Thermosphere Composition

The thermosphere is primarily composed of **atomic oxygen (O), atomic nitrogen (N), and helium (He)**, with atomic oxygen becoming the dominant gas in the upper thermosphere due to the dissociation of molecular oxygen by solar radiation at high altitudes; essentially, the main gases in the thermosphere are the lighter elements like hydrogen, helium, and atomic oxygen, resulting from the breakdown of heavier molecules like nitrogen and oxygen. [[1](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.), [2](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.), [3](https://heliophysics.ucar.edu/sites/default/files/heliophysics/resources/presentations/2021-HelioSS-Zou-Ionosphere-Basics-Dynamics.pdf), [4](https://homework.study.com/explanation/what-gases-are-found-in-the-thermosphere.html)]

**Key points about the thermosphere composition: [**[**1**](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.)**,** [**2**](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.)**,** [**3**](https://heliophysics.ucar.edu/sites/default/files/heliophysics/resources/presentations/2021-HelioSS-Zou-Ionosphere-Basics-Dynamics.pdf)**]**

* **Dominant gas:** Atomic oxygen (O) [[1](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.), [2](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.), [3](https://heliophysics.ucar.edu/sites/default/files/heliophysics/resources/presentations/2021-HelioSS-Zou-Ionosphere-Basics-Dynamics.pdf)]
* **Other significant gases:** Atomic nitrogen (N) and helium (He) [[1](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.), [2](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.), [4](https://homework.study.com/explanation/what-gases-are-found-in-the-thermosphere.html)]
* **Reason for composition:** High energy solar radiation breaks down heavier molecules like O2 and N2 into their atomic components [[1](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.), [2](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.), [3](https://heliophysics.ucar.edu/sites/default/files/heliophysics/resources/presentations/2021-HelioSS-Zou-Ionosphere-Basics-Dynamics.pdf)]
* **Important factor:** The composition varies depending on altitude, with lighter gases becoming more prevalent at higher altitudes [[1](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.), [2](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.), [5](https://en.wikipedia.org/wiki/Thermosphere)]

*Generative AI is experimental.*

[1] [https://scied.ucar.edu/learning-zone/atmosphere/thermosphere](https://scied.ucar.edu/learning-zone/atmosphere/thermosphere#:~:text=Atomic%20oxygen%20(O)%2C%20atomic%20nitrogen%20(N)%2C%20and,the%20types%20of%20chemical%20elements%20they%20contain.)

[2] [https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/thermosphere#:~:text=The%20thermosphere%20is%20the%20atmospheric%20region%20from,to%20%E2%88%BC500%20km%20altitude%2C%20containing%20the%20ionosphere.&text=The%20composition%20of%20the%20lower%20thermosphere%20is,photodissociation%20and%20molecular%20diffusion%20at%20high%20altitude.)

[3] <https://heliophysics.ucar.edu/sites/default/files/heliophysics/resources/presentations/2021-HelioSS-Zou-Ionosphere-Basics-Dynamics.pdf>

[4] <https://homework.study.com/explanation/what-gases-are-found-in-the-thermosphere.html>

[5] <https://en.wikipedia.org/wiki/Thermosphere>

*Not all images can be exported from Search.*