

New words 1

3. junkyard /dʒŋgkjɑːrd/
4. stretch /streɪtʃ/
5. mile /maɪl/
5. overhead /ˌoʊvərˈhɛd/
6. junk /dʒŋgk/
6. dust /dʌst/
6. comet /kɒmɪt/
7. manmade /mænmeɪd/
7. orbital /ˈɔːrbɪtəl/
7. debris /dəˈbrɪː/

New words 2

8. satellite /sætəlɑɪt/
9. apart /əˈpɑːrt/
10. weigh /weɪ/
10. pound /paʊnd/
13. fingernail /fɪŋɡəˈneɪl/
14. orbit /ˈɔːrbɪt/
15. bowling /ˈboʊlɪŋ/
16. per /pər, pɛːr/

Phrases 2

9. fall apart

New words 3

19. track /træk/
19. avoid /əˈvɔɪd/
19. collision /kəˈlɪʒən/
20. crack /kræk/
20. shuttle /ʃʌtl/
21. challenger /tʃælɪndʒər/
24. endeavo(u)r /ɪndəˈvɔːr/
25. garbage /ˈɡɑːrbɪdʒ/

Phrases 3

23. be in danger

1 On a clear night, you can look at the stars in the sky. Even though you cannot see it, you are also looking at the largest junkyard in the solar system. Placed higher than the highest clouds but much closer than the moon, the junkyard stretches to 20,000 miles overhead. There are tens of millions of pieces of junk there. Some are rocks and dust from passing comets, but most are manmade and are called “orbital debris.”

2 Most of the junk comes from large satellites and rockets that fell apart after they stopped working. Together, all the space junk would weigh about 11 million pounds on the Earth, or more than 3,000 cars. The largest piece is a part of a rocket about the size of a family car. The smallest piece is smaller than your fingernail. Most pieces fly through space at more than 20 times the speed that sound travels on the Earth. A small stone in orbit around the Earth can have as much energy as a bowling ball going 500 miles per hour, or a car going 30 miles per hour.

3 The junkyard is a serious problem for the future of space travel. You have thousands of satellites in orbit all the time. Without tracking debris, you cannot avoid collisions. In 1983, a small crack appeared in one window of the space shuttle Challenger while it was in space. That was caused by a small, orbiting piece of paint. If the shuttle had been struck by a larger piece of junk, the astronauts might have been in danger. When the space shuttle Endeavour returned to the Earth, its body had small holes from space garbage hitting it. Two satellites also have had to change direction to avoid collisions with big pieces of junk.



4 The US Space Surveillance Network and NASA work together to keep track of the largest pieces of space junk. When the shuttle is in orbit, for example, their attention is on nearby junk that might get in the way. If there is even a small chance of a collision, then the shuttle speeds up while changing direction. There are about 18,000 pieces of garbage larger than four inches. The Space Surveillance Network keeps a list of all these pieces, with dozens of telescopes and antennas on the Earth and in space to watch them. Because all the pieces are in motion all the time, keeping track of them is difficult.

5 The scientists have to know two things: where the garbage is now, and where it is going to be in the future. The prediction of direction is not simple because the junk can move north or south, east or west, and up or down. They are always looking about four days into the future, tracking objects which might come close. Scientists cannot keep track of them all, however. Instead of watching each piece one by one, scientists watch one area of sky and count the number of pieces that pass overhead. With that small measurement, they can use a computer program to get a good idea of what the whole sky looks like.

6 Like other environmental problems, space junk will get worse without careful attention. In the future, pieces of junk will probably hit each other, making even more trash. A team of engineers has been at work for years to develop a space cleanup satellite. The technology for this, however, is very expensive. Instead, we should try to stop adding new garbage. For example, engineers are changing the way they build spacecraft to minimize debris.

7 A solution will require international cooperation. Guidelines for how to reduce the risk of space junk have already been approved. Countries have come together to address environmental problems, and if countries work together to control the amount of trash sent into space, we can probably keep the problem under control.

New words 4

1. surveillance /sərˈveɪlɪns/
4. nearby /ˈnɪəbáɪ/
8. dozen /ˈdɒzən/
8. telescope /ˈteləskəʊp/
8. antenna /ˈænténə/
10. motion /ˈmóʊʃən/

Phrases 4

2. keep track of A
4. get in the way
9. be in motion

New words 5

19. measurement /ˈmeʒəmənt/

Phrases 5

20. get a (good) idea of A

New words 6

23. trash /træʃ/
25. cleanup /ˈkliːnʌp/
28. spacecraft /ˈspéɪskræft/
28. minimize /ˈmɪnɪməɪz/

Phrases 6

24. at work



New words 7

29. solution /səˈlúʃən/
29. cooperation /kəʊˈɒpəreɪʃən/
29. guideline /ˈɡáɪdláɪn/
31. approve /əˈpruːv/

Phrases 7

31. come together
33. keep A under control



初出 L	初出 P	単 語	品 詞	意 味	英語での定義
5	82	junkyard	名詞	ごみ捨て場	a place where scrap is collected before being discarded, reused, or recycled
5	82	stretch	動詞	広がる, 伸びる	to spread over an area of land
5	82	mile	名詞	マイル	a unit for measuring distance equal to 1,760 yards or 1,609 meters
5	82	overhead	副詞	頭上に[を, で]	above your head
5	82	junk	名詞	ごみ	things that are considered useless or of little value
5	82	dust	名詞	ちり	a fine powder that consists of very small pieces of sand or dirt
5	82	comet	名詞	彗星	a mass of ice and dust that moves around the sun and looks like a bright star with a tail
5	82	manmade	形容詞	人造の, 人工の	made by people; not natural
5	82	orbital	形容詞	軌道の	connected with the path of a planet around the sun or of an object in space
5	82	debris	名詞	破片; がれき, ごみ	pieces of wood, metal, or brick that are left after something has been destroyed
5	82	satellite	名詞	衛星	an electronic device that is sent into space and moves around the Earth or another planet
5	82	apart	副詞	ばらばらに, 離れて	separated by a distance, of space or time
5	82	weigh	動詞	重さが～である	to have a particular weight
5	82	pound	名詞	ポンド	a unit for measuring weight, equal to 453.6 grams
5	82	finger nail	名詞	爪	the thin hard layer that covers the outer tip of each finger
5	82	orbit	名詞	軌道	the curved path in which a planet, satellite, or spacecraft moves in a circle around another body
5	82	bowling	名詞	ボーリング	a game in which players roll heavy balls along a special track toward a group of pins and try to knock over as many of them as
5	82	per	前置詞	～につき	used to express the cost or amount of something for each person, number used, distance traveled, etc.

Lesson 5 Space Debris

- The solar system's biggest junkyard -

Part 1

On a clear night, you can look at the stars in the sky.

*clear : 晴れた *look at A : A を見る

Even though you cannot see it, you are also looking at the largest junkyard in the solar system.

*even though S V : たとえ S が V であっても *it : the largest junkyard

*junkyard : ゴミ捨て場

Placed higher than the highest clouds but much closer than the moon, the junkyard stretches to 20,000 miles overhead.

☆受動態の分詞構文 The junkyard is placed higher~, and it stretched...

*stretch to A : A まで及ぶ *mile : マイル (長さの単位 ≒1.6km)

*overhead : 頭上に

There are tens of millions of pieces of junk there.

*tens of millions of A : 何千万の A

Some are rocks and dust from passing comets, but most are manmade and are called "orbital debris."

*some~, but most~ : あるものは~だが、ほとんどは~ *passing comets : 通過した彗星

*manmade : 人工≒artificial *orbital debris : 軌道上デブリ

Most of the junk comes from large satellites and rockets that fell apart after they stopped working.

*most of A : A のほとんど

*that 以下 : large satellites and rockets を修飾

*fall apart : ばらばらに壊れる

*they : large satellites and rockets

Together, all the space junk would weigh about 11 million pounds on the Earth, or more than 3,000 cars.

*together : 合わせて *would : ~だろう *weigh : ~の重さになる

*pound : ポンド (重さの単位≒0.45kg) *or : つまり *more than~ : 以上

The largest piece is a part of a rocket about the size of a family car.

The smallest piece is smaller than your fingernail.

*fingernail : 指の爪

Most pieces fly through space at more than 20 times the speed that sound travels on the Earth.

*more than 20 times : 20 倍以上の *the speed that sound travels on the Earth : 地球上で音が伝わる速さの

A small stone in orbit around the Earth can have as much energy as a bowling ball going 500 miles per hour, or a car going 30 miles per hour.

*can have as much energy as a bowling ball : ボーリングのボールと同じくらいのエネルギーを持ちうる can : 可能性の can 「~うる」

*going : 現在分詞「進んでいる」 *per hour : 毎時 *or : つまり

*1 マイル : 1.6 km

晴れた夜には、空に星を見ることができる。

たとえ見えなくとも、あなたは太陽系で最大のゴミ捨て場にも目を向けているのだ。

最も高い雲よりも高いが、月よりはずっと近くに位置し、そのゴミ捨て場は頭上2万マイルに広がっている。

そこには何千万個ものゴミがある。

通過した彗星から出た岩やちりもあるが、ほとんどは人工の物で、「軌道上デブリ (宇宙ゴミ)」と呼ばれている。

ゴミのほとんどは、機能しなくなった後、ばらばらになった巨大な衛星やロケットから出たものである。

すべての宇宙廃棄物を合わせると、地球上で約1,100万ポンド、つまり車3,000台分以上の重さになるだろう。

最も大きなものは、ほぼ自家用車くらいの大サイズのロケットの一部である。

最も小さなものは、あなたの指の爪よりも小さい。

ほとんどのかいは、地球上で音が伝わる速さの20倍以上の速度で宇宙空間を飛行している。

地球の周回軌道上の小さな石は、時速500マイルで進むボーリングのボール、つまり、時速30マイルで進む自動車と同じくらいのエネルギーを持ちうる。

Lesson 5 Space Debris

1

On a clear night, /
you can look at the stars /
in the sky. //

Even though you cannot see it, /
you are also looking at the largest junkyard /
in the solar system. //

Placed higher than the highest clouds /
but much closer than the moon, /
the junkyard stretches /
to 20,000 miles overhead. //

There are tens of millions of pieces of junk there. //

Some are rocks and dust /
from passing comets, /
but most are manmade /
and are called "orbital debris." //

晴れた夜には
星を見ることができ
空に。
たとえ見えなくとも
あなたは最大のごみ捨て場にも目を向けているのだ
太陽系で。
最も高い雲よりも高く位置して
しかし月よりはずっと近くに
そのごみ捨て場は広がっている
頭上2万マイルに。
そこには何千万個ものごみがある。
岩やちりもある
通過した彗星から出た
しかしほとんどは人工の物である
そして「軌道上デブリ」と呼ばれている。

2

Most of the junk /
comes from large satellites and rockets /
that fell apart /
after they stopped working. //

Together, /
all the space junk would weigh /
about 11 million pounds on the Earth, /
or more than 3,000 cars. //

The largest piece is a part of a rocket /
about the size of a family car. //

The smallest piece is smaller than your fingernail. //

Most pieces fly through space /
at more than 20 times the speed /
that sound travels on the Earth. //

A small stone in orbit around the Earth /
can have as much energy as a bowling ball /
going 500 miles per hour, /
or a car going 30 miles per hour. //

ごみのほとんどは
巨大な衛星やロケットから出たものである
ばらばらになった
機能しなくなった後。
合わせると
すべての宇宙廃棄物は〜の重さになるだろう
地球上で約1,100万ポンド
つまり車3,000台分以上の。
最も大きなものはロケットの一部である
ほぼ自家用車くらいの大ささの。
最も小さなものは、あなたの指の爪よりも小さい。
ほとんどのかけらは宇宙空間を飛行する
20倍以上の速度で
地球上で音が伝わる。
地球の周回軌道上の小さな石は
ボーリングのボールと同じくらいのエネルギーを持ちうる
時速500マイルで進む
つまり、時速30マイルで進む自動車と。

Lesson 5 Space Debris

パートごとの補充問題

Paragraph 1・2

Reading Comprehension

A Choose the correct title for each paragraph. There are some unnecessary options.

1 () 2 ()

- (a) How to Find the Space Junkyard
- (b) The Largest Junkyard in the Solar System
- (c) What Orbital Debris Is Really Like
- (d) How the Junkyard Formed

B Answer T (true) or F (false).

- 1. There is a large junkyard overhead, even though we cannot see it. ()
- 2. Most space junk comes from passing comets. ()
- 3. The smallest piece of space junk is about the size of a bowling ball. ()

+ α Choose the two correct statements.

- 1. The largest junkyard is located beyond our solar system.
- 2. Rocks and dust in the junkyard are called “orbital debris.”
- 3. When satellites or rockets stop working, they become debris in space.
- 4. The largest piece of debris is a piece of a comet as big as a car.
- 5. A small stone flying through space has as much energy as a car going 30 miles per hour.

Q1. Where is the space junkyard?

Q2. What is the manmade junk in the space junkyard called?

Q3. How much does all the space junk weigh?

Reading Comprehension

A 1 (b) 2 (c)

B 1. T 2. F 3. F

+ α 3, 5

Q1. It is 20,000 miles overhead

Q2. It is called “orbital debris”.

Q3. It weighs about 11 million pounds on the Earth.

Lesson 5

Story Retelling

[Keywords]

Lesson 5

Retelling

1 2

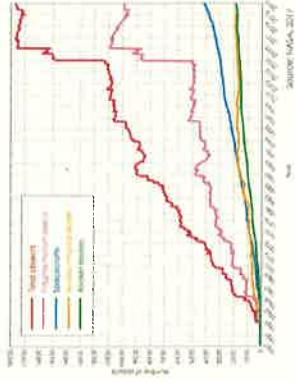


the largest junkyard
higher than the highest clouds
tens of millions of pieces
orbital debris
large satellites and rockets
about 11 million pounds
at more than 20 times
a bowling ball going 500 miles per hour

Lesson 5

Retelling

3

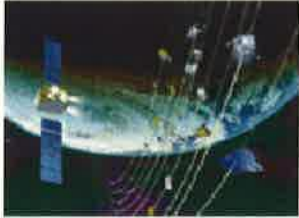


a serious problem
for the future of space travel
thousands of satellites in orbit
tracking debris
avoid collisions
a small crack appeared
small holes from space garbage
change direction

Lesson 5

Retelling

4 5

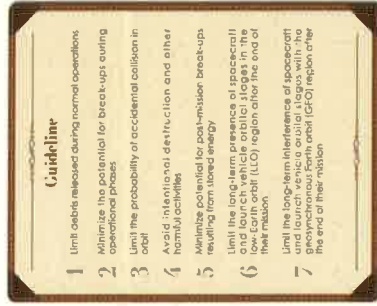


the US Space Surveillance Network
keep track of the largest pieces
dozens of telescopes and antennas
all the pieces are in motion
the prediction of direction
about four days into the future
count the number of pieces
what the whole sky looks like

Lesson 5

Retelling

6 7



get worse without careful attention
even more trash
develop a space cleanup satellite
stop adding new garbage
changing the way they build spacecraft
international cooperation
keep the problem under control

Class

Number

Name

Lesson 5

Space debris



Part 1



- On clear night, you can look at the stars in the sky.
- Even though you can't see it, you're looking at the largest junkyard in the solar system.



- The junkyard stretches to 20,000(32,186km) miles overhead.



- Tens of millions of pieces of junk there.



- Rocks, dust from passing comets
- Most are manmade and called, "orbital debris"



- Most of junk → large satellites and rockets



- All the space junk weigh about ... 11 million pounds / more than 3,000 cars!
- The largest piece : a part of rocket ≈ family car size!
- The smallest piece : smaller than your fingernail



- most pieces fly at more than 20 times the sound speed.



- A small stone has a energy : bowling ball 500 miles / hour (800km/h) or car going 30 miles / hour(48km/h).



Part 2



- The junkyard is serious problem.
- Thousands of satellites in orbit all the time.
- Without tracking debris, we cannot avoid collision.



collision

Now, please open the text p.82,
read the 3rd paragraph, and
find the examples of accidents.

In 1983...

- Small crack appeared in the window of space shuttle, "Challenger"
- Small orbiting piece of paint
- If larger, astronaut may be in danger

