

TIME AND SPACE, T

*„ If you know Time as well as I do, I wouldn't talk about wasting it.
It's him (...). Now, if you only kept on good terms with him,
he'd do almost anything you liked with the clock. For instance,
suppose it were 9 o'clock in the morning, just time to begin lessons;
you'd only have to whisper a hint to Time, and around goes the clock
in a twinkling: Half past one, time for dinner!“*

Lewis Carroll, *Alice in Wonderland*

I. Discuss the questions below

1. Do you believe that the place and time you were born influence your whole life?
2. What do you think about the idea of Daylight Saving Time?
3. If time travel were possible, which period of world history would you like to return to? Why?

II. Read the text and fill in the gaps with appropriate words and expressions

Philosophy of Space and Time

Time and space are two of few fundamental quantities which cannot be defined in terms of other quantities. Thus, they are both defined via measurement. Currently, the standard time interval (called „**1. __conventional__** second“ or simply „second“) is defined as 9,192,631,770 oscillations of a hyperfine transition in the 133 caesium atom. Time can be combined mathematically with the fundamental quantities of space and mass to **2. __derive__** concepts such as velocity, momentum, **3. __energy__** and fields. The space interval, called a standard meter or simply a meter, is defined as the distance travelled by light in a **4. __vacuum__** during a time interval of 1/299792458 of a second. This definition **5. __coupled with__** the present definition of time makes special relativity theory to be absolutely correct by definition.

In classical physics, space is a three-**6. __dimensional__** Euclidean space where any position can be described using three coordinates. Special and general relativity uses spacetime rather than space, and it is modelled as a four-**7. __dimensional__** space (with the **8. __time axis__** being imaginary in special relativity and real in general relativity, and currently there are many theories which use more than 4-dimensional spaces).

Some theories, most notably special and general relativity, **9. __suggest that__** suitable geometries of spacetime may allow time travel into the past and future. Albert Einstein's special theory of relativity predicts time **10. __dilation__** that could be interpreted as time travel. It states that, relative to a stationary **11. __observer__**, time appears to pass more slowly for faster-moving bodies. For example, a moving clock will appear to run slow; as the clock approaches the speed of light its hands will appear to nearly stop moving. A second type of travel is **12. __permitted by__** general relativity. In this type a distant observer sees time passing more slowly for a clock at the bottom of a deep gravity **13. __well__**, and a clock lowered into it and pulled back up will indicate that less time has passed compared to a stationary clock that stayed with the distant observer. These effects are to some degree similar to **14. __hibernation__**, (which slows down the rates of chemical processes in the subject) almost indefinitely suspending their life thus resulting in „time travel“ **15. __toward__** the future, but never backward.

Many in the scientific community believe that time travel is unlikely, because it violates **16. __causality__**, i.e. the logic of cause and effect. For example, what happens if you attempt to go back in time and kill yourself at an earlier stage of your life? Stephen Hawking once suggested that the absence of **17. __tourists__** from the future constitutes a strong argument **18. __against__** the existence of time travels.

time axis, hibernation, dimensional x2, tourists, energy, suggest that, permitted by, conventional, observer, toward, interval, causality, coupled with, dilation, against, derive, well, vacuum

III. Watch the video and fill in the table with relevant information (1-2 words)

<https://www.youtube.com/watch?v=fUKN5oaP52s> 18:09 – 23:59

1.Name of the project 19:39 I pause, 20:41, 20:48, 20:52- answer given	Gravity Probe B
2.Anticipated length of the project	3 years
3.Real length of the project	4 decades
4.Cost of the project	_____ 750 million _____ dollars
5.Date of the launch (month and year)	April 2004
6.No of project authors present at the launch	1
7.Period of flawless operation of the telescope with gyroscopes	1 year
8.One of additional financial sources	Saudi __royal family__
9.Time taken to fix the problem	2 years
10.The project proved it	space is a physical entity/ fabric

IV.Match the terms with the sentences relating to them;

1. Greenwich (prime) meridian	6. Greenwich Mean Time	11. autumnal/vernal equinox
2. latitude	7. Coordinated Universal Time	12. equator
3. Greenwich (prime) meridian	8. International Date Line	13. longitude
4. solar day	9. sidereal day	14. Gregorian calendar
5. winter solstice	10. summer solstice	15. precession

- a) when the sun reaches its southernmost point /**winter solstice**
- b) the zero meridian /**Greenwich (prime) meridian**
- c) when the night and day is of approximately equal length all over the earth /**autumnal/vernal equinox**
- d) angular measurement in degrees east or west of the prime meridian /**longitude**
- e) the height above sea level /**altitude**
- f) elapsed time between two successive crossings of the same meridian by a star other than the Sun /**sidereal day**
- g) an imaginary line around the earth at an equal distance from the North and South Poles / **equator**
- h) when the sun reaches its northernmost point on the celestial sphere /**summer solstice**
- i) time referenced to atomic clocks /**coordinated universal time**
- j) angular measurement in degrees north and south of the equator /**latitude**
- k) when crossed travelling west, the date is advanced; anti-meridian zig-zag /**international date line**
- l) half circles that are portions of a great circle (from one pole to another) /**meridians**
- m) elapsed time between two successive crossings of the same meridian by the Sun /**solar day**
- n) skips 3 leap years every 400 years /**Gregorian calendar**

- o) the slow rotation of the Earth's axis /**precession**
- p) universal time /**Greenwich Mean Time**

V. Transition phrases. Choose the right word to complete each sentence.

1. _____, a complete gene cluster was isolated.
a) Until then b) Than c) **Meanwhile** d) After
2. In this essay I will look at what racism is, and I will _____ explore why it still persists.
a) **then** b) than c) after then d) after
3. The only advice that can be given to applicants is to ensure that they apply _____ possible.
a) when b) while c) until d) **as soon as**
4. _____ language development, newborns have already established a direct link with other people.
a) As soon as b) **Prior to** c) First of all d) Previously
5. _____, let us look at the data given in an Air Ministry report.
a) Final b) **First** c) Since d) Since then

VI. Complete the following idioms by adding the correct preposition;

1. **on** the dot
2. **in** the nick of time
3. **at** the crack of dawn
4. **in** this day and age
5. **for** donkeys' years
6. **in** due course

now use them with the sentences:

1. I expect you to be here at 8 **on** the dot .
2. For the big number of applicants, your request will be dealt with **in** due course .
3. It is unbelievable that there are so many people suffering from hunger **in** this day and age .
4. He loves to wake up **at** the crack of dawn and have a cup of coffee in bed and read some papers before everybody else in the house gets up.
5. I'm never early and I'm never late, but I do admit to doing things **in** the nick of time .
6. I fully trust him, we've known each other **for** donkey's years .

Sources:

(adapted from) <http://iteslj.org/questions/> accessed on 14 April, 2012

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