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

Q1.

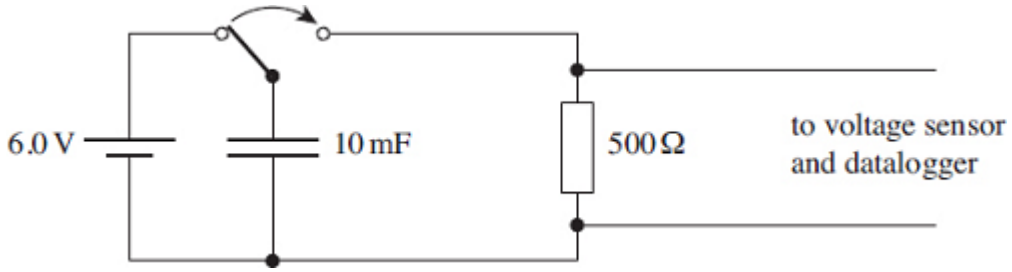
An initially uncharged capacitor of capacitance 20 μF is charged by a constant current of 80 μA. Which line, **A** to **D**, in the table gives the potential difference across, and the energy stored in, the capacitor after 50 s?

	potential difference / V	energy stored / J
A	4.0×10^{-3}	2.0×10^{-3}
B	4.0×10^{-3}	4.0×10^{-1}
C	2.0×10^{2}	2.0×10^{-3}
D	2.0×10^{2}	4.0×10^{-1}

(Total 1 mark)

Q2.

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. Which line, **A** to **D**, in the table gives the pd and the number of readings made after a time equal to the time constant of the discharge circuit?



	potential difference/V	number of readings
A	2.2	50
B	3.8	50
C	3.8	500
D	2.2	500

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(Total 1 mark)

Q3.

A 1000 μF capacitor and a 10 μF capacitor are charged so that they store the same energy. The pd across the 1000 μF capacitor is V_1 and the pd across the other capacitor is V_2.

What is the value of the ratio $\left(\frac{V_1}{V_2}\right)^2$?

A $\frac{1}{1000}$

B $\frac{1}{100}$

C $\frac{1}{10}$

D 10

(Total 1 mark)

Q4.

When a 220 μF capacitor is discharged through a resistor R, the capacitor pd decreases from 6.0 V to 1.5 V in 92 s.

What is the resistance of R?

A 210 kΩ

B 300 kΩ

C 420 kΩ

D 440 kΩ

(Total 1 mark)

Q5.

A capacitor stores a charge of 600 μC when charged to a potential difference (pd) of 6.0 V. What will be the pd across the plates if the charge stored increases by 50%?

A 3.0 V

B 4.5 V

C 9.0 V

D 12.0 V

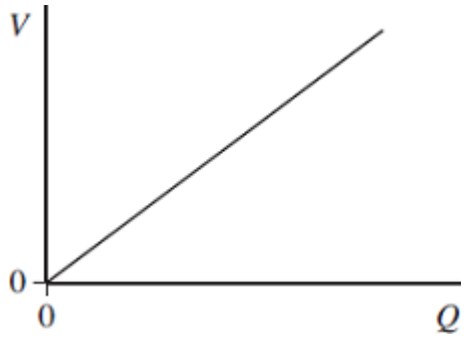
(Total 1 mark)

Q6.

The graph shows the results of an experiment which was carried out to investigate the relationship

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between the charge Q stored by a capacitor and the pd V across it.



Which one of the following statements is **not** correct?

A The energy stored can be calculated by finding the area under the line.

B If a capacitor of smaller capacitance had been used the gradient of the graph would be steeper.

C If Q were doubled, the energy stored would be quadrupled.

D The gradient of the graph is equal to the capacitance of the capacitor.

(Total 1 mark)

Q7.

A 400 μF capacitor is charged so that the voltage across its plates rises at a constant rate from 0 V to 4.0 V in 20 s. What current is being used to charge the capacitor?

A 5 μA

B 20 μA

C 40 μA

D 80 μA

(Total 1 mark)

Q8.

A 10 μF capacitor is fully charged to a pd of 3.0 kV. The energy stored in the capacitor can be used to lift a load of 5.0 kg through a vertical height h. What is the approximate value of h?

A 0.03 mm

B 0.9 mm

C 0.3 m

D 0.9 m

(Total 1 mark)

Q9.

A capacitor of capacitance C stores an amount of energy E when the pd across it is V. Which line, **A** to **D**, in the table gives the correct stored energy and pd when the charge is increased by 50%?

	energy	**pd**

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A	1.5 *E*	1.5 *V*
B	1.5 *E*	2.25 *V*
C	2.25 *E*	1.5 *V*
D	2.25 *E*	2.25 *V*

(Total 1 mark)

Q10.

A capacitor of capacitance *C* discharges through a resistor of resistance *R*. Which one of the following statements is **not** true?

A The time constant will decrease if *C* is increased.

B The time constant will increase if *R* is increased.

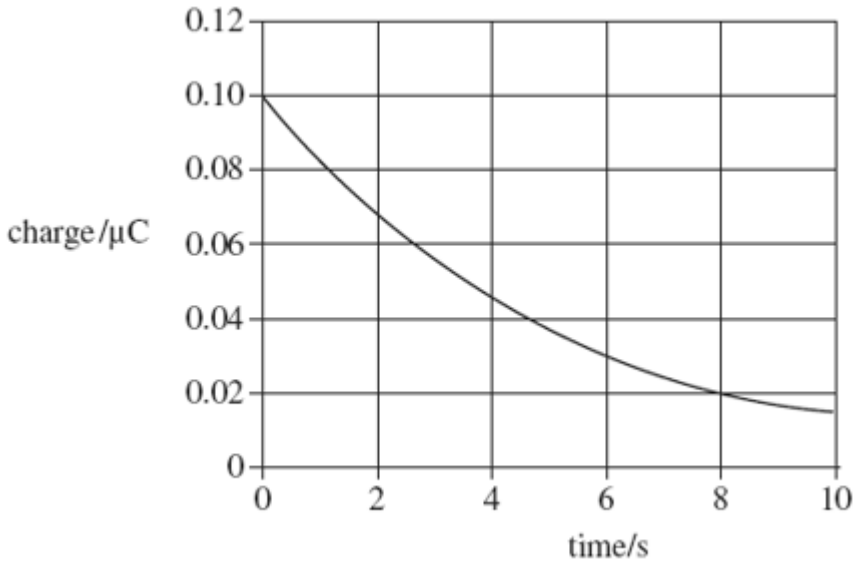
C After charging to the same voltage, the initial discharge current will increase if *R* is decreased.

D After charging to the same voltage, the initial discharge current will be unaffected if *C* is increased.

(Total 1 mark)

Q11.

The graph shows how the charge on a capacitor varies with time as it is discharged through a resistor.



What is the time constant for the circuit?

A 3.0 s

B 4.0 s

C 5.0 s

D 8.0 s

(Total 1 mark)

Q12.

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A 10 mF capacitor is charged to 10 V and then discharged completely through a small motor. During the process, the motor lifts a weight of mass 0.10 kg. If 10% of the energy stored in the capacitor is used to lift the weight, through what approximate height will the weight be lifted?

A 0.05 m

B 0.10 m

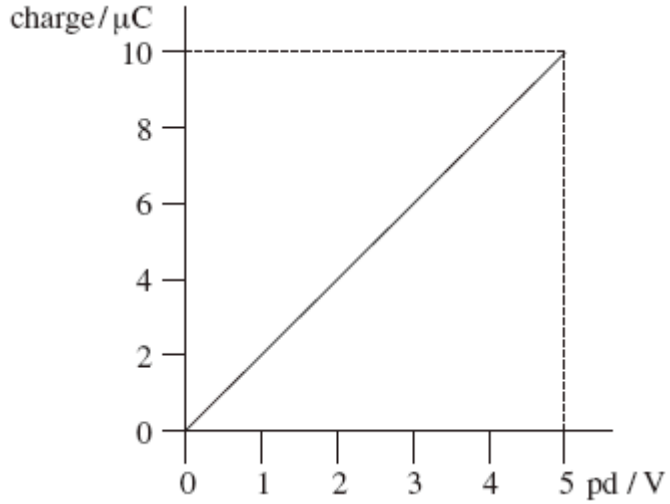
C 0.50 m

D 1.00 m

(Total 1 mark)

Q13.

The graph shows how the charge stored by a capacitor varies with the pd applied across it.



Which line, **A** to **D**, in the table gives the capacitance and the energy stored when the potential difference is 5.0 V?

	capacitance/μF	**energy stored/μJ**
A	2.0	25
B	2.0	50
C	10.0	25
D	10.0	50

(Total 1 mark)

Q14.

A 1 μF capacitor is charged using a **constant** current of 10 μA for 20 s. What is the energy finally stored by the capacitor?

A 2×10^{-3} J

B 2×10^{-2} J

C 4×10^{-2} J

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D 4×10^{-1} J

(Total 1 mark)

Q15.

A 2.0 mF capacitor, used as the backup for a memory unit, has a potential difference of 5.0 V across it when fully charged. 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%. How long can the capacitor be used for before it must be recharged?

A 10 s

B 100 s

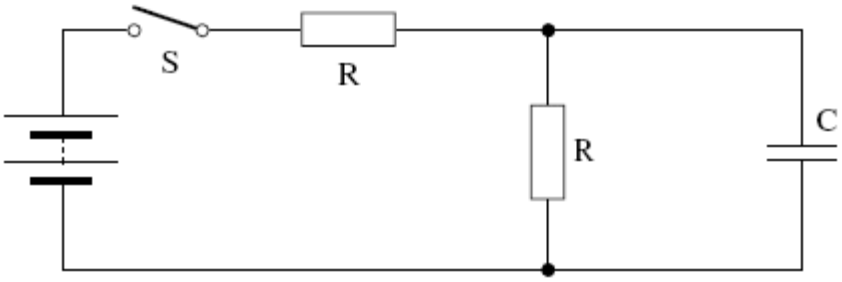
C 200 s

D 1000 s

(Total 1 mark)

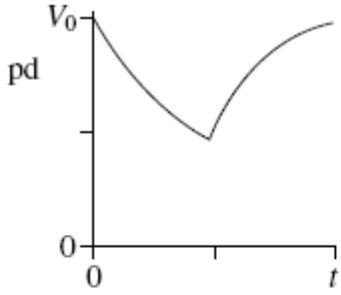
Q16.

When switch S in the circuit is closed, the capacitor C is charged by the battery to a pd V_0. The switch is then opened until the capacitor pd decreases to 0.5 V_0, at which time S is closed again. The capacitor then charges back to V_0.

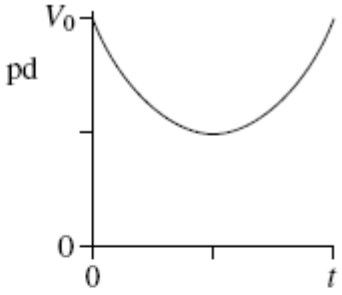


Which graph best shows how the pd across the capacitor varies with time, *t*, after S is opened?

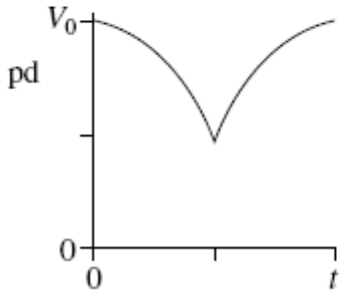
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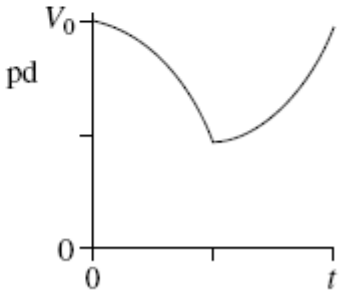


A



B





(Total 1 mark)

Q17.

An initially uncharged capacitor of capacitance 10 μF is charged by a **constant** current of 200 μA. After what time will the potential difference across the capacitor be 2000 V?

A 50 s

B 100 s

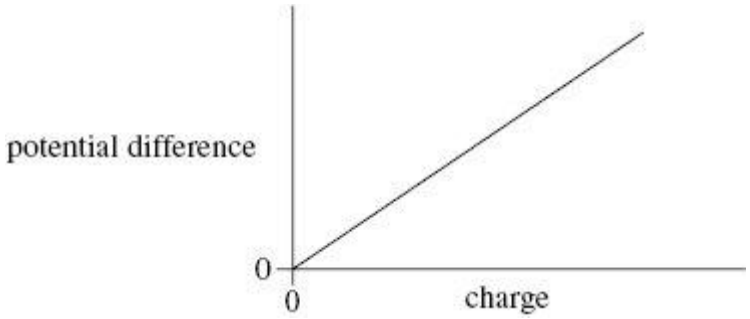
C 200 s

D 400 s

(Total 1 mark)

Q18.

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



Which one of the following statements is correct?

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A The gradient of the line equals the capacitance of the capacitor.

B The gradient of the line equals the energy stored by the capacitor.

C The reciprocal of the gradient equals the energy stored by the capacitor.

D The reciprocal of the gradient equals the capacitance of the capacitor.

(Total 1 mark)

Q19.

When a capacitor discharges through a resistor it loses 50% of its charge in 10 s. What is the time constant of the capacitor-resistor circuit?

A 0.5 s

B 5 s

C 14 s

D 17 s

(Total 1 mark)

Q20.

A 1000 μF capacitor, X, and a 100 μF capacitor, Y, are charged to the same potential difference. Which row, **A** to **D**, in the table gives correct ratios of charge stored and energy stored by the capacitors?

	$\frac{\text{charge stored by X}}{\text{charge stored by Y}}$	$\frac{\text{energy stored by X}}{\text{energy stored by Y}}$
A	1	1
B	1	10
C	10	1
D	10	10

(Total 1 mark)

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