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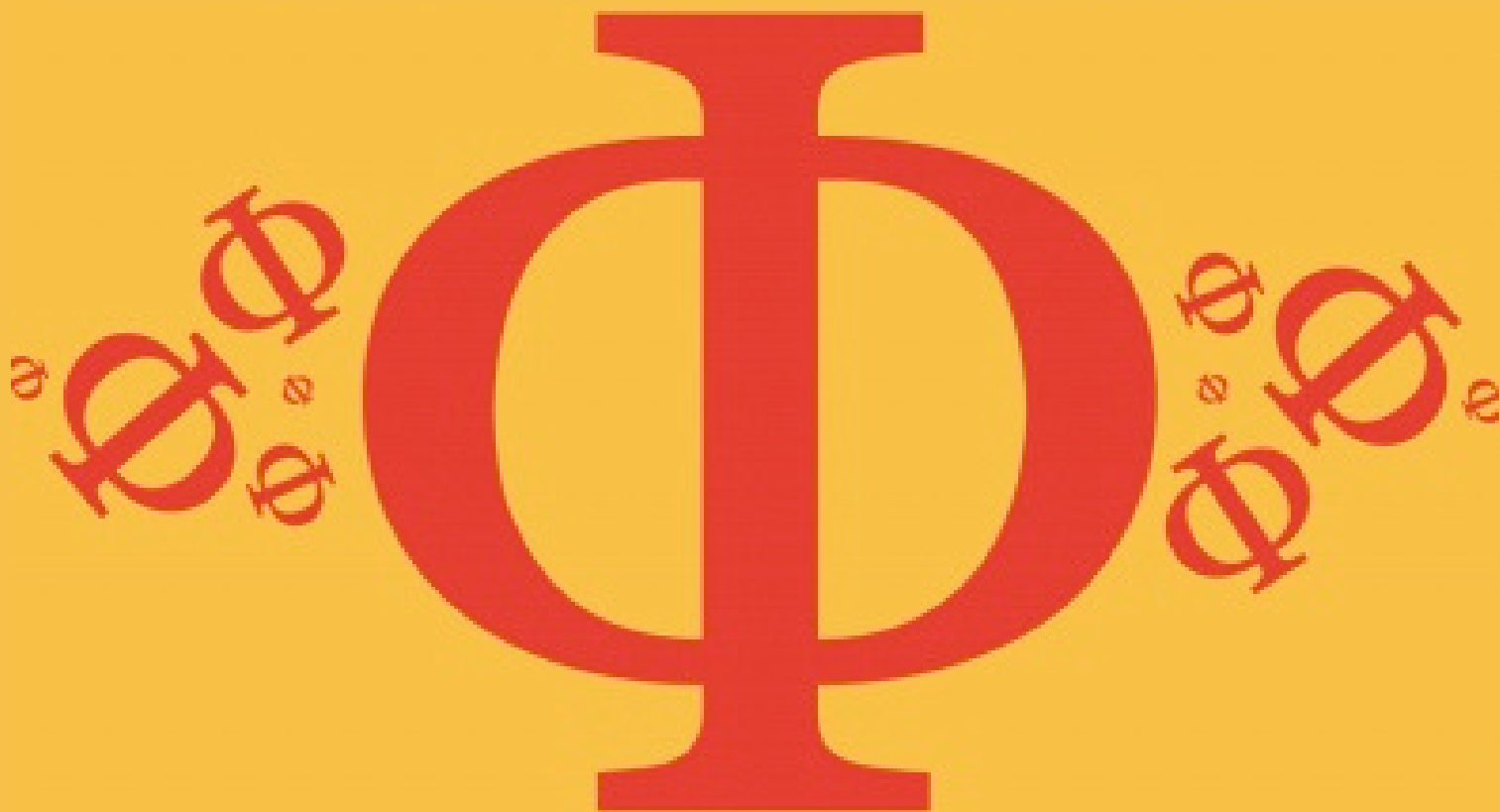
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## **5.3 Electric Cells**

Medium



# **PHYSICS**

## **IB HL**

## 5.3 Electric Cells

### Question Paper

Course	DP IB Physics
Section	5. Electricity & Magnetism
Topic	5.3 Electric Cells
Difficulty	Medium

EXAM PAPERS PRACTICE

Time allowed: 20  
Score: /10  
Percentage: /100

### Question 1

The potential difference across the terminals of a battery is 5.0 V when the current is 1.0 A and 4.0 V when the current is 1.5 A. What is the emf of the battery and its internal resistance?

	emf (V)	internal resistance ( $\Omega$ )
A.	7.0	2.0
B.	7.0	0.5
C.	3.0	2.0
D.	3.0	0.5

[1 mark]

### Question 2

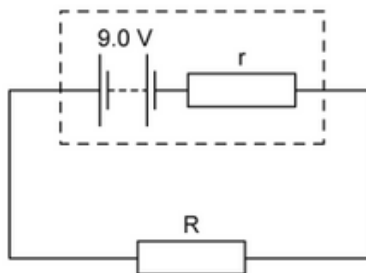
Which of the following statements about discharging cells is incorrect?

- A. The capacity of a cell is proportional to the amount of charge delivered to an external circuit over a cell's lifetime
- B. The lifetime of a cell depends on its capacity
- C. The lifetime of a cell depends on the current it produces
- D. The internal resistance of a cell gradually increases over its lifetime

[1 mark]

### Question 3

A resistor  $R$  is connected to the terminals of a battery of emf  $9.0\text{ V}$  and internal resistance  $r$ .



A charge of  $240\text{ C}$  through the resistor in two minutes. The power dissipated in the resistor as a result is  $1440\text{ J}$ . What is the internal resistance  $r$  of the battery?

- A.  $3.0\ \Omega$
- B.  $2.0\ \Omega$
- C.  $1.5\ \Omega$
- D.  $4.5\ \Omega$



[1 mark]

### Question 4

A battery of electromotive force  $\epsilon$  delivers charge  $Q$  to the load resistance. Which of the following statements is correct?

- A. The chemical work done around the circuit is  $\epsilon Q$
- B. The electrical work done between the terminals of the battery is  $\epsilon Q$
- C. The load resistance is  $\epsilon Q$
- D. The electrical work done in the battery and the across the load resistance is  $\epsilon Q$

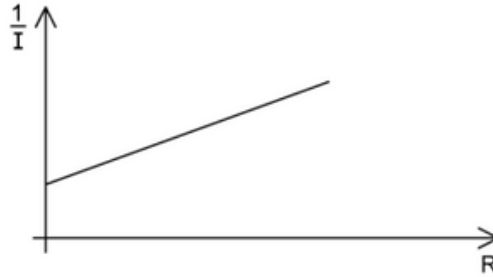
[1 mark]



### Question 5

An electrical circuit is designed to measure the current  $I$  through a variable resistor  $R$ . The cell used in the circuit has an emf  $\epsilon$  and an internal resistance  $r$ .

A graph shows the variation of  $\frac{1}{I}$  with  $R$ .



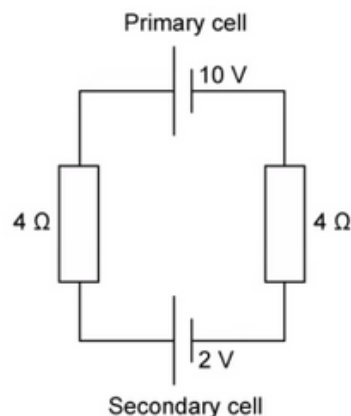
What is the magnitude of the gradient?

- A.  $\frac{1}{\epsilon}$
- B.  $\frac{1}{R}$
- C.  $\frac{1}{r}$
- D.  $r$



### Question 6

In the circuit shown, a primary cell charges a secondary cell through a pair of resistors.



Which of the following statements about the circuit is correct?

- A. Primary cells are rechargeable
- B. The power generated in the primary cell is equal to the power stored in the secondary cell
- C. The current in the circuit is 0.5 A
- D. The power stored in the secondary cell is 20% of the power generated by the primary cell

[1 mark]

### Question 7

Which statement about terminal potential difference  $V$  and e.m.f.  $\epsilon$  is incorrect?

- A. For non-ideal batteries, terminal potential difference is always measured to be less than the e.m.f.
- B.  $V = \epsilon$  only when current in the cell is zero
- C. For ideal batteries, the terminal potential difference is always measured to be less than the e.m.f.
- D. The terminal potential difference of non-ideal batteries decreases over time

[1 mark]

### Question 8

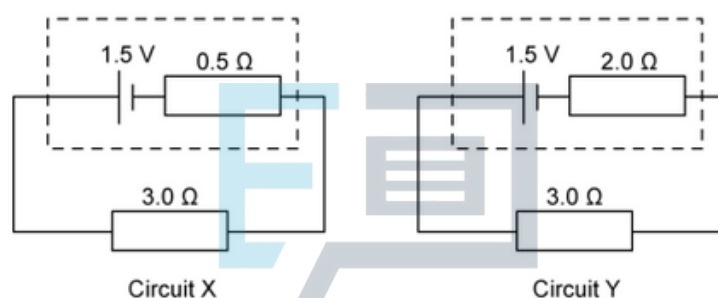
Which of the following units for internal resistance is incorrect?

- A.  $\text{VA}^{-1}$
- B.  $\text{Js}^{-1}\text{A}^{-2}$
- C.  $\text{kgm}^2\text{A}^{-2}\text{s}^{-2}$
- D.  $\text{kgm}^2\text{A}^{-2}\text{s}^{-3}$

[1 mark]

### Question 9

In the two circuits shown, only the internal resistances differ.



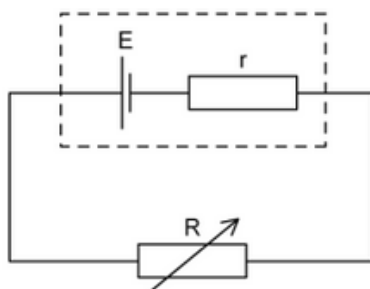
Which row in the table below correctly describes the potential difference across and power dissipated by the  $3\ \Omega$  resistor?

	potential difference across the $3\ \Omega$ resistor (V)	power dissipated in the $3\ \Omega$ resistor (W)
A.	Greater in X than in Y	Lesser in X than in Y
B.	Greater in X than in Y	Greater in X than in Y
C.	Lesser in X than in Y	Lesser in X than in Y
D.	Lesser in X than in Y	Greater in X than in Y

[1 mark]

### Question 10

A cell of internal resistance  $r$  is connected to a variable resistor  $R$ .



Which of the following statements about the circuit is/are correct?

- (1) If the resistance of  $R$  decreases, the terminal potential difference of the cell also decreases, but the power dissipated in the cell is large
- (2) If the resistance of  $R$  is made very large, the current in the circuit is very small but most of the power supplied by the cell is dissipated by  $R$
- (3) If the resistance of  $R$  is made very small, then the lifetime of the cell reduces

- A. Statement (1) only
- B. Statement (2) only
- C. Statements (1) and (3) only
- D. Statements (1), (2) and (3)

[1 mark]