

Student #: _____

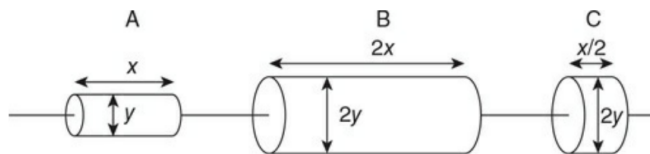
Student Name: _____

Physics 11 Homework Unit 8: Electricity and Magnetism

- _____ 1. An electrical circuit must contain:
- (a) a load, connecting wires, and a fuse
 - (b) a power source, connecting wires, and switch
 - (c) a load, power source, and fuse
 - (d) a load, power source, and connecting wires
- _____ 2. A resistor
- (a) splits electricity along two paths.
 - (b) is a device that converts electrical energy into heat.
 - (c) is an unwanted part of an electrical circuit.
 - (d) All of these choices are correct.
- _____ 3. If five light bulbs are connected in *series* to an energy source and one of them burns out, the others will:
- (a) go out
 - (b) become brighter
 - (c) become dimmer
 - (d) not be affected
- _____ 4. If five light bulbs are connected in *parallel* to an energy source and one of them burns out, the others will:
- (a) go out
 - (b) become brighter
 - (c) become dimmer
 - (d) not be affected
- _____ 5. A load (resistor) that has 2.0 A of current passing through it with a potential difference of 6.0 V has a resistance of:
- (a) $2\ \Omega$
 - (b) $0.333\ \Omega$
 - (c) $12\ \Omega$
 - (d) $3\ \Omega$
- _____ 6. If there are three $2.0\ \Omega$ resistors connected in parallel, their equivalent resistance is:
- (a) $0.67\ \Omega$
 - (b) $1.5\ \Omega$
 - (c) $2.0\ \Omega$
 - (d) $6.0\ \Omega$

7. Three cylindrical resistors made of the same material but different dimensions are connected, as shown in the figure below. A battery is connected across the resistors to produce current. Which is the correct ranking of the currents for the resistors?

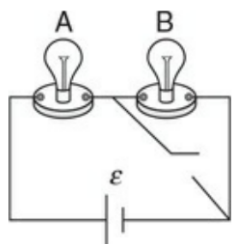
- (a) $I_A = I_B = I_C$
 (b) $I_A > I_B > I_C$
 (c) $I_C > I_A = I_B$
 (d) $I_C > I_B > I_A$



8. Using the same diagram as the previous question, which is the correct ranking of the potential differences of the resistors?

- (a) $V_A = V_B = V_C$
 (b) $V_A > V_B > V_C$
 (c) $V_A = V_B > V_C$
 (d) $V_C > V_B > V_A$

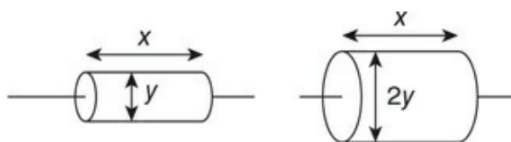
9. The figure shows two bulbs connected to a battery in a circuit with a switch that is originally in the closed position. What happens to the brightness of the bulbs when the switch is opened?



	Bulb A	Bulb B
(a)	Four times brighter	Goes out
(b)	Same brightness as originally	Glow as brightly as bulb A
(c)	Half as bright as originally	Glow as brightly as bulb A
(d)	Quarter as bright as originally	Glow as brightly as bulb A

10. Two resistors made of the same material are shown in the figure. A current of I flows through the left resistor when connected to a potential difference of V . What current will flow through the right resistor when connected to the same potential?

- (a) $I/2$
 (b) I
 (c) $2I$
 (d) $4I$



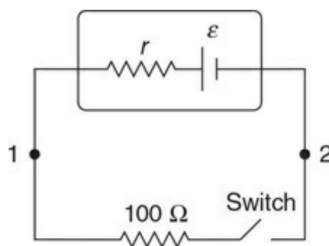
11. The Earth's magnetic field

- (a) is slightly off centre compared to the Earth's axis of rotation.
 (b) has its magnetic South pole at the geographic North pole.
 (c) attracts the North end of the compass needle to the geographic North pole.
 (d) All of these choices are correct.

12. A proton is moving toward the top of the page when it encounters a magnetic field that changes its direction of motion. After encountering the magnetic field, the proton's velocity vector is pointing out of the page. What is the direction of the magnetic field?

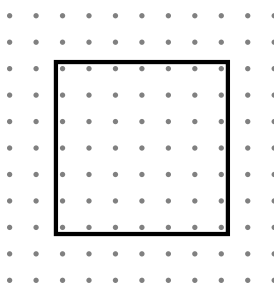
- (a) Toward the bottom of the page
 (b) To the right
 (c) To the left
 (d) Into the page

- _____ 13. A student is given a battery with an unknown emf (\mathcal{E}) and an internal resistance r . The student sets up a circuit with a known resistor and switch, as shown in the figure below. Which measurements should the student make to find the values of both \mathcal{E} and r ? *Select two answers.*

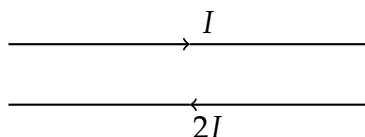


- (a) With the switch open, measure the potential difference between points 1 and 2 and the current at point 1.
 - (b) With the switch closed, measure the potential difference between points 1 and 2 and the current at point 1.
 - (c) With the switch open, measure the potential difference between points 1 and 2. Close the switch and measure the current at point 1.
 - (d) With the switch open, measure the potential difference between points 1 and 2. Close the switch and measure the potential difference between points 1 and 2.
- _____ 14. A magnetic field line is
- (a) a line that shows the direction in which the field is getting smaller.
 - (b) a line that points towards the strongest magnetic field.
 - (c) a line drawn to represent the direction the magnetic field traces out through space.
 - (d) None of these choices is correct.
- _____ 15. How do potential drop and potential rise compare in a completed simple circuit?
- (a) Potential rise does not affect potential drop.
 - (b) Potential rise in the source is equal to the potential drop in the load.
 - (c) Potential rise in the source is greater than potential drop across the load.
 - (d) Potential rise in the source is less than potential drop across the load.
16. A floodlight filament has an operating resistance of $22.0\ \Omega$. The lamp is designed to operate at $110\ \text{V}$.
- (a) What is its power rating?
 - (b) How much energy is consumed if you use the lamp for $2.50\ \text{h}$?

17. What magnetic field will exert a force of 22.0 N downward on a coil of 450 turns carrying a current of 3.20 A to the right through the field? The edge of the coil inside the field is 7.50 cm long.
18. A magnetic field points directly *out of the page*. A square coil is inside the field so that the plane of the coil is parallel to the surface of the page. From your perspective, looking at the page, a current moves counter-clockwise around the coil. Find the direction of the force on each side of the coil. Label them on the diagram below.

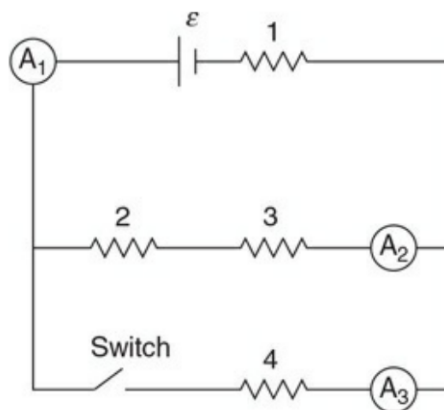


19. Two long wires, distance d apart, carry different currents in opposite directions, as shown in the figure below. The top wire exerts a magnetic force on the bottom wire, while the bottom wire exerts a force on the top wire.



- (a) What is the *direction* of the magnetic force on the top wire?
- (b) How does the magnetic force on the bottom wire compare in strength and direction to the force on the top wire?
- (c) What is the strength of the magnetic field at the midpoint between the wires?

20. The figure below shows a circuit with a battery of emf \mathcal{E} and negligible internal resistance, and four identical resistors of resistance R numbered 1, 2, 3 and 4. There are three ammeters (A_1 , A_2 , and A_3) that measure the currents I_1 , I_2 , and I_3 , respectively. The circuit also has a switch that begins in the closed position.



- (a) A student makes this claim: "The current I_3 is twice as large as I_2 ." Do you agree or disagree with the student's statement? Why or why not? (You can support your answer by writing one or more algebraic equations.)
- (b) Rank the power dissipated into heat by the resistors from highest to lowest, being sure to indicate any that are the same. Justify your ranking.
- (c) The power dissipated into heat by resistor 4 is P . What is the power dissipated by resistor 1 in terms of P ?

- (d) The switch is opened. A student makes this statement: "The power dissipation of resistors 2 and 3 remain the same because they are in parallel with the switch. The power dissipation of resistor 1 decreases because opening the switch cuts off some of the current going through resistor 1." What parts of the student's statement do you agree or disagree with? Justify your answer with appropriate physics principles and/or mathematical models.