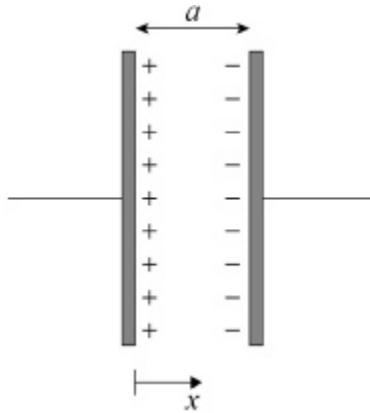
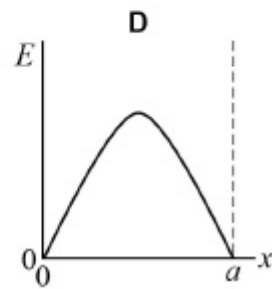
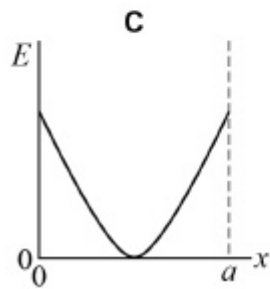
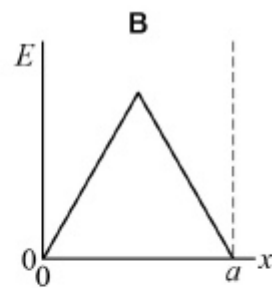
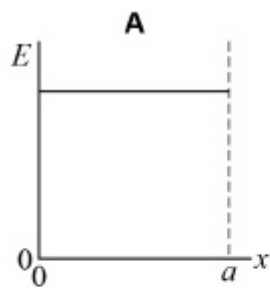


1.

Two parallel metal plates of separation a carry equal and opposite charges.



Which graph best represents how the electric field strength E varies with the distance x in the space between the two plates?



A ☐

B ☐

C ☐

D ☐

(Total 1 mark)

2.

A particle of mass m and charge q is accelerated through a potential difference V over a distance d .

What is the average acceleration of the particle?

A $\frac{qV}{md}$ ☐

B $\frac{mV}{qd}$ ☐

C $\frac{V}{mqd}$ ☐

D $\frac{dV}{mq}$ ☐

(Total 1 mark)

3.

An electron on the surface of the Earth is placed in an electric field of strength 5000 N C^{-1} .

What is $\left(\frac{\text{electric force}}{\text{gravitational force}} \right)$ for the electron?

A 1.1×10^{-14} ☐

B 2.9×10^{-10} ☐

C 3.4×10^9 ☐

D 9.0×10^{13} ☐

(Total 1 mark)

4.

An α particle makes a head-on collision with a gold nucleus containing 79 protons. The distance of closest approach of the α particle to the nucleus is $4.0 \times 10^{-14} \text{ m}$.

What electrostatic force acts on the gold nucleus when at this separation?

A $9.1 \times 10^{-11} \text{ N}$ ☐

B 23 N ☐

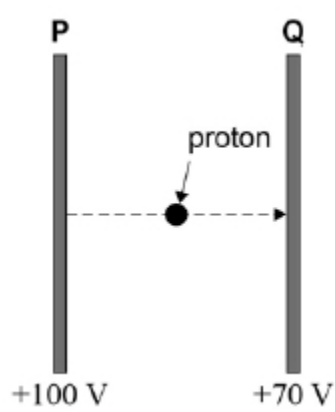
C 290 N ☐

D $1.4 \times 10^{20} \text{ N}$ ☐

(Total 1 mark)

5.

Two fixed parallel metal plates **P** and **Q** are at constant electrical potentials of +100 V and +70 V respectively. A proton travelling from **P** to **Q** experiences a force F due to the electric field between **P** and **Q**, and a change of potential energy of ΔE_p .



Which line, **A** to **B**, in the table gives the direction of F and the value of ΔE_p ?

	Direction of F	ΔE_p	
A	towards P	+30 eV	☐
B	towards Q	+30 eV	☐
C	towards Q	-30 eV	☐
D	towards P	-30 eV	☐

(Total 1 mark)

6.

An electron moves through a distance of 0.10 m parallel to the field lines of a uniform electric field of strength 2.0 kN C^{-1} .

What is the work done on the electron?

- A** zero

☐
- B** $1.6 \times 10^{-17} \text{ J}$

☐
- C** $3.2 \times 10^{-17} \text{ J}$

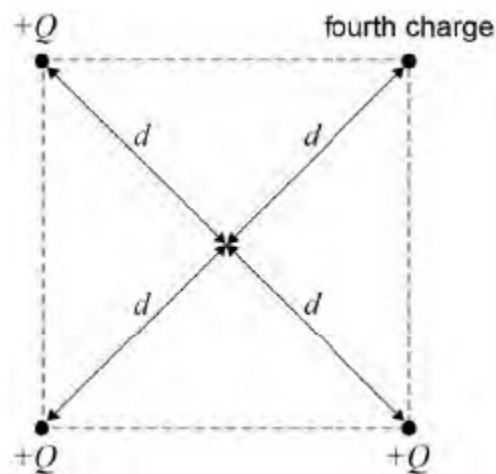
☐
- D** $1.6 \times 10^{-21} \text{ J}$

☐

(Total 1 mark)

7.

Four positive charges are fixed at the corners of a square as shown.



The total potential at the centre of the square, a distance d from each charge, is $\frac{5Q}{4\pi\epsilon_0 d}$

Three of the charges have a charge of $+Q$

What is the magnitude of the fourth charge?

A $-\frac{7Q}{4}$

☐

B Q

☐

C $\sqrt{2}Q$

☐

D $2Q$

☐

(Total 1 mark)

8.

A charged spherical conductor has a radius r . An electric field of strength E exists at the surface due to the charge.

What is the potential of the spherical conductor?

A $r^2 E$

☐

B $r E^2$

☐

C $\frac{E}{r}$

☐

D $r E$

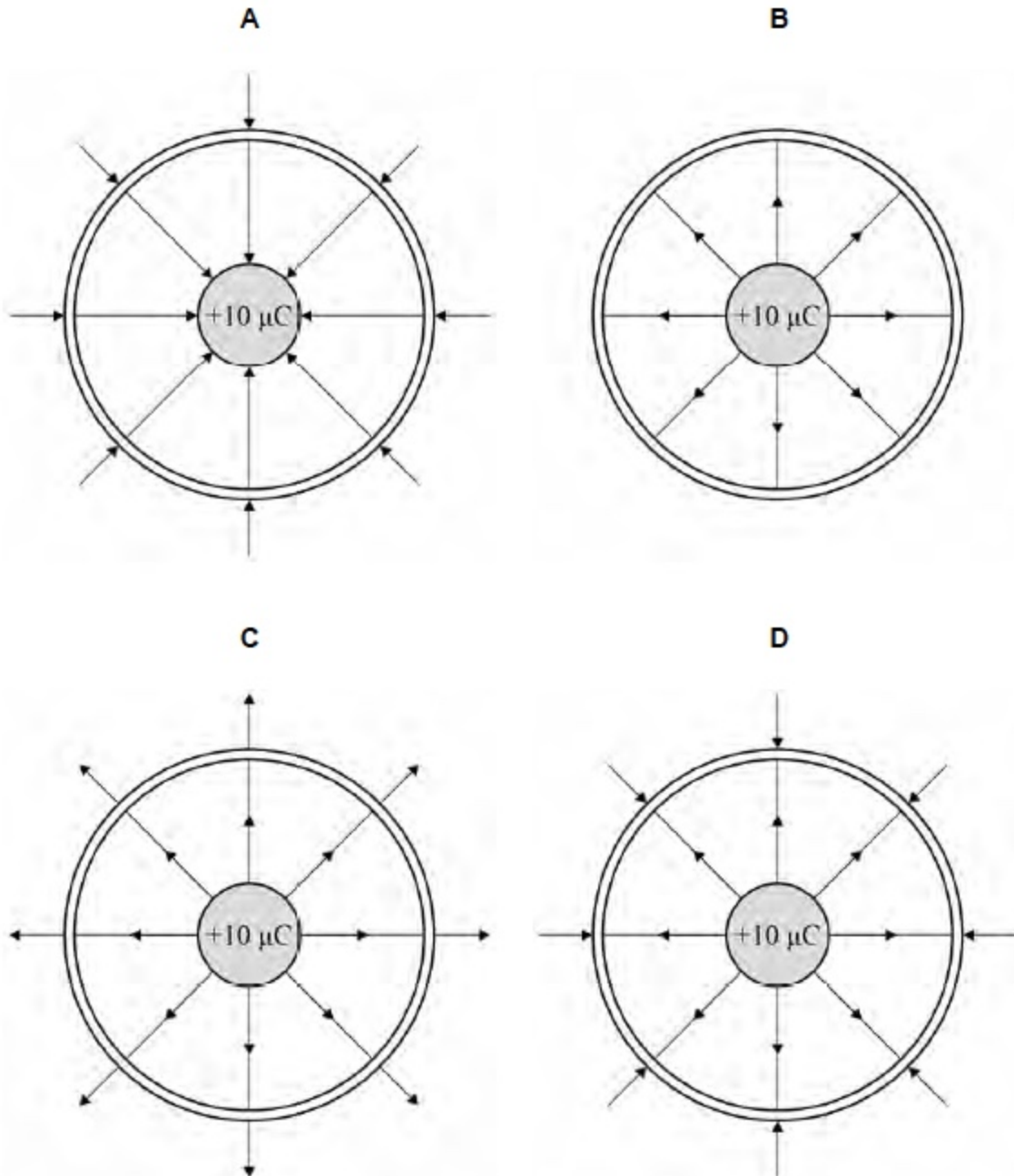
☐

(Total 1 mark)

9.

A conducting sphere holding a charge of $+10\ \mu\text{C}$ is placed centrally inside a second uncharged conducting sphere.

Which diagram shows the electric field lines for the system?



- A ☐
- B ☐
- C ☐
- D ☐

(Total 1 mark)

10.

The ionisation potential for the atoms of a gas is V . Electrons of mass m and charge e travelling at a speed v can just cause ionisation of atoms in the gas.

What is V ?

A $\frac{eV}{2m}$

☐

B $\frac{2eV}{m}$

☐

C $\sqrt{\frac{eV}{2m}}$

☐

D $\sqrt{\frac{2eV}{m}}$

☐

(Total 1 mark)

11.

An electric field acts into the plane of the paper. An electron enters the field at 90° to the field lines.

The force on the electron is

A zero.

☐

B along the direction of the field.

☐

C at 90° to the field.

☐

D opposite to the direction of the field.

☐

(Total 1 mark)

12.

A positive charge of $2.0 \times 10^{-4} \text{ C}$ is placed in an electric field at a point where the potential is +500 V.

What is the potential energy of the system?

A $1.0 \times 10^{-1} \text{ J}$

☐

B $1.0 \times 10^{-1} \text{ J C}^{-1}$

☐

C $4.0 \times 10^{-7} \text{ J}$

☐

D $4.0 \times 10^{-7} \text{ J C}^{-1}$

☐

(Total 1 mark)

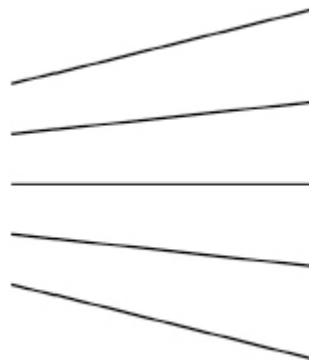
13.

Which diagram shows lines of equipotential in steps of equal potential difference near an isolated point charge?

A



B



C



D



A



B



C



D



(Total 1 mark)

14.

Two fixed charges of magnitude $+Q$ and $+3Q$ repel each other with a force F . An additional charge of $-2Q$ is given to each charge.

What are the magnitude and the direction of the force between the charges?

	Magnitude of force	Direction of force	
A	$\frac{F}{3}$	repulsive	☐
B	$5F$	attractive	☐
C	$5F$	repulsive	☐
D	$\frac{F}{3}$	attractive	☐

(Total 1 mark)

15.

At a distance L from a fixed point charge, the electric field strength is E and the electric potential is V .

What are the electric field strength and the electric potential at a distance $3L$ from the charge?

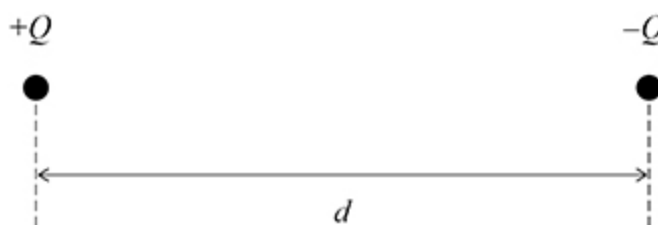
	Electric field strength	Electric potential	
A	$\frac{E}{3}$	$\frac{V}{9}$	☐
B	$\frac{E}{3}$	$\frac{V}{3}$	☐
C	$\frac{E}{9}$	$\frac{V}{3}$	☐
D	$\frac{E}{9}$	$\frac{V}{9}$	☐

(Total 1 mark)

16.

The diagram shows a particle with charge $+Q$ and a particle with charge $-Q$ separated by a distance d .

The particles exert a force F on each other.



An additional charge of $+2Q$ is then given to each particle and their separation is increased to $2d$.

What is the force that now acts between the particles?

- A an attractive force of $\frac{9}{2}F$ ☐
- B an attractive force of $\frac{9}{4}F$ ☐
- C a repulsive force of $\frac{3}{2}F$ ☐
- D a repulsive force of $\frac{3}{4}F$ ☐

(Total 1 mark)

17.

Two protons are separated by distance r .

The electrostatic force between the two protons is X times the gravitational force between them.

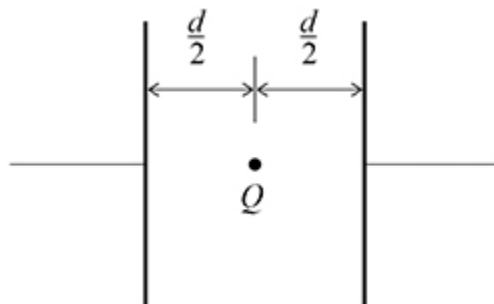
What is the best estimate for X ?

- A 10^{20} ☐
- B 10^{28} ☐
- C 10^{36} ☐
- D 10^{42} ☐

(Total 1 mark)

18.

Two parallel metal plates separated by a distance d have a potential difference V across them. A particle with charge Q is placed midway between the plates.



What is the magnitude of the electrostatic force acting on the particle?

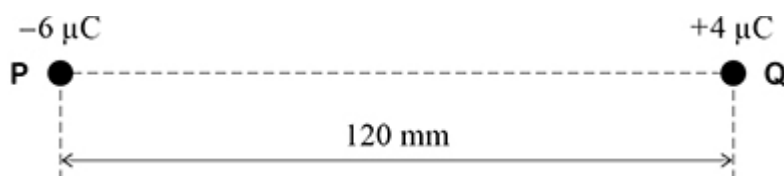
A zero

☐
B $\frac{QV}{2d}$
☐
C $\frac{QV}{d}$
☐
D $\frac{2QV}{d}$
☐

(Total 1 mark)

19.

Two charged particles **P** and **Q** are separated by a distance of 120 mm. **X** is a point on the line between **P** and **Q** where the electric potential is zero.



What is the distance from **P** to **X**?

A 40 mm

☐

B 48 mm

☐

C 60 mm

☐

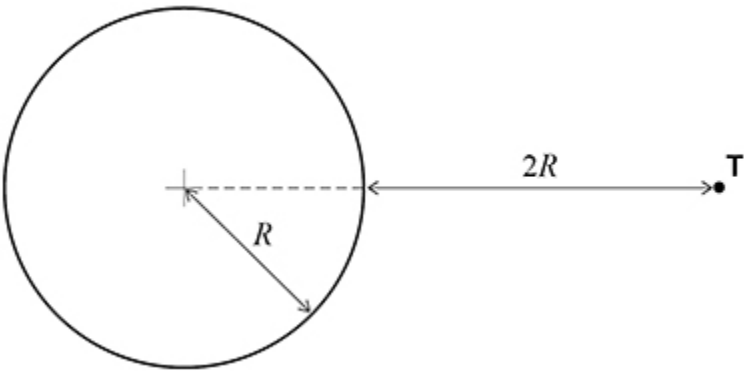
D 72 mm

☐

(Total 1 mark)

20.

An isolated spherical conductor is charged.
The conductor has a radius R and an electric potential V . The electric field strength at its surface is E .



Point **T** is a distance $2R$ from the surface.

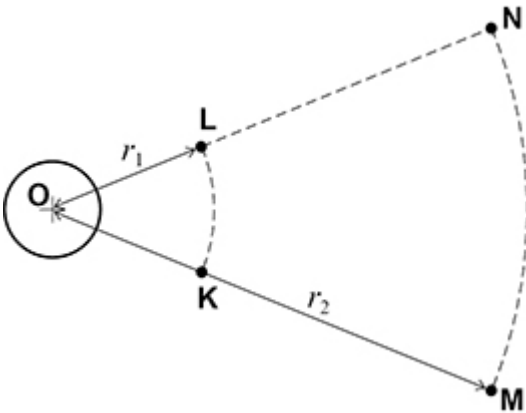
What are the electric field strength and electric potential at **T**?

	Electric field strength	Electric potential	
A	$\frac{E}{2}$	$\frac{V}{4}$	☐
B	$\frac{E}{3}$	$\frac{V}{9}$	☐
C	$\frac{E}{4}$	$\frac{V}{2}$	☐
D	$\frac{E}{9}$	$\frac{V}{3}$	☐

(Total 1 mark)

21.

O is the centre of a negatively charged sphere.



K and **L** are two points at a distance r_1 from **O**.
M and **N** are two points at a distance r_2 from **O**.

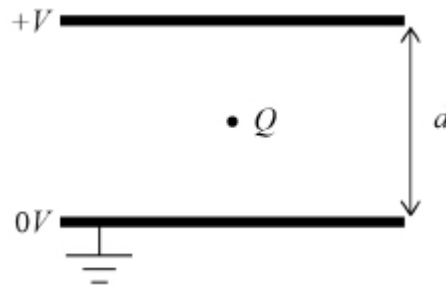
Which statement is true?

- A** The work done moving an electron from **M** to **K** is the same as that done moving an electron from **K** to **L**. ☐
- B** The work done moving a positron from **K** to **M** is the same as that done moving an electron from **K** to **M**. ☐
- C** No work is done moving an electron from **M** to **N**. ☐
- D** No work is done moving a positron from **L** to **N**. ☐

(Total 1 mark)

22.

A small object of mass m has a charge Q . The object remains stationary in an evacuated space between two horizontal plates. The plates are separated by a distance d and the potential difference between the plates is V .

What is V ?

- A** $\frac{mQg}{d}$ ☐
- B** $\frac{mdg}{Q}$ ☐
- C** $\frac{mQ}{d}$ ☐
- D** $\frac{md}{Q}$ ☐

(Total 1 mark)

23. 1.5 mJ of work is done when a charge of 30 μC is moved between two points, **M** and **N**, in an electric field.

What is the potential difference between **M** and **N**?

- A

20 mV

☐
- B

20 V

☐
- C

45 V

☐
- D

50 V

☐

(Total 1 mark)

24. A parallel-plate capacitor is fully charged and then disconnected from the power supply. A dielectric is then inserted between the plates.

Which row correctly identifies the charge on the plates and the electric field strength between the plates?

	Charge	Electric field strength	
A	Stays the same	Increases	☐
B	Increases	Decreases	☐
C	Increases	Increases	☐
D	Stays the same	Decreases	☐

(Total 1 mark)