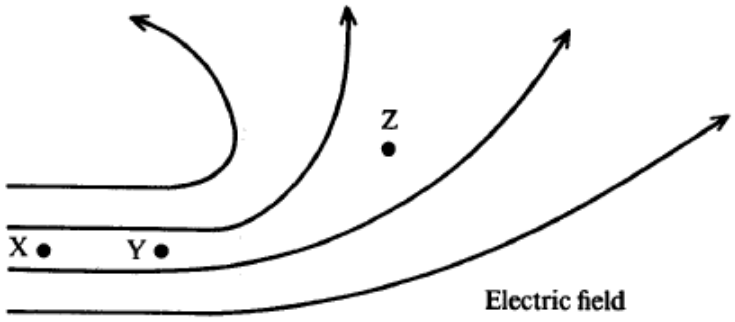
The diagram below represents electric field lines in space. The points X, Y and. Z are three points situated in the field.



94 1985 Question 67, 1 mark

If the electric potential at Y is zero, which line (**A - F**) in the following table represents the sign of the electric potential at X and Z?

	Sign of electric potential at X	Sign of electric potential at Z
A.	+	+
B.	+	-
C.	-	-
D.	-	+
E.	zero	+
F.	zero	-

A small, positive charge is placed successively at X, Y and Z.

95 1985 Question 68, 1 mark

Which one or more of the following statements is correct?

A. When the charge is at Y it will accelerate towards X.

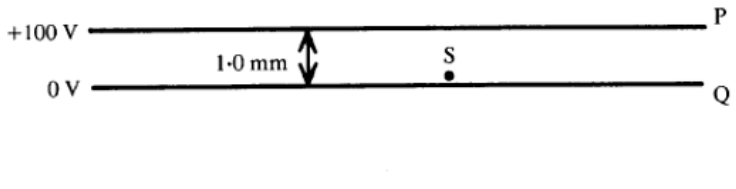
B. The magnitude of the force on the charge is the same at each of the points X, Y and Z.

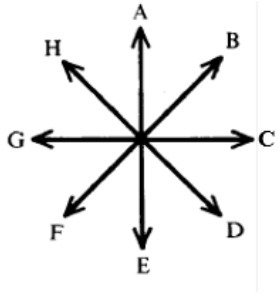
C. The force on the charge at X will be greater than the force on the charge at Z.

D. When the charge is at Z it will experience a smaller force than at either X or Y.

(one or more answers)

Two large metal plates, P and Q, are separated by 1.0 mm and are charged so that a potential difference of 100 V exists between them. The diagram shows an edge-on view of the plates.





96 1984 Question 49, 1 mark

What is the magnitude of the electric field at point S just above the surface of the plate Q?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

97 1984 Question 50, 1 mark

i. What is the magnitude of the electric field mid-way between the plates?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

ii. Which of the alternatives (A - H) in the key above best gives the direction of the electric field mid-way between the plates?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

98 1984 Question 51, 1 mark

i. What is the magnitude of the acceleration of an electron placed mid-way between the plates?

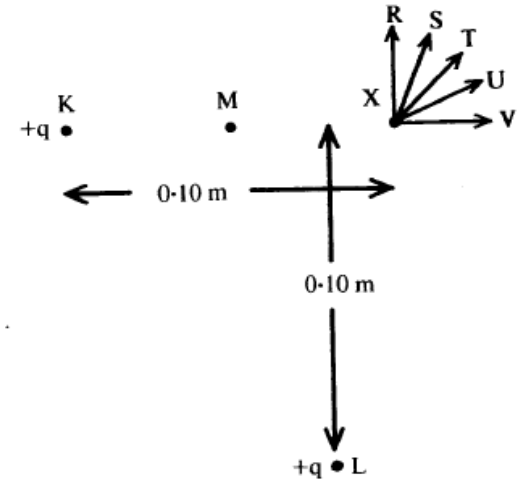
Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

ii. Which of the alternatives (A - H) in the key above best gives the direction of this acceleration?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

(The ratio $\frac{\text{charge}}{\text{mass}}$ for an electron is -2.0×10^{11} C kg^{-1})

Two equal point charges are placed at the points K and L in the diagram below and produce a resultant electric field at the point X of magnitude 100 V m^{-1} in the direction of T.



The charge at the point K is then shifted a distance of 0.05 m to M.

99 1984 Question 52, 1 mark

Which of the arrows (R - V) now best describes the direction of the resultant electric field at the point X?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

100 1984 Question 53, 1 mark

Which of the alternatives (**A** - **D**) below best gives the magnitude of the resultant electric field at X?

A. 4.0×10^2 V m^{-1}

B. 2.9×10^2 V m^{-1}

C. 2.0×10^2 V m^{-1}

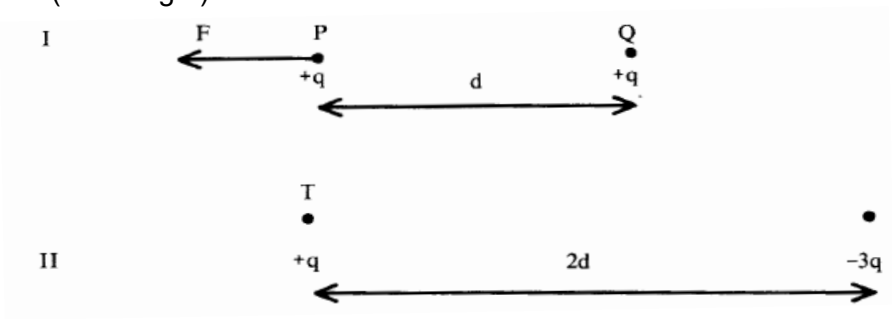
D. 1.7×10^2 V m^{-1}

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

The two diagrams below each show a pair of point charges. The two charges and their separations are indicated. In case I the force on P is shown by a vector F.

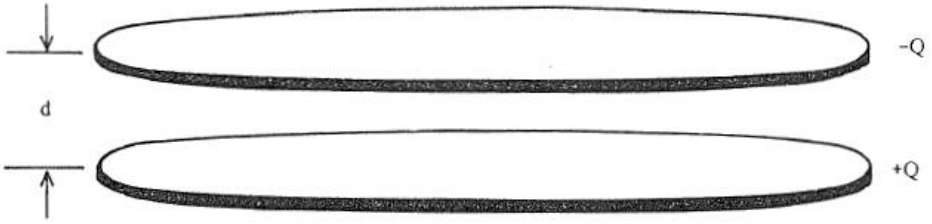
101 1983 Question 49, 1 mark

Write an expression in terms of F for the magnitude of the force on the charge T shown in case II, and indicate the direction (left or right) of this force.



Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

Two large isolated parallel metal plates distance *d* apart are both uniformly charged such that the charge on one plate is equal in magnitude and opposite in sign to the charge on the other.



Use the answer key below for the following question:

A. the quantity increases by a factor of 4
B. the quantity increases by a factor of 2
C. the quantity has not changed
D. the quantity decreases by a factor of2
E. the quantity decreases by a factor of 4

102 1983 Question 50, 1 mark

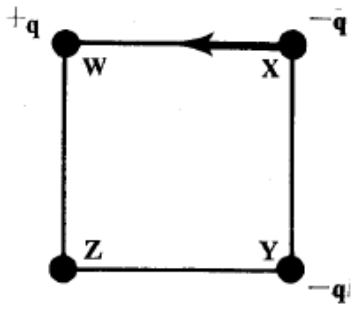
What happens to the magnitude of the electric field midway between the plates if d is halved?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.

103 1983 Question 51, 1 mark

What happens to the magnitude of the potential difference between the two plates if d is doubled?

Reproduced by permission of the Victorian Curriculum and Assessment Authority, Victoria, Australia.



A fourth charge, Q, is placed at Z, after which the charge at X experiences a net electrostatic force indicated by the arrow.

108 1982 Question 51, 1 mark

What is the value of Q?

A. -2.8q

B. -1.4q

C. +1.4q

D. +2.8q

E. +4.0q

Constant in Coulomb's Law $k = 9{\cdot}0 \times 10^{9}$ newton m^2 $coulomb^{-2}$
Charge on electron $e = 1.6 \times 10^{-19}$ coulomb .

Use these data to answer questions 50 and 51.

125 1977 Question 50, 1 mark

How many electronic charges are there in one coulomb?

126 1977 Question 51, 1 mark

What is the value of k in newton m^2 $(electronic\ charge)^{-2}$?

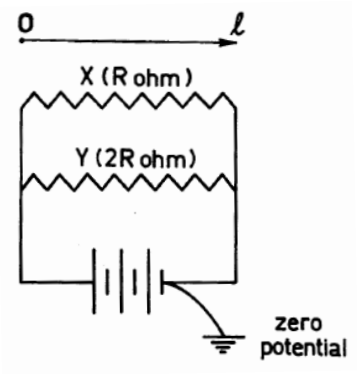
Two insulated uncharged metal spheres are each given net charges of + *Q* coulomb. The force each exerts on the other is ***F*** newton when they are placed *d* m apart.

127 1977 Question 52, 1 mark

What distance apart should the spheres be if the force between them is to be *3**F**?*

128 1977 Question 53, 1 mark

The spheres are now returned to their original separation of *d* m. What charge should be added to one of the spheres if the force between them is to be – *2**F***?



152 1973 Question 73, 1 mark

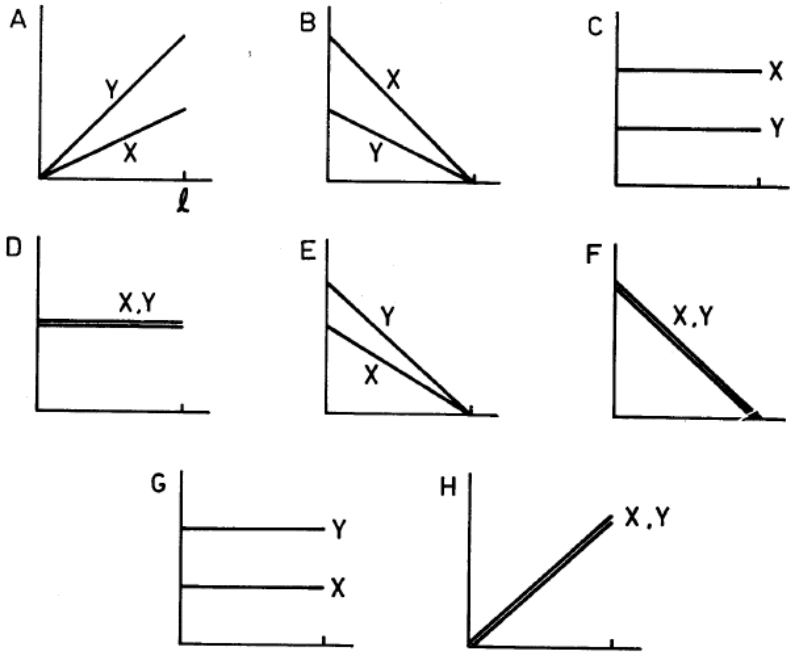
Which of the graphs below represents the electrical potential versus distance along each wire?

153 1973 Question 74, 1 mark

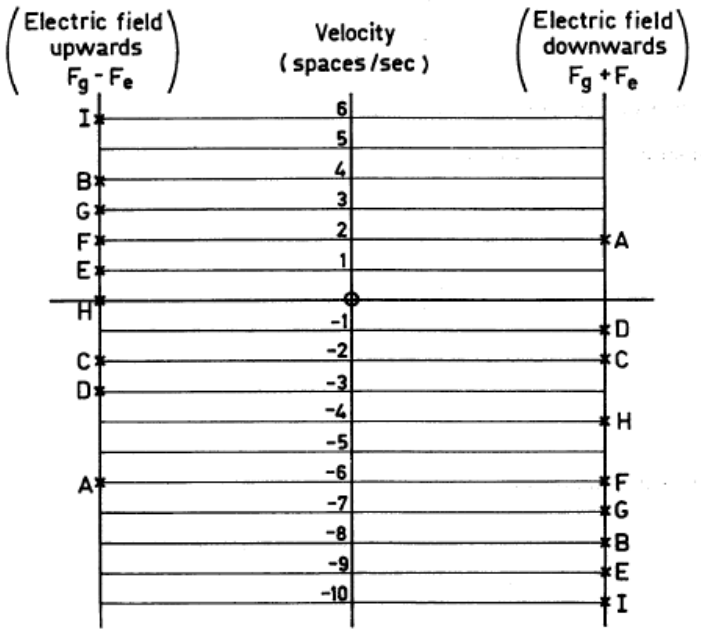
Which graph represents the current versus distance along each wire?

154 1973 Question 75, 1 mark

Which graph represents the electric field versus distance along each wire?



A student carries out the Millikan experiment with small plastic spheres, all of the same size.
He measures the terminal velocities of several spheres under two conditions, one when the electric field is in the same direction as gravity, and one when the field is reversed. He displays his results as shown in the diagram. The letters refer to particular spheres.



159 1972 Question 64, 1 mark

Which sphere carries the greatest charge?

160 1972 Question 65, 1 mark

Which sphere carries no net charge?

161 1972 Question 66, 1 mark

Which sphere is apparently of different mass from the others?

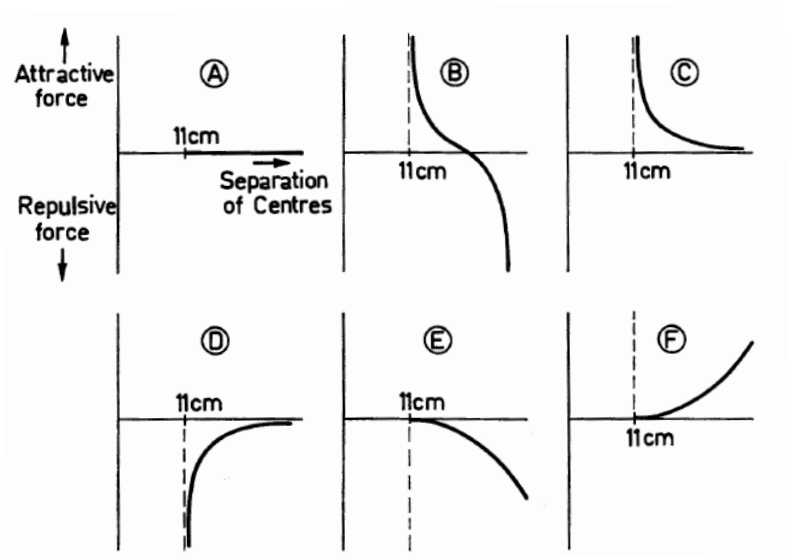
162 1972 Question 67, 1 mark

How many electronic charges appear to be on the sphere G?

A large, uncharged metal sphere is moved towards a small, charged metal sphere.

163 1971 Question 67, 1 mark

Which graph best represents the relation between the electrical force and the separation between the centres of the spheres?

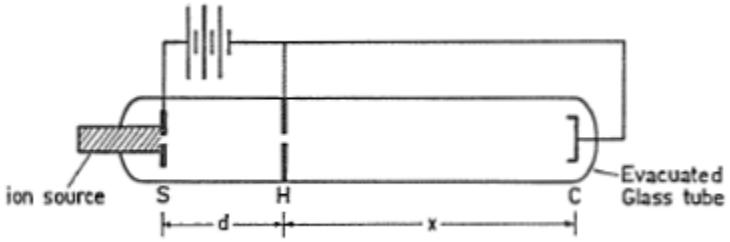


The two spheres are now touched together.

164 1971 Question 68, 1 mark

When the spheres are separated, which graph best represents the force-distance relation?

In the apparatus in the diagram, positive ions are accelerated in the electric field produced by the battery whose EMF is *V* volt.



The ions are released from the ion source S, pass through the hole in electrode H and are collected by electrode C.

168 1971 Question 83, 1 mark

(a) What is the potential difference between H and S?

(b) What is the potential difference between C and H?

Assuming the fields to be uniform.

169 1971 Question 84, 1 mark

(a) What is the electric field between H and S?

(b) What is the electric field between C and H?

An ion of mass *m* kg and charge *+e* coulomb, initially at rest, is released by the ion source.

170 1971 Question 85, 1 mark

What is its acceleration

(a) in the space between H and S?

(b) in the space between C and H?

171 1971 Question 86, 1 mark

What is the speed of the ion
(a) just before reaching H?

(b) just before reaching C?

172 1971 Question 87, 1 mark

Write an expression for the time taken by an ion to travel from H to C using only symbols selected from the following: *V, m, e, d, x.*

Two parallel plates 3 cm apart in a vacuum have a certain potential difference between them. Suppose that an electron is released from the negative plate at the same instant as an α-particle (He++) leaves the positive plate.
Note : the mass of the α-particle is about 7×10^3 times the mass of the electron.

173 1971 Question 91, 1 mark

Neglecting any interaction between the electron and the α-particle, the particles pass one another

A. midway between the plates.

B. 1 cm from the positive plate.

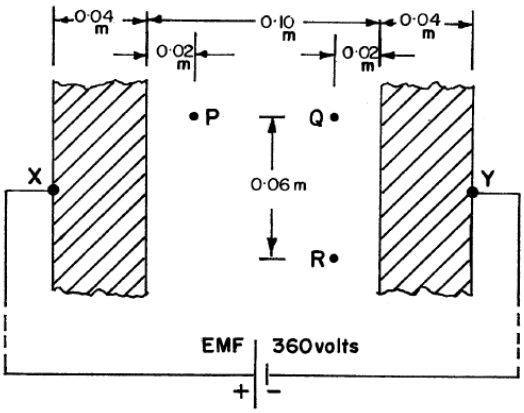
C. 1 cm from the negative plate.

D. very close to the positive plate.

E. very close to the negative plate.

174 1971 Question 92, 1 mark

What is the value of the ratio $\dfrac{\text{maximum kinetic energy of electron}}{\text{maximum kinetic energy of α-particle}}$



Two large parallel metal blocks are set up 0.1 metre apart in a vacuum. A battery of EMF 360 volt is connected across the blocks so that the block on the left is positively charged and the other one negatively charged.
P is a point 0.02 metre from the positive block, Q and R are points 0.02 metre from the negatively charged block. The distances PQ and QR are both 0.06 metre.
Experiments are performed using a proton and an alpha particle.
An alpha particle has twice the charge and four times the mass of a proton.

185 1970 Question 67, 1 mark

What is the value of the ratio:

$$\frac{\text{kinetic energy of alpha particle at Q after release from rest at P}}{\text{kinetic energy of proton at Q after release from rest at P}}\ ?$$

186 1970 Question 68, 1 mark

What is the value of the ratio:

$$\frac{\text{work done in taking alpha particle from Q to P}}{\text{work done in taking alpha particle from R to P}}\ ?$$

187 1970 Question 69, 1 mark

What is the value of the electric field between the blocks?

188 1970 Question 70, 1 mark

Which of the following graphs best represents the electric potential at all points along the straight line between X and Y?