PHYSICS

BOOKS - MBD -HARYANA BOARD

WORK, ENERGY AND POWER

Example

1. A force of 7N acts on an object. The displacement is, say 8m, in the direction of the force, Let us take it that the force acts on the

object throughout the displacement. What is the work done in this case ?

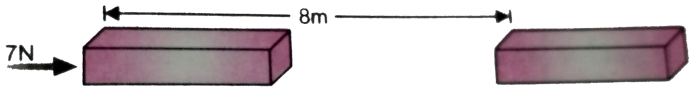

FIGURE 5.16

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2. When do we say that work is done ?

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3. Write an expression for the work done when a force is acting on an object in the direction of its displacement.

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4. A pair of bullocks exerts a force of $140N$ on a plough. The field being ploughed is $15m$ long. How much work is done in ploughing the length of the field?

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6. Define 1 J of work.

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7. What is the kinetic energy of an object ?

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8. Write an expression for kinetic energy of an object.

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9. The kinetic energy of an object of mass` m moving with a velocity of 5 m//s is 25 J. What will be its kinetic energy when its velocity is

doubled ? What will be its kinetic energy - when its velocity si increased three times ?

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10. What is power ?

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11. Define 1watt of Power.

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12. A lamp consumes 1000 J of electrical energy is 10 s. What is its power ?

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13. Define Average Power.

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14. Look at the activities listed below. Reson out whether or not work is done in the light of

your understanding of the term work. Suma is swimming in a pond.

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15. Look at the activites listed below. Reason out whether or not work is done in the light of your understanding of the term 'work'. (a) Suma is swimming in a pond. (b) A donkey is carrying a load on its back. (c) A wind -mill is lifting water from a well. (d) A green plant is carrying out photosynthesis. (e) An engine is

pulling a train. (f) Food grains are getting drired in the Sun. (g) A saliboat is moving due to wind energy.

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20. An object thrown at a certain angle to the ground moves in a curved path and falls back to the ground. The intial and the final points of the path object lie on the same horizontal line. What is the work done by the force of gravity on the object ?

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21. A battery lights a bulb. Describe the energy changes involved in the process.

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22. Certain force acting on a 20 kg mass changes its velocity from $5ms^{-1}$ to $2ms^{-1}$. Calculate the work done by the force.

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23. A mass of 10 kg is at a point A on a table. It is moved to a point B. If the line joining A and B is horizontal, what is the work done on the

object by the gravitational force ? Explain your answer.

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24. The potential energy of a freely falling object decreases progressively. Does this violate the law of conservation of energy ? Why ?

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25. What are the verious energy transformations that occur when you are riding a bicycle ?

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26. Does the transfer of energy take palce when you push a huge rock with all your might and fail to move it ? Where is the energy you spend going ?

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27. A certain household has consumed 250 units of electric energy during a month.How much energy is this in joules ?

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28. An object of mass 40 kg is raised to a height of 5 m above the ground. What is its potential energy ? If the object is allowed to fall, find its kinetic energy when it is half - way down.

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29. What is the work done by the force of gravity on a satellite moving round the Earth ? Justify your answer.

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30. Can there be a displacement of any object in the absence of any external force?

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31. A person holds a bundle of hay over his head for 30 minutes and gets tired. Has he done some work or not ? Justify your answer.

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32. An electric heater is rated 1500W. How much energy does it use in 10 hours ?

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33. An electric heater is rated 1500 W. How much energy does it use in 10 hours ?

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34. An object of mass m is moving with a constant velocity v How much work should be done on the object in order to bring the object to rest ?

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35. Calculate the work required to be done to stop a car of $1500kg$ moving with a speed of $60km/h$.

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36. What do you mean by kinetic energy ? Derive an expression for the kinetic energy of an object of mass m moving with velocity, v.

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37. Explain the law of conservation of charge with the help of a suitable example.

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38. If the force acting on the object is not in the direction of motion then how will you consider the work done ? Explain giving example and also tell when will the work done be minimum and when it will be maximum ?

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39. Define power and its SI unit.?

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40. Can a given amount of mechanical energy be completely converted into heat ?

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41. Differentiate between Potential Energy and Kinetic Energy.

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42. (a) What do you understand by the kinetic energy of a body ?

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

(c) A horse and a dog are running with the same speed. If the weight of the horse is ten times that of the dog, what is the ratio of their kinetic energies ?

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43. Two masses m and 2m are dropped from height h and 2h. On reaching the ground, which will have a greater kinetic energy and why ?

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44. Two objects having same mass 'm' are moving with velocities v and 2v. Find ratio of

their kinetic energies.

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45. A man drops a 10 kg rock from the top of a 20 m ladder. What will be its kinetic energy when it reaches the ground ? What will be its speed just before it hits the ground ? Does the speed depend on the mass of the rock ?

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46. A rocket of maxx 3×10^6kg takes off from a launching pad and acquires a verticle velcoity of 1km//s and an altitude of 25km. Calculate its (a) potential energy (b) kineitc energy.

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47. An electric heater of 1000W is used for 2 hours a day. What is the cost of using it for a month of 28 days, if 1 unit costs ? 3.00 ?

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48. The power of a motor pump is 5 kW. How much water per minute the pump an raise to height of 20 m ? Take$g = 10ms^{-2}$.

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49. Calculate the electricity bill amount for the month of November of a family if 4 tube lights of 40 W each for seven hours, a TV of 150 W for three hours and two bulbs of 60 W each

for four hours are used per day. The cost per unit is RS 3.50.

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50. A person carrying 10 bricks each of man 2.5 kg. on his head moves to a height 20 metres in 50 seconds. Calculate the power spent in carrying bricks of the person.

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51. A car of 1000 kg moving with a velocity of $30m/s$ stops with uniform acceleration after covering a distance of 50 m on application of brakes. Find the force applied by the brakes on the car and also work done.

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52. What is the kinetic energy of a body of mass 1 kg moving with a speed of 2 m/s ?

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53. The work done by the heart 1J per beat. Calculate the power of the heart if it beats 72 times//min.

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54. Commercial Unit Of Energy

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55. What is the work done by centripetal force in moving a body through half cycle on the circular path of radius 35 m ?

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56. 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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57. If the heart works 60 joules in one minute, what is its power ?

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58. Fill In the blanks:

__ is the sum of kinetic energy and potential energy.

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59. How many joules are there in one kilowatt-hour?

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60. By what factor the velocity of a body should be increased so that its kinetic energy is increased by a factor of nine ? Justify your answer.

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61. Work done by a force on an object is zero, if

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62. What is the power of a machine which does 1000 joules of work in 10 seconds ?

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63. What is the SI unit of kinetic energy ?

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64. If a compressed spring is dissolved in acid, what happens to the elastic potential energy of the spring ?

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