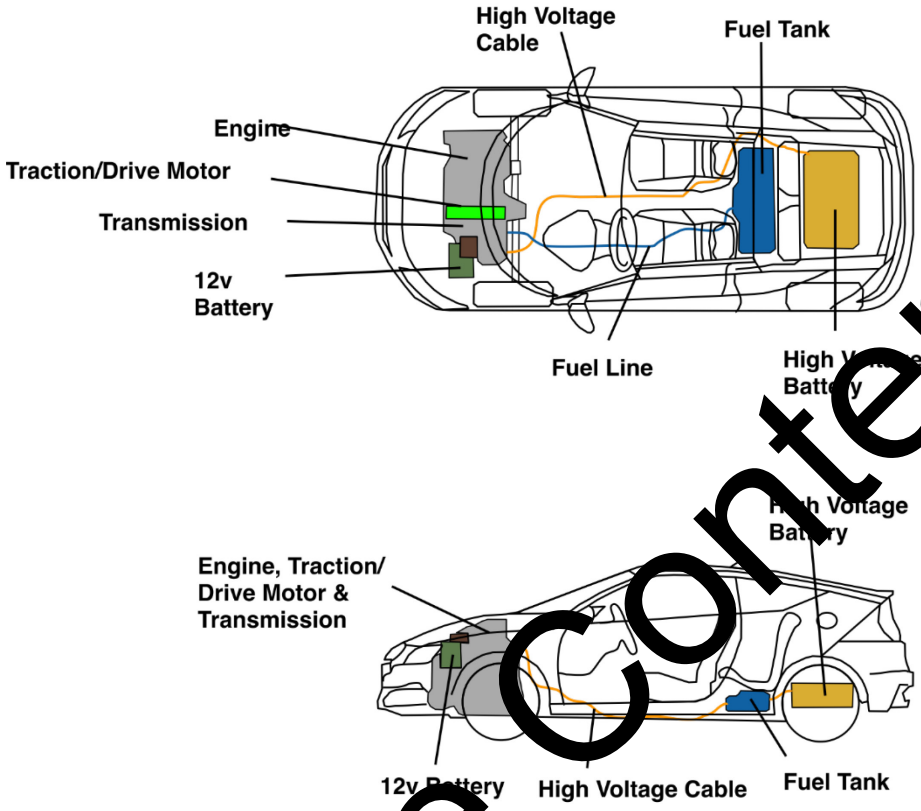


Figure 2.8 A hybrid vehicle system layout

Some hybrid drive vehicles are able to supplement the charge in their high voltage batteries by connecting to mains electricity when not in use. These types are known as 'plug-in hybrids'.

Hybrid drive

A hybrid vehicle is one which combines an internal combustion engine with an electric motor to provide drive. This gives the flexibility of a petrol or Diesel engine with the fuel economy and low pollution characteristics of electric motors.

There are three main types of hybrid drive:

- **Series hybrid:** A small capacity internal combustion engine is used to act as a generator. This then charges batteries that are used to power the electric motors that drive the wheels. There is no direct connection between the engine and the wheels, meaning that a gearbox is not required. The advantage of this system is that no driving loads are placed on the engine and it can run at a constant speed. This reduces fuel consumption, emission output and engine wear.

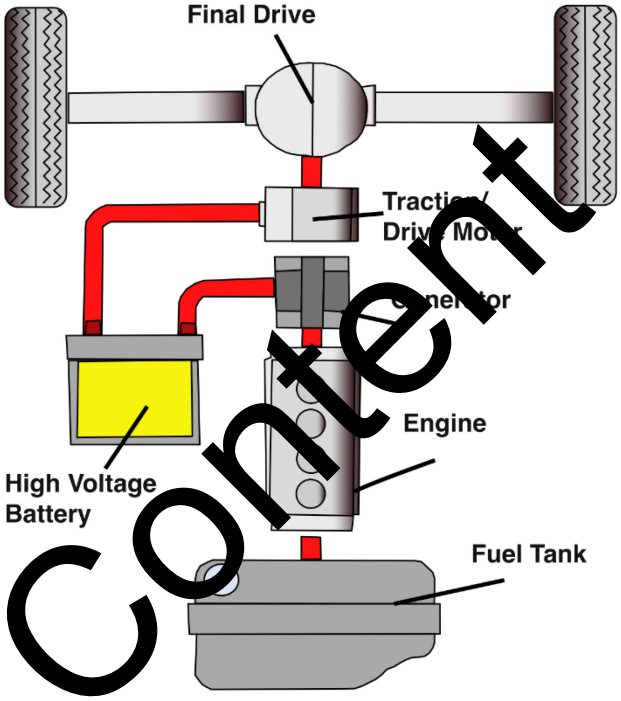


Figure 2.9 Series hybrid drive

- **Parallel hybrid:** An integrated electric motor is used to support or boost the performance of a small capacity internal combustion engine. When not required, the electric motor can be converted into a generator to recharge the high voltage electric battery.

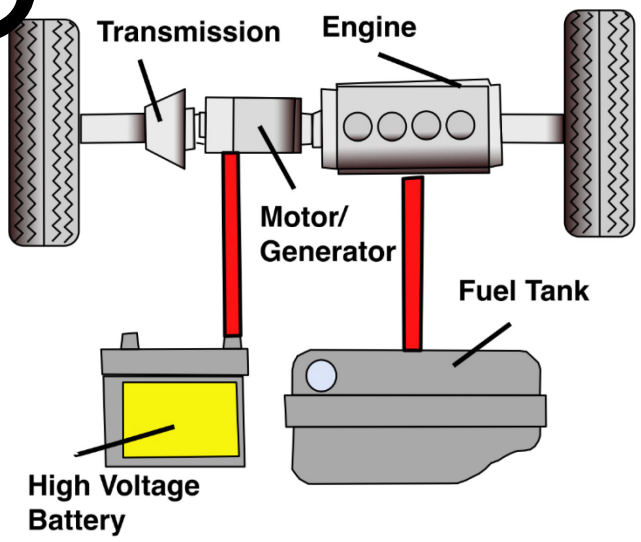


Figure 2.10 Parallel hybrid drive