**PHYSICS 2021 - 22 February 28, 2022**

**Today’s Agenda (Day 112)**

1. HOUSEKEEPING ITEMS

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1. HOMEWORK CHECK:

🡪 Project – Draft 1

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

\*draft of schematic diagram, list of materials needed to accomplish schematic

\*draft of game questions (min. 15) & responses

1. CLASS ACTIVITY

🡪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 24 – Magnetic Fields

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Polarized | Magnetic field | Solenoid | Galvanometer | Armature |
| Domain | Magnetic flux | Electromagnet | Electric motor |  |

Chapter 25 – Electromagnetic Induction

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Electromagnetic induction | Electric generator | Eddy current | Transformer | Step-up transformer |
| Induced electromotive force | Lenz’s law | Self-inductance | Mutual inductance | Step-down transformer |

REMINDERS:

* TEST: Chapter 23 🡪 March 1
* TEST: Chapter 24 🡪 March 8
* Ch 24 & 25 Vocabulary – March 2
* PROJECT: Operation Beagle – March 8
* **QUIZ: Ch 24 & 25 Vocabulary – March 10**
* TEST: Chapter 25 🡪 March 15

**PHYSICS 2021 - 22 Review Questions**

**CH 23 PRACTICE PROBLEMS**

SECTION 23.1

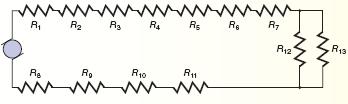
1. Three 22 Ω resistors are connected in series across a 125 V generator. What is the equivalent resistance of the circuit? What is the current in the circuit?
2. A 12 Ω, a 15 Ω and a 5 Ω resistor are connected in a series circuit with a 75 V battery. What is the equivalent resistance of the circuit? 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)?

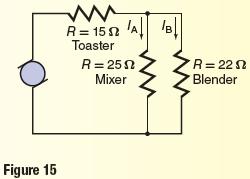
b. What is the potential difference across the switch if it is opened (turned off)?

Section 23.2

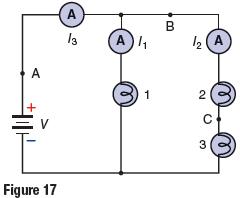
1. A series-parallel circuit, similar to the one in Example Problem 4, has three resistors: one uses 2.0 W, the second 3.0 W and the third 1.5 W. How much current does the circuit require from a 12-V battery?
2. If the 13 lights shown in Figure 14 are identical, which of them will burn brightest?



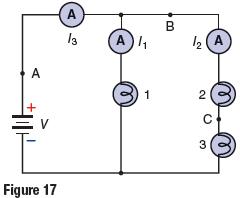
1. A series-parallel circuit has three appliances on it. A blender and a stand mixer are in parallel, and a toaster is connected in series as shown in Figure 15. The series-parallel circuit has a total electric potential difference of 125 V. Find the current through the blender.



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?



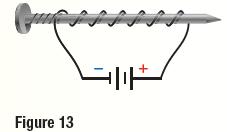
1. The wire at point C is broken and a small resistor is inserted in series with bulbs 2 and 3 (refer to Figure 17). What happens to the brightness of the two bulbs? Explain.
2. A voltmeter connected across bulb 2 measures 3.8 V, and a voltmeter connected across bulb 3 measures 4.2 V.What is the potential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

**PHYSICS 2021 - 22 Review Questions**

**CH 24 PRACTICE PROBLEMS**

SECTION 24.1

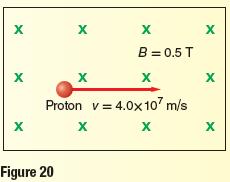
1. If you hold a bar magnet in each hand and bring your hands close together, will the force be attractive or repulsive if the magnets are held in the following ways:
2. The two north poles are brought together
3. A north pole and a south pole are brought together
4. The ends of a compass needle are marked N and S. How would you explain to someone why the pole marked N points north? A complete answer should involve Earth’s magnetic poles.
5. When students use magnets and compasses, they often touch the magnets to the compasses. Then they find that the compasses point south. Explain why this might occur.
6. How does the strength of a magnetic field that is 1 cm from a current-carrying wire compare with each of the following:
7. The strength of the field 2 cm from the wire
8. The strength of the field 3 cm from the wire
9. A long, straight current-carrying wire lies in a north-south direction.
10. The north pole of a compass needle placed above this wire points toward the east. In what direction is the current?
11. If a compass were place underneath this wire, in which direction would the compass needle point?
12. A student makes a magnet by winding around a nail and connecting it to a battery, as in Fig. 13 below. Which end of the nail—the pointed end or the head—is the north pole?



1. You have a battery, a spool of wire, a glass rod, an iron rod, and an aluminum rod. Which rod could you use to make an electromagnet that can pick up steel objects? Explain.
2. Explain how to construct an electromagnet.
3. What two things about a magnetic field can magnetic field lines represent?
4. Two current-carrying wires are close to and parallel to each other and have identical currents. If the two currents were in the same direction, how would the magnetic fields of the wires be affected? How would the fields be affected if the two currents were in opposite directions?
5. Describe how to use a right-hand rule to determine the direction of a magnetic field around a straight, current-carrying wire.
6. Explain what happens to the domains of a temporary magnet when the temporary magnet is removed from a magnetic field

SECTION 24.2

1. Explain the method you could use to determine the direction of force on current-carrying wire at right angles to a magnetic field. Identify what must be known to use this method.
2. A wire that is 0.50 m long and carrying a current of 8.0 A is at right angles to a 0.4 T magnetic field. How strong is the force that acts on the wire?
3. A wire that is 75 cm long and carrying a current of 6.0 A is at right angles to a uniform magnetic field. The magnitude of the force acting on the wire is 0.60 N. What is the strength of the magnetic field?
4. A 40.0 cm long copper wire carries a current of 6.0 A and weighs 0.65N. A certain magnetic field is strong enough to balance the force of gravity on the wire. What is the strength of the magnetic field?
5. How much current would be required to produce a force of 0.38 N on a 10.0 cm length of wire at right angles to a 0.49 T field?
6. In what direction is the force on an electron if that electron is moving east through a magnetic field that points north?
7. A stream of doubly ionized particles (missing tow electrons and thus carrying a net positive charge of two elementary charges) moves at a velocity of 3.0 x 104 m/s perpendicular to a magnetic field of 9.0 x 10-2 T. How large is the force acting on each ion?
8. A singly ionized particle experiences a force of 4.1 x 10-13 N, when it travels at a right angle through a 0.61 T magnetic field. What is the particle’s velocity?
9. What are the magnitude and direction of the force acting on the proton shown in Figure 20?



1. A stream of doubly ionized particles (missing two electrons and thus carrying a net charge of two elementary charges) moves at a velocity of 3.0×104 m/s perpendicular to a magnetic field of 9.0×10−2 T. How large is the force acting on each ion?
2. Triply ionized particles in a beam carry a net positive charge of three elementary charge units. The beam enters a magnetic field of 4.0×10−2 T. The particles have a speed of 9.0×106 m/s and move at right angles to the field. How large is the force acting on each particle?
3. Explain how electric motors use magnets to convert electrical energy to mechanical energy.

**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.