

A-Level Physics

Name: _____ Score: _____

1. A force of 10 N pushes a box 3.0 m in the direction of the force. How much work is done?
_____ J
2. A 2.0 kg book is lifted 5.0 m. How much gravitational PE does it gain? (Use $g = 9.81 \frac{\text{m}}{\text{s}^2}$.)
_____ J
3. A force acting at right angles to the motion does how much work?
☐ the most work
☐ negative work
☐ zero
☐ positive work
4. A 4.0 kg trolley moves at $3.0 \frac{\text{m}}{\text{s}}$. What is its kinetic energy?
_____ J
5. Friction on a sliding object does negative work.
☐ True ☐ False
6. As a ball rolls down a frictionless ramp, its gravitational PE turns mainly into:
☐ elastic potential energy
☐ kinetic energy
☐ thermal energy
☐ electrical energy
7. Energy cannot be created or destroyed, only _____ from one form to another.

8. A 2.0 kg block slides from rest down a smooth ramp, dropping 1.5 m in height. What is its speed at the bottom, in $\frac{\text{m}}{\text{s}}$? ($g = 9.81 \frac{\text{m}}{\text{s}^2}$)

9. A machine takes in 200 J and gives out 60 J of useful energy. What is its efficiency (in %)?
_____ %
10. In $mg\Delta h$ the height is the distance travelled along the slope.
☐ True ☐ False

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1. **30 J**

Force is along the motion ($\theta = 0$), so $W = Fs = 10 \times 3.0 = 30 \text{ J}$.

2. **98.1 J**

$\Delta E_P = mg\Delta h = 2.0 \times 9.81 \times 5.0 \approx 98 \text{ J}$.

3. **zero**

$W = Fs \cos 90^\circ = 0$. The normal contact force on a car on a flat road does no work.

4. **18 J**

$E_K = \frac{1}{2}mv^2 = \frac{1}{2} \times 4.0 \times 3.0^2 = 18 \text{ J}$.

5. **True**

Friction points opposite to the motion ($\theta = 180^\circ$), so $W = -Fs$ – it takes energy away.

6. **kinetic energy**

With no friction, all the lost GPE becomes kinetic energy: $mgh = \frac{1}{2}mv^2$.

7. **transferred**

That is conservation of energy – the total in a closed system stays the same.

8. **5.4**

$mgh = \frac{1}{2}mv^2$, and the mass cancels: $v = \sqrt{2 \times 9.81 \times 1.5} = 5.4 \frac{\text{m}}{\text{s}}$. Use the VERTICAL drop, never the distance along the ramp.

9. **30 %**

$\frac{60}{200} \times 100\% = 30\%$. The other 140 J is wasted, mostly as heat.

10. **False**

It is the VERTICAL height gained or lost. Using the slope distance always overestimates the energy change, by a factor of $\frac{1}{\sin \theta}$.