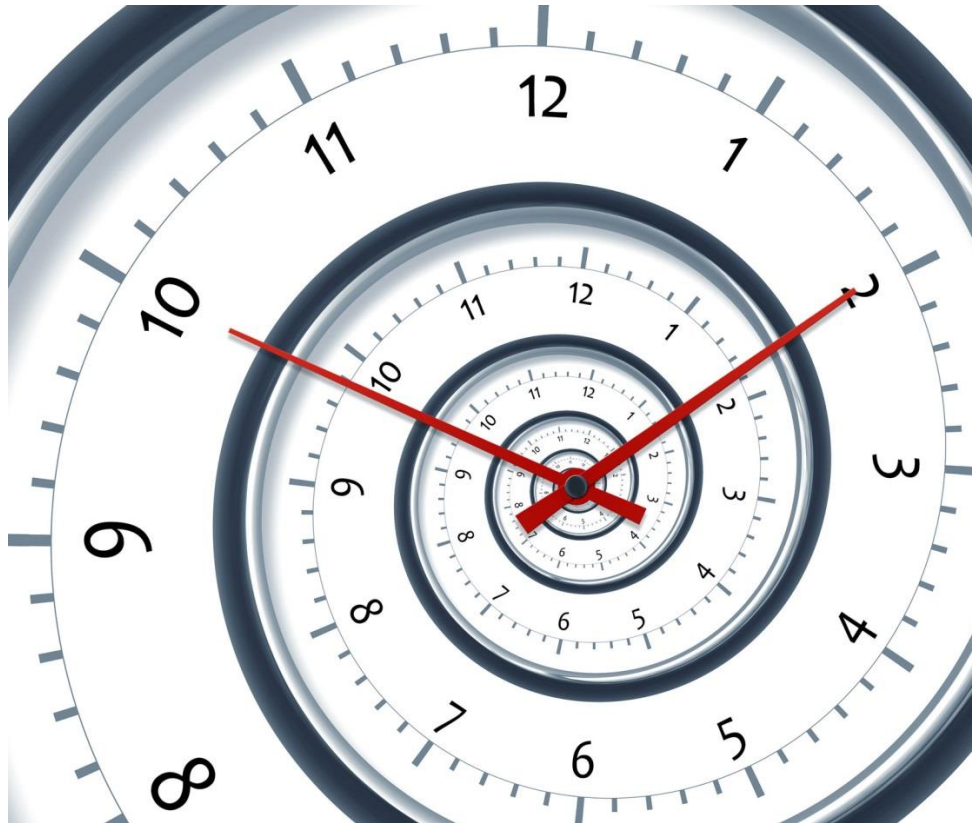# SSSS It's About Time Division C

Event By syo_astro

Directions

* **Each question is worth one point, where each part (ie. a, b, etc or i, ii, etc) is worth an additional point. The test is 71 points and 30 minutes. Use space provided for answers.**

* **The test involves various types of questions relating to time, timekeeping, astronomy, physics, and/or mechanics.**

* **Within plus or minus 10% of a quantitative answer is considered correct. Without units and significant figures, a correct answer is given a ½ point.**

* **Don't be afraid to guess (logically) for partial credit where possible, and have fun!**

1. This man came up with the idea of absolute time.
2. In 1502, who built the first pocketwatch?
3. Who invented the 1st quartz clock in 1927?
4. In 1577, who invented the first minute hand?
5. Who completed the first documented astrarium clock?
6. In what year was daylight saving time first established in the US?
7. What type of clocks are H1, H2, H3, H4, and H5?
8. What escapement is shown below?
9. Describe one common problem with the escapement below.

10. Label the following referring to the escapement below.
   a.
   b.
   c.
   d.
   e.
   f.
   g.
   h.
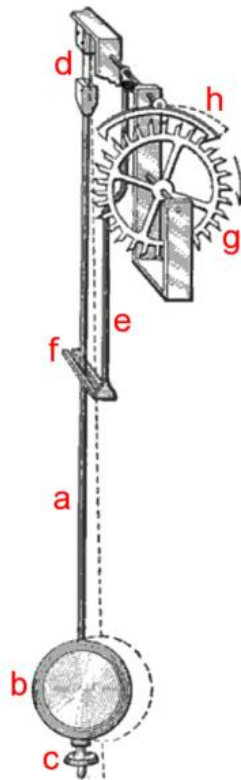
11. What is the physical purpose of the pendulum in clocks? Why is one used?

12. What clockmaker's tool is an iron vertical plunger that can place rollers and balanced wheels on staffs?

13. Circle the fusee in the device shown below.
    a. What is its purpose?

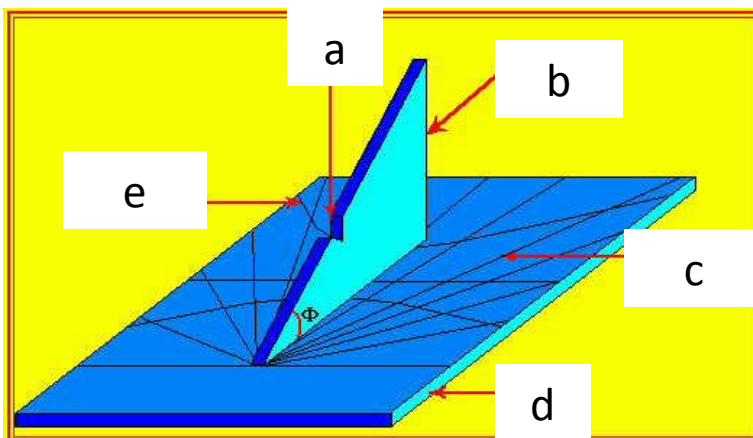14. What is a silent timekeeping instrument traditionally called?
15. What is the purpose of an escapement in clocks? Why is one used?

16. A clepsydra uses what to measure time?
17. What type of timekeeping device is shown below?
18. Label the following referring to the timekeeping device below.
    a.
    b.
    c.
    d.
    e.

19. Clocks can have quartz that oscillates when a current is sent through the crystal, what is this effect known as?

20. Given the circuit below, a capacitor of capacitance equal to 2.20 µF was charged to 9.00 V. This is in series with a 270. kΩ resistor. How long would it take for the capacitor to discharge approximately 76.0% of its stored charge assuming it was initially fully charged and the switch was just closed?
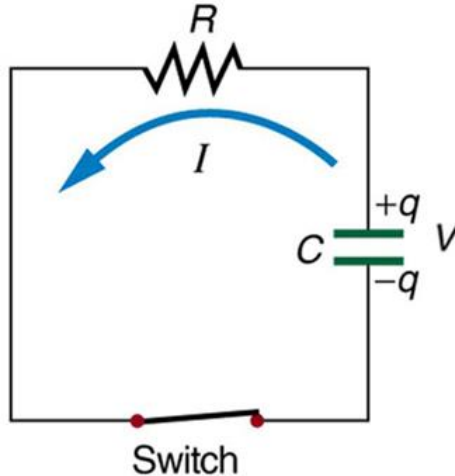

21. A clock that displays its mechanics is known as?

22. What is the image below an example of?

23. GPS satellites can be setup to work with a Network Time Protocol to synchronize many clocks across the world in a clock network. In this case, the satellites are known as what type of precise clocks?

24. What is the length of a day based upon?

25. What is the Julian date for CE 2015 May 15 19:00:00.0 UT (give an answer with three numbers after the decimal point)?
    a. What's the modified Julian date (again, give three numbers after the decimal point)?

26. Convert 281 yottaseconds to attoseconds.

27. Convert 1.00 ke to lustrums.

28. A Planck time unit is defined by what (provide an explanation referencing light)?

29. Explain what Zulu time is (Hint: What is it alternatively known as?).

30. A fast-moving object would be seen as slower in time from a stationary observer's point of view. What is this effect called?
   a. According to clocks on Earth (an inertial reference frame), a spaceship that has to travel a distance of 50.0 light years to a destination, Planet X, at a speed of 4/5c relative to the Earth would appear to take how long to travel there in years? Assume Planet X and the Earth are at rest relative to one another.
   b. How long would passengers on the spaceship report it takes to get to Planet X in years?
31. What is a time interval known as when it is defined as a squared spacetime interval of zero?
32. What is the period of an object with angular frequency of 5.00 rad/s?
33. Find the period of a massless spring, shown below on the left, attached to a mass, m, of 3.00 kg and spring constant 10.0 N/m is.
   a. What if the mass was attached to the spring vertically, shown below on the right?
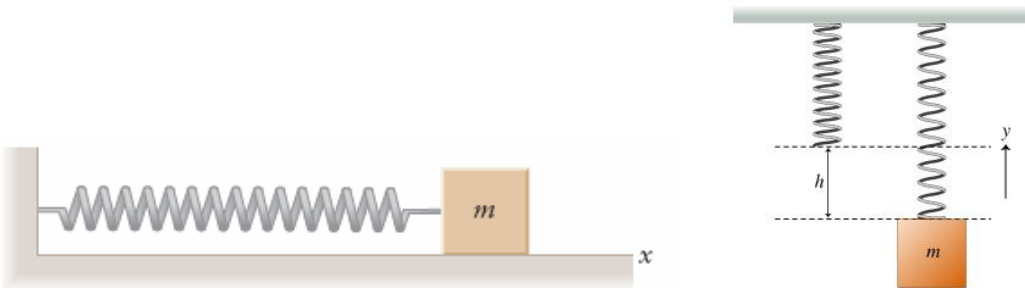
34. Period for an object moving in a circle of radius 5.00 m at a speed of 10.0 m/s is?
35. What is the period of a simple pendulum with length of 1.00 m on Earth?
36. A case where more than three notes are heard sounding simultaneously is an example of complex harmonic motion is known as a musical chord. If this forms a continuous periodic function, the wave-like function can be decomposed using what?
37. In a conventional Feynman diagram, which axis (x or y) represents time?
38. The thermodynamic arrow of time is given by which law of thermodynamics?
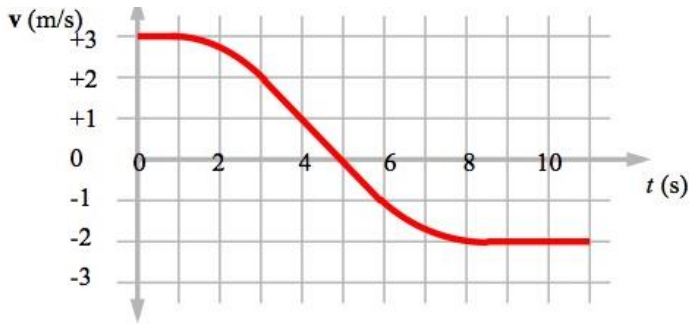
A billiard ball rolling across a table in the +**x** direction at 3 m/s hits the edge of the table at a perpendicular angle, and bounces back in the -**x** direction, now traveling at 2 m/s in the opposite direction. The greatest magnitude of acceleration for the billiard ball was at time

    a. $t = 1$ s
    b. $t = 2$ s
    c. $t = 5$ s
    d. $t = 7$ s
    e. $t = 9$ s

39.

40. While taking your test, you don't realize you've been put onto a boat. A river you want to cross on the boat flows west to east at a speed of 12 m/s. You run your rotor to go across the river (South to North) at a constant speed of 38 m/s. The river is 46 m wide. How long does it take to cross the river (ignore frictional effects)?

41. An object of mass M is hung on a vertical spring of spring constant k and is set into vertical oscillations. The period of this oscillation is T0. The spring is then cut in half and the same mass is attached and the system is set up to oscillate on a frictionless inclined plane making an angle θ to the horizontal. Determine the period of the oscillations on the inclined plane in terms of T0.

42. A ball is thrown straight up from the edge of the roof of a building. A second ball is dropped from the roof 1.00 seconds later (ignore air resistance). If the height of the building is 20.0 meters, what must be the initial speed of the first ball if both are to hit the ground at the same time?

43. What is the image below an example of?

    a. This represents what time-based effect?

    b. List two reasons why the equation of time varies.

44. Would 2200 C.E. be a leap year? Explain why (an explanation is necessary for points).

     a. What day is leap day?
     b. Why do we need leap years?

45. In what two U.S. states is daylight saving time not observed in any way?
     a. Explain why either one of the two states do not follow daylight saving time.

     b. Why are time zones split into 15 degree zones of longitude?

46. A chronometer watch is specified for a timepiece that is quite precise. What watch company was the first to earn this certification?
47. What type of mechanical watch winds the mainspring as a result of natural motions of the wrist and arm?
48. Chemical X is a toxic chemical that disappears over time and follows a second-order reaction. It has an initial concentration of 0.000254 M. Given a rate constant of 0.79 $M^{-1}s^{-1}$, after 268 s, what is the final concentration?
     a. How long would it take for Chemical X to become 0.000001 M?