

18. Electric fields

Starter Quiz · 课前小测

A-Level Physics

Name: _____ Score: _____

1. Electric field strength is the force per unit:

- ☐ positive charge
- ☐ mass
- ☐ area
- ☐ volume

2. Two plates 0.050 m apart have 200 V between them. What is the field strength?

_____ V/m

3. Coulomb's law gives the force between two point charges as:

- ☐ $\frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$
- ☐ $\frac{Q_1 Q_2}{4\pi\epsilon_0 r}$
- ☐ $\frac{Q_1 Q_2}{r}$
- ☐ $4\pi\epsilon_0 Q_1 Q_2 r^2$

4. The field strength at distance r from a point charge Q is:

- ☐ $\frac{Q}{4\pi\epsilon_0 r^2}$
- ☐ $\frac{Q}{4\pi\epsilon_0 r}$
- ☐ $\frac{Qq}{4\pi\epsilon_0 r^2}$
- ☐ $\frac{Q}{r}$

5. Electric potential at a point is the work per unit charge to bring a positive charge from:

- ☐ infinity
- ☐ the nearest charge
- ☐ the ground
- ☐ one metre away

6. A charge of 2.0 C feels a force of 6.0 N. What is the field strength?

_____ N/C

7. A uniform field between two plates points:

- ☐ from the + plate to the – plate
- ☐ from the – plate to the + plate
- ☐ along the plates
- ☐ in circles

8. Two charges of the same sign repel each other.

- ☐ True
- ☐ False

9. The field is $100 \frac{\text{N}}{\text{C}}$ at distance r from a charge. What is it at $2r$?

_____ N/C

10. The two-mark definition of electric potential needs which elements? Select **all** that apply.

- ☐ work done per unit positive charge
- ☐ in bringing a small test charge from infinity to the point
- ☐ the potential is zero at infinity
- ☐ the charge must be stationary

Tick every correct option.

1. **positive charge**

$E = \frac{F}{q}$ — the force on each coulomb of a small positive test charge.

2. **4000 V/m**

$$E = \frac{V}{d} = \frac{200}{0.050} = 4000 \frac{\text{V}}{\text{m}}.$$

3. $\frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$

Proportional to each charge, inversely proportional to the distance squared.

4. $\frac{Q}{4\pi\epsilon_0 r^2}$

From $E = F/q$ with Coulomb's force, the test charge cancels, leaving $E = \frac{Q}{4\pi\epsilon_0 r^2}$.

5. **infinity**

Like gravitational potential, it is measured from infinity, where the potential is taken as zero.

6. **3 N/C**

$$E = \frac{F}{q} = \frac{6.0}{2.0} = 3.0 \frac{\text{N}}{\text{C}}.$$

7. **from the + plate to the – plate**

The field runs from high potential (+) toward low potential (–).

8. **True**

Like charges repel; opposite charges attract — both along the line joining them.

9. **25 N/C**

$$\text{Inverse-square: } \frac{100}{2^2} = 25 \frac{\text{N}}{\text{C}}.$$

10. **work done per unit positive charge; in bringing a small test charge from infinity to the point; the potential is zero at infinity**

Per unit positive charge, and from infinity. The zero at infinity is what makes the definition well posed; stationarity is not part of it.