Class 11 Physics · Chapter 5: Work, Energy and Power

Worksheet · 20 marks · about 40 minutes · based on NCERT

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1. The component of $\vec{A} = 4\hat{i} + 2\hat{j} + 4\hat{k}$ along the direction of $\vec{B} = 2\hat{i} - \hat{j} + 2\hat{k}$ is [1]

(a) 14 (b) 7/3

(c) 2 (d) 14/3

2. A child pulls a toy cart with a string that makes 60° with the horizontal. The tension in the string is 10 N and the cart moves 5 m along the level floor. The work done by the tension is [1]

(a) 50 J (b) 43.3 J

(c) 0 J (d) 25 J

3. Two vectors $\vec{A}$ and $\vec{B}$ have magnitudes 4 units and 6 units, and the angle between them is 120°. The scalar product $\vec{A}\cdot\vec{B}$ is [1]

(a) 12 (b) −12

(c) 24 (d) −24

4. The dimensions of the spring constant k are [1]

(a) $[MT^{-2}]$ (b) $[MLT^{-2}]$

(c) $[ML^{2}T^{-2}]$ (d) $[ML^{-1}T^{-2}]$

5. A 2 kW geyser is used for 45 minutes every day. The electrical energy it uses in 30 days is [1]

(a) 2700 kWh (b) 60 kWh

(c) 45 kWh (d) 4.5 kWh

6. A 2 kg book rests on a shelf 1.5 m above the floor. A table top is 0.8 m above the floor. Find the gravitational potential energy of the book (i) taking the floor as zero and (ii) taking the table top as zero. Show that the change in potential energy when the book is moved from the shelf to the table top is the same in both cases. ($g = 10\ m\ s^{-2}$) [2]

7. A stone tied to a string is whirled in a horizontal circle at constant speed. What is the work done by the tension in the string during one revolution? Give a reason, and check that your answer agrees with the work-energy theorem. [2]

8. An electric iron rated 1.5 kW is used for 40 minutes every day. Find the electrical energy it uses in 30 days in kWh, and the cost at ₹8 per kWh. [2]

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9. Prove the work-energy theorem for a variable force acting on a particle moving in one dimension. [3]

10. A car of mass 1200 kg has an engine that delivers a maximum power of 30 kW. On a level road the total resistive force on it is 1500 N. (a) Find its maximum speed on the level road. (b) Find its maximum speed up a slope that rises 1 m for every 20 m travelled along it, with the same resistive force. ($g = 10\ m\ s^{-2}$) [3]

11. A block of mass 0.2 kg is attached to a spring of spring constant 80 N m^{-1} and rests on a smooth horizontal surface. It is pulled 5 cm from its equilibrium position and released from rest. Find (a) the total mechanical energy of the system, (b) the maximum speed of the block, and (c) the displacement at which the kinetic energy equals the potential energy. [3]