

**Chapter 2 Mechanical Equilibrium**

**Exercises**

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**2.1 Force (pages 13–14)**

1. A force is a \_\_\_\_\_ or a \_\_\_\_\_.
2. A force is needed to change the state of \_\_\_\_\_ of an object.
3. Is the following sentence true or false? If an object is sliding on ice, it will continue sliding until a force slows it down. \_\_\_\_\_
4. Define net force.

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*Match the applied forces on an object with the letter of the corresponding net force on the object.*

<b>Applied Forces</b>	<b>Net Force</b>
_____ 5. 5 N to the right and 5 N to the left	a. 2 N to the left
_____ 6. 4 N to the right and 6 N to the left	b. 2 N to the right
_____ 7. 7 N to the right and 5 N to the left	c. 10 N to the right
_____ 8. 6 N to the right and 4 N to the right	d. 0 N (no change in motion)

9. Describe the forces that act on a rock at rest in your hand.

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10. Circle the letter that identifies the force acting upward on an object suspended from a spring scale.
 

a. gravity	b. equilibrium
c. tension	d. weight

11. A \_\_\_\_\_ is an arrow that represents the magnitude and direction of a quantity.

12. Explain the difference between a vector quantity and a scalar quantity.

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13. Write *V* beside each vector quantity. Write *S* beside each scalar quantity.

- |                |                 |
|----------------|-----------------|
| _____ a. time  | _____ b. area   |
| _____ c. force | _____ d. volume |

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**2.2 Mechanical Equilibrium (page 16)**

14. Express the equilibrium rule in words.

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15. Express the equilibrium rule mathematically, and explain what the symbol in the rule means.

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16. Circle the letter that describes the forces acting on a suspended object at rest.

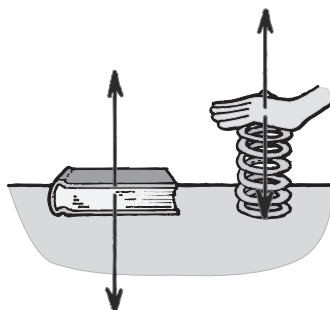
- a. The forces acting upward on the object are greater than the forces acting downward on the object.
- b. The forces acting upward on the object are less than the forces acting downward on the object.
- c. The forces acting upward and downward on the object are balanced.
- d. No forces are acting on the object.

**2.3 Support Force (page 17)**

17. Identify the two forces acting on a book at rest on a table. State the direction of each force.

- a. \_\_\_\_\_
- b. \_\_\_\_\_

18. The \_\_\_\_\_ force is the upward force that balances the weight of an object on a surface. Another name for this force is the \_\_\_\_\_ force.



19. Look at the drawing above. Explain how the force of the table pushing up on the book is similar to what happens when the spring is compressed.

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**Chapter 2 Mechanical Equilibrium**

20. Circle the letter that describes an object at rest on a horizontal surface.
- The support force is equal to the object's weight.
  - The support force is greater than the object's weight.
  - The support force is less than the object's weight.

**2.4 Equilibrium for Moving Objects (pages 18–19)**

21. If an object is moving at a \_\_\_\_\_ speed in a \_\_\_\_\_ path, it is in a state of equilibrium.
22. Is the following sentence true or false? If a desk is pushed at a constant speed across a horizontal floor, the force of friction must be equal in magnitude and opposite in direction to the pushing force on the desk. \_\_\_\_\_
23. Objects at rest are said to be in \_\_\_\_\_ equilibrium.
24. Objects moving at constant speed in a straight-line path are said to be in \_\_\_\_\_ equilibrium.

**2.5 Vectors (pages 19–22)**

25. Suppose a gymnast with a weight of 300 N is suspended by a single vertical rope. What is the tension in the rope? \_\_\_\_\_
26. Now suppose the same gymnast hangs from two vertical ropes. What are the tensions in the ropes? \_\_\_\_\_
27. Define resultant. \_\_\_\_\_
28. State the parallelogram rule.  
 \_\_\_\_\_  
 \_\_\_\_\_
29. The gymnast shown below is suspended from two non-vertical ropes. The solid vector represents the gymnast's weight. What does the dashed vector represent? \_\_\_\_\_  
 \_\_\_\_\_

