

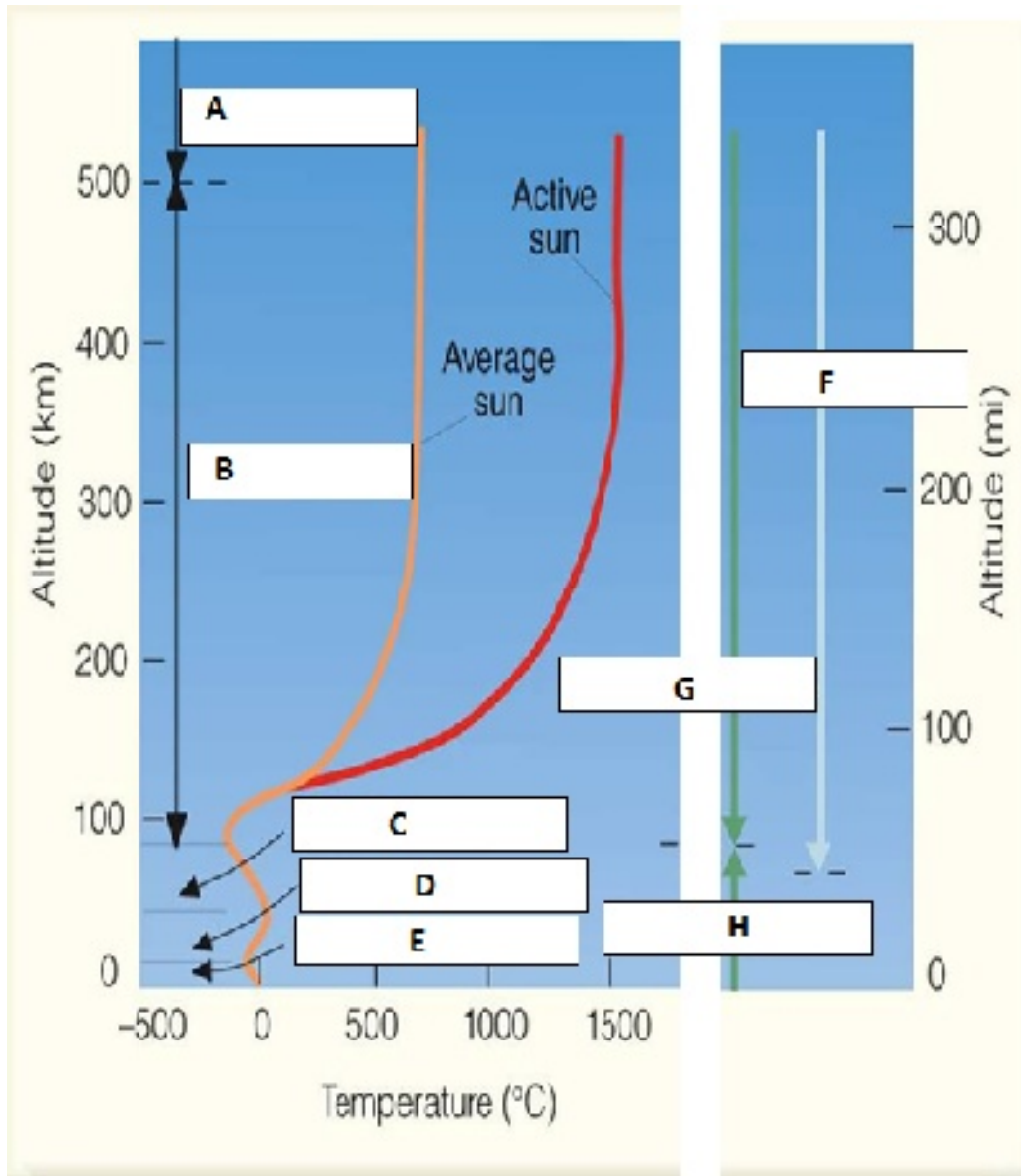
ATMOSPHERE written test IESO 2011

Name _____ Country _____

1) The diagram bellow showed the average structures of the atmosphere based on its properties i.e. temperature, molecular bond and electrical. Match the letter in the boxes with right option from the list given bellow.

- | | | | |
|----------------|-----------------|-----------------|---------------|
| 1. Homosphere | 2. Heterosphere | 3. Ionosphere | 4. Exosphere |
| 5. Troposphere | 6. Stratosphere | 7. Thermosphere | 8. Mesosphere |

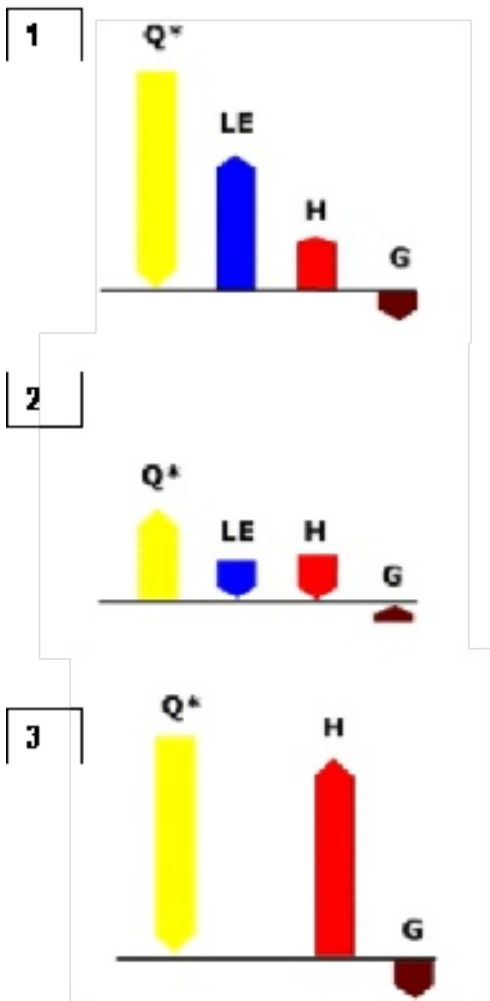
. _/2 (0,25 x 8)



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2) Consider the following figure where are reported the surface energy balance terms for different surface and day/night conditions. _/3 pt.

- Q* = net radiation
- LE = latent heat flux
- H = sensible heat flux
- G = soil heat flux



Choose the correct surface description for each case:

- 1)
 - a) moist surface-day
 - b) moist surface-night
 - c) dry surface-day
 - d) dry surface-night

- 2)
 - a) moist surface-day
 - b) moist surface-night
 - c) dry surface-day
 - d) dry surface –night

- 3)
 - a) moist surface-day
 - b) moist surface-night
 - c) dry surface –night
 - d) dry surface-day

3) Which two gases are responsible for the absorption of very shortwave (e.g., ultraviolet) incoming solar radiation? **/1 (0,5 x 2)**

- 1) molecular oxygen
- 2) ozone
- 3) carbon dioxide
- 4) water vapour
- 5) nitrogen

4) Join with lines the surface types with the corresponding surface albedo **/1. (0.25 x 4)**

| | |
|------------|---------|
| Fresh snow | 0-10 % |
| Soil | 22-35 % |
| Water | 80-90% |
| Crops | 18-23 % |

5) The following images represent different kinds of clouds.



Join with lines the images (from A to D) with the cloud type classification: **/1 pt. (0,25 x 4)**

- | | |
|---|--------------|
| A | STRATUS |
| B | CUMULUS |
| C | CUMULONIMBUS |
| D | CIRRUS |

6) What is the frictional effect on the geostrophic wind? **/1 pt.**

- A) In the northern hemisphere the effect of the friction is to deflect the wind in direction of high pressure
- B) In both hemispheres the effect of the friction is to deflect the wind in direction of low pressure
- C) In the southern hemisphere the effect of the friction is to deflect the wind in direction of high pressure
- D) In both hemispheres the effect of the friction is to deflect the wind in direction of high pressure

7) An aircraft departs from A (airfield elevation 1700ft) with QFE 960 hPa set. The altimeter is not reset. When landing at B (airfield elevation 2700ft), the QNH is 1005 hPa. What will the altimeter read? **_/3 pt**

Assume that 1hPa is equivalent to 27ft and remember that

QNH = atmospheric pressure at sea level

and

QFE = atmospheric pressure at field elevation

A) 1700 ft

B) 1000 ft

C) 1485 ft

D) 2700 ft

8) With a classical warm front there are: **_/1 pt.**

A) high cloud with no precipitation

B) cumulus and cumulonimbus

C) no significant cloud

D) high cloud, middle cloud, mostly stratiform cloud, and light/moderate rainfall

9) According to the three cell general circulation model, in which direction do winds blow in the upper troposphere in the tropics in the northern hemisphere? **_/1 pt.**

A) From SW

B) From S

C) From W

D) From SE

10) The increasing of the Earth's rotation velocity could most likely lead to **_/1 pt.**

A) decreasing number of circulation cells

B) increasing number of circulation cells

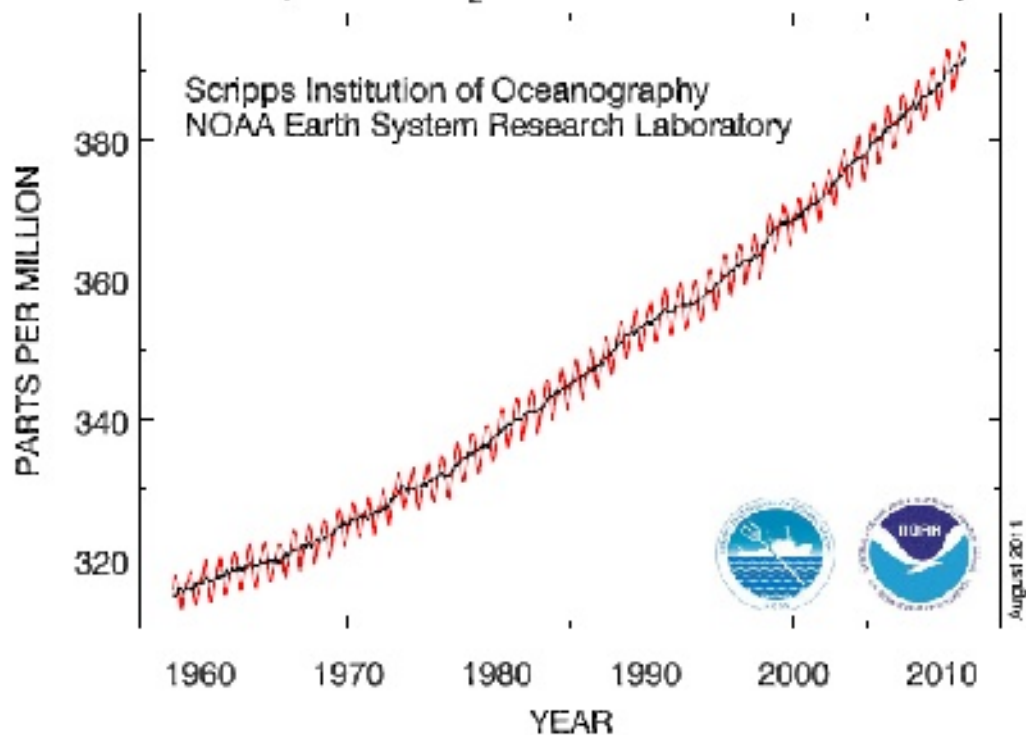
C) no change in the number of circulation cells

11) Graph 1 describes data of atmospheric CO₂ concentration measurements from Mauna Loa, Hawaii.

Which of the following Earth systems and processes are responsible for the increase in CO₂ concentration in the atmosphere during the period described in the graph? **_/1 pt.**

- CO₂ from the geosphere to the atmosphere by volcanic activity.
- CO₂ from the geosphere to the hydrosphere and the atmosphere by erosion.
- CO₂ from the biosphere to the atmosphere and hydrosphere by respiration.
- CO₂ from the hydrosphere to the atmosphere by diffusion.
- CO₂ from the geosphere and the biosphere to the atmosphere by anthropogenic activity.
- CO₂ from the geosphere and the hydrosphere to the atmosphere as a result of global warming.

Graph 1: Atmospheric CO₂ at Mauna Loa Observatory



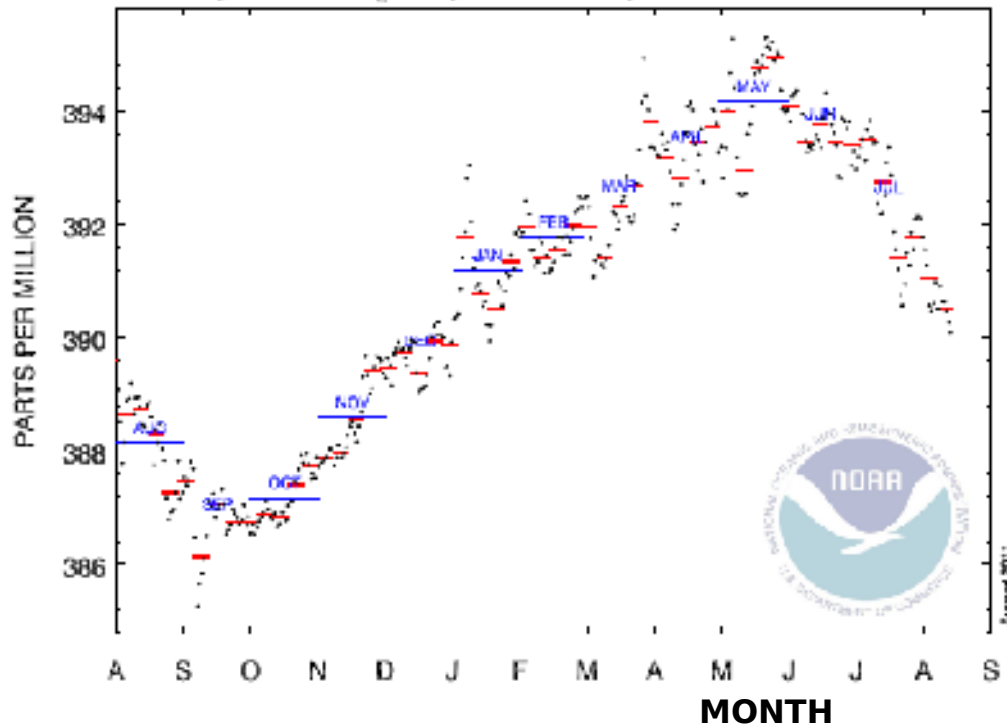
From: Earth system research laboratory (<http://www.esrl.noaa.gov>)

12) Graph 2 describes the annual changes of atmospheric CO₂ concentration. The data shown indicates a minimal concentration in October and maximal in June. The reason for that change is: /1 pt.

- Increased CO₂ flux from the geosphere to the atmosphere as a result of change in fossil fuel consumption between summer and winter.
- CO₂ flux between the atmosphere and the hydrosphere as a result of temperature differences.
- CO₂ flux between the atmosphere and the hydrosphere as a result of wind speed and direction.

- d. CO₂ flux between the atmosphere and the biosphere as a result of changes in photosynthesis activity.
- e. CO₂ flux between the atmosphere and the biosphere as a result of forest fires.
- f. Changes in CO₂ flux between the geosphere and the atmosphere as a result of changes in sedimentation rates.

Graph 2: One year of CO₂ daily and weekly means at Mauna Loa



From: Earth

system research laboratory (<http://www.esrl.noaa.gov>)

13) Many scientists conclude that the increase in atmospheric CO₂ concentration is a major factor in global warming. The results of continuous monitoring of atmospheric CO₂ concentration indicates that some CO₂ from the atmosphere is absorbed by the oceans. What would happen if CO₂ in the atmosphere increases? (Mark all correct answers) **_/3 pt. (0,30 x 10)**

Hydrosphere:

- a. The pH of ocean water will become higher / lower
- b. The temperature of ocean water will increase / decrease
- c. The amount of sea-ice in the Arctic will increase / decrease
- d. Ocean capacity to absorb CO₂ will increase / decrease

Biosphere

- e. The amount of organisms with carbonate skeleton will increase / decrease
- f. The distribution of marine organisms will change as result of the changes in water temperature. True / false.
- g. The change in water pH will expand / reduce coral reefs

Geosphere

- h. The changes in ocean temperature will affect volcanic activity in ocean ridges. . True / false.
- i. The changes in ocean water pH will increase / decrease the rate of CaCO_3 sedimentation in the continental shelf.
- j. The changes in ocean water pH will increase / decrease the rate of CaCO_3 sedimentation below the Calcium Carbonate Compensation Depth (CCD). True/false

TOT. PT. = 20