**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*

1. **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?

1. **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

1. **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** |
| * 1. Anticipated length of the project | **3 years** |
| * 1. Real length of the project | **4 decades** |
| * 1. Cost of the project | **\_\_\_\_\_750 million\_\_\_\_** dollars |
| * 1. Date of the launch (month and year) | **April 2004** |
| * 1. No of project authors present at the launch | **1** |
| * 1. Period of flawless operation of the telescope with gyroscopes | **1 year** |
| * 1. One of additional financial sources | Saudi **\_\_royal family\_\_\_\_\_\_\_\_\_** |
| * 1. Time taken to fix the problem | **2 years** |
| * 1. The project proved it | space is a **physical entity/ fabric** |

1. **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 |

1. when the sun reaches its southernmost point /**winter solstice**
2. the zero meridian /**Greenwich (prime) meridian**
3. when the night and day is of approximately equal length all over the earth /**autumnal/vernal equinox**
4. angular measurement in degrees east or west of the prime meridian /**longitude**
5. the height above sea level /**altitude**
6. elapsed time between two successive crossings of the same meridian by a star other than the Sun /**sidereal day**
7. an imaginary line around the earth at an equal distance from the North and South Poles / **equator**
8. when the sun reaches its northernmost point on the celestial sphere /**summer solstice**
9. time referenced to atomic clocks **/coordinated universal time**
10. angular measurement in degrees north and south of the equator **/latitude**
11. when crossed travelling west, the date is advanced; anti-meridian zig-zag /**international date line**
12. half circles that are portions of a great circle (from one pole to another) **/meridians**
13. elapsed time between two successive crossings of the same meridian by the Sun /**solar day**
14. skips 3 leap years every 400 years /**Gregorian calendar**
15. the slow rotation of the Earth's axis /**precession**
16. universal time /**Greenwich Mean Time**
17. **Transition phrases.** Choose the right word to complete each sentence.
    1. \_\_\_\_\_\_, a complete gene cluster was isolated.
18. Until then b) Than c) **Meanwhile**  d) After
    1. In this essay I will look at what racism is, and I will \_\_\_\_\_ explore why it still persists.
19. **then** b) than c) after then d) after
    1. The only advice that can be given to applicants is to ensure that they apply \_\_\_\_\_ possible.
20. when b) while c) until d) **as soon as**
    1. \_\_\_\_\_\_ language development, newborns have already established a direct link with other people.
21. As soon as b) **Prior to** c) First of all d) Previously
    1. \_\_\_\_\_, let us look at the data given in an Air Ministry report.
22. Final b) **First**  c) Since d) Since then
23. **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

(adapted from) [www.wikipedia.org](http://www.wikipedia.org/#_blank) visited on April 14, 2012

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