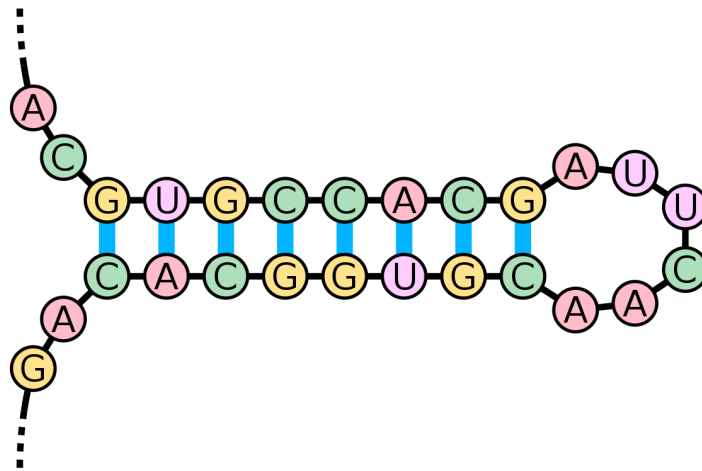


1. Kary Mullis was an American biochemist who won the Nobel Prize in Chemistry in 1993 for his invention of the polymerase chain reaction technique (PCR). PCR allows for rapid amplification of DNA sequences which are important in many medical diagnostics to identify disorders, bacteria and viruses. For example, in the COVID-19 pandemic, PCR plays an essential role in helping to detect if a person carries the coronavirus.

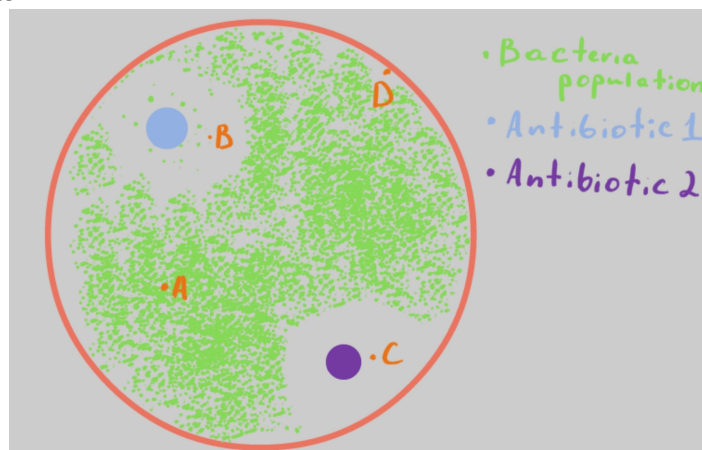
To amplify the DNA sequences using PCR, RNA primers are required. When designing RNA primers for PCR, one must take note to **avoid** the possibility of formation of hairpin loops of the RNA primers. Hairpin loops are formed when the bases in the RNA primer sequences are complementary and bind with itself, forming a hairpin-shaped loop.



Which of the following RNA primers can be used in PCR?

- A. 5'-GGUACGGGUAACC-3'  
B. 5'-ACGUACAGAGUACGU-3'  
C. 5'-AAAAACCGCGUUUUU-3'  
D. 5'-AUAAAUAGAGCCGGA-3'

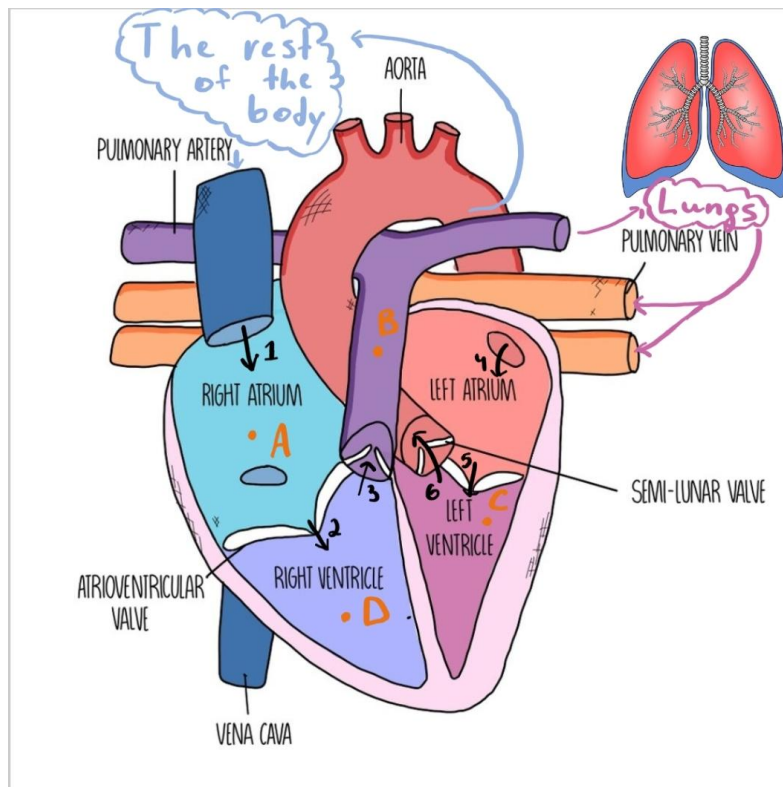
2. Scientists tested the action of two antibiotics on the population of bacterias. They put two drops of antibiotics into the petri dish and left it for 24 hours. After that experiment, two antibiotics showed the following results:



Scientists are aimed to find a bacteria that has resistance against antibiotics. In which region do those bacteria exist?

- A. A
- B. B
- C. C
- D. D

3. The diagram below shows the cardiac cycle of human:

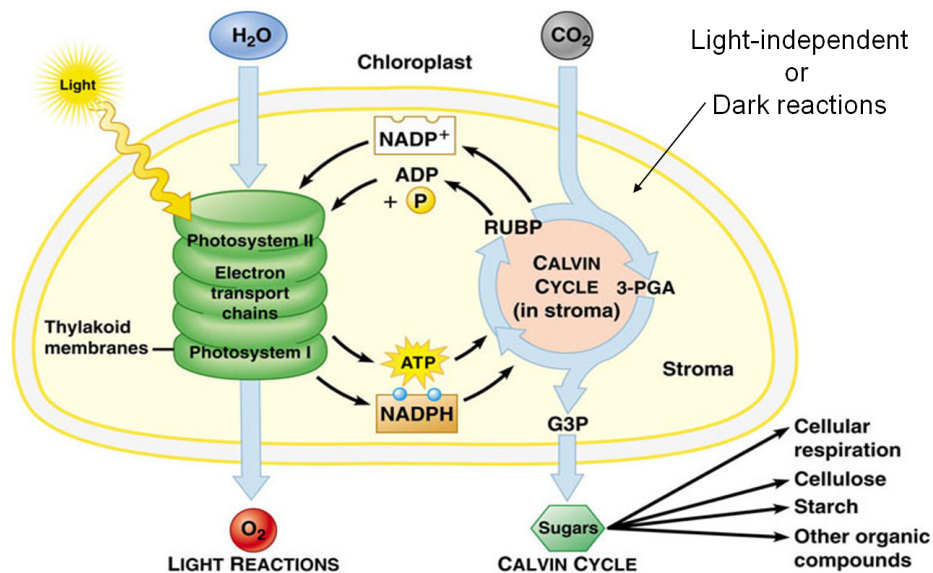


In which region, does oxygenated blood flow?

- A. A
- B. B
- C. C
- D. D

4. The diagram below represents light-dependent (on the left) and light-independent (on the right) reactions of the photosynthesis:

### Photosynthesis summary

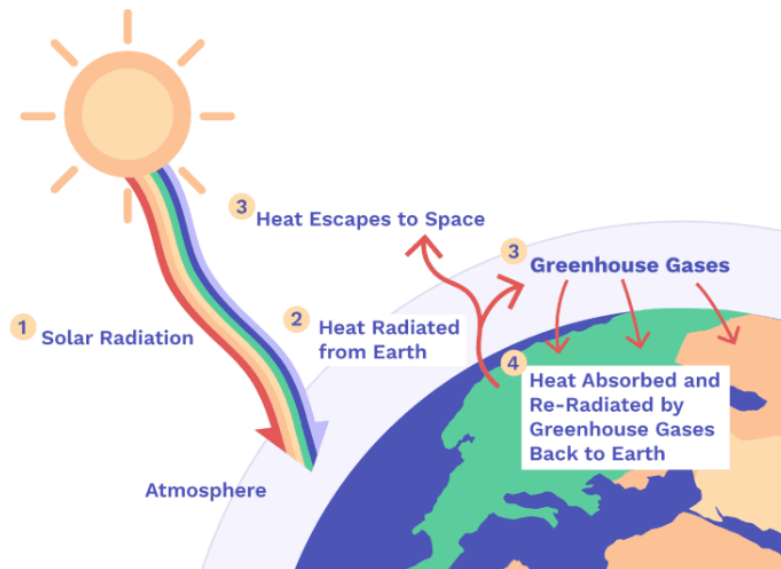


The plant was not receiving the sun rays for 3 days. Do light-independent reactions still occur in that plant and why?

- A. No, because it requires ATP and NADPH that comes from the light-independent reactions
- B. No, because it requires sun rays
- C. Yes, because it requires CO<sub>2</sub>, which is still coming to the plant
- D. Yes, because it may replace ATP with ADP

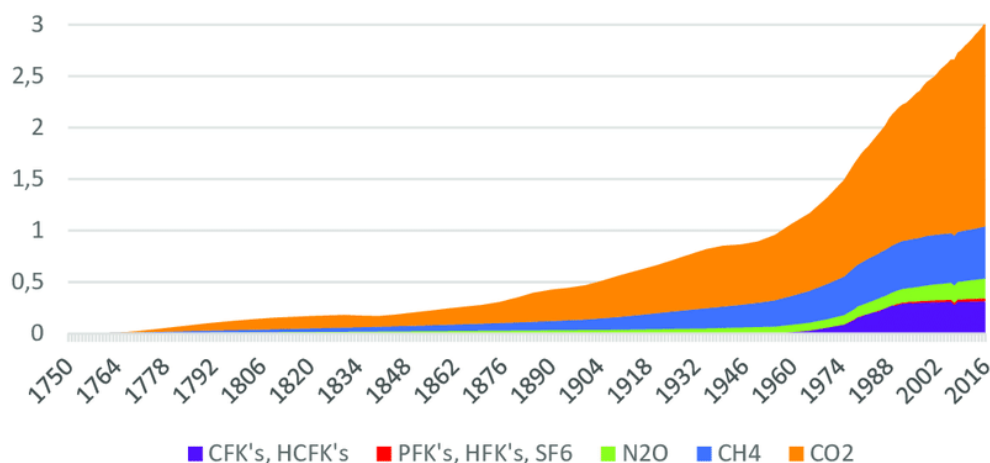
5. Greenhouse effect is the natural process that warms the Earth's surface. Sun rays reach the surface and reflect. Some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases. The absorbed energy warms the atmosphere and the surface of the Earth.

## The Greenhouse Effect



In the last three centuries, the amount of greenhouse gasses in the atmosphere dramatically increased, which led to the increasing average temperature on the Earth and melting glaciers. The diagram below represents the changes of the amount of greenhouse gasses with a pass of time:

Concentrations of greenhouse gases in the global atmosphere since 1750



Which factor mostly affected the greenhouse effect situation in the 21<sup>st</sup> century?

- A. Using oil as a fuel
- B. High volcanic activity
- C. Plastic waste
- D. Air pollution from factory waste

## Answers

1. D
2. B
3. C
4. A
5. A