IB PHYSICS

Name: _____

Period: _____ Date: _____

DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

TSOKOS READING ACTIVITY

Section 11-3

1. Essential Idea: Capacitors can be used to store electrical energy for later use.
2. Nature Of Science:
   a. Relationships: Examples of exponential growth and decay pervade the whole of science. It is a clear example of the way that scientists use mathematics to model reality.
   b. This topic can be used to create links between physics topics but also to uses in chemistry, biology, medicine and economics.
3. International-Mindedness: Lightning is a phenomenon that has fascinated physicists from Pliny through Newton to Franklin. The charged clouds form one plate of a capacitor with other clouds or Earth forming the second plate. The frequency of lightning strikes varies globally, being particularly prevalent in equatorial regions. The impact of lightning strikes is significant, with many humans and animals being killed annually and huge financial costs to industry from damage to buildings, communication and power transmission systems, and delays or the need to reroute air transport.
4. Understandings:
   a. Capacitance
   b. Dielectric materials
   c. Capacitors in series and parallel
   d. Resistor-capacitor (RC) series circuits
   e. Time constant
5. Applications And Skills:
   a. Describing the effect of different dielectric materials on capacitance
   b. Solving problems involving parallel-plate capacitors
   c. Investigating combinations of capacitors in series or parallel circuits
   d. Determining the energy stored in a charged capacitor
   e. Describing the nature of the exponential discharge of a capacitor
   f. Solving problems involving the discharge of a capacitor through a fixed resistor
   g. Solving problems involving the time constant of an RC circuit for charge, voltage and current
6. Guidance:
   a. Only single parallel-plate capacitors providing a uniform electric field, in series with a load, need to be considered (edge effect will be neglected)

b. Problems involving the discharge of capacitors through fixed resistors need to be treated both graphically and algebraically

c. Problems involving the charging of a capacitor will only be treated graphically

d. Derivation of the charge, voltage and current equations as a function of time is not required

7. Data Booklet Reference:

a. $C = \frac{q}{V}$

b. $C_{parallel} = C_1 + C_2 + \cdots$

c. $\frac{1}{C_{series}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots$

d. $C = \varepsilon \frac{A}{d}$

e. $E = \frac{1}{2} CV^2$

f. $\tau = RC$

g. $q = q_0 e^{-\frac{t}{\tau}}$

h. $I = I_0 e^{-\frac{t}{\tau}}$

i. $V = V_0 e^{-\frac{t}{\tau}}$

8. Utilization: The charge and discharge of capacitors obeys rules that have parallels in other branches of physics including radioactivity.

9. Aims:

a. Aim 3: the treatment of exponential growth and decay by graphical and algebraic methods offers both the visual and rigorous approach so often characteristic of science and technology.

b. Aim 6: experiments could include (but are not limited to): investigating basic RC circuits; using a capacitor in a bridge circuit; examining other types of capacitors; verifying time constant.

10. Read section 11-3, pages 457-471, in your textbook.

11. Use the Cornell Notes system to take notes on the lesson material. You have the following options:

a. You can print multiple copies of one of the forms on the following pages of this document and handwrite your notes.

b. You can use the MS Word form supplied below and type your notes.

i. You can then print your work and submit a hardcopy, or

ii. You can e-mail your work to smithky@pcsb.org. If you choose this option, you must use a filename in the format, "LastnameFirstinitialPerXAsgnmtName". For example, "SmithKPer4ReadActT9-3.doc"

c. You can take notes on notebook paper using the Cornell Notes format and submit the hardcopy.

12. When using this form, remember the **Five R's of Notetaking**:

a. ***Record*** – the most important or emphasized information

b. ***Reduce*** – and synthesize information wherever possible, making it as concise as you can

c. ***Recite*** – read your notes out loud

d. ***Reflect*** – and consider how this information is connected to your personal experiences and what you already know

e. ***Review*** – look over your notes more than once

13. As a minimum, you must include notes on the following topics:
    a. Capacitance
    b. Effect of Dielectric on Capacitance
    c. Capacitors in Parallel
    d. Capacitors in Series
    e. Energy Stored in a Capacitor
    f. Charging a Capacitor
    g. Discharging a Capacitor
    h. Capacitors in Rectification
    i. Flux Capacitors
14. Answers may be typed or neatly printed. You do not need to include this page of instructions with your assignment.
15. ***Note: The following computer skills should be practiced:***
    a. Use Microsoft Equation to type any equations.
    b. Drawings may be freehand, but try to make use of the 'Shapes', 'Insert Picture' or 'Insert Clipart" functions of MS Word.
    c. A reading assignment may contain drawings that would be useful in your notes. If you have scanning capability, you should practice scanning pictures and inserting them into documents. As you prepare for college, you should consider investing in a desktop printer-scanner-copier.
    d. Just remember that for formal reports you have to cite any images that you insert into your document. You don't have to cite scanned images for this exercise unless you use a source other than the textbook.

CORNELL NOTES and the 5 R's

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Recite – read your notes out loud
Reflect – and consider how this information is connected to your personal experiences and what you already know
Review – look over your notes more than once

Name:

Date:

Topic:

Questions/Key Points	**Notes**

SUMMARY:

Name _____

Date _____

CORNELL NOTES

Topic _____

Questions/key points	Notes

Summary

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