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## Vocabulary Builder Reference from...

*Garik Israelian: How spectroscopy could reveal alien life | TED Talk*

[https://www.ted.com/talks/garik\\_israelian\\_how\\_spectroscopy\\_could\\_reveal\\_alien\\_life](https://www.ted.com/talks/garik_israelian_how_spectroscopy_could_reveal_alien_life)

### Advanced Words Only

#### IMPORTANT

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## Session 1: Word List

### spectroscope

*n.* an optical instrument used for spectrographic analysis (= measurement of properties of light over a specific portion of the electromagnetic spectrum)

(1) infrared **spectroscope**, (2) Fourier **spectroscope**

An X-ray **spectroscope** can determine the composition of the elements in a sample.

### nebula

*n.* a cloud of gas and dust in space, visible in the night sky, typically as a diffuse light source

*synonym*: cloud, mist, stardust

(1) a spiral **nebula**, (2) emission **nebula**

The galactic **nebula** was a beautiful sight through the telescope, with its vibrant colors and swirling clouds.

### dedicate

*v.* to give all of your energy, time, etc., entirely to a specific person, activity, or cause; to set apart for a particular purpose or use

*synonym*: consecrate, devote, commit

(1) **dedicate** a few hours, (2) **dedicate** a chapter to the subject

He **dedicated** his life to helping others.

## isotope

*n.* a variation of an element that has the same number of protons in its nucleus but a different number of neutrons, resulting in a different atomic mass and often different physical or chemical properties

*synonym*: variant, nuclide, radioisotope

(1) radioactive **isotope**, (2) stable **isotope**

The **isotope** carbon-14 is commonly used in radiocarbon dating of fossils.

## asteroid

*n.* (also "planetoid") a small rocky body orbiting the sun, typically in the region between Mars and Jupiter

*synonym*: minor planet, planetoid, rocky planetesimal

(1) **asteroid** mining, (2) **asteroid** explorer

Scientists are studying the composition and origins of the **asteroid** belt to understand the early solar system better.

## engulf

*v.* to swallow up; to surround and cover completely

*synonym*: swallow, submerge, inundate

(1) **engulf** the politician, (2) **engulf** in water

The fire quickly **engulfed** the entire building.

## astronomer

*n.* a physicist who studies astronomy

*synonym*: stargazer, cosmologist, astrophysicist

(1) amateur **astronomer**, (2) solar **astronomer**

This question has fascinated solar **astronomers** for decades.

## spectrograph

*n.* an instrument that separates light into its component wavelengths and records the distribution of intensities as a graph, used for chemical analysis or to determine the properties of stars and galaxies

*synonym*: spectrometer, spectroscope, instrument

(1) **spectrograph** analysis, (2) acoustic **spectrograph**

The **spectrograph** data showed that the element was composed of multiple spectral lines.

## Kelvin

*n.* a unit of measurement for temperature in the International System of Units (SI), which starts at

absolute zero, the theoretical lowest limit of temperature, and named after the British physicist William Thomson, also known as Lord Kelvin

*synonym* : K, degree

(1) **Kelvin** scale, (2) **Kelvin** measurement

The scientist cooled the sample to just a couple of **Kelvin** to observe quantum effects.

## osmium

*n.* a hard, dense, and brittle chemical element of the platinum group with the symbol Os and atomic number 76, primarily used in alloys and as a catalyst

*synonym* : Os

(1) **osmium** metal, (2) **osmium** tetroxide

The scientist conducted experiments to study the catalytic properties of **osmium** compounds.

## supernova

*n.* a powerful and luminous explosion that occurs in some stars, resulting in an extremely bright, short-lived object that later fades into a supernova remnant

*synonym* : explosion, detonation, blast

(1) extragalactic **supernova**, (2) **supernova** remnant

The **supernova** explosion created a bright new star in the night sky.

## polluted

*adj.* contaminated with harmful or poisonous substances

*synonym* : contaminated, poisoned, unclean

(1) **polluted** air, (2) cadmium- **polluted** area

The river was **polluted** with chemicals, causing harm to the wildlife.

## galactic

*adj.* relating to or concerning the galaxy or galaxies; having characteristics or qualities that are vast, extensive, or cosmic in scope

*synonym* : cosmic, celestial, enormous

(1) **galactic** scale, (2) a **galactic** system

The Milky Way is a **galactic** collection of billions of stars and

planets.

## flare

*v.* to burn brightly with a sudden, intense burst of flame or light; (noun) a sudden and brief burst of bright flame or light; a sudden and intense burst of radiation from the Sun's surface

*synonym*: blaze, ignite, light up

(1) **flare** up into a major crisis, (2) the **flare** of a match  
The Sun **flared** and caused a sudden brightening in the sky.

## recycle

*v.* to sort and collect things to process them and produce valuable materials that can be used again

*synonym*: reclaim, reuse, reprocess

(1) **recycle** the cardboard boxes, (2) **recycle** milk packaging into new paper

We largely **recycle** the circuit board of cell phones because they contain a lot of valuable metals.

## interstellar

*adj.* relating to or located in the space between stars

*synonym*: galactic, cosmic, intergalactic

(1) **interstellar** communication, (2) **interstellar** space

The **interstellar** medium comprises gas, dust, and cosmic rays that fill the space between stars.

## centimeter

*n.* a unit of measurement of length in the metric system, equivalent to one-hundredth of a meter

(1) **centimeter** measurement, (2) thirty **centimeters** tall

The room was only one **centimeter** wider than the piano, making it a tight fit.

## codex

*n.* a manuscript book, especially one written in the medieval period, before the invention of printing

*synonym*: manuscript, tome, document

(1) **codex** manuscript, (2) medieval **codex**

The archaeologists found a **codex** buried alongside a mummy in an underground tomb.

## seismology

*n.* the scientific study of earthquakes and the behavior of seismic waves that occur within the Earth's crust, as well as the structure and dynamics of the Earth's interior

*synonym* : earthquake science, seismic study, tremor analysis

(1) **seismology** research, (2) **seismology** data

The institute invested in advanced **seismology** equipment to better monitor underground vibrations.

## infrasonic

*adj.* relating to sound waves below the range of human hearing, typically below 20 Hz

*synonym* : inaudible, subsonic

(1) **infrasonic** sensor, (2) **infrasonic** electronic waves

**Infrasonic** waves can be used for communication, such as in long-range submarines.

## tectonic

*adj.* relating to the structure of the Earth's crust and the large-scale processes that occur as a result of movements within it

*synonym* : seismic, geologic, geological

(1) **tectonic** valleys, (2) a **tectonic** earthquake

The **tectonic** plates shifted, causing an earthquake.

## geothermal

*adj.* relating to or produced by the internal heat of the earth; often used to refer to energy produced by tapping into the natural heat of the earth

*synonym* : underground, thermal, subterranean

(1) **geothermal** activity, (2) **geothermal** drilling

The town is exploring using **geothermal** energy to power its homes and buildings.

## thorium

*n.* a radioactive chemical element with the symbol Th and atomic number 90 that is silvery-white in color and is used as fuel in some nuclear reactors

*synonym* : Th, radioactive element

(1) **thorium** deposit, (2) **thorium** reactor

Certain isotopes of **thorium** are used in medicine for treating liver cancer.

## parsec

*n.* a unit of measurement of astronomical distance equivalent to 3.26 light-years (= about 5.88 trillion miles or 9.46 trillion kilometers)

(1) distance of a **parsec**, (2) astronomical **parsec** distance

The nearest star to our planet is about 1.3 **parsecs** away.

## biomarker

*n.* a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention

*synonym*: indicator, measure, signature

(1) diabetes **biomarker**, (2) **biomarker** discovery

The **biomarker** test showed that the patient was responding well to the treatment.

## methane

*n.* a chemical compound with the chemical formula CH<sub>4</sub> with no smell or color, often used as a fuel

(1) atmospheric **methane**, (2) reduce **methane** emissions

The ignition of **methane** gas in the plant killed five employees.

## technetium

*n.* a radioactive metallic element with the atomic number 43 and the symbol Tc that has no stable isotopes and is used in medical imaging procedures and as a tracer in various scientific studies

*synonym*: Tc

(1) **technetium** scan, (2) **technetium-99m** tracer

Due to its radioactive nature, handling **technetium** materials requires strict safety protocols.

## Session 2: Spelling

1. atmospheric me\_\_\_\_\_e  
*n.* a chemical compound with the chemical formula CH<sub>4</sub> with no smell or color, often used as a fuel
2. cadmium-po\_\_\_\_\_ed area  
*adj.* contaminated with harmful or poisonous substances
3. thirty cen\_\_\_\_\_ers tall  
*n.* a unit of measurement of length in the metric system, equivalent to one-hundredth of a meter
4. de\_\_\_\_\_te a few hours  
*v.* to give all of your energy, time, etc., entirely to a specific person, activity, or cause; to set apart for a particular purpose or use
5. geo\_\_\_\_\_al activity  
*adj.* relating to or produced by the internal heat of the earth; often used to refer to energy produced by tapping into the natural heat of the earth
6. geo\_\_\_\_\_al drilling  
*adj.* relating to or produced by the internal heat of the earth; often used to refer to energy produced by tapping into the natural heat of the earth
7. ga\_\_\_\_\_ic scale  
*adj.* relating to or concerning the galaxy or galaxies; having characteristics or qualities that are vast, extensive, or cosmic in scope
8. the fl\_\_e of a match  
*v.* to burn brightly with a sudden, intense burst of flame or light; (noun) a sudden and brief burst of bright flame or light; a sudden and intense burst of radiation from the Sun's surface

ANSWERS: 1. methane, 2. polluted, 3. centimeter, 4. dedicate, 5. geothermal, 6. geothermal, 7. galactic, 8. flare

9. Fourier spe\_\_\_\_\_ope *n.* an optical instrument used for spectrographic analysis (= measurement of properties of light over a specific portion of the electromagnetic spectrum)
10. th\_\_\_\_\_m deposit *n.* a radioactive chemical element with the symbol Th and atomic number 90 that is silvery-white in color and is used as fuel in some nuclear reactors
11. fl\_\_e up into a major crisis *v.* to burn brightly with a sudden, intense burst of flame or light; (noun) a sudden and brief burst of bright flame or light; a sudden and intense burst of radiation from the Sun's surface
12. bi\_\_\_\_\_er discovery *n.* a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention
13. medieval co\_\_x *n.* a manuscript book, especially one written in the medieval period, before the invention of printing
14. Ke\_\_\_\_n scale *n.* a unit of measurement for temperature in the International System of Units (SI), which starts at absolute zero, the theoretical lowest limit of temperature, and named after the British physicist William Thomson, also known as Lord Kelvin

ANSWERS: 9. spectroscope, 10. thorium, 11. flare, 12. biomarker, 13. codex, 14. Kelvin



15. int\_\_\_\_\_lar communication      *adj.* relating to or located in the space between stars
16. os\_\_\_m metal      *n.* a hard, dense, and brittle chemical element of the platinum group with the symbol Os and atomic number 76, primarily used in alloys and as a catalyst
17. amateur ast\_\_\_\_\_er      *n.* a physicist who studies astronomy
18. Ke\_\_\_n measurement      *n.* a unit of measurement for temperature in the International System of Units (SI), which starts at absolute zero, the theoretical lowest limit of temperature, and named after the British physicist William Thomson, also known as Lord Kelvin
19. en\_\_\_f in water      *v.* to swallow up; to surround and cover completely
20. re\_\_\_\_\_e milk packaging into new paper      *v.* to sort and collect things to process them and produce valuable materials that can be used again
21. as\_\_\_\_\_id mining      *n.* (also "planetoid") a small rocky body orbiting the sun, typically in the region between Mars and Jupiter
22. int\_\_\_\_\_lar space      *adj.* relating to or located in the space between stars
23. tec\_\_\_\_\_um scan      *n.* a radioactive metallic element with the atomic number 43 and the symbol Tc that has no stable isotopes and is used in medical imaging procedures and as a tracer in various scientific studies

ANSWERS: 15. interstellar, 16. osmium, 17. astronomer, 18. Kelvin, 19. engulf, 20. recycle, 21. asteroid, 22. interstellar, 23. technetium

24. as\_\_\_\_id explorer *n.* (also "planetoid") a small rocky body orbiting the sun, typically in the region between Mars and Jupiter
25. po\_\_\_\_ed air *adj.* contaminated with harmful or poisonous substances
26. os\_\_\_\_m tetroxide *n.* a hard, dense, and brittle chemical element of the platinum group with the symbol Os and atomic number 76, primarily used in alloys and as a catalyst
27. emission ne\_\_\_\_a *n.* a cloud of gas and dust in space, visible in the night sky, typically as a diffuse light source
28. co\_\_x manuscript *n.* a manuscript book, especially one written in the medieval period, before the invention of printing
29. tec\_\_\_\_um-99m tracer *n.* a radioactive metallic element with the atomic number 43 and the symbol Tc that has no stable isotopes and is used in medical imaging procedures and as a tracer in various scientific studies
30. astronomical pa\_\_\_\_c distance *n.* a unit of measurement of astronomical distance equivalent to 3.26 light-years (= about 5.88 trillion miles or 9.46 trillion kilometers)
31. a ga\_\_\_\_ic system *adj.* relating to or concerning the galaxy or galaxies; having characteristics or qualities that are vast, extensive, or cosmic in scope
32. inf\_\_\_\_ic sensor *adj.* relating to sound waves below the range of human hearing, typically below 20 Hz

ANSWERS: 24. asteroid, 25. polluted, 26. osmium, 27. nebula, 28. codex, 29. technetium, 30. parsec, 31. galactic, 32. infrasonic

33. su\_\_\_\_\_va remnant *n.* a powerful and luminous explosion that occurs in some stars, resulting in an extremely bright, short-lived object that later fades into a supernova remnant
34. acoustic spe\_\_\_\_\_aph *n.* an instrument that separates light into its component wavelengths and records the distribution of intensities as a graph, used for chemical analysis or to determine the properties of stars and galaxies
35. en\_\_\_f the politician *v.* to swallow up; to surround and cover completely
36. a spiral ne\_\_\_a *n.* a cloud of gas and dust in space, visible in the night sky, typically as a diffuse light source
37. reduce me\_\_\_\_\_e emissions *n.* a chemical compound with the chemical formula CH<sub>4</sub> with no smell or color, often used as a fuel
38. radioactive is\_\_\_\_\_e *n.* a variation of an element that has the same number of protons in its nucleus but a different number of neutrons, resulting in a different atomic mass and often different physical or chemical properties
39. diabetes bi\_\_\_\_\_er *n.* a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention

ANSWERS: 33. supernova, 34. spectrograph, 35. engulf, 36. nebula, 37. methane, 38. isotope, 39. biomarker

40. inf\_\_\_\_\_ic electronic waves *adj.* relating to sound waves below the range of human hearing, typically below 20 Hz
41. sei\_\_\_\_\_gy research *n.* the scientific study of earthquakes and the behavior of seismic waves that occur within the Earth's crust, as well as the structure and dynamics of the Earth's interior
42. solar ast\_\_\_\_\_er *n.* a physicist who studies astronomy
43. stable is\_\_\_\_\_e *n.* a variation of an element that has the same number of protons in its nucleus but a different number of neutrons, resulting in a different atomic mass and often different physical or chemical properties
44. re\_\_\_\_\_e the cardboard boxes *v.* to sort and collect things to process them and produce valuable materials that can be used again
45. sei\_\_\_\_\_gy data *n.* the scientific study of earthquakes and the behavior of seismic waves that occur within the Earth's crust, as well as the structure and dynamics of the Earth's interior
46. te\_\_\_\_\_ic valleys *adj.* relating to the structure of the Earth's crust and the large-scale processes that occur as a result of movements within it
47. a te\_\_\_\_\_ic earthquake *adj.* relating to the structure of the Earth's crust and the large-scale processes that occur as a result of movements within it

ANSWERS: 40. infrasonic, 41. seismology, 42. astronomer, 43. isotope, 44. recycle, 45. seismology, 46. tectonic, 47. tectonic

48. spe\_\_\_\_\_aph analysis *n.* an instrument that separates light into its component wavelengths and records the distribution of intensities as a graph, used for chemical analysis or to determine the properties of stars and galaxies
49. th\_\_\_\_\_m reactor *n.* a radioactive chemical element with the symbol Th and atomic number 90 that is silvery-white in color and is used as fuel in some nuclear reactors
50. distance of a pa\_\_\_\_c *n.* a unit of measurement of astronomical distance equivalent to 3.26 light-years (= about 5.88 trillion miles or 9.46 trillion kilometers)
51. cen\_\_\_\_\_er measurement *n.* a unit of measurement of length in the metric system, equivalent to one-hundredth of a meter
52. de\_\_\_\_\_te a chapter to the subject *v.* to give all of your energy, time, etc., entirely to a specific person, activity, or cause; to set apart for a particular purpose or use
53. infrared spe\_\_\_\_\_ope *n.* an optical instrument used for spectrographic analysis (= measurement of properties of light over a specific portion of the electromagnetic spectrum)
54. extragalactic su\_\_\_\_\_va *n.* a powerful and luminous explosion that occurs in some stars, resulting in an extremely bright, short-lived object that later fades into a supernova remnant

ANSWERS: 48. spectrograph, 49. thorium, 50. parsec, 51. centimeter, 52. dedicate, 53. spectroscope, 54. supernova

ANSWERS:

## Session 3: Fill in the Blanks

1. The fire quickly \_\_\_\_\_ the entire building.  
*v.* to swallow up; to surround and cover completely
2. The \_\_\_\_\_ test showed that the patient was responding well to the treatment.  
*n.* a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention
3. The Milky Way is a \_\_\_\_\_ collection of billions of stars and planets.  
*adj.* relating to or concerning the galaxy or galaxies; having characteristics or qualities that are vast, extensive, or cosmic in scope
4. The river was \_\_\_\_\_ with chemicals, causing harm to the wildlife.  
*adj.* contaminated with harmful or poisonous substances
5. \_\_\_\_\_ waves can be used for communication, such as in long-range submarines.  
*adj.* relating to sound waves below the range of human hearing, typically below 20 Hz
6. The galactic \_\_\_\_\_ was a beautiful sight through the telescope, with its vibrant colors and swirling clouds.  
*n.* a cloud of gas and dust in space, visible in the night sky, typically as a diffuse light source
7. The ignition of \_\_\_\_\_ gas in the plant killed five employees.  
*n.* a chemical compound with the chemical formula CH<sub>4</sub> with no smell or color, often used as a fuel

ANSWERS: 1. engulfed, 2. biomarker, 3. galactic, 4. polluted, 5. Infrasonic, 6. nebula, 7. methane

8. The \_\_\_\_\_ carbon-14 is commonly used in radiocarbon dating of fossils.
- n.* a variation of an element that has the same number of protons in its nucleus but a different number of neutrons, resulting in a different atomic mass and often different physical or chemical properties
9. Scientists are studying the composition and origins of the \_\_\_\_\_ belt to understand the early solar system better.
- n.* (also "planetoid") a small rocky body orbiting the sun, typically in the region between Mars and Jupiter
10. An X-ray \_\_\_\_\_ can determine the composition of the elements in a sample.
- n.* an optical instrument used for spectrographic analysis (= measurement of properties of light over a specific portion of the electromagnetic spectrum)
11. The \_\_\_\_\_ medium comprises gas, dust, and cosmic rays that fill the space between stars.
- adj.* relating to or located in the space between stars
12. The town is exploring using \_\_\_\_\_ energy to power its homes and buildings.
- adj.* relating to or produced by the internal heat of the earth; often used to refer to energy produced by tapping into the natural heat of the earth
13. The scientist conducted experiments to study the catalytic properties of \_\_\_\_\_ compounds.
- n.* a hard, dense, and brittle chemical element of the platinum group with the symbol Os and atomic number 76, primarily used in alloys and as a catalyst
14. This question has fascinated solar \_\_\_\_\_ for decades.
- n.* a physicist who studies astronomy

ANSWERS: 8. isotope, 9. asteroid, 10. spectroscope, 11. interstellar, 12. geothermal, 13. osmium, 14. astronomers



15. The room was only one \_\_\_\_\_ wider than the piano, making it a tight fit.  
*n.* a unit of measurement of length in the metric system, equivalent to one-hundredth of a meter
16. The nearest star to our planet is about 1.3 \_\_\_\_\_ away.  
*n.* a unit of measurement of astronomical distance equivalent to 3.26 light-years (= about 5.88 trillion miles or 9.46 trillion kilometers)
17. The \_\_\_\_\_ data showed that the element was composed of multiple spectral lines.  
*n.* an instrument that separates light into its component wavelengths and records the distribution of intensities as a graph, used for chemical analysis or to determine the properties of stars and galaxies
18. The \_\_\_\_\_ explosion created a bright new star in the night sky.  
*n.* a powerful and luminous explosion that occurs in some stars, resulting in an extremely bright, short-lived object that later fades into a supernova remnant
19. The \_\_\_\_\_ plates shifted, causing an earthquake.  
*adj.* relating to the structure of the Earth's crust and the large-scale processes that occur as a result of movements within it
20. We largely \_\_\_\_\_ the circuit board of cell phones because they contain a lot of valuable metals.  
*v.* to sort and collect things to process them and produce valuable materials that can be used again
21. Due to its radioactive nature, handling \_\_\_\_\_ materials requires strict safety protocols.  
*n.* a radioactive metallic element with the atomic number 43 and the symbol Tc that has no stable isotopes and is used in medical imaging procedures and as a tracer in various scientific studies

ANSWERS: 15. centimeter, 16. parsecs, 17. spectrograph, 18. supernova, 19. tectonic, 20. recycle, 21. technetium

22. The archaeologists found a \_\_\_\_\_ buried alongside a mummy in an underground tomb.
- n.* a manuscript book, especially one written in the medieval period, before the invention of printing
23. He \_\_\_\_\_ his life to helping others.
- v.* to give all of your energy, time, etc., entirely to a specific person, activity, or cause; to set apart for a particular purpose or use
24. The scientist cooled the sample to just a couple of \_\_\_\_\_ to observe quantum effects.
- n.* a unit of measurement for temperature in the International System of Units (SI), which starts at absolute zero, the theoretical lowest limit of temperature, and named after the British physicist William Thomson, also known as Lord Kelvin
25. Certain isotopes of \_\_\_\_\_ are used in medicine for treating liver cancer.
- n.* a radioactive chemical element with the symbol Th and atomic number 90 that is silvery-white in color and is used as fuel in some nuclear reactors
26. The institute invested in advanced \_\_\_\_\_ equipment to better monitor underground vibrations.
- n.* the scientific study of earthquakes and the behavior of seismic waves that occur within the Earth's crust, as well as the structure and dynamics of the Earth's interior
27. The Sun \_\_\_\_\_ and caused a sudden brightening in the sky.
- v.* to burn brightly with a sudden, intense burst of flame or light; (noun) a sudden and brief burst of bright flame or light; a sudden and intense burst of radiation from the Sun's surface

ANSWERS: 22. codex, 23. dedicated, 24. Kelvin, 25. thorium, 26. seismology, 27. flared

ANSWERS: