SL Paper 1

A particle of mass m is a distance R from the surface of Earth of mass M. The force acting on the particle is F. Which of the following is the gravitational field strength at R?

A. $\frac{Gm}{R^2}$

B. $\frac{GmM}{R^2}$

C. $\frac{F}{m}$

D. $\frac{F}{M}$

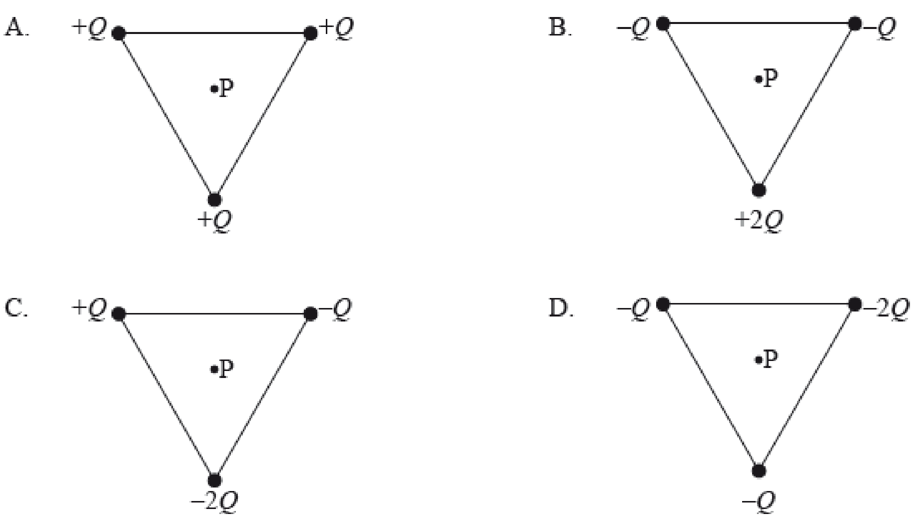
Markscheme

C

Examiners report

B was the most popular choice despite it clearly representing a force, rather than field strength. The field strength at a point is the acceleration of a mass placed at the point, so clearly C is the correct response.

Which arrangement of three point charges at the corner of an equilateral triangle will result in a zero electric field strength at the centre of the triangle, point P?



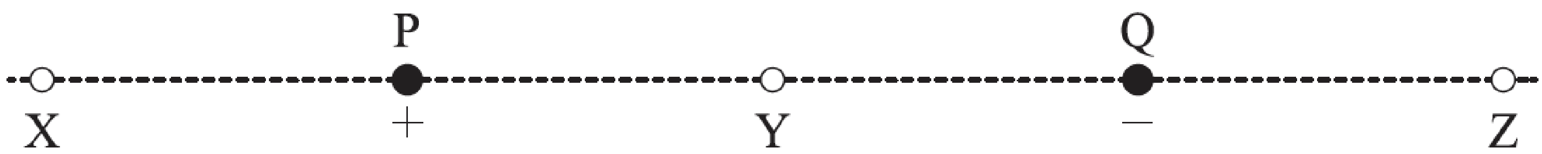
Markscheme

A

Examiners report

[N/A]

A positive point charge P and a negative point charge Q of equal magnitude are held at fixed positions. Y is midway between P and Q.



Which of the following gives the direction of the electric field due to the charges at X, Y and Z?

	X	Y	Z
A.	to right	to left	to right
B.	to right	to right	to left
C.	to left	to right	to right
D.	to left	to right	to left

Markscheme

D

Examiners report

[N/A]

A point charge of magnitude $2.0\ \mu\ \mathrm{C}$ is moved between two points X and Y. Point X is at a potential of $+6.0\ \mathrm{V}$ and point Y is at a potential of $+9.0\ \mathrm{V}$. The gain in potential energy of the point charge is

A. $0.20\ \mu\mathrm{J}$.

B. $1.5\ \mu\mathrm{J}$.

B. $6.0\ \mu\text{J}$.

B. $30\ \mu\text{J}$.

Markscheme

C

Examiners report

[N/A]

The gravitational field strength at a point X in a gravitational field is defined as the force

A. per unit mass on a mass placed at X.

B. on a mass placed at X.

C. per unit mass on a small point mass placed at X.

D. on a small point mass placed at X.

Markscheme

C

Examiners report

This is another case where candidates are required to learn a definition and identify it accurately.

The electric field strength between two oppositely charged parallel plates

A. has the same value everywhere between the two plates.

B. decreases from the positive plate to the negative plate.

C. is larger at the edges than in the center.

D. is smaller at the edges than in the center.

Markscheme

D

Examiners report

The majority of candidates chose option A that states that the electric field is the same everywhere in between the plates. The examining team felt that this deserved credit and so this option along with option D (field being weaker at the edges) were both accepted.

A particle has charge and mass. Which types of field cause a force to be exerted on the particle when it is moving in the direction of the field?

A. Electric, gravitational and magnetic fields

B. Electric and magnetic fields only

C. Gravitational and magnetic fields only

D. Electric and gravitational fields only

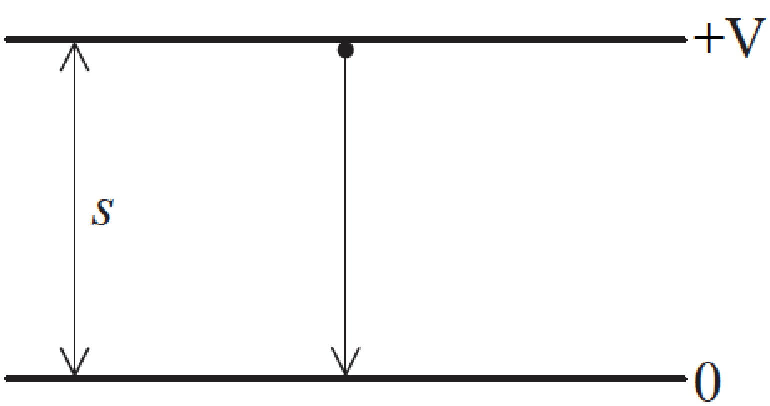
Markscheme

D

Examiners report

[N/A]

An electron of mass m_e and charge e accelerates between two plates separated by a distance s in a vacuum. The potential difference between the plates is V.



What is the acceleration of the electron?

A. $\frac{m_e ev}{s}$

B. $\frac{m_e v}{es}$

C. $\frac{eV}{m_e s}$

D. $\frac{V}{m_e es}$

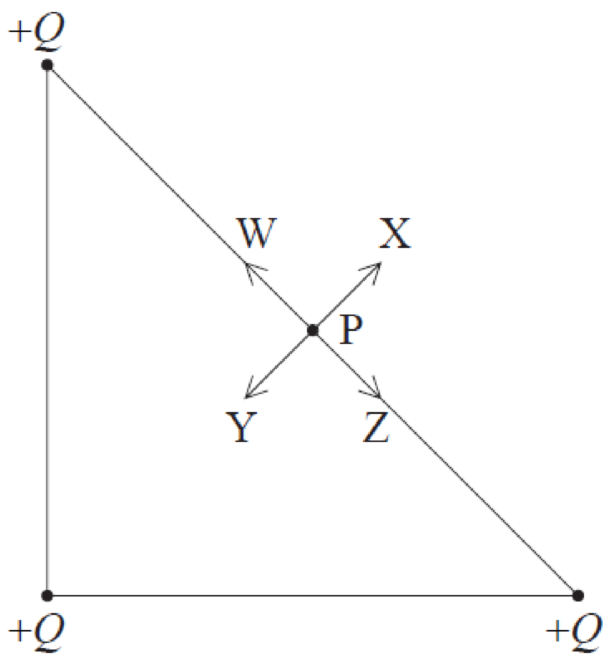
Markscheme

C

Examiners report

This questions proved to be somewhat difficult, especially for SL candidates. A number of different approaches could be used here, such as looking at the dimensions of the fundamental units, or by considering the cause and effect of increasing each one of the variable.

Three positive point charges +Q are fixed in position at the vertices of an isosceles triangle. P is the mid point between two of the charges.



Which arrow correctly identifies the direction of the electric field at point P?

A. W
B. X
C. Y
D. Z

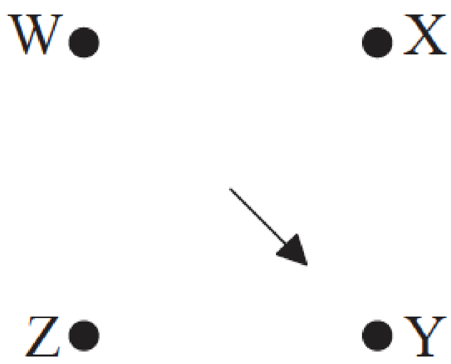
Markscheme

B

Examiners report

[N/A]

Four point charges of equal magnitude W, X, Y and Z are each fixed to a corner of a square.



W is a positive charge and X is a negative charge. The arrow shows the direction of the resultant electric field at the centre of the square. What are the correct signs of charge Y and of charge Z?

	Y	Z
A.	positive	positive
B.	negative	positive
C.	positive	negative
D.	negative	negative

Markscheme

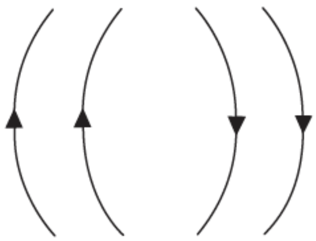
D

Examiners report

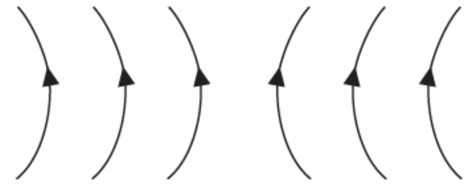
[N/A]

What field pattern can be produced by two point charges?

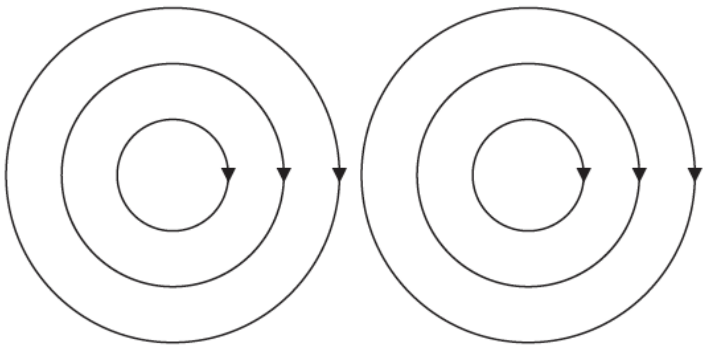
A.



B.



C.



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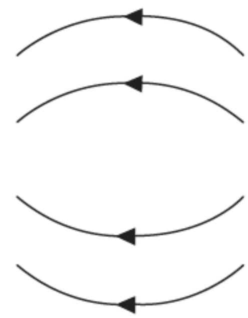


Markscheme

D

Examiners report

The statistics suggest that many candidates were confused by this question. Field lines have to start and finish on a charge which means that only A and B could be correct if only two point charges are present. But the field lines will be in the same direction on leaving a charge, hence D is the only sensible solution.

An electron is held close to the surface of a negatively charged sphere and then released. Which describes the velocity and the acceleration of the electron after it is released?

	Velocity	Acceleration
A.	decreasing	constant
B.	decreasing	decreasing
C.	increasing	constant
D.	increasing	decreasing

Markscheme

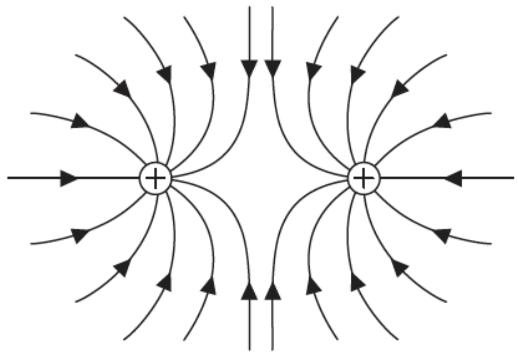
D

Examiners report

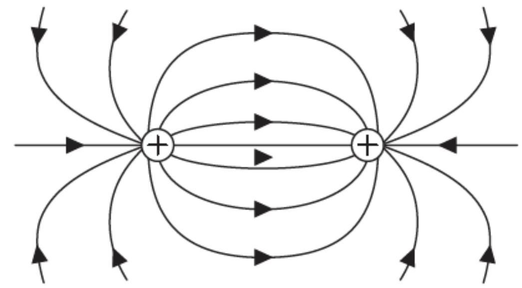
[N/A]

Which diagram shows the electric field pattern surrounding two equal positive point charges?

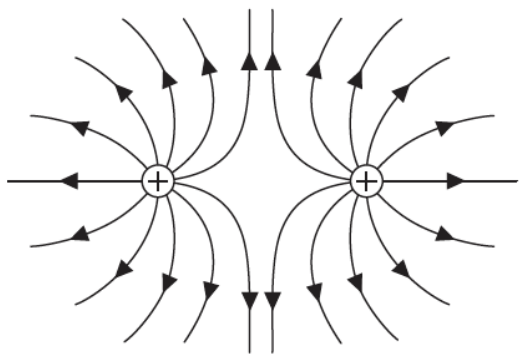
A.



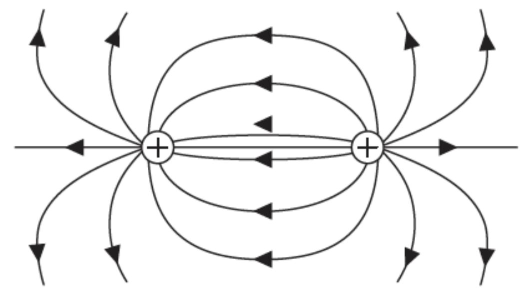
B.



C.



D.



Markscheme

C

Examiners report

[N/A]