Name _____ Date _____

AP Physics Lab Activity #16 (40 pts)

Period _____ Mrs. Nadworny

Partners: Due Date _____

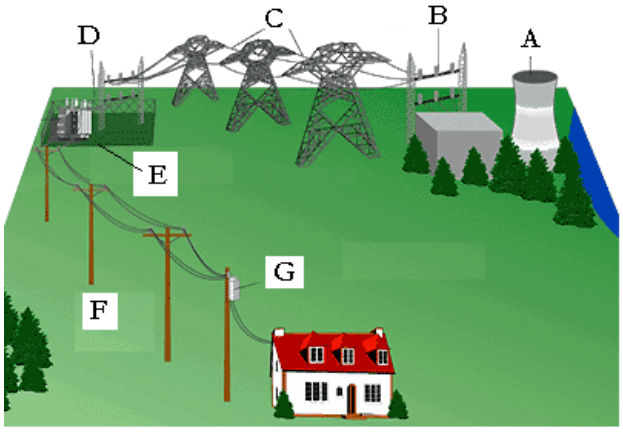
Power Transmission

NO Lab Write-Up Required

Purpose

- To get a basic overview of how electrical energy makes it from the power generating station to your home, read the article on "How Power Grids Work" at http://science.howstuffworks.com/power.htm and answer the following questions. [Hint: At the bottom of the page, clicking "Print" will open the article in a single page for easier viewing.]

1. Identify each of the main parts of the power grid pictured at right. (7 pts)



A:

B:

C:

D:

E:

F:

G:

2. What are at least THREE ways to cause a generator in a power plant to spin? (3 pts)

3. What do commercial electrical generators of any size generate? (1 pt)

4. Single phase AC service consists of power that varies like a sine wave which has: (2 pts)

   a) a peak voltage of: b) an effective (rms) voltage of:

5. What is the purpose of a transmission substation? (1 pt)

6. What are typical voltages for long distance transmission? (2 pts)

7. Why are long distance transmission voltages so high? (2 pts)

8. What is the purpose of step-down transformer in a power substation? (1 pt)

9. What is the purpose of a transformer drum seen on a power pole? (1 pt)

Next, you are going to investigate the operations of two of the main components of the power grid – the generator and the transformer.

Go to http://www.wvic.com/Content/How_Generators_Work.cfm to learn how an AC generator operates and answer the following questions.

10. What is the purpose of an AC generator? (1 pt)

11. An AC generator works on the principle of electromagnetic induction. Explain what this principle means. (2 pts)

12. Briefly describe how an AC generator works. (Watch the animation, there is no sound). (2 pts)

Now go to http://ecmweb.com/archive/basics-transformers to learn how a transformer works and answer the following questions.

13. What is the purpose of a transformer? (1 pt)

14. Sketch and label the three main parts of a simple transformer. (3 pt)

15. Describe how a transformer works, using the concept of magnetic flux. (2 pts)

16. What is the purpose of the iron core? (1 pt)

Go to http://micro.magnet.fsu.edu/electromag/java/transformer/index.html and play with the animation to answer the following questions. [Note: Use Internet Explorer or Firefox to open this webpage, since the animation uses Java. Click "Run" when prompted.]

17. As you increase the number of windings in the primary coil, what happens to the output voltage? (1 pt)

18. As you increase the number of windings in the secondary coil, what happens to the output voltage? (1 pt)

19. In a step-up transformer: (2 pts)

a) which coil has more windings?

b) which coil has a higher voltage?

20. In a step-down transformer: (2 pts)

a) which coil has more windings?

b) which coil has a higher voltage?

(2)
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