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Level 3 – 20th October, 2020

A zeptosecond - the shortest unit of time ever measured

FREE online quizzes, mp3 listening and more for this lesson here:

<https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

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Please try Levels 0, 1 and 2 (they are easier).

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THE ARTICLE

From <https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

In today's world, many things are getting shorter and shorter. Scientists have just measured something incredibly short. They recorded the shortest unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, tiny fraction of one second. It is a trillionth of a billionth of a second. This is a decimal point followed by 20 zeros and then a 1. The scientists study atomic physics at the Goethe University in Germany. They used special high-tech equipment to measure how long it takes a photon to cross a hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too small for the human eye to see, and the time it takes is too fast for humans to sense.

In 1999, Ahmed Zewail, an Egyptian chemist won the Nobel Prize in Chemistry for measuring the speed at which molecules change their shape. He found that one femtosecond equals 0.000000000000001 seconds. This is a decimal point followed by 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things in terms of the speed of light. It is difficult for the human mind to understand these measurements. One millisecond is a thousandth of one second. This is the time for a neuron in the human brain to fire. One nanosecond is one billionth of one second. The shortest unit of time it may be possible to measure is one Planck. This is a decimal point followed by 44 zeros and a 1.

Sources: <https://interestingengineering.com/new-smallest-time-measurement-how-long-it-takes-a-photon-to-cross-a-hydrogen-molecule>
<https://www.livescience.com/zeptosecond-shortest-time-unit-measured.html>
[https://en.wikipedia.org/wiki/Orders_of_magnitude_\(time\)](https://en.wikipedia.org/wiki/Orders_of_magnitude_(time))

WARM-UPS

1. ONE ZEPTOSECOND: Students walk around the class and talk to other students about one zeptosecond. Change partners often and share your findings.

2. CHAT: In pairs / groups, talk about these topics or words from the article. What will the article say about them? What can you say about these words and your life?

today's world / scientists / short / fraction / decimal point / equipment / hydrogen / chemist / molecules / shape / billionth / human mind / measurements / brain / fire

Have a chat about the topics you liked. Change topics and partners frequently.

3. PHYSICS: Students A **strongly** believe all students should study physics at school; Students B **strongly** believe this is unnecessary. Change partners again and talk about your conversations.

4. TIME: How important are these periods of time to you? What can you do? Complete this table with your partner(s). Change partners often and share what you wrote.

	Hoe important	What Can You Do?
A second		
A minute		
An hour		
A day		
A month		
A year		
A decade		

5. TINY: Spend one minute writing down all of the different words you associate with the word "tiny". Share your words with your partner(s) and talk about them. Together, put the words into different categories.

6. MATHS: Rank these with your partner. Put the most important areas of maths at the top. Change partners often and share your rankings.

- fractions
- arithmetic
- algebra
- geometry
- statistics
- number theory
- logic
- computer science

VOCABULARY MATCHING

Paragraph 1

- | | |
|------------------|---|
| 1. incredibly | a. A small or tiny part, amount, or proportion of something. |
| 2. unit | b. A dot placed after a number in a fraction. |
| 3. tiny | c. To a great degree; extremely or unusually. |
| 4. fraction | d. Be aware of. |
| 5. decimal point | e. A quantity chosen as a standard in terms of which other quantities may be expressed. |
| 6. equipment | f. Very, very, very small. |
| 7. sense | g. The necessary items for a particular purpose. |

Paragraph 2

- | | |
|----------------|---|
| 8. molecule | h. Find the size, amount, or degree of something. |
| 9. in terms of | i. A group of atoms representing the smallest unit of a chemical. |
| 10. equal | j. Regarding. |
| 11. mind | k. A nerve cell. |
| 12. neuron | l. A person's mental processes rather than their physical action. |
| 13. billion | m. Be the same as in number or amount. |
| 14. measure | n. 1,000,000,000 |

BEFORE READING / LISTENING

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

1. TRUE / FALSE: Read the headline. Guess if a-h below are true (T) or false (F).

- a. The article said things in tomorrow's world are getting shorter. **T / F**
- b. A zeptosecond is a billionth of a trillionth of a second. **T / F**
- c. A zeptosecond has 21 zeros after the decimal point. **T / F**
- d. It took a photon 247 zeptoseconds to cross a hydrogen molecule. **T / F**
- e. An Egyptian physicist won the 1999 Nobel Prize in Chemistry. **T / F**
- f. A femtosecond measures how fast molecules change their shape. **T / F**
- g. The time it takes for a neuron in the human brain to fire is a millisecond. **T / F**
- h. The time unit called a Planck is a decimal point followed by 100 zeros. **T / F**

2. SYNONYM MATCH: (The words in **bold** are from the news article.)

- | | |
|----------------------|-----------------|
| 1. measured | a. understand |
| 2. incredibly | b. hard |
| 3. tiny | c. calculated |
| 4. equipment | d. rate |
| 5. sense | e. minute |
| 6. speed | f. nought |
| 7. shape | g. unbelievably |
| 8. difficult | h. start |
| 9. fire | i. tools |
| 10. zero | j. form |

3. PHRASE MATCH: (Sometimes more than one choice is possible.)

- | | |
|--|----------------------------|
| 1. In today's world, many things are getting | a. billionth of one second |
| 2. measured something incredibly | b. fraction of one second |
| 3. This is a tiny, tiny, tiny | c. human eye to see |
| 4. a decimal point | d. be possible to measure |
| 5. This is too small for the | e. short |
| 6. the speed at which molecules | f. of light |
| 7. a millionth of a | g. followed by 20 zeros |
| 8. in terms of the speed | h. mind |
| 9. the human | i. shorter and shorter |
| 10. the shortest unit of time it may | j. change their shape |

GAP FILL

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

In today's world, many things are getting (1) _____ and shorter. Scientists have just measured something incredibly short. They recorded the (2) _____ unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, tiny (3) _____ of one second. It is a trillionth of a billionth of a second. This is a decimal (4) _____ followed by 20 zeros and then a 1. The scientists study atomic (5) _____ at the Goethe University in Germany. They used special high-tech equipment to measure how long it (6) _____ a photon to cross a hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too (7) _____ for the human eye to see, and the time it takes is too fast for humans to (8) _____.

point
takes
shorter
sense
fraction
small
shortest
physics

In 1999, Ahmed Zewail, an Egyptian chemist won the Nobel Prize in Chemistry for measuring the speed at which molecules change their (9) _____. He found that one femtosecond equals 0.000000000000001 seconds. This is a (10) _____ point followed by 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things in (11) _____ of the speed of light. It is difficult for the human (12) _____ to understand these measurements. One millisecond is a thousandth of one second. This is the (13) _____ for a neuron in the human brain to (14) _____. One nanosecond is one billionth of one second. The (15) _____ unit of time it may be possible to measure is one Planck. This is a decimal point (16) _____ by 44 zeros and a 1.

fire
shape
mind
followed
terms
shortest
decimal
time

LISTENING – Guess the answers. Listen to check.

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

- 1) In today's world, many things are getting _____
 - a. shorter and shorten
 - b. shorter and shorts
 - c. shorter and shorter
 - d. shorter and shortens
- 2) They recorded the shortest unit of _____
 - a. time never measured
 - b. time every measured
 - c. time ever measured
 - d. time even measured
- 3) This is a tiny, tiny, tiny _____ second
 - a. fraction of one
 - b. fiction of one
 - c. faction of one
 - d. function of one
- 4) They used special high-tech equipment to measure how _____
 - a. long it take
 - b. long they takes
 - c. long these takes
 - d. long it takes
- 5) human eye to see, and the time it takes is too fast for _____
 - a. humans to cents
 - b. humans two cents
 - c. humans too sense
 - d. humans to sense
- 6) the Nobel Prize in Chemistry for measuring the speed at which molecules _____
 - a. changes their shape
 - b. change their shape
 - c. changed their shape
 - d. charge their shape
- 7) This is a decimal point _____ zeros
 - a. followed of 14
 - b. followed by 14
 - c. followed at 14
 - d. followed on 14
- 8) and then a 1, or a millionth of a _____ second
 - a. billionth of one
 - b. billionth of one
 - c. billion of one
 - d. billionth oft one
- 9) This is the time for a neuron in the human _____
 - a. brain to fired
 - b. brain to fires
 - c. brain to fire
 - d. brainy to fire
- 10) The shortest unit of time it may be possible to _____ Planck
 - a. measured is one
 - b. measures is one
 - c. measure is one
 - d. measuring is one

LISTENING – Listen and fill in the gaps

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

In today's world, (1) _____ getting shorter and shorter. Scientists have just measured something incredibly short. They recorded the shortest unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, (2) _____ one second. It is a trillionth of a billionth of a second. This is (3) _____ followed by 20 zeros and then a 1. The scientists study atomic physics at the Goethe University in Germany. They used (4) _____ equipment to measure how long it takes a photon (5) _____ hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too small for the human eye to see, and the time it takes is too fast for (6) _____.

In 1999, Ahmed Zewail, an Egyptian (7) _____ Nobel Prize in Chemistry for measuring the (8) _____ molecules change their shape. He found that one femtosecond equals 0.000000000000001 seconds. This is a decimal (9) _____ 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things (10) _____ the speed of light. It is difficult for the human mind to understand these measurements. One millisecond is a thousandth of one second. This is the time for a neuron in the human (11) _____. One nanosecond is one billionth of one second. The shortest unit of time it may (12) _____ measure is one Planck. This is a decimal point followed by 44 zeros and a 1.

COMPREHENSION QUESTIONS

From <https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

1. What did the article say is getting shorter and shorter in today's world?
2. How many zeros are after a decimal point in a zeptosecond?
3. What do the scientists in the article study?
4. How long does it take for a photon to cross a hydrogen molecule?
5. What did the article say a process was too small for us to do?
6. What is the nationality of the winner of the 1999 Nobel Chemistry Prize?
7. What does a femtosecond measure the speed of change in?
8. What does a zeptosecond measure things in terms of?
9. How long does it take for a neuron in the brain to fire?
10. What time unit has a decimal point followed by 44 zeros?

MULTIPLE CHOICE - QUIZ

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

- 1) What did the article say is getting shorter and shorter in today's world?
 - a) everything
 - b) many things
 - c) time
 - d) one second
- 2) How many zeros are after a decimal point in a zeptosecond?
 - a) 22
 - b) 21
 - c) 20
 - d) 19
- 3) What do the scientists in the article study?
 - a) particle physics
 - b) quantum physics
 - c) astrophysics
 - d) atomic physics
- 4) How long does it take for a photon to cross a hydrogen molecule?
 - a) 247 femtoseconds
 - b) 247 zeptoseconds
 - c) 247 nanoseconds
 - d) 247 milliseconds
- 5) What did the article say a process was too small for us to do?
 - a) see
 - b) feel
 - c) react to
 - d) touch
- 6) What is the nationality of the winner of the 1999 Nobel Chemistry Prize?
 - a) Egyptian
 - b) American
 - c) Japanese
 - d) Indian
- 7) What does a femtosecond measure the speed of change in?
 - a) time
 - b) the weather
 - c) the blink of an eye
 - d) molecules changing shape
- 8) What does a zeptosecond measure things in terms of?
 - a) relativity
 - b) space
 - c) the speed of light
 - d) the speed of sound
- 9) How long does it take for a neuron in the brain to fire?
 - a) a tenth of a second
 - b) a nanosecond
 - c) a zeptosecond
 - d) a millisecond
- 10) What time unit has a decimal point followed by 44 zeros?
 - a) a Steppe
 - b) a Planck
 - c) a Pluto
 - d) a Mayu

ROLE PLAY

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

Role A – Fractions

You think fractions is the most important area of maths. Tell the others three reasons why. Tell them what is wrong with their areas. Also, tell the others which is the least important of these (and why): arithmetic, algebra or statistics.

Role B – Arithmetic

You think arithmetic is the most important area of maths. Tell the others three reasons why. Tell them what is wrong with their areas. Also, tell the others which is the least important of these (and why): fractions, algebra or statistics.

Role C – Algebra

You think algebra is the most important area of maths. Tell the others three reasons why. Tell them what is wrong with their areas. Also, tell the others which is the least important of these (and why): arithmetic, fractions or statistics.

Role D – Statistics

You think statistics is the most important area of maths. Tell the others three reasons why. Tell them what is wrong with their areas. Also, tell the others which is the least important of these (and why): arithmetic, algebra or fractions.

AFTER READING / LISTENING

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

1. WORD SEARCH: Look in your dictionary / computer to find collocates, other meanings, information, synonyms ... for the words 'short' and 'time'.

short	time

- Share your findings with your partners.
- Make questions using the words you found.
- Ask your partner / group your questions.

2. ARTICLE QUESTIONS: Look back at the article and write down some questions you would like to ask the class about the text.

- Share your questions with other classmates / groups.
- Ask your partner / group your questions.

3. GAP FILL: In pairs / groups, compare your answers to this exercise. Check your answers. Talk about the words from the activity. Were they new, interesting, worth learning...?

4. VOCABULARY: Circle any words you do not understand. In groups, pool unknown words and use dictionaries to find their meanings.

5. TEST EACH OTHER: Look at the words below. With your partner, try to recall how they were used in the text:

<ul style="list-style-type: none">• world• tiny• 20• study• equipment• happen	<ul style="list-style-type: none">• prize• speed• 14• mind• fire• 44
--	---

ONE ZEPTOSECOND SURVEY

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

Write five GOOD questions about one zeptosecond in the table. Do this in pairs. Each student must write the questions on his / her own paper. When you have finished, interview other students. Write down their answers.

	STUDENT 1 _____	STUDENT 2 _____	STUDENT 3 _____
Q.1.			
Q.2.			
Q.3.			
Q.4.			
Q.5.			

- Now return to your original partner and share and talk about what you found out. Change partners often.
- Make mini-presentations to other groups on your findings.

ONE ZEPTOSECOND DISCUSSION

STUDENT A's QUESTIONS (Do not show these to student B)

1. What did you think when you read the headline?
2. What images are in your mind when you hear the word 'second'?
3. What do you think of time?
4. How important is time to you?
5. How can you make better use of your time?
6. What do you think of scientists measuring a zeptosecond?
7. What do you think of physics?
8. Why do we need to know about zeptoseconds?
9. What things can you do in one second?
10. What do you think when someone asks you to wait a second?

A zeptosecond - the shortest unit of time ever measured - 20th October, 2020
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ONE ZEPTOSECOND DISCUSSION

STUDENT B's QUESTIONS (Do not show these to student A)

11. Did you like reading this article? Why/not?
12. What do you think of when you hear the word 'time'?
13. What do you think about what you read?
14. Do you ever waste time?
15. What do you think of wasting time?
16. What do you know about molecules?
17. What do you know about the speed of light?
18. What do you know about neurons in the brain?
19. What would you like to know about time?
20. What questions would you like to ask the scientists?

DISCUSSION (Write your own questions)

STUDENT A's QUESTIONS (Do not show these to student B)

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____

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DISCUSSION (Write your own questions)

STUDENT B's QUESTIONS (Do not show these to student A)

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____

LANGUAGE - CLOZE

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

In today's world, many (1) _____ are getting shorter and shorter. Scientists have just measured something (2) _____ short. They recorded the shortest unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, tiny (3) _____ of one second. It is a trillionth of a billionth of a second. This is a decimal point followed by 20 zeros and then a 1. The scientists study atomic (4) _____ at the Goethe University in Germany. They used special high-tech equipment to measure how long it takes a photon to (5) _____ a hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too small for the human eye to see, and the time it takes is too fast for humans (6) _____ sense.

In 1999, Ahmed Zewail, an Egyptian (7) _____ won the Nobel Prize in Chemistry for measuring the speed at which molecules change (8) _____ shape. He found that one femtosecond equals 0.000000000000001 seconds. This is a decimal point followed by 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things in (9) _____ of the speed of light. It is difficult for the human mind to understand (10) _____ measurements. One millisecond is a thousandth of one second. This is the time for a neuron in the human brain (11) _____ fire. One nanosecond is one billionth of one second. The shortest unit of time it may be possible to measure is one Planck. This is a decimal (12) _____ followed by 44 zeros and a 1.

Put the correct words from the table below in the above article.

- | | | | | |
|-----|----------------|----------------|--------------|-----------------|
| 1. | (a) shorted | (b) shorter | (c) shorten | (d) shorts |
| 2. | (a) incredible | (b) incredibly | (c) inedible | (d) incredulous |
| 3. | (a) faction | (b) fiction | (c) function | (d) fraction |
| 4. | (a) physical | (b) physics | (c) physique | (d) physicality |
| 5. | (a) less | (b) cross | (c) plus | (d) over |
| 6. | (a) for | (b) by | (c) to | (d) as |
| 7. | (a) chemistry | (b) chemical | (c) chemist | (d) chemically |
| 8. | (a) them | (b) thus | (c) their | (d) though |
| 9. | (a) looks | (b) relates | (c) means | (d) terms |
| 10. | (a) third | (b) that | (c) them | (d) these |
| 11. | (a) to | (b) as | (c) of | (d) on |
| 12. | (a) punt | (b) paint | (c) point | (d) pint |

SPELLING

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

Paragraph 1

1. just measured something nceiidrbly short
2. the ostrhest unit of time
3. a tiny, tiny, tiny caftroin of one second
4. The scientists study atomic ypishcs
5. used special high-tech qupeminet
6. too fast for humans to nesse

Paragraph 2

7. Iscleemuo change their shape
8. a aiecmdl point followed by 14 zeros
9. in rtsme of the speed of light
10. a tnhausohd of one second
11. a nnrueo in the human brain
12. it may be sopilesb

PUT THE TEXT BACK TOGETHER

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

Number these lines in the correct order.

- () a hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too small
- () fraction of one second. It is a trillionth of a billionth of a second. This is a decimal
- () time for a neuron in the human brain to fire. One nanosecond is one billionth of one second. The shortest
- () speed at which molecules change their shape. He found that one femtosecond equals 0.000000000000001
- () billionth of one second. The zeptosecond measures things in terms of the speed of light. It is difficult for the human
- () In 1999, Ahmed Zewail, an Egyptian chemist won the Nobel Prize in Chemistry for measuring the
- () in Germany. They used special high-tech equipment to measure how long it takes a photon to cross
- () for the human eye to see, and the time it takes is too fast for humans to sense.
- (**1**) In today's world, many things are getting shorter and shorter. Scientists have just measured something incredibly
- () unit of time it may be possible to measure is one Planck. This is a decimal point followed by 44 zeros and a 1.
- () mind to understand these measurements. One millisecond is a thousandth of one second. This is the
- () point followed by 20 zeros and then a 1. The scientists study atomic physics at the Goethe University
- () seconds. This is a decimal point followed by 14 zeros and then a 1, or a millionth of a
- () short. They recorded the shortest unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, tiny

PUT THE WORDS IN THE RIGHT ORDER

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

1. are shorter . Many things getting shorter and
2. unit recorded ever . shortest They of time the
3. A one of tiny, tiny, fraction second . tiny
4. photon takes cross . How to a it long
5. see . the Too eye human small to for
6. change which The molecules speed their at shape .
7. zeros . point decimal A followed by 14
8. for mind understand Difficult to human these . the
9. of millisecond One one thousandth is a second .
10. human the in fire . neuron brain A to

CIRCLE THE CORRECT WORD (20 PAIRS)

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

In today's world, many things are getting *shorten* / *shorter* and shorter. Scientists have just measured something *incredible* / *incredibly* short. They recorded the shortest unit of time ever *measured* / *measure*. It is called a zeptosecond. This is a tiny, tiny, tiny fraction of *once* / *one* second. It is a trillionth of a *billionth* / *billion* of a second. This is a decimal point *following* / *followed* by 20 zeros and then a 1. The scientists study *atom* / *atomic* physics at the Goethe University in Germany. They used special high-tech *equipment* / *equipped* to measure how long it takes a photon to cross a hydrogen molecule. The scientists said it took 247 zeptoseconds for *them* / *this* to happen. This is too small for the human eye to see, and the time it takes is too fast for humans *to* / *for* sense.

In 1999, Ahmed Zewail, an Egyptian *chemistry* / *chemist* won the Nobel Prize in Chemistry for measuring the *speedy* / *speed* at which molecules change their shape. He found that one femtosecond *equally* / *equals* 0.000000000000001 seconds. This is a decimal point followed *at* / *by* 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things in *terms* / *teams* of the speed of light. It is difficult for the human mind *to* / *so* understand these measurements. One millisecond is a thousandth of one second. This is *a* / *the* time for a neuron in the human brain to fire. One nanosecond is one billionth of one second. The shortest unit *of* / *by* time it may be *possible* / *possibly* to measure is one Planck. This *be* / *is* a decimal point followed by 44 zeros and a 1.

Talk about the connection between each pair of words in italics, and why the correct word is correct.

INSERT THE VOWELS (a, e, i, o, u)

From <https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

In t_day's w_rld, many things _r_ g_tting sh_rt_r _nd sh_rt_r. Sci_ntists hav_ j_st m_as_r_d s_m_thing incr_dibly sh_rt. Th_y r_c_rd_d th_ sh_rt_st _nit _f tim_ _v_r m_as_r_d. It is call_d _ z_pt_s_c_nd. This is _ tiny, tiny, tiny fracti_n _f _n_ s_c_nd. It is _ trilli_nth _f _ billi_nth _f _ s_c_nd. This is _ d_cimal p_int f_ll_w_d by 20 z_r_s _nd th_n _ 1. Th_ sci_ntists st_dy _t_mic physics _t th_ G__th_ _niv_r_sity in G_rmany. Th_y _s_d sp_cial high-t_ch _q_ipm_nt t_ m_as_r_ h_w l_ng it tak_s _ ph_t_n t_ cr_ss _ hydr_g_n m_l_c_l_. Th_ sci_ntists said it t__k 247 z_pt_s_c_nds f_r this t_ happ_n. This is t__ small f_r th_ h_man _y_ t_ s__, _nd th_ tim_ it tak_s is t__ fast f_r h_mans t_ s_ns_.

In 1999, _hm_d Z_wail, _n _gyptian ch_mist w_n th_ N_b_l Priz_ in Ch_mistry f_r m_as_ring th_ sp__d_t which m_l_c_l_s chang_ th_ir shap_. H_ f__nd that _n_ f_mt_s_c_nd _q_als 0.0000000000000001 s_c_nds. This is _ d_cimal p_int f_ll_w_d by 14 z_r_s _nd th_n _ 1, _r _ milli_nth _f _ billi_nth _f _n_ s_c_nd. Th_ z_pt_s_c_nd m_as_r_s things in t_rms _f th_ sp__d _f light. It is diffic_lt f_r th_ h_man mind t_ _nd_rstand th_s_ m_as_r_m_nts. _n_ millis_c_nd is _ th__sandth _f _n_ s_c_nd. This is th_ tim_ f_r _ n__r_n in h_man brain t_ fir_. _n_ nan_s_c_nd is _n_ billi_nth _f _n_ s_c_nd. Th_ sh_rt_st _nit _f tim_ it may b_ p_ssibl_ t_ m_as_r_ is _n_ Planck. This is _ d_cimal p_int f_ll_w_d by 44 z_r_s _nd _ 1.

PUNCTUATE THE TEXT AND ADD CAPITALS

From <https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

in today's world many things are getting shorter and shorter scientists have just measured something incredibly short they recorded the shortest unit of time ever measured it is called a zeptosecond this is a tiny tiny tiny fraction of one second it is a trillionth of a billionth of a second this is a decimal point followed by 20 zeros and then a 1 the scientists study atomic physics at the goethe university in germany they used special hightech equipment to measure how long it takes a photon to cross a hydrogen molecule the scientists said it took 247 zeptoseconds for this to happen this is too small for the human eye to see and the time it takes is too fast for humans to sense

in 1999 ahmed zewail an egyptian chemist won the nobel prize in chemistry for measuring the speed at which molecules change their shape he found that one femtosecond equals 0000000000000001 seconds this is a decimal point followed by 14 zeros and then a 1 or a millionth of a billionth of one second the zeptosecond measures things in terms of the speed of light it is difficult for the human mind to understand these measurements one millisecond is a thousandth of one second this is the time for a neuron in the human brain to fire one nanosecond is one billionth of one second the shortest unit of time it may be possible to measure is one planck this is a decimal point followed by 44 zeros and a 1

PUT A SLASH (/) WHERE THE SPACES ARE

From <https://breakingnewsenglish.com/2010/201020-zeptosecond.html>

In today's world, many things are getting shorter and shorter. Scientists have just measured something incredibly short. They recorded the shortest unit of time ever measured. It is called a zeptosecond. This is a tiny, tiny, tiny fraction of one second. It is a trillionth of a billionth of a second. This is a decimal point followed by 20 zeros and then a 1. The scientists study atomic physics at the Goethe University in Germany. They used special high-tech equipment to measure how long it takes a photon to cross a hydrogen molecule. The scientists said it took 247 zeptoseconds for this to happen. This is too small for the human eye to see, and the time it takes is too fast for human senses. In 1999, Ahmed Zewail, an Egyptian chemist worth the Nobel Prize in Chemistry for measuring the speed at which molecules change their shape. He found that one femtosecond equals 0.0000000000000001 seconds. This is a decimal point followed by 14 zeros and then a 1, or a millionth of a billionth of one second. The zeptosecond measures things in terms of the speed of light. It is difficult for the human mind to understand these measurements. One millisecond is a thousandth of one second. This is the time for a neuron in the human brain to fire. One nanosecond is one billionth of one second. The shortest unit of time it may be possible to measure is one Planck. This is a decimal point followed by 44 zeros and a 1.

ACADEMIC WRITING

From <https://breakingnewsenglish.com/2010/201020-septosecond.html>

We must never, ever waste time. Discuss.

HOMework

1. VOCABULARY EXTENSION: Choose several of the words from the text. Use a dictionary or Google's search field (or another search engine) to build up more associations / collocations of each word.

2. INTERNET: Search the Internet and find out more about this news story. Share what you discover with your partner(s) in the next lesson.

3. ONE ZEPTOSECOND: Make a poster about one zeptosecond. Show your work to your classmates in the next lesson. Did you all have similar things?

4. TIME: Write a magazine article about all of us having to spend our time in better ways. Include imaginary interviews with people who are for and against this.

Read what you wrote to your classmates in the next lesson. Write down any new words and expressions you hear from your partner(s).

5. WHAT HAPPENED NEXT? Write a newspaper article about the next stage in this news story. Read what you wrote to your classmates in the next lesson. Give each other feedback on your articles.

6. LETTER: Write a letter to an expert on one zeptosecond. Ask him/her three questions about it. Give him/her three of your ideas on what we could do better with our time. Read your letter to your partner(s) in your next lesson. Your partner(s) will answer your questions.

ANSWERS

VOCABULARY (p.4)

1. c 2. e 3. f 4. a 5. b 6. g 7. d
8. i 9. j 10. m 11. l 12. k 13. n 14. h

TRUE / FALSE (p.5)

- a F b T c F d T e F f T g T h F

SYNONYM MATCH (p.5)

1. c	2. g	3. e	4. i	5. a
6. d	7. j	8. b	9. h	10. f

COMPREHENSION QUESTIONS (p.9)

1. Many things
2. 20
3. Atomic physics
4. 247 zeptoseconds
5. See
6. Egyptian
7. Molecules changing shape
8. The speed of light
9. A millisecond
10. A Planck

WORDS IN THE RIGHT ORDER (p.20)

1. Many things are getting shorter and shorter.
2. They recorded the shortest unit of time ever.
3. A tiny, tiny, tiny fraction of one second.
4. How long it takes a photon to cross.
5. Too small for the human eye to see.
6. The speed at which molecules change their shape.
7. A decimal point followed by 14 zeros.
8. Difficult for the human mind to understand these.
9. One millisecond is a thousandth of one second.
10. A neuron in the human brain to fire.

MULTIPLE CHOICE - QUIZ (p.10)

1. b 2. c 3. d 4. b 5. a 6. a 7. d 8. c 9. d 10. b

ALL OTHER EXERCISES

Please check for yourself by looking at the Article on page 2.
(It's good for your English ;-)