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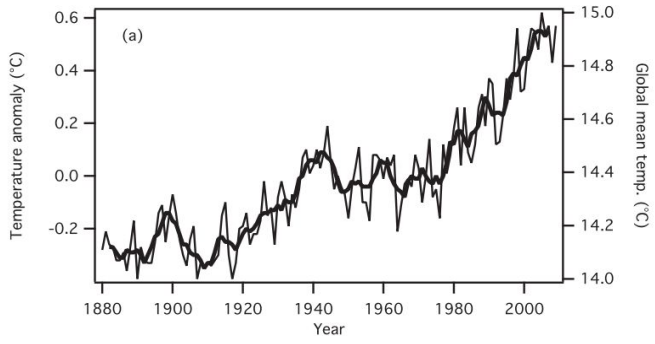
**Midterm test**
**October 22, 2017**

**1. How do you determine whether or not to believe in a scientific claim? What are some problematic ways that people reach conclusions on scientific issues, especially climate change and global warming?**

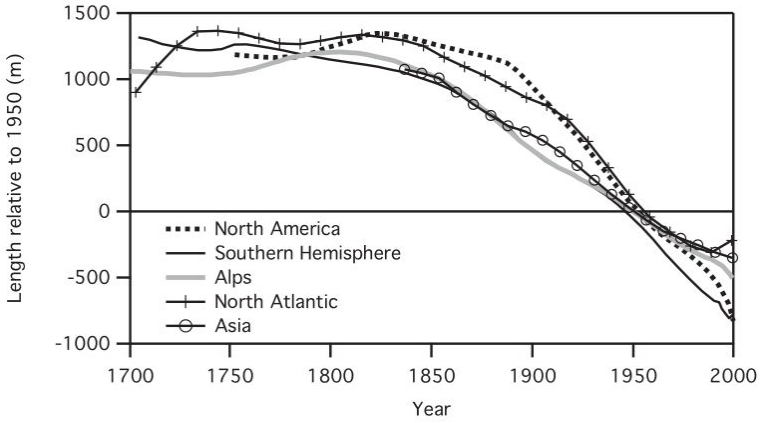
I agree with the scientific claim that global warming is real and the main cause for this is a large amount of burning fossil fuel. I believe that experts claim can be more legit if it's based on strong evidence. From this book, I know the scientist in climate change field is shown data how climate has been changed from past. "Science Collections Alliance, the Organization of Biological Field Stations, the Society for Industrial and Applied Mathematics, the Society of Systematic Biologists, the Soil Science Society of America, and the University Corporation for Atmospheric Research. Comparable non-U.S. scientific organizations in other countries have also endorsed the mainstream view of the science of climate change." These all are big organizations which have all expert climate scientist working. Some people declined this climate change claim because they will lose the big amount of money. Most people who declined climate change argument are owners of big companies who burned fossil fuel to run their business or the politician who supports that businessman. Experts in climate field shown data that how average surface temperature has been increased by 1 degree Celsius, carbon dioxide has been increased by 285 ppm, ice sheet melted and ocean level has been raised. These all incident indicate global warming.

**2. Please explain in detail 3 pieces of evidence that shows that climate change exists.**

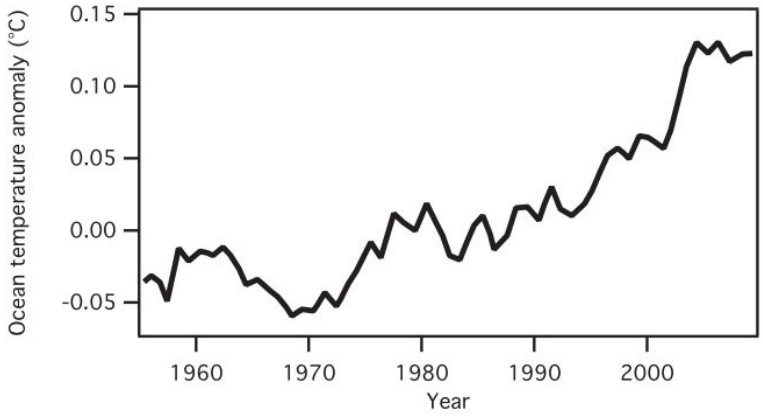
Ans:-



There is no doubt that climate is changing. There is much evidence which shows how much climate has been changed from past. Data shows that global mean temperature has been increased by 1-degree Celsius since 1880 which is important evidence of climate change. The Earth is warming and the decade from 2000-2009 was warmest.



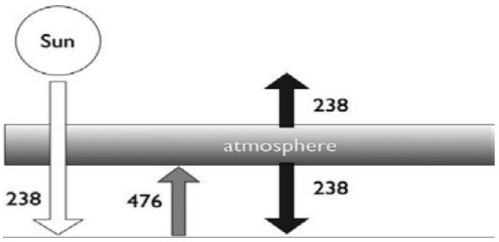

The second evidence of climate change is shrinking glacier length over time. The Glacier receding all over the planet which would affect in the whole world. The sea level has been increased 15 cm over last century.




The third evidence of climate change is ocean temperature. The data shows in the figure above that temperature in the ocean has been increased. Ocean temperature has increased approximate 0.20-degree Celsius from 1960.

All these evidence are supporting that climate is changing and it's causing global warming. The Earth temperature is increasing which causing melt the ice sheet and water going into the sea. Therefore, sea level is increasing too.

**3. Please explain in detail how the greenhouse gas effect works, and what role do the greenhouse gases have? What is the difference between the natural greenhouse gas effect and global warming.**




The atmosphere of earth is transparent to visible photons but absorb infrared photons that fall on it. It emits photons based on temperature which acts like a blackbody. Half of the photons emitted in the upward direction toward space which escapes with energy. The other half photons emit downward to earth and absorbed by it. This whole process showed in the diagram. The atmosphere includes 78% diatomic nitrogen (N2) which is dry, 21% from diatomic oxygen (O2),1% argon atoms, 4% of water vapor (H2O), methane and 0.05% of CO2. Water vapor is important greenhouse gas but it contributes nothing to its atmospheric abundance. Carbon dioxide absorbs infrared photons, therefore, it is very important gas. Methane also performs an important role in absorbing heat from the sun and it has warming power of approximately 20 carbon dioxide molecules. Ozone is absolute necessary gas because it absorbs high energy ultraviolet photons emitted by the sun. Global warming is a process where the average temperature of the Earth and the Ocean rise and Greenhouse effect control of the heat by greenhouse gases on the Earth surface. Greenhouse effect one of the contributions to global warming.

**4. Explain what the Carbon Cycle is and why is it so important to the Earth's Climate?**

The carbon cycle is a process which regulates atmospheric abundance. In the carbon cycle, carbon moved between the ocean and the land. The carbon can store in the land and the ocean for a long time. On the land, plants absorb more carbon dioxide and use it to produce more plants material. Beside plants carbon dioxide also stored in animals and organic carbon in soil. The Ocean stored more carbon dioxide than the land. Carbon dioxide dissolved in water and become carbonic acid and then it converted to other forms of carbons. Due to converted into many forms of carbon the ocean can store more carbon. Carbon moved from mixed layer to deep layer in the ocean. Most of

the carbon in this world stored in rocks from millions of year and it transferred to atmosphere via volcanic eruptions. The carbon cycle is very important to Earth climate. Where CO2 is only 0.05% in Earth atmosphere but it plays huge role to balance energy. The Carbon dioxide works like a blanket layer in the planet which trap longwave radiation and give us warming effect. However, too much CO2 can cause global warming, which can lead to disaster.

**5. How do we know that combustion of fossil fuels is responsible for the increase in carbon dioxide instead of nonhuman sources such as volcanoes or plants?**

There are many pieces of evidence which show that carbon dioxide has been increased in the atmosphere over the past century due to fossil fuel combustion. Data shows that carbon dioxide in the atmosphere is half of what human emitting every year from past half-century. In 1960's rate of carbon dioxide was increasing very slow compared to today where a large amount of carbon dioxide been dumping into the atmosphere. The chemical fingerprint of carbon dioxide shows that it comes from fossil fuel. Fossil fuel is derived from plants which have preference carbon-12 over carbon-13 and carbon produced from fossil fuel also have the same preference. These plants buried from million years and carbon-14 converted back to nitrogen-14. SO fossil fuel contained no carbon-14 and measurement shows that carbonic dioxide in the atmosphere is coming from long-dead plants which are fossil fuel. After putting all evidence together it shows that carbon dioxide is increasing due to human activities.