

Chapter 12 Work and Machines

Study Guide

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 - ii. Only Force in the Same Direction
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 - i. **Joule**
2. Mechanical Advantage and Efficiency
 - a. What is a **Machine**?
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- i. Advantage of a Wheel and Axle
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- i. Fixed Pulleys
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- iii. Pulley Systems

g. **Compound Machines**

i. **Gears**

4. **Machines in the Human Body**

a. **Living Levers**

i. **Tendons**

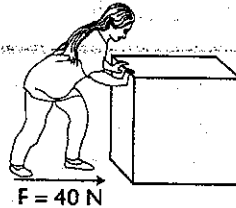
b. **Working Wedges**

SECTION 12-1 REVIEW AND REINFORCE

What Is Work?

◆ Understanding Main Ideas

Use the following illustration to answer questions 1 through 3.



1. The illustration shows Beatrice pushing on a heavy box. Beatrice pushes with a force of 40 N. How can you determine if Beatrice is doing work on the box?

2. Beatrice pushes the box 2 m to the right. What formula should you use to calculate the amount of work done on the box?

3. How much work does Beatrice do pushing the box?

◆ Building Vocabulary

Write a definition for each of the following terms on the lines below.

4. work

5. joule

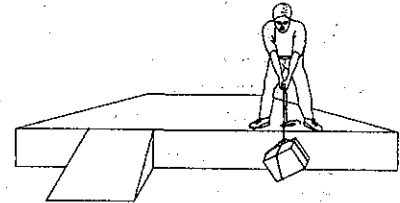
SECTION 12-2

REVIEW AND REINFORCE

Mechanical Advantage and Efficiency

◆ Understanding Main Ideas

In the diagram, the man can either pull the box upward onto the platform or pull the box up the ramp. Use the diagram to answer Questions 1 through 4.



If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

- _____ 1. The work of pulling the box will be easier if the man uses the ramp.
- _____ 2. The ramp makes work easier by dividing distance.
- _____ 3. To calculate the efficiency of the ramp, divide the output work by the input work and multiply the result by 100 percent.
- _____ 4. The ideal mechanical advantage of the ramp is its mechanical advantage with friction.

◆ Building Vocabulary

From the list below, choose the term that best completes each sentence.

- | | | |
|-----------------------------|-------------|----------------------------|
| machine | input force | output force |
| mechanical advantage | efficiency | ideal mechanical advantage |
| actual mechanical advantage | | |

5. A machine's _____ is the number of times the machine multiplies the input force.
6. The force you exert on a machine is called the _____.
7. A _____ is a device you can use to make work easier.
8. The _____ is the mechanical advantage of a machine without friction.
9. The _____ is the mechanical advantage that a machine provides in a real situation.
10. The _____ of a machine compares the output work to the input work and is expressed as a percent.
11. The force exerted by a machine is called the _____.

SECTION 12-3

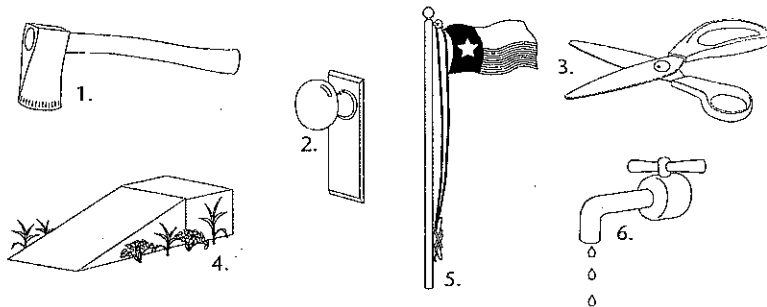
REVIEW AND REINFORCE

Simple Machines

◆ Understanding Main Ideas

Write the type of simple machine shown in the diagram on the line by its number.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



◆ Building Vocabulary

From the list below, choose the term that best completes each sentence.

- | | | |
|----------------|----------------|------------------|
| inclined plane | screw | fulcrum |
| pulley | gear | wedge |
| lever | wheel and axle | compound machine |

7. A(n) _____ is a machine made from two or more simple machines.
8. A seesaw is an example of a simple machine called a(n) _____.
9. A rope or chain wrapped around a grooved wheel is called a(n) _____.
10. A toothed wheel that fits into other toothed wheels is called a(n) _____.
11. A(n) _____ is an inclined plane wrapped around a central cylinder to form a spiral.
12. A(n) _____ is a flat, slanted surface.
13. A lever rotates around a fixed point called the _____.
14. A(n) _____ is thick on one end and tapers to a thin edge at the other end.
15. A screwdriver is an example of a simple machine called a(n) _____.

SECTION 12-4

REVIEW AND REINFORCE

Machines in the Human Body

◆ Understanding Main Ideas

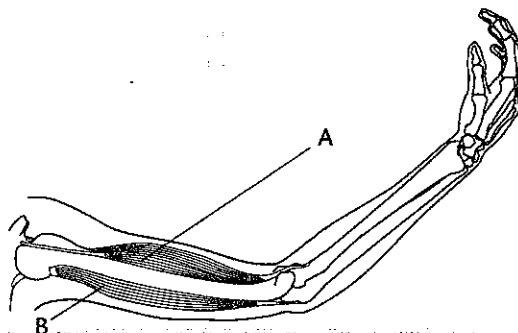
Using the figure below, answer the following questions in the spaces provided.

1. What simple machine is represented?

2. What happens to your arm when muscle A contracts?

3. What happens to your arm when muscle B contracts?

4. What does the tendon do to the bone when muscle A contracts?



Answer the following questions in the spaces provided.

5. What kind of simple machine is an incisor?

6. What provides the input force when you use the lever of your jaw?

◆ Building Vocabulary

Answer the following questions in the space provided.

7. What is a tendon?

Name: _____

Class: _____

Choose the letter of the correct answer.

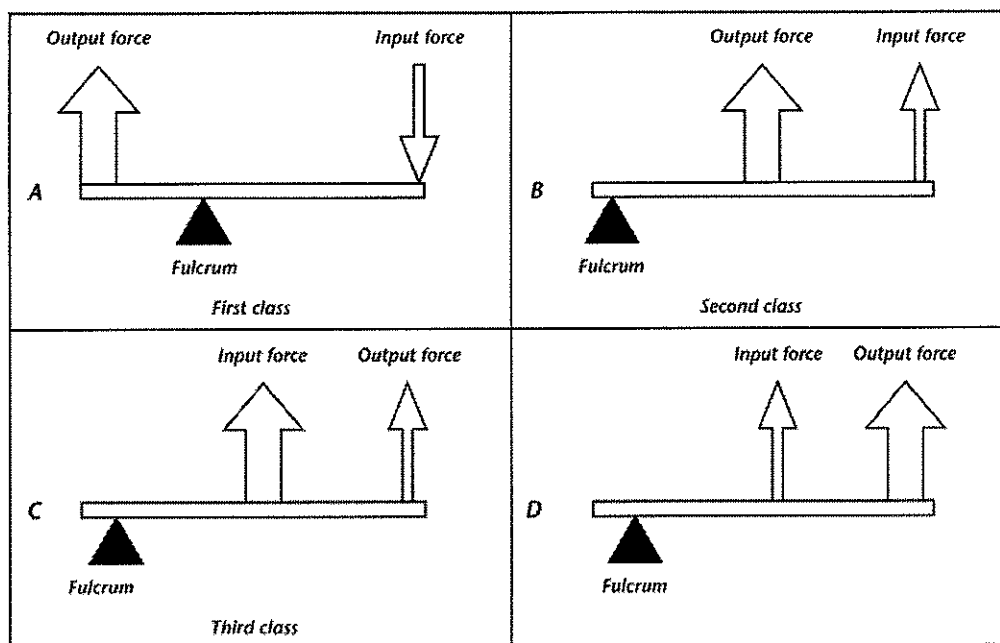
1. When you raise or lower a flag on a flagpole, you are using a
[A] wheel and axle. [B] pulley. [C] inclined plane. [D] wedge.
2. A device with toothed wheels that fit into one another is called a
[A] fulcrum. [B] system of gears. [C] pulley. [D] wheel and axle.
3. Pulling down on a rope to hoist a sail on a sailboat is an example of a machine
[A] reducing friction. [B] changing direction.
[C] multiplying force. [D] multiplying distance.
4. Which body parts act as the fulcrums of levers?
[A] tendons [B] bones [C] muscles [D] joints
5. A machine that uses two or more simple machines is called a
[A] mechanical machine. [B] combination machine.
[C] compound machine. [D] mixed machine.
6. How can a hockey stick be considered a machine?
[A] It multiplies distance. [B] It multiplies force.
[C] It changes direction. [D] It reduces friction.
7. The mechanical advantage of a machine that changes the direction of force only is
[A] greater than 1. [B] 1. [C] zero. [D] less than 1.
8. $\text{Work} = \text{force} \times$
[A] mass. [B] distance. [C] velocity. [D] energy.
9. For work to be done on an object,
[A] the object must move a distance equal to the amount of force exerted on it.
[B] some force need only be exerted on the object.
[C] the object must move, whether or not a force is exerted on it.
[D] the object must move some distance as a result of a force.

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

21. The ideal mechanical advantage of a wheel and axle is the radius of the wheel times the radius of the axle.
22. When you raise your leg, the knee acts as a fulcrum for the upper leg.
23. The mechanical advantage of a machine that only changes the direction of a force is one.
24. The work done by a machine is called the output work.

Use the diagram to answer the question(s).

Lever



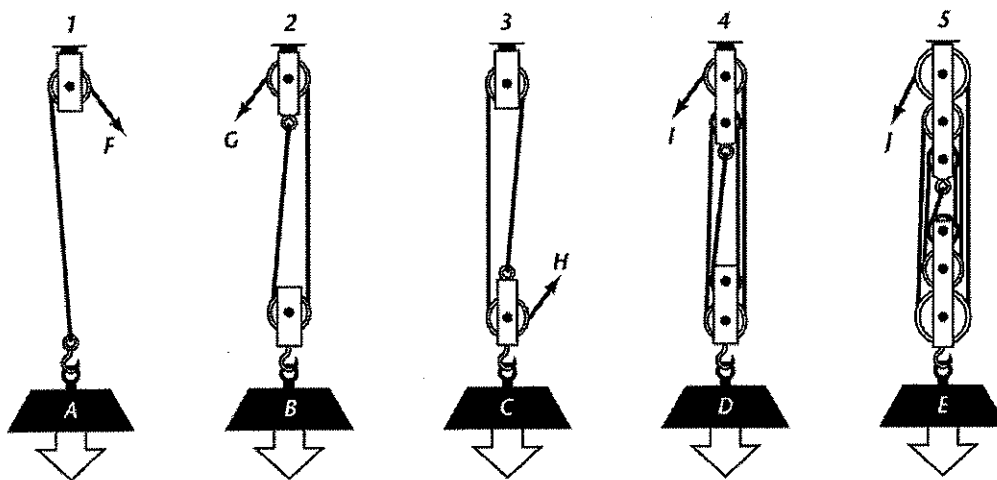
25. What class of lever is a pair of scissors? Explain your answer.
26. Which class of lever does not multiply the input force? What is its advantage?

Write an answer to the following question(s).

28. The output force of a lever with an ideal mechanical advantage of 3 is used as the input force of a pulley system with an ideal mechanical advantage of 2. Use the definition of ideal mechanical advantage to determine the ideal mechanical advantage of the compound machine.
29. You push a food tray 1.5 m along a cafeteria table with a constant force of 18 N. How much work do you do?
30. When you bite with your front teeth, your jaw acts as a third class lever. As you chew with your back teeth, your jaw acts as a second class lever. Explain how your jaw can act as two different classes of levers and how the ideal mechanical advantage of each helps you bite and chew food.

Use the diagram to answer the question(s).

Simple and Compound Machines



27. Which machine has the greatest ideal mechanical advantage?