

FORMATION OF PETROLEUM AND NATURAL GAS

Syllabus reference 8.5.1

Read the following information then complete the questions.

Petroleum, natural gas and coal are the main sources of energy for modern use. They are classified as fossil fuels because they were formed from prehistoric plants and animals that lived hundreds of millions of years ago.

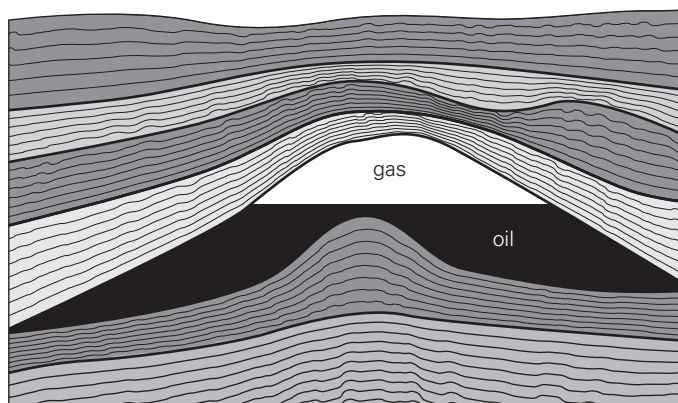
Most of the world's oil was formed from microscopic plants and animals in the marine environments that existed in the past 50–500 million years. When the micro-organisms died, they settled on the ocean floor in sediment that had been washed from the land down rivers into the oceans.

The environment where the plant and animal remains settled was oxygen-deficient so complete decomposition could not occur.

Over time, the partly decomposed remains of the micro-organisms (organic matter) became trapped under more layers of sediment.

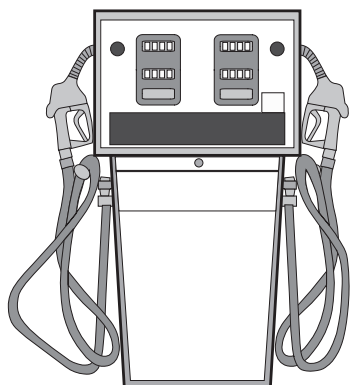
Over millions of years, the accumulation of sediment meant that the layers containing the remains were buried deep beneath the Earth's surface. Under the enormous pressure of the layers above and high temperatures (as the depth of the Earth's layers increases so does temperature), the organic matter was transformed into oil and gas. The crude oil and natural gas formed are compounds of carbon and hydrogen—hydrocarbons. The oil is a liquid while the gas is mainly the compounds methane and ethane.

In some cases, the oil (petroleum) remained in the rock where it was formed. Such rock is called oil shale and is a possible source of oil in the future. In other cases, the tiny droplets of oil and molecules of gas migrated upwards towards the surface where they evaporated. Sometimes the oil and gas were prevented from reaching the surface by a layer of impermeable rock, resulting in an oil and gas reservoir where the oil became trapped in porous rock and accumulated.



Oil and gas trapped in a typical geological structure

Once trapped the less dense gas separated from the oil to form layers. The temperature and other conditions during the formation of petroleum deposits varied, so the volume of gas and oil produced in different oilfields also varies. While it is common for reservoirs to contain both oil and gas, most of the world's gas reserves are found in giant gas fields containing little or no oil.



There are thirteen basins in Australia known to contain significant petroleum reserves. The Gippsland Basin is the largest basin for crude oil, followed by the North West Shelf of the Carnarvon Basin.

Natural gas is a mixture of methane (75–90%), ethane (5–10%), propane and butane (3–6%) and small amounts of other hydrocarbons, along with nitrogen, carbon dioxide and water.

The composition of petroleum varies from one field to another. Light crude oils are usually pale yellow or colourless and have a high proportion of hydrocarbons suitable for use as motor fuel and kerosene. Heavy crude has a higher viscosity with higher proportions of the higher boiling point components, diesel, lubricating oil, wax, tar and asphalt.

QUESTIONS

- 1 Use the information in the text to draw a flowchart or diagrams to show the sequence of formation of petroleum and natural gas.

- 2 Complete the following table using the attached map to list the main oil and gas basins from which we currently extract oil and gas commercially. Indicate where they are found and whether they provide oil or gas or both.

BASIN NAME	OFFSHORE OR ONSHORE	STATES	OIL OR GAS

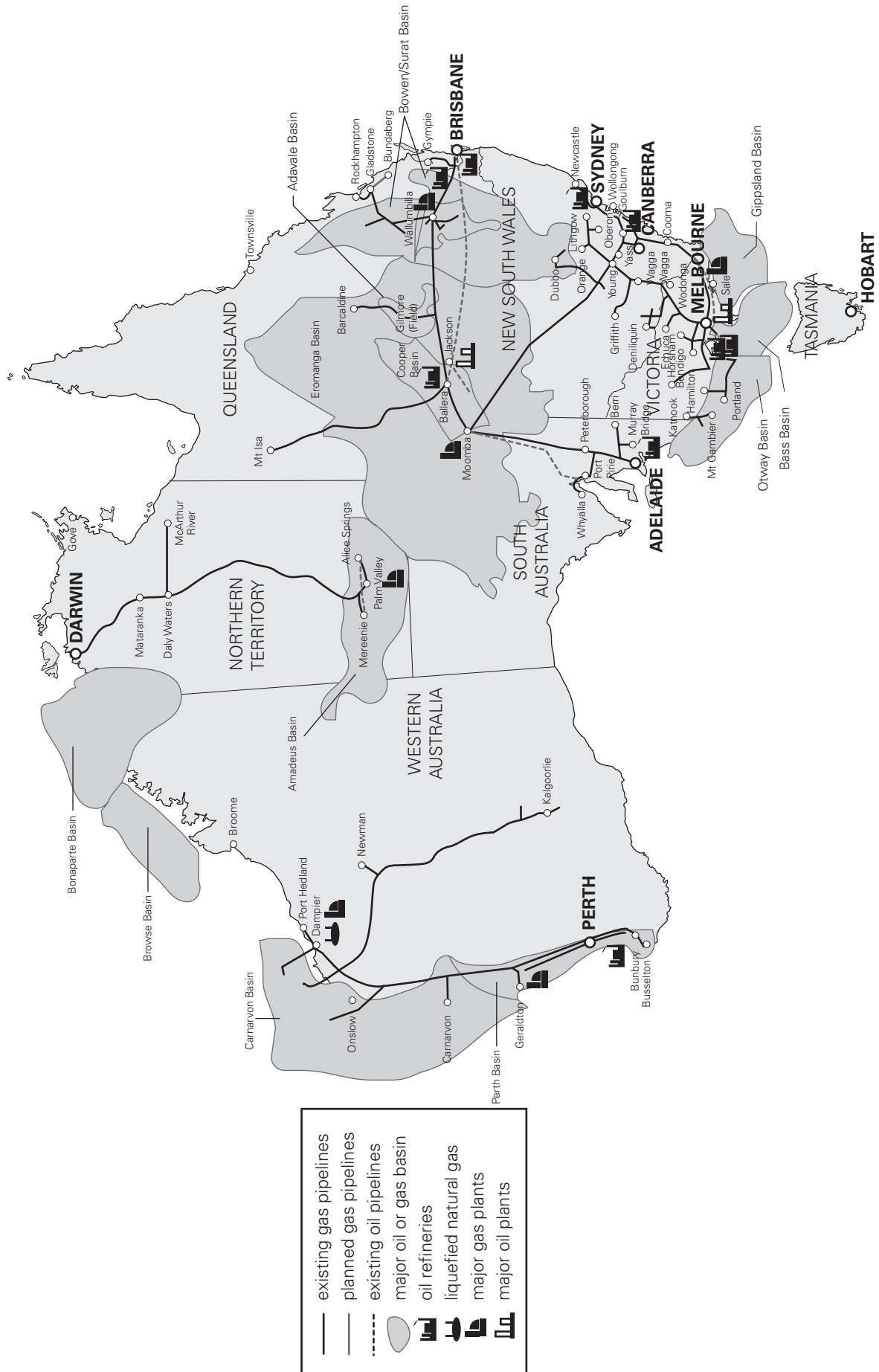
- 3 a List in order from least to most dense: oil, gas, water.

- b In an oil reservoir, what is the most likely order of layers from top to bottom?

- 4 Using your textbook or other references list the compounds found in:

- a natural gas

- b petroleum



Major oil and gas basins, pipelines and facilities in Australia