**PHYSICS 2021 - 22 February 25, 2022**

**Today’s Agenda (Day 111)**

1. HOUSEKEEPING ITEMS

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1. HOMEWORK CHECK:

🡪 Ch 22 & 23 Vocabulary

1. CLASS ACTIVITY

🡪 **BEGIN: Project – Operation Beagle**

\*Agree upon type of game, format of game, rules of game

\*Begin draft of schematic diagram – decide upon list of materials needed to accomplish schematic

\*Begin draft of game questions & responses

🡪 MONDAY: CONT’D: Chapter 23 PPT Review

1. Section 23.2 – Applications of Circuits

HOMEWORK:

* READ: Chapter 23 – Series and Parallel Circuits
* STUDY: Chapter 23 Test

<http://glencoe.mheducation.com/sites/0078807220/student_view0/self-check_quizzes.html>

Chapter 22 – Current Electricity

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| --- | --- | --- | --- |
| Electric current | Electric circuit | Resistor | Superconductor |
| Conventional current | Ampere | Parallel connection | Kilowatt-hour |
| Battery | Resistance | Series connection |  |

Chapter 23 – Series and Parallel Circuits

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| --- | --- | --- | --- | --- |
| Series circuit | Voltage divider | Short circuit | Circuit breaker |  |
| Equivalent resistance | Parallel circuit | Fuse | Ground-fault interrupter | Combination series-parallel circuit |

REMINDERS:

* TEST: Chapter 23 🡪 March 1
* PROJECT: Operation Beagle – March 4

**PHYSICS 2021 - 22 Review Questions**

**CH 23 PRACTICE PROBLEMS**

SECTION 23.1

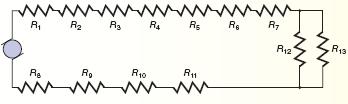
1. Three 22 Ω resistors are connected in series across a 125 V generator. What is the equivalent resistance of the circuit? What is the current in the circuit?
2. A 12 Ω, a 15 Ω and a 5 Ω resistor are connected in a series circuit with a 75 V battery. What is the equivalent resistance of the circuit? What is the current in the circuit?
3. A string of lights has ten identical bulbs with equal resistances connected in a series. When the string of lights is connected to a 117 V outlet, the current through the bulbs is 0.06 A. What is the resistance of each bulb?
4. A 9V battery is in a circuit with three resistors connected in series.
5. If the resistance of one of the resistors increases, how will the equivalent resistance change?
6. What will happen to the current?
7. Will there be any change in the battery voltage?
8. Suppose the circuit shown in Example Problem #1, p. 628, has these values: R1 = 255Ω, R2 = 290Ω, and V1 = 17V. No other information is available.
9. What is the current in the circuit?
10. What is the potential difference across the battery?
11. What is the total power used in circuit, and what is the power used in each resistor?
12. Does the sum of the power used in each resistor in the circuit equal the total power used in the circuit? Explain.
13. Holiday lights often are connected in series and use special lamps that short out when the voltage across a lamp increases to the line voltage. Explain why. Also explain why these light sets might blow their fuses after many bulbs have failed.
14. A 22 Ω resistor and a 33 Ω resistor are connected in series and are connected to a 120 V power source.
15. What is the equivalent resistance of the circuit?
16. What is the current in the circuit?
17. What is the potential difference across each resistor?
18. You connect three 15.0 Ω resistors in parallel across a 30.0 V battery.
19. What is the equivalent resistance of the parallel circuit?
20. What is the current through the entire circuit?
21. What is the current through each branch of the circuit?
22. Suppose you replace one of the 15.0 Ω resistors in the previous problem with a 10.0 Ω resistor.
23. How does the equivalent resistance change?
24. How does the current through the entire circuit change?
25. How does the current through one of the 15.0 Ω resistors change?
26. Compare and contrast the voltages and the currents in series and parallel circuits.
27. A parallel circuit has four branch currents: 120 mA, 250 mA, 380 mA, and 2.1 A. How much current passes through the power source?
28. A series circuit has four resistors. The current through one resistor is 810 mA. How much current is supplied by the source?
29. You connect a switch in series with a 75-W bulb to a 120-V power source.

a. What is the potential difference across the switch when it is closed (turned on)?

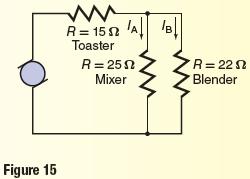
b. What is the potential difference across the switch if it is opened (turned off)?

Section 23.2

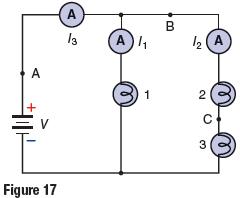
1. A series-parallel circuit, similar to the one in Example Problem 4, has three resistors: one uses 2.0 W, the second 3.0 W and the third 1.5 W. How much current does the circuit require from a 12-V battery?
2. If the 13 lights shown in Figure 14 are identical, which of them will burn brightest?



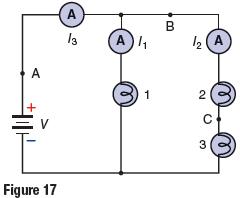
1. A series-parallel circuit has three appliances on it. A blender and a stand mixer are in parallel, and a toaster is connected in series as shown in Figure 15. The series-parallel circuit has a total electric potential difference of 125 V. Find the current through the blender.



1. How do the brightness of the bulbs compare?



1. If I3 is 1.7 A and I1 is 1.1 A, what is the current through bulb 2?



1. The wire at point C is broken and a small resistor is inserted in series with bulbs 2 and 3 (refer to Figure 17). What happens to the brightness of the two bulbs? Explain.
2. A voltmeter connected across bulb 2 measures 3.8 V, and a voltmeter connected across bulb 3 measures 4.2 V.What is the potential difference across the battery? Refer to Figure 17.

**PHYSICS 2021 - 22 PROJECT**

**Operation Beagle**

<http://www.hightechhigh.org/archived/dps/asolis/DP_Projects_OPBeagle.html>

**Duration: 2 week**s

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| --- | --- |
| **The “Operation Beagle” Project**  The goal of Operation Beagle is to help students explore Darwin’s Voyage of the Beagle (or any other Science Explorer’s Journey), while learning about electricity. The original game of Operation inspired the connection between Humanities and Math & Science.  **Scope of Work**  Every team of four (4) students is responsible for creating an electronic board game. The goal or “How to Win” the game, along with the rules, will be determined by each team. The following materials & tools (or something similar) will be required: -- Gift Box (11"x17"x2.5") -- 11"x17" Paper -- 18 Gauge Stranded Wire and Wire Cutters -- 30-Watt Soldering Gun with Flux -- Electrical Tape  The following suggested materials could be found at any electronic store: -- Conductive Material (Aluminum Foil, Screws, etc.) -- LED with Resistor -- Battery Casing -- 1.5V Motor -- Buzzers |  |

**Deliverables**

Circuit Challenge

Master Action Plan  
Game Concept  
Game Board  
Detailed Schematic  
Hardware

Digital Portfolio

**Requirements**

The Master Action Plan **must**:  
-- Have ALL detailed items for the successful completion of the project  
-- Reflect benchmarks via the dates  
-- Have team member assignments  
-- Be kept up-to-date

Game Concept **must** include a brief overview of the idea and how it integrates with electronics.

The Game Board **must** include:  
-- A detailed World Map  
-- Minimum of Forty (40) questions/factoids (evenly divided between Darwin’s journey/findings and Electricity/Magnetism)  
-- Rules & Instructions on how to play  
-- Necessary game cards and/or pieces

The Detailed Schematic **must** include:  
-- A digital drawing representing the circuit  
-- Proper labeling with actual values of electronic components (Final Drawing)

The Hardware **must** include:  
-- A simple/complex circuit in series (minimum), parallel, and/or both  
-- Two (2) electronic actions upon completing the circuit with a switch

-- Electronics that is integral to the game

The Digital Portfolio **must** include:  
-- A brief overview of the Game Concept  
-- Pictures of the exterior and interior of the game  
-- An image file of the schematic

-- Have a reflection discussing technical issues occurring during the project and how they were overcome.

**Grading Criteria**

The students will be working in teams of four (4), but they will each receive an individual grade. The varying weights for the following criteria will determine their overall score.  
-- Attractiveness  
-- Creativity & Playability  
-- Rules  
-- Accuracy of Content  
-- Schematic  
-- Hardware (and its functionality)

**Safety**

By participating in Operation Beagle, the students are agreeing to all the safety issues discussed in class, when authorized tools are in use and they will employ all safety precautions to ensure each member (and future players) well-being.