

FORM 5

CHAPTER 3

Paper 1

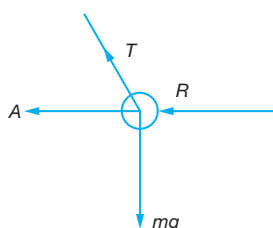
- 1 D 2 B 3 D 4 A 5 B
6 D 7 B 8 A 9 B 10 D
11 D 12 C 13 C 14 A

Paper 2

Structured Question

- 1 (a) The ball moves back and forth between two plates. After touching plate X , the ball becomes positively charged and is then pushed from plate X to plate Y . After touching plate Y , the ball is charged to negative and then pushed back to X .

- (b) (i)



T = tension

R = repulsive force from X

A = attractive force from Y

mg = gravitational force

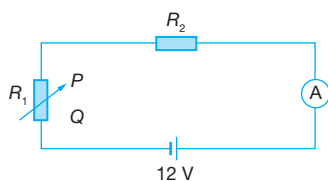
$$\begin{aligned} \text{(ii)} \quad E &= \frac{dV}{dr} \\ &= \frac{5000\text{V}}{5 \times 10^{-2}\text{cm}} \\ &= 100\,000\text{ V cm}^{-1} \end{aligned}$$

- (c) To conduct electricity.

- 2 (a) Wrap a constant wire around an insulating core PQ .

- (b) (i) Ammeter

- (ii)



- (c) (i) The meter reading decreases.
(ii) When the tank becomes empty, the contact touches the point P , the resistance of the circuit increases. The current decreases because the current varies inversely with the resistance.
- (d) Control the current that flows.

- (e) The effective resistance in the circuit, $R = 75 + 25 = 100\ \Omega$

$$\begin{aligned} I &= \frac{V}{R} \\ &= \frac{12}{100} \\ &= 0.12\text{ A} \end{aligned}$$

- 3 (a) (i) A battery labeled 6 V supplies 6 J of electrical energy for every 1 C of charge that passes through it.

- (ii) • Before the switch is turned on, the battery does not supply current to the bulb.
• Voltmeter reading = Electromotive force (d.e) of the battery.
• D.e.g battery, $E = 6.0\text{ V}$
• After the switch is turned on, the battery conducts current around the circuit.
• The gas is passed through the battery and also through the bulb.
• Voltmeter reading, V = Potential difference across the battery terminals.
 V = Potential difference supplied to the bulb.
• Potential difference across the bulb = 5.6 V.
• A voltmeter reading that drops from 6.0 V to 5.6 V indicates the battery has an internal resistance, r .
• Potential difference loss, $E - V = Ir$, where I is the current supplied by the battery through the bulb.

- (b) Advantages:

- The amount of internal resistance is smaller

$$\left(\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \dots \right)$$

- Can last longer, because the amount of energy stored in the batteries is more. Disadvantages: The effective d.e.g is the same as the d.e.g of one battery.

- (c) • Battery life is caused by the active chemicals in the battery.
• For older batteries, the resistance in the battery increases to a higher value.
• When the battery is connected to the mental, its large internal resistance causes a large potential difference loss in the battery.
• The small potential difference left across the battery terminals supplied to the mental is not high enough to light the bulb.
• Old batteries need to be changed to a suitable power supply.
• Mains electricity supply (240 V) needs to lower the potential difference to a value that corresponds to the potential difference on the mental label, which is the working voltage of the mental.
• The voltage to turn on the mental is the potential difference that needs to be supplied to turn on the mental under normal conditions.
• Suitable fuses are installed in electrical circuits to prevent fire and mental damage.