Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Fields And Their Consequences (Capacitance)

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A capacitor of capacitance 120 μF is charged and then discharged through a 20 kΩ resistor.

What fraction of the original charge remains on the capacitor 4.8 s after the discharge begins?

A 0.14 ⬭
B 0.37 ⬭
C 0.63 ⬭
D 0.86 ⬭

(Total 1 mark)

Q2.

A capacitor consists of two parallel square plates of side l separated by distance d.
The capacitance of the arrangement is C.

What is the capacitance of a capacitor with square plates of side $2l$ separated by a distance $\frac{d}{2}$?

A C ⬭
B $2C$ ⬭
C $4C$ ⬭
D $8C$ ⬭

(Total 1 mark)

Q3.

Initially a capacitor stores 600 μC of charge. When it loses half of this charge, the potential difference (pd) across it decreases by 50 V.

What is the capacitance of the capacitor?

A 1.5 μF ⬭

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B 3.0 µF ⬭

C 6.0 µF ⬭

D 12 µF ⬭

(Total 1 mark)

Q4.

A 500 µF capacitor is charged to a pd of 10.0 V. It is then discharged through a 100 kΩ resistor.

What is the time taken for the pd to fall from 10.0 V to 5.0 V?

A 35 s ⬭

B 50 s ⬭

C 72 s ⬭

D 100 s ⬭

(Total 1 mark)

Q5.

The separation of the plates of an isolated charged parallel−plate capacitor is increased.

What also increases?

A the capacitance of the capacitor ⬭

B the charge on the plates ⬭

C the strength of the electric field between the plates ⬭

D the pd between the plates ⬭

(Total 1 mark)

Q6.

The initial charge stored by a capacitor of capacitance 0.50 µF is 2.0 µC. The capacitor is then discharged through a resistor.

How much energy is stored by the capacitor after a time equal to one time constant?

A 0.06 µJ ⬭

B 0.54 µJ ⬭

C 1.0 µJ ⬭

D 4.0 µJ ⬭

(Total 1 mark)

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Q7.

Which of the following statements about a parallel plate capacitor is **incorrect**?

A The capacitance of the capacitor is the amount of charge stored by the capacitor when the pd across the plates is 1 V. ⬭

B A uniform electric field exists between the plates of the capacitor. ⬭

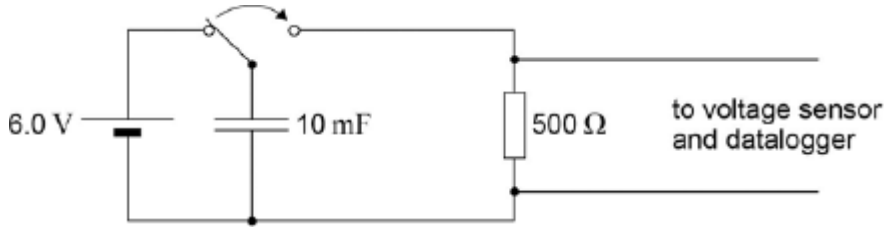
C The charge stored on the capacitor is inversely proportional to the pd across the plates. ⬭

D The energy stored when the capacitor is fully charged is proportional to the square of the pd across the plates. ⬭

(Total 1 mark)

Q8.

A voltage sensor and a datalogger are used to record the discharge of a 10 mF capacitor in series with a 500 Ω resistor from an initial pd of 6.0 V. The datalogger is capable of recording 1000 readings in 10 s.



After a time equal to the time constant of the discharge circuit, which one of the rows gives the pd and the number of readings made?

	Potential difference / V	Number of readings	
A	2.2	50	⬭
B	3.8	50	⬭
C	3.8	500	⬭
D	2.2	500	⬭

(Total 1 mark)

Q9.

A variable capacitor has a capacitance which can be varied from 6.0×10^{-12} F to 3.0×10^{-12} F. The capacitor is set to its maximum capacitance and fully charged using a 48 V supply. The capacitor is then disconnected from the supply and isolated. Finally the capacitance is reduced to its minimum value without any charge being lost by the capacitor.

Which line, **A** to **D**, in the table correctly shows the potential difference (pd) across the capacitor and the charge it stores after the capacitance has been reduced?

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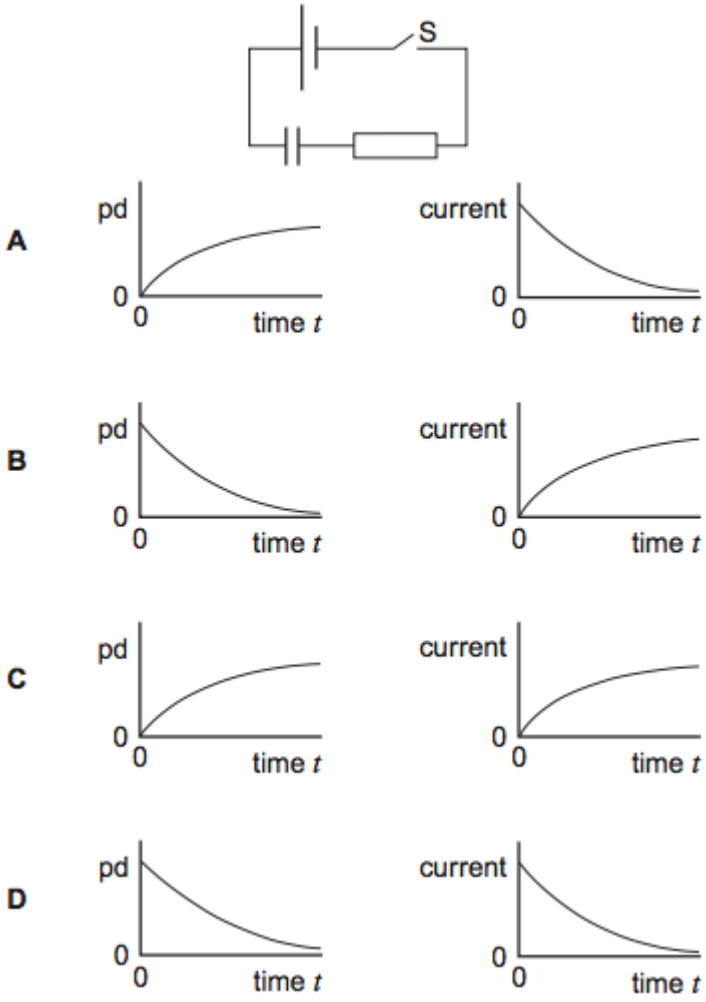
	pd / V	Charge / C
A	48	2.9×10^{-10}
B	24	2.9×10^{-10}
C	96	2.9×10^{-10}
D	96	1.4×10^{-10}

(Total 1 mark)

Q10.

The capacitor in the circuit is initially uncharged. The switch S is closed at time $t = 0$.

Which pair of graphs, **A** to **D**, correctly shows how the pd across the capacitor and the current in the circuit change with time?



(Total 1 mark)

Q11.

When fully charged the 2.0 mF capacitor used as a backup for a memory unit has a potential difference of 5.0 V across it. The capacitor is required to supply a constant current of 1.0 μA and can be used until the potential difference across it falls by 10%. For how long can the capacitor be used before it must be recharged?

A 10 s

B 100 s

C 200 s

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D 1000 s

(Total 1 mark)

Q12.

An uncharged 4.7 nF capacitor is connected to a 1.5 V supply and becomes fully charged.

How many electrons are transferred to the negative plate of the capacitor during this charging process?

A 2.2×10^{10}

B 3.3×10^{10}

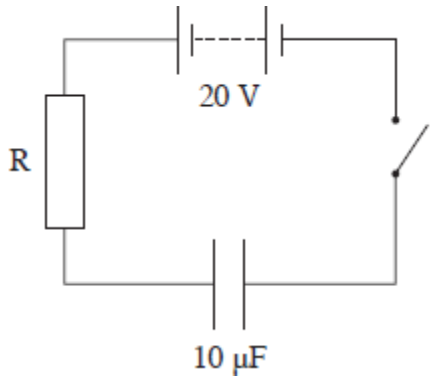
C 4.4×10^{10}

D 8.8×10^{10}

(Total 1 mark)

Q13.

A capacitor of capacitance 10 μF is charged through a resistor R to a potential difference (pd) of 20 V using the circuit shown.



When the capacitor is fully charged which one of the following statements is **incorrect**?

A The energy stored by the capacitor is 2 mJ.

B The total energy taken from the battery during the charging process is 2 mJ.

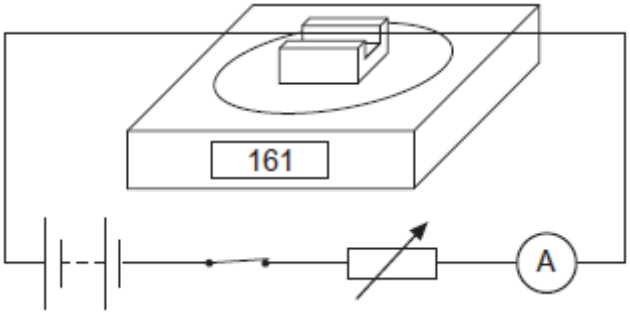
C The pd across the capacitor is 20 V.

D The pd across the resistor is 0 V.

(Total 1 mark)

Q14.

The diagram shows a rigidly-clamped straight horizontal current-carrying wire held mid-way between the poles of a magnet on a top-pan balance. The wire is perpendicular to the magnetic field direction.



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The balance, which was zeroed before the switch was closed, read 161 g after the switch was closed. When the current is reversed and doubled, what would be the new reading on the balance?

A −322 g

B −161 g

C zero

D 322 g

(Total 1 mark)

Q15.

Initially a charged capacitor stores 1600 μJ of energy. When the pd across it decreases by 2.0 V, the energy stored by it becomes 400 μJ.

What is the capacitance of this capacitor?

A 100 μF

B 200 μF

C 400 μF

D 600 μF

(Total 1 mark)

Q16.

A nuclear fusion device is required to deliver at least 1 MJ of energy using capacitors. If the largest workable potential difference is 10 kV, what is the minimum capacitance of the capacitors that should be used?

A 0.01 F

B 0.02 F

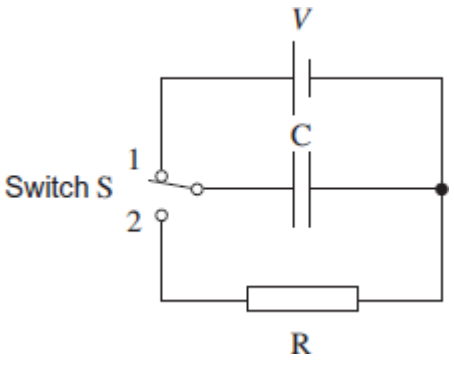
C 2 F

D 100 F

(Total 1 mark)

Q17.

Switch S in the circuit is held in position 1, so that the capacitor C becomes fully charged to a pd V and stores energy E.



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The switch is then moved quickly to position 2, allowing C to discharge through the fixed resistor R. It takes 36 ms for the pd across C to fall to $\frac{V}{2}$. What period of time must elapse, after the switch has moved to position 2, before the energy stored by C has fallen to $\frac{E}{16}$?

A 51 ms

B 72 ms

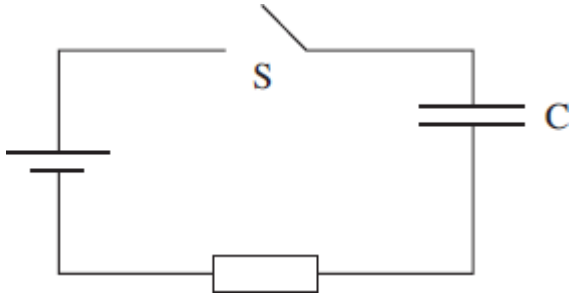
C 432 ms

D 576 ms

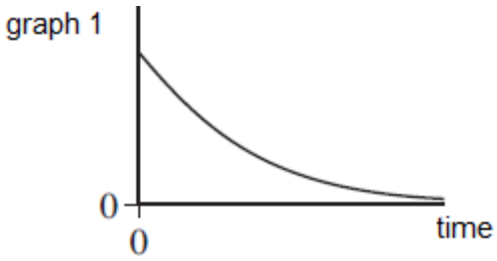
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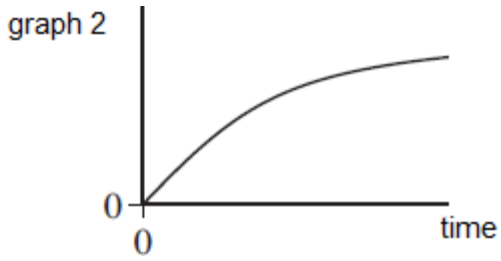
Q18.

In the circuit shown the capacitor C charges when switch S is closed.



Which line, **A** to **D**, in the table gives a correct pair of graphs showing how the charge on the capacitor and the current in the circuit change with time after S is closed?





	charge	current
A	graph 1	graph 1
B	graph 1	graph 2
C	graph 2	graph 2
D	graph 2	graph 1

(Total 1 mark)

Q19.

The voltage across a capacitor falls from 10 V to 5 V in 48 ms as it discharges through a resistor. What is the time constant of the circuit?

A 24 ms

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B 33 ms

C 69 ms

D 96 ms

(Total 1 mark)

Q20.

Which one of the following statements about a parallel plate capacitor is **incorrect**?

A The capacitance of the capacitor is the amount of charge stored by the capacitor when the pd across the plates is 1V.

B A uniform electric field exists between the plates of the capacitor.

C The charge stored on the capacitor is inversely proportional to the pd across the plates.

D The energy stored when the capacitor is fully charged is proportional to the square of the pd across the plates.

(Total 1 mark)

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