| Science 30 | Unit C: Physics |
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| Lesson 8 - Chapter Review | 84 mins |

## Science 30 - Lesson 32 - Unit C - Review 1

Name: $\qquad$

1. In this chapter you investigated three kinds of fields: gravitational fields, electric fields, and magnetic fields.

Complete the following table in your notes to summarize the key features of each kind of field.

| Type of <br> Fleld | General Description <br> of Source(s) | General Description <br> of Test Bodies | Equation That <br> Describes Strength <br> of Fleld | Example of How <br> Fleld Assists You in <br> a Task or Activity |
| :---: | :--- | :--- | :--- | :--- |
| gravitational <br> field |  |  |  |  |
| electric field |  |  |  |  |
| magnetic <br> field |  |  |  |  |

2. Refer to your answer to question 1 as you answer questions 2.a. and 2.b.
a. Compare and contrast gravitational fields with electric fields.
b. Compare and contrast electric fields with magnetic fields.
3. The concept of a field is a fundamental idea that has been referred to throughout Chapter 1. Distinguish between the following pairs of terms that all relate to the concept of a field.
a. force and field
b. field lines and field strength
c. source of field and test body
4. Sketch the field lines associated with each object below.

5. Sketch a simple diagram of a DC electric motor. Label all the key parts.
6. Explain the differences between the output of a DC generator and the output of an AC generator. Use voltage-versus-time graphs to aid in your explanation.
7. In Roman mythology Mars (the god of war) had two attendants, Phobos (fear) and Deimos (panic). This is the origin of the names for the two moons of the planet Mars. Phobos has a mass of $1.08 \times 10^{16} \mathrm{~kg}$ and an average radius of $1.35 \times 10^{4} \mathrm{~m}$, while Deimos has a mass of $1.8 \times 10^{15} \mathrm{~kg}$ and an average radius of $7.5 \times 10^{3} \mathrm{~m}$.
a. Calculate the gravitational field strength at the surface of each moon.
b. Calculate the force of gravity that would act on an astronaut with a total mass of 107 kg on the surface of each moon.
c. Explain how the same astronaut can experience a different force of gravity on each moon even though the astronaut's mass is the same.
8. A van de Graaff generator is a machine that is able to put large quantities of charge on the metal globe on its top surface. During the winter months, when the air inside buildings is very dry, the globe on top of a van de Graaff generator can hold significant quantities of charge. For this question, consider that charge to be $+5.5 \times 10^{-6} \mathrm{C}$.
a. Calculate the strength of the electric field at the following distances from the centre of the large metal globe.
i. $\quad 40 \mathrm{~cm}$
ii. $\quad 160 \mathrm{~cm}$
9. A car speaker is connected to an AC circuit within the amplifier that supplies the speaker with 20.0 V . Consider the speaker to have a constant resistance of $4.0 \square$ for all parts of this question.
a. Calculate the electric current that flows through the speaker.
b. Use your answer to question a. to determine the power rating of this speaker.
c. Use your answers to questions a. and b. to determine the electrical energy that is supplied to the speaker during 10.0 min of operation. Answer in joules.

A student uses the following equipment to complete a Science 30 lab activity:

- 3 resistors (500 $\square, 1000 \square$, and $1500 \square$ )
-6.0-V battery pack
- several leads for connecting the components of circuits
- digital multimeter capable of measuring volts, amperes, and ohms

These materials can be used to build either a series circuit or a parallel circuit.
10. The first task is to build a circuit that will incorporate all three resistors and use the minimum amount of electrical energy from the battery pack.
a. Sketch a schematic diagram of this circuit. Be sure to include how the meter would be used to measure the current through all three resistors and the voltage across each of the three resistors.
b. Using the data provided, calculate the total resistance for the resistors in your circuit.
c. Use your answer to question b. to calculate the current that would flow through all three resistors.
d. Use your answer to question b. to calculate the electrical energy that would be used by this circuit if it were allowed to operate for 10.0 min .

11. Carefully examine the illustration for Device 1.
a. Identify the proper name for this device.
b. Sketch a graph of voltage versus time to describe the output from this device.
c. The number of rotations the loop is forced to make every minute can be increased. Sketch a graph of voltage versus time to show the output from the device under these circumstances.
12. Carefully examine the illustration for Device 2.
a. Identify the proper name for this device.
b. Sketch a graph of voltage versus time to describe the output from this device.
c. The number of rotations the loop is forced to make every minute can be increased. Sketch a graph of voltage versus time to show the output from the device under these circumstances.
13. The doorbell of a home requires 10.0 V to operate. A transformer is used to connect the doorbell to a $120-\mathrm{V}$ circuit within the home. The doorbell transformer has 500 turns on the primary coil and supplies the doorbell with 900 mA of current.
a. Determine whether the transformer features a step-up or step-down design.
b. Calculate the number of turns on the secondary coil.
c. Calculate the current that is drawn from the $120-\mathrm{V}$ household circuit to operate the doorbell.

Use the following information to answer the next question
Comparison Shopping
The following data was collected for two 22-cubic-foot refrigerators with top-mounted freezers.

| Refrigerator | Model A | Model B |
| :---: | :---: | :---: |
| Cost to <br> Purchase | $\$ 1699.99$ | $\$ 1200$ |
| Annual Energy <br> Consumption | $435 \mathrm{~kW} \cdot \mathrm{~h}$ | $545 \mathrm{~kW} \cdot \mathrm{~h}$ |
| Life Expectancy <br> of Refrigerator | 17 years | 17 years |

14. Use $9.3 \phi / \mathrm{kWih}$ to calculate the following costs.
a. the lifetime operating costs for Model A
b. the lifetime operating costs for Model B
