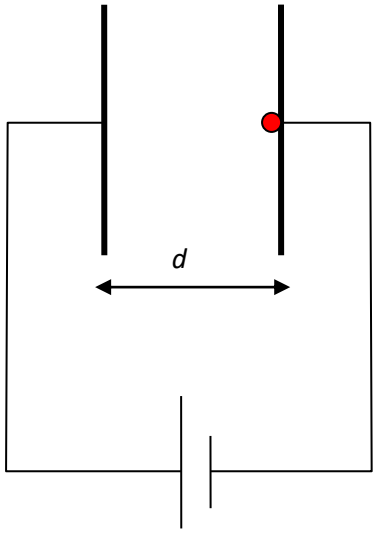
Quiz D19

Motion in EM fields

1. An electron is placed on the negative of two oppositely charged plates and released. The plates are a distance *d* apart.

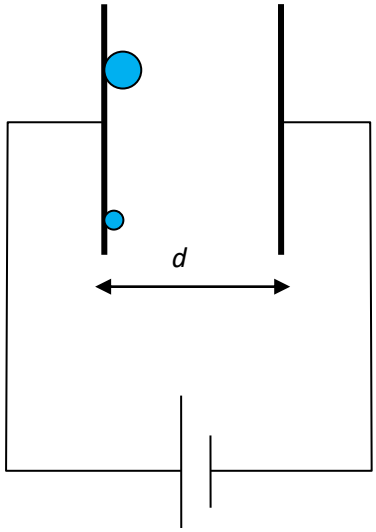


The electron gains kinetic energy *K* when it arrives at the positive plate after time *T*. The separation of the plates is doubled.

What is the kinetic energy gained by the electron and how long does it take it to reach the positive plate?

	Gain in kinetic energy	**Time of travel**
A	*K*	*T*
B	*K*	2*T*
C	2*K*	*T*
D	2*K*	2*T*

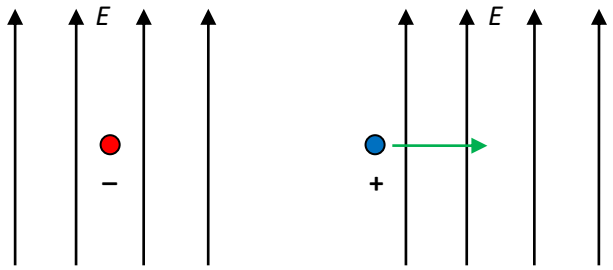
2. Two parallel plates are oppositely charged. An alpha particle and a proton are placed on the positive plate. The particles are then released.



What is correct about the ratio of speeds $\frac{v_p}{v_\alpha}$ of the particles when they reach the opposite plate?

A 4 **B** 2 **C** $\sqrt{2}$ **D** 1

3. A negatively charged particle is released from rest in a region of uniform electric field. Another positively charged particle enters the region of electric field with a velocity that is at right angles to the electric field.



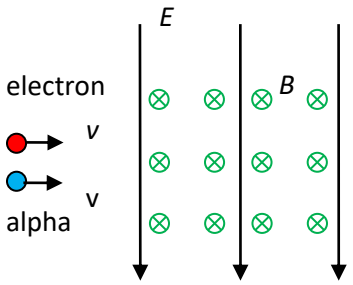
What are possible paths for these particles?

	Negatively charged particle	**Positively charged particle**
A	Straight line along field	Parabolic path curving upwards
B	Straight line along field	Parabolic path curving downwards
C	Straight line opposite to field	Parabolic path curving upwards
D	Straight line opposite to field	Parabolic path curving downwards

4. A particle of mass m and charge q enters a region of uniform magnetic field directed at right angles to the velocity v. The particle follows a circular path completing one full revolution in time T. A second particle of mass $2m$ and charge $2q$ enters the same region of magnetic field with velocity $2v$. What is the period of revolution of this particle?

A T **B** $2T$ **C** $4T$ **D** $8T$

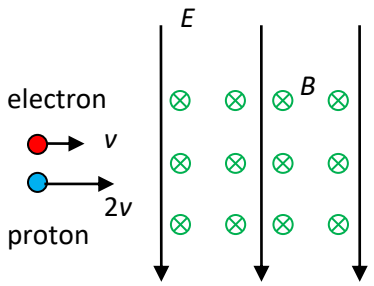
5. An electron (e) enters a region of uniform electric and magnetic fields that are at right angles to each other. The electron is undeflected.



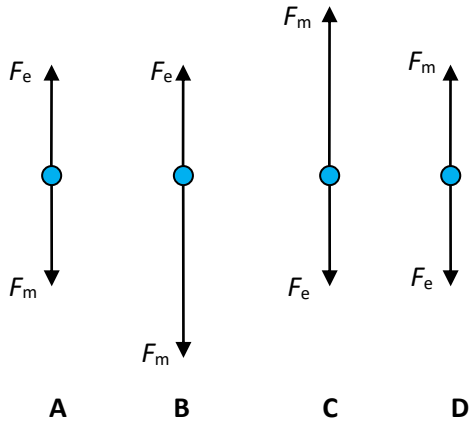
An alpha particle (α, charge +2e) enters the same region of fields with the same velocity as the electron. What is correct about the alpha particle?

	Path followed	Reason
A	Will be deflected	The charge of the α is positive
B	Will be deflected	The charge of the α is different from that of the e
C	Will not be deflected	The mass of the α is much greater than that of the e
D	Will not be deflected	Deflection or not does not depend on charge and mass.

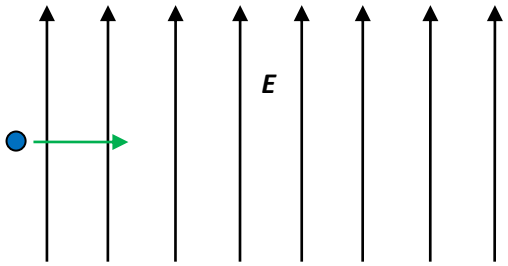
6. An electron enters a region of uniform electric and magnetic fields that are at right angles to each other. The electron is undeflected.



A proton enters the same region of fields with a velocity that is double that of the electron. What diagram shows the forces on the proton while in the region of the fields?



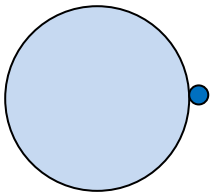
7. A positively charged particle enters a region of uniform electric field. The particle follows a parabolic path.



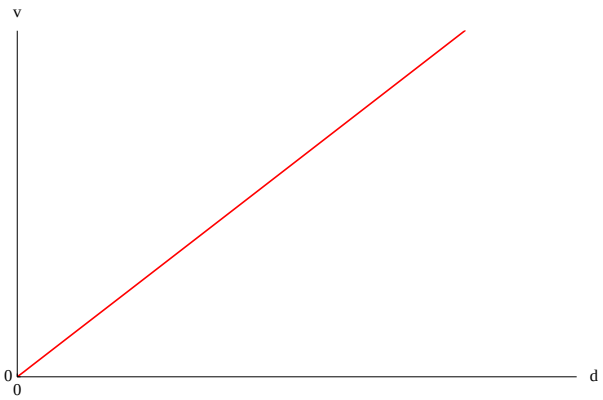
A second positively charged particle enters the same region of field with the same velocity as the first particle. It follows an identical path. What can be concluded from this observation?

A The two particles have the same charge and mass.
B The two particles have the same charge to mass ratio.
C The two particles have the same charge.
D The two particles have the same mass.

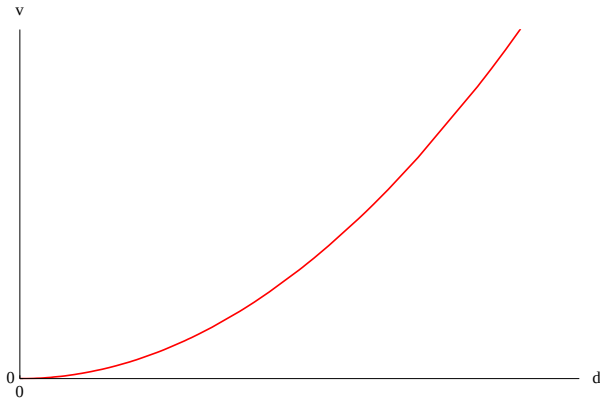
8. A small positively charged particle is placed on the surface of a positively charged sphere. The particle is then released.



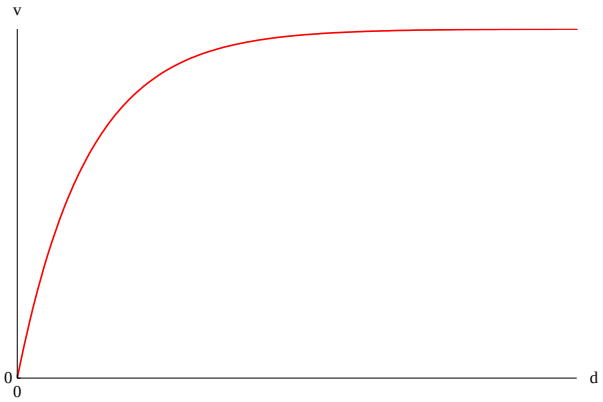
Which graph shows the variation with distance *d* from the surface of the sphere of the speed *v* of the particle?



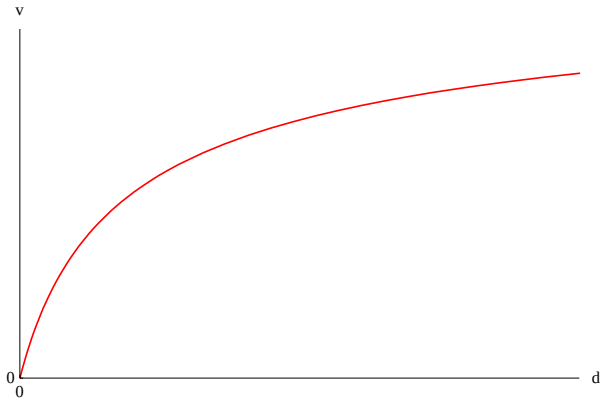
A



B

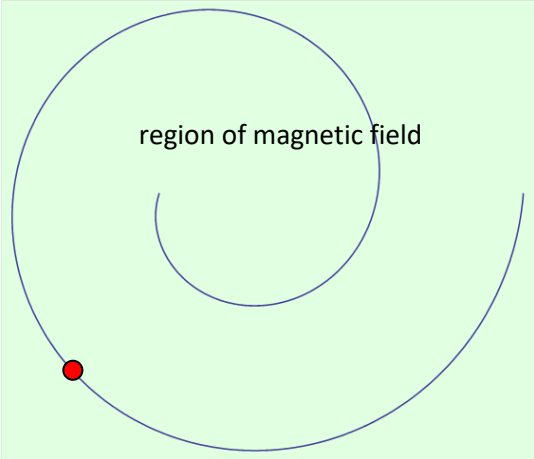


C



D

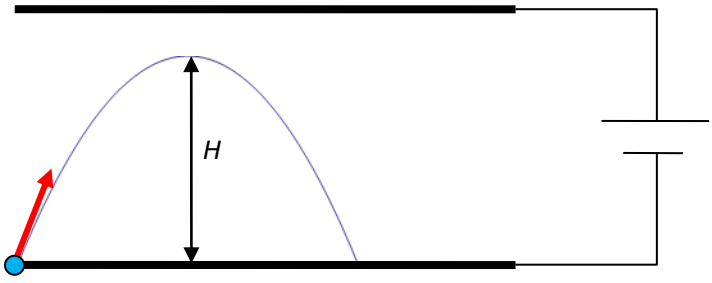
9. The diagram shows the path of an electron in a magnetic field. The electron is radiating energy and so its kinetic energy is decreasing.



What is the direction of motion of the electron and what is the direction of the magnetic field?

	Direction of motion	Direction of field
A	Clockwise	Into page
B	Clockwise	Out of page
C	Counter-clockwise	Into page
D	Counter-clockwise	Out of page

10. A positively charged particle P is projected in between two oppositely charged parallel plates as shown. The maximum height of P from the lower plate is *H*.



A particle Q has double the mass and charge of P. Q is projected with the same velocity as P. What is the maximum height of Q from the lower plate? Ignore gravity.

A H **B** $\frac{H}{2}$ **C** $\frac{H}{\sqrt{2}}$ **D** $\frac{H}{4}$

Quiz D19 Answers	
1	B
2	C
3	C
4	A
5	D
6	C
7	B
8	C
9	A
10	A