AP PHYSICS

Name: _____

Period: _____ Date: _____

Points: 58 Score: _____ IB Curve: _____

DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

AP EXAM		CHAPTER TEST	
50 Multiple Choice • 45 Single Response • 5 Multi-Response	90 min, 1 point each	25 Multiple Choice • 22 Single Response • 3 Multi-Response	45 min
Free Response • 3 Short Free Response • 2 Long Free Response	90 min • 13 min ea, 7 pts ea • 25 min ea, 12 pts ea	Free Response • 2 Short Free Response • 1 Long Free Response	45 min • 12 min ea, 7 pts ea • 20 min ea, 12 pts ea

CHAPTER 16,18,19 TEST REVIEW -- MARKSCHEME

MULTIPLE CHOICE

1. (__/1) Materials in which the electrons are bound very tightly to the nuclei are referred to as
   a. insulators
   b. conductors
   c. semiconductors
   d. superconductors

2. (__/1) Sphere A carries a net positive charge, and sphere B is neutral. They are placed near each other on an insulated table. Sphere B is briefly touched with a wire that is grounded. Which statement is correct?
   a. Sphere B remains neutral
   b. Sphere B is now positively charged
   c. Sphere B is now negatively charged
   d. The charge on sphere B cannot be determined without additional information

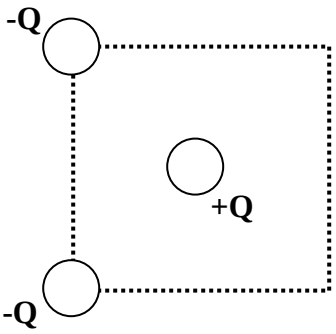
3. (__/1) A positively charged object touches a neutral electroscope, the leaves separate. Then a negative object is brought near the electroscope, but does not touch it. What happens to the leaves?
   a. They separate further
   b. They move closer together
   c. They are unaffected
   d. Cannot be determined without further information

4. (__/1) Two charged objects attract each other with force F. What happens to the force between them if one charge is doubled, the other charge is tripled, and the separation distance between their centers is reduced to one-fourth its original value? The force is now equal to
   a. 16F
   b. 24F
   c. (3/8)F
   d. 96F

5. (__/1) A piece of plastic has a net charge of +2.00μC. How many more protons than electrons doe this piece of plastic have?
   a. 1.25×10^{13}
   b. 1.25×10^{19}
   c. 2.50×10^{13}
   d. 2.50×10^{19}

6. (__/1) The force between a 30-μC charge and a -90-μC charge is 1.8 N. How far apart are they?
   a. 1.9 m
   b. 2.3 m
   c. 3.7 m
   d. 4.2 m

7. (__/1) Three identical point charges of 2.0 μC are placed on the x-axis. The first charge is at the origin, the second to the right at x = 50 cm, and the third is at the 100 cm mark. What are the magnitude and direction of the electrostatic force which acts on the charge at the origin?
   a. 0.18 N left
   b. 0.18 N right
   c. 0.36 N left
   d. 0.36 N right
   e. zero

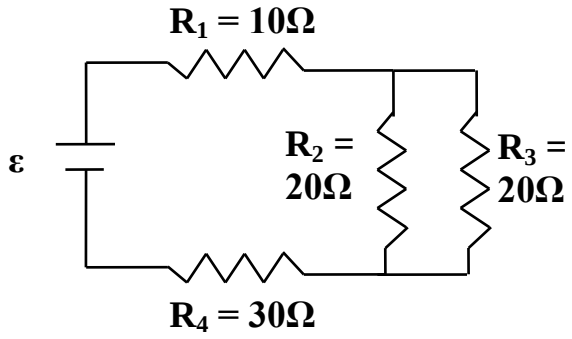


8. (__/1) A point charge of +Q is placed at the center of a square, and a second point charge of –Q is placed at the upper-left corner. It is observed that an electrostatic force of 2.0 N acts on the positive charge at the center. What is the magnitude of the force that acts on the center charge if a third charge of –Q is placed at the lower-left corner?
   a. zero
   b. 1.4 N
   c. 2.8 N
   d. 4.0 N
   e. 5.3 N
9. (__/1) The resistance of a wire is
   a. proportional to its length and its cross-sectional area
   b. proportional to its length and inversely proportional to its cross-sectional area
   c. inversely proportional to its length and proportional to its cross-sectional area
   d. inversely proportional to its length and its cross-sectional area
10. (__/1) The resistivity of most common metals
   a. remains constant over wide temperature ranges
   b. increases as the temperature increases
   c. decreases as the temperature increases
   d. varies randomly as the temperature increases
11. (__/1) A kilowatt-hour is equivalent to
   a. 1000 W
   b. 3600 s
   c. 3,600,000 J/s
   d. 3,600,000 J
12. (__/1) If the current flowing through a circuit of constant resistance is doubled, the power dissipated by that circuit will
   a. quadruple
   b. double
   c. decrease to one half
   d. decrease to one fourth
13. (__/1) A coffee maker, which draws 13.5 A of current, has been left on for 10 min. What is the net number of electrons that have passed through the coffee maker?
   a. 1.5×10^{22}
   b. 5.1×10^{22}
   c. 8.4×10^{20}
   d. 1.8×10^{3}
   e. 8.1×10^{3}
14. (__/1) A light bulb operating at 110 V draws 1.40 A of current. What is its resistance?
   a. 12.7 Ω
   b. 78.6 Ω
   c. 109 Ω
   d. 154 Ω
15. (__/1) A 120-m long copper wire (resistivity 1.68×10^{-8} Ω•m) has resistance 6.0 Ω. What is the diameter of the wire?
   a. 0.065 mm
   b. 0.65 mm
   c. 0.65cm
   d. 0.65m

16. (__/1) A 1.0-m length of nichrome wire has a radius of 0.50 mm and a resistivity of 100 x 10^{-8} Ω•m. If the wire carries a current of 0.50 A, what is the voltage across the wire?
    a. 0.0030 V
    b. 0.32 V
    c. 0.64 V
    d. 1.6 V
17. (__/1) When resistor are connected in series,
    a. the same power is dissipated in each one
    b. the potential difference across each one is the same
    c. the current flowing in each is the same
    d. more than one of the answers is true
18. (__/1) As more resistors are added in series to a constant voltage source, the power supplied by the source
    a. increases
    b. decreases
    c. does not change
    d. increases initially and then starts to decrease
19. (__/1) When resistors are connected in parallel, we can be certain that
    a. the same current flows in each one
    b. the potential difference across each is the same
    c. the power dissipated in each is the same
    d. their equivalent resistance is greater than the resistance of any one of the individual resistances
20. (__/1) As more resistors are added in parallel to a constant voltage source, the power supplied by the source
    a. increases
    b. decreases
    c. does not change
    d. increases initially and then starts to decrease
21. (__/1) Four resistors of 12, 3.0, 5.0, and 4.0 Ω are connected in series. A 12-V battery is connected to the combination. What is the current through the battery?
    a. 0.10 A
    b. 0.20 A
    c. 0.30 A
    d. 0.40 A
22. (__/1) A 22-A current flows into a parallel combination of 4.0 Ω, 6.0 Ω, and 12 Ω resistors. What current flows through the 12- Ω resistor?
    a. 3.7 A
    b. 11 A
    c. 7.3 A
    d. 18 A
23. (__/1) The following three appliances are connected to a 120-V circuit: 1200-W toaster, 650-W coffee pot, and 600-W microwave. If all were operated at the same time, what total current would they draw?
    a. 4.0 A
    b. 5.0 A
    c. 10 A
    d. 20 A
24. (__/1) A combination of a 2.0 Ω resistor in series with a 4.0 Ω resistor is connected in parallel with a 3.0 Ω resistor. What is the equivalent resistance?
    a. 2.0 Ω
    b. 3.0 Ω
    c. 4.0 Ω
    d. 9.0 Ω

FREE RESPONSE

25. Use this figure to answer the following questions.



a. (__/3) What is the total resistance in the circuit above?

$\frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R_p} = \frac{1}{20} + \frac{1}{20} = \frac{2}{20} = \frac{1}{10}$

$R_p = 10$

$R_{Total} = 10 + R_p + 30$

$R_{Total} = 10 + 10 + 30 = 50$

b. (__/3) If ε = 40 V, what is the voltage across R_1 in the circuit above?

$\varepsilon = IR_{Total}$

$\frac{\varepsilon}{R_{Total}} = I = \frac{40}{50} = 0.8A$

$V_1 = IR_1 = (0.8)(10) = 8.0A$

c. (__/3) If ε = 20 V, what is the current through R_3 in the circuit above?

$\varepsilon = IR_{Total}$

$\frac{\varepsilon}{R_{Total}} = I = \frac{20}{50} = 0.4A$

$V_p = IR_3$

$\frac{V_p}{R_3} = I = \frac{4}{20} = 0.2A$

Or

$V_P = 20 - IR_1 - IR_4$

$V_P = 20 - (0.4)(10) - (0.4)(30)$

$V_P = 4$

$V_p = IR_p$

$V_p = (0.4)(10)$

$V_p = 4$

d. (__/3) If 1.5 A flows through R_2, what is ε in the circuit above?

$V_p = I_2R_2 = (1.5)(20) = 30V$

$V_p = IR_p$

$\frac{V_p}{R_p} = I = \frac{30}{10} = 3.0A$

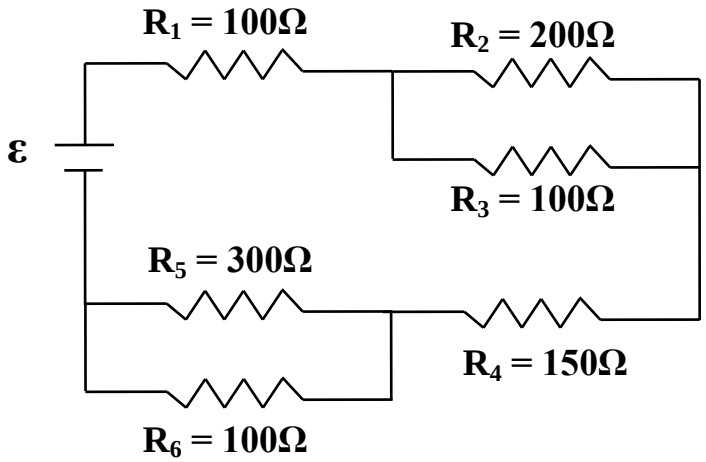
Or

$V = IR_{Total} = (3.0)(50) = 150V$

$V = IR_1 + IR_p + IR_4$

$V = (3.0)(10) + (3.0)(10) + (3.0)(30) = 150V$

26. Use this figure to answer the following questions.



a. (__/5) What is the total resistance of the above circuit?

$R_{Total} = 100 + R_{p23} + 150 + R_{p56}$

$\frac{1}{R_{p56}} = \frac{1}{R_5} + \frac{1}{R_6}$

$\frac{1}{R_{p23}} = \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R_{p56}} = \frac{1}{300} + \frac{1}{100} = \frac{4}{300}$

$\frac{1}{R_{p23}} = \frac{1}{200} + \frac{1}{100} = \frac{3}{200}$

$R_{p56} = \frac{300}{4} = 75\Omega$

$R_{p23} = \frac{200}{3} = 66.7\Omega$

$R_{Total} = 100 + 66.7 + 150 + 75 = 392\Omega$

b. (__/3) If ε = 100 V, what is the voltage across R_5 in the circuit above?

$V_5 = V_{p56} = \varepsilon - V_1 - V_{p23} - V_4$

$\varepsilon = IR_{Total}$

$V_5 = \varepsilon - IR_1 - IR_{p23} - IR_4$

$\frac{\varepsilon}{R_{Total}} = I = \frac{100}{392} = 0.255A$

$V_5 = 100 - (0.255)(100) - (0.255)(66.7) - (0.255)(150) = 19.2V$

c. (__/3) If ε = 4.0 V, what is the current through R_6 in the circuit above?

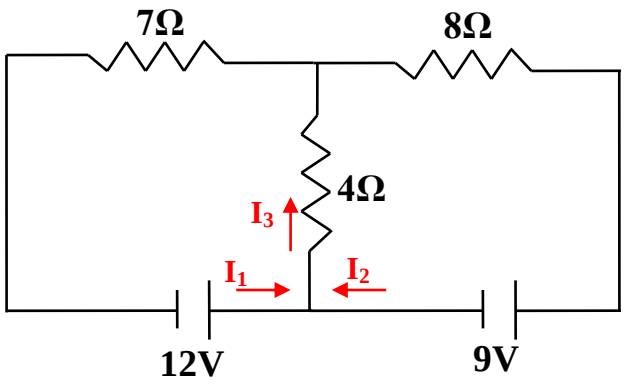
$R_{Total} = 392\Omega$

$\frac{\varepsilon}{R_{Total}} = I = \frac{4.0}{392} = 0.0102A$

$V_6 = V_{p56} = \varepsilon - IR_1 - IR_{p23} - IR_4$

$V_6 = 4.0 - (0.0102)(100) - (0.0102)(66.7) - (0.0102)(150) = 0.770V$

27. Use this figure to answer the following questions.



a. (__/X) State Kirchoff's junction rule

At any junction point, the sum of all the currents entering the junction must equal the sum of all the currents leaving the junction

b. (__/X) State Kirchoff's loop rule

The sum of the changes in potential around any closed pathe of a circuit must be zero

c. (__/X) Determine the current in the 4-Ω resistor in the above figure.

$I_1 + I_2 = I_3$ $12V = (4\Omega)(I_3) + (7\Omega)(I_1)$ $9V = (4\Omega)(I_3) + (8\Omega)(I_2)$

$12V - (4\Omega)(I_3) = (7\Omega)(I_1)$ $9V - (4\Omega)(I_3) = (8\Omega)(I_2)$

$1.71 - (0.571)(I_3) = (I_1)$ $1.125 - (.5)(I_3) = (I_2)$

$[1.71 - (0.571)(I_3)] + [1.125 - (.5)(I_3)] = I_3$

$2.835 - (1.071)(I_3) = (I_3)$

$2.835 = (2.071)(I_3)$

$1.37A = (I_3)$

d. (__/X) Determine the current in the 8-Ω resistor in the above figure.

$1.125 - (.5)(I_3) = (I_2)$

$1.125 - (.5)(1.37) = (I_2)$

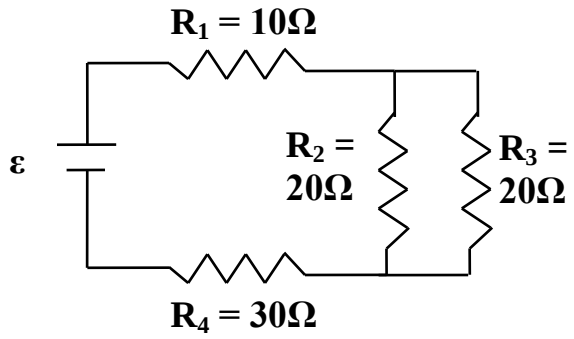
$0.440A = (I_2)$

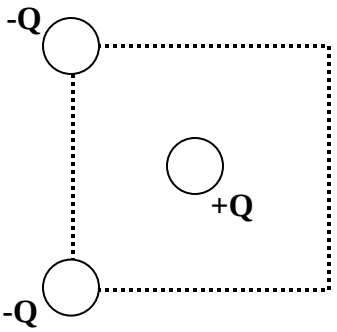
e. (__/X) Determine the current in the 7-Ω resistor in the above figure.

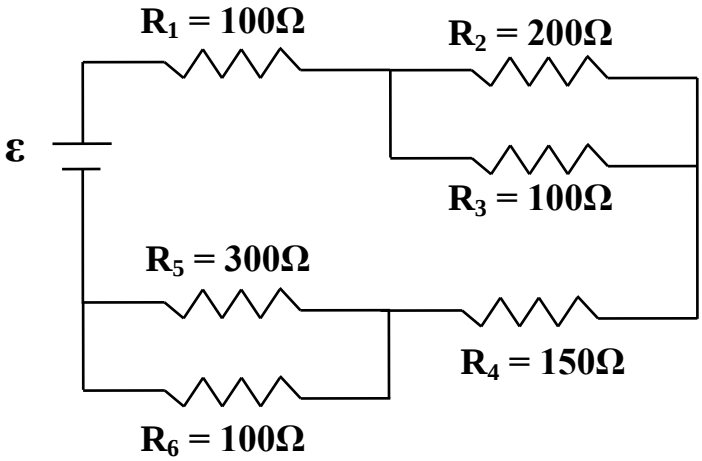
$1.71 - (0.571)(I_3) = (I_1)$

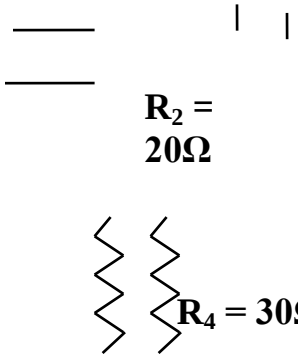
$1.71 - (0.571)(1.37) = (I_1)$

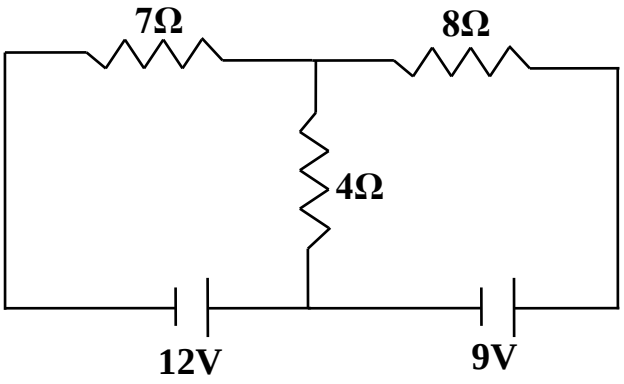
$0.928A = (I_1)$

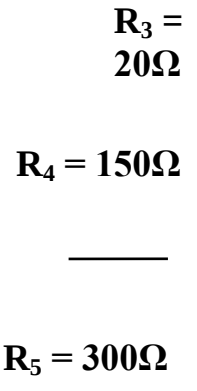

R1 = 10Ω
ε
R2 = 20Ω
R3 = 20Ω
R4 = 30Ω


-Q
+Q
-Q


R1 = 100Ω
R2 = 200Ω
ε
R3 = 100Ω
R5 = 300Ω
R4 = 150Ω
R6 = 100Ω


R2 = 20Ω
R4 = 30Ω


7Ω
8Ω
4Ω
12V
9V


R3 = 20Ω
R4 = 150Ω
R5 = 300Ω