Physics SL

IB2 Examination

- Paper 1A -

30 IB MCQ

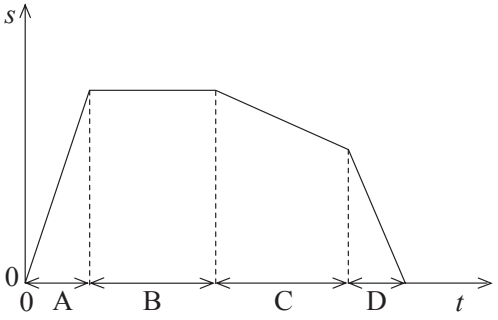
Wednesday 17 december 2025

Max Time : 50min.

Name: _____

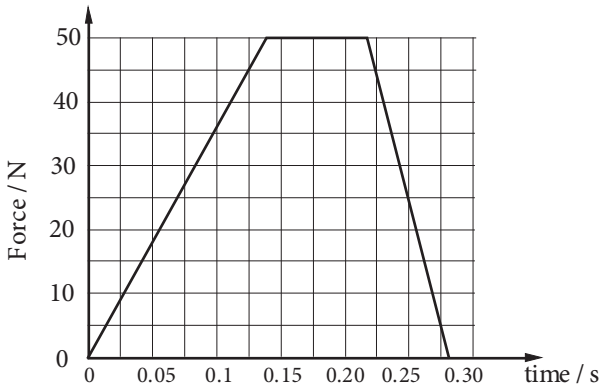
1.

The graph below shows the variation with time *t* of the displacement *s* of a car. In which time interval is the speed greatest?



2.

What is the quantity we can know using the *gradients* of the graph below



A. Impulse

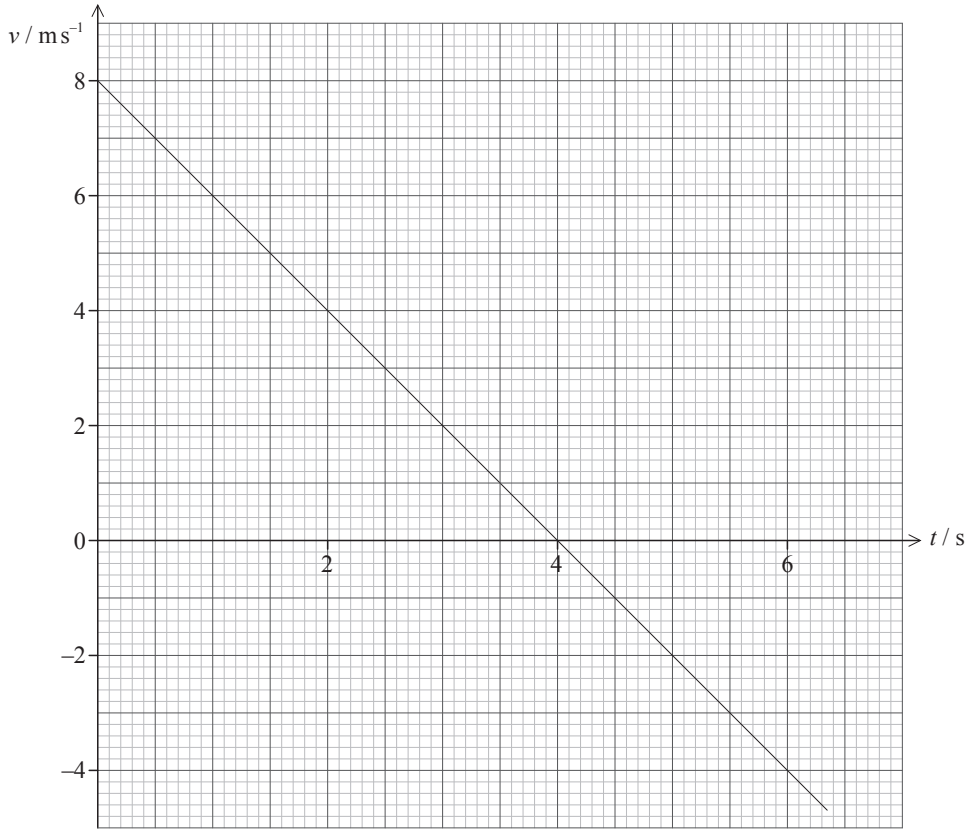
B. Momentum

C. Weight

D. Not any one

3.

The graph below shows the variation with time t of the velocity v of an object moving along a straight line.



The displacement of the object between $t = 0\,\text{s}$ and $t = 6.0\,\text{s}$ is

A. 2.0 m.

B. 12 m.

C. 20 m.

D. 24 m.

4.

An object of mass m is initially at rest. An impulse I acts on the object. The change in kinetic energy of the object is

A. $\frac{I^2}{2m}$.

B. $\frac{I^2}{m}$.

C. I^2m.

D. $2I^2m$.

5.

Two trolleys P and Q, are connected by a rubber band. They are at rest on a horizontal surface. The mass of Q is twice that of P. The trolleys are pulled apart so that the band is stretched and are then released.

The ratio $\frac{\text{magnitude of initial acceleration of trolley P}}{\text{magnitude of initial acceleration of trolley Q}}$ is

A. $\frac{1}{4}$.

B. $\frac{1}{2}$.

C. 1.

D. 2.

6.

An object of mass m falls from rest in a vacuum. As the object falls it loses an amount E of gravitational potential energy. The speed of the object is then

A. $\sqrt{\frac{2E}{m}}$.

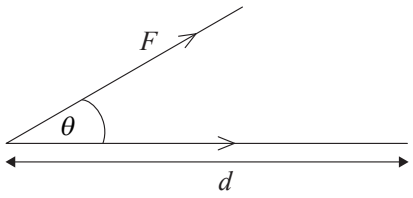
B. $\sqrt{\frac{m}{2E}}$.

C. $\frac{2E}{m}$.

D. $\frac{m}{2E}$.

7.

The point of action of a constant force F is displaced a distance d. The angle between the force and the direction of the displacement is θ, as shown below.



Which **one** of the following is the correct expression for the work done by the force?

A. Fd

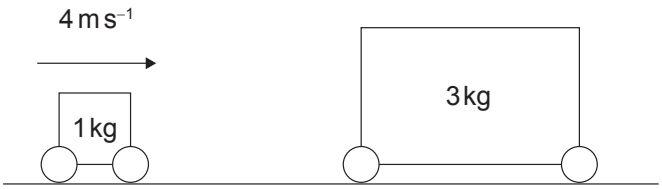
B. $Fd \sin\theta$

C. $Fd \cos\theta$

D. $Fd \tan\theta$

8.

A cart of mass 1 kg moving at $4\,\text{m s}^{-1}$ collides with a stationary cart of mass 3 kg.



After the collision the carts stick together.

What is $\dfrac{\text{kinetic energy after the collision}}{\text{kinetic energy before the collision}}$?

A. $\dfrac{1}{16}$

B. $\dfrac{1}{8}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{2}$

9.

The tension in a horizontal spring is directly proportional to the extension of the spring. The energy stored in the spring at extension x is *E*. What is the work done by the spring when its extension changes from x to $\frac{x}{4}$?

A. $\frac{E}{16}$

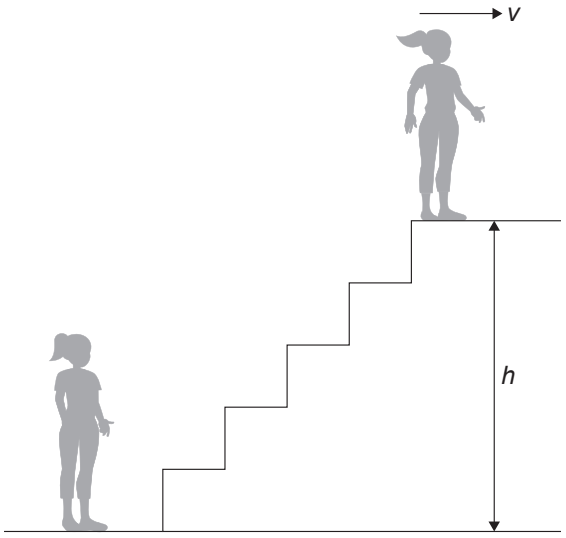
B. $\frac{E}{4}$

C. $\frac{3E}{4}$

D. $\frac{15E}{16}$

10.

A student of mass *m* initially at rest takes *t* seconds to run up stairs of height *h*. At the top of the stairs the student has a velocity *v*.



What is the average power supplied by the student during the climb?

A. $\frac{mgh}{t}$

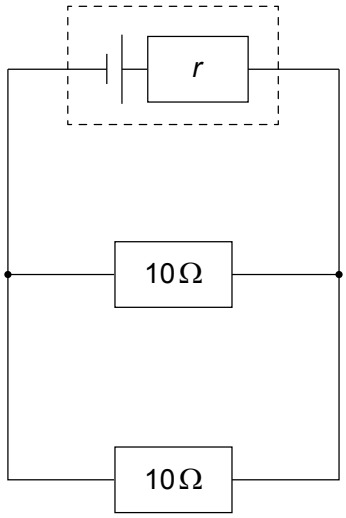
B. $\frac{m(gh+\frac{1}{2}v^2)}{t}$

C. $\frac{m(gh-\frac{1}{2}v^2)}{t}$

D. mgv

11.

A cell has an emf of 17.0 V and internal resistance *r*. It is connected to two 10 Ω external resistors.



There is a current of 1.5A in one of the external resistors.

What is the value of *r*?

A. 0.34 Ω

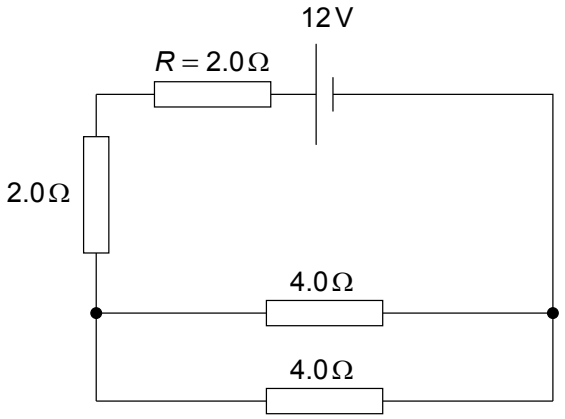
B. 0.50 Ω

C. 0.67 Ω

D. 1.3 Ω

12.

A network of three resistors is connected to a cell of emf 12 V and internal resistance R of 2.0 Ω as shown.



What is the current in one of the 4.0 Ω resistors?

A. 0.5 A

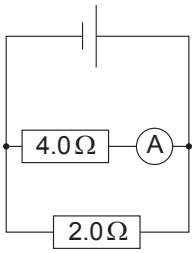
B. 1.0 A

C. 1.2 A

D. 2.0A

13.

A 2.0 Ω and a 4.0 Ω resistor are connected in parallel to a cell with negligible internal resistance. An ammeter placed in the circuit as shown measures a current of 1.0A.



What is the current passing through the 2.0 Ω resistor?

A. 0.5A

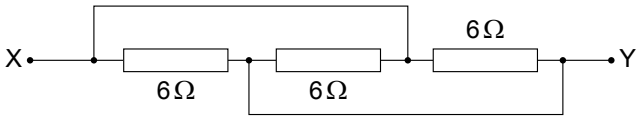
B. 1.0A

C. 2.0A

D. 4.0A

14.

Three identical resistors of $6\,\Omega$ are arranged as shown.



What is the resistance between X and Y?

A. $2\,\Omega$

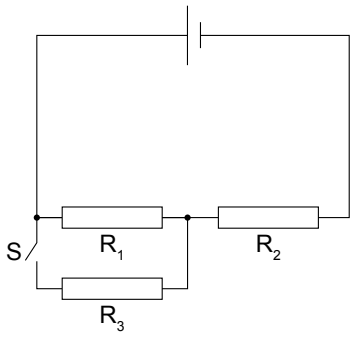
B. $4\,\Omega$

C. $9\,\Omega$

D. $18\,\Omega$

15.

Three identical resistors, R_1, R_2 and R_3, each of resistance $2\,\Omega$, are connected to a cell of negligible internal resistance as shown. When switch S is open, the power dissipated by R_1 is 18 W.



What is the power dissipated by R_1 when S is closed?

A. 8 W

B. 16 W

C. 18 W

D. 36 W

16.

A conductor has a resistance of 1.0 kΩ. The length of the conductor is 20 km and the cross-sectional area is 1.0 mm^2.

What is the resistivity of this conductor?

A. $2.0 \times 10^{-5}\,\Omega m$

B. $5.0 \times 10^{-5}\,\Omega m$

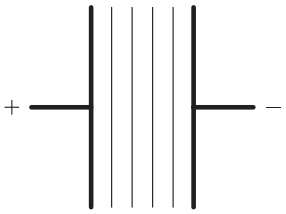
C. $2.0 \times 10^{-8}\,\Omega m$

D. $5.0 \times 10^{-8}\,\Omega m$

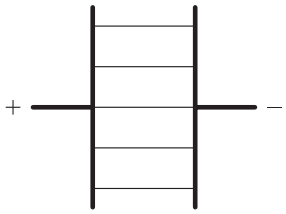
17.

Which diagram shows the equipotential lines between a pair of parallel charged conductors?

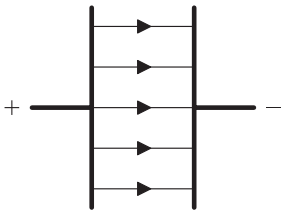
A.



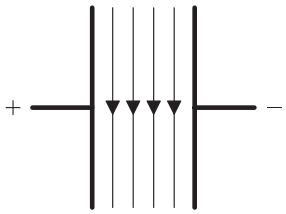
B.



C.



D.



18.

Current I flows in a conducting wire.

What expression correctly gives the number of electrons passing through a cross section of the wire in a time t?

A. It

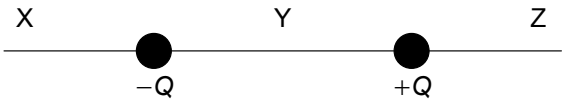
B. $\frac{I}{t}$

C. Ite

D. $\frac{It}{e}$

19.

The diagram shows two equal and opposite charges that are fixed in place.



At which points is the net electric field directed to the right?

A. X and Y only

B. Z and Y only

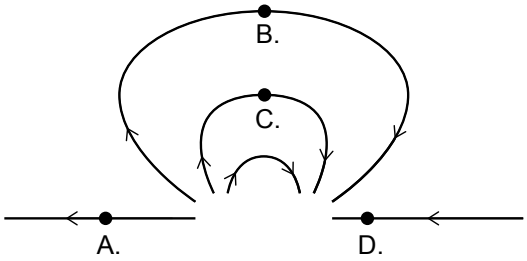
C. X and Z only

D. X, Y and Z

20.

The diagram shows electrostatic field lines. The source of the field is not shown.

At which position in the field would a negative point charge experience the greatest force to the right?



21.

Two isolated point charges, X of charge $+Q$ and Y of charge $+2Q$, are separated by a distance $3d$. P is a point d from X and $2d$ from Y respectively.

What is the net electric field strength at P?

A. 0

B. $\frac{kQ}{2d^2}$

C. $\frac{3kQ}{4d^2}$

D. $\frac{3kQ}{2d^2}$

22.

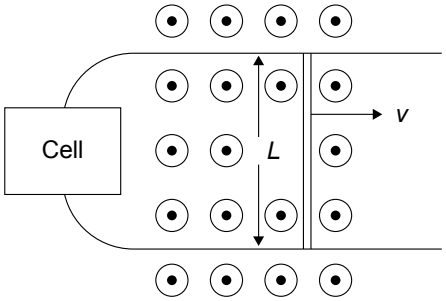
Two isolated identical point charges, Q_1 and Q_2, are separated by distance *d*. The electrostatic force on each charge is *F*. The charge of Q_1 is halved.

What is the electrostatic force on each charge?

	Force on Q_1	Force on Q_2
A.	F	F
B.	F	$\frac{F}{2}$
C.	$\frac{F}{2}$	$\frac{F}{2}$
D.	$\frac{F}{2}$	F

23.

A circuit is created with a cell, two parallel conducting wires and a moveable metal rod of length *L*. When a uniform magnetic field *B* is directed out of the page through the circuit, the metal rod moves to the right with velocity *v*. The initial current in the circuit is I.

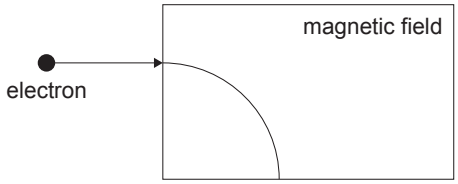


What is the direction of the current through the circuit and the initial force on the metal rod?

	Direction of I	Initial force on the metal rod
A.	anti-clockwise	$BIL\sin(90°)$
B.	clockwise	$BIL\sin(90°)$
C.	anti-clockwise	$BIL\sin(0°)$
D.	clockwise	$BIL\sin(0°)$

24.

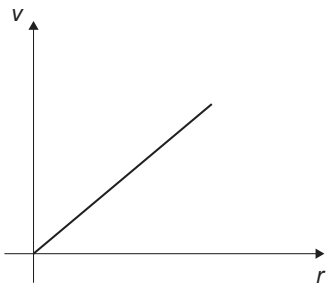
An electron enters a region of uniform magnetic field at a speed *v*. The direction of the electron is perpendicular to the magnetic field. The path of the electron inside the magnetic field is circular with radius *r.*



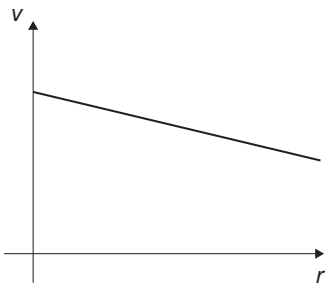
The speed of the electron is varied to obtain different values of *r*.

Which graph represents the variation of speed *v* with *r*?

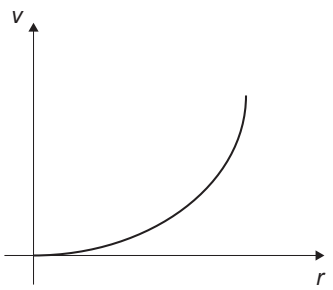
A.



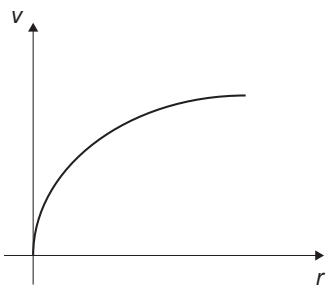
B.



C.

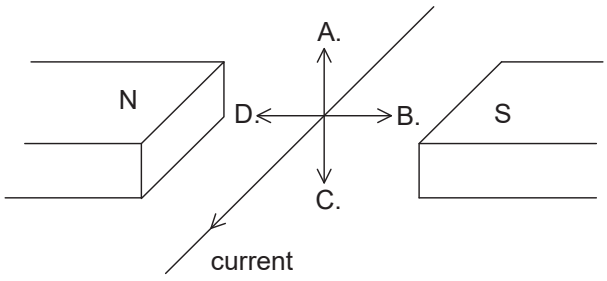


D.



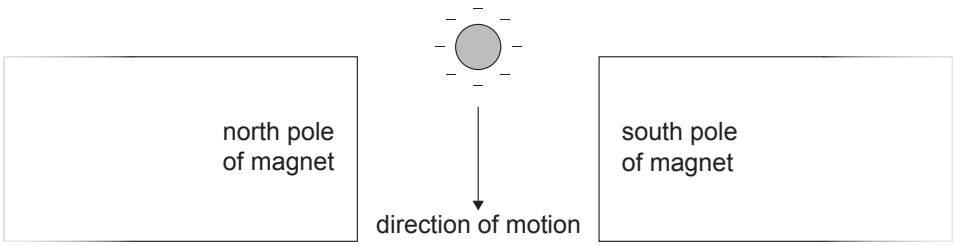
25.

A current in a wire lies between the poles of a magnet. What is the direction of the electromagnetic force on the wire?



26.

A negatively charged sphere is falling through a magnetic field.



What is the direction of the magnetic force acting on the sphere?

A. To the left of the page

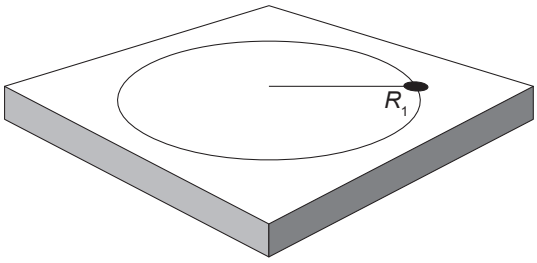
B. To the right of the page

C. Out of the page

D. Into the page

27.

A mass on the end of a string is rotating on a frictionless table in circular motion of radius R_1 and undergoes an angular displacement of θ in time t.



The string tension is kept constant, but the angular displacement of the mass is increased to 2θ in time t. The radius of the motion changes to R_2.

What is R_2?

A. $\frac{R_1}{4}$

B. $2R_1$

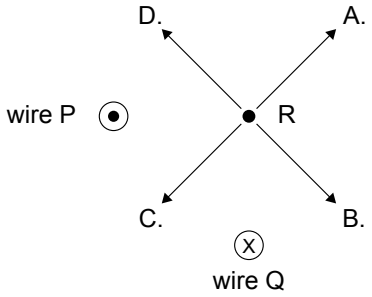
C. $4R_1$

D. $R_1 \times R_1$

28.

P and Q are two parallel wires perpendicular to the page that carry currents of equal magnitude in opposite directions. The current in P is out of the page. R is a fixed point equidistant from P and Q.

What is the direction of the magnetic field produced at R?



29.

A current-carrying conductor is at right angles to a magnetic field. The force on the conductor is *F*. The conductor is turned so that it is parallel to the field with no other changes. In what way, if any, does the force on the conductor change?

A. It is unchanged.

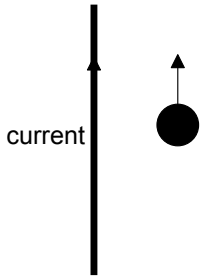
B. It increases so that it is greater than *F*.

C. It decreases so that it is greater than zero but less than *F*.

D. It becomes zero.

30.

A positively-charged particle moves parallel to a wire that carries a current upwards.



What is the direction of the magnetic force on the particle?

A. To the left

B. To the right

C. Into the page

D. Out of the page

Physics SL

IB2 Examination

- Paper 1B -

2 IB Questions

Wednesday 17 december 2025

Max Time : 25min.

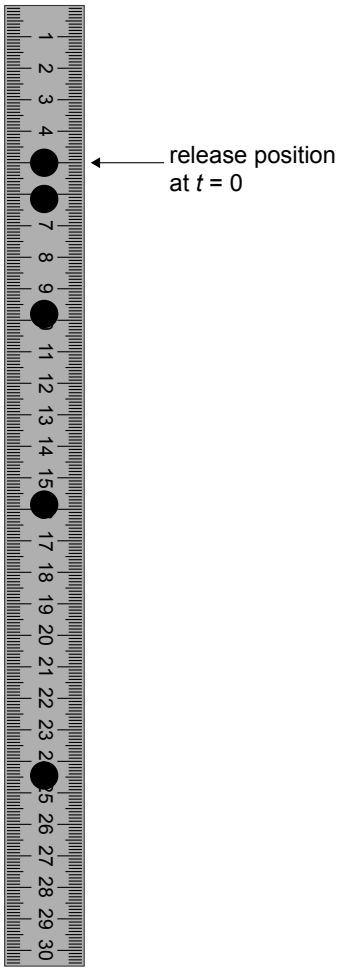
Name: _____

These two questions are based on experimental reasoning.

They may not be typical for you, but they aren't difficult. Do your best.

Question 1

A small ball is released from rest at time $t = 0$ in front of a vertical ruler. A multi-flash photograph is taken of the ball at $t = 0$ and every 0.050 s from then on.



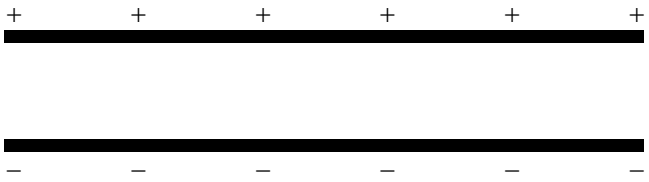
The distance s fallen by the ball is related to the acceleration g of the ball and t by $s = \frac{1}{2} g t^2$

Base on some of the displacements between consecutive flashe (visible on the photograph), determine g.

Question 2

Help : question (a) will involved a

The diagram shows two parallel conducting plates that are oppositely charged.



(a) (i) Draw the electric field lines due to the charged plates. [2]

(ii) The potential difference between the plates is 960 V and the distance between them is 8.0 mm. Calculate the electric field strength *E* between the plates. [2]

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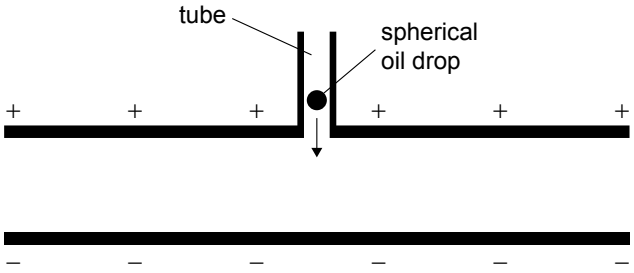
In an experiment, an oil drop is introduced into the space between the plates through a small hole in the upper plate. The oil drop moves through air in a tube before falling between the plates.



(b) Explain why the oil drop becomes charged as it falls through the tube. [1]

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(c) The oil drop is observed to be stationary in the space between the plates. Buoyancy is one of the forces acting on the drop.

The density of oil is 730 times greater than that of air.

$\text{help}: m = \rho V$
$(\text{for air: } \rho = 1\text{kg}/m^3)$

(i) Show that the buoyancy force is much smaller than the weight. [3]

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(ii) Draw the forces acting on the oil drop, ignoring the buoyancy force. [2]

oil drop

(iii) Show that the electric charge on the oil drop is given by

$$q = \frac{\rho_o g V}{E}$$

where ρ_o is the density of oil and V is the volume of the oil drop. [2]

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(iv) State the sign of the charge on the oil drop. [1]

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(d) The electric field is turned off. The oil drop falls vertically reaching a constant speed v.

(i) Outline why, for this drop, $\rho_o gV = 6\pi\eta rv$ where η is the viscosity of air and r is the radius of the oil drop. [2]

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(ii) Show that the charge on the oil drop is about 4.8×10^{-19} C.

The following data for the oil drop are available:

$r = 1.36\,\mu m$
$\eta = 1.60 \times 10^{-5}\,Pa\,s$
$v = 0.140\,mm\,s^{-1}$ [3]

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(iii) The oil drop splits into two parts of equal mass. Both are charged. Deduce the net charge on each part. [2]

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