

Corpus Christi College Physics Estimation Evening

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No calculators or aids allowed, pencil and paper encouraged. Answers are to be given in the form 10^x , where x is integer or half integer, that is give **$\log_{10}(\text{answer})$, rounded to nearest half integer**. This therefore accommodates answers like 1×10^5 or 3×10^{15} , since $3 \approx 10^{0.5}$, and so you are in effect rounding the prefactor to the powers of 10 to be 1, 3 or 10.

1. *The 'London Eye' is a large Ferris wheel that is a popular London tourist attraction. What is the rotational kinetic energy of the London Eye when it is fully loaded and moving at normal speed?* [answer in J]
2. *How many physics papers are published worldwide each year?* [answer in number of papers]
3. *On a clear night, roughly how many visible light photons per second make it to your eye from Alpha Centauri A (a sun-like star about 4 light years away?)* [answer in photons s^{-1}]
4. *Last month astronomers announced the detection of Gliese 581g[†], which is believed to be the first extrasolar planet observed that possesses an Earth-like mass and range of temperatures. The scientists inferred its presence by observing the changes in the radial velocity of the star Gliese 581 via the Doppler shift, as it and the planet orbit about a common center of mass. The Gliese planetary system is thought to be almost coplanar to our own. If aliens on Gliese 581g were to detect Earth using the same method, what is the required resolution of their instrument?* [answer in m s^{-1}]
5. *What is the energy cost of removing 1 kg of CO_2 from the atmosphere?* [answer in J]
6. *What is the pressure at the center of the Earth?* [answer in Pa]

[†] Shiga, David (2010-09-29). "Found: first rocky exoplanet that could host life". *New Scientist*.