

ELECTROSTATICS II

1. 1995 Q24 P1

Figure 8 represents two parallel plates of a capacitor separated by a distance d . Each plate has an area of A square units

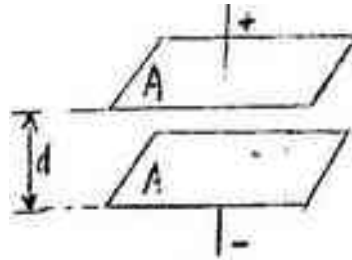


Fig. 8

Suggest two adjustments that can be made so as to reduce the effective capacitance

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2. 1996 Q9 P1

State the law of electrostatic charges (1 mark)

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3. 1997 Q11 P1

Name a device used to convert light energy directly into electrical energy

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4. 1997 Q15 P1

Figure 7 shows an incomplete circuit of an electromagnet. Complete the circuit between X and Y drawing the windings on the two arms of the core such that A and B are both North poles when switch S is closed. Indicate the direction of the current on the windings drawn.

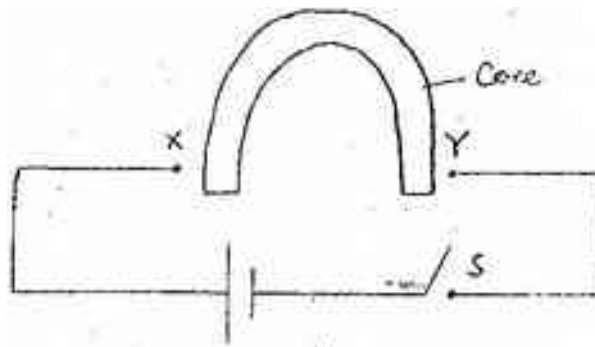
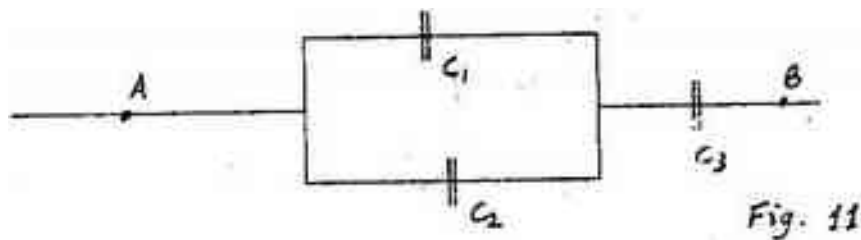


Fig. 7

5. 1997 Q29 P1

Figure 11 shows part of a circuit containing three capacitors



Write an expression for C_T the effective capacitance between A and B.

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6. 1998 Q15 P1

A highly negatively charged rod is gradually brought close to the cap of a positively charged electroscope. It is observed that the leaf collapses initially and then diverges. Explain the observation.

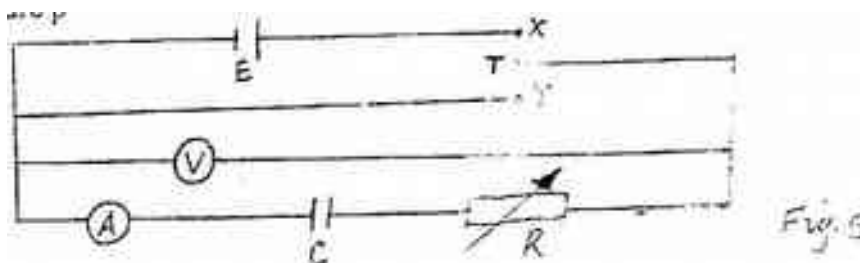
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7. 1998 Q6 P2

Fig 5 shows a circuit for charging and discharging a capacitor; e, through a variable resistor R, X Y and T are points on a two-way switch.



a) Explain how the charging and discharging processes are achieved.

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b) **Table 2** show the variation of the charge q with time t when a $500\mu\text{F}$ capacitor was discharged through a resistor.

Time, t , (s)	0	20	40	60	80	100
Charge, q (μC)	300	150	75	38	19	10

Table 2

(i) Plot a graph of charge q (y axis) against time.

(ii) Determine the current flowing in the circuit at $t=30\text{s}$. (Give your

answer to 1 decimal place)

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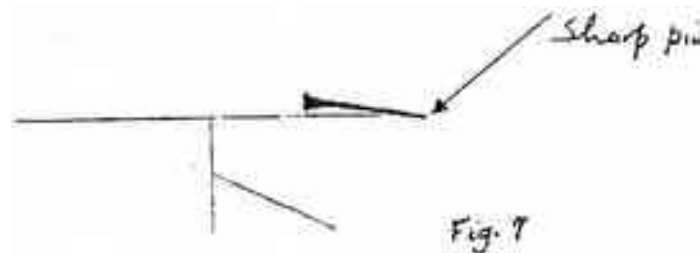
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8. 1999 Q9 P1

Figure 7 shows a sharp pin fixed on a cap of leaf electroscope. The electroscope is highly charged and then left for some time.



Explain why the leaf collapses

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9. 1999 Q30 P1

It is observed that when ultraviolet light is shone onto a clean zinc plate connected to the cap of negatively charged leaf electroscope, the leaf collapse. Explain this observation.

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10. 2000 Q4 P1

A positively charged rod is brought near the cap of a leaf electroscope. The cap is then earthed momentarily by touching with the finger. Finally the rod is withdrawn. The electroscope is found to be negatively charged. Explain how this charge is acquired

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11. 2000 Q26 P1

Fig. 15 shows a battery of emf 3.0 V connected in series with two capacitors.

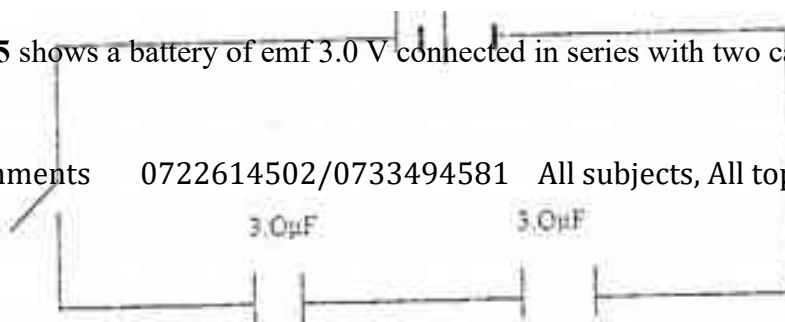


Figure 15

Determine the charge stored in the capacitors when the switch S is closed

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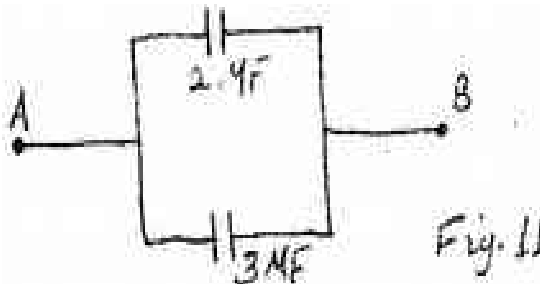
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12. 2002 Q21 P1

Fig. 11 shows part of the circuit containing two capacitors of $2\mu\text{F}$ and $3\mu\text{F}$ respectively.



Determine the p.d across AB given that the total charge in the capacitors is 1×10^{-4} Coulombs.

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13. 2003 Q37 P1

Figure 20 shows three capacitors connected between two points A and B.

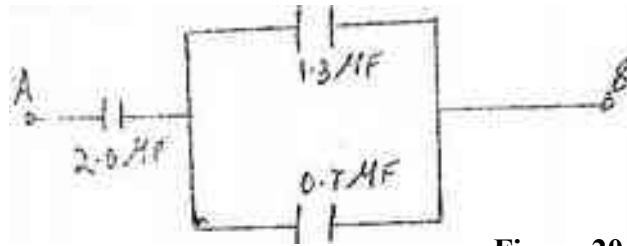


Figure 20

Determine the capacitance across AB

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14. 2004 Q26 P1

The capacitors in the circuit in **fig 14** are identical and initially uncharged.

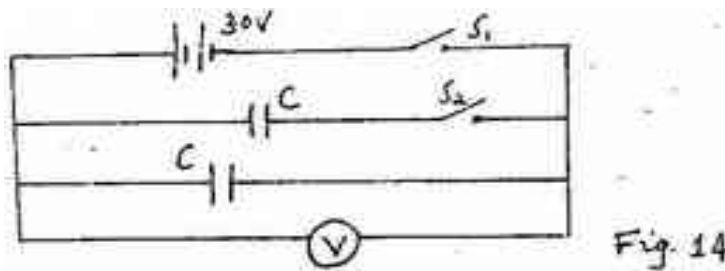


Fig. 14

Switch S_1 is closed while switch S_2 remains open. After sometime, switch S_1 is opened and switch S_2 closed. Determine the final reading of the voltmeter, V.

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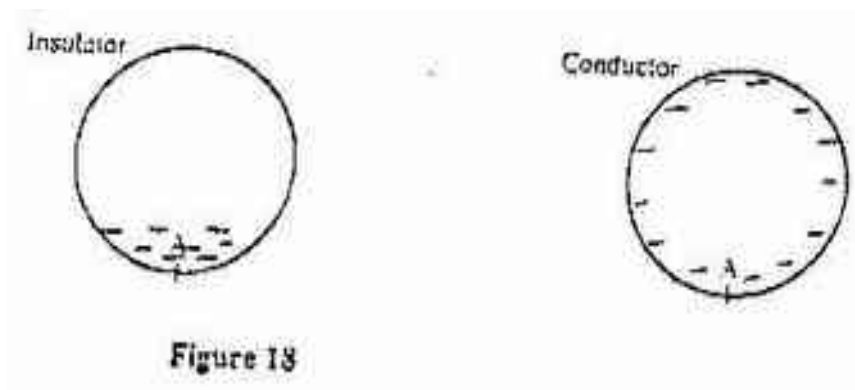
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15. 2005 Q38 P1

Fig 18 shows two spherical materials one an insulation conductor, the other a conductor, Negative charge are introduced at point A in each case.



On the same figure indicate the final position of the charges. Explain your answer. (2 marks)

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16. 2006 Q17 P2

Figure 7 shows a circuit where a battery of emf 4.5V, switches A and B, two capacitors $C_1 = 0.3\mu\text{F}$ and $C_2 = 0.5\mu\text{F}$ and a voltmeter are connected

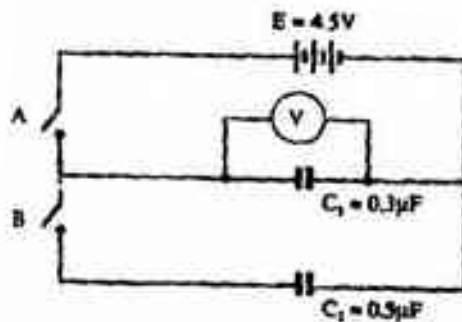


Figure 7

(a) Determine the charge on C_1 when switch A is closed and switch B is open (3 marks)

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(b) What is the effective capacitance C_t when both switches A and B are closed?

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(c) State what is observed on the voltmeter when
(i) switch A is closed and switch B is open (1 mark)

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(ii) Switch A is closed and opened, and then B is closed (1 mark)

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(iii) Explain the observation made in c (ii) above (2 marks)

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17. 2009 Q14 P2

(a) **Figure 7** shows a pair of parallel plates of a capacitor connected to a battery. The upper plate is displaced slightly to the left.

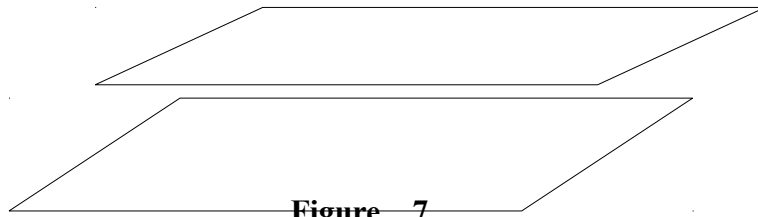
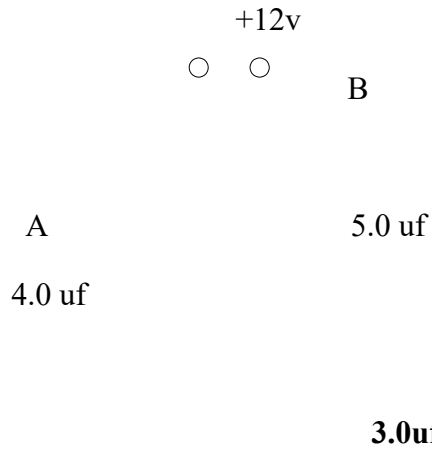


Figure 7

State with reason the effect of this movement on the capacitance (2 marks)

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(b) **Figure 8** shows an electrical circuit with three capacitors A, B, and D of Capacitance 4.0uf, 5.0uf and 3.0uf respectively connected to a 12V battery.



Determine:

- (i) The combined capacitance of the three capacitors; (3 marks)

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- (ii) The charge of the capacitor A; (2 marks)

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- (iii) The potential difference across the capacitor B. (2 marks)

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18. 2010 Q15 P2

(a) **Figure 8**, shows a circuit that may be used to charge a capacitor.

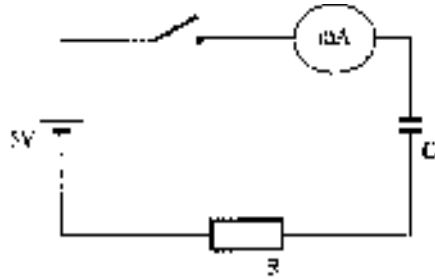


Figure 8

(i) State the observation on the millimeter when the circuit is switched on:

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(ii) Explain the observation in (i) above.

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(b) The circuit in **figure 8** is left on for some time. State the value of p.d. across:

(i) the resistor R;

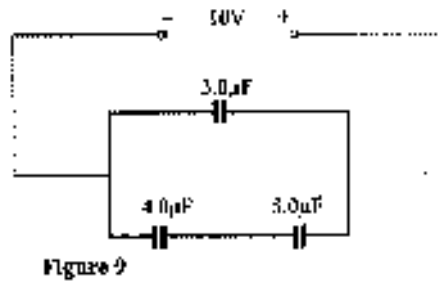
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(ii) the capacitor C;

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(c) Sketch the graph of potential difference (V) across R against time.

(d) **Figure 9** shows three capacitors connected to a 10V battery.



Calculate:

- (i) the combined capacitance of the three capacitors;

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- (ii) the charge on the 5.0 μF capacitor.

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19. 2011 Q2 P2

Figure 3 shows a voltmeter connected across two charged parallel plates.



Parallel plates

Figure 3

When a thin sheet of mica is inserted between the plates, the voltmeter reading is observed to reduce. Explain this observation. (3 marks)

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20. 2012 Q8 P2

Light from a lamp falls on the cap of a negatively charged electroscope. It is observed that the divergence of the leaf decreases. Explain the observation

(2 marks)

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