PHYSICS

BOOKS - NAVNEET PUBLICATION

WORK AND ENERGY

Exampels

1. What are the different types of force and their examples?

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2. What will happen in the following case

A fast cricket ball strikes the stumps.

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3. What will happen in the following case

The striker hits a coin on the carrom board.

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4. What will happen in the following case

One marble strikes another in a game of marbles.

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Exercise

1. Fill in the blanks with appropriate words and writw the completed statemenrs:

The work done is zero if there is no.....

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2. Fill in the blanks with appropriate words and writw the completed statemenrs:

Flowing water has.....energy.

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3. Fill in the blanks with appropriate words and writw the completed statemenrs:

By stretching the rubber strings of a catapult we store.....energy in it.

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4. Fill in the blanks with appropriate words and write the completed statements:

The energy stored in a dry cell is in the form of .....

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5. Fill in the blanks with appropriate words and write the completed statements:

The kinetic energy of a body of mass 2 kg moving with a velocity of $1\frac{m}{s}$ is .....J.

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6. Fill in the blanks with appropriate words and write the completed statements:

The work done is zero if the angle between the forece acting on a body and the displacement of the body is .....

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7. Fill in the blanks with appropriate words and write the completed statements:

The CGS unit of work is the .....

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8. Fill in the blanks with appropriate words and write the completed statements:

The SI unit of energy is the .....

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9. Fill in the blanks with appropriate words and write the completed statements:

The kilowatt hour (kW h) is the unit of .....

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10. Fill in the blanks with appropriate words and write the completed statements:

The rate of doing work is called.....

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11. Choose the correct alternative and write it along with its allotted alphabet:

The potential energy of your body is least when you are .....

A. sitting on a chair

B. sitting on the ground

C. sleeping on the ground

D. standing on the ground

A. sitting on a chair

B. sitting on the ground

C. sleeping on the ground

D. standing on the ground

Answer: C

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12. Choose the correct alternative and write it along with its allotted alphabet:

The total energy of an object falling freely towards the ground.....

A. decreases

B. remains unchanged

C. increases

D. increases in the beginning and then decreases

A. decreases

B. remains unchanges

C. increases

D. increases in the beginning and then decreases

Answer: B

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13. Choose the correct alternative and write it along with its allotted alphabet:

If we increase the velocity of a car moving on a flat surface to four times its original speed, its potential energy.....

A. will be twice its original energy

B. will not change

C. will be 4 times its original energy

D. will be 16 times its original energy

A. will be twice its original energy

B. will not change

C. will be 4 times its original energy

D. will be 16 times its original energy

Answer: B

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14. Choose the correct alternative and write it along with its allotted alphabet:

The work done on an object does not depend on .....

A. displacement

B. applied force

C. initial velocity of the object

D. the angle between force and displacement

A. displacement

B. applied force

C. initial velocity of the object

D. the angle between force and displacement

Answer: C

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15. Choose the correct alternative and write it along with its allotted alphabet:

Work done

A. is always positive

B. is always negative

C. can be positive, negative or zero

D. can never be zero

A. is always positive

B. is always negative

C. can be positive, negative or zero

D. can never be zero

Answer: C

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16. Choose the correct alternative and write it along with its allotted alphabet:

The SI unit of work is the.....

A. joule

B. erg

C. dyne

D. kilogram

A. joule

B. erg

C. dyne

D. kilogram

Answer: A

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17. Choose the correct alternative and write it along with its allotted alphabet:

The CGS unit of energy is the.....

A. joule

B. erg

C. dyne

D. newton

Answer: B

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18. Choose the correct alternative and write it along with its allotted alphabet:

When you compress a spring, the potential energy of the spring.....

A. increases

B. decreases

C. remains unchanged

D. becomes zero

Answer: A

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19. Choose the correct alternative and write it along with its allotted alphabet:

When an object of mass 10kg is lifted through 3 metres by the applicaton of a force, the work done by the applied force is..... $\left(g = 9.8\frac{m}{s^2}\right)$

A. 30J

B. 147J

C. 29.4J

D. 294J

Answer: D

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20. Choose the correct alternative and write it along with its allotted alphabet:

The kinetic energy of a body is.....

A. mv^2

B. $\frac{1}{2}(mv)$

C. $\frac{1}{2}(mv^2)$

D. $2mv^2$

Answer: C

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21. Choose the correct alternative and write it along with its allotted alphabet:

The kinetic energy of a body of mass 2 kg moving with a velocity of $2m/s$ is .....

A. 8J

B. 4J

C. 2J

D. 16J

A. 8J

B. 4J

C. 2J

D. 16J

Answer: B

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22. Choose the correct alternative and write it along with its allotted alphabet:

Power is the.....

A. time rate of change of momentum

B. time rate of doing work

C. product of force and displacement

D.capacity to do work

A. time rate of change of momentum

B. time rate of doing work

C. product of force and displacement

D. capacity to do work

Answer: B

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23. Choose the correct alternative and write it along with its allotted alphabet:

The gravitational potential energy of a body at a height h from surface of the energy is .....

A. $\frac{1}{2}mgh$

B. mgh

C. mv^2

D. mg

A. $\frac{1}{2}mgh$

B. mgh

C. mv^2

D. mg

Answer: B

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24. Choose the correct alternative and write it along with its allotted alphabet:

In the case of a body falling freely.....

A. its potential energy remains constant

B. its kinetic energy remains constant

C. its potential energy is converted into kinetic energy

D. its kinetic energy Is converted into potential energy

A. its potential energy remains constant

B. its kinetic energy remains constant

C. its potential energy is converted into kinetic energy

D. its kinetic energy os converted into potential energy

Answer: C

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25. Choose one or more alternatives:

For work to be performed, energy must be .....

A. transferred from one place to another

B. concentrated

C. transformed from one type to another

D. destroyed

A. transferred from one place to another

B. concentrated

C. transformed from one type to another

D. destroyed

Answer: A::C

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26. Choose one or more alternatives:

the joule is the unit of.....

A. force

B. work

C. power

D. energy

A. force

B. work

C. power

D. energy

Answer: B::D

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27. Choose one or more alternatives:

Which of the forces involved in dragging a heavy object on a smooth, horizontal surface, have the same magnitude?

A. the horizontal applied force

B. gravitational force

C. reaction force in vertical direction

D. force of friction

Answer: B::C

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28. Choose one or more alternatives:

Power is a measure of the .....

A. the rapidity with which work is done

B. amount of energy required to perform the work

C. the slowness with which work is performed

D. length of time

Answer: A::C

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29. Choose one or more alternatives:

While dragging or lifting an objectm negative work is done by.....

A. the applied force

B. gravitational force

C. frictional force

D. reaction force

Answer: B::C

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30. State whether the following statements are true or false:

Power is a scalar quantity.

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31. State whether the following statements are true or false:

The kilowatt.hour is a unit of energy.

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32. State whether the following statements are true or false:

The CGS unit of energy is the dyne.

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33. State whether the following statements are true or false:

The. SI unit of work is the newton

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34. State whether the following statements are true or false:

The kinetic energy of a body of mass, , moving with velocity v is $\frac{1}{2}mv^2$.

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35. Find the odd one out and give the reason:

Work, energy, power, force.

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36. Find the odd one out and give the reason:

A stretched spring, A body placed at some height from the ground,

A stretched bow, a bullet fired from a gun.

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37. Complete the following table

Fill in the blanks:

K.E. (J)	m(kg)	v(m/s)
(1)	28	15
(2) 2000	10	.....
(3) 9520	.....	4

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38. Answer the following questions:

In what sense is the word work used in everyday life? Give two examples.

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39. Answer the following questions:

In what sense is the word work used in scientific terms? Give two examples.

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40. Answer the following questions:

Suppose we stand in one place, hold a book in our hand and stretch the hand in the horizontal position.Is work being done on the book?

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41. Answer the following questions:

Define work.

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42. Answer the following questions:

Derive the expression for the work done when the displacement is in the direction of the force.

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43. Answer the following questions:

Obtain an expression for the work done by a force acting on a body when the angle between the force and the dispalcemnt of the body is 0.

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44. Answer the following questions:

Determine the amount of work done when an

object is displaced at an angle of 30° with respect to the direction of the applied force.

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45. Answer the following questions:

State the condition under which the work done is (i) positive (ii) negative(iii) zero.

Why is the work done on an object moving with uniform circular motion zero?

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46. Answer the following questions:

Give two examples of positive work done

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47. Answer the following questions:

Give two examples of negative work done.

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48. Answer the following questions:

Give two examples of zero work done.

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49. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Activity: One applies a force on a big rock but fails to move it.

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50. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Activity: A student reads a book.

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51. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Phenomenon: The revoluition of the earth arpound the sun.

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52. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Activity: A person carries some goods on a handcart.

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53. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Activity: A worker climbs a staircase with some load o n his head.

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54. Answer the following questions:

In the following case, state whether work is done or not. Justify your answer:

Activity: A body slides on a frictonless horizontal surface with a uniform velocity.

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55. Answer the following questions:

In the following case, state giving reasons whether the work done is positive or negative:

Activity: A boy goes from the first floor to the third floor with his school bag. Force: The force applied by the boy.

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56. Answer the following questions:

In the following case, state giving reasons whether the work done is positive or negative:

Activity: A cyclist applies brakes to his bicycle, yet the bicycle covers some distance before coming to a halt. Force: the force applied by the brakes.

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57. Answer the following questions:

In the following case, state giving reasons whether the work done is positive or negative:

Phenomenon: A ripe fruit falling from a tree.

Force: Gravitational force of the earth.

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58. Answer the following questions:

What do you understand by unit work?

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59. Answer the following questions:

State the SI and CGS units of work.

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60. Answer the following questions:

State the SI and CGS units of work.

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61. Answer the following questions:

Define the joule and the erg.

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62. Answer the following questions:

Obtain the relation between the joule and the erg.

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63. Answer the following questions:

Give one example in which a body is acted upon by forces, but the work done is zero.

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64. Answer the following questions:

Defien energy.

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65. Answer the following questions:

State the SI and CGS units of energy.

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66. Answer the following questions:

Why do energy and work have the same units?

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67. Answer the following questions:

What are the two forms of mechanical energy?

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68. Answer the following questions:

Define kinetic energy.

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69. Answer the following questions:

Give two examples of kinetic energy.

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70. Answer the following questions:

Derive the formula for the kinetic energy of an object of mass m moving with velocity v.

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71. Answer the following questions:

can kinetic energy be negative? Why?

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72. Answer the following questions:

If an object has 0 momentum, does it have kinetic energy? Explain your answer.

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73. Answer the following questions:

What do you understand by the kinetic energy of a body? With suitable examples explain how a body does work by virtue of its kinetic energy.

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74. Answer the following questions:

Explain the correlation between work and energy.

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75. Answer the following questions:

Explain the statement, "work is done due to transfer of energy."

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76. Answer the following questions:

Define potential energy.

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77. Answer the following questions:

Give two examples of potential energy.

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78. Answer the following questions:

Obtain the expression for the gravitational potential energy.

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79. Answer the following questions:

What do you understand by the potential energy of a body?

Explain it with a suitable example.

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80. Answer the following questions:

Classify the following into potential energy and kineti energy:

(1) Water stored on the top of a hill (2) An

arrow released from a stretched bow (3) A stretched spring (4) A revolving electric fan.

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81. Answer the following questions:

Classify each of the following into kinetic energy, potential energy or kinetic energy and potential energy:

(1) A compressed spring (2) The wound up spring of a watch (3) A raised hammer (4) A bullet released from a gun (5) A falling stone

(6) The swinging pendulum of a clock (7) The explosive mixture in a bomb (8) wind (9) Water stored in a dam (10) A stretched bow string (11) Running water (12) waterfall.

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82. Answer the following questions:

Name the various forms of energy.

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83. Answer the following questions:

How is heat energy needed to cook food obtained?

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84. What is the current electricity?

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85. Answer the following questions:

What is solar energy?

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86. Answer the following questions:

State two used of solar energy.

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87. Answer the following questions:

What is chemical energy?

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88. Answer the following questions:

What is nuclear energy?

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89. Answer the following questions:

State one use of nuclear energy?

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90. Answer the following questions:

State the law of conservation of energy.

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91. Answer the following questions:

Explain with any three examples how various forms of energy are interchangeable.

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92. Answer the following questions:

Explain with a neat labelled diagram, the interconversion of potential energy and kinetic energy during the oscillatory motion of a simple pendulum.

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93. Answer the following questions:

Show that the total energy (potential energy+kinetic energy) of a freely falling body remains constant during its motion.

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94. Answer the following questions:

Prove that the kinetic energy of a freely falling object on reaching the ground is nothing but

the transformation of its initial potential energy.

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95. Answer the following questions:

What happens to the chemical energy stored in a fire cracker when it explodes?

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96. Answer the following questions:

A batsman hits a six. What is the nature of energy transformaiton of the ball?

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97. Answer the following questions:

Define power.

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98. Answer the following questions:

State the SI and CGS units of power and write the relation between them.

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99. Answer the following questions:

Define the watt.

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100. Answer the following questions:

State the units of power used in industry and for commercial purpose. Express them in watt.

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101. Answer the following questions:

What is the kilowatt.hour? How is it related to the joule?

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102. Answer the following questions:

List the electrical gadgets you use at your home. Identify and prepare a list of energy transformation that take place.

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103. Answer the following questions:

In an assembly hall microphones and loudspeakers are used. What is the energy transformation taking place?

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104. Answer the following questions:

What is the power of an engine, which is working at the rate of 1000 joules per second?

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105. Use your Brain Power!

If the mass of a moving body is doubled, how many times will be kinetic energy increase?

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106. Use your Brain Power!

Can your father climb stairs as fast as you can?

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107. Use your Brain Power!

Will you fill the overhead water tank with the help of a bucket or an electric motor?

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108. Use your Brain Power!

Suppose Rajashree, Yash and ranjeet have to reach the top of a small hill. Rajshress wen to car, Yash went by cycling while Ranjeet went by walking. If all of them choose the same path, who will reach first and who will reach last?

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109. Give scientific reasons:

It is easy to swim in a swimming pool than in a river.

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110. Give scientific reasons:

When a body performs uniform circular motion, the work doen is zero.

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111. Give scientific reasons:

The wound spring of a watch possesses potential energy.

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112. Give scientific reasons:

A fast bowler takes a longer start while bowling.

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113. Give scientific reasons:

When a bullet fired from a gun strikes the target, the target becomes hot.

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114. Give scientific reasons:

A bicycle moving fast on a levelled road moves up to a certain height on an uphill road even without its being pedalled.

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115. Differentiate between OR difference between:

Kinetic energy and Potential energy.

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116. Solve the following examples:

Ravi applied a force of 10 N and moved a book 30 cm in the direction of the force. How much was the work done by Ravi?

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117. Solve the following examples:

A force of 20 N acts on a body. If the displacement of the body is 0.6 m in the

direction opposite to that of the force, calculate the work done by the force.

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118. Solve the following examples:

A body of mass 0.1 kg thrown upward reaches a maximum height of 10 m. Calculate the work done by the force of gravity during this vertical displacement.

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119. Solve the following examples:

Ajit carries a load of 17 kg from the ground to the height of 2 m from the ground. Calculate the work done by him.

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120. Solve the following examples:

When a force of 20 N acts on a body, the body is displaced by 5 m. If the angle between the force and displacement is 60°, find the work done by the force.

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121. Solve the following examples:

If the energy required to move a body of mass 1 kg from the ground level to a certain height is 49 J, find the height.

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122. Solve the following examples:

If the energy of a ball falling from a height of

10 metres is reduced by $40\ \%$, how high will it rebound?

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123. Solve the following examples:

A body of mass 1 kg has kinetic energy 2 J. Find the velocity of the body.

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124. Solve the following examples:

The velocity of a car increases from $54km/h$ to $72km/h$. If the mass of the car is 1500 kg, find the work done to increase the velocity.

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125. Solve the following examples:

A man carrying a box of mass 20 kg climbs up to a height of 1m in 40s. Calculate the power delivered by him to the box.

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126. Solve the following examples:

An electric pump has 2 kW power. How much water will the pump lift every minute to a height of 10m?

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127. Solve the following examples:

If a 1200 W electric iron is used daily for 30

minutes, how much total electricity is consumed in the month of April?

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128. Solve the following examples:

Find the mass of water lifted by a pump of power 0.5 hp to a height of 5m in 98 seconds.

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129. Solve the following examples:

An electric bulb of 40 W is used for 25 days at 10 hours per day. Find the units of energy consumed by the bulb and the cost of using electricity at the rate Rs. 2 per unit.

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130. Calculate the work done when a force of 60 N displaces a body through 10 m in the direction of the force.

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131. When a force of 30 N acts on a body, the body is displaced by 10 m in the direction inclined at 60° to the force. Find the work done by the force.

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132. A body of mass 5 kg is lifted through a height of 20 m. Calculate the work done by the applied force.

Watch Video Solution

133. If the energy of a ball falling from a height of 20 m is reduced by 60%, how high will it rebound?

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134. A body of mass 2 kg moves with a velocity of 5 m/s. Find its kinetic energy.

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135. The speed of a body of mass 4 kg increases from $2m/s \rightarrow 4m/s$ in certain time interval. Find the increase in the kinetic energy of the body.

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136. Calculate the potential energy of a body of mass 5 kg at a height of 2m from the ground.

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137. A box of mass 10 kg is lifted through a height of 10 m in 49 s. Find the corresponding power.

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138. Find the mass of water lifted by a pump of power 0.5 hp to a height of 10 m in 49s.

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139. A pump lifts 373 kg of water to a height of 10m in 98s. Find the power of the pump. Express it in horsepower.

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140. An electric bulb of 40 W is used for 50 days at 5 hours per day. Find the units of energy consumed by the bulb and the cost of using electricity at the rate Rs. 3 per unit.

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