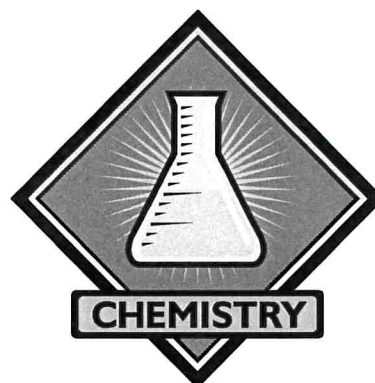
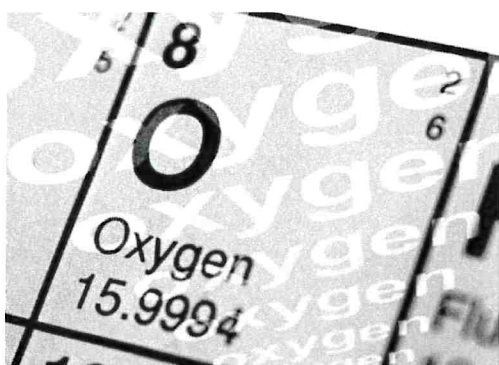


# GCSE Chemistry

The four extra help sessions that you have been invited to are going to cover the following topics:

1. Atom structure (Monday 19 June 2017)
2. Periodic table (Monday 26 June 2017)
3. Bonding (Monday 3 July 2017)
4. Energy changes (Monday 10 July 2017)

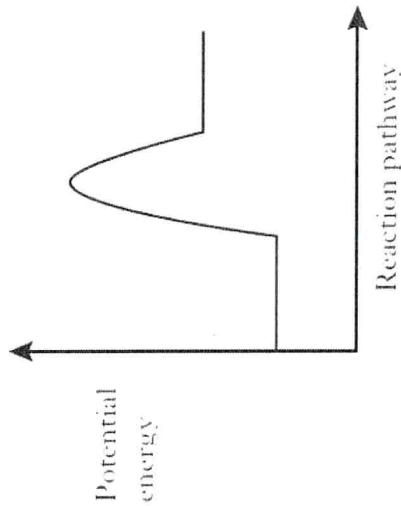


## AQA Combined Trilogy Chemistry

## Topic 4: energy changes

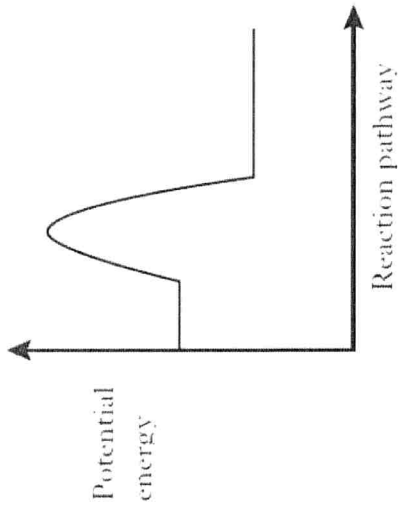
|  | Taught | Practiced | Mastered |
|--|--------|-----------|----------|
| Do you know that energy is <u>conserved</u> in reactions? You don't create or destroy it, just transfer it.  |        |           |          |
| Can you define the terms endothermic and exothermic? Can you give some everyday examples of these reactions?   |        |           |          |
| Can you draw energy profiles for exothermic and endothermic reactions? Can you explain what the diagrams show?   |        |           |          |
| Define the activation energy. Can you draw arrows on energy profiles that show the activation energy?  |        |           |          |
| Can you describe bond breaking as endothermic and bond making as exothermic?   |        |           |          |
| Explain why a chemical reaction is classed as being overall exothermic or endothermic in relation to the energy involved in breaking and making bonds. |        |           |          |
| Can you calculate the energy transfer in chemical reactions using bond energies if you are given them in a table?                                      |        |           |          |

Which type of reaction does this profile show?



Add labels for activation energy and energy taken in.

Which type of reaction does this profile show?



Add labels for activation energy and energy released.

What is wrong with this sentence?

In a combustion reaction, energy is created and the reaction gets hot.

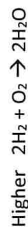
When a reaction is an equilibrium, what does that mean?

Describe a product that uses an exothermic reaction is ...

Describe a product that uses an endothermic reaction is ...

## Energy changes

Add notes and diagrams to make it useful



| Bond | Bond energy in kJ/mol |
|------|-----------------------|
| H-H  | 436                   |
| O-O  | 498                   |
| H-O  | 464                   |

Bond energy of reactant bonds broken =

Bond energy of product bonds formed =

Overall =

hot surroundings cold released  
absorbed broken formed  
surroundings released broken  
absorbed

With an endothermic reaction, energy is transferred from the ..... to the reaction mixture.

In endothermic reactions more energy is ..... than is ..... when the new product bonds form.

The reaction mixture feels .....

With an exothermic reaction, the energy is transferred from the ..... to the .....

Less energy is ..... as the reactant bonds are ..... than is ..... when the new product bonds form.

The reaction mixture feels .....

What do you know about a reaction if you are told that the energy change for the forward reaction is  $-100 \text{ kJ}$ ? Write as much as you can.

What does the activation energy of a reaction mean? What is the activation energy actually for?

Given an example of how you might reach the activation energy for a reaction?

Bond breaking is ...

Bond making is ...

An example of an exothermic reaction is...

An example of an endothermic reaction is ...

# Past paper questions

1 Read the following statements.

**Endothermic reactions take energy from the surroundings, which get colder.**

**Exothermic reactions release energy into the surroundings, which get hotter.**

Now decide whether the reactions you carried out were endothermic or exothermic. Write down how you know.

Station 1 was endothermic/exothermic. I know this because:

.....  
.....

(2 marks)

Station 2 was endothermic/exothermic. I know this because:

.....  
.....

(2 marks)

Station 3 was endothermic/exothermic. I know this because:

.....  
.....

(2 marks)

Station 4 was endothermic/exothermic. I know this because:

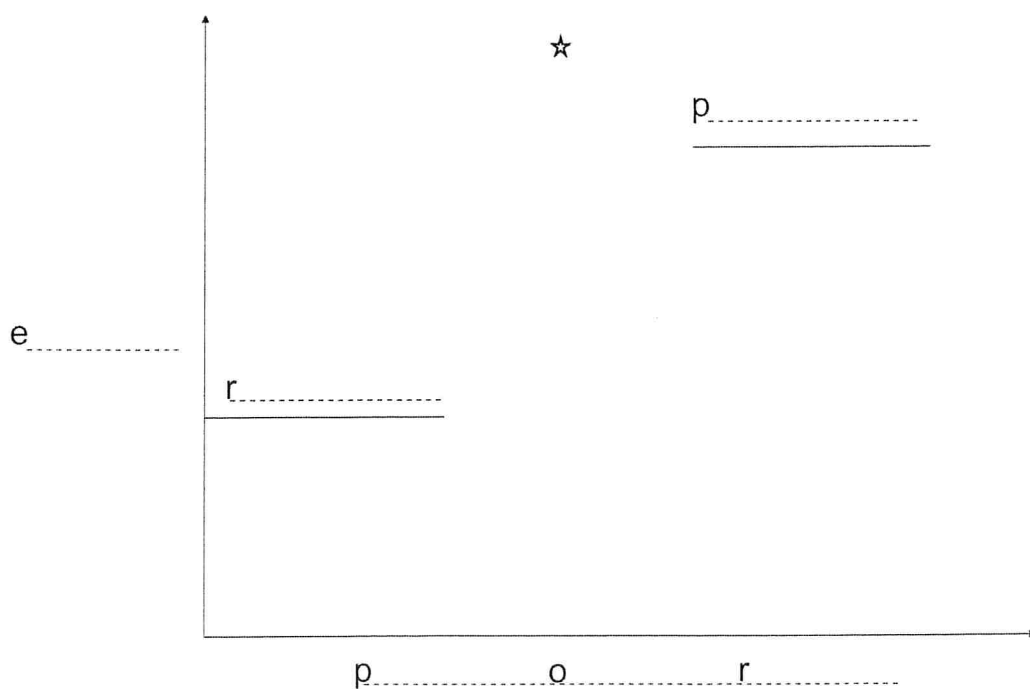
.....  
.....

(2 marks)

2 You have been provided with two blank reaction profiles. These show how the amount of energy changes through the course of a reaction.

Carry out the steps described below to complete each reaction profile.

a Endothermic reactions



i Complete the boxes for each label. Choose from the following words: (4 marks)

reactants energy progress of reaction products

ii Find the line that shows the energy level of the reactants. (1 mark)

Draw a dotted curved line from this line, up to the star (this is only there to help you, it is not usually found on a reaction profile) and then back down to the line that shows the energy level of the products.

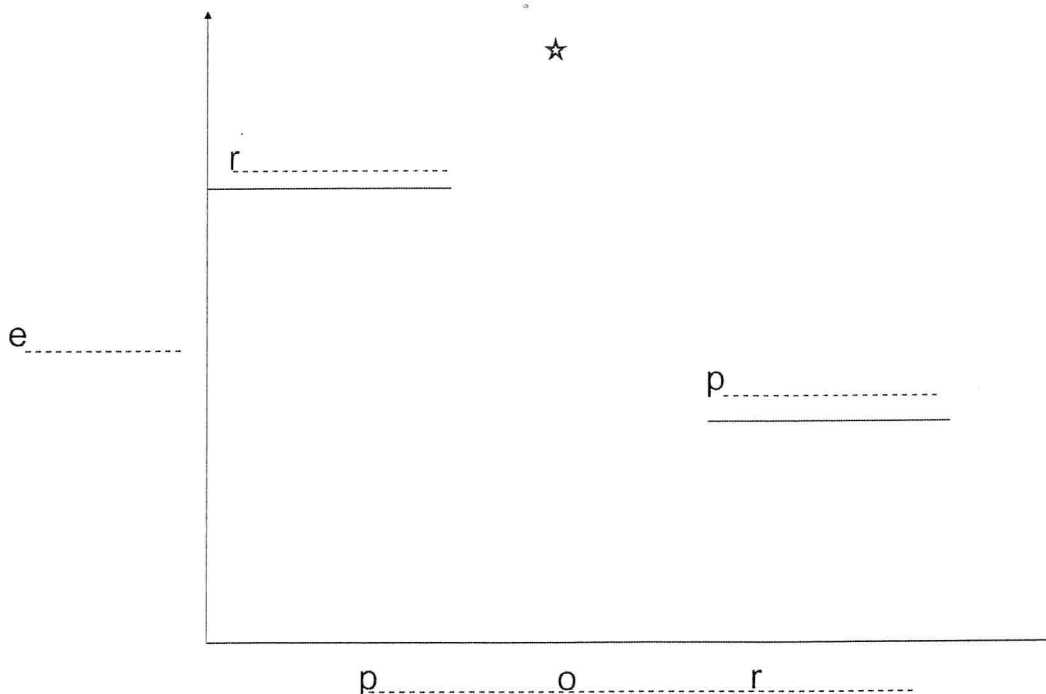
iii Use these words to complete the following paragraph to describe your endothermic reaction profile: (7 marks)

colder products energy start endothermic temperature activation

On a reaction profile for an \_\_\_\_\_ reaction, the energy level of the reactants is lower than the energy level of the \_\_\_\_\_.

Because the reactants need to gain \_\_\_\_\_ to get to the higher energy level, they take it from the surroundings. This means the surroundings lose energy and get \_\_\_\_\_. The \_\_\_\_\_ of endothermic reactions decreases. The dotted line on the profile shows that the energy has to get past a certain level before the reaction can \_\_\_\_\_. This is called the \_\_\_\_\_ energy.

b Exothermic reactions



iv Complete the boxes for each label. Try and recall the labels without looking back at your endothermic reaction profile. (4 marks)

v Find the line that shows the energy level of the reactants.

Draw a dotted line from this line, up to the star (this is only there to help you, it is not usually found on a reaction profile) and then back down to the line that shows the energy level of the products.

(1 mark)

- vi Finish the sentences below to describe the reaction profile. Try and complete each one without looking back at your paragraph about the endothermic reaction profile.

On a reaction profile for an exothermic reaction, the energy level of the products is:

.....  
.....

(1 mark)

Energy is given out to the surroundings. This means that:

.....  
.....

(1 mark)

The dotted line on the profile shows:

.....  
.....

(1 mark)

Hydrogen reacts with chlorine as shown in the equation.



The bond enthalpies are shown in **Table 1**.

Table 1

| Bond  | Bond energy in kJ/mol |
|-------|-----------------------|
| H—H   | 436                   |
| Cl—Cl | 243                   |
| H—Cl  | 432                   |

Calculate the energy change for the reaction in kJ/mol.

[3 marks]