Introduction to Petroleum



<u>What is it?</u>

Petroleum - a liquid mixture of hydrocarbons that is present in rock layers

- It can be extracted and refined to produce fuels including gasoline, kerosene, and diesel oil
- Also used for chemicals, plastics, and synthetic materials
- Also known as crude oil, or black gold, or Texas
 Tea





- <u>Petroleum</u> (crude oil) is a mixture of hundreds to thousands of different compounds which
- a) are very rich in energy when burned
- b) can be transformed into many different compounds



a) is burned for energy b) is transformed into many compounds

Other uses of Petroleum

- Look around! Find something that DOESN'T come from petroluem
- cd's, sports equipment, clothing, auto parts, carpeting, artificial limbs, medication. Etc.
- <u>Eighty-four</u> percent of petroleum us used outright as fuel
- <u>Seven</u> percent is used for medications and plastics
- The remaining 9% used for:
- - lubricants, paving materials, miscellaneous products
- For every gallon of petroleum used to make useful products, more than <u>five</u> gallons are <u>burned</u> to release energy

What is it like?

- Color?? Varies from pale yellow to dark black Color. Wide Range
- Texture?? Varies from very runny to a sludge-like texture (viscous) Texture: Very runny to highly viscous
- <u>Viscosity</u> resistance to flow; slow flowing liquids are very viscous

Viscosity - resistance to flow





Petroleum From Around the World

When did most petroleum form?

- 252 to 66 million years ago
 - 70% of oil deposits existing today were formed in the Mesozoic age (252 to 66 million years ago),
 - 20% were formed in the Cenozoic age (65 million years ago), and only
 - 10% were formed in the Paleozoic age (541 to 252 million years ago).



<u>Summary</u>

- Most petroleum on the planet formed around 200 million years ago for three reasons:
- 1. It was significantly warmer than it is now
- 2. The ocean level was much higher, which resulted in MANY shallow seas
- 3. The shallow seas were TEEMING with life.

Note: there have been other geological episodes similar to this in which abundant petroleum formed.



The Greenhouse Era 100 Myr Ago The Cretaceous Period of the Mesozoic Era



- Global Sea Level 200 m higher than today
- Shallow seas flooded continental interiors
- Cretaceous is from the Latin word creta which means chalk

So, how did it form?

- 200 m.y.a many continents were covered by warm, shallow seas
- *marine life was abundant!! (mostly itty bitty stuff)*
- it died, fell and built up on the ocean floor
- it rotted, got compressed from overlying material, and was heated from inside the earth
- this resulted in a mixture of gooey petroleum molecules!!!

What Happens Next??

- After petroleum molecules form....
- they heat up and become less dense than the rocks around them
- they begin to rise up through the rocks
- petroleum can either escape into the atmosphere (where it is of no use to us) or....
- It can get trapped in a geologic structure



Plants and animals die and sink to the bottom of the sea.



The plant and animal layer gets covered with mud.

Petroleum Formation

-> marine life, which is abundant in warm shallow seas, dies and sinks to the bottom of the sea.

- layers begin to form with the dead organisms and mud.

-> rotting organic matter, becomes compressed from overlying layers -> compression and heat from the earth rearrange the molecules into a wide variety of hydrocarbons (petroleum) _____







- New petroleum molecules heat up, become less dense, and begin to rise through the surrounding materials

- it may continue Over time, more sediment creates pressure, compressing rising all the way to the dead plants and animals into oil the surface or get trapped and accumulate as a reservoir in a geologic Structure.



Oil moves up through porous rocks and eventually forms a reservoir.



















World Distribution, Population, and Usage



Petroleum Distribution and Usage

- Petroleum is not <u>uniformly</u> distributed
- Approximately 57% of out world's known reserves are located in just five <u>Middle Eastern</u> nations, which include: Iran, Iraq, Saudi Arabia, Kuwait, and United Arab Emirates
- North America accounts for just 7% of the world's known reserves

Petroleum Distribution and Usage -> Petroleum is not uniformly distributed or used. -> We use the most (and have a relatively low population). -> Most reserves are in the Middle East