**PHYSICS 2021 - 22 March 9, 2022**

**Today’s Agenda (Day 118)**

1. HOUSEKEEPING ITEMS

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1. HOMEWORK CHECK:

🡪 Project Operation Beagle

🡪 Ch 24 & 25 Vocabulary

1. CLASS ACTIVITY

🡪 CONT’D: Project Presentation - Operation Beagle

🡪Chapter 24 PPT Review

1. **Section 24.2 – Applying Magnetic Forces**

HOMEWORK:

* READ: Chapter 24 – Magnetic Fields
* STUDY: Chapter 24 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:

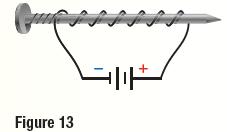
* TEST: Chapter 24 🡪 March 10
* **QUIZ: Ch 24 & 25 Vocabulary – March 15**
* TEST: Chapter 25 🡪 March 17

**PHYSICS 2021 - 22 Review Questions**

**CH 24 PRACTICE PROBLEMS**

SECTION 24.1

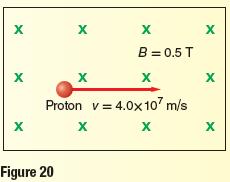
1. If you hold a bar magnet in each hand and bring your hands close together, will the force be attractive or repulsive if the magnets are held in the following ways:
2. The two north poles are brought together
3. A north pole and a south pole are brought together
4. The ends of a compass needle are 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.