Stewards Academy

Science KS3:

Year 7

Blended Learning Booklet

Unit 3: Energy

Name:

Form:

- *Aim to complete three lessons each week.*
- *Use the online text book to help you*
- https://www.kerboodle.com/app
- *Login using your user name (1st initial followed by surname all lower case eg Joe Blogs = jblogs)*
- *Password (initially the same as your user name) should be reset to stewards lower case*
- *Institution code is fu0*
- *Complete the work described in the four part lesson*
- Use the mark schemes provided to self assess your work and make corrections in blue pen.



Big Picture – Year 7 Overview
Science

Next Year

End of Year Assess-ment

End of Unit Test

Energy transfer

Energy and temperature

Work energy and machines

Cost of energy

Energy and Power

Energy resources

UNIT 6

Energy

I will be able to explain that there is energy in food and fuel and that it is measured in Joules. **I will be able to** explain how energy from non-renewable or renewable resources can be used to provide electricity**. I will be able to** use equations to link energy and power and to calculate the unit cost of energy. **I will be able to** state the Law of conservation of energy, describe 3 methods of heat transfer and how to prevent heat transfer using an insulator.

End of Unit Test

Plant structure and function

Photo-synthesis

Microbial Bio-technology

Respiration

Flowers and pollination

Ecosystems and competition

Food chains and webs

UNIT 5

Ecosystems

I will be able to explain that plants are able to make their own food by photosynthesis and that animals are consumers eating other organisms to take in energy. **I will be able to** explain that plants and animals are linked through food chains and webs which show the relationships between organisms in an ecosystem. **I will be able to** explain the processes and the importance of respiration and photosynthesis and how these are linked ,as well as how plants are uniquely adapted to carry out photosynthesis

End of Unit Test

The periodic table. Groups 1, 7 & 0

Compounds and chemical formulae

Atoms and elements

Separation techniques

Solutions and solubility

Pure substances and mixtures

Particle model

States of matter

UNIT 4

Matter

I will be able to use the particle model to explain how particles are arranged in solids, liquids and gases and how a substance can change between these states. **I will be able to** use the particle model to explain the process of diffusion and gas pressure. **I will be able to** recognize a pure substance and be able to describe methods for separating mixtures. **I will be able to** identify substances as elements or compounds and know that the periodic table shows how the elements are grouped together.

End of Unit Test

Pressure in solids, liquids and gases

Squashing, stretching and turning

Friction and drag

Gravity

Speed

Introduction to forces

UNIT 3

Forces

I will be able to explain that a forces are a push or a pull that can change the speed, direction or shape of an object. **I will be able to** explain how some forces such as gravity act at a distance (non-contact) and some such as friction and drag require objects to touch (contact). **I will be able to** use an equation to calculate speed and be able to represent changing speeds on a graph. Finally **I will be able to** use and equation to link force and pressure.

End of Unit Test

Digestive system

Nutrients, healthy diet and food tests

Breathing and gas exchange

Drugs, alcohol and smoking

Uni-cellular organisms

Using a microscope & Plant and animal cells

UNIT 2

Organisms

I will be able to explain How cells are the basic building blocks of life for both plants and animals. How some organisms can exist as simple single celled organisms and how in others cells are organized into tissues, organs and organ systems to create more complex multicellular organisms. **I will also be able to** explain the structure and function of some of these organ systems and how they are affected by different lifestyle choices

End of Unit Test

Evaluating data and methods

Analysing patterns in data

Collecting, recording and presenting data

Planning scientific investigations

Asking scientific questions

UNIT 1

The Enquiry Process

I will be able to plan and carry out a scientific investigation. This procedure will include being able to write a hypothesis, design a method, collect and analyse data and finally be able to critically evaluate the whole process.

Year 7

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Energy: Year 7 Unit: 6

This unit will enable students to understand how energy is stored, transferred and dissipated. Also how amounts of energy and it's cost can be calculated.
It will link to future learning by providing key knowledge to support KS3 topics on potential difference and resistance, sound & light, work done and heating and cooling. At KS4 this knowledge will provide the basis for you to be able to learn about specific heat capacity and how to investigate it. It also links to thermal conductivity, and house building materials as well as to how different surfaces radiate different amounts of thermal energy.

DEVELOPING COURAGE

C That alternative energy resources will provide electrical energy in the future

O To set see how an electricty meter works

U How insulating materials work

R When calculating the amoount and cost of electrical energy

A The need to use energy in a responsible and sustainable manner

G Share our scientific knowledge

E Testing different types of insulating materials

UP NEXT
End of year
Catch-up & Booster

CAREERS
- Renewables engineer
- Power station operator.
- Dietician

PREVIOUS LEARNING

Pupils should have some experience of the following:
Animals get their food from plants and other animals.
Animals are unable to make their own food.
That household appliances run on electricity.
That objects fall to Earth due to gravity.
That air resistance, water resistance and friction act between moving surfaces.
.

WHAT WE KNOW/ REMEMBER
- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. Energy: Heat, Light, and Fuel by Darlene Ruth Stille.
2. Simple Machines by Baby Professor
3. Killer Energy (Horrible Science) by Nick Arnold
4. The Powerful World of Energy with Max Axiom by Agnieszka Biskup

PERSONAL OBJECTIVES
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Lesson 1: Book 1 – Food and fuels (3.1.1)

Connection

Have a look at the topic overview and the zoom in.

Populate what you know and your personal objectives.

Activation

LI: State the unit of energy and compare the energy content of food and fuels with amount needed for different activities.

1. Make a note of the date, title and the LI
2. Key words – energy, joules, kilojoules
3. Read pages 42 to 43
4. https://youtu.be/RPAien1dbEQ
5. Copy the table of foods and energy (p42)
6. Answer Questions A, B
7. Have a go at “How far?” Green box page 43

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 1: Answers **3.1.1 Food and fuels**

Connection

1. N/A
2. N/A
3. N/A

Activation & Demonstration

In-text questions	**A** joules **B** three from: wood, oil, gas
Summary questions	**1** food, fuels, joules, breathing, bones/muscles/brains (6 marks) **2** 200 g chips contains 2000kJ (1 mark), so you need to cycle for 2000kJ/25kJ/min = 80 minutes (1 mark) **3** Examples answers (6 marks): Identifies a range of activities. Identifies the energy used per minute for the activities using the table. Calculate the energy for each activity by multiplying the time by the energy per minute. Identifies the energy stored in bananas, peas, chips, and chocolate from the table. Works out the mass of each that would be needed for the daily activities. Comments on the contrast in mass between fruit and chips/chocolate.

Lesson 2: Book 1 – Energy resources (3.1.2)

Connection

Q1. Name one thing our body uses energy for.

Q2. Why would a person doing sport need more energy?

Activation

LI: Explain the advantages and disadvantages of different energy resources

1. Make a note of the date, title and the LI
2. Key words – energy resources, fossil fuels, non-renewable, renewable
3. Read pages 44 to 45
4. https://youtu.be/upf9Kfaun-g
5. State the two main fossil fuels used in a power station (p44)
6. Describe the difference between a non-renewable and a renewable energy source
7. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 2: Answers

3.1.2 Energy resources

Connection

1. Keep warm, to breathe, to move, talk and think.

2. They are moving and using their muscles and this needs energy

Activation & Demonstration

In-text questions	**A** A fuel like coal, oil, or gas that took millions of years to form. **B** carbon dioxide
Summary questions	**1** non-renewable, fossil fuel, renewable, pollution, reliable (6 marks) **2** Burning coal produces steam. Steam drives a turbine. The turbine drives a generator. The generator generates electricity. (4 mark) **3** Credit any suitable board game, for example, snakes and ladders or collecting cards/tokens relating to different types. Points/board relates to ways fuels are formed or ways electricity is generated. Point system includes ideas about climate change/pollution. Board game must have a suitable scoring method relating to advantages and disadvantages of each method of electricity generation. (6 marks)

Lesson 3: Book 1 – Energy and power (3.1.3)

Connection

Q1. Define the term non-renewable.

Q2. What is the main problem with burning fossil fuels?

Activation

LI: Describe what power is and how our use of it is calculated and charged for

1. Make a note of the date, title and the LI
2. Key words – watt, power, kilowatt, kilowatt hour
3. Read pages 46 to 47
4. https://youtu.be/bXhcQxd3QrU
5. Explain how you can reduce an energy bill (p47)
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 3: Answers **3.1.3 Energy and power**

Connection

1. An energy source that cannot be replaced and will be used up.

2. They will run out one day and they produce a lot of carbon dioxide (CO_2).

Activation & Demonstration

In-text questions	**A** watt (W) **B** kilowatt hour (kWh)
Summary questions	**1** joules, watts, second, kWh, lower, less (6 marks) **2** Extended response question (6 marks). Example answers: The power rating tells you the energy that each kettle can transfer per second. The higher the power, the quicker the element will transfer energy to the water. The higher the power, the quicker the temperature of the water will rise. A power of 1200 W is the same as 1.2 kW (or 2kW is the same as 2000 W). The 2 kW kettle will heat water faster than the 1.2 kW kettle. The energy that you pay for is measured in kilowatt hours(kWh). The energy that you pay for depends on the power and the time that you use it for. **3a** One from: Run a campaign to raise awareness/raise taxes on energy use/require the use of lower power devices. (1 mark) **b** People like to save money/care about the environment. (1 mark)

Lesson 4: Book 1 – Energy adds up (3.2.1)

Connection

Q1. What are the units of power?

Q2. What unit is used to charge for energy use?

Activation

LI: Describe how energy can be transferred from one store to another

1. Make a note of the date, title and the LI
2. Key words – law of conservation of energy, chemical energy store, thermal energy store, kinetic energy store, gravitational potential energy store, elastic energy store
3. Read pages 48 to 49
4. https://youtu.be/7nUYhX2biz4
5. Copy table of energy stores and examples (pg 48)
6. Answer Questions A, B, C,

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 4: Answers **3.2.1 Energy adds up**

Connection

1. Watts (W) or kilowatt (kW)

2. Kilowatt hours (kWh)

Activation & Demonstration

In-text questions	**A** Energy cannot be created or destroyed. It can only be transferred. **B** kinetic, thermal, gravitational, chemical, elastic **C** Three from: radiation, waves, forces, electricity
Summary questions	**1** created, destroyed, chemical, thermal, cannot (5 marks) **2a** Energy is transferred from a chemical store of a battery to a thermal store to the surroundings (1 mark) by an electric current and heating (1 mark) **b** Energy is transferred from the chemical store of the coal to thermal stores of the food and the surroundings (1 mark) using an electric current. (1 mark) **c** Energy is transferred from the kinetic store of the wind to kinetic and thermal stores of the motor and the surroundings (1 mark) using an electric current. (1 mark) **3** Kinetic – speed increases (1 mark), thermal – temperature increases (1 mark), gravitational potential – height increases (1 mark), elastic – extension/deformation increases (1 mark). **4** Extended response question (6 marks). Example answers: There is a chemical store associated with the wood (and oxygen). The wood burns in the oxygen. Energy is transferred to the sausages. Because the fire heats the sausages. There is more energy in the thermal store associated with the sausages. There is more energy in the thermal store associated with the air. There is less energy in the chemical store associated with the wood.

Lesson 5: Book 1 – Energy dissipation (3.2.2)

Connection

Q1. State the law of conservation of energy.

Q2. Name two energy stores.

Activation

LI: Describe how energy can be dissipated and how we calculate efficiency

1. Make a note of the date, title and the LI
2. Key words – dissipation, efficiency
3. Read pages 50 to 51
4. https://youtu.be/i2KJkt1VdxQ
5. Write down the equation for calculating efficiency
6. Explain why you cannot really "waste energy"
7. Answer Questions A and B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 5: Answers **3.2.2 Energy dissipation**

Connection

1. Energy
cannot be created or
destroyed, only transferred.

2. Any two
from thermal, chemical,
kinetic, elastic, gravitational

Activation & Demonstration

In-text questions	**A** The transfer of energy to a store, usually the thermal store of the surroundings, so that it is no longer useful. **B** Two suitable suggestions e.g., reducing air resistance by streamlining, reducing friction in the engine by lubrication.
Summary questions	**1** friction, heating, dissipated (3 marks) **2a** wasted energy = 500J – 200J = 300J (2 marks) **b** efficiency = $\frac{\text{useful energy x 100\%}}{\text{total energy}} = \frac{\text{200J x 100\%}}{\text{500J}}$ = 40% (2 marks) **3** Extended response (6 marks). Example answers: Conservation of energy says energy cannot be created or destroyed, just transferred. Energy dissipated is when energy is transferred to a store so that it is no longer useful/spread out. All processes dissipate energy (usually to a thermal store of the surroundings) In any process there is a useful energy transfer, and a wasted energy transfer (dissipation) You can calculate the energy dissipated if you know the useful energy transferred and the total energy transferred Using the conservation of energy, the energy dissipated = total energy transferred – useful energy transferred.

Lesson 7: Book 2 – Work, energy and machines (3.3.1)

Connection

Q1. What is the scientific term for “wasted” energy?

Q2. You don’t really save energy by turning off your engine when parked. What do you actually save?

Activation

LI: Describe what work is and how machines can help us carry out work

1. Make a note of the date, title and the LI
2. Key words – work, deform, displacement, simple machine, lever, input force, output force
3. Read pages 46 to 47
4. https://youtu.be/jAPxALm9fZA
5. Copy the equation for work done.
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Connection

1. Dissipated

2. Fuel

Activation & Demonstration

In-text questions	**A** Work is done when a force moves through a distance. **B** levers, pulleys
Summary questions	**1** force, distance, machine, lever, force, pulley, smaller, bigger (8 marks) **2a** Diagram as in book with stone changed to box. Pivot, input force, and output force correctly labelled. (3 marks) **b** If the pivot is nearer the box the force you use is smaller but the distance your hand moves is bigger (or opposite reasoning). (2 marks) **c** The wheels on the trolley reduce friction. (1 mark) **3** Climbing Mount Everest: Work done = force × distance = 600 N × 10 000 m = 6 000 000 J Climbing upstairs to bed: Work done = force × distance = 600 N × 2.5 m = 1500 J Comparing the two: 6 000 000 J/1500 J = 4000 so climbing Mount Everest requires 4000 times the work. (4 marks)

Lesson 8: Book 2 – Energy and temperature (3.4.1)

Connection

Q1. Give an example of a simple machine.

Q2. How does a machine help us carry out work?

Activation

LI: State the difference between energy and temperature and explain why objects change temperature

1. Make a note of the date, title and the LI
2. Key words – temperature, thermometer, thermal energy store
3. Read pages 48 to 49
4. https://youtu.be/qlX-dah7MlU
5. State what happens to things when you heat them up (pg 49)
6. Answer Questions A, B and C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 12: Answers **3.4.1 Energy and temperature**

Connection

1. Wheel or lever

2. They reduce the amount of force required to do the work. Work done = force x distance.

Activation & Demonstration

In-text questions	**A** temperature: degrees Celsius (°C); energy: joules (J) **B** Mass, temperature, what it is made of. **C** Energy is being transferred to the object.
Summary questions	**1** temperature, thermometer, hotter, cooler (4 marks) **2** a cup of water at 30 °C, a saucepan of water at 30 °C, a saucepan of water at 50 °C (1 mark) **3** Example answers (6 marks): Each graph shows that over time the temperature of the water decreases. The temperature of each mass of water is the same at the start. The temperature of the large mass of water is higher at the end than the temperature of the small mass of water. Each graph is a curve so the rate of change of temperature is decreasing. The energy in the thermal store of the large mass of water is bigger than the energy in the thermal store of the small mass of water. Energy is transferred to the surroundings, lowering the temperature. It takes longer to reduce the energy in the store of the larger mass than the smaller mass. The rate of energy transfer depends on the temperature difference – when it is large the rate of change of temperature is large.

Lesson 9: Book 2 – Energy transfer: particles (3.4.2)

Connection

Q1. What instrument do we use to measure temperature?

Q2. In which direction does thermal energy flow?

Activation

LI: Describe how energy is transferred between particles

1. Make a note of the date, title and the LI
2. Key words – thermal conductor, conduction, convection, radiation, thermal insulator, convection current
3. Read pages 50 to 51
4. https://youtu.be/HpCvWuvCUoA
5. Draw diagram of conduction in a solid block (pg 50)
6. Draw diagram to show convection in a sauce pan (pg 51)
7. Answer Questions A, B and C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 12: Answers **3.4.2 Energy transfer: particles**

Connection

1. Thermometer.

2. From a warmer object to a cooler one.

Activation & Demonstration

In-text questions	**A** conduction, convection, radiation **B** A material that does not transfer energy quickly.
Summary questions	**1** conduction, temperature difference, convection, move, slowly (5 marks) **2** The jumper traps air. Air is an insulator/poor conductor which reduces thermal energy transfer by conduction. Air trapped in the jumper cannot move which reduces thermal energy transfer by convection. (5 marks) **3** Answers show a labelled diagram of the convection current above a radiator. (3 marks) **4** Example answers (6 marks) : The metal element gets hot. The particles in the metal vibrate more. Energy moves from the element to the water in contact with the element. The hot water molecules move faster. The hot water becomes less dense. Hot water floats up. Cooler (denser) water sinks to replace it. A convection current forms. The water circulates until all the water is hot.

Lesson 9: Book 2 – Energy transfer: radiation and insulation (3.4.3)

Connection

Q1. What 3 ways can thermal energy be transferred?

Q2. What term do we give to materials which do not conduct heat well?

Activation

LI: State some sources of infrared radiation and compare insulation methods

1. Make a note of the date, title and the LI
2. Key words – infrared radiation, thermal imaging camera
3. Read pages 52 to 53
4. https://youtu.be/3nX2Lee5MwY
5. Copy table showing methods of insulation pg 53
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
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Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 12: Answers **3.4.3 Energy transfer: particles**

Connection

1. Conduction, convection and radiation.

2. Thermal insulators.

Activation & Demonstration

In-text questions	**A** Two from: Sun, fire, light bulb **B** It is reflected.
Summary questions	**1** sources, radiation, temperature, reflected, absorb, medium, vacuum, radiation/infrared (8 marks) **2a** There are no particles in space. (1 mark) **b** The fire emits infrared radiation so the camera cannot distinguish between the infrared radiation from the people and the infrared radiation from the fire. (2 marks) **3** Example answers (6 marks): Some insulation prevents energy transfer by conduction by using materials that do not conduct well, such as thick bricks, or materials that trap air, which is an insulator, such as double glazing. Some insulation prevents energy transfer by convection because it does not contain many particles. **4** Example answers (6 marks): The three ways that energy is transferred by heating are conduction, convection, and radiation. Conduction and convection need particles, but radiation can travel through a vacuum. Conduction happens when energy is transferred by free electrons/vibrations. Convection happens when a fluid is heated and moves. Radiation is usually infrared, which is part of the electromagnetic spectrum.

Lesson 10 & 11: Book 1 &2 Revision questions

Connection

Q1. What is the main type of radiation given off by hot objects?

Q2. A food flask has a shiny reflective inside surface, a vacuum between the inner and outer walls and a lid. Explain how each of these help keep the food warm.

Activation

LI: Practice some Big Idea questions about Energy

1. Make a note of the date, title and the LI
2. Read page 53 for Book 1 questions and page 55 for Book 2 questions
3. Use the previous pages of the book and your notes to help you answer the questions

Demonstration

Work with others on your table to answer as many of the questions as you can.

In 45 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 10: Revision Answers **Energy – Part 1 Checkpoint**

Connection

1. Infra red

2. The air gap or vacuum prevents thermal energy being dissipated by conduction or convection. The shiny surface reflects infrared radiation.

Activation & Demonstration

End-of-Big Idea questions	**1** wind, solar, geothermal (1 mark) **2a** C (1 mark) **b** kW, watts, kilowatts (1 mark) **3a** Energy is transferred to the surroundings (1 mark) so the energy in the gravity store decreases over time (1 mark). **b** Any suitable situation where the energy is dissipated by friction e.g. braking (1 mark) **4a** Any one from coal, oil, gas (1 mark) **b** Fossil fuels are formed from the remains of plants and animals that died millions of years ago. (1 mark) **c** When all fossil fuels are burnt there will not be any more as they take millions of years to form. (2 mark) **5a** 100W = 0.1 kW (1 marks) **b** cost = power x time x cost of 1 kWh = 0.1 kW x 3 hours x $\frac{10p}{kWh}$ = 3p (2 marks) **c** Sensible suggestion, e.g., use appliances for less time, use more efficient appliances. (1 mark) Because this will reduce the number of kWh, and hence the cost. (1 mark) **6a** power = energy ÷ time = 6000 J ÷ 60 s = 100 W (2 marks) **b** Lightbulbs transfer energy by light and by heating (1 mark) Lightbulb B transfers more energy usefully (as light)/Lightbulb A transfers less energy usefully (as light). (1 mark) Lightbulb A has a greater heating effect/lightbulb B has less of a heating effect. (1 mark) **c** Any sensible suggestion and reason for how it will reduce cost (2 marks)

Activation & Demonstration

7a gravitational potential (1 mark)
bi Energy is conserved/cannot be lost (1 mark)
difference = 50 – 8 = 42 N (1 mark)
ii Some energy is transferred/dissipated to the thermal store as the ball falls through the air. (1 mark)
c There is a force (of gravity) acting on the ball. (2 marks)
8a

Kettle	Energy input (kJ)	Useful energy input (kJ)	Wasted energy (kJ)
BoilFast	600	540	60 (1 mark)
KettlePro	800	720 (1 mark)	80

b efficiency = useful energy out in kWh/total energy in
$= \frac{540\text{ kJ} \times 100\%}{600\text{ J}}$ (1 mark) = 90% (1 mark)

efficiency = useful energy out in kWh/total energy in
$= \frac{520\text{ kJ} \times 100\%}{900\text{ J}}$ (1 mark) = 80% (1 mark)
c It is not about the amount of wasted energy but the fraction of wasted energy (1 mark)
The Boilfast wastes a smaller fraction so is more efficient (1mark

Lesson 11: Revision Answers **Energy – Part 2 Checkpoint**

Connection

N/A

Activation & Demonstration

End-of-Big Idea questions	**1** joules, kilowatthours (1 mark) **2** Conduction happens mainly in solids. Convection happens in liquids and gases. Radiation can happen in a vacuum. (2 marks) **3** more, more, more (3 marks) **4** C (1 mark) **5a** work done = force × distance = 500 N × 200 m = 100 000 J (2 marks) **b** work done = force × distance = 50 N × 1.5 m = 75 J (2 marks) **6a** Purple solid dissolves, the Bunsen burner heats the water around the solid, and the purple colour diffuses throughout the water in a convection current. (3 marks) **b** Diagram showing convection current moving anticlockwise. (2 marks) **c** The purple solid diffuses into the water. (1 mark) As the water gets hot it moves upwards (1 mark) and is replaced by cold water forming a convection current. (1 mark) **7a** Energy is transferred by conduction through the inner pane of glass/passed on by vibrations from the hot room. Air inside the gap heats up/conduction occurs very slowly through the air. Energy is transferred by conduction through the outer pane of glass/passed on by vibration to the cold air outside. (3 marks) **b** The rate of transfer would decrease. There is no air to transfer the energy between the panes. Conduction will not occur/energy would be transferred very slowly by radiation. (3 marks) **8** Example answers (6 marks): Energy is transferred from a warm house to the cold air outside. Energy is transferred by conduction, convection, and radiation. To keep a house at the same temperature it needs to be heated. A lot of insulators trap air. Air is a poor conductor. Insulators reduce the rate of transfer of energy to the surroundings. The rate at which you need to heat the house to maintain the temperature decreases. A lower power heater is needed/heating is required for less time. This reduces the number of kWh of energy used. This will cost less money.

Lesson 11: Revision - Energy

Connection

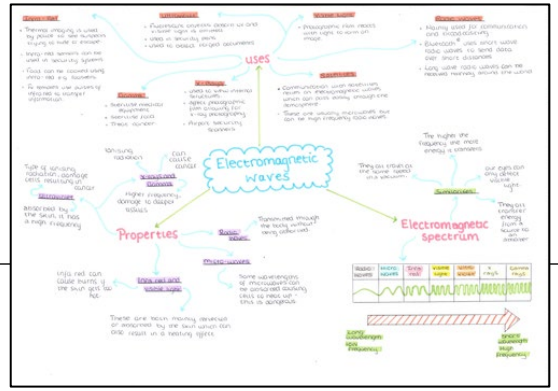
N/A

Activation

LI: Complete a piece of revision work

1. Make a summary sheet OR
2. Make flash cards OR
3. Complete the revision questions from book 1 (page 197) and 2 (page 161)

mind map



Demonstration

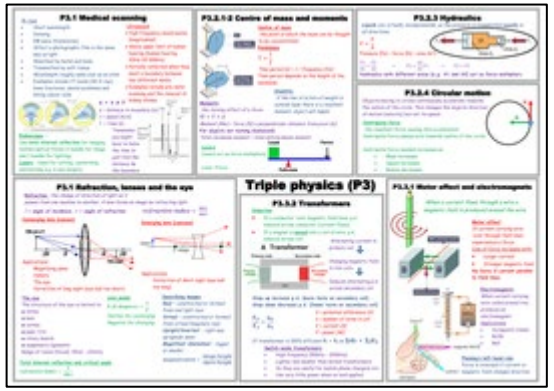
Use your revision work to quiz the person sat next to you OR work in a group to quiz each other.



flash cards

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Summary sheet

Attainment Band	Ecosystem & Bioenergetics Knowledge and Understanding
Yellow/Yellow +	• Analyse and evaluate the impact of changes in a food web • Evaluate a model of predator–prey populations and explain the importance of predators • Communicate, in a creative way, the impact of rainforest destruction on biodiversity • Analyse and evaluate how beak adaptations in seashore birds allow them to survive in the same ecosystem • Critically evaluate the use of pesticides • Analyse and evaluate the risks involved with monoculture – particularly with regard to food security in poorer countries • Explain the importance of respiration in releasing energy and in building up complex molecules • Evaluate the quality of evidence for respiration • Explain what is meant by oxygen debt and why it occurs • Compare the implications of aerobic respiration and anaerobic respiration for the organism • Write a logical method for an investigation of what is produced in anaerobic respiration, taking safety into consideration • Evaluate an investigation carried out into the effect of different sugars on fermentation • Critically evaluate secondary data showing plants growing in different habitats • Critically evaluate the risks involved when testing a leaf for starch • Critically evaluate the structure of different cells related to their function • Analyse stomata density in different temperatures and different concentrations of carbon dioxide • Analyse secondary data and apply learning to new situations • Evaluate the limitations of collected evidence • Evaluate cell structures that allow the movement of water and minerals through a plant
Blue	• Predict the effects of different environmental factors on plant and animal populations – e.g. disease and drought • Explain why prey populations affect predator populations • Explain how organisms help or depend on each other for survival • Explain the concept of resource partitioning • Explain the process of bioaccumulation • Explain why hand-pollination is cost effective for some crops • Recall the word equation for aerobic respiration and describe it as a way of releasing energy from food • Describe some practical experiments on plants that provide evidence for respiration • Explain why some sports rely on anaerobic respiration while others can use aerobic respiration; describe some of the effects on the body of anaerobic respiration • Describe several similarities and differences between aerobic respiration and anaerobic respiration • Describe a piece of evidence to show that anaerobic respiration produces carbon dioxide • Manage variables in an investigation into the effect of different sugars on fermentation, and make a conclusion • Explain the evidence that van Helmont obtained from his experiment • Predict that plants will only photosynthesise in the light and that photosynthesis will only occur in the green areas of leaves where chlorophyll is present; draw up a good plan for an investigation • Explain the functions of the different cells in a leaf; identify the different cells found in the leaf • Explain how stomata open and close to control the movement of gases • Accurately predict the results of investigations of photosynthesis • Explain the roles of nitrogen, phosphorus and potassium in plant growth • Explain how water and minerals are taken in and move through a plant

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Science Department
ASSESSMENT FEEDBACK
Year 7 – 5

Green	• Describe food webs as a number of interrelated food chains • Describe some ways in which organisms affect their environment • Describe a range of examples of interdependence • Describe the role of niches • Describe how toxins pass along the food chain • Describe the impact of low pollination on crop yield and how this could potentially be avoided • Recall that energy is released in our bodies by aerobic respiration, which uses oxygen and glucose • Recall that plants respire; describe how to demonstrate that water is produced during respiration • Describe anaerobic respiration as requiring no oxygen; know that some sports rely mainly on anaerobic respiration • Describe one similarity and one difference between aerobic respiration and anaerobic respiration • Recall some examples of microbes and know that they carry out anaerobic respiration • Explain simply what is meant by fermentation; follow instructions to investigate the effect of sugars on fermentation • Identify the various ways in which plants are essential to life on Earth • Identify carbon dioxide and water as reactants, and glucose and oxygen as products of photosynthesis • Name the common features of leaves that are adaptations to photosynthesis; explain how the size of leaves relates to the availability of light • Describe the movement of gases into/out of a leaf • Identify the factors that affect the rate of photosynthesis • Identify nitrogen, phosphorus and potassium as essential for healthy plant growth • Identify the passage of water and minerals through a plant; summarise the inputs and outputs for plant growth by a diagram
White	• Some of the above elements have been achieved.