

Practice - Work & Energy

Name: _____

Date: _____

- How much work is required to lift a 2-kilogram mass to a height of 10 meters?

A. 5 joules B. 20 joules

C. 100 joules D. 200 joules
- When a 5-kilogram mass is lifted from the ground to a height of 10 meters, the gravitational potential energy of the mass is increased by approximately

A. 0.5J B. 2J C. 50J D. 500J
- Four machines do the amounts of work listed in the table shown. The time they take to do the work is also listed. Which machine develops the most power?

Machine	Work	Time
A	1,000 joules	5 sec
B	1,000 joules	10 sec
C	2,000 joules	5 sec
D	2,000 joules	10 sec

- A. A B. B C. C D. D
- As the length of time it takes a student to swim 100 meters decreases, the power developed by the student

A. decreases B. increases

C. remains the same
 - What force is required to do 60 joules of work in sliding an object a distance of 10 meters across a level floor?

A. 6 newtons B. 10 newtons

C. 60 newtons D. 600 newtons

- How long would it take a machine to do 5,000 joules of work if the power rating of the machine is 100 watts?

A. 5,000 sec B. 50 sec

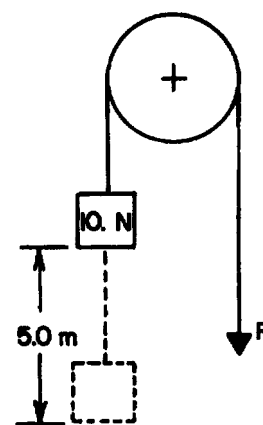
C. 10 sec D. 0.2 sec
- The work done on a 10.0-kilogram mass to give it a speed of 5.00 meters per second is

A. 50.0J B. 2.00J C. 125J D. 2500J
- Car A and car B of equal mass travel up a hill. Car A moves up the hill at a constant speed that is twice the constant speed of car B. Compared to the power developed by car B, the power developed by car A is

A. the same B. twice as much

C. half as much D. four times as much
- In the diagram, 55 joules of work is needed to raise a 10-newton 5.0 meters. How much work is done to overcome friction as the weight is raised?

- A. 5J B. 5.5J
- C. 11J D. 50J

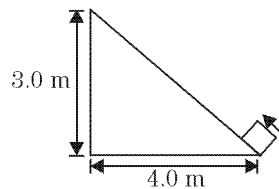


10. One joule is equivalent to one

- A. $\frac{\text{newton}}{\text{meter}^3}$ B. kilogram \cdot meter³
 C. watt² \cdot newton D. $\frac{\text{kilogram} \cdot \text{meter}^2}{\text{second}^2}$

11. A 20-newton block is at rest at the bottom of a frictionless incline as shown in the diagram. How much work must be done against gravity to move the block to the top of the incline?

- A. 10 J
 B. 60 J
 C. 80 J
 D. 100 J



12. Work is being done when a force

- A. acts vertically on a cart that can only move horizontally
 B. is exerted by one team in a tug of war when there is no movement
 C. is exerted while pulling a wagon up a hill
 D. of gravitational attraction acts on a person standing on the surface of the Earth

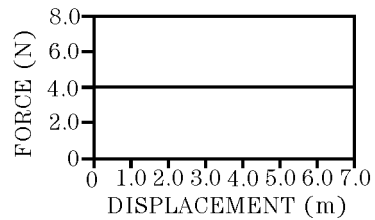
13. What is the maximum distance that a 60-watt motor may vertically lift a 90-newton weight in 7.5 seconds?

- A. 2.3 m B. 5.0 m
 C. 140 m D. 1100 m

14. One watt is equivalent to one

- A. $N \cdot m$ B. N/m C. $J \cdot s$ D. J/s

15. The graph shows the force exerted on a block as a function of the block's displacement in the direction of the force. How much work did the force do in displacing the block 5.0 meters?



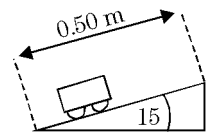
- A. 0J B. 20J C. 0.80J D. 4.0J

16. A person does 100 joules of work in pulling back the string of a bow. What will be the initial speed of a 0.5-kilogram arrow when it is fired from the bow?

- A. 20 m/s B. 50 m/s
 C. 200 m/s D. 400 m/s

17. As shown in the diagram, pulling a 9.8-newton cart a distance of 0.50 meter along a plane inclined at 15° requires 1.3 joules of work. If the cart were raised 0.50 meter vertically instead of being pulled along the inclined plane, the amount of work would be

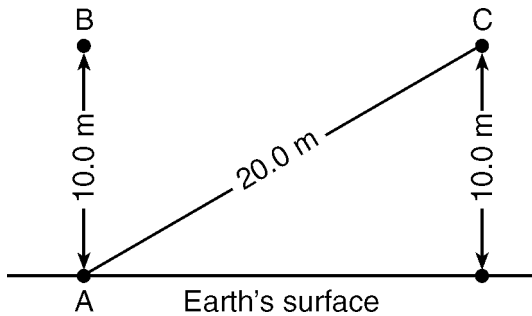
- A. less
 B. greater
 C. the same



18. When a force moves an object over a rough, horizontal surface at a constant velocity, the work done against friction produces an increase in the object's

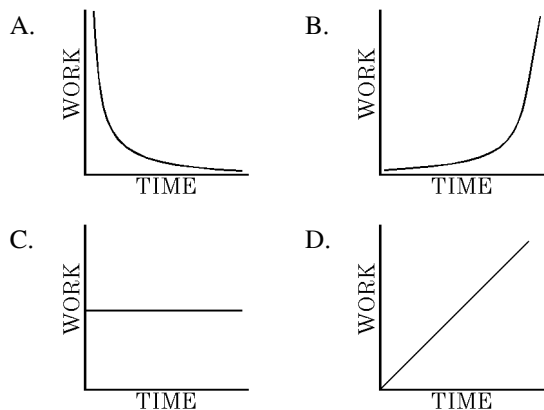
- A. weight B. momentum
 C. potential energy D. internal energy

19. The diagram below shows points A, B, and C at or near Earth's surface. As a mass is moved from A to B, 100. joules of work are done against gravity.



What is the amount of work done against gravity as an identical mass is moved from A to C?

- A. 100. J B. 173 J C. 200. J D. 273 J
20. A student running up a flight of stairs increases her speed at a constant rate. Which graph best represents the relationship between work and time for the student's run up the stairs?



21. How much work is done on a downhill skier by an average braking force of 9.8×10^2 newtons to stop her in a distance of 10 meters?

- A. 1.0×10^1 J B. 9.8×10^1 J
C. 1.0×10^3 J D. 9.8×10^3 J

22. A 45-kilogram bicyclist climbs a hill at a constant speed of 2.5 meters per second by applying an average force of 85 newtons. Approximately how much power does the bicyclist develop?

- A. 110 W B. 210 W
C. 1100 W D. 1400 W

23. Which action would require no work to be done on an object?

- A. lifting the object from the floor to the ceiling
B. pushing the object along a horizontal floor against a frictional force
C. decreasing the speed of the object until it comes to rest
D. holding the object stationary above the ground

24. A student does 300. joules of work pushing a cart 3.0 meters due east and then does 400. joules of work pushing the cart 4.0 meters due north. The total amount of work done by the student is

- A. 100. J B. 500. J
C. 700. J D. 2500 J

25. A 5.0×10^2 -newton girl takes 10. seconds to run up two flights of stairs to a landing, a total of 5.0 meters vertically above her starting point. What power does the girl develop during her run?

- A. 25 W B. 50. W
C. 250 W D. 2,500 W

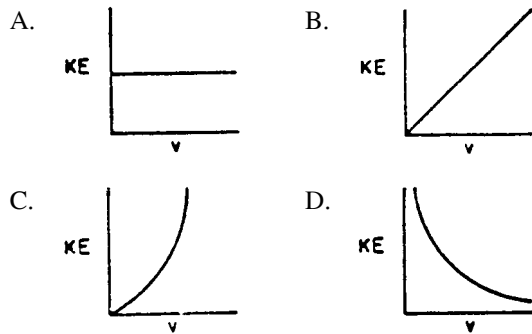
26. A 100-kilogram person acquires a velocity of 15 meters per second down a ski slope. What is the skier's kinetic energy?

- A. 22,500 joules B. 11,250 joules
C. 1,500 joules D. 115 joules

27. Which terms represent scalar quantities?

- A. power and force
- B. work and displacement
- C. time and energy
- D. distance and velocity

28. Which graph best represents the relationship between the kinetic energy (KE) of a moving object as a function of its velocity (v)?



29. If the speed of an object is doubled, its kinetic energy will be

- A. halved
- B. doubled
- C. quartered
- D. quadrupled

30. As the speed of a bicycle moving along a level horizontal surface changes from 2 meters per second to 4 meters per second, the magnitude of the bicycle's gravitational potential energy

- A. decreases
- B. increases
- C. remains the same

31. Base your answer(s) to the following question(s) on the information below.

A 680-newton student runs up a flight of stairs 3.5 meters high in 11.4 seconds. The student takes 8.5 seconds to run up the same flight of stairs during a second trial.

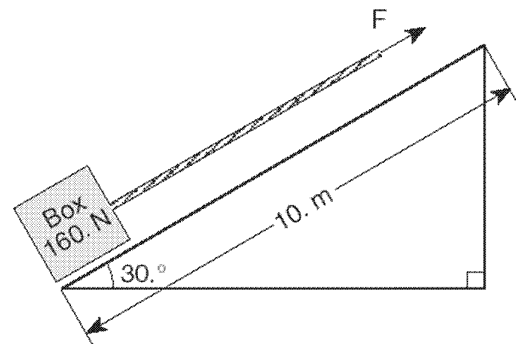
Determine the work done by the 680-newton student in climbing the stairs. [Show all calculations, including the equation and substitution with units.]

32. Determine the power developed by the student during the 11.4-second climb. [Show all calculations, including the equation and substitution with units.]

33. Using one or more complete sentences, compare the power developed by the student climbing the stairs in 11.4 seconds to the power developed during the 8.5-second trial.

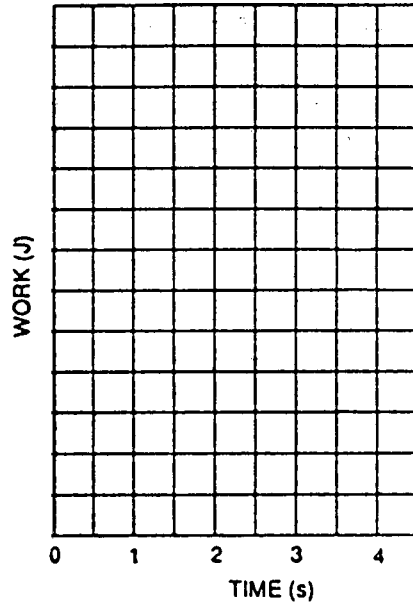
34. Base your answer(s) to the following question(s) on the information and diagram below.

A 160.-newton box sits on a 10.-meter-long frictionless plane inclined at an angle of $30.^\circ$ to the horizontal as shown. Force (F) applied to a rope attached to the box causes the box to move with a constant speed up the incline.



Calculate the amount of work done in moving the box from the bottom to the top of the inclined plane. [Show all work, including the equation and substitution with units.]

35.



A student performs a laboratory activity in which a 15-newton force acts on a 2.0-kilogram mass. The work done over time is summarized in the table shown.

DATA TABLE

Time (s)	Work (J)
0	0
1.0	32
2.0	59
3.0	89
4.0	120

- A. Using the information in the data table, construct a graph on a grid, following the directions given. 1) Develop an appropriate scale for work and plot the points for a *work-versus-time* graph. 2) Draw the best-fit line.
- B. Calculate the value of the slope of the graph constructed in the previous part. (Show all calculations, including equations and substitutions with units.)
- C. Based on your graph, how much time did it take to do 75 joules of work?
- D. What is the significance of the slope of your line?

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| <p>1.
Answer: D</p> <p>2.
Answer: D</p> <p>3.
Answer: C</p> <p>4.
Answer: B</p> <p>5.
Answer: A</p> <p>6.
Answer: B</p> <p>7.
Answer: C</p> <p>8.
Answer: B</p> <p>9.
Answer: A</p> <p>10.
Answer: D</p> <p>11.
Answer: B</p> <p>12.
Answer: C</p> <p>13.
Answer: B</p> <p>14.
Answer: D</p> <p>15.
Answer: B</p> <p>16.
Answer: A</p> <p>17.
Answer: B</p> <p>18.
Answer: D</p> <p>19.
Answer: A</p> <p>20.
Answer: B</p> | <p>21.
Answer: D</p> <p>22.
Answer: B</p> <p>23.
Answer: D</p> <p>24.
Answer: C</p> <p>25.
Answer: C</p> <p>26.
Answer: B</p> <p>27.
Answer: C</p> <p>28.
Answer: C</p> <p>29.
Answer: D</p> <p>30.
Answer: C</p> <p>31.
Answer: 2400 J or 2400 N · m</p> <p>32.
Answer: 208.8 J/s</p> <p>33.
Answer: The power developed during the
 11.4-second trial is less.</p> <p>34.
Answer: 800 J</p> <p>35.
Answer: [see answer sheet];
 slope = $\frac{\Delta W}{\Delta t} = 30 \text{ J/s}$, or $\frac{\Delta v}{\Delta x} = \frac{120 \text{ J}}{4 \text{ s}}$ or
 $P = \frac{W}{\Delta t} = \frac{120 \text{ J}}{4 \text{ s}} = 30 \text{ W} \pm 2.5 \text{ s} \pm 0.3 \text{ s}$</p> |
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