

# Assignment 1

Maxime CHAMBREUIL  
McGill ID: 260067572  
maxime.chambreuil@mail.mcgill.ca

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**Question 1:** *How did the formation of oceans and the coming of life on the planet affect the evolution of the atmosphere ?*

The formation of oceans has affected the composition of the atmosphere. Indeed the first producer of oxygen comes from the ocean and is at the origin of the life. The coming of life has also affected the composition of the atmosphere, since life has the main process to consume oxygen and produce dioxide of carbone. Life has finally affected the evolution of the atmosphere with pollutant agents.

**Question 2:** *Provide three examples of how the atmosphere sustains life on Earth.*

The atmosphere :

- protects the Earth from solar radiation,
- provides oxygen for life, and
- enables the Earth to keep a good temperature for life.

**Question 3:** *Distinguish between weather and climate and explain why a description of climate only in terms of average weather is incomplete and potentially misleading ?*

"Meteorology. The Atmosphere and the Sciences of Weather", by Joseph M. Moran and Michael D. Morgan, *3rd Edition* : "We define weather as the state of the atmosphere at some place and time, described in terms of variables such as temperature, cloudiness, precipitation and wind. [...] We define climate as weather conditions at some locality averaged over a specified time period."

The average in general does not give a good perception of the reality whatever the domain averaged. It is the same for climate. Averaging will make you lose the variation of information.

**Question 4:** *The Sun is the ultimate source of heat for the planet Earth. The tops of mountains are closer to the Sun than lowlands and yet mountain tops are colder than lowlands. Why ?*

Although mountains are closer to the heat source, they are colder than lowlands because the width of the atmosphere layer is thinner on a mountain than on a lowlands.

**Question 5:** *Weather satellites in outer space make observations of the Earth's atmosphere. Identify some of the advantages of using satellites compared with using radiosondes.*

A radiosonde gives you a local view, as you are measuring at a unique point, whereas the satellite can give you information of a larger area.

**Question 6:** *Why do you feel cool when stepping out of a swimming pool on a hot, dry day ?*

Assume that the water is colder than the air. In the water, our body will have a trend to produce a certain amount  $x$  of heat. When we will step out of the pool, our body will not respond immediately to the change of temperature and will still produce heat. The balance of the body will be negative: we will produce more than we will receive and feel that it is colder outside. After few minutes, the heat exchange will be balanced to produce as much as you receive.

**Question 7:** *At the same relatively low temperature, why does a metal object feel colder to the hand than a wooden object ?*

The feeling is due to the heat transfer speed of each material.

**Question 8:** *Explain why AM stations vary their transmission power between day and night.*

AM stations vary their transmission power because the effect of the Sun on ions is different between day and night.

**Question 9:** *Why does the temperature of the thermosphere vary between average and active Sun conditions ?*

The thermosphere is the first layer of the atmosphere, interacting directly with the Sun conditions. As the heat from the Sun vary, the temperature of the thermosphere vary.

**Question 10:** *Is red light more energetic than infrared radiation ? Why ?*

Yes, the red light has a wavelength of 0,7 microns and the infrared radiation wavelength range is from 1 to 1 000 microns. As the wavelength is lower, the energy is greater.