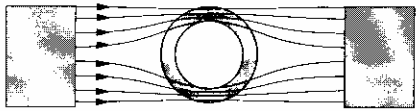
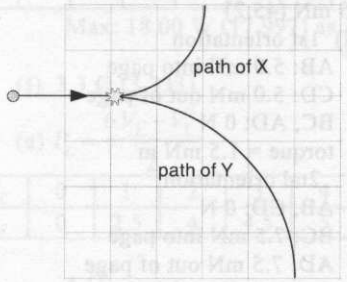
Supplementary Exercise on Electromagnetism (Beyond)

7. 0.12 N upwards
8. (a) to the left
   (b) 0.20 m s^{-2}
9. (a) 4.9 mN (4.89) along E-W
   (b) 1.8 mN (1.78) along E-W
   (c) 5.2 mN along an inclined line 70° above the horizontal in the N-S plane
10. (a) 8.2 N
    (b) 5.0 N
11. 160 A from left to right
12. 45 mN (45.2)
13. (a) 1st orientation
    AB: 5.0 mN into page
    CD: 5.0 mN out of page
    BC, AD: 0 N
    torque = 1.5 mN m
    2nd orientation
    AB, CD: 0 N
    BC: 7.5 mN into page
    AD: 7.5 mN out of page
    torque = 1.5 mN m
    (b) torque = 1.5 mN m, axis passes through coil centre and ⊥ to B-field
14. 1.1×10^{-4} A (1.14×10^{-4})
15. (a) 1.0 mN m (1.047)
    (b) 24°, 0.20 mN m
    (c) concave pole pieces to provide radia magnetic field; torque independent o orientation of the coil.
16. (a)

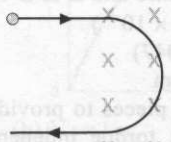


    (b) avoid interference from external B field.
17. (a) 1.0 rad (57.3°)

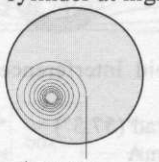
24. (a) anti-clockwise
    (b) Note: velocities are the same
    i) Moving together along initial pa
    ii) Uncharged: moves in a straight along the tangent; Charged: *m* redu so *r* reduced.
25.



Y has equal but opposite charge
26. (a)



    (b) 8.9×10^{-12} s (8.93×10^{-12})
27. (a) -ve
    (b) increasing
    (c) metal cylinder at higher potential
28.



29. (a) 4.5 m s^{-1} (4.47)
    (b) 8.9×10^{-4} N (8.94×10^{-4})
    (c) 6.89 mN
    (d) 5.11 mN

30. (a) $v_o = A\sqrt{g/l}$
    (b) i) because magnetic force is always at right angles to the motion. So, *a*, *v*, *A* are not affected.
    ii) at the lowest point moving to the right side
31. (a) $v_{//} = 1.7 \times 10^8$ m s^{-1} (1.73×10^8)
    $v_{\perp} = 1.0 \times 10^8$ m s^{-1}
    (b) 3.3×10^{-7} s (3.28×10^{-7})
    (c) 56.8 m
32. 9.6×10^4 N kg^{-1} (9.58×10^4)
33. Apply B-field into page, $B = \frac{V}{dv}$
34. (b) 5.0×10^6 m s^{-1}
    (c) Yes. Undeflected
35. (a) 3.3 mT (3.33)
    (b) 6.0×10^7 m s^{-1}
    (c) 1.75×10^{11} C kg^{-1}. Electron
36. (a) 7.6×10^7 Hz (7.62×10^7)
    (b) 3.8×10^7 Hz (3.81×10^7)
37. (a) 1.6×10^{20} m^{-3}
    (b) n-type. negative charge-carrier By left head rule, current to the right, field up, force to shaded area