

Name: \_\_\_\_\_

Period: \_\_\_\_\_

### **Intro to Digital Motors**

Do Now: What is the role of a magnet in a motor?

1. From the Motors video: what is the name for the part of the motor that the brushes touch?
2. Why do commercial motors have so many wires?
3. How is this design an improvement on the basic motors we built yesterday?
4. What are 2+ devices that could use basic DC motors?
5. What are the main advantages of servo motors?
6. What is the biggest disadvantage of servo motors?

7. What are 2+ devices that could use servo motors?
8. What are the main advantages of stepper motors?
9. What is the biggest disadvantage of stepper motors?
10. What are 2+ devices that could use stepper motors?
11. With your partner, determine which type of motor you would use for each device and explain your reasoning
  1. Automatic doors
  2. Laptop fan
  3. Elevator
  4. Escalator
  5. Electric toothbrush
  6. Grocery store conveyor belt

Name: \_\_\_\_\_ KEY \_\_\_\_\_

Period: \_\_\_\_\_

### **Intro to Digital Motors ANSWER KEY**

Do Now: What is the role of a magnet in a motor?

*The magnet causes the rotor to spin by providing a force on the current-carrying wire coil*

1. From the Motors video: what is the name for the part of the motor that the brushes touch?  
*Commutator*

2. Why do commercial motors have so many wires?

*More wires make the electromagnets stronger*

3. How is this design an improvement on the basic motors we built yesterday?

*In our design, the wire loop only had current (and thus only received a torque) 50% of the time, whereas this design continually has current, which switches direction at the correct time based on the commutator coming into contact with a different brush. This design has multiple coils of wire rather than just 1 so that the coil which is at the correct angle to the permanent magnets can be magnetized. This design has stronger electromagnets through the use of more wires. This design has magnets surrounding the entire apparatus rather than just on one side.*

4. What are 2+ devices that could use basic DC motors?

*Fan, blender, car*

5. What are the main advantages of servo motors?

*Can control the angle exactly  
High torque and high speed*

6. What is the biggest disadvantage of servo motors?

*Limited to 180 degrees rotation in most cases. (Also expensive)*

7. What are 2+ devices that could use servo motors?

*Robotic arm, windshield wipers*

8. What are the main advantages of stepper motors?

*Precise angles, continuous rotation*

9. What is the biggest disadvantage of stepper motors?

*Slow (also loud and energy inefficient)*

10. What are 2+ devices that could use stepper motors?

*3d printers, printing presses, analog clocks, feed mechanisms for ATMs and metrocard machines*

11. With your partner, determine which type of motor you would use for each device and explain your reasoning

*Note: Answers may vary*

1. Automatic doors

*Servo—there is a limited range of motion necessary*

2. Laptop fan

*DC motor—it's the cheapest and simplest, and the features of the other motor types aren't necessary since the angle the fan spins is unimportant*

3. Elevator

*Servo or stepper—there is a limited range of motion but precision is very important*

4. Escalator

*DC motor—must run continuously. The angle is unimportant*

5. Electric toothbrush

*DC motor—must run continuously when on. The angle is unimportant*

6. Grocery store conveyor belt

*Stepper motor—needs to be able to run continuously but also stop and start and move forward by very specific amounts*