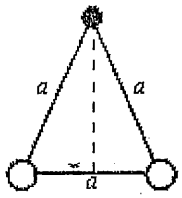
1. If 500 J of work are required to carry a 40-C charge from one point to another, the potential difference between these two points is:

(A) 12.5 V
B) 20,000 V
C) 0.08 V
D) depends on the path
E) none of these

2. If the electric field is in the positive x direction and has a magnitude given by $E = Cx^2$, where C is a constant, then the electric potential is given by $V =$:

A) $2Cx$
B) $-2Cx$
C) $Cx^3/3$
(D) $-Cx^3/3$
E) $-3Cx3$

3. Two particle with charges Q and $-Q$ are fixed at the vertices of an equilateral triangle with sides of length a. If $k = 1/4\pi\varepsilon_0$, the work required to move a particle with a charge q from the other vertex to the center of the line joining the fixed charges is:



(A) 0
B) kQq/a
C) kQq/a^2
D) $2kQq/a$
E) $\sqrt{2}kQq/a$

4. A particle with a charge of 5.5×10^{-8} C is 3.5 cm from a particle with a charge of -2.3×10^{-8} C. The potential energy of this two-particle system, relative to the potential energy at infinite separation, is:

A) 3.2×10^{-4} J
(B) -3.2×10^{-4} J
C) 9.3×10^{-3} J
D) -9.3×10^{-3} J
E) zero

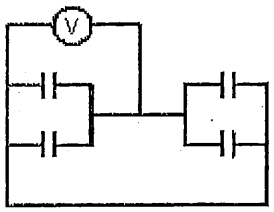
5. A conducting sphere has charge Q and its electric potential is V, relative to the potential far away. If the charge is doubled to $2Q$, the potential is:

A) V
B) $2V$
C) $4V$
D) $V/2$
E) $V/4$

6. Two identical capacitors, each with capacitance C, are connected in parallel and the combination is connected in series to a third identical capacitor. The equivalent capacitance of this arrangement is:

A) $2C/3$
B) C
C) $3C/2$
D) $2C$
E) $3C$

7. Each of the four capacitors shown is 500 μF. The voltmeter reads 1000V. The magnitude of the charge, in coulombs, on each capacitor plate is:



A) 0.2
B) 0.5
C) 20
D) 50
E) none of these

8. A charged capacitor stores 10.C at 40 V. Its stored energy is:

A) 400 J
B) 4 J
C) 0.2 J
D) 2.5 J
E) 200 J

9. A cylindrical copper rod has resistance R. It is reformed to twice its original length with no change of volume. Its new resistance is:

A) R
B) $2R$
C) $4R$
D) $8R$
E) $R/2$

10. A student kept her 60-watt, 120-volt study lamp turned on from 2:00 PM until 2:00 AM. How many coulombs of charge went through it?

A) 150
B) 3,600
C) 7,200
D) 18,000
E) 21,600

11. An ordinary light bulb is marked "60 watt, 120 volt". Its resistance is:

A) 60 Ω
B) 120 Ω
C) 180 Ω
D) 240 Ω
E) 15 Ω

12. A current of 0.3 A is passed through a lamp for 2 minutes using a 6 V power supply. The energy dissipated by this lamp during the 2 minutes is:

A) 1.8 J
B) 12 J
C) 20 J
D) 36 J
E) 216 J

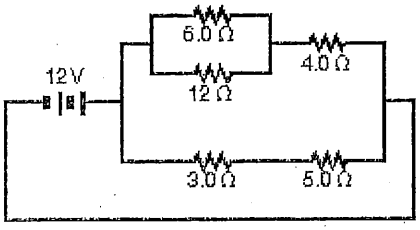
13. Four 20-Ω resistors are connected in series and the combination is connected to a 20-V emf device. The potential difference across any one of the resistors is:

A) 1 V
B) 4 V
C) 5 V
D) 20 V
E) 80 V

14. Resistances of 2.0 Ω, 4.0 Ω, and 6.0 Ω and a 24-V emf device are all in series. The potential difference across the 2.0-Ω resistor is:

A) 4 V
B) 8 V
C) 12 V
D) 24 V
E) 48 V

15. The current in the 5.0-Ω resistor in the circuit shown is:

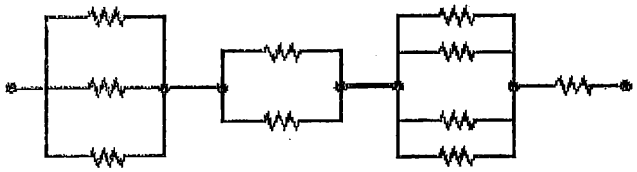


A) 0.42 A
B) 0.67 A
C) 1.5 A
D) 2.4 A
E) 3.0 A

16. Four wires meet at a junction. The first carries 4A into the junction, the second carries 5A out of the junction, and the third carries 2A out of the junction. The fourth carries:
A) 7A out of the junction
B) 7A into the junction
C) 3A out of the junction
D) 3A into the junction
E) 1A into the junction

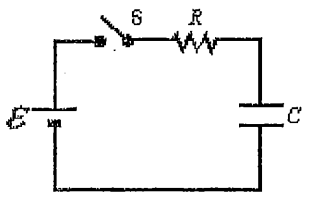
17. Four 20-Ω resistors are connected in parallel and the combination is connected to a 20-V emf device. The current in any one of the resistors is:
A) 0.25 A
B) 1.0 A
C) 4.0 A
D) 5.0 A
E) 100 A

18. Each of the resistors in the diagram is 12 Ω. The resistance of the entire circuit is:



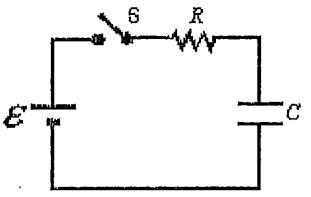
A) 5.76 Ω
B) 25 Ω
C) 48 Ω
D) 120 Ω
E) none of these

19. Four circuits have the form shown in the diagram. The capacitor is initially uncharged and the switch S is open.



The values of the emf ε, resistance and R, and capacitance C for each for the circuits are
circuit 1: $\varepsilon = 18$ V, $R = 3\ \Omega$, $C = 1\ \mu$F
circuit 2: $\varepsilon = 18$ V, $R = 6\ \Omega$, $C = 9\ \mu$F
circuit 3: $\varepsilon = 12$ V, $R = 1\ \Omega$, $C = 7\ \mu$F
circuit 4: $\varepsilon = 10$ V, $R = 5\ \Omega$, $C = 7\ \mu$F
Rank the circuits according to the current just after switch S is closed least to greatest.
A) 1, 2, 3, 4
B) 4, 3, 2, 1
C) 4, 2, 3, 1
D) 4, 2, 1, 3
E) 3, 1, 2, 4

20. Four circuits have the form shown in the diagram. The capacitor is initially uncharged and the switch S is open.



The values of the emf ε, resistance R, and the capacitance C for each of the circuits are
circuit 1: $\varepsilon = 18$ V, $R = 3\ \Omega$, $C = 1\ \mu$F
circuit 2: $\varepsilon = 18$ V, $R = 6\ \Omega$, $C = 9\ \mu$F
circuit 3: $\varepsilon = 12$ V, $R = 1\ \Omega$, $C = 7\ \mu$F
circuit 4: $\varepsilon = 10$ V, $R = 5\ \Omega$, $C = 7\ \mu$F
Rank the circuits according to the time after switch S is closed for the capacitors to reach half their final charges, least to greatest.
A) 1, 2, 3, 4
B) 4, 3, 2, 1
C) 1, 3, 4, 2
D) 4, 2, 1, 3
E) 3, 1, 2, 4