Electric Field - 2018

1. 9702/11/M/J/18/No.28

A particle has a charge of +2.0 mC and is in a vertical uniform electric field. An electric force of 1.0×10^{-2} N acts upwards on the particle.

What is the electric field strength?

$E = \frac{F}{Q} = \frac{1.0 \times 10^{-2}}{2 \times 10^{-3}}$

$= 5 \text{ N m}^{-1}$ upwards

A 0.20 V m^{-1} downwards

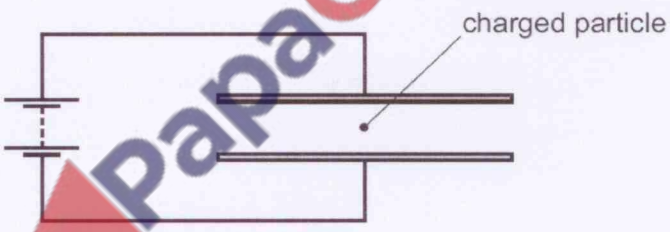
B 0.20 V m^{-1} upwards

C 5.0 V m^{-1} downwards

D 5.0 V m^{-1} upwards ✓

2. 9702/11/M/J/18/No.29

A charged particle is in the electric field between two horizontal metal plates connected to a battery, as shown. There is a force *F* on the particle due to the electric field.



The separation of the plates is doubled.

What is the new force on the particle?

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

$F = \frac{V}{d}$

$F = \frac{V_2}{d}$

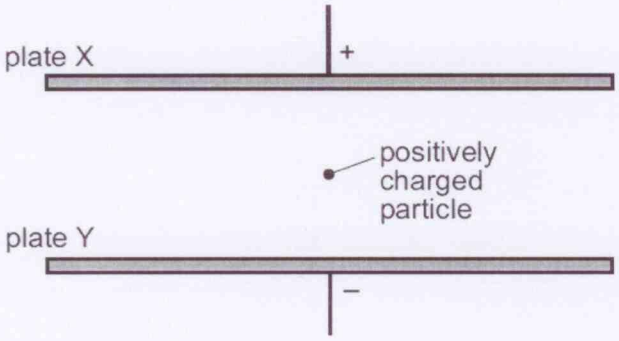
$F_2 = \frac{V_2}{2d}$

Substitute F in F_2.

$F_2 = \frac{F}{2}$

3. 9702/12/M/J/18/No.30

Two large parallel metal plates X and Y are situated in a vacuum as shown.



- +ve particle is repelled by plate X and attracted by plate Y.
- The two forces are equal
- The force is constant.

Plates X and Y carry equal and opposite charges.

What happens to the force on a positively charged particle as it moves from plate X to plate Y?

A It decreases because the positively charged particle is moving away from the positively charged plate.

B It decreases because the positively charged particle is moving in the direction of the electric field between the plates.

C It increases because the positively charged particle is moving closer to a negatively charged plate.

D It remains constant because the positively charged particle is in the uniform electric field between the plates.

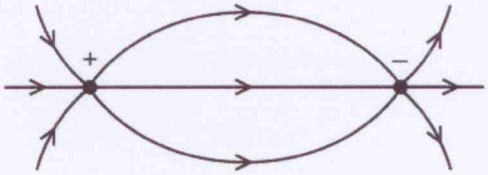
4. 9702/12/M/J/18/No.31

Four diagrams representing the electric field between two oppositely-charged point charges are shown.

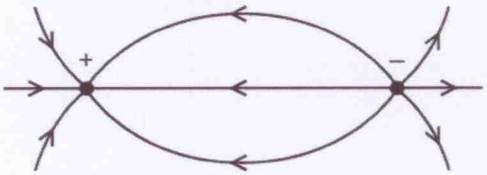
Which diagram correctly shows the electric field lines?

A

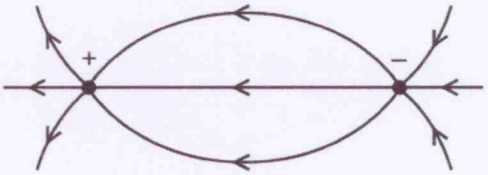
B



C

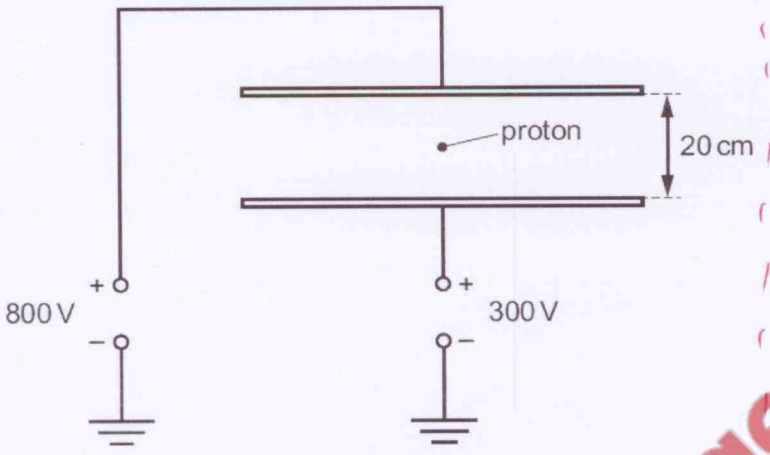


D



5. 9702/13/M/J/18/No.27

Two parallel metal plates are situated 20 cm apart in a vacuum. They are connected to two sources of potential difference as shown.



A proton is released in the space between the plates.

What is the magnitude and direction of the acceleration of the proton?

A ✓ $2.4 \times 10^{11}\,\text{m s}^{-2}$ downwards

B $2.4 \times 10^{11}\,\text{m s}^{-2}$ upwards

C $5.3 \times 10^{11}\,\text{m s}^{-2}$ downwards

D $5.3 \times 10^{11}\,\text{m s}^{-2}$ upwards

$F = \frac{Vq}{d}$

$= \frac{500 \times 1.6 \times 10^{-19}}{0.2}$

$= 4 \times 10^{-16}\,\text{N}$

$F = ma$

$a = \frac{F}{m_p}$

$= \frac{4 \times 10^{-16}\,\text{N}}{1.67 \times 10^{-27}\,\text{kg}}$

$= 2.395 \times 10^{11}\,\text{m s}^{-2}$

$= 2.4 \times 10^{11}\,\text{m s}^{-2}$

– downwards since proton is the – upper plate is truly charged.

p.d across plate = 800 − 300 = 500 V.

charge on proton = $+1.6 \times 10^{-19}$ C

d = 0.2 m.

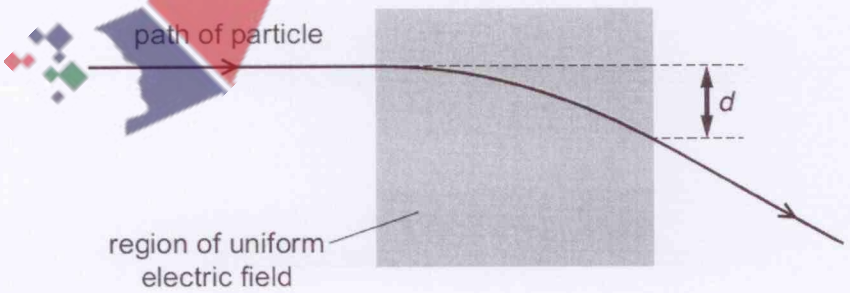
mass of proton = 1.67×10^{-27} kg.

6. 9702/13/M/J/18/No.28

A particle having mass m and charge $+q$ enters a uniform electric field with speed v.

Initially, the particle is travelling at right-angles to the electric field.

During its movement through the field, the particle is deflected through distance d, as shown.



A second particle of mass $2m$, charge $+q$ and speed v enters the electric field along the same path.

What is the distance through which this particle is deflected in the electric field?

A $\frac{d}{4}$ B ✓ $\frac{d}{2}$ C $2d$ D $4d$

7. 9702/13/M/J/18/No.29

What is a possible charge on a particle?

- charge should be multiple of 1.6×10^{-19} C.

A 6.40×10^{-20} C

B 4.00×10^{-19} C

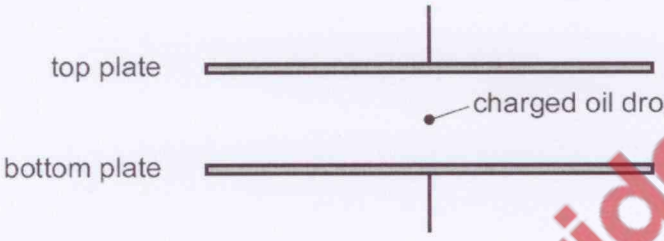
C 1.12×10^{-18} C

D 9.11×10^{-18} C

$2 \times 1.6 \times 10^{-19} = 3.2 \times 10^{-19}$
$3 \times 1.6 \times 10^{-19} = 4.8 \times 10^{-19}$
$4 \times 1.6 \times 10^{-19} = 6.4 \times 10^{-19}$
$5 \times 1.6 \times 10^{-19} = 8.0 \times 10^{-19}$
$6 \times 1.6 \times 10^{-19} = 9.6 \times 10^{-19}$
$7 \times 1.6 \times 10^{-19} = 1.12 \times 10^{-18}$

8. 9702/12/F/M/18/No.12

A charged oil drop is held stationary between two charged parallel plates.



Which forces act on the oil drop?

- oil drop is matter
- It is attracted by gravity.
- oil drop is charged
- It will feel force due to electric field.

A both electric and gravitational

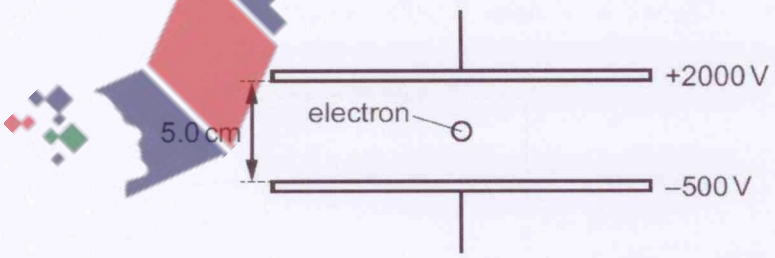
B electric only

C gravitational only

D neither electric nor gravitational

9. 9702/12/F/M/18/No.30

An electron passes into the space between two parallel plates that are 5.0 cm apart and which are maintained at electric potentials of +2000 V and –500 V, respectively.



What is the electric force on the electron?

p.d = 2000 − −500
= 2000 + 500
= 2500 V.

$F = \frac{eV}{d}$

$= \frac{1.6 \times 10^{-19} C \times 2500 V}{0.05 m}$

$= 8.0 \times 10^{-15} N$

A 1.6×10^{-15} N

B 4.8×10^{-15} N

C 6.4×10^{-15} N

D 8.0×10^{-15} N

10. 9702/12/F/M/18/No.31

Which statement about electric charges in a uniform electric field is **not** correct?

A Electric charges of the same magnitude, whether positive or negative, experience the same magnitude of force when placed in the same uniform electric field.

B The direction of the force on a positive charge placed in a uniform electric field is independent of the magnitude of the charge.

C The magnitude of the force on a positive charge placed in a uniform electric field is proportional to the magnitude of the electric field strength.

D The work done to move a positive charge a certain distance in a uniform electric field is independent of the direction of the movement.