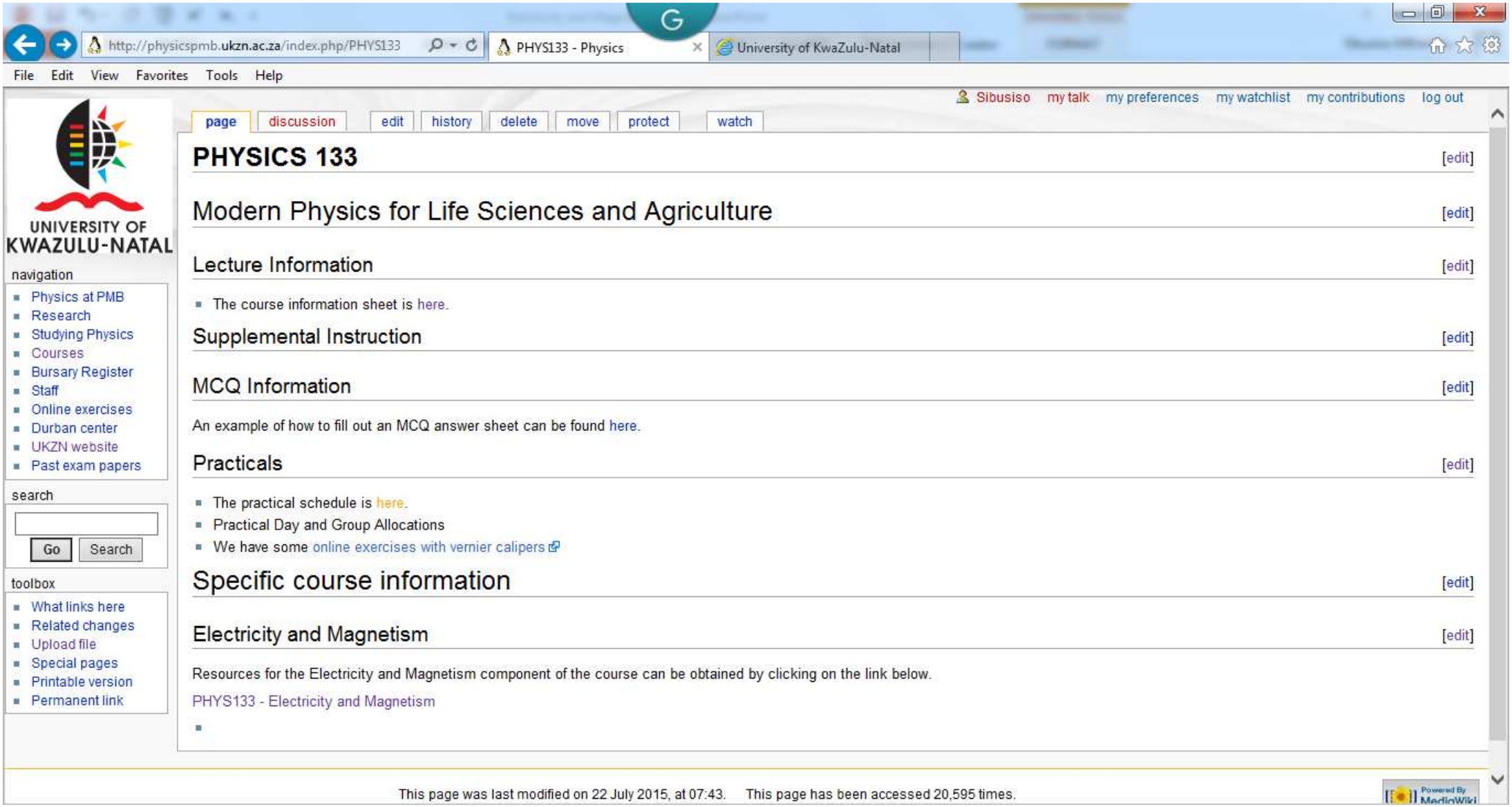
http://physicspmb.ukzn.ac.za/index.php/PHYS133



Example 1.2: Neutral point in the field due to two point charges

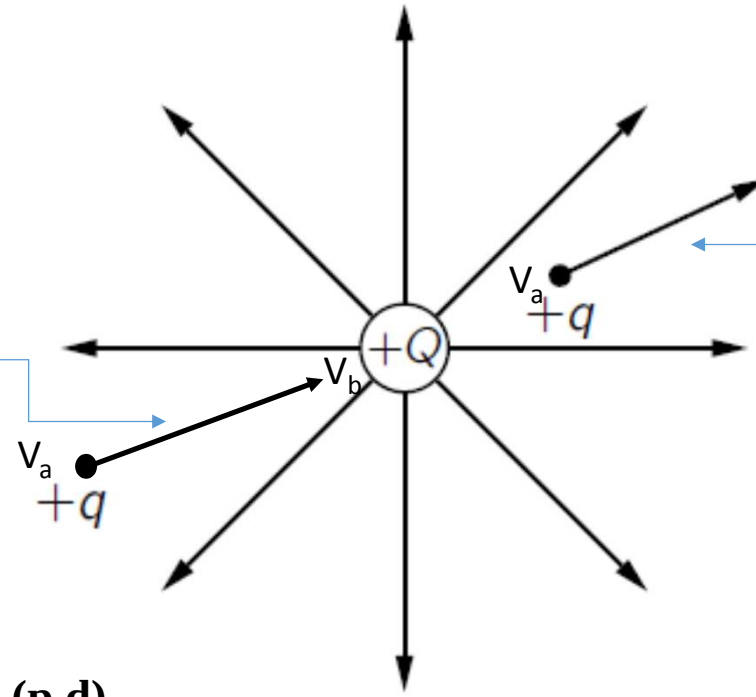
Charges of +5 nC and +20 nC are located 30 cm apart in air. Calculate

1. the force between them, and
2. the position of the neutral point in the resulting electric field.

Example 1.3: Force on a charge in a uniform electric field

Calculate the force on an electron ($e = 1.60 \times 10^{-19}$ C) in a uniform electric field E of magnitude $E = 1.5 \times 106\ NC^{-1}$.

Electric potential and potential difference



An electric potential is defined as the **potential energy per unit charge** (PE/q). Electric potential can not be physically measured but potential difference (V) can be measured.

Potential difference (p.d)

The potential difference between two points in an electric field is the **work done per unit charge** in slowly transferring a small positive test charge from one point to the other.

$V = V_b - Va = \frac{\Delta PE}{q}$ but $\Delta PE = W$ (Work-energy theorem)

$$V = \frac{W}{q}$$

The SI unit of potential difference is the volt (1V = 1 J C^{-1}).

One volt is the p.d. between two points in an electric field if **1 joule** of work moves a charge of **1 coulomb** between these points. Note that V is a **scalar quantity**.

The electron volt – a unit of energy

The joule is a very large unit for dealing with energies of electrons, atoms or molecules. For this purpose, the electron volt is used (abbreviated eV).

Electron volt

One electron volt is defined as the energy acquired by an electron when moving through a potential difference of 1 V. From Equation

$$W = qV$$
$$eV = 1.6 \times 10^{-19}\, C \times (1V),$$

hence we have

$$\mathbf{1}\, \boldsymbol{eV} = \mathbf{1.6} \times \mathbf{10^{-19}}\, \boldsymbol{J}.$$

Example: An electron moves freely from one point to another in an electric field and gains 200 eV of energy. Express this energy into J.