

You have exactly 25 minutes to finish this quiz. Please show all work. This quiz is worth 5 points. Please, don't just repeat the question in your writing.

1. In the list below I have provided one mechanism to concentrate prebiotic molecules in water, provide 3 additional mechanisms in nature that could have concentrated prebiotic molecules for subsequent chemical evolution leading to the origin of life. **What is a natural geological context that you would find them in? That is, give me an example of where you would look in nature to find such mechanisms operating (even now).**

a. **Membranes:** by foaming via wave action acting on surface films on the ocean causing small bubbles to form.

b. **Eutectic Freeze-out:** such as in a freezing lake or glacial environment.

c. **Adsorption:** as in the attachment of chemical compounds to mineral surfaces (e.g. clays or clay interlayers).

d. **Evaporation:** such as in a drying lake, lagoon or beach.

2. The earliest atmosphere of the Earth (4.4 – 3.5 Ga) **was dominated by what gases?** (circle one; gases are listed here in terms of decreasing relative abundance).

A. Methane (CH₄), Ammonia (NH₃), Hydrogen (H₂), Helium (He)

B. Carbon monoxide (CO), Nitrogen (N₂), Water vapor (H₂O), Ethane (C₂H₆)

C. Sulfur (S₈), Phosphoric acid (H₂PO₄), Oxygen (O₂), Nitrogen (N₂), Carbon (C), Hydrogen (H₂)

D. Carbon dioxide (CO₂), Water vapor (H₂O), Nitrogen (N₂)

E. Nitrogen (N₂), Oxygen (O₂), Argon (Ar), Water vapor (H₂O)

3. (*Ultra-short answer, 2 sentences*) From question #3 (above), **how** can we surmise the composition of the early atmosphere of the Earth?

The present-day composition of gases from volcanoes on the Earth are dominated by these compounds and presumably were the same early on. I will also accept that Venus and Mars have atmospheres like "D" above, which provides clues about an abiotic Earth atmosphere.

4. (Short answer) A widely accepted model for the formation of the Earth's Moon invokes a glancing collision of a Mars sized body with the Earth during its earliest history. **Name two lines of evidence have been used to support the catastrophic model of the formation of our Moon along with a one sentence explanation for each.**

Here in this question, I was looking for reference to at least two of the following:

Earth and Moon have the same bulk composition

Both planets have the same age which is slightly LESS than meteorites (D/N ratios are the same)

Numerical models have been used to explain the formation of the Moon

Isotopic compositions of oxygen are the same for both planetary bodies

