Physics. You work it out.

Essential Pre-Uni Physics H1.8

A Level

Please give your answers to the lowest number of significant figures provided in the question. In these questions ignore the effects of non-electrical forces.

What is the force on a $+6.0 \times 10^{-13}\,\mathrm{C}$ charge between two metal surfaces if the surfaces are $5.0 \times 10^{-5}\,\mathrm{m}$ apart, and the voltage difference across the plates is $9.0\,\mathrm{V}$?

Physics. You work it out.

Essential Pre-Uni Physics H3.7

A Level

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

For electrons moving at a speed greater than 10% of the speed of light, you should only claim that your answer is approximate (unless you have used relativistic equations). If you reckon that the electron is travelling at a speed greater than 80% of the speed of light, you should decline to give your answer unless using relativity

It is desired to produce protons with a kinetic energy of $5.0\,\mathrm{MeV}$. What accelerating voltage is needed?

Gameboard:

STEM SMART Physics 42 - School of Fields - Putting it together

Essential Pre-Uni Physics H4.5

A Level

C C C

Ignore the effect of the Earth's magnetic field unless specifically asked to include it.

Assume that the horizontal component of the Earth's magnetic field points North, and the vertical component points down.

The horizontal component of the Earth's magnetic field in Britain is $6.91 \times 10^{-5}\,\mathrm{T}$, while the vertical component is $1.55 \times 10^{-4}\,\mathrm{T}$.

Part A Force on a wire

There is a bad electrical fault in a house. A $6.0\,\mathrm{m}$ wire running North-South carries a current of $6000\,\mathrm{A}$ for a short time. Calculate the magnitude of the force on it given that it is exposed to the Earth's magnetic field.

Part B Direction of the force

At an instant when the current in the wire is running from North to South, what is the direction of the force?

- East
- North
- West
- South

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Physics. You work it out.

Essential Pre-Uni Physics H5.2

A Level

Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

Part A Perpendicular to the field

Calculate the force on an electron going at $3.5 \times 10^7\,\mathrm{m\,s^{-1}}$ in a $3.4\,\mathrm{mT}$ magnetic field if the electron is travelling perpendicular to the magnetic field.

Part B Parallel to the field

Repeat the question if the electron is travelling parallel to the magnetic field.

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Physics. You work it out.

Vectors and Fields - Between a Planet and a Moon 27.5

A Level

C C C

For the Earth - Moon system, $M_\text{P} = 81M_\text{M}$ (the mass of the Earth is 81 times the mass of the Moon) and the distance between them $R = 3.85 \times 10^8\,\text{m}$.

r_M is the distance to the Moon and r_P is the distance to the Earth.

Part A r_M/r_P

Calculate r_M/r_P for the place where $g = 0$.

Part B r_M as a fraction of R

Evaluate r_M (for the same place) as a fraction of R.

Part C r_P

Evaluate r_P at this place.

Gameboard:

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Physics. You work it out.

Vectors and Fields - Electric Deflection 28.8

A Level

In an oscilloscope, a deflector applies up to $1.0\,\mathrm{kV}$ between two $3.0\,\mathrm{mm}$-long plates separated by $2.0\,\mathrm{mm}$. Electrons with initial kinetic energy $1500\,\mathrm{eV}$ pass through the deflector.

Part A Deflection angle

By what angle are electrons deflected at the maximum voltage?

Part B Screen position

A phosphorescent screen is placed $10\,\mathrm{cm}$ away so that undeflected electrons hit the centre of the screen. How far from the centre of the screen can deflected electrons land?

Gameboard:

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Vectors and Fields - Helix in Magnetic Field 29.2

A Level

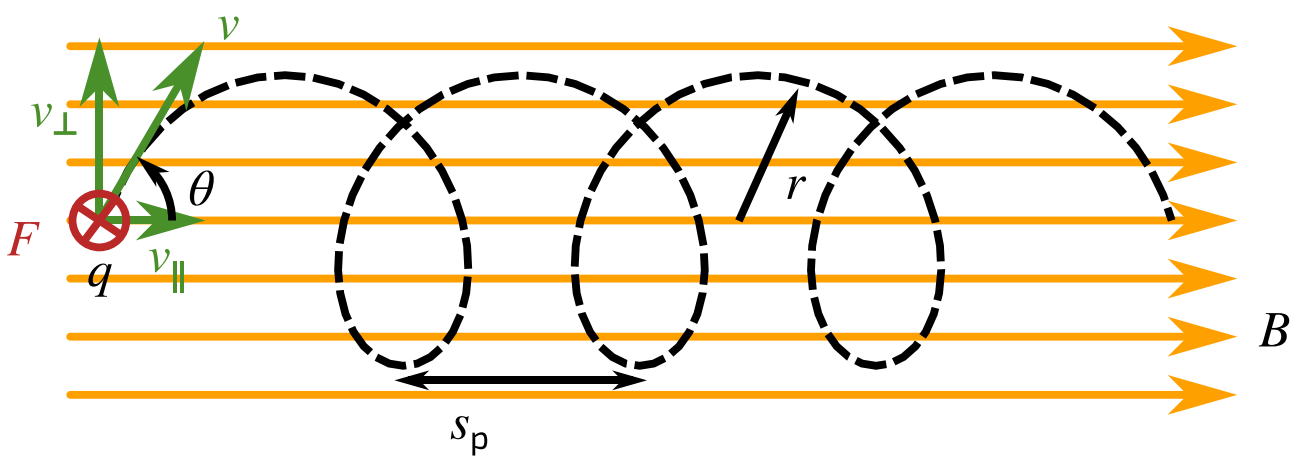

Figure 1: The helical path of a charged particle in a magnetic field.

A charged particle of mass $1.05 \times 10^{-25}\,\mathrm{kg}$ and charge $3.2 \times 10^{-19}\,\mathrm{C}$ enters a $1.45\,\mathrm{T}$ magnetic field with a speed of $3.2 \times 10^{6}\,\mathrm{m\,s^{-1}}$. The velocity of the particle is at an angle of 30° to the magnetic field. What is the radius and the pitch of the helix that the particle now follows?

Part A Radius

What is the radius of the helix?

Part B Pitch

What is the pitch of the helix?

Gameboard:

STEM SMART Physics 42 - School of Fields - Putting it together

Physics. You work it out.

Energy and Fields - Closest Approach 25.2

A Level

Calculate the distance of closest approach of a proton travelling at $2.0 \times 10^6\,\mathrm{m\,s^{-1}}$ to a copper nucleus with 29 protons. Assume that the copper nucleus remains stationary.