

Possible Questions for Climate Change in Chemistry 10

1. Convert between the following terms and definitions

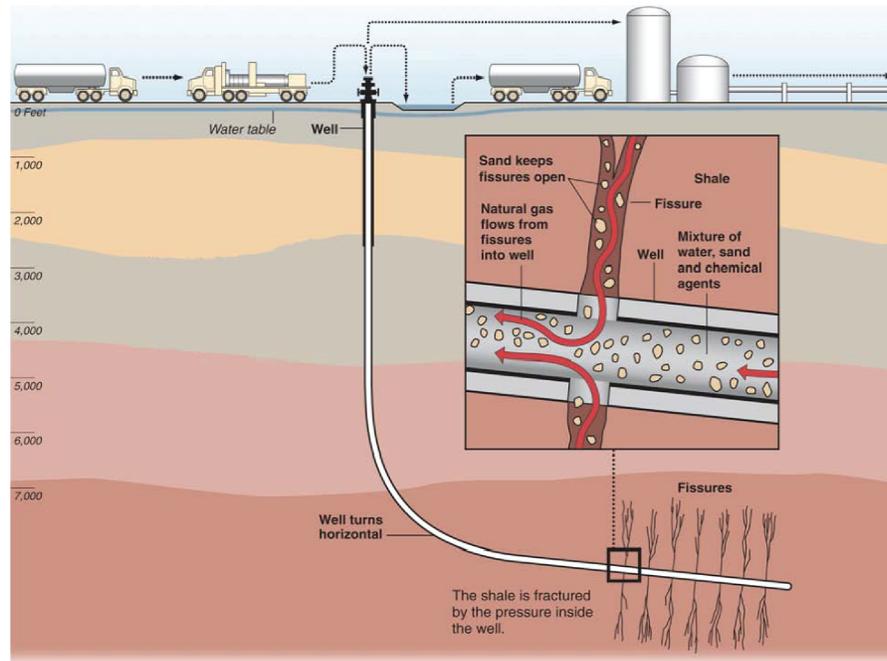
Climate = the statistics of temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological elemental measurements in a given region over long periods. Climate can be contrasted to weather, which is the present condition of these elements and their variations over shorter periods.

Greenhouse effect = a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions. Since part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases.

Greenhouse gas (sometimes abbreviated **GHG**) = a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Heavy crude oil or extra heavy crude oil = any type of crude oil which does not flow easily. It is referred to as "heavy" because its density is higher than that of light crude oil.

Hydraulic fracturing = the propagation of fractures in a rock layer caused by the presence of a pressurized fluid. Some hydraulic fractures form naturally, as in the case of veins or dikes, and are a means by which gas and petroleum from source rocks may migrate to reservoir rocks. **Induced hydraulic fracturing** or **hydrofracking**, commonly known as **fracking**, is a technique used to release petroleum, natural gas, or other substances for extraction. This type of fracturing creates fractures from a wellbore drilled into reservoir rock formations.



Light crude oil = liquid petroleum that has a low density and flows freely at room temperature due to the presence of a high proportion of low molecular mass hydrocarbons

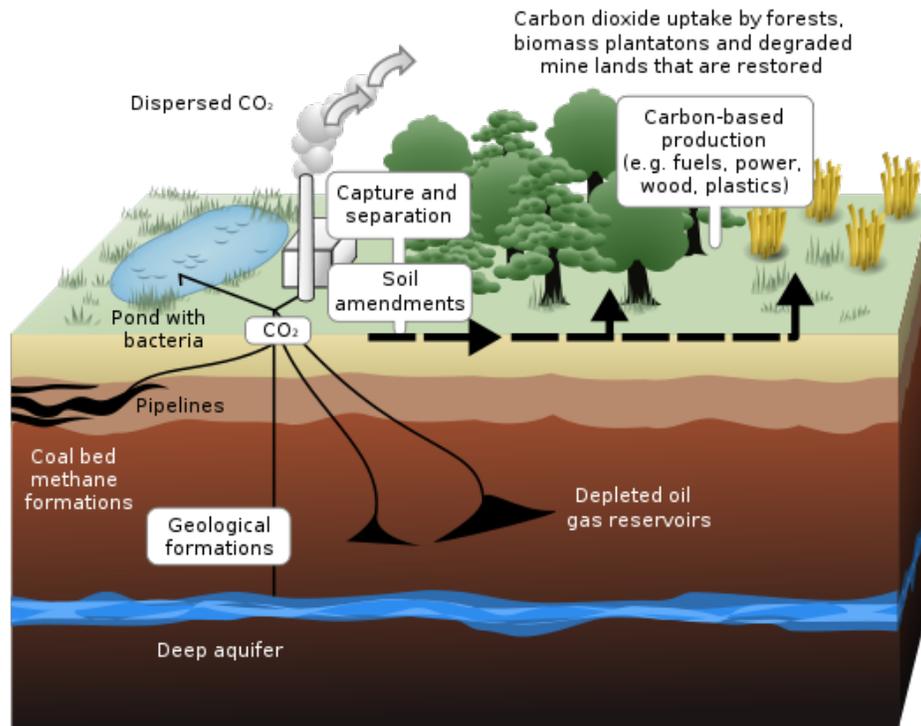
Oil sands, tar sands (bituminous sands) = a type of unconventional petroleum deposit. The oil sands are loose sand or partially consolidated sandstone containing naturally occurring mixtures of sand, clay, and water, saturated with a dense and extremely viscous form of petroleum technically referred to as bitumen.

Petroleum or crude oil = a naturally occurring flammable liquid consisting of a complex mixture of hydrocarbons and other liquid organic compounds, that are found in geologic formations beneath the Earth's surface. A fossil fuel, it is formed when large quantities of dead organisms, usually zooplankton and algae, are buried underneath sedimentary rock and undergo intense heat and pressure.

Unconventional oil = According to the EIA definition, conventional crude oil and natural gas production refers to oil and gas “produced by a well drilled into a geologic formation in which the reservoir and fluid characteristics permit the oil and natural gas to readily flow to the wellbore”. By converse unconventional hydrocarbon production doesn't meet these criteria, either because geological formations present a very low level of porosity and permeability, or because the fluids have a density approaching or even exceeding that of water, so that they cannot be produced, transported, and refined by conventional methods.

Weather = the present condition of temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological elemental measurements and their variations over shorter periods.

Carbon capture and storage (CCS), (carbon capture and sequestration) = technology attempting to prevent the release of large quantities of CO₂ into the atmosphere from fossil fuel use in power generation and other industries by capturing CO₂, transporting it and ultimately, pumping it into underground geologic formations to securely store it away from the atmosphere. It is a potential means of mitigating the contribution of fossil fuel emissions to global warming.



Global-warming potential (GWP) = a relative measure of how much heat a greenhouse gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide. A GWP is calculated over a specific time interval, commonly 20, 100 or 500 years. GWP is expressed as a factor of carbon dioxide (whose GWP is standardized to 1). For example, the 20 year GWP of methane is 72, which means that if the same mass of methane and carbon dioxide were introduced into the atmosphere, that methane will trap 72 times more heat than the carbon dioxide over the next 20 years.

2. Describe how petroleum, natural gas, and coal are formed.
3. Explain how hydraulic fracturing (fracking) allows oil companies to extract greater quantities of natural gas. Your answer should include the steps taken from the pumping of fracking fluids into the well to the pumping of the natural gas out of the well. It should also include an explanation for why this process leads to more natural gas being able to be pumped out of the ground.
4. Describe the difference between climate and weather.
5. Describe the factors that determine Earth's energy balance, and describe the factors that could affect this balance.
6. Explain why we should care about climate change. What effects is it expected to have on ourselves and our environment?

7. List the three most important greenhouse gases.
8. Explain how greenhouse gases trap infrared radiation that would otherwise escape. Your answer should include mention of molecules, vibrations of atoms, vibrational energy states, relative stability, relative potential energy, and infrared photons.
9. Explain how global warming potential (GWP) describes the relative effects of greenhouse gases on global warming, and list the relative GWPs of carbon dioxide, methane, and nitrous oxide.
10. Describe the atmospheric concentration trends for the greenhouse gases of carbon dioxide, methane, and nitrous oxide.
11. Describe the role of humans in the increased concentration of CO₂ in the atmosphere.
12. List at least four biogenic sources and four non-biogenic sources of methane in the atmosphere.
13. Describe the role of humans in the release of N₂O into the atmosphere.
14. Describe the projected impacts of climate change.
15. List the things you could do personally to mitigate climate change.
16. Describe the International Energy Agency (IEA) and describe their objectives.
17. Describe the 2 °C Scenario (2DS), and describe how, according to the IEA's ETS 2012 document, we are doing in our attempts to meet the 2DS goals.
18. Describe how carbon capture and storage (CCS) can decrease the amount of CO₂ released into the atmosphere.