Name: _____

Date: _____

Class: _____

IB Environmental Systems and Societies

6.1 Introduction to the Atmosphere

Significant ideas:

The atmosphere is a dynamic system which is essential to life on Earth

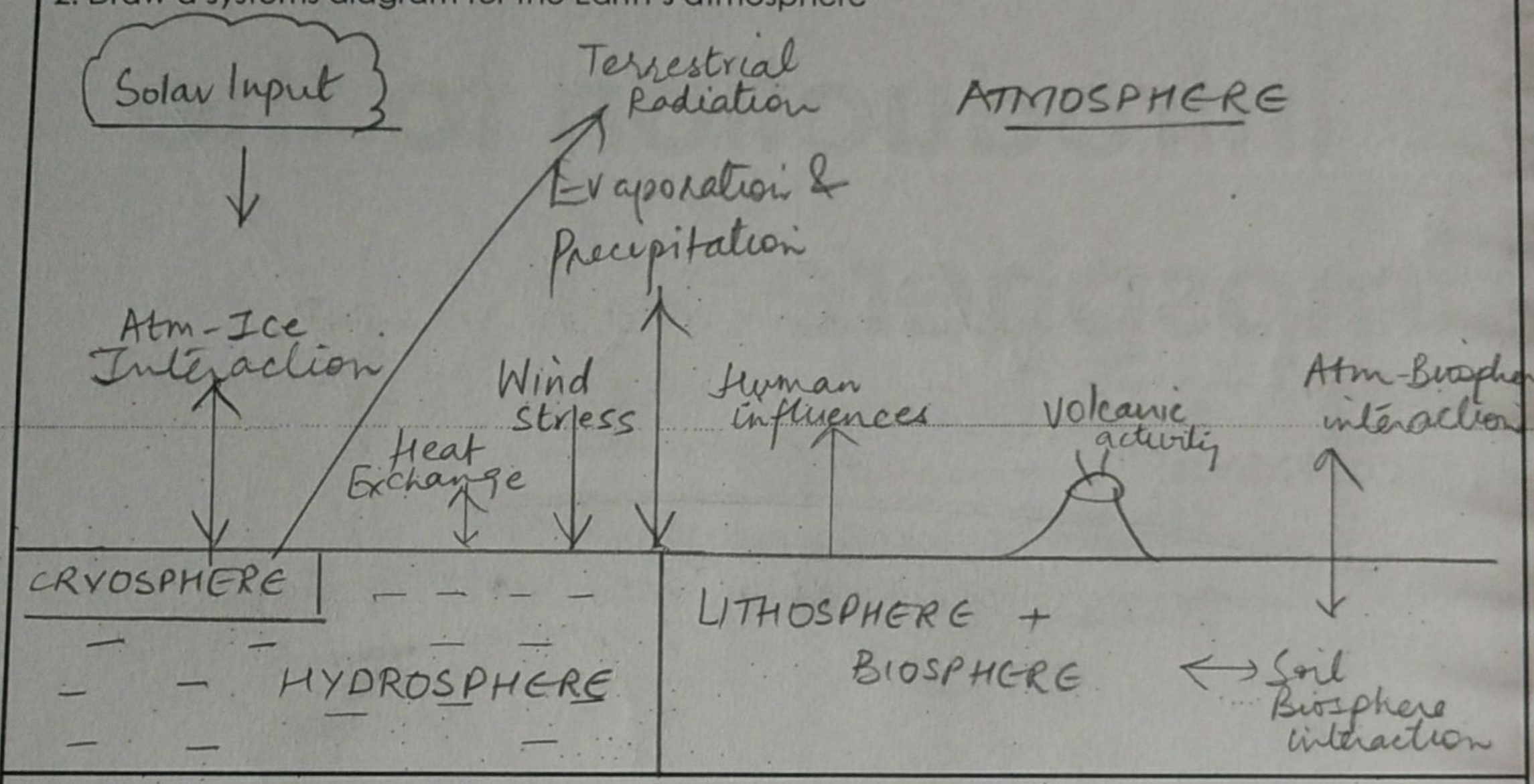
The behaviours, structure and composition of the atmosphere influence variations in all ecosystems.

Structure of the Atmosphere

1. Outline why the atmosphere can be considered a "dynamic system"

Has inputs, outputs, flows & storages that have undergone changes in geological time with changes in the concentration of atm. gases such as O_2, CH_4, CO_2, water vapour (H_2O↑).

2. Draw a systems diagram for the Earth's atmosphere



3. Outline the vertical structure of the atmosphere.

(Hints: include the temperature and pressure changes with altitude. Remember to name the different sections.)

The troposphere is the lowest part of the atm. The next upper part of the atm is the stratosphere. It is separated from the troposphere by Tropopause. Above Stratosphere is mesosphere. It is separated from Stratosphere by Stratopause. The highest layer of the atm is Thermosphere. It is separated from mesosphere by Mesopause.

From earths surface to 11-12 km, temp decreases with height. Bcoz warm air rises & cool sinks, Troposphere is the location of much movement of air & thus weather changes

The Stratosphere is marked by temp. Inversion (from 11 km to 50 km) Bcoz warmer air lies above cooler air, there are a few overturnings air currents ∴ Less Mixing in Stratosphere. ∴ particles which travel from Troposphere to Stratosphere can stay aloft for years.

4. State the parts of the atmosphere (name and altitudes) in which the majority of chemical reactions relating to living organisms occur

Troposphere – 11–12 km above sea level

5. Outline factors that have influenced atmospheric composition over geological time

Note: "Geological time" suggests that human-related effects are not relevant here.

Geological factors :- Volcanoes, forest fires

6. Outline what is meant by the term "albedo effect"

Albedo - fraction of light that is reflected by a surface.
eg: Clouds have ↑ albedo effect / Ice has ↑ Albedo.
Soil has ↓ albedo effect

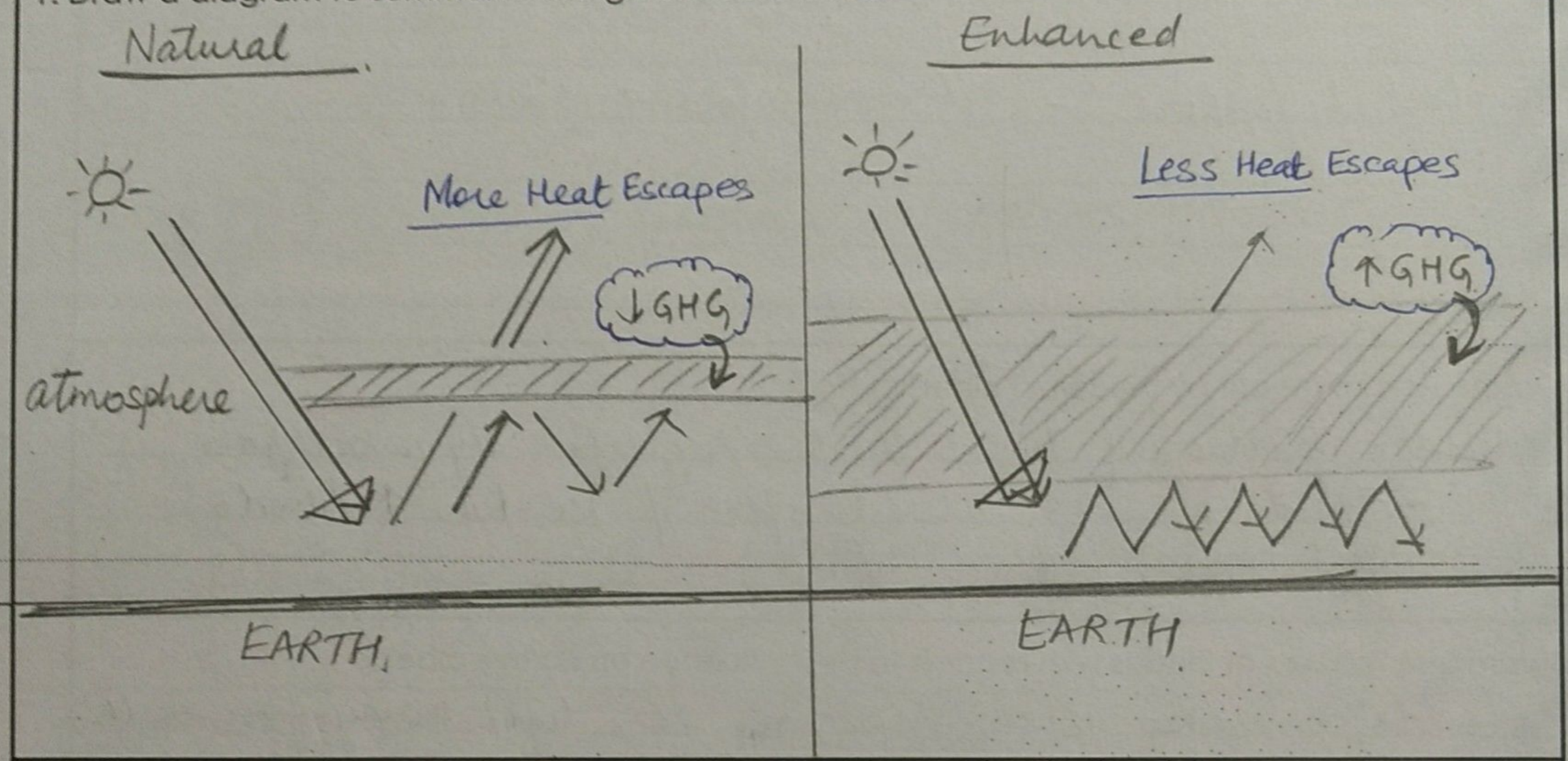
7. Summarise the role of clouds with regards to their influence on Earth's albedo

Clouds increase albedo, reflecting more light away from earth (especially: cumulonimbus cloud i.e dense cloud). ∴ Temp. falls & rates of evaporation fall

The greenhouse effect and human influences on the atmosphere

Before you go any further, be clear of one thing: "the greenhouse effect" is not a bad thing. The greenhouse effect maintains a suitable temperature on Earth for living organisms. The *enhanced* greenhouse effect, which results in global warming, has potential disastrous consequences, however. Don't use "greenhouse effect" and "global warming" interchangeably; they are not the same thing. Unfortunately, it is common to see these two phrases mixed up in the media.

1. Draw a diagram to summarise the greenhouse effect



2. Describe the ways in which human activities are influencing the atmosphere. Use the subheadings to guide your answer.

Carbon dioxide concentration

Burning fossil fuels (coal, oil, natural gas)
Deforestation - Not only adds CO_2 to atm, but removes trees that convert CO_2 into O_2.

Ozone levels

Manmade chemicals - Ozone Depleting Substances (ODS) eg CFC, HCFC, Methyl bromide (Pesticide) & NOx (NOx breakdown product react to form Tropospheric O_3) *

Water vapour (Hint: think about feedback cycles)

When we heat planet, the ability of atm to hold moisture increases ie More water vapour → which is a GHG & it amplifies the warming effect ie Positive feedback.

* $NO + O_2 \rightarrow NO_2 \xrightarrow{s/l} NO + O$; $O + O_2 \rightarrow O_3$