Section: What Is a Machine?
MACHINES: MAKING WORK EASIER

1. What is a device that makes work easier by changing the size or direction of force?
   a. a machine  
   b. a load  
   c. an engine  
   d. a computer

2. What type of simple machine is a screwdriver that is used to pry off the lid on a paint can?
   a. a pulley  
   b. a wheel  
   c. a lever  
   d. a screw

3. The work you do on a machine is called ____________________.

4. The work done by a machine on an object is called ____________________.

5. Explain the difference between work input and work output and give an example of each.

6. Name two examples of simple everyday machines.

7. A ramp will decrease the size of the input force needed to lift a box, and ____________________ the distance over which the force is exerted.

8. When a screwdriver is used to open a can, both the size and direction of the ____________________ are changed.

9. How does the amount of work the screwdriver does on the can compare with the amount of work you do on the screwdriver?
10. When a machine changes the size of the force, the ______________ through which the force is exerted must also change.

11. Why would it be wrong to suggest that machines help us by increasing the amount of work done?

MECHANICAL ADVANTAGE

12. What is the number of times a machine multiplies force called?
   a. output force
   b. input force
   c. mechanical advantage
   d. work output

13. Which of the following is the formula for finding mechanical advantage?
   a. $MA = \frac{\text{input force}}{\text{output force}}$
   b. $MA = \frac{\text{output force}}{\text{input force}}$
   c. $MA = \frac{\text{input force}}{\text{output force}} \times 100$
   d. $MA = \frac{\text{output force}}{\text{input force}} \times 100$

14. A machine that has a mechanical advantage of 1 has an output force that is ______________ than the input force.

15. A machine that has a mechanical advantage of less than 1 reduces the output force, but can increase the ______________

MECHANICAL EFFICIENCY

16. What is the comparison of a machine’s work output and work input?
   a. mechanical work
   b. mechanical efficiency
   c. mechanical force
   d. mechanical energy

17. Which of the following is the equation for finding mechanical efficiency?
   a. $\text{mechanical efficiency} = \frac{\text{work input}}{\text{work output}}$
   b. $\text{mechanical efficiency} = \frac{\text{work output}}{\text{work input}}$
   c. $\text{mechanical efficiency} = \frac{\text{work input}}{\text{work output}} \times 100$
   d. $\text{mechanical efficiency} = \frac{\text{work output}}{\text{work input}} \times 100$

18. The work output of a machine can never be greater than the work ______________.
19. When a machine drills holes, some of the work input is used to overcome ________________.

20. What is an ideal machine?

21. Why aren’t machines 100% efficient?

22. Name two things that are used to help machines be more efficient.
Directed Reading A

SECTION: WORK AND POWER

1. C
2. A
3. Answers will vary. Sample answer: Carrying a book across a room is not work because the book is not moving in the direction of the force.
4. The object moves as a force is applied to it and the direction of the object’s motion is the same as the direction of the force.
5. kinetic
6. Because work depends upon distance and force. The straight cliff is a shorter distance but takes more force. The slope is a longer distance, but takes less force.
7. force \( (F) \), distance \( (D) \)
8. joule
9. energy
10. weight and distance
11. B
12. C
13. Power measures how fast work happens or how quickly energy is transferred
14. Power output is greater when more work is done in a given amount of time and when the time it takes to do a certain amount of work is decreased.
15. The power output is lower when you sand the shelf by hand.
16. A more powerful engine will move the car more quickly. For a given speed, a more powerful engine can move a heavier car than a less powerful engine can.
17. A joule is a unit to express energy. One watt is equal to 1 joule per second.

SECTION: WHAT IS A MACHINE?

1. A
2. C
3. work input
4. work output
5. Work input is the work done on a machine, such as when you push on the screwdriver to pry the paint can lid off. Work output is the work done by the machine such as the screwdriver lifting the paint can lid. Students examples may vary.
6. Sample answer: scissors and chopsticks
7. increases
8. input force
9. The amount of work for each is the same.
10. distance
11. Machines make work easier by changing the size or direction of the input force. But the amount of work done is the same.
12. C
13. B
14. greater
15. distance
16. B
17. D
18. input
19. friction
20. A machine that is 100% efficient.
21. Machines aren’t 100% efficient because some of the machine’s work input is used up by the friction from moving parts.
22. Magnets and lubricants can help reduce friction.

SECTION: TYPES OF MACHINES

1. wedge
2. lever, inclined plane, wedge, screw, pulley, wheel and axle
3. B
4. C
5. B
6. B
7. fulcrum, bar, load