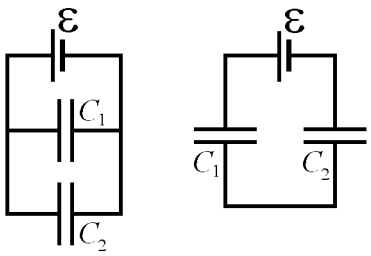
Base your answers to questions **1** through **3** on the diagram below which shows two different capacitors, C_1 and C_2, in two different connections to the same source of emf ε that has no internal resistance.

For each question pick your answer from the following list.

I. It is greater for the parallel connection.
II. It is greater for the series connection.
III. It is the same for both connections.
IV. It is different for each connection, but one must know the values of C_1 and C_2, to know which is greater.
V. It is different for each connection, but one must know the value of ε to know which is greater.



1. How does the equivalent capacitance for these two cases compare?

   A) I

   B) II

   C) III

   D) IV

   E) V

2. How does the total charge stored on the capacitors for these two cases compare?

   A) I

   B) II

   C) III

   D) IV

   E) V

3. How does the voltage drop over C_1 for these two cases compare?

   A) I

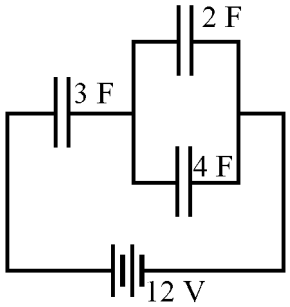
   B) II

   C) III

   D) IV

   E) V

Base your answers to questions **4** through **6** on the circuit diagram below which shows three capacitors connected to a 12 volt battery.



4. What is the equivalent capacitance of this arrangement.

   A) 2 F

   B) 3 F

   C) $\frac{10}{3}$ F

   D) $\frac{13}{3}$ F

   E) 9 F

5. What is the total energy stored in the circuit?

   A) 24 J

   B) 52 J

   C) 144 J

   D) 288 J

   E) 312 J

6. What is the charged stored on the 4 F capacitor?

   A) 8 C

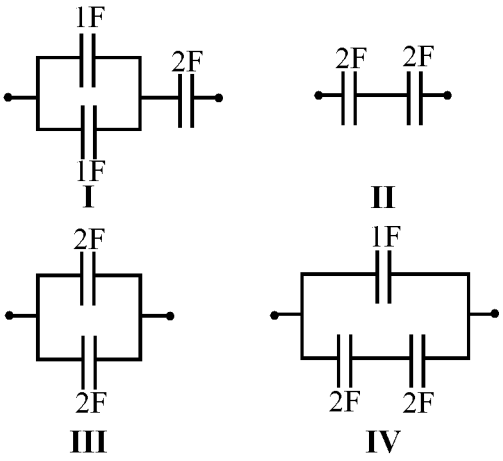
   B) 16 C

   C) 24 C

   D) 32 C

   E) 48 C

Base your answers to questions **7** and **8** on the four arrangements of capacitors shown below.



7. Which two arrangements of capacitors shown above have the same capacitance between the terminals?

   A) I and II

   B) I and III

   C) I and IV

   D) II and III

   E) III and IV

8. What is the equivalent capacitance of circuit IV?

   A) 1 F

   B) 2 F

   C) 2.5 F

   D) 3 F

   E) 4 F

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9. A portion of a circuit is built using three identical capacitors of capacitance *C*. What is a possible equivalent capacitance for this portion of the circuit?

   A) $\frac{C}{2}$

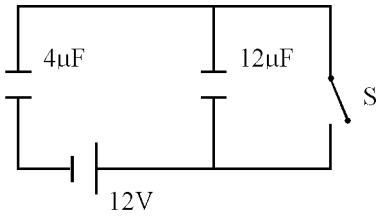
   B) C

   C) $\frac{3}{2}C$

   D) $2C$

   E) $\frac{5}{2}C$

Base your answers to questions **10** and **11** on the following circuit diagram in which the battery has zero internal resistance.



10. When the switch *S* is closed, what is the charge on the 4 μF capacitor?

    A) 3 μC

    B) 4 μC

    C) 12 μC

    D) 36 μC

    E) 48 μC

11. When the switch *S* is open, what is the voltage across the 12 μF capacitor?

A) 1 V

B) 3 V

C) 4 V

D) 9 V

E) 12 V

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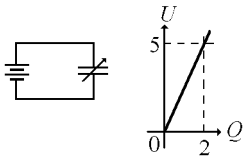
12. 

The circuit shown above left is made up of a variable capacitor and a battery of negligible internal resistance. A graph of the energy *U* (in Joules) stored in the capacitor as a function of the charge *Q* (in Coulombs) stored on it is given above. The emf of the battery is most nearly

A) 1.6 V

B) 2.2 V

C) 2.5 V

D) 5 V

E) 6.3 *V*

13. Which of the following is necessarily true for capacitors connected in series in a circuit?

A) They all must have the same capacitance.

B) They all must hold an equal amount of charge.

C) The total capacitance is the sum of the individual capacitances.

D) They all must store the same amount of energy.

E) The potential drop across each of them must be equal.

14. Compared to a two identical capacitors in parallel, two identical capacitors in series at the same voltage

A) carry the same charge per plate

B) hold more energy

C) carry more charge per plate

D) carry less charge per plate

E) hold the same amount of energy

Answer Key
Ohm's Law MC Questions [Mar 28, 2011]

1. A
2. A
3. A
4. A
5. C
6. B
7. A
8. B
9. C
10. E
11. B
12. D
13. B
14. D

Name _____ Class _____ Date _____

1. _____
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