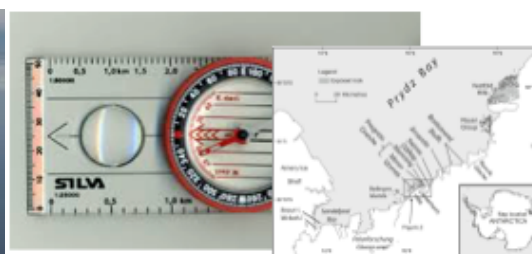


'Science in the Real World' Quiz Answers



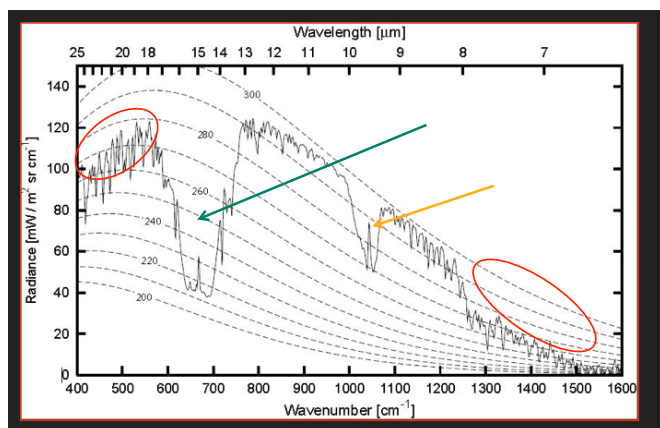
I want to fuel my private jet (above) with biofuel derived from oil seed rape. What area of crop will I have to plant to fill the plane's tanks?

Depending on the exact estimates for field productivity and conversion efficiency the answers is between 150 and 450 hectares. That's the size of a medium sized farm in the UK. Just to fill up the plane once...



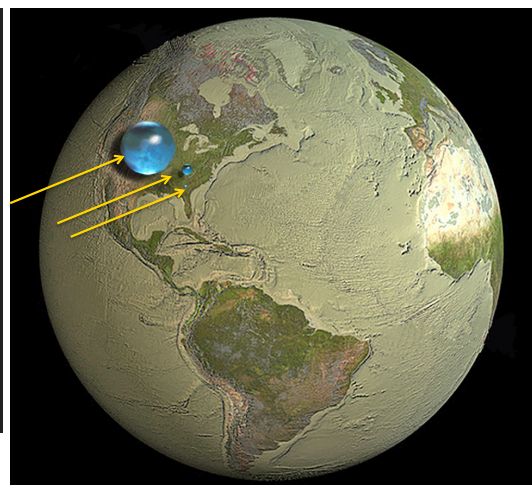
In which direction is the red end of the compass needle likely to point near the south magnetic pole?

Its likely to dip up/downwards (and get stuck) as the magnetic field lines are almost vertical near the magnetic pole. Buy a 'southern hemisphere compass' if you go there!



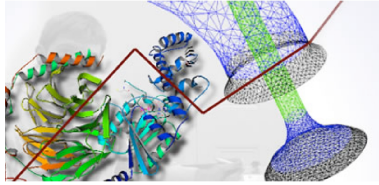
This is an infra red spectrum, but of what? And what are the red, yellow, and green bits?

The smooth dotted lines are the black body radiation emitted by the earth at various temperatures. This is the spectrum you get from pointing an ir spectrometer down to the ground. The jagged line is the same radiation recorded from a satellite looking down from the top of the atmosphere. The difference between the two is the energy absorbed by greenhouse gases. Green is carbon dioxide, red is water, yellow is ozone



What do the 3 blue spheres on this graphic represent

According to the US Geographical Survey, this is all the water in the world scaled to the earth. The large sphere is mainly sea water and the ice-caps, the middle sphere is fresh water including artesian, and the smallest sphere (~35 miles diameter) is all the accessible fresh water in rivers lakes and reservoirs.
<https://water.usgs.gov/edu/earthhowmuch.html>



A summer day in Scotland, a summer day in the Sahara. Two identical sets of PV cells. Which produces the most energy that day?

What is this and where would you find one?

The answer would be the cells in Scotland. So knowledgeable types will be saying 'its a trick question, the daylight hours are much longer in summer in Scotland'. And you are correct. But thats not the only reason. PV cells work by light not by heat. In fact they get less efficient as the temperature rises. Most cells are rated at 25C, but efficiency typically decreases by 0.4% per degree. See

<https://solarcalculator.com.au/solar-panel-temperature/>

Long cool sunny days are the best!

Its a marine diesel engine, as used in cruise ships and container ships. Its the unsung hero of the global economy, as its very efficient and runs on very low cost fuel. A container ship can transport 4 cars from Japan to California for the price of moving one car overland from New Jersey to California.

For some people, its the villain not the hero, as the very cheap fuel (on which no tax is paid) contains 3.5% sulphur and is highly polluting. Not to mention the carbon dioxide. So its good news that the International Marine Organisation will be enforcing the move to 0.5% S fuel in 2020.

<http://www.theguardian.com/environment/2014/nov/02/environmental-impact-of-shipping-goods>