1. Consider the scalar field given by:
$\phi = 4x^2 + y^2 + z^2 - 2xy + yz$.
Calculate the vector field $\underline{\nabla}\phi$.

2. Find the divergence of the vector field:
$\bar{A} = x^2 y\,i + y z^2\,j + xk$ at the point $(2, 1, 2)$.

3. Find the curl of the vector field:
$\bar{A} = x^2 y\,i + 2xyz\,j - x^2 k$ at the point $(1, 1, 1)$.

4. State the Lorentz Force Law, explaining each term.

5. Consider a 0·5T magnetic field at an angle of 60° to the x-axis, lying in the x-y plane. Find the Lorentz Force exerted on an electron moving with speed $8 \times 10^6\ ms^{-1}$ along the positive x-axis in this field.

6. Describe the motion of a charged particle in a constant magnetic field. Find expressions for the radius, angular speed, period and frequency of the particle.

7. State Ampères Law for the magnetic field produced by a steady current, explaining the significance of each term.

8. Use Ampères Law to find the magnetic field a distance d from an infinitely long straight wire carrying a current I.

9. State the Biot-Savart Law for the magnetic field at a point P due to a current carrying wire, and explain the significance of each term.

10. Use the Biot-Savart Law to calculate the magnetic field at the centre of a circular loop of wire of radius R, carrying a current I.