

8 End-of-chapter test

Answer all questions.

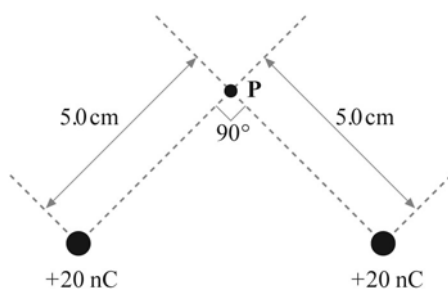
permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ F m}^{-1}$

elementary charge $e = 1.6 \times 10^{-19} \text{ C}$

- 1
 - a Define electric field strength at a point in space. [1]
 - b The electric field strength close to a charged plate is $5.0 \times 10^5 \text{ V m}^{-1}$.
A droplet of paint carrying a charge of $-4.8 \times 10^{-19} \text{ C}$ passes near to the charged plate.
 - i Calculate the force the paint droplet experiences due to the electric field. [2]
 - ii Determine the number of excess electrons on the droplet. [2]
- 2 The diagram shows the nucleus of a gold atom.



- a Draw the electric field pattern for the nucleus. [2]
- b The radius of the nucleus is $6.8 \times 10^{-15} \text{ m}$ and it has a charge of $+1.3 \times 10^{-17} \text{ C}$.
Calculate the magnitude of:
 - i the electric field strength on the 'surface' of the gold nucleus [3]
 - ii the force experienced by an α -particle of charge $+3.2 \times 10^{-19} \text{ C}$ at a distance of $1.4 \times 10^{-14} \text{ m}$ from the centre of the gold nucleus. [3]
- 3 The diagram shows two identical point charges situated in air.



- a Calculate the magnitude of the electric field strength at point **P** due to one of the $+20 \text{ nC}$ charges. [3]
- b On the diagram above, draw the direction of the field at point **P**. [1]
- c Show that the resultant electric field is $\sqrt{2}$ times greater than your answer to part a. [2]

Total: $\frac{\quad}{19}$ Score: $\quad\%$