Electric Potential

TOPIC QUESTIONS

Level	AS Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

1. The force between two point charges is F when they are separated by a distance r. If the separation is increased to $3r$, what is the force between the charges?

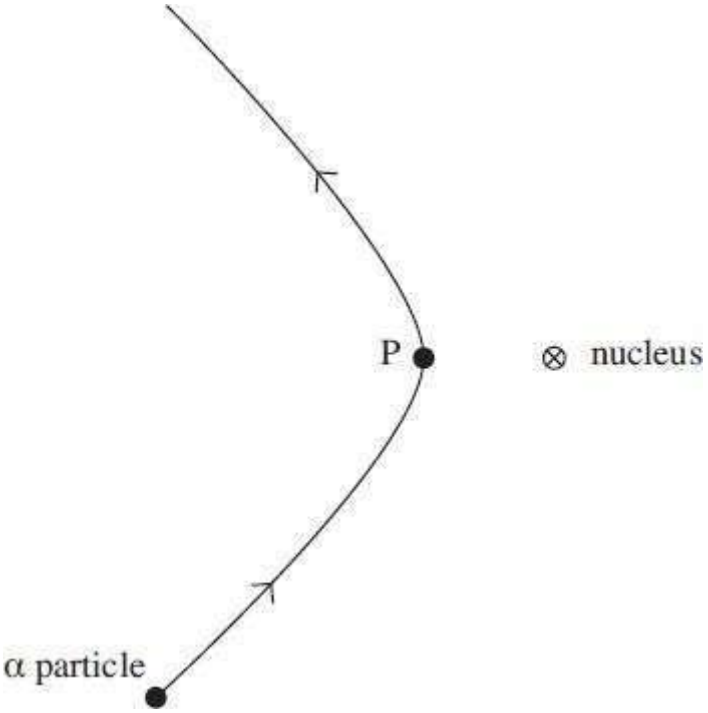
A $\frac{F}{3r}$

B $\frac{F}{9r}$

C $\frac{F}{3}$

D $\frac{F}{9}$

2. The diagram shows the path of an α particle deflected by the nucleus of an atom.
Point P on the path is the point of closest approach of the α particle to the nucleus.



Which one of the following statements about the α particle on this path is correct?

A Its acceleration is zero at P.

B Its kinetic energy is greatest at P.

C Its speed is least at P.

D Its potential energy is least at P.

3. A repulsive force *F* acts between two positive point charges separated by a distance *r*. What will be the force between them if each charge is doubled and the distance between them ishalved?

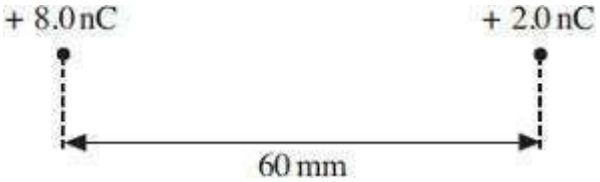
A *F*

B 2*F*

C 4*F*

D 16*F*

4. The distance between two point charges of + 8.0 nC and + 2.0 nC is 60 mm.



At a point between the charges, on the line joining them, the resultant electric field strength iszero. How far is this point from the + 8.0 nC charge?

A 20 mm

B 25 mm

C 40 mm

D 45 mm

5. Which one of the following **cannot** be used as a unit for electric field strength?

A $J\ m^{-1}\ C^{-1}$

B $J\ A^{-1}\ s^{-1} m^{-1}$

C $N\ A^{-1}\ s^{-1}$

D $J\ C\ m^{-1}$

6. An electron and a proton are 1.0×10^{-10} m apart. In the absence of any other charges, what isthe electric potential energy of the electron?

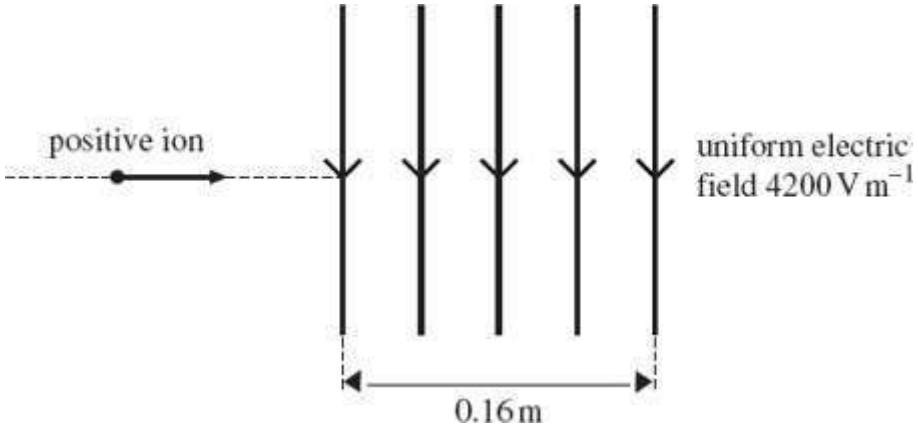
A $+2.3 \times 10^{-18}$J

B -2.3×10^{-18}J

C $+2.3 \times 10^{-8}$J

D -2.3×10^{-8}J

7.



An ion carrying a charge of +4.8 × 10^{-19}C travels horizontally at a speed of 8.0 × 10^{5}ms^{-1}. It enters a uniform vertical electric field of strength 4200 V m^{-1}, which is directed downwards and acts over a horizontal distance of 0.16m. Which one of the following statements is **not** correct?

A The ion passes through the field in 2.0 × 10^{-7}s.

B The force on the ion acts vertically downwards at all points in the field.

C The magnitude of the force exerted on the ion by the field is 1.6 × 10^{-9} N.

D The horizontal component of the velocity of the ion is unaffected by the electric field.

8. The electric potential at a distance *r* from a positive point charge is 45 V. The potential increases to 50 V when the distance from the charge decreases by 1.5 m. What is the value of *r*?

A 1.3 m

B 1.5 m

C 7.9 m

D 15 m

9. The repulsive force between two small negative charges separated by a distance r is F.

What is the force between the charges when the separation is reduced to $\frac{r}{3}$?

A $\frac{F}{9}$

B $\frac{F}{3}$

C $3F$

D $9F$

10. What is the acceleration of an electron at a point in an electric field where the field strength is 1.5×10^5 V m^{-1}?

A 1.2×10^6 m s^{-2}

B 1.4×10^{13} m s^{-2}

C 2.7×10^{15} m s^{-2}

D 2.6×10^{16} m s^{-2}

11. 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	$\frac{E}{9}$	$\frac{V}{9}$

12. The diagram shows a particle with charge $+Q$ and a particle with charge $-Q$ separated by adistance 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 $\frac{3}{4}F$

13. 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**?

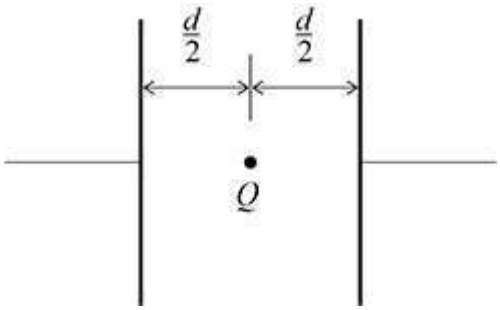
A 10^{20}

B 10^{28}

C 10^{36}

D 10^{42}

14. 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?

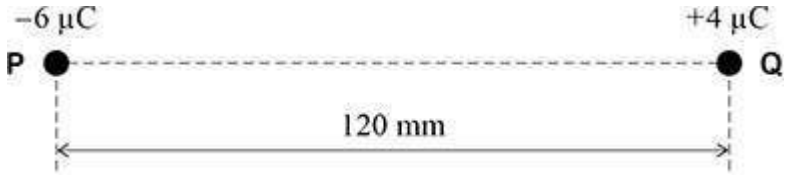
A zero

B $\frac{QV}{2d}$

C $\frac{QV}{d}$

D $\frac{2QV}{d}$

15. 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

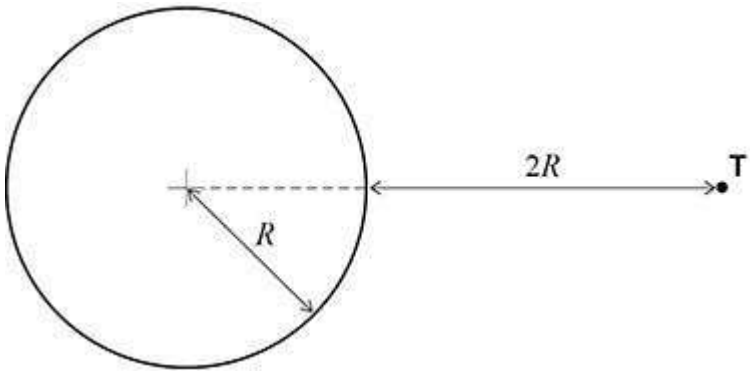
B 48 mm

C 60 mm

D 72 mm

16. An isolated spherical conductor is charged.

The conductor has a radius R and an electric potential V. The electric field strength at its surfaceis E.

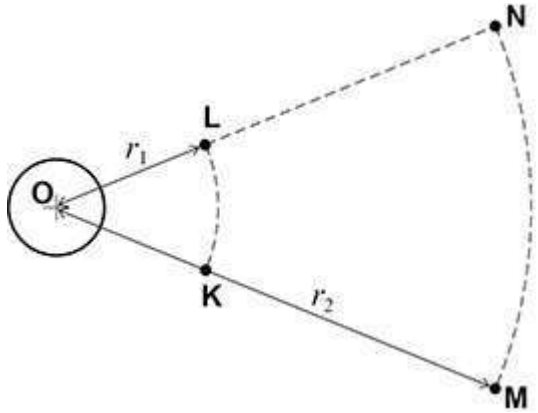


Point **T** is a distance $2R$ from the surface.

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	$\frac{E}{9}$	$\frac{V}{3}$

17. **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?

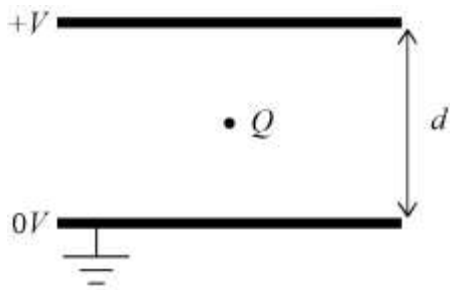
A The work done moving an electron from **M** to **K** is the same as thatdone moving an electron from **K** to **L**.

B The work done moving a positron from **K** to **M** is the same as thatdone 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**.

18. 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 $\frac{md}{Q}$

19. mJ of work is done when a charge of 30 μC is moved between two points, **M** and **N**, in anelectric field.

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

A 20 mV

B 20 V

C 45 V

D 50 V

20. 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 theplates?

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