PHYSICS

BOOKS - MBD

WORK, ENERGY AND POWER

Example

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

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

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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 displacment.

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4. A pair of bullocks exerts a force of 140 N on a plough. The field being ploughed is 15 m 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. Define kinetic energy?

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

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9. The kinetic energy of an object of mass 'm' moving with a velocity of $5ms^{-1}$ is 25 J. What will be its kinetic energy when its velocity is doubled ? What will be its kinetic energy when its velocity is increased to 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 1,000 J of electric energy in 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. Reason 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 activities listed below. Reason out whether or not work is done in the light of your understanding of the term 'work'. A donkey is carrying a load on its back

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16. Look at the activities listed blew. Reson out whether or not work is done in the light of your understanding of the term 'work'. A wind-mill is lifting water from a well.

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17. Look at the activities listed below. Reason out whether or not work is done in the light of your understanding of the term 'work'. A green plant is carrying out photosynthesis.

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

your understanding of the term 'work'. Food grains are getting dried in the sun.

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19. Look at the activities listed below. Reason out whether or not work is done in the light of your understanding of the term 'work'. A sail boat is moving due to wind energy.

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20. An object throw at a certain angle to the ground moves in a curved path and falls back to the ground. The initial and final points of the path of 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 line joining A and B is horizontal, what is the work done on the

object by 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 various energy transformations that occur when you are riding a bicycle ?

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26. Does the transfer of energy takes place when you push a huge rock with all your might and fail to move it ? Where is the energy you spent 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. Take$g = 10ms^{-2}$.

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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 1500 W. 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 velocity 'v'. How much work should be done on the object in order to bring the object at rest ?

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35. Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of $60kh^{-1}$.

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36. What is kinetic energy ? Derive a mathematical expression for kinetic energy .

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37. What is law of conservation of mass?

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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. What is work ? How can you calculate it ? Also give the unit of work.

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40. Show by giving an example that if force acting in the body does not produce any displacement then the work done will be zero ?

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41. A stone tied to one end of string is moved in a circle. How much work is done by the centripetal force in this circular motion ?

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42. What is power ? Write its SI unit also.

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43. Prove by an experiment that mechanical energy can be transformed into heat energy.

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44. Differentiate between Potential Energy and Kinetic Energy.

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45. A horse and a dog are running with the same velocity- If the mass of horse is ten times the mass of the dog then what will be ratio of their kinetic energy ?

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46. 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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47. Two objects having same mass 'm' are moving with velocities v and 2v. Find ratio of their kinetic energies.

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48. 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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49. A rocket of $3 \times 10^6 kg$ mass takes off from a launching pad and acquires a vertical velocity of 1 km/s at an altitude of 25 km. Calculate the potential energy, and the kinetic energy.

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50. 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 is 3.00 ?

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51. 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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52. 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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53. A person carrying 10 bricks each of mass 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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54. 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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55. A car is moving with a speed of$54km/h$. What will be the kinetic energy of the boy of mass 40 kg sitting in the car ?

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56. 1 Joule of energy is used for one heart beat. Calculate the power of the heart if it beats 72 times in one minute.

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57. State the relation between commercial unit of energy and joules.

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58. How much work is done on a body of mass 1 kg whirling on a circular path of radius 5m?

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59. What is the SI unit of power ?

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60. A ball is thrown vertically upwards. Its velocity keeps on decreasing. What happens to

its kinetic energy when it reaches the maximum height ?

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

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62. Name the term used for the sum of kinetic energy and potential energy of a body.

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63. How many joules are present in 1 kilowatt hour?

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64. What should be the change in velocity of a body required to increase its kinetic ? energy to four times of its initial value ?

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65. Under what conditions the work done by a force is zero in spite of displacement being taking place?

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66. What is the power of a machine which does 2000 joules of work in 10 seconds ?

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67. What is the SI unit of kinetic energy ?

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68. Waterflows down the mountains to the plains. What happens to the potential energy of water ?

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