Oil and Gas Deposits

Oil and *Gas* are considered Fossil Fuels.
Consist of mixtures of hydrogen and carbon, referred to as *liquid hydrocarbons*.

Fossil Fuels:

- Non-renewable fuels that formed long ago from the remains of plants and animals.
- The origin of fossil fuels, starts with *photosynthesis*. If the reaction runs in reverse, it produces energy and releases carbon dioxide and water.

Reference:
Tarbuck and Lutgens
Pages 249

The Formation of Oil and Gas Involves Several Steps:

1) Organic matter must be produced in great abundance.
2) It is buried rapidly before oxidation takes place.
3) Slow chemical reactions transform the organic material into the hydrocarbons found in petroleum.
4) As a result of compaction, the oil and natural gas are forced out into porous and permeable rock, such as sandstone and limestone. Called a reservoir rock.
5) The reservoir rock is capped by impermeable rocks, like shale, and prevents the oil and gas from leaking out to the surface. This impermeable layer is called a cap rock. This is called an oil trap.

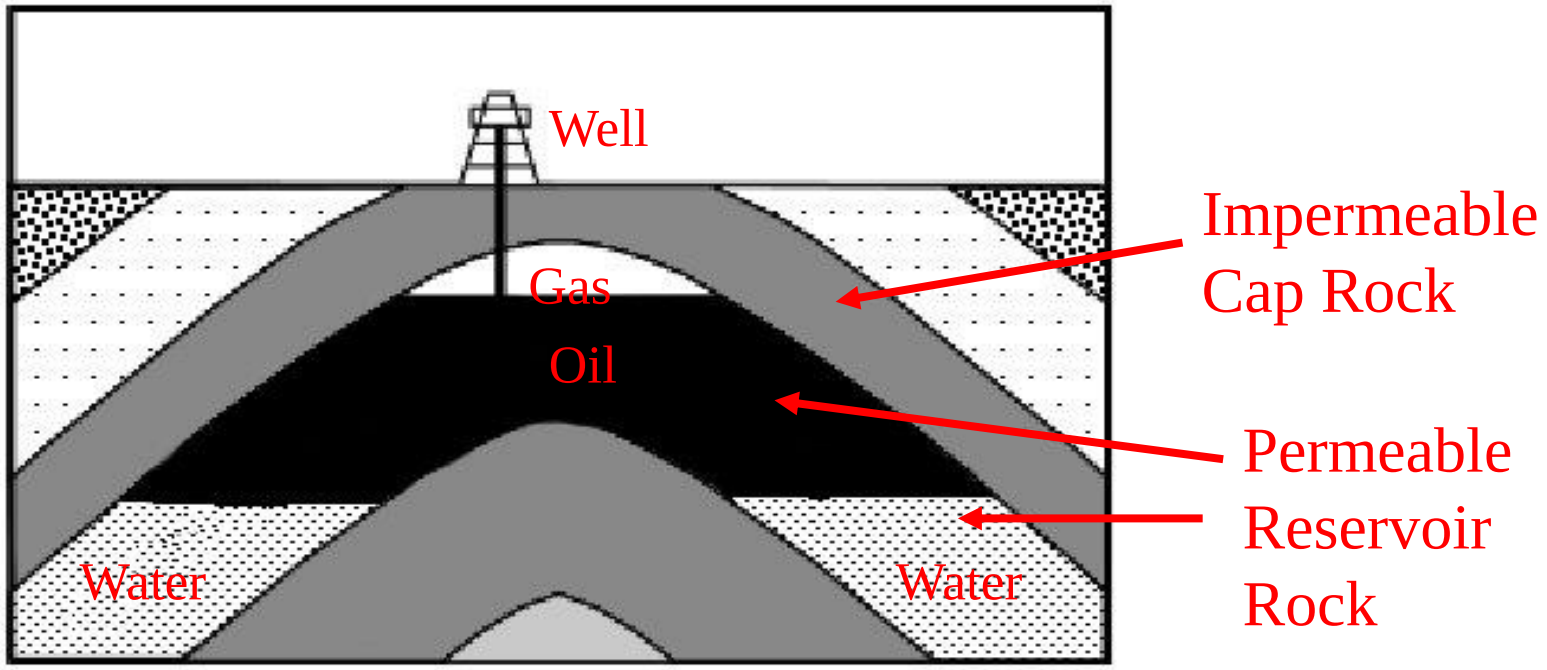
- Because oil and natural gas have a low density they will migrate upward and accumulate in the reservoir rock if a cap rock is present to trap the oil and gas.
- Oil traps that form as a result of geologic structures like folds and faults, called *structural traps*.
- Natural gas will occur above the oil, which in turn will overly water in the pore spaces of the reservoir rock. This occurs because the density of natural gas is lower than that of oil, which is lower than that of water.

Four types of oil traps:

1) Anticline Trap
2) Fault Trap
3) Salt Dome Trap
4) Stratigraphic Trap

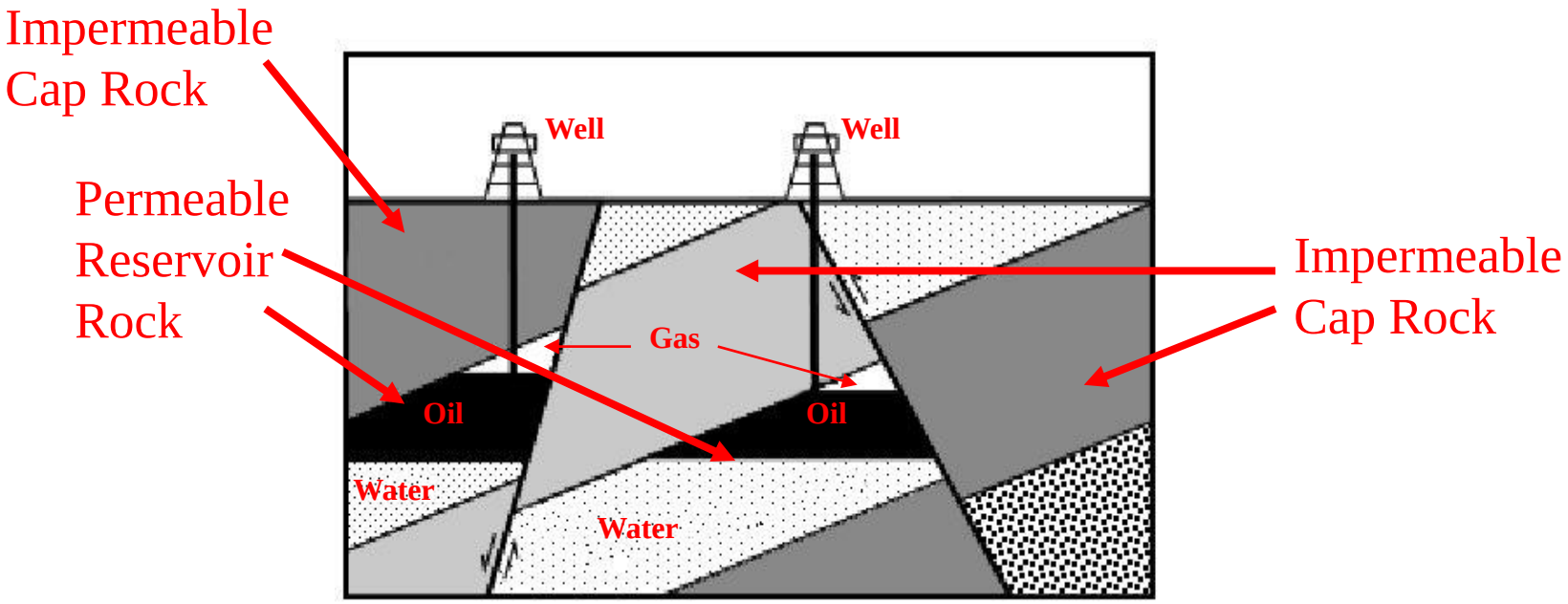
Anticline Trap:

- Permeable rock (like sandstone or limestone) is located between impermeable rock layers (like shale). The rocks are folded into an anticline. Oil and gas move upward in the reservoir rocks, and accumulate in the upper region of the anticline.



Fault Trap:

- If faulting can shift permeable and impermeable rocks so that the permeable rocks always have impermeable rocks above them, then an oil trap can form. Note that both normal faults and reverse faults can form this type of oil trap. Since faults are often exposed at the Earth's surface, the locations of such traps can often be found from surface exploration.



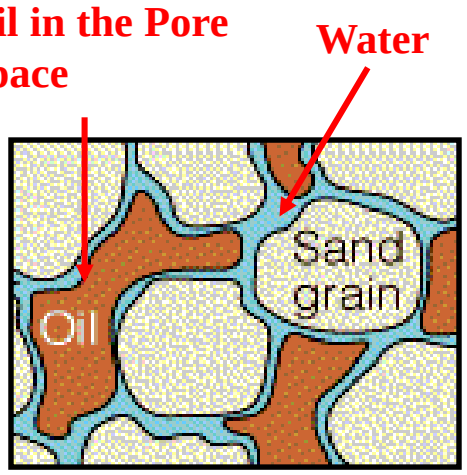
Oil can also be extracted from solid rocks:

1) Oil Shale

- organic matter that has not decomposed completely. Oil can be extracted when heated to high enough temperatures to drive the oil out. This process requires a lot of energy, so recovering oil this way is not cost-effective, but may be someday

2) Tar Sands

- sandstones that have thick accumulations of oil in their pore spaces. This oil also requires heating the rock and is therefore not currently cost effective.



Sample Problem

Oil is generally considered a non-renewable resource. Explain why oil sometimes may be considered a renewable resource.

In which rock type would oil and gas be found?

(A) igneous
(B) metamorphic
(C) sedimentary
(D) volcanic