**Name:   
Team and Team Number:**

**Raw Score:**

1. **1460 danda**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **30th**.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Sunday.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **Thursday.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. **The constellation near which the full moon occurs. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. **Arithmetic.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. **Yes.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. **The solar year does not follow an integer number of days, so counting whole numbers will lead to fractional errors building up over time.**\_\_\_\_\_\_\_
7. **Incenses burn at a slow rate. Other answers could include that incenses burn at a continuous rate and do not light on fire.** \_\_\_
8. **Equal to one’s latitude.** \_\_\_\_\_\_\_\_\_\_ **\_**\_\_\_\_\_\_
   1. **Noon.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. **Shepherd's dials are read by casting a shadow from an object at the top of the diagram, and the length of the shadow depends on season. In the north, the Sun produces longer shadows in summer months, so it should be used in the Northern hemisphere**.\_\_\_\_\_
9. **-6.84°.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. **First date within March 3rd to 5th and other date within October 10th to 12th.**
   2. **No,** **you would measure true local time, while your watch/other sources would be measuring standard mean time.**
10. **60 minutes.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    1. **Three (one striking train for the hours, one striking train for the half hours, one is the timekeeping train).**\_\_\_\_\_\_\_\_\_
11. **Pinecone.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    1. **Ctesibius.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    2. **The water flow rate is not constant and varies based on pressure of water above the nozzle that water comes out of**.\_\_\_\_
    3. **Added extra vessel of water that kept \_ the main reservoir of water full, thus \_ producing constant outflow rate. Half \_ points for only: Adding nozzle to main\_ reservoir for overflowing and/or adding a float to measure time with.**\_\_\_\_\_\_\_\_ \_
12. **0.707 seconds.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    1. **While moment of inertia does change since temperature can expand/contract materials, size changes can also influence elasticity, which would affect the torsional constant.**\_\_\_\_\_\_
    2. **The bimetallic strip.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    3. **H3.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    4. **Making careful measurements of the \_ positions of the Jovian moons.**\_\_\_\_\_\_\_\_
    5. **The solid granules do not condense, \_ which would affect time flow rate \_ greatly (based on changing pressure, \_ having to refill the water, etc).** \_\_\_\_\_\_\_
    6. **703 hours.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. **(Daniels) Co-Axial escapement.\_**\_\_\_\_\_\_\_\_\_\_\_\_
    1. **Sliding friction is effectively eliminated. Or: Lubrication is unnecessary.**
14. **Omega SA.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
15. **0.0070 H.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    1. **17:32:00.0, May 21st, 2016 DST (sadly, the awards ceremony will be late).\_\_\_\_**
    2. **The 03 bit.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
16. **The (time-energy) uncertainty principle** \_\_\_\_\_\_
17. **Cesium.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
18. **342.4 days.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
19. **88.3 m.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
20. **Black holes emit Hawking radiation at some \_ temperature over time, thus overall following \_ the second law of thermodynamics (overall, \_ entropy increases).**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
21. **Allowing the disk to rotate means that energy \_ can be put translationally more into moving \_ the center of mass than when not. This is \_ because the moment of inertia decreases from \_ not having to move the disk rotationally about\_ the center of mass (to make up for the fact that it is not rotating). So, the one with the shorter \_ period would be the freely spinning case.**\_\_\_\_\_
    1. **1.97 seconds.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    2. **At first no, but the long run period \_ (based on the natural frequency) does\_ increase.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
22. **When it matches the natural frequency.**\_\_\_\_\_\_
23. **2089 days.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
24. **217.5°**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
25. **0.497 days.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_