Name: _____

Date: _____

Class: _____

IB ESS

2.4 Biomes, Zonation and Succession

Significant Ideas:

Climate determines the type of biome in a given area although individual ecosystems may vary due to many local abiotic and biotic factors.

Succession leads to climax communities that may vary due to random events and interactions over time. This leads to a pattern of alternative stable states for given ecosystems.

Ecosystem stability, succession and biodiversity are intrinsically linked.

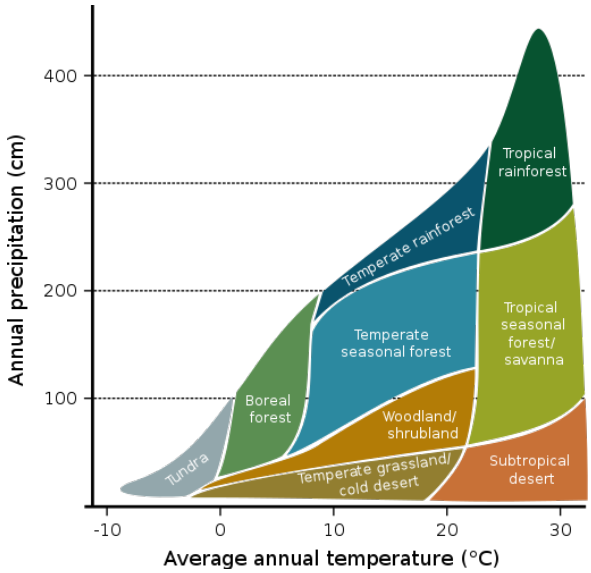


Image: Navarras (CC0)
https://upload.wikimedia.org/wikipedia/commons/6/68/Climate_influence_on_terrestrial_biome.svg

Biomes and Their Distribution

1. Define "biome".

2. There are lots of types of biome but they can be grouped into five major classes. List them.

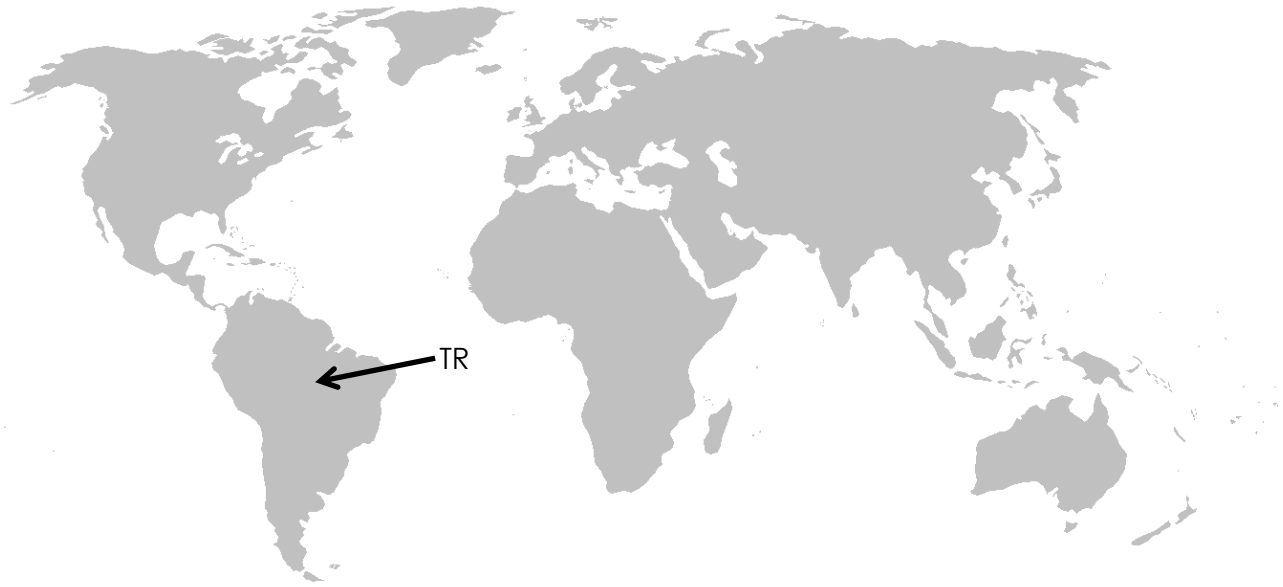
3. The distribution of biomes is largely affected by productivity, which is influenced by photosynthesis. State how the following climatic variables affect the rate of photosynthesis

Climate Variable	Effect on photosynthesis
Insolation	
Temperature	
Precipitation	

4. What else, apart from climate, can influence the distribution of biomes.

5. State the type of biome of the area that you currently live in.

6. On the world map below, label **one** example of **each** biome. Name the nation and/or region that you have labeled in each case. Complete the details in the table. One has been done as an example.



Label	Biome	Name	Nation/region
TR	Tropical Rainforest	The Amazon	Brazil
S			
D			
P/HI			
C			
TG			
TDF			
CF			
Tu			

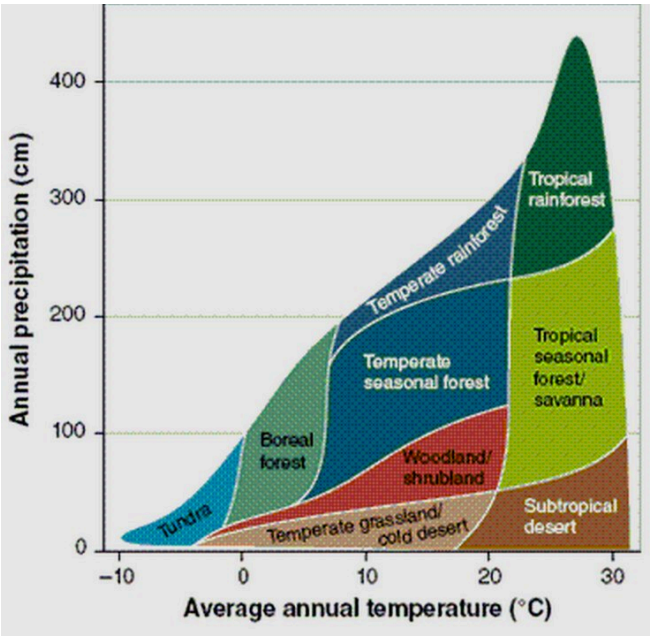
Factors Influencing Biomes

1. Without taking seasonal changes into account, <u>describe</u> how latitude affects insolation and temperature.

2. With the help of a diagram, **explain** the changes described above.

Hint: solar zenith angle

3. The diagram below shows the relationship between temperature, precipitation and biomes.



Show your working for these questions. What precipitation and temperature values will result in...

i) ***A tropical rainforest***

Precip. Range: _____

Temp. Range: _____

ii) ***Tundra***

Precip. Range: _____

Temp. Range: _____

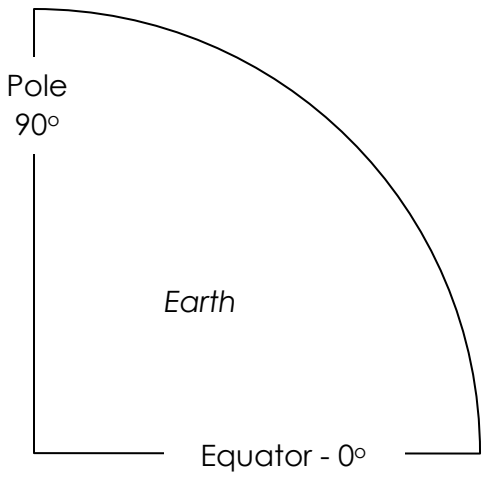
Image ref: https://en.wikipedia.org/wiki/Biome#/media/File:PrecipitationTempBiomes.jpg (Creative Common 0 license)

4. Precipitation to evaporation ratios (P/E) influence soil conditions. Explain why...

a) ...a high P/E results in low soil fertility:

b) ...a low P/E results in salinization of soil:

5. Complete the diagram below to represent the tri-cellular model of atmospheric circulation. **Label** your diagram.



6. With reference to the tri-cellular model, summarise what is happening in terms of air movement and precipitation at the following places:

Location	Air/precipitation
ITCZ	Warm air rises. Water condenses as it rise so there is high amount of precipitation
Between 90° and 60°	
At 60°	
Between 60° and 30°	

7. Most scientists agree that the global climate is changing. As a result, biomes are moving.

a) Outline the changes that are occurring worldwide as a consequence of global climate change.

b) Briefly explain the ways some species are moving in response to climate change.

c) Summarise the limits to species movement and migration.

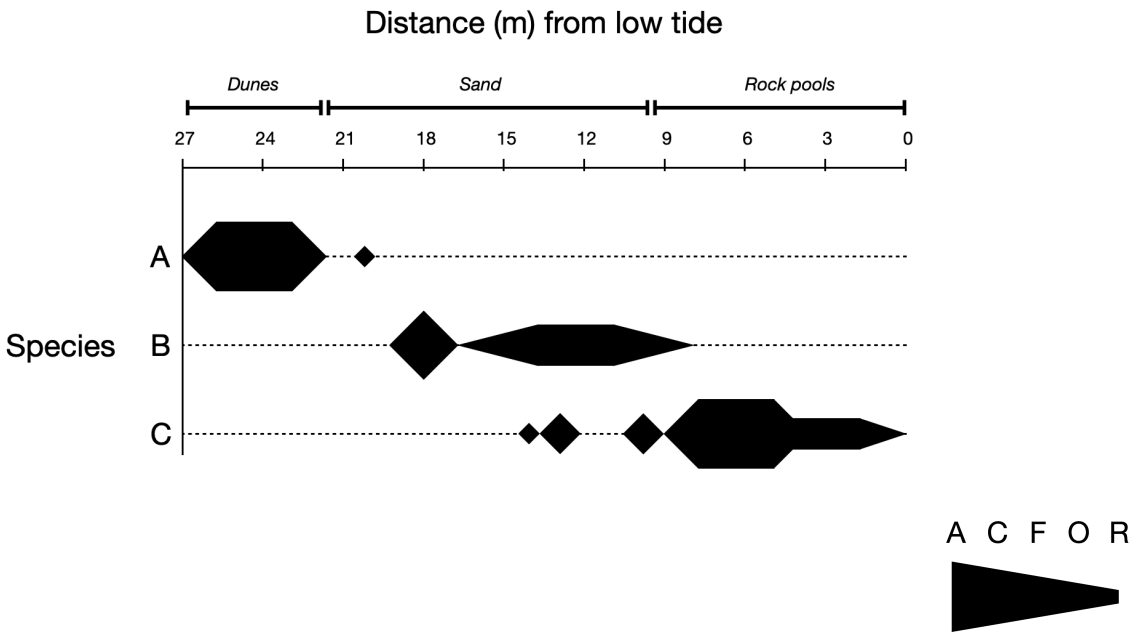
Zonation

1. Define "Zonation":

2. Complete the table below to show the factors that vary with altitude and how they vary. One of them has been completed for you.

Factor	How it varies
Temperature	*Decreases as altitude increases.*

3. Kite diagrams are an effective way to show how species abundance changes along an environmental gradient. Use the kite diagram below to answer the questions



a) State which species is most abundant in rock pools

_____

b) State which species is present furthest from the shoreline

_____

c) Using the ACFOR scale, state the maximum abundance of the following species in the specified location:

Species	Location	Abundance (ACFOR)
A	Sand	
B	Sand	
C	Sand	
A	Rock pools	

Succession

1. State what is meant by the term "succession" of an ecosystem.

2. Distinguish between primary and secondary succession.

3. Give 2 circumstances in which primary and secondary succession may occur.

Circumstances in which primary succession may occur	Circumstances in which secondary succession may occur

(For the following two questions, think carefully about what the command words are asking for).

4.

a) **Describe** the changes in both NPP and GPP that occur throughout succession.

b) **Explain** the changes in both NPP and GPP that occur throughout succession.

5. Complete the boxes to show the stages of primary succession

Stage	Terrain/soil	Biota
Bare surface	No real soil. Only mineral particles.	None.
Stage 1: colonization		Pioneer species. R-selected species, small in size with short life cycles and rapid growth.
Stage 2: Establishment		
Stage 3: Competition		
Stage 4: Stabilisation		
Climax community		

6. Outline how the following change throughout succession

NPP	
GPP	
Productivity:Respiration ratio	
Soil depth	
Complexity of ecosystem	
Energy flow	
Average organism size	

7. The specific climax community that is formed from succession will vary. Explain why this is.

8. a) List the ways in which humans can disrupt the process of succession.

b) When succession is disrupted, the system may recover quickly or slowly from the disruption, depending on its resilience. Explain what is meant by ecosystem resilience.