

AQA GCSE Physics and Combined Science Energy Knowledge Questions

If you know the answers to all of these questions then you will have all the knowledge for this part of the course.

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Energy Stores and Systems

1. What is meant by a system? A group of objects.
2. There are changes in the way energy is stored when a system changes. Describe the energy changes and energy stores in the following examples.
 - a. an object projected upwards
 - b. a moving object hitting an obstacle
 - c. an object accelerated by a constant force
 - d. a vehicle slowing down
 - e. bringing water to a boil in an electric kettle.

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Energy transfer
will explained perfectly.

Changes in Energy

- Write down an equation to calculate the kinetic energy of a moving object. $KE = \frac{1}{2}mv^2$
- What is the unit of kinetic energy? Joule
- What is the unit of mass? kg
- What is the unit of velocity? m/s
- Rearrange this equation so that mass and velocity are the subject of the equation. E.g. mass =, velocity =. The velocity one must include a square root. $m = \frac{2KE}{v^2}$
- Write down an equation to calculate the amount of elastic potential energy stored in a stretched spring. $E = \frac{1}{2}ke^2$
- What are the units of elastic potential energy? Joule
- What are the units of the spring constant? N/m
- What are the units of extension? m
- Rearrange this equation so that spring constant and extension are the subjects of the equation. E.g. $k =$, $e =$. For extension, you will have to include a square root. $k = \frac{2E}{e^2}$ $e = \sqrt{\frac{2E}{k}}$
- What does the spring constant tell you? The amount of force needed to stretch a spring by a metre .
- Write down an equation to calculate the amount of gravitational potential energy gained by an object raised above ground level. $E = mgh$
- What is the unit of mass? kg
- What is the unit of height? m
- What is the unit of gravitational field strength? N/kg
- Rearrange the equation for mass. kg
- Rearrange the equation for the height m
- Rearrange the equation for gravitational field strength. $g = \frac{E}{mh}$
- What does a gravitational field strength of 10 N/Kg mean?
 $\text{EVERS 1kg pulled to Earth by 10 N.}$

Energy Changes in Systems

Energy needed to raise the temp of 1kg by 1°C.

1. Write down the equation to calculate the amount of energy stored in or released from a system as its temperature changes. This is the one with a specific heat capacity in it. $E = mc\Delta\theta$
2. What is the unit of change in thermal energy? Joule
3. What does the word thermal mean? Heat
4. What is the unit of mass? kg
5. What is the unit of specific heat capacity? $J/kg^\circ C$
6. What is the unit of temperature? $^\circ C$
7. What is the symbol for change in temperature? $\Delta\theta$
8. Write down the definition for specific heat capacity.

Δ means change.

Power

1. Copy and fill in the blanks. Power is defined as the rate at which energy is _____ or the rate at which work is done.
transferred.

$$power = \frac{\text{energy transferred}}{\text{time}}$$

$$[P = \frac{E}{t}]$$

$$power = \frac{\text{work done}}{\text{time}}$$

$$[P = \frac{W}{t}]$$

2. Consider these equations. ✓
3. Can you see by comparing the equations that work done = energy transferred? ✓
4. What is the unit of power? watt or W
5. What is the unit of energy? Joule
6. What is the unit of work done? Joule
7. What is the unit of time? second
8. Rearrange the equations so that $E =$, $t =$ $E = p \times t$ $t = \frac{E}{p}$
9. Rearrange the equations so that $W =$ and $t =$

$$W = p \times t \quad t = \frac{W}{p}$$

10. Copy the following: An energy transfer of 1 joule per second is equal to a power of 1 watt.

Energy Transfers in Systems

transferred

1. Copy and fill in the blanks: Energy can be _____ usefully, stored or dissipated, but cannot be created or destroyed.
2. Give an example of an energy transfer in a closed system?
3. What is meant by the term 'closed system'? no net change to total system
4. Give an example in which energy is dissipated and stored in less useful ways. E.g. it is wasted. Stopping a bike with brakes
5. Give two ways in which unwanted energy transfers can be reduced. One for free → lubrication. thermal insulation.
6. Copy and complete the following sentence. **The higher the thermal conductivity of material the higher the rate transfer by conduction across the material.**
7. How might the idea in Q6 be applied to a double glazed window?

Air in between glass has a lower thermal conductivity.

Efficiency

see below

1. State two equations that can be used to calculate efficiency.
2. How can efficiency be changed into a percentage? $\times 100$
3. What are the units of useful power input and useful power output? watt
4. What is the unit of useful energy transferred and total energy transfer? Joule
5. How can efficiency be increased? For instance, keeping a house warm once heated.

lubricating contacts

National and Global Energy Resources

$$eff = \frac{\text{Useful E out}}{\text{Total E in.}} = \frac{\text{Useful P out}}{\text{Useful P in.}}$$

1. Write a list of the main energy sources used on Earth.
2. What is meant by a renewable source? *is replenished*
3. Make a list of renewable sources and non-renewable sources of energy. *as used.*

①

Fossil fuels — *Coal*
 — *oil* NR
 — *gas*

nuclear fuel *R*

bio fuel *R*

wind *R*

hydroelectric *R*

geothermal *R*

tides *R*

sun *R*

water waves *R*