



Physics Worksheet

Instructions: Use data from your electric motorboat to answer the following questions.

Materials Needed: electric motorboat, race times, calculator, electronic balance, & multi-meter.

1. What is the total mass of your electric motorboat and batteries? $m = \underline{\hspace{2cm}}$ kg
2. What is the average time it took your boat to race 5meters? $t_{ave} = \underline{\hspace{2cm}}$ s
3. Calculate the average speed of your boat. $v_{ave} = \underline{\hspace{2cm}}$ m/s
4. Using $\Delta d = \frac{1}{2} at^2$, calculate the average acceleration of your boat. $a = \underline{\hspace{2cm}}$ m/s²
5. Is the acceleration of your boat constant during a race? Why or why not?
6. If the force forward on the boat is $\underline{\hspace{1cm}} \underline{\hspace{1cm}}$ the resistance forces acting on the boat, then the boat will accelerate forward. The boat's acceleration also depends on its $\underline{\hspace{2cm}}$.
7. Calculate the average net force that accelerated your boat forward. $F = \underline{\hspace{2cm}}$ N
8. Give two ways you could improve your boat's acceleration (besides increasing battery power).
 - 1)
 - 2)
9. What law explains that the force forward on the boat is equal to the force backward on the $\underline{\hspace{2cm}}$?
10. Use the average speed to calculate your boat's kinetic energy. $KE = \underline{\hspace{2cm}}$ J

11. Draw and label a circuit diagram (schematic) that shows your battery(ies), motor, and switch.

12. Did you wire your circuit in series or parallel? How do you know?

13. What was the maximum voltage your motor received? $V = \underline{\hspace{2cm}}$ V

14. Using a multi-meter, measure the resistance of your motor. $R = \underline{\hspace{2cm}}$ Ω

15. Using Ohm's Law, calculate the current through the motor. $I = \underline{\hspace{2cm}}$ A

16. Calculate the electrical power delivered to the motor. $P = \underline{\hspace{2cm}}$ W

17. Calculate the total energy delivered to the motor during a 5 m drag race. $E = \underline{\hspace{2cm}}$ J

18. Compare this electrical energy (#17) to the kinetic energy of the boat (#10). Which is greater? Why?

19. This electrical energy (#17) came from the battery. List three forms of energy it became.

1)

2)

3)

20. Give two more ways your motorboat could be made faster (besides the answers given for #8).

1)

2)