



**PHYSICS VCE UNITS 3&4
DIAGNOSTIC TOPIC TESTS 2017**

TEST 1: HOW DO THINGS MOVE WITHOUT CONTACT? (I)

TOTAL 45 MARKS (45 MINUTES)

Student's Name: _____ Teacher's Name: _____

Directions to students

Write your name and your teacher's name in the spaces provided above.
Answer all questions in the spaces provided.

Use $k = 9.0 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$, $q_e = 1.6 \times 10^{-19} \text{ C}$ and $m_e = 9.11 \times 10^{-31} \text{ kg}$.

Question 1 (8 marks)

Draw eight electric field lines between each of the charged points or planes.

a.  2 marks

b.  2 marks

c.  2 marks

d.  2 marks

Question 2 (12 marks)

Draw eight magnetic field lines for each of the diagrams below. Arrows in wires show the direction of the positive current.

a.  2 marks

b.  3 marks

c.  3 marks

d.  2 marks

e.  2 marks

Question 3 (4 marks)

Figure 1 shows the electric field around a point charge. A dashed line AB is shown cutting across the electric field.

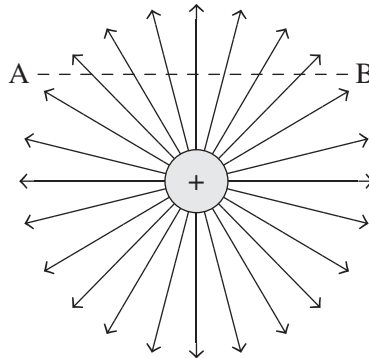


Figure 1

Complete the following sentences by circling the correct option from the choice of three that is given within each set of brackets.

- a. As an electric field probe is passed from A to B along the line AB, the electric field direction is **zero** / **static** / **changing** and the magnitude of the electric field is **zero** / **static** / **changing**. 2 marks
- b. As an electric field probe is passed from the centre radially outwards, the electric field direction is **constant** / **changing** and the magnitude of the electric field is **zero** / **constant** / **increasing** / **decreasing**. 2 marks

Question 4 (4 marks)

Two electrons are a distance of 1.0×10^{-10} m apart.

- a. Determine the electric field strength at the position of one electron due to the other. 2 marks

N C⁻¹

- b. Determine the magnitude of the electric force between the electrons. 2 marks

N

Question 5 (6 marks)

The potential difference between two plates of distance 2.0 cm is 12.0 V.

- a. Determine the electric field strength between the two plates. 2 marks

N C^{-1}

- b. Determine the electric force acting on an electron passing in the region of the electric field. 2 marks

N

- c. Determine the work done on an electron if it travels from the negative plate to the positive plate. 2 marks

J

Question 6 (11 marks)

An electron is fired into a region of magnetic field, as shown in Figure 2.

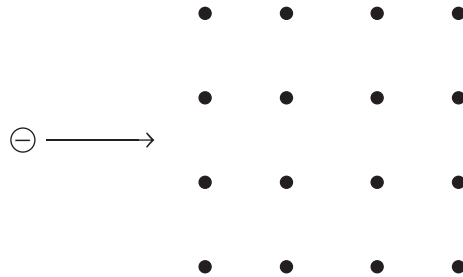


Figure 2

- a. Sketch the path of the electron through the magnetic field in Figure 2 and identify the direction of the force at any point chosen by you along the path you sketch. 2 marks
- b. If the electron travels at $2.0 \times 10^6 \text{ m s}^{-1}$ and the magnitude of the magnetic field is 0.50 T, determine the size of the force acting on the electron. 2 marks

N

c. Determine the radius of the path followed by the electron.

3 marks

m

d. Explain how the answers to parts **a.**, **b.** and **c.** would vary if the electron had been fired parallel with one of the magnetic field lines in Figure 2.

4 marks
