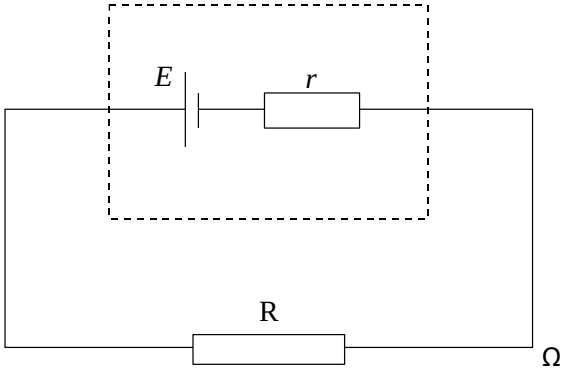
Name: _____ Phys 12

Year End Review: Circuits and Electromagnetism

1) A cell of electromotive force (emf) *E* and internal resistance *r* is connected in series with a resistor R, as shown below. The emf of the cell is 1.4 V. The resistor R has resistance 6.0 Ω. The potential difference between its terminals is 1.2 V.



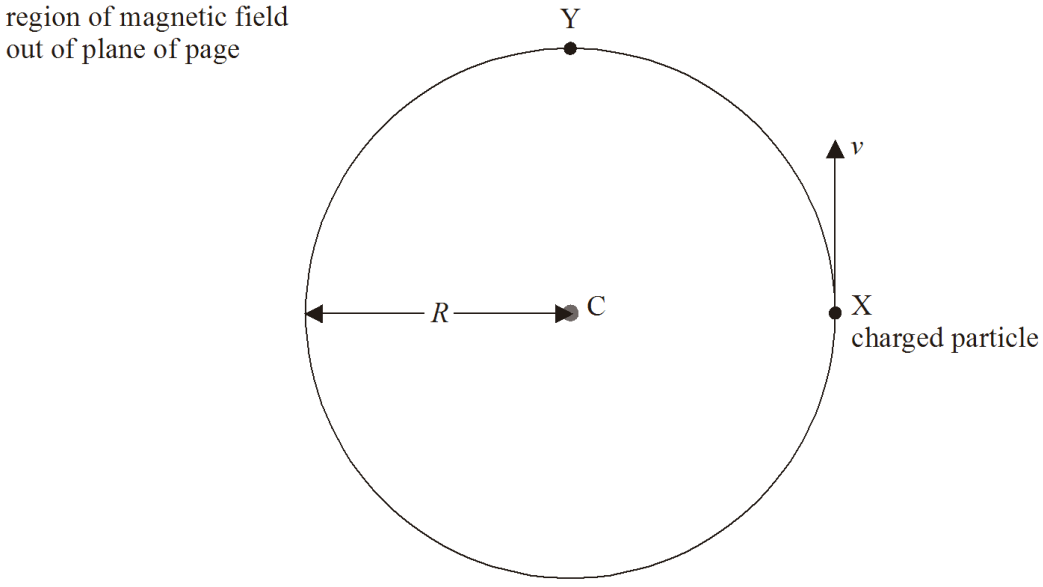
a. Determine the internal resistance r of the cell.

b. What is the power dissipated by the internal resistance?

c. What is the power consumed by the cell?

d. If another resistor R with the same resistance was added in series, state and explain what would happen to the power consumed by the cell.

2) A charged particle is projected from point X with speed *v* at right angles to a uniform magnetic field of 1.25 x 10^{-6}T. The magnetic field is directed out of the plane of the page. The particle moves along a circle of radius *R* = 1.00 m and centre C as shown in the diagram below.



a. On the diagram above, draw arrows to represent the magnetic force on the particle at position X and at position Y.

b. State and explain whether

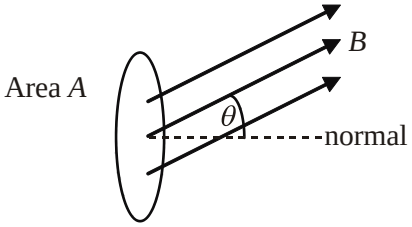
i. the charge is positive **or** negative;

ii. work is done by the magnetic force.

c. If the momentum of the particle is 2.00×10^{-25} kg m/s, find the charge of the particle.

d. What could be the identity of this particle? If so, calculate its speed.

3) A small area *A* is in a region of uniform magnetic field of strength *B*. The field makes an angle ? to the normal to the area as shown below.



A thin copper ring encloses an area of 1.8×10^{-3} m^2. The plane of the ring is normal to a uniform magnetic field. The magnetic field strength increases at a constant rate of 5.0×10^{-2} T s^{-1}.

a. If the left side of the loop looks like it's coming out of the page, what direction would be the induced current?

b. Calculate the e.m.f. induced in the ring.

Answer key

1)
   a. 1.0 Ω
   b. 0.040W
   c. 0.28W

2)
   a.
   b.
      i. negative
      ii. 0 J
   c. 1.6×10^{-19} C
   d. Electron, 2.2×10^{5} m/s

3)
   a. Clockwise
   b. 9.0×10^{-5} V