

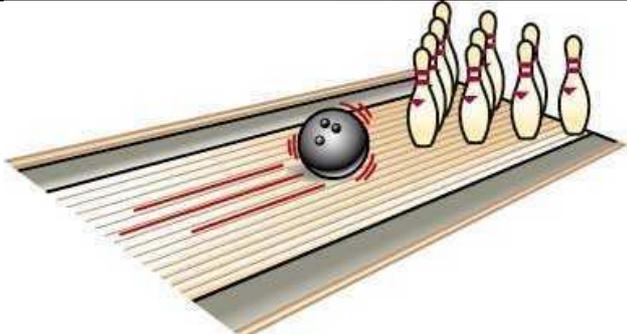
LO: Describe and explain how energy is stored and transferred

**Do Now:**

1. Give an example of a substance that can be recycled. (1)
2. Define 'reuse'. (1)
3. Give the equation for complete combustion. (1)
4. Define independent variable. (1)
5. Calculate the mean from the following (1)  
**2.25 2.76 3.40 2.98 3.00**

**Challenge:** Explain why recycling is beneficial for the environment (4)

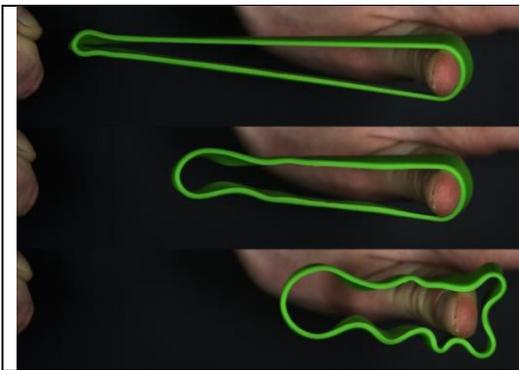
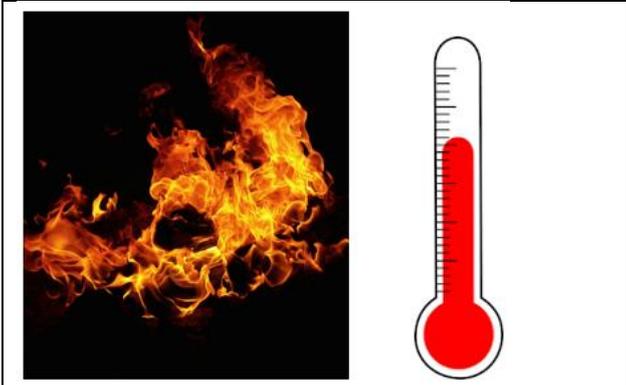
New information – Energy Transfers

<p style="text-align: center;"><b>Chemical</b></p> 	<p>Learning about energy is really important because every process in our bodies relies on energy, and we transfer energy every day when we move around, keep our bodies warm and do things like climb the stairs.</p> <p>There are 8 energy stores described by scientists. The first of these is the “<b>chemical energy store</b>”, which is energy stored in a fuel or chemicals, such as the chemicals in a battery.</p>
	<p>The second energy store is the “<b>gravitational potential energy store</b>”. Objects raised against the force of gravity have a gravitational potential energy store. The further they are raised, the greater the amount of gravitational potential energy stored.</p>
	<p>The third energy store is the “<b>kinetic energy store</b>” of a moving object.</p>

**Pause Point 1 – Complete the sentence in your book:**

*Chemical energy is stored in....., whereas gravitational potential energy is stored in.....*

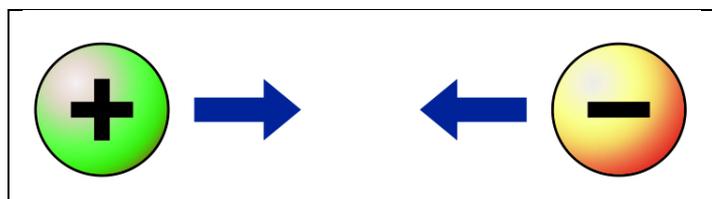
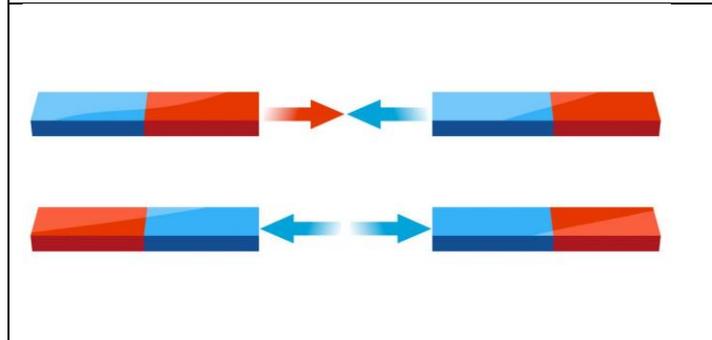
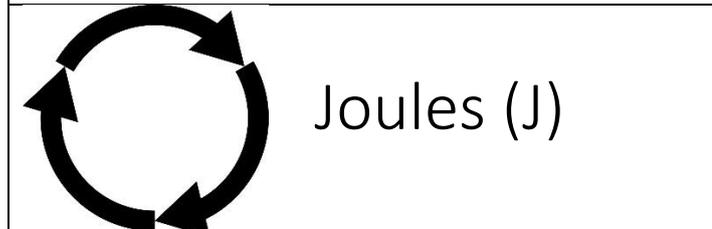
New information – More energy stores

	<p>There is the “<b>elastic potential energy store</b>” in a stretched or squashed object which can return to its original shape, such as a spring. If we stretch a spring, we increase the elastic potential store, when we release the spring, it returns to its original shape.</p>
	<p>Any hot object has a “<b>thermal energy store</b>”.</p>

**Pause Point 2 – Complete the sentence in your book:**

You can increase the gravitational potential energy store by.....

**New information – More energy stores**

	<p>The energy stored between two charged objects is called an “<b>electrostatic potential energy store</b>”.</p>
	<p>Finally, the “<b>magnetic potential energy store</b>” is the store of energy when two magnets are brought together, causing them to attract, or repel one another</p>
	<p>Energy cannot be created nor destroyed. It can only be transferred usefully, stored or dissipated</p> <p>Energy is measured in Joules (J)</p>

	<p>There are 4 ways energy can be transferred:</p> <p><b>Electrically</b> - by the movement of charged particles (such as electrons in an electrical circuit). We transfer energy from power stations to homes and schools electrically.</p> <p><b>Radiation</b> – energy transferred by waves (sound and light are both examples of radiation as they transfer energy by waves)</p> <p><b>Mechanically</b> – whenever there is a force moving through a distance (i.e. work done = <math>fs</math>) for example, lifting glass of water off a desk.</p> <p><b>Heating</b> – when two objects of different temperature are next to each other and transfer energy from one object to another (i.e. by conduction or convection) for example, when a kettle heats water.</p>
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### Key Knowledge

Complete 2x LCWC in your book – don't forget to green pen this

<p><b>Recall Quiz:</b></p> <ol style="list-style-type: none"> <li>1. Energy cannot be _____ or _____. (2)</li> <li>2. The units for measuring energy are...(1)</li> <li>3. Give an example of an object with lots of stored kinetic energy. (1)</li> <li>4. Give an example of an object with lots of stored thermal energy. (1)</li> <li>5. Give an example of an object with lots of stored gravitational potential energy. (1)</li> </ol> <p><b>Self assess when finished using key knowledge</b></p>	<table border="1"> <tr> <td>What does the law of conservation of energy states?</td> <td>Energy cannot be created nor destroyed. It can only be transferred usefully, stored or dissipated</td> </tr> <tr> <td>What are the units for energy?</td> <td>Joules (J)</td> </tr> <tr> <td>What are the 8 stores of energy?</td> <td>Chemical, kinetic, gravitational, elastic, thermal, magnetic, electrostatic and nuclear</td> </tr> <tr> <td>What are the 4 ways in which energy can be transferred?</td> <td>Electrical, Mechanical, Heating and Radiation</td> </tr> </table>	What does the law of conservation of energy states?	Energy cannot be created nor destroyed. It can only be transferred usefully, stored or dissipated	What are the units for energy?	Joules (J)	What are the 8 stores of energy?	Chemical, kinetic, gravitational, elastic, thermal, magnetic, electrostatic and nuclear	What are the 4 ways in which energy can be transferred?	Electrical, Mechanical, Heating and Radiation
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### I do, we do, you do

#### Model Example - 'I do':

Describe the energy transfer taking place when a ball hits a tennis racket. (4)

#### Model answer:

As the tennis ball hits the tennis racket, the kinetic energy store of the tennis ball decreased and the elastic potential energy store of the racket strings increased. The energy was transferred mechanically from one store to the other



#### Practice Example - 'We do':

Describe the energy transfer taking place when a ball is thrown into the air

Copy and complete the sentences into your book:

As the ball is thrown in to the air, the \_\_\_\_\_ energy store decreased and the \_\_\_\_\_ store increased

The energy was transferred from one store to the other \_\_\_\_\_.



#### Application task – 'You do'

Complete the exam questions on the sheets then self assess using the mark scheme

**Q1.**

A gannet is a type of sea bird.



- (a) To catch food, the gannet dives down into the sea.  
What is the useful energy transfer when the gannet dives?  
Choose words from the box below.

<b>thermal</b>	<b>gravitational potential</b>	<b>kinetic</b>	<b>chemical</b>
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When the gannet dives, ..... energy is transferred to ..... energy.

2 marks

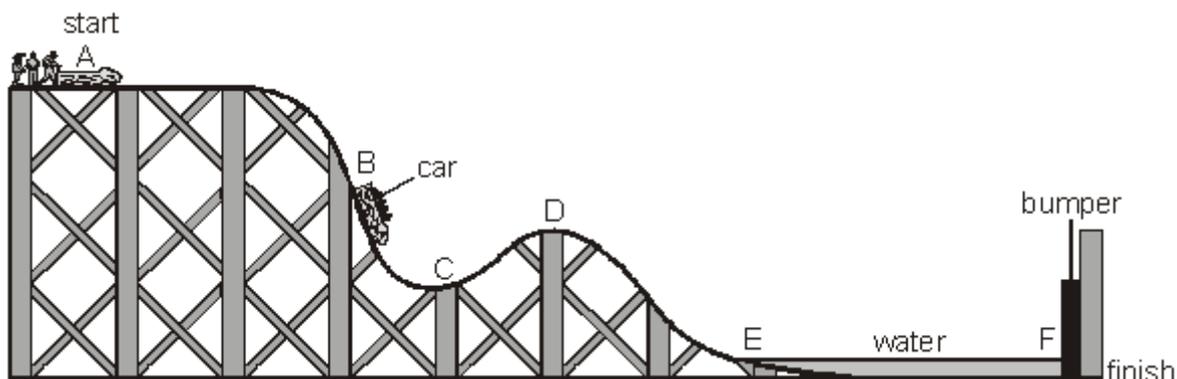
- (b) Gannets have pockets of air between their muscles and their skin.  
Suggest how this is a good adaptation for gannets when they hit the water at fast speeds.

.....  
.....

1 mark

**Q2.**

The drawing shows in a log car on a theme-park ride.  
The letters A, B, C, D, E and F show different points along the track.



The car starts from A and travels to F, where it stops by hitting a bumper.  
At E the car enters a trench filled with water.

- (a) (i) At which **two** points does the car have **no** kinetic energy?

Give the **two** correct letters.

..... and .....

1 mark

- (ii) At which point does the car have the **most** gravitational potential energy?  
Give the correct letter.

.....

1 mark

- (iii) At which point does the car have **some** kinetic energy and the **least** gravitational potential energy?  
Give the correct letter.

.....

1 mark

- (b) Complete the sentence below by choosing from the following words.

**Chemical   Thermal   Kinetic   Gravitational potential   Nuclear**

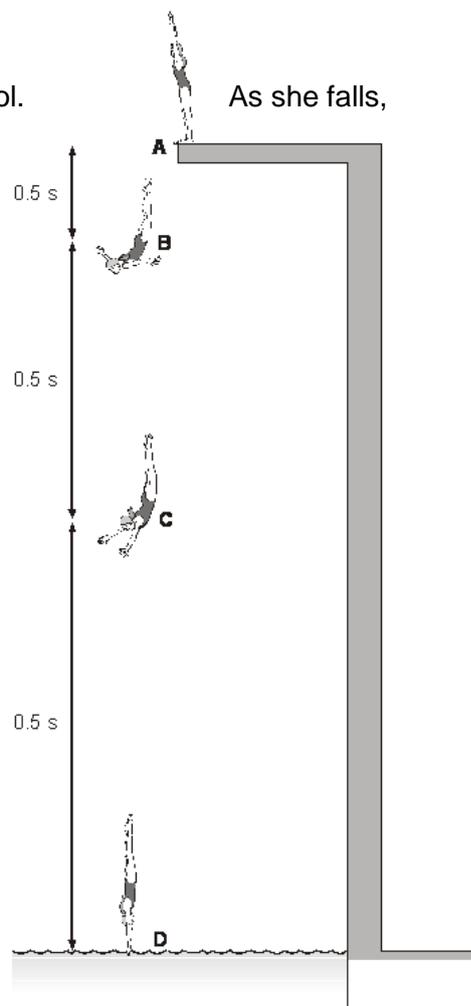
When the car hits the bumper at F, its ..... energy

is transferred into ..... energy

2 marks  
maximum 7 marks

**Q3.**

The drawings below show Caroline diving into a swimming pool. gravitational potential energy is changed into kinetic energy.



(a) Why does Caroline have **no** kinetic energy at A?

.....

.....

1 mark

(b) The table shows Caroline's gravitational potential energy and kinetic energy at four stages of the dive.

stage of the dive	total energy (kJ)	gravitational potential energy (kJ)	Kinetic energy (kJ)
A	8	8	0
B	8	7	1
C	8	4	4
D	8	0	

(i) Write the missing kinetic energy value for stage D in the table.

(ii) As Caroline falls there is **no** loss of energy to the air. How do the energy values for stages A, B, C and D show this?

.....

.....

**Challenge/Plenary**

Describe the energy transfers taking place in each of these examples:

1. A car speeding up (remember, fuel contains an energy store).
2. A car slowing down (hint, the breaks get hotter).
3. Bringing water to the boil in a kettle.

## Mark schemes

### Q1.

- (a) • gravitational potential  
• kinetic

*accept 'gravitational' or 'potential' for gravitational potential  
award one mark for each correct answer  
answers must be in the correct order*

2 (L5)

- (b) any **one** from

- they cushion the impact with water

*accept 'protects organs or muscles'  
'for protection' is insufficient*

- it acts as a shock absorber

*accept 'to make it buoyant after the dive'  
accept 'helps them float or get back up'  
'stops hurting them' is insufficient  
'slows them down' is insufficient  
'insulation' or 'keeps them warm' is insufficient*

1 (L6)

### Q2.

- (a) (i) A and F

*answers may be in either order  
both answers are required for the mark*

1 (L6)

- (ii) A

1 (L6)

- (iii) E

1 (L6)

- (b) (i) gravity **or** gravitational force

*accept 'weight'*

1 (L6)

- (c) kinetic

*the last two answers may be in either order*

1 (L5)

thermal

*accept 'heat'*

1 (L5)

[8

### Q3.

- (a) any **one** from

- she is not moving **or** falling  
*accept 'she has not dived or jumped'*  
*award a mark for an answer which implies she is not moving*

- she is standing still  
*accept 'she is still'*

1 (L5)

(b) (i) • 8

1 (L5)

(ii) any **one** from

- the total energy is the same  
*accept 'they are the same'*

- the gravitational potential and the kinetic energy add up to 8  
*accept 'they all add up to 8'*

1 (L6)

[5]