

## Electricity Review Sheet

**MULTIPLE CHOICE:** Circle the best answer.

- 1 Consider the following statements given below and determine if the charge of Object A is:

A. positive    B. negative    C. neutral

I. Object A is charged by friction using animal fur. Animal fur has a weaker electron affinity than object A.

II. Object A is charged by contact using a negatively charged object.

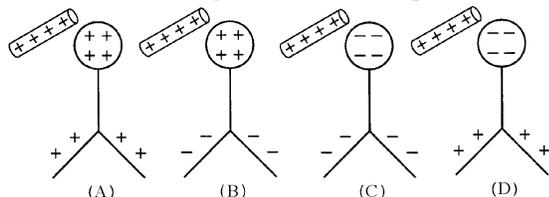
III. Object A is charged by induction using a positively charged object.

IV. Object A is attracted to a negatively charged object.

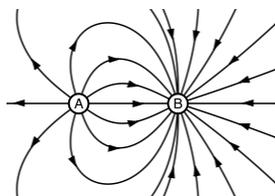
- 2 A glass rod is given a positive charge by rubbing it with silk. The rod has become positive by

(A) losing electrons                      (C) losing protons  
(B) gaining electrons                      (D) gaining protons

- 3 A positively charged rod is held near the knob of a neutral electroscope. Which diagram best represents the distribution of charge on the electroscopes?



- 4 The diagram shown represents the electric field surrounding two charged spheres, A and B. What is the sign, and the ratio of charges, of the spheres?



(A) A is positive; B is negative; A equal charge of B.  
(B) A is positive; B is negative; B twice charge of A.  
(C) A is negative; B is positive; A equal charge of B.  
(D) A is negative; B is positive; B twice charge of A.

- 5 What is the magnitude of the electrostatic force between two electrons at a distance of  $1.00 \times 10^{-8}$  m?

(A)  $2.56 \times 10^{-22}$  N                      (C)  $2.30 \times 10^{-12}$  N  
(B)  $2.30 \times 10^{-20}$  N                      (D)  $1.44 \times 10^{-1}$  N

- 6 A negatively charged comb has  $-8.0 \mu\text{C}$  of charge on it. How many excess electrons are on it?

(A)  $5 \times 10^{13}$                                   (C)  $2 \times 10^{-14}$   
(B)  $5 \times 10^{19}$                                   (D)  $5 \times 10^{-25}$

- 7 The electrical resistance of a metallic conductor is inversely proportional to its

(A) temperature                              (C) length  
(B) cross-sectional area                      (D) resistivity

- 8 What is the current in a 100-ohm resistor connected to a 0.40-volt source of potential difference?

(A) 250 mA                                      (C) 2.5 mA  
(B) 40 mA                                        (D) 4.0 mA

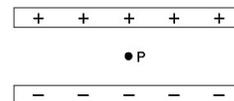
- 9 The potential difference between two points in an electric field is 10 volts. The energy to move a positive charge of  $2 \times 10^{-4}$  C from a point at the lower potential to a point at the higher potential is:

(A)  $5 \times 10^4$  J                                  (C)  $2 \times 10^{-3}$  J  
(B)  $2 \times 10^{-2}$  J                                  (D)  $2 \times 10^{-5}$  J

- 10 At a distance 10 cm from a point charge, the electric field is 3600 N/C and points toward the charge. The amount of this point charge is

(A) 40 microcoulombs                      (C) 4 nanocoulombs  
(B) 4 microcoulombs                      (D) 4 megacoulombs

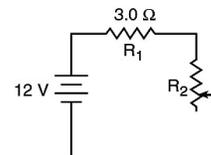
- 11 The diagram to the right shows a point, P, located between two oppositely charged parallel plates.



The electric field between the plates

(A) points up, and is varying (non-uniform)  
(B) points down, and is varying (non-uniform)  
(C) points up, and is constant (uniform)  
(D) points down, and is constant (uniform)

- 12 The diagram to the right represents an electric circuit consisting of a 12-volt battery, a 3.0-ohm resistor,  $R_1$ , and a variable resistor,  $R_2$ .



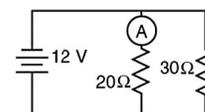
At what value must the variable resistor be set to produce a current of 2.0 ampere through  $R_1$ ?

(A) 6.0  $\Omega$                                       (C) 3.0  $\Omega$   
(B) 9.0  $\Omega$                                       (D) 12  $\Omega$

- 13 An electric iron operating at 120 volts draws 10 amperes of current. How much heat energy is delivered by the iron in 30 seconds?

(A)  $3.0 \times 10^2$  J                                  (C)  $3.6 \times 10^3$  J  
(B)  $1.2 \times 10^3$  J                                  (D)  $3.6 \times 10^4$  J

- 14 A 20-ohm resistor and a 30-ohm resistor are connected in parallel to a 12-volt battery as shown. As shown to the right, an ammeter is connected.



What is the equivalent resistance of the circuit?

(A) 10  $\Omega$                                         (C) 25  $\Omega$   
(B) 12  $\Omega$                                         (D) 50  $\Omega$

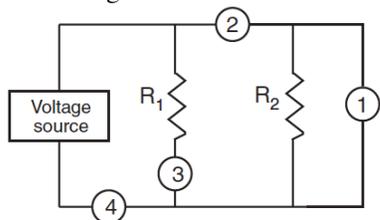
- 15 In the previous question, what is the current reading of the ammeter?

(A) 1.0 A                                        (C) 0.40 A  
(B) 0.60 A                                        (D) 0.20 A

- 16 In the previous question, what is the power of the 30-ohm resistor?

(A) 4.8 W                                        (C) 30 W  
(B) 12 W                                        (D) 75 W

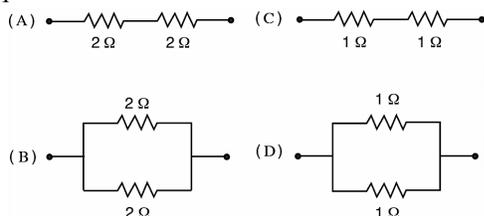
- 17 Two resistors are connected to a source of voltage as shown in the diagram below.



At which position should an ammeter be placed to measure the current passing only through resistor  $R_1$  and a voltmeter be placed to measure the potential difference across  $R_2$ , respectively?

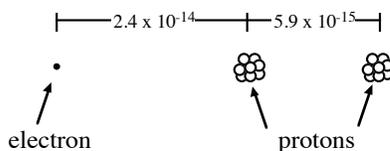
- (A) 2 and 1 (C) 3 and 1  
(B) 3 and 2 (D) 4 and 1

- 18 Which combination of resistors has the smallest equivalent resistance?



*Problem Solving: Do the following problems on separate paper. Show the general equation, substitutions, calculations, final results with units.*

- 19 The drawing below shows the atomic nucleus of two atoms each with 8 protons, and a nearby electron.

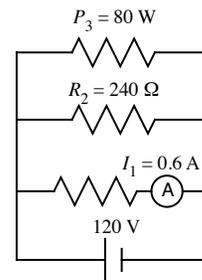


- a Find the force between the two groups of protons.  
b Find the net force on the electron.  
c Find the electric field at the electron's location.

- 20 Two resistors are wired in series with a 12-volt battery. The first resistor has 10 volts across it, and the second resistor has 0.5 amps through it. Solve the following with equations, then check with tables:

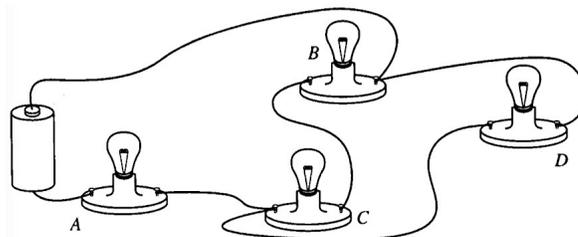
- a Draw and label the circuit schematic diagram.  
b Calculate the potential difference across  $R_2$ .  
c Calculate the resistance  $R_1$ .  
d Calculate the combined resistance of  $R_1$  and  $R_2$ .  
e Calculate the amount of power  $R_1$  consumes.

- 21 The schematic diagram to the right shows an ammeter A, and three resistors. Solve the following with equations, then check with tables:



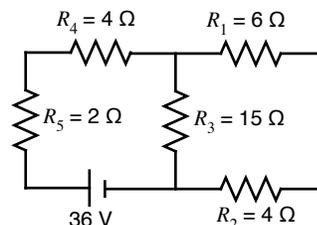
- a Calculate resistance  $R_1$ .  
b Calculate current in  $R_2$ .  
c Calculate current in  $R_3$ .  
d Calculate power in  $R_1$ .

- 22 HONORS: The wiring diagram shown below shows four light bulbs and a battery arranged in a circuit. The battery is 6 volts, and each light bulb is  $12 \Omega$ .



- a Draw the schematic diagram for the circuit.  
b Calculate the circuit's equivalent resistance. Use tables to find:  
c Calculate the potential difference of each resistor.  
d Calculate the current through each resistor.  
e Calculate the power consumed by each resistor.

- 23 HONORS: The schematic diagram shown below shows five resistors and a battery are arranged in a combination circuit. Solve with tables.



- a Calculate the equivalent resistance, total current, and total power for this circuit.  
b Calculate the current, voltage, and power of all five resistors.

- 24 HONORS: A  $+3.0 \text{ nC}$  charge is located 1.0 m to the left of a  $-1.0 \text{ nC}$  charge.

- a Draw the field lines around these two charges.  
b Calculate the electric field at the midpoint between the two charges.  
c HONORS: Where should a third charge of  $+2 \text{ nC}$  be placed so that it is in static equilibrium?

## Answers

1 I-B, II-B, III-B, IV-A or C 2 A 3 D 4 B 5 C 6 A 7 B 8 D 9 C 10 C 11 D 12 C 13 D 14 B 15 B 16 A 17 C 18 D  
19a 424 N b 5.26 N, right c  $3.29 \times 10^{19} \text{ N/C}$ , left 20b 2 v c  $20 \Omega$  d  $24 \Omega$  e 5 W 21a  $200 \Omega$  b 0.5 A c 0.67 A d 72 W  
22b  $20 \Omega$  c  $\Delta V_{A-D}$ : 3.6, 1.2, 1.2, 2.4 V d  $I_{A-D}$ : 0.3, 0.1, 0.1, 0.2 A e  $P_{A-D}$ : 1.08, 0.12, 0.12, 0.48 W 23a  $12 \Omega$ , 3 A, 108 W  
23b  $I_{1-5}$ : 1.8, 1.8, 1.2, 3, 3 A;  $\Delta V_{1-5}$ : 10.8, 7.2, 18, 12, 6 V;  $P_{1-5}$ : 19.44, 12.96, 21.6, 36, 18 W 24a 144 N/C, right b 1.37 m