2009-10 PreAP Circuits 3
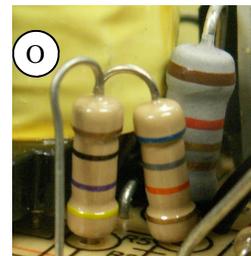
Use the notes: "Power and Voltage Drops".

24V · 1Ω · 1Ω · 10A fuse

1. A. What is the current flowing in the circuit?

    B. What will happen to the fuse?
    C. Can you reset a fuse?
    D. What could you use that could be reset?
    E. Give one way that you could fix the circuit so that the fuse will not blow.
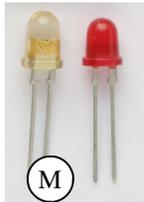
2. Identify the pictures.

A. _____Resistor.   D. _____ Capacitor
B. _____Diode   E. _____ Variable resistor
C. _____Fuse   F. _____ Light emitting diode.

G. _____ Can protect a circuit from too much current.
H. _____ Only lets the current flow one way.
I. _____ Stores charge temporarily.
J. _____ Used by an oven to change temperature.
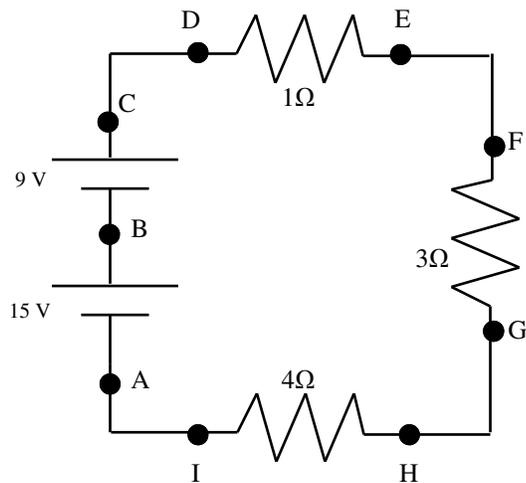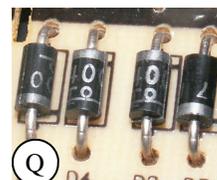
Use your "Series Circuit Lab" to answer the following.

3. A. What is the total voltage of the circuit?
    B. How much current flows thru the 3Ω?

    C. How much voltage is used by each resistor?

    D. What is the voltage at point F?
    D. Calculate the power used by each resistor.

    H. What is the total power used by the circuit?

D · E · C · 1Ω · F · 9 V · B · 3Ω · 15 V · A · G · I · 4Ω · H

4. In the diagram at the right you will need to decide which switches to close to allow different situations. Start at the + side of the battery (the big side). This is like maze games—follow the path, but be sure you don't make a short-circuit.
    Which resistor or resistors allows:
    A) only resistor 1 to have current in it?
    B) only resistor 2 to have current thru it?
    C) to by-pass both resistors?
    D) for electricity to go thru both resistors?
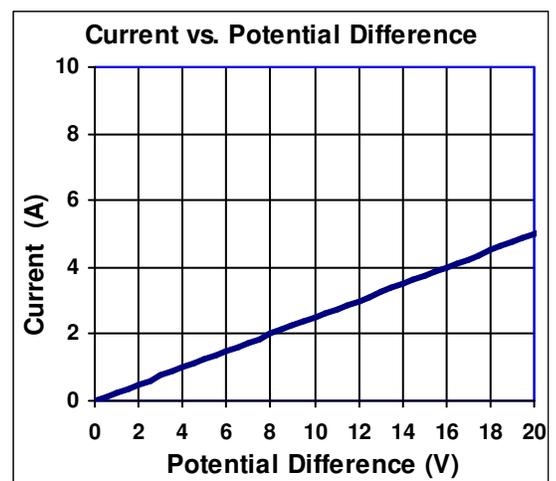
B · 1 · C · D · A · F · 2 · E

R₂ · R₁
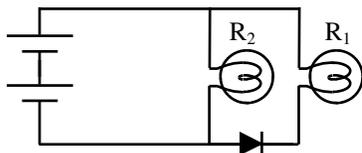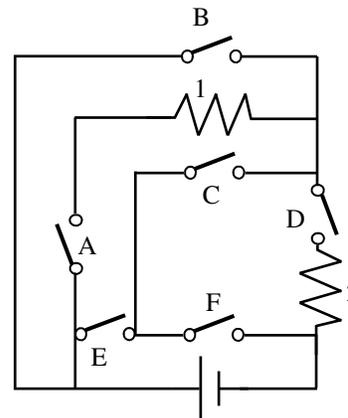
5. In the circuit at the left, R₁ isn't working. Without doing anything to the light bulbs, what is one change that would make R₁ turn on?

Now turn to p.694 in your book. Just so you know: a "cross-sectional area" means the area you get when you cut a solid object. When you cut a cylindrical wire, the cross-sectional area you get is a circle.

6. More or less current?
   A. _____ The amount of charges flowing increases.
   B. _____ The fewer electrons flow per second.
   C. _____ The same number of charges flow, but it takes more time.

Resistors are usually measured in kΩ. 5kΩ = 5,000Ω.

7. A very simple circuit has a 12V battery and a 3kΩ resistor.
   A. How much current is flowing thru the resistor?
   B. How much charge flows in 30seconds?

   C. How many electrons passed thru the resistor in that time?

8. (p.696)—What moves thru metal solids (like copper)?

9. Give two examples of positives moving.

10. What is conventional current?

11. A. Are wires like empty or full pipes of water?
    B. When one electron is pushed against a chain of electrons, what happens?
    C. So, why do you not have to wait for the electricity to get from the switch to a light bulb when you turn on a light bulb?

12. What is the path of electrons thru a metal conductor?

13. How long does it take an electron in a copper wire to move 1 m?

14. What does move thru wires very fast?

15. Where do batteries get their energy?

16. (p. 698) What is and is not used up when a battery is worn out?

17. (p.700) Define the difference between Ohmic and non-Ohmic materials.

18. A. What is the resistance of the device shown on the graph?

    B. How would the resistance change if the voltage was doubled?

19. Give the quantities that affect an object's resistance:

20. Would the resistance increase or decrease?

    A. _____ Making the wire shorter.
    B. _____ Making the wire colder.
    C. _____ Increasing the length of the wire.
    D. _____ Changing from gold to silver.

Current vs. Potential Difference

Graph: Current (A) on the y-axis ranging from 0 to 10; Potential Difference (V) on the x-axis ranging from 0 to 20. A straight line rises from the origin passing through approximately (8, 2) to (20, 5).

21. For each of the following pairs, circle the one with the greatest resistance.
    A) A 25 Ω resistor at 5°C or at 25°C?
    B) A 5 cm wire or a 5 meter wire?
    C) Thick wires or thin wires?
    D) Aluminum wires or Copper wires?
    E) Silver wires or wires made with a superconductor?

22. Given that V = IR and P = VI.
    A.   Write an equation for power that does not have voltage in it.

    B.   Write an equation for power that does not have current in it.

23. Using your three equations for power, how does the power used change if:
    A.   The voltage is doubled.
    B.   The current is doubled and the resistance is doubled.
    C.   The voltage is doubled and the resistance is halved.
    D.   The voltage is halved and the current is doubled.

24. A 45kΩ resistor has 0.65A flowing thru it. How much power does it dissipate?
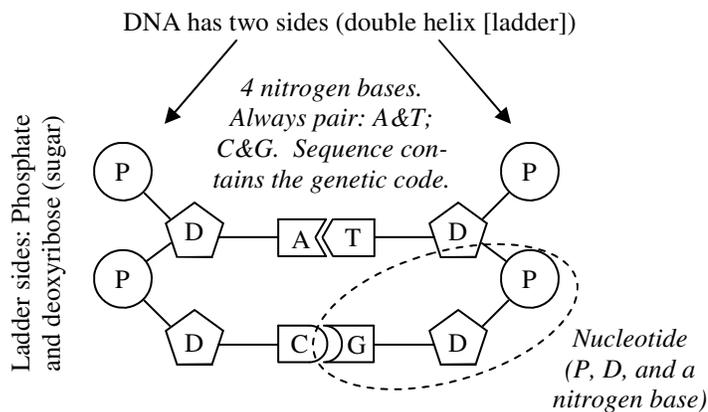

    A little more about units:
    You know that m/s means meters every second. It also means meters divided by seconds. The units tell you the formula. Likewise, momentum is kgm/s, meaning multiple kg times meters and divide by seconds OR m(d)/t = mv = p. Use the units to guide you… (also, see the example on p.710).
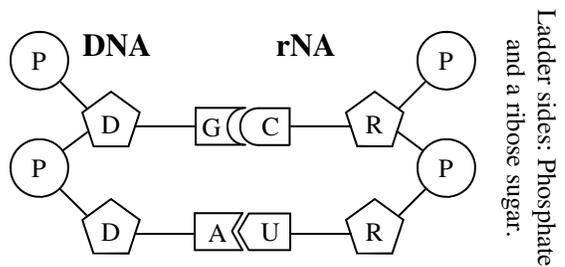
25. Convert 560W to kW.

26. A.   A resistor hooked up to 120V has 16A flowing thru it. How many kW does it use?

    B.   If the resistor is on for 30 minutes, how many hours is it on for?

    C.   How many kWhr does it use?

27. An electric company sells electricity for 12 cents per kWhr, how much does it cost for 118kWhr?

28. A 800 W oven cooks a turkey in 4.5 hours. If the electric company charges 13 cents per kWhr, how much does it cost for a 800 W oven to roast a turkey for 4.5 hours?

    TAKS next page

DNA –   Found in the nucleus of all cells. Contain the characteristics of a cell.

DNA has two sides (double helix [ladder])

RNA has only 1 side.
It has Uracil instead of Thymine.

*4 nitrogen bases.
Always pair: A&T;
C&G. Sequence con-
tains the genetic code.*

Ladder sides: Phosphate
and deoxyribose (sugar)

Ladder sides: Phosphate
and a ribose sugar.

DNA   rNA

*Nucleotide
(P, D, and a
nitrogen base)*

29. A. On the diagram at the right circle each individual nucleotide.
     B. How many nucleotides are there in the diagram?

30. DNA, RNA (could be both).

A. _____ Contains nitrogen bases.
B. _____ Found in the nucleus of a cell.
C. _____ Double helix structure.
D. _____ A goes with T

E. _____ Has a sugar on its side.
F. _____ Has uracil
G. _____ Has a phosphate backbone
H. _____ Has ribose as a sugar

31. Given the following genetic
     codes give the paired sequence.

DNA	RNA
A	
C	
G	
G	
T	

DNA	DNA
T	
G	
C	
G	
A	

Gametes—Egg or sperm; has only 1/2 the chromosomes of a full cell.
Zygote—fertilized egg. Has the full set of chromosomes.
Mitosis—Cell division for regeneration (exact copies to replace aging body cells).
Meiosis—Cell division for sexual reproduction: produces gametes (egg or sperm).

DNA Mutation—Occurs when the nitrogen base sequence is copied wrong.
Doesn't cause a permanent mutation unless it occurs in the gametes and is passed
on to the offspring.

32. Will it cause a mutation of the species?
     A. _____ A gene mutation occurs when a skin cell is replicated.
     B. _____ A mutation happens during meiosis.
     C. _____ If the sequence is copied perfectly.
     D. _____ If the sequence is off by one nitrogen base when making a sperm cell.
     E. _____ If the mutation occurs during mitosis.
     F. _____ If the mutation ends up in a gamete cell.

33. If the gamete cell has 28 chromosomes, how many chromosomes are in the zygote?