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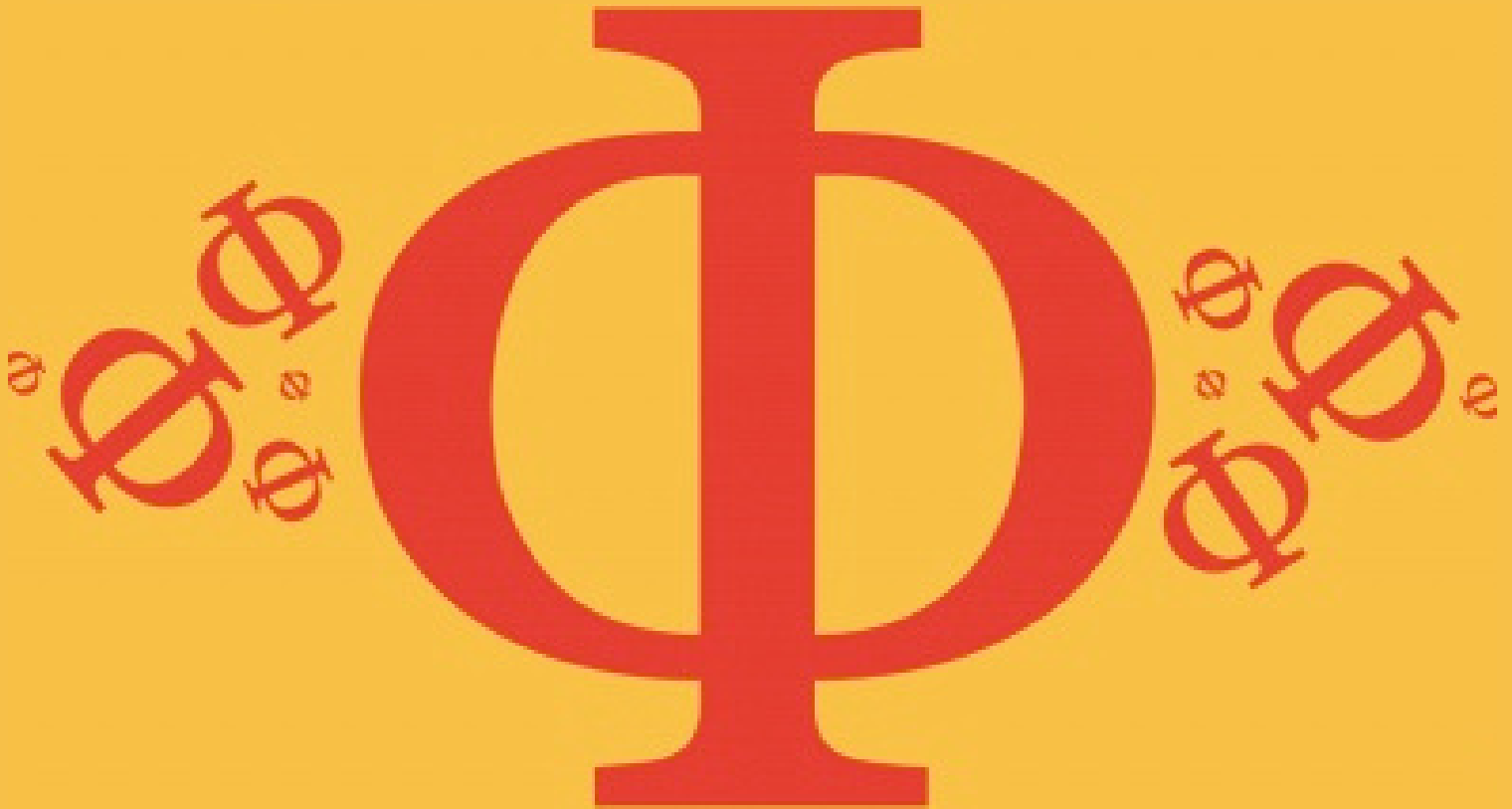
Detailed mark scheme

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## **11.3 Capacitance**

### **Easy**



# **PHYSICS**

## **IB HL**

# 11.3 Capacitance

## Question Paper

Course	DP IB Physics
Section	11. Electromagnetic Induction (HL only)
Topic	11.3 Capacitance
Difficulty	Easy

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

### Question 1

What is the capacitance of a capacitor in a circuit with a time constant of 60 s when it is discharged through a 15  $\Omega$  resistor?

- A. 1 F
- B. 2 F
- C. 3 F
- D. 4 F

[1 mark]

### Question 2

Which statement about the effect of dielectric materials on capacitance is incorrect?

- A. The larger the opposing electric field from the polar molecules in the dielectric, the larger the permittivity
- B. When the polar molecules in a dielectric align with the applied electric field from the plates they each produce their own electric field
- C. The electric field from the polar molecules opposes the electric field from the plates, reducing the overall electric field
- D. The dielectric material is an electrical conductor

[1 mark]

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### Question 3

A capacitor has a time constant,  $\tau$ .

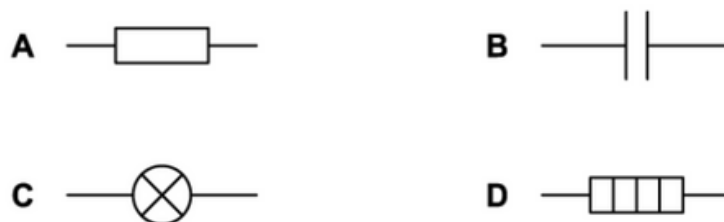
Which definition of  $\tau$  is incorrect?

- A. The time taken for a charging capacitor's potential difference to reach 63% of its maximum value.
- B. The time taken for a discharging capacitor's potential difference to decrease to 63% of its original value.
- C. The time taken for a discharging capacitor's potential difference to decrease to its original value multiplied by a factor of  $\frac{1}{e}$ .
- D. The product of the resistance of the resistor and the capacitance of the capacitor.

[1 mark]

### Question 4

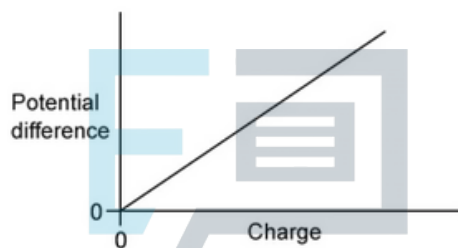
What is the correct circuit symbol for a capacitor?



[1 mark]

### Question 5

The graph shows how the potential difference across a capacitor varies with the charge stored by it.



Which one of the following statements is incorrect?

- A. The charge and potential difference are directly proportional to each other
- B. The energy stored in the capacitor is the area under the graph
- C. The gradient of the line equals the capacitance
- D. The gradient of the line equals the reciprocal of the capacitance

[1 mark]

### Question 6

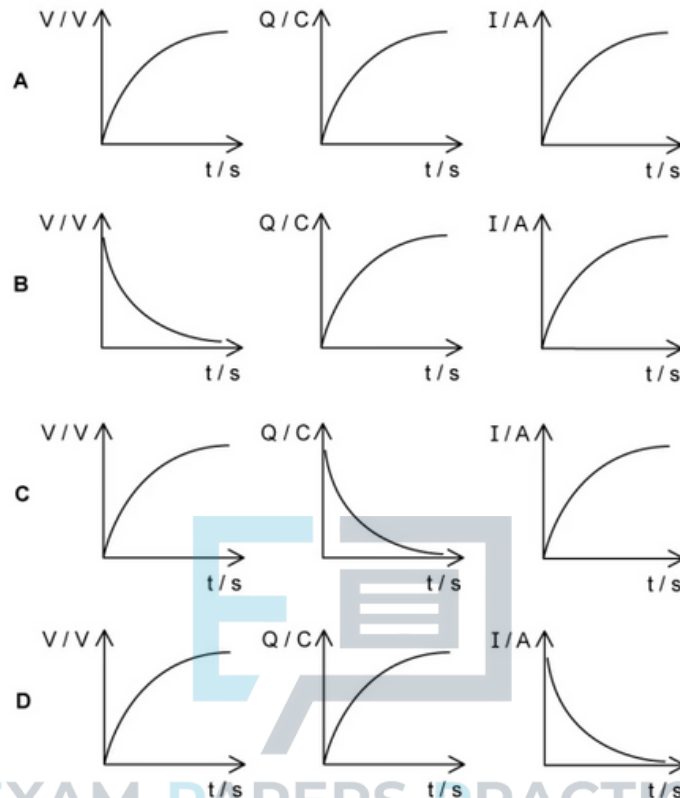
Which row in the table shows the correct units for capacitance,  $C$ , charge,  $q$  and potential difference,  $V$ ?

	<b>C</b>	<b>q</b>	<b>V</b>
<b>A.</b>	C	V	P
<b>B.</b>	F	C	V
<b>C.</b>	C	C	V
<b>D.</b>	F	A	V



### Question 7

Which of the following series of graphs shows the correct charging graphs for a capacitor?

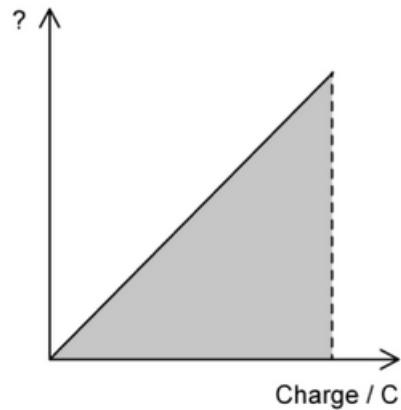


[1 mark]

### Question 8

The shaded area on the graph represents the energy stored in a capacitor.

What quantity is missing on the label of the Y axis?



- A. Energy
- B. Charge
- C. Voltage
- D. Capacitance

[1 mark]

### Question 9

A capacitor is discharging. The initial current is given by  $I_0$ .

What is the current when a time has passed equal in length to the time constant?

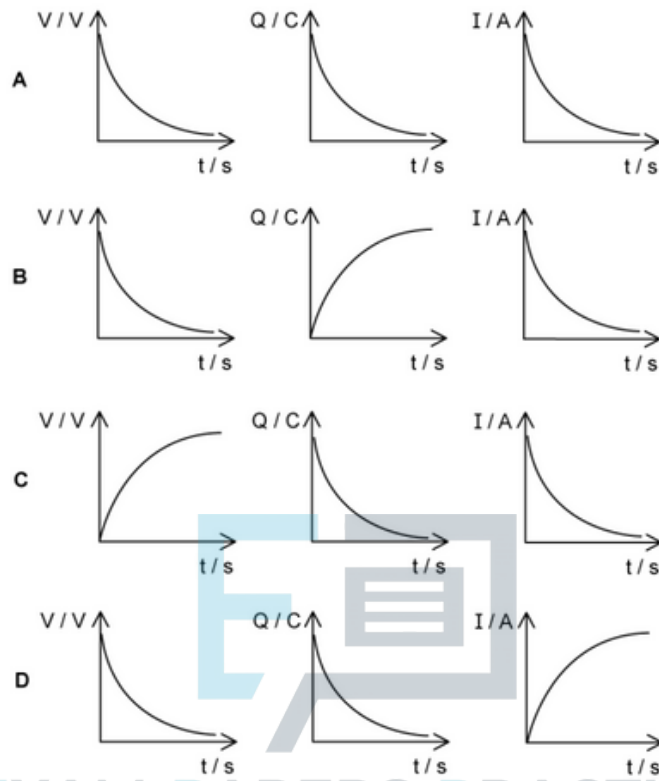
- A.  $\frac{I_0}{2}$
- B.  $I_0 e$
- C.  $\frac{I_0}{e}$
- D.  $I_0$

[1 mark]



### Question 10

Which of the following shows the correct discharging graphs for a capacitor?



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[1 mark]