PHYSICS

BOOKS - S CHAND IIT JEE FOUNDATION

WORK AND ENERGY

Examples

1. Using a force of 20N, a person pushes a shopping cart 8 m. How much work does the

person do?

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2. A chair weighing 60 N is lifted to a height of 0.8 m and then carried 6 m across the room. How much work is done on the chair?

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3. What is the kinetic energy of a vehicle having a mass of 2000 kg and moving at 20

m/s.

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4. An object of mass 8 kg is placed at a height of 5 m above the ground.

What kind of energy does this object possess?

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5. An object of mass 8 kg is placed at a height of 5 m above the ground.

Find the amount of energy possessed by the object. (Take g=9.8 m/s^2)

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Question Bank 3

1. Fill In the blanks:

__ is said to be done when a force causes an object to move in the direction of the force. ·

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2. Fill In the blanks:

The S.I. unit of work is __ which is more simply called __

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3. Fill In the blanks:

1 __ is the amount of work done by a force of 1 N acting through a distance of 1 __ 'in the direction of the force ..

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4. Fill In the blanks:

__ is the ability to do work and is expressed in units of __

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5. Fill In the blanks:

__ is the energy which a body possess by virue of its position, shape or condition.

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6. Fill In the blanks:

__ is the energy which a body possess because of its motion.

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7. Fill In the blanks:

__ is the sum of kinetic energy and potential energy.

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8. Fill In the blanks:

The energy stored in an object when it is lifted above the surface of earth is called ___

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9. Fill In the blanks:

Energy can be _____ from one form to another.

Watch Video Solution

10. Fill In the blanks:

A microphone converts sound energy to _____ energy.

Watch Video Solution

11. Fill In the blanks:

The law of _____ of energy states that energy can neither be created nor deslroyed.

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12. Fill In the blanks:

Burning of wood converts __ energy to heat and light energy.

Watch Video Solution

13. Fill In the blanks:

Washing machine converts electrical energy to _____ energy.

Watch Video Solution

14. Fill In the blanks:

There is practically limitless supply of _____ source of energy.

 Watch Video Solution

15. Fill In the blanks:

Plants convert ____ energy into chemical energy.

 Watch Video Solution

16. Fill In the blanks:

Energy and work are expressed in units of____

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17. Fill In the blanks:

__ sources of energy are more quickly used up than they are being replaced

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18. Name the type of energy (K.E. or P.E.) possessed in the following cases

A moving cricket ball

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19. Name the type of energy (K.E. or P.E.) possessed in the following cases

A moving bus

Watch Video Solution

20. Name the type of energy (K.E. or P.E.) possessed in the following cases

The bob of a simple pendulum in its extreme position

Watch Video Solution

21. Name the type of energy (K.E. or P.E.) possessed in the following cases

A stretched bow

Watch Video Solution

22. Name the type of energy (K.E. or P.E.) possessed in the following cases

Water stored at a height

Watch Video Solution

23. Name the type of energy (K.E. or P.E.) possessed in the following cases

A stone placed at the roof

Watch Video Solution

24. Name the type of energy (K.E. or P.E.) possessed in the following cases

Flowing water

Watch Video Solution

25. Name the type of energy (K.E. or P.E.) possessed in the following cases

A suitcase kept on the head

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26. Name the type of energy (K.E. or P.E.) possessed in the following cases

A wound up watch spring.

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27. Answer true or false.

Work is done when we try to push a wall.

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28. Answer true or false.

Falling water can be used to produce electrical energy.

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29. Answer true or false.

Photosynthesis converts solar energy to chemical energy.

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30. Answer true or false.

A cell or battery converts electric energy into chemical energy

Watch Video Solution

31. Answer true or false.

K.E. of an object of mass m movig with velocity v is equal to 1/2 mv

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32. Answer true or false.

The S.L unit of work is Newton.

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33. Answer true or false.

Energy exists in different forms.

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34. Answer true or false.

Energy can be converted from one form to

anolher.

Watch Video Solution

35. Answer true or false.

Sun is the ultimate source of energy.

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36. Answer true or false.

Work is done by a coolie standing still with heavy luggage on his head.

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37. How do the meanings of the two tenns 'Work and Joule' differ?

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38. What are the two things that must happen for work to be done?·

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39. Work is done on a ball when a player kicks it. Is the player still doing work on the ball as it flies through the air? Explain.

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40. You lift a chair that weighs 30 N to a height of 0.8 m and cauy it 20 m across the hall. How much work is done by you on the chair ?

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41. From the ground floor a man comes up to the fourth floor of a building using a staircase. If the man comes up to the same floor using an elevator, neglecting friction, compare the work done by the man in the two cases.

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42. Answer the following questions giving explanation for your answers :

How is work done related to applied force?

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43. When an arrow is shot from a bow, it has kinetic energy. From where does it get the kinetic energy ?

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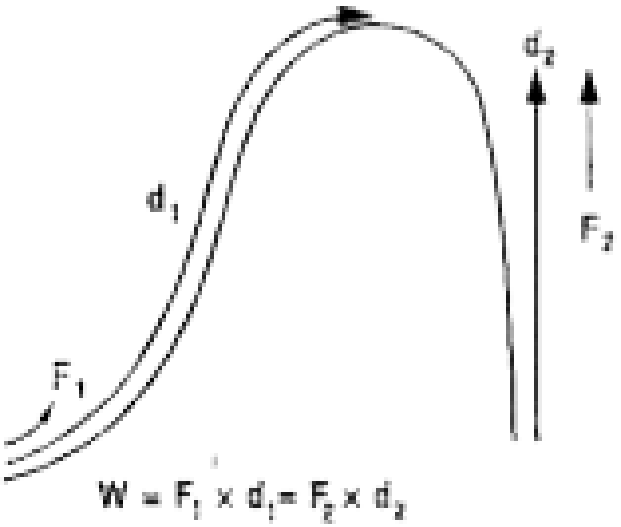
44. Answer the following questions giving explanation for your answers :

What idea about work and force does the

following diagram describe?



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45. Answer the following questions giving explanation for your answers :

Hammer drives a nail into wood only when lifted and then struck.

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46. Answer the following questions giving explanation for your answers :

In what way will the temperature of water at the bottom of a waterfall be different from the temperature at the top?

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47. Answer the following questions giving explanation for your answers :

A truck driver starts off his loaded truck. What are the major energy changes that take place in setting the truck in motion

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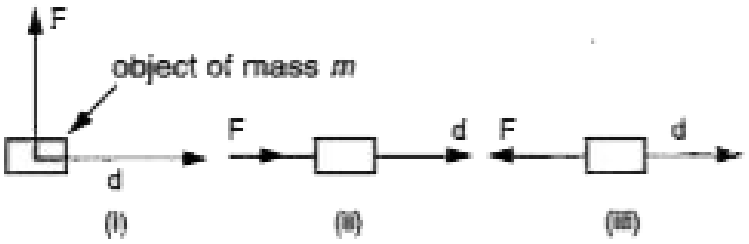
48. Answer the following questions giving explanation for your answers :

In each of the following-figures, a force 'F' is

acting on an objeet of mass 'm'. The difeçon of displacement 'd' is from left to right as shown. State whether the work done by the force is negative, positive or zero.



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49. Answer the following questions giving explanation for your answers :

A bullet is fired from a gun. Whicli will have greater kinetic energy, the bullet or the gun?

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50. In a tug of war, one team is giving way to other. What work is being done and by whom?

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51. Answer the following questions giving explanation for your answers :

What is the amount of work.done when an object moves in a circular path for one complete rotation?

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52. Answer the following questions giving explanation for your answers :

Describe why chemical energy is a form of potential energy.

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53. When you hit a nail into a board by using a hammer, the head. of the nail gets warm. In terms of kinetic and thermal energy, describe why you think the nail head gets warm.

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54. Explain why ·a high speed collision may cause more damage lo vehicles than a low speed collision does.

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55. How is elastic potential energy stored and released?

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56. State the energy changes taking place in the following:

An oscillating pendulum

Watch Video Solution

57. State the energy changes taking place in the following:

Photosynthesis in green leaves

Watch Video Solution

58. State the energy changes taking place in the following:

Charging of a battery

Watch Video Solution

59. State the energy changes taking place in the following:

The unwinding of a spring of a watch

Watch Video Solution

60. State the energy changes taking place in the following:

A dynamo

Watch Video Solution

61. State the energy changes taking place in the following:

An electric toaster

Watch Video Solution

62. State the energy changes taking place in the following:

A photoelectric cell

Watch Video Solution

63. State the energy changes taking place in the following:

An electromagnet

Watch Video Solution

64. State the energy changes taking place in the following:

A loudspeaker

Watch Video Solution

65. State the energy changes taking place in the following:

An alarm clock

Watch Video Solution

66. State the energy changes taking place in the following:

A light bulb

Watch Video Solution

67. State the energy changes taking place in the following:

A hair dryer

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68. Describe kinetic-potential energy conversion that occurs when a basketball bounces

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69. Brakes are suddenly applied to a speeding car and it comes to a. screeching halt. Is the sound energy produced in this conversion a useful form of energy? Explain your answer.

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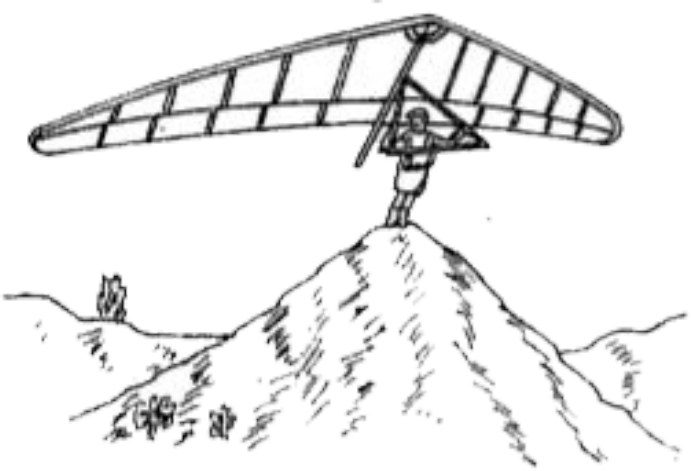
70. What kind of energy does the skier have at the top of the slope?



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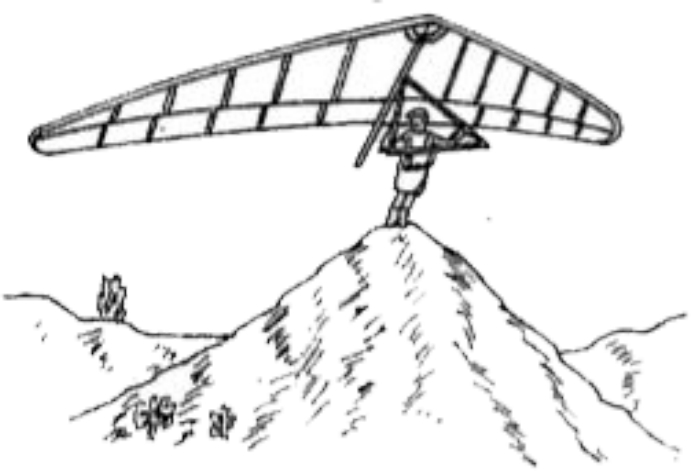
71. What happens to that energy after the skier races down the slope of the mountain?



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72. Describe what happens in terms of energy when you blow up a balloon and release it

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73. Imagine that the sun ran out of energy. What would happen to our energy resources on Earth?

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74. A pendulum is oscillating about its mean position in vacuum. It has

A. only kinetic energy

B. maximum kinetic energy at extreme position,

C. maximum potential energy at its mean position

D. sum of kinetic energy and potential energy remains constant throughout the motion.

Answer:

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75. A stretched spring possesses _____ energy.

A. kinetic

B. elastic potential

C. electrical

D. magnetic

Answer:

Watch Video Solution

76. A raised hammer possesses

A. K.E. only

B. gravitational P.E.

C. electrical energy

D. b

Answer:

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77. In plants , energy is transformed from

A. kinetic to potential

B. light to chemical

C. chemical to electrical

D. electrical to chemical

Answer:

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78. Which of the following is a renewable source of energy?

A. wind energy

B. solar energy

C. nuclear energy

D. All of the above

Answer:

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79. A bird flying in the sky has

A. K.E. only

B. P.E . only

C. neilherK.E. nor P.E.

D. d

Answer:

Watch Video Solution

80. The flowing of water posseses __ energy

A. gravitational

B. kinetic

C. potential

D. none of these

Answer: b

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81. A steam engine converts

A. beat energy into sound energy

B. mechanical energy into beat energy

C. heat energy into mechanical energy

D. heat energy into electrical energy

Answer:

Watch Video Solution

82. When energy changes from one form to another some of the energy always. changes into

A. sound

B. heat

C. electricity

D. light

Answer:

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83. Priyanka lifts a doll from the floor and places it on a table. If the weight of the doll is known. what else does one need to know in order to calculate the work done by Priyanka on the doll?

A. The time taken in lifting the doll to tlie table

B. Height of the table

C. Mass of the ball

D. none of these

Answer:

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84. A body is dropped from a certain height from the ground. When it is halfway down, it possesses,

A. only K.E.

B. zero energy

C. only P.E.

D. d

Answer:

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85. K:.E. depends on

A. mass and volume

B. velocity and weight

C. weight and height

D. velocity and mass

Answer:

Watch Video Solution

86. Which of the following type of energy is/are not a renewable source?

A. wind energy

B. nuclear energy

C. solar energy

D. chemical energy

Answer:

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87. A car is moving along a straight level road with constant speed. Then

A. the work done on the car is a.measure of.its gravitational P.E.

B. the work one on the car is zero.

C. the work done on the car cannot. be found

D. the work done on the'car is infinite.

Answer:

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88. Which of the following sentences describes a conversion from chemical energy to thermal energy?

A. Food is digested and used to regulate body temprature.

B. Charcoal is burnt in a barbecue pit.

C. Coal is burnt to produce steam

D. All of the above

Answer:

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89. When you compress a coil spring. you do work on it The elastic potential energy

A. increases

B. decreases

C. disappears

D. remains wichanged

Answer:

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90. Potential eneigy of your body is minimum when you

A. are standing

B. are sitting on a chair

C. .are sitting on the ground

D. lie down on the ground

Answer:

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91. A truck and a car are moving on a smooth, level road such that the K.E. associated with them is same. Brakes are applied to both of them simultaneously. Which one will cover a greater distance before it stops?

A. car

B. both will cover the same distance

C. truck

D. none of these

Answer:

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92. Mechanically work done is equal to (symbols have their usual meanings)

A. W=F/d

B. W=Fd

C. W=F+d

D. W=F-d

Answer:

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93. Numerical problems Calculate

Work done if using a force of 12 N, a cart is pushed through 8 m.

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94. Numerical problems Calculate

Work done if a stool weighs 25 N is lifted to a height of 80 cm

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95. Numerical problems Calculate

K.E. of a car of mass 400 kg moving with ·a speed of 20 ms^{-1}

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96. Numerical problems Calculate

P.E. of a body of mass 8 kg raised to a height of 5 m. (g = I0 ms^{-2}

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97. Numerical problems Calculate

(a)Increase in the P.E. of a boy of mass 50kg when be moves from a height of 5 m to 8 m (g= 10 ms^{-1})

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98. Numerical problems Calculate

Work done by the boy against gravity

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99. Numerical problems Calculate

How fast sbould a man of 70 kg run so that his kinetic energy is 1715 J?

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100. Numerical problems Calculate

Work done by a man of weight of 300 N in, climbing the second floor of a building 7 .0 mhigh

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101. Numerical problems Calculate

Speed of a 1 kg mass having KE. equal to 1 J.

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102. Numerical problems Calculate

Velocity of a body of mass 100 g having a K.E. of 20 J.

Watch Video Solution

103. Numerical problems Calculate

The height to which an object of 0.5 kg will rise if 1 J of energy is applied do it

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104. Numerical problems Calculate

The kinetic energy of a boy of mass 50 kg sitting in a car moving with a uniform velocity of 72 km/hr

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105. Numerical problems Calculate

Work done in holding a 15 kg bag while waiting for a bus IO minutes

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106. A mass of 4 kg originally at rest is pulled by a string along a smooth horizontal surface. The force of 15 N is maintained until the mass undergoes a displacement of 20m. at which stage the mass is allowed to keep moving at

constant velocity.

How much work is done by the force ?

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107. A mass of 4 kg originally at rest is pulled by a string along a smooth horizontal surface. The force of 15 N is maintained until the mass undergoes a displacement of 20m. at which stage the mass is allowed to keep moving at constant velocity.

What would be the velocity of the mass at the end of 20 m ?

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108. A ball of mass 500 g falls from a height of 4 m Find the K.E. of the ball when it reaches the ground. (Take g =9.8 $\frac{m}{s^2}$)

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109. A body of mass 10 kg is dropped from a height of 20 m. (Take g = 10 $\frac{m}{s^2}$)

Fuid its potential energy before it is dropped

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110. A body of mass 10 kg is dropped from a height of 20 m. (Take g = 10 $\frac{3}{s^2}$)

Its kinetic energy when it is 8 m abgve the ground

Watch Video Solution

111. A body of mass 10 kg is dropped from a height of 20 m. (Take g = 10 $\frac{3}{s^2}$)

Its kinetic energy when it hits the ground.

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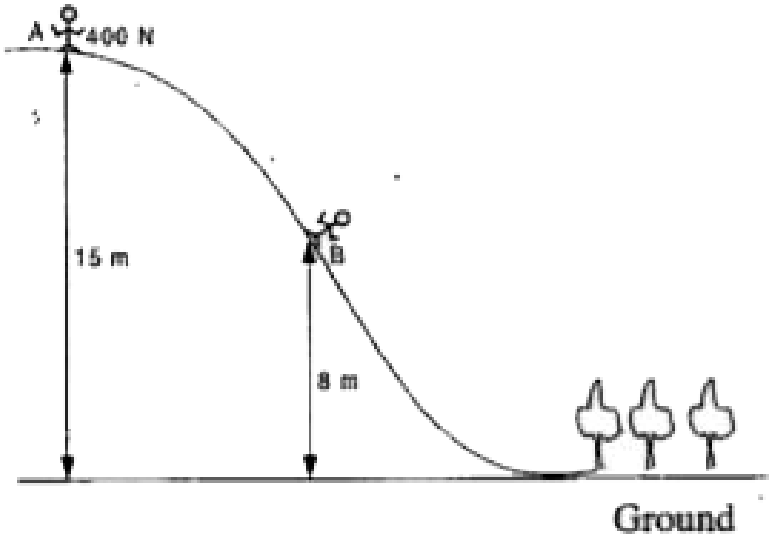
112. Use the figure below to fmd the following



the skier's gravitational potential energy at point A.

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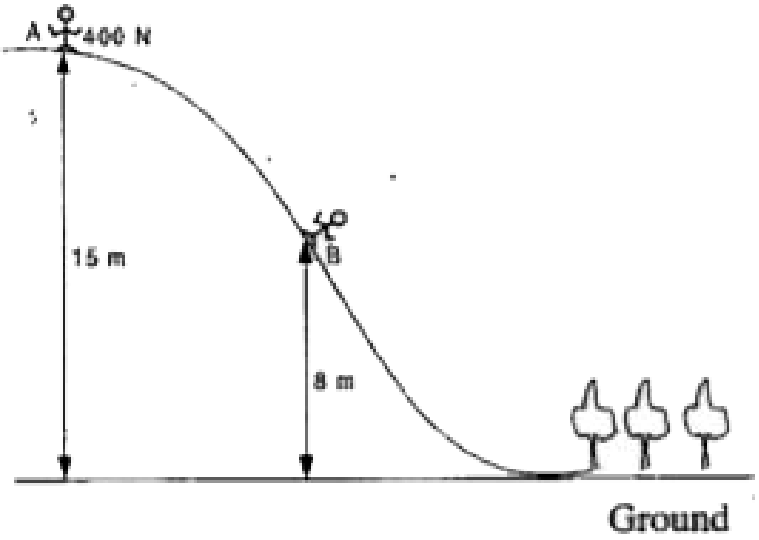
113. Use the figure below to fmd the following



the skier's gravitational potentiafenergy at point B.

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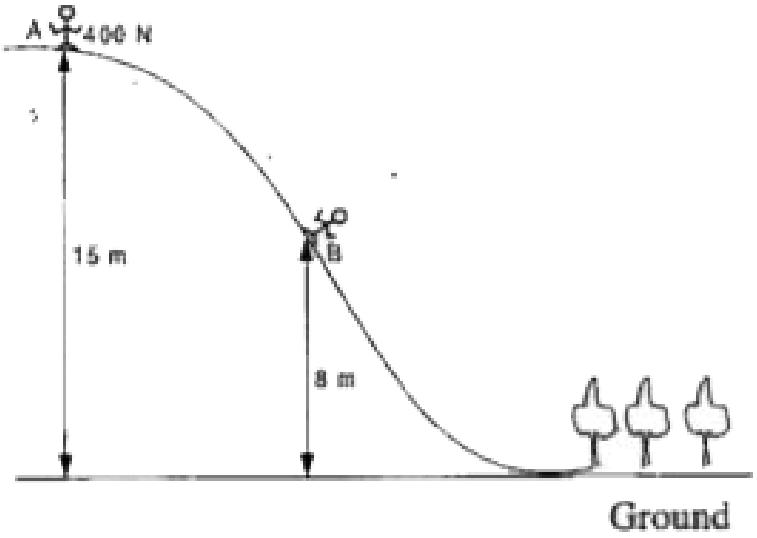
114. Use the figure below to fmd the following



the skier's kinetic energy at B.

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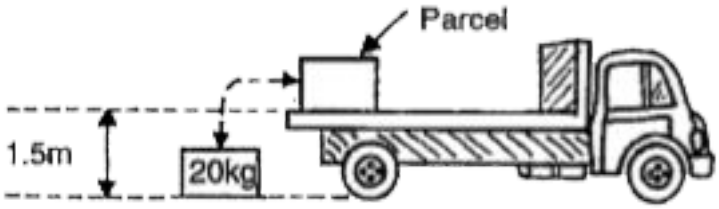
115. A person lifts a parcel of mass 20 kg 1.5 m up from the ground and puts it in a truck. Find



What force needs to be applied to the parcel to move it up at constant speed ?

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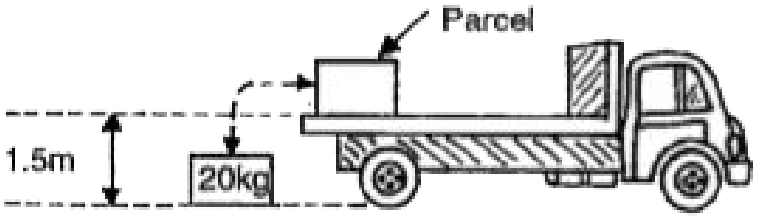
116. A person lifts a parcel of mass 20 kg 1.5 m up from the ground and puts it in a truck. Find



What is the work done by the force ?

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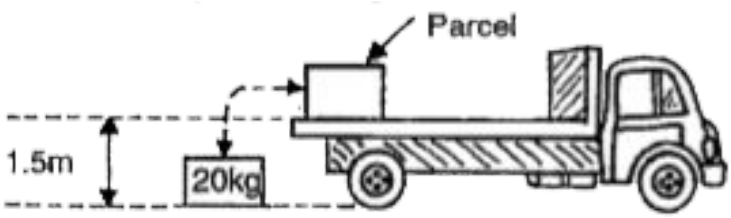
117. A person lifts a parcel of mass 20 kg 1.5 m up from the ground and puts it in a truck. Find



The work is now stored as energy in the parcel. What type of energy is it?

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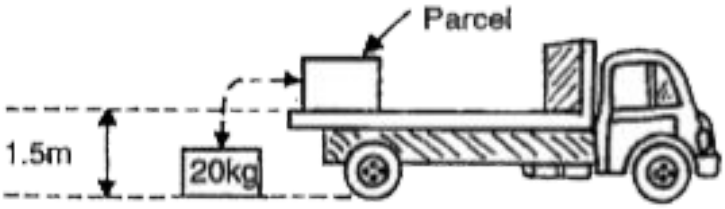
118. A person lifts a parcel of mass 20 kg 1.5 m up from the ground and puts it in a truck. Find



H the parcel were to fall off the back of the trock, what would happen to this stored energy as it fell to the ground ?

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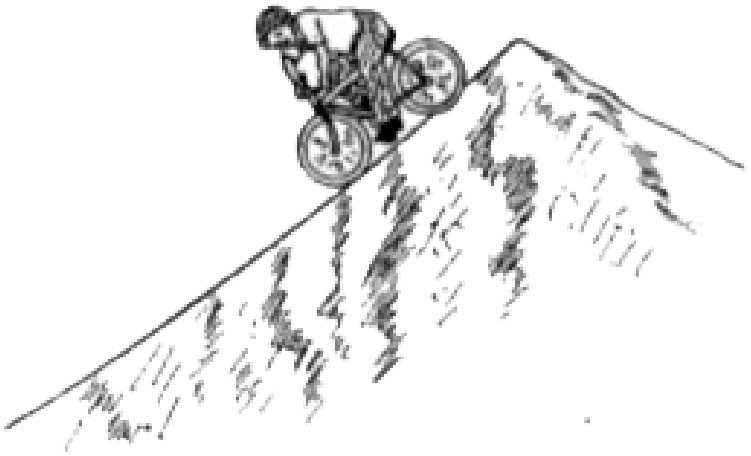
119. Suppose that while riding bike, a person coasts down both a small hill and a large hill. Compare his final speed at the bottom of the small hill with his final speed at the bottom of the large hill. Explain your answer



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120. Use the following to create a concept map.

Energy, Kinetic energy, Potential energy, Joule, Gravitational, Mechanical, Chemical, Electrical, Thermal, Sound, Light, Elastic Renewable, Non-renewable, Solar, Wind, Running water, Petrol, Coal, Fossil fuels, Biomass.

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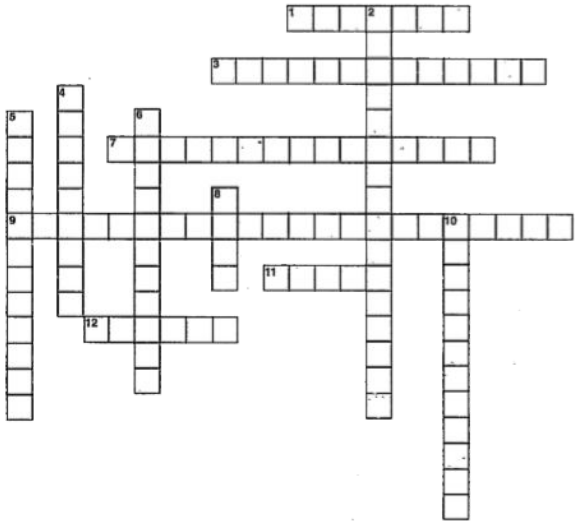
121. Solve the following crossword with the help of the given clues :



ACROSS

1. Organic materials, such as plant matter and manure
3. The energy possessed by a body as a result of being in motion.
7. The energy possessed by a body as a result of its position or condition.
9. Energy stored when objects are stretched, compressed or bent.
11. Unit of work and energy
12. The capacity or power to do work.

DOWN

2. Total energy of motion and position of an object.
4. Relating to a natural source, such as solar energy that is never used up or that can be replaced b new growth.
5. The continuance of a physical quantity, such a mass, in the same amount.
6. Fuels derived from the hardened remains of plants and animals.
8. Force multiplied by the distance over which it is moved.
10. Relating to a natural source that cannot be replaced once it has been used.

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Self Assessment Sheet 3

1. Which of the following is a non-renewable source of-energy ?

A. coal

B. water

C. air

D. none of these

Answer:

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2. The leaning tower of Pisa is 45 m high. A mass of 4 kg is drow from the. top Calculate its potential eneigy at the top

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3. Match correctly the lists of items in column I and collumn II

Column I	Column II
1. A falling leaf.	a. chemical energy
2. A raised hammer	b. light energy
3. A stretched rubber	c. potential energy
4. Explosives	d. mechanical energy
5. Switching on an electric bulb	e. kinetic energy

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4. Answer true or false.

A body can have only-one type of energy at a time.

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5. Answer true or false.

The S.I unit of energy is Joule.

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6. Answer true or false.

Water is a non-renewable source of energy

Watch Video Solution

7. Answer true or false.

An electric bulb converts heat energy into light energy

Watch Video Solution

8. Answer true or false.

Work done does not depend on time

Watch Video Solution

9. Answer true or false.

The sun is the source of most energy on Earth

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10. Compare fossil fuels and biomass as energy resources.

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11. Answer the following questions :

Where does the kinetic energy come from when you role down a hill

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12. Answer the following questions :

Why are light bulbs so hot after they have been on for a while

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13. Answer the following questions :

How much work had to be done to give the box that energy ?

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14. Answer the following questions :

}lf the box weighs 200N, how far above the ground is it?

View Text Solution

15. Answer the following questions :

How is the kinetic energy of a moving cart affected if

View Text Solution

16. Answer the following questions :

its mass doubled

View Text Solution

17. Answer the following questions :

its velocity is tripled ?

View Text Solution

18. Answer the following questions :

A body falls freely under gravity from rest

Name the kind of energy it will possess

Watch Video Solution

19. Answer the following questions :

while falling

Watch Video Solution

20. A body falls freely under gravity from rest.

Name the kind of energy it will possess

(a) at the point from where it falls,

(b) while falling,

(c) on reaching the ground.

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21. A body is thrown vertically upwards ? Its velocity goes on decreasing. What happens to its kinetic energy as its velocity becomes zero ?

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22. two bodies A and B of equal masses are kept at heights of h and 2h respectively. What will be the ratio of their potential energies ?

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23. A truck weighing 5×10^3 kgf and.a cart weighing 500 kgf are moving with the same speed. Compare their kinetic energies.

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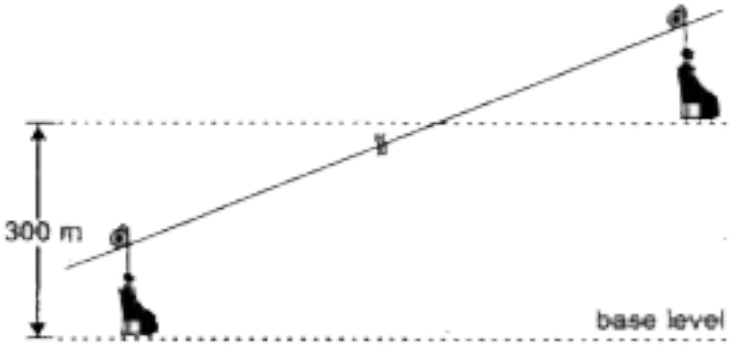
24. A ski lift elevates a skier of total mass 70 kg a vertical displacement of 300 m.on ski slope. What work is done to elevate the skier ?



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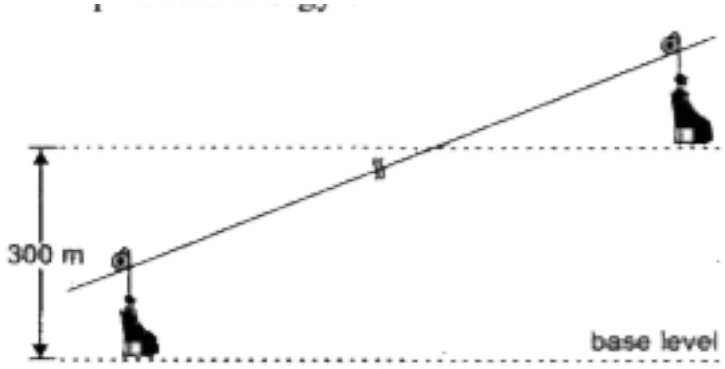
25. A ski lift elevates a skier of total mass 70 kg a fertical displacement of 300 m.on ski slope.

What is the gain in the skier·'s gravitational potential energy ?



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26. A bike is pedalled with 100 J·of energy and then coasts·. It does. 80 J of work in moving forward until it stops. How much of the energy

that was put into the bike became thermal energy?

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27. Imagine that you drop a ball. It bounces a few times and then it stops. Your friend says that the energy that the ball had is gone Where did the energy go ? Evaluate your friends statement based on energy conservation.

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