

Topic 4 - Energy

What's the science story?

Introduction to energy and energy equations. The SOW is linked throughout towards a design/build of an eco-house, to decrease energy transfer and think about renewable energy resources.



Previous knowledge:

Knowledge of particles, energy transfer and how particles behave in 3 stages of matter.

Next steps...

KS4
P1 Energy

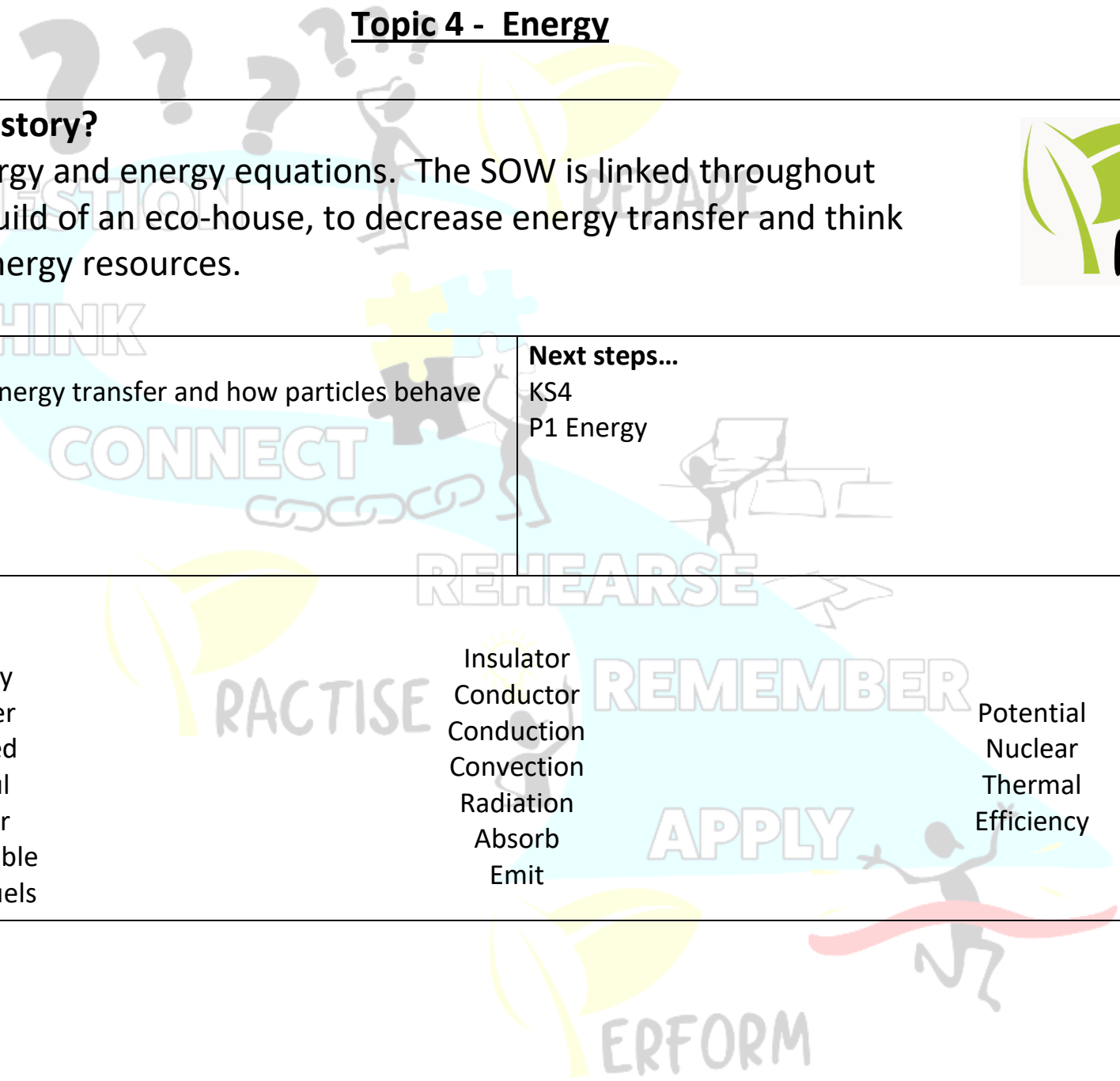


Keywords

Energy
Transfer
Wasted
Useful
Power
Renewable
Fossil fuels

Insulator
Conductor
Conduction
Convection
Radiation
Absorb
Emit

Potential
Nuclear
Thermal
Efficiency



Lesson No. and Title	Learning objectives	National Curriculum	Working scientifically skills	Practical equipment
1. Energy Transfer - Conduction	<p>ARE – Explain conduction in terms of particles and plan how to test conduction in different materials.</p> <p>AGD – Link understanding of conduction to materials and their uses.</p>	<ul style="list-style-type: none"> heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators 		
2. Conduction-practical	<p>ARE – Conduct practical and make conclusions.</p> <p>AGD – Link understanding and observations to materials and their uses.</p>	<ul style="list-style-type: none"> heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators 		<p>Rods of different materials</p> <p>Vaseline</p> <p>Stop watches</p> <p>Drawing pins</p>
3. Energy Transfer – Convection	<p>ARE – Explain convection in terms of particles.</p> <p>AGD – Link understanding of convection to different contexts.</p>	<ul style="list-style-type: none"> heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators 		<p>Demo – convection tube</p>

Assessment 1: Energy transfers

KS3 – Year 9

<p>4. Energy transfer - Radiation</p>	<p>ARE – Explain how energy is transferred via radiation. AGD – Link understanding of radiation to methods in reducing heat transfer.</p>	<ul style="list-style-type: none"> heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators 		<p>Huddling penguins. Beakers, test tubes, kettle, thermometers, stop watches, elastic bands.</p>
<p>5. Energy transfer - insulation</p>	<p>ARE – Compare different materials as thermal insulators. AGD – Evaluate data on thermal insulators and link to design.</p>	<ul style="list-style-type: none"> heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators 		<p>Beakers, various insulation materials, lids, thermometers, stop watches.</p>
<p>6. More energy transfers</p>	<p>ARE – Define different types of energy and apply to everyday objects. AGD – Apply knowledge to unknown situation.</p>	<ul style="list-style-type: none"> other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels 		

<p>7. Efficiency</p>	<p>ARE – Apply the efficiency equation. AGD – Explain why appliances cannot be 100% efficient.</p>	<ul style="list-style-type: none"> energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change 		
<p>8. Power and Work Done</p>	<p>ARE – use the equation for power and work done AGD – re-arrange the equation and apply to appliances</p>	<ul style="list-style-type: none"> energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions 		
<p>9. Energy in Food</p>	<p>ARE – Explain the importance of eating a variety of food groups. AGD – Conduct an experiment to investigate the amount of energy in foods. Compare theory to practical results. Evaluate.</p>	<ul style="list-style-type: none"> comparing energy values of different foods (from labels) (kJ) 		<p>Boiling tubes, stop watches, different foods, thermometer. Food labels</p>

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<p>10. Cost of electricity</p>	<p>ARE – Calculate electricity use from an electricity bill. AGD – Explain ways to reduce energy usage.</p>	<ul style="list-style-type: none"> • comparing power ratings of appliances in watts (W, kW) • comparing amounts of energy transferred (J, kJ, kW hour) • domestic fuel bills, fuel use and costs • 		<p>Fuel bills</p>
<p>11. Energy demands</p>	<p>ARE – Describe the operation of power stations. AGD – Compare energy use from different sources and different societies from available data.</p>	<ul style="list-style-type: none"> • fuels and energy resources 		<p>Power stations to stick in</p>
<p>Assessment 2: Generating electricity</p>				
<p>12. Design and build an eco house</p>	<p>ARE – Use previous knowledge to design an eco house. AGD – Apply equations and evaluation of previous knowledge to a deeper level when applying to house design.</p>			<p>A3 paper, building materials (optional), help sheets.</p>



Assessment Criteria

Assessment No. & Title	Working Towards	Age Related Expectations	At Greater Depth
1. Energy transfer in a saucepan	Name the energy transfers through solids, liquids, and in air	Describe what happens when you heat up solids, liquids, and gases	Explain, in terms of particles, how energy is transferred.
	Describe simply what happens in conduction and convection.		
n/a	State some sources and properties of infrared radiation	Describe how an insulator can reduce energy transfer.	Explain why certain materials are good insulators
		Explain how energy is transferred by radiation	
n/a	Describe energy requirements in different situations	Compare the energy in food and fuels with the energy needed for different activities.	Calculate energy requirements for various situations.
n/a	State the definition of the conservation of energy	Explain what brings about transfers in energy	Account for energy dissipation during transfers
2. Generating electricity	State one advantage and one disadvantage of fossil fuels.	Describe how electricity is generated in a power station	Explain how a range of resources generate electricity
n/a	State the definitions of energy and power	Describe the link between power, fuel use, and cost of using domestic appliances	Calculate and compare energy costs in different scenarios
n/a	State how work is calculated	Calculate work done	Explain how conservation of energy applies in one example
		Apply the conservation of energy to simple machine	