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Activity

Practice-for-exam questions

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Use the questions below either in class or for individual work after reading the articles in the magazine. Some of the questions require additional data. You should either make reasonable estimates of quantities, or look up values using a data book or websites. Suggested outline answers to these questions are provided in a separate document.

Where is the North Pole?

1 A group of walkers do not know about magnetic declination. They use a map and magnetic compass to follow a route over open moorland Yorkshire. The route follows the grid lines due north for 2 km. The walkers follow their compass for 2 km.

Calculate how far they will be from their destination, and in which direction.

2 Charged particles in the solar wind travel at up to 800 km s^{-1} (<https://solarscience.msfc.nasa.gov/SolarWind.shtml>).

Estimate the maximum electromagnetic force on an electron in the solar wind travelling close to the Earth's surface.

Will electric cars break the National Grid?

1 The range of a Nissan Leaf is given as 160 miles. Describe and explain three different factors that might reduce this range in normal driving.

2 Using data on page 5 of the magazine:

a Show that the author's approximation that the energy needed to boil a kettle of water is about 0.1 kWh is correct.

b Estimate how many 1 litre kettles of water might be boiled using the energy stored at Dinorwig.

Specific heat capacity of water, $c = 4200 \text{ J kg}^{-1}\text{C}^{-1}$

Skillset: Magnetic force on a current-carrying wire

1 The experiments described in the *Skillset* take place in the Earth's magnetic field.

a Use data in this article and on page 5 to show that the force on the wire due to the Earth's field can be ignored.

b Explain how you can set up the experiment to ensure that the force due to the Earth's magnetic field is minimised.

2 Suggest and explain one safety precaution that should be taken when carrying out this experiment.

How loud is that?

1 An environmental sound-intensity meter is checking the noise from a machine following a complaint. The sound intensity meter measures a value of 110 dB.

Calculate, in W m^{-2} , the intensity of the sound at the meter.

2 The article refers to other measures that use a logarithmic ratio. Logarithmic scales are also used to display data.

Explain, with examples, why data about the electromagnetic spectrum are usually displayed using a logarithmic scale.

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