6 **(a)** Define *magnetic flux density*.

....

....

....

.... [2]

(b) A horseshoe magnet is placed on a top-pan balance. A rigid copper wire is held horizontally between the poles of the magnet as shown in Fig. 6.1.

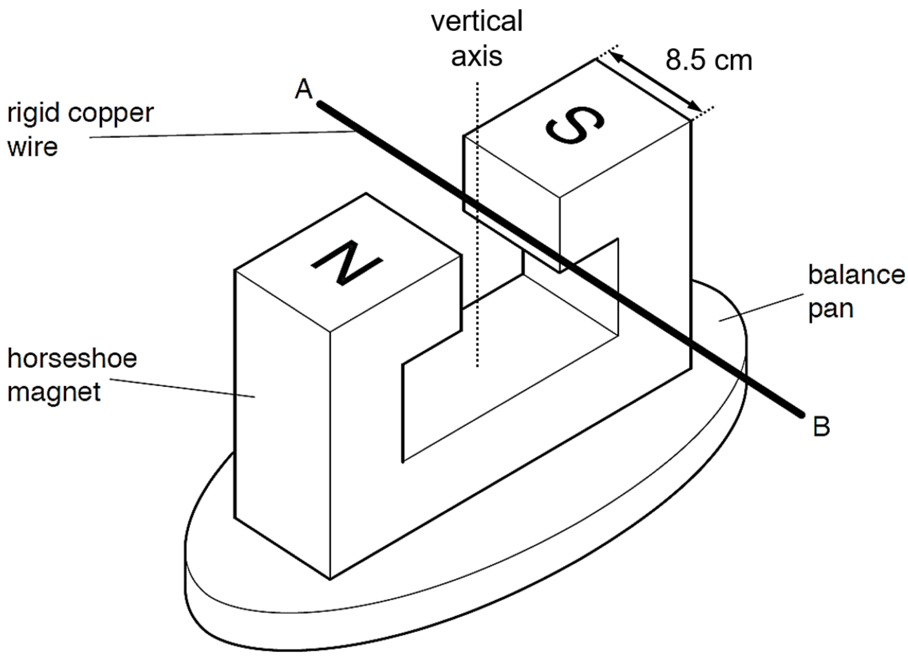

Fig. 6.1

The wire is clamped at ends A and B.

When a direct current of 4.6 A is switched on in the wire, the reading on the balance increases.

(i) State and explain the direction of the force acting on the wire.

....

....

.... [2]

(ii) Hence, state the direction of the current in the wire.

.... [1]

(iii) The width of each pole is 8.5 cm and the magnetic flux density *B* in the region between the poles of the magnets is 3.7 mT. Assume that the magnetic flux density exists only between the poles.

Calculate the force on the wire.

force = …………...……… N [2]

(iv) The wire is now rotated about the vertical axis through 45° as shown by the top view in Fig. 6.2.

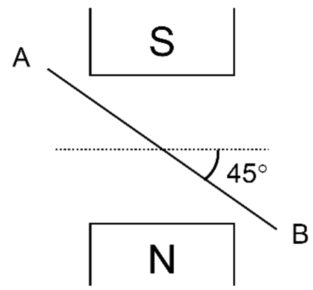

Fig. 6.2

Explain why the reading on the balance remains the same when the wire is rotated about the vertical axis.

………………………………………………………………………………………..

………………………………………………………………………………………..

…………………………………………………………………...………………….. [2]

[Total: 9]