

Worksheet

Activity 1

Gist statements

Use the following jumbled statements to make three true sentences and three false sentences. Once you have finished, read them aloud and challenge your classmates to say if they are true or false!

1st part of the sentence	2nd part of the sentence	TRUE/FALSE
Combustion	cannot be reversed	
A physical change	may be a chemical change	
Melting ice	does not produce new substances	
A chemical change	is always evident	
Appearance of a gas	is a reversible change	
A chemical reaction	produces different substances	

Activity 2

Sequencing a procedure

Reorder the sentences to indicate the appropriate order to perform the experiment 'The Foam Monster'.

1. Pour the potassium iodide in the graduated cylinder.
2. Weigh 5 grams of potassium iodide on a piece of paper.
3. Move away from the graduated cylinder.
4. Put 15 mL of hydrogen peroxide into the graduated cylinder.
5. Put the graduated cylinder in a sink.
6. Fold the piece of paper with the potassium iodide on it.
7. Put 5 mL of washing-up liquid in the graduated cylinder.

Activity 3

Watch the video 'Volcano Experiment' at <https://www.youtube.com/watch?v=RrbQHW74hQw> (C for Chemistry Channel).

Write the procedure to perform this experiment. State clearly what the reactants and the products are, and how the reaction starts.

Activity 4 Jumbled sentences

The sentence fragments in this paragraph are disordered. Put them in the correct order. Start with the first one:

In a chemical reaction...

called products - No new atoms - substances called reactants - different chemicals - : atoms recombine. - react and transform into - are created in the process

Activity 5 Academic word list

There is a difference between academic and general vocabulary, for example:

main vs. major
show vs. indicate
different vs. distinct
labour vs. work

In this activity, you have to substitute the underlined words in the text with an academic word from the box below with the same meaning:

Chemical reactions are the processes by which chemicals react to form new chemicals with different compositions. Simply explained, a chemical reaction is the process where reactants are changed into products. How chemicals react is governed by the chemical properties of the element or compound- the ways in which a compound or element goes through changes in composition. (*Adapted from chemwiki.ucdavis.edu*)

produce - interact - stated - undergoes - manners - transformed - dictated - distinct

Activity 6

Odd one out

In these four lists of words related to chemical experiments, one is out of place. Find it and explain the reason why that word is the 'odd one out'.

- beaker, flask, zinc, test tube
- flammable, volatile, dense, solution
- amount, saturated, dilute, concentrated
- carbon dioxide, limewater, hydrochloric acid, copper

Activity 7

Fill in the gaps in the paragraph.

In the chemical reaction $\text{C (s)} + \text{O}_2 \text{ (g)} \rightarrow \text{CO}_2 \text{ (g)}$, the weight of CO_2 is _____ as the weight of C and O_2 combined. The mass of O_2 is _____ than the mass of CO_2 . In the reaction $2\text{KClO}_3 \text{ (s)} \rightarrow 2\text{KCl (s)} + 3\text{O}_2 \text{ (g)}$, the weight of KClO_3 is _____ than the mass of oxygen.

Activity 8

Fill in the gaps in this text about Antoine Lavoisier, using the words in the box below.

The _____ career of Lavoisier, who _____ many important studies on combustion _____, was cut short by the French _____. Guillotined in 1794 during the Reign of Terror, he is generally considered the father of _____ chemistry because he conducted _____ controlled _____ and used quantitative _____. (*Chemistry, The Central Science. Brown et al.*)

measurements - experiments - modern - conducted - science - reactions - Revolution - carefully

Activity 9

Watch the video 'Vacation or conservation of mass' (Crash Course Kids, <https://www.youtube.com/watch?v=3IHHiTdmK4>), min. 1:17-2:37

The following sentences are not in the correct order. Read them and discuss the order in which you think they will occur in the video with a partner. Watch the video and check your answers.

1. Lots of experiments have provided evidence of the conservation of mass.
2. Reactants are substances that change in a chemical reaction.
3. Matter cannot just appear or vanish.
4. A chemical change occurs when the particles that make up two or more substances are rearranged.
5. The amount of matter in an object is never made and never lost.
6. There are clues that a chemical change is occurring, like the production of gas bubbles.

Activity 10

Carefully listen to the reading of a text, but do not take notes. Do not look at the text below, either. After listening to the reading, place the keywords listed below in the gaps:

A flask containing dilute _____ was placed on a digital _____. An excess of _____ chippings was added to this acid, a plug of _____ wool was placed in the neck of the flask and the _____ mass was recorded. A chemical reaction happened and the _____ turned fizzy, showing formation of a _____. The mass of the apparatus was recorded every two _____. At the end of the experiment the _____ in mass of the apparatus was calculated and the results were _____ in a table.

The loss of weight and the bubbling is evidence of a gas (_____) being produced. The gas escapes through the cotton plug. The mass of gas produced can be _____ by _____ the final weight from the initial weight of the _____.

scale - subtracting - hydrochloric acid - minutes - mixture - apparatus
calculated - carbon dioxide - wool - initial - loss - marble - gas

Original text (it can be read by the assistant)

A flask containing dilute hydrochloric acid was placed on a digital scale. An excess of marble chippings was added to this acid, a plug of cotton wool was placed in the neck of the flask and the initial mass was recorded. A chemical reaction happened and the mixture turned fizzy, showing formation of a gas. The mass of the apparatus was recorded every two minutes. At the end of the experiment, the loss in mass of the apparatus was calculated and the results were registered in a table.

The loss of weight and the bubbling is evidence of a gas (carbon dioxide) being produced. The gas escapes through the cotton plug. The mass of gas produced can be calculated by subtracting the final weight from the initial weight of the apparatus.

Activity 11

The words in these definitions have been disordered. Rearrange the words to write a correct statement.

Exothermic: energy reaction released Chemical where is

Chemical bond: together holds atoms that Force

Bond energy: needed Amount break of bond energy chemical a to

Endo: means Greek that prefix inside

Combustion: reaction that big of Chemical produces a energy amount

Activity 12

Passive sentences

The order of the words in a sentence can be changed, so that the object moves to the front and becomes the subject. Look at the example:

The police arrested the thief. → The thief was arrested by the police.

Change these sentences to the passive form:

Water decomposition produces hydrogen and oxygen.

An exothermic reaction releases energy.

An endothermic reaction takes energy from the surroundings.

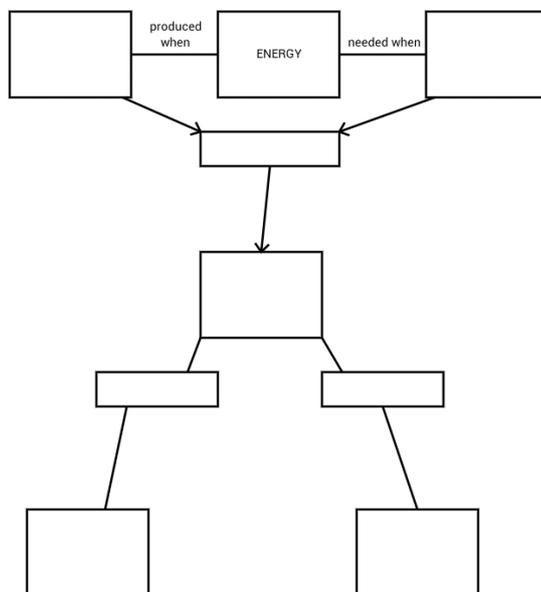
Breaking a bond needs an amount of energy.

Forming a bond releases an amount of energy.

5 Chemical reactions

Activity 13 Mind map

Complete the mind map below with the phrases and words in the box:



breaking bonds - released less than needed - exothermic - energy balance -
comparing - needed less than released - endothermic - making new bonds

Activity 14 Noticing

Find and practise examples of the passive form in a text.

The passive form is quite common in scientific language. Underline examples of the passive form in the following text. Then, try to rewrite the text without using the passive form. Was it easy?

When natural gas is burnt with an excess supply of air, a large amount of energy is produced. During this process, the combustion of methane, heat is given out. It is an exothermic reaction. If the supply of air is limited, then the reaction is not so exothermic and a poisonous gas (carbon monoxide) is produced. This is the incomplete combustion of methane. This gas is odourless and many people have been killed by its presence in non-ventilated rooms.

Activity 15

Write a full paragraph answering the following questions. Use linking words such as *and*, *but*, *however*, *therefore*, *firstly*, *lastly*, etc.

1. What is reaction rate?
2. What is kinetics?
3. How do we classify reactions by their rate?
4. Can we control reaction rate?
5. What variables affect reaction rate?
6. What is the effect of temperature on particles' speed?
7. How does temperature affect reaction rate?
8. What is concentration?
9. What is the effect of concentration on reaction rate?

Activity 16

Look at these two sentences:

Nitroglycerine is a very unstable and explosive liquid that has to be handled very carefully.

In 1867, Alfred Nobel invented dynamite and became very rich, establishing the famous Nobel Prizes.

Investigate the relationship between dynamite and nitroglycerine and write a brief report, explaining the effect of concentration on this invention.

Activity 17

Explain the following facts according to the influence of temperature. Look at the example for help.

1. Potatoes cook faster in oil than in water.
The boiling point of oil is higher than the boiling point of water. When we cook potatoes in oil, the temperature of the oil is higher than if we cook them in water. The rate of the reaction increases and potatoes cook faster.
2. Food is kept in the refrigerator.
The temperature in the refrigerator is _____ than _____. The reaction of food spoilage happens in the because the _____ Food stays fresh _____
3. Food is cooked faster in a pressure cook.
4. Life is not possible in a frozen or a very hot planet.
5. Baking powder works faster when we put the dough into the oven.
6. You can keep frozen food for weeks.

Activity 18

Adjectives describe nouns. When comparing a number of nouns, we need to use the comparative form of adjectives. Look at the examples:

The Amazon, the Nile and the Rhine are very long rivers. The Amazon is **longer** than the Rhine, but the Nile is the **longest** river in the world.

Silver, gold and platinum are expensive metals. Gold is **more expensive** than silver, but platinum is the **most expensive** metal.

Use the adjectives in the box and/or their comparative forms to fill in the gaps in the paragraph:

The amount of solute in a solution indicates how _____ it is. A solution that has 5 g of solute in 100 mL is _____ than a solution that has 2 g of solute in 100 mL of solution.

Laura is performing an experiment with a chemical reaction at 30 °C. When the same reaction occurs at 50 °C, its rate is _____. She does the experiment again at 70 °C and 90 °C. The rate at 90 °C was the _____.

Raúl does the experiment with the same reaction, but he changes the concentration of the reactants. For his first test, he uses a solution with a 15 % concentration. Then he uses a solution that is 10 % and finds that the rate is _____. When he uses a 5 % solution, the rate is the _____ of the three.

concentrated – slow - fast

Activity 19

Focus on language

The suffix *-ly* is used to transform an adjective into an adverb. Look at this example:

Rusting is a slow reaction. Rusting happens *slowly*.

Transform the following reactions as in the example:

- An explosion is a rapid reaction. An explosion _____
- Fruit ripening is a slow reaction. _____
- Combustion is a quick reaction. _____
- Food spoiling is a _____ It happens slowly.

Activity 20

Write an ending for these sentences:

- The higher the concentration of a reactant, _____
- When there is a bigger number of reactant particles, _____
- When we cool down a chemical reaction _____
- A reaction that occurs very fast _____
- The lower the temperature at which a reaction happens, _____

Activity 21

pH investigation

Draw a pH scale showing the colours of indicator paper, from dark blue to bright red (see example at <http://ibchem.com/IB16/08.84.htm> and indicate the position on the scale of some common substances (water, vinegar, ammonia, washing soap, baking powder, etc.) according to their pH.

Activity 22

Underline the correct word in each sentence.

1. A solution has a pH = 10. Therefore, it is an acid/basic/neutral solution.
2. Indicator paper changes colour/shape/odour when used for testing a solution.
3. Acids have a sweet/bitter/sour taste.
4. Alkaline is the same as acid/base/neutral.
5. Acids react with baking powder and limestone producing solids/gas/ash.

Activity 23

Research and fill in this table.

Common name	Active chemical name	Acid, base or salt?
Caustic soda		
Baking powder		
Vinegar		
Limestone		
Table salt		
Antacid tablets		
Bleach		

5 Chemical reactions

Activity 24

Match the beginning and the ending in these sentences:

- | | |
|---|-------------------------------------|
| 1. Acids and bases | A. form in a precipitation reaction |
| 2. An acid solution | B. is a decomposition reaction |
| 3. Indicator paper | C. react and produce salt and water |
| 4. Combustion is an example of | D. is an example of fermentation |
| 5. Reduction happens when | E. is used to measure pH |
| 6. Insoluble products | F. has a pH lower than 7 |
| 7. Electrolysis of water into H ₂ and O ₂ | G. an element gains electrons |
| 8. Making wine from grape juice | H. an oxidation reaction |

Activity 25

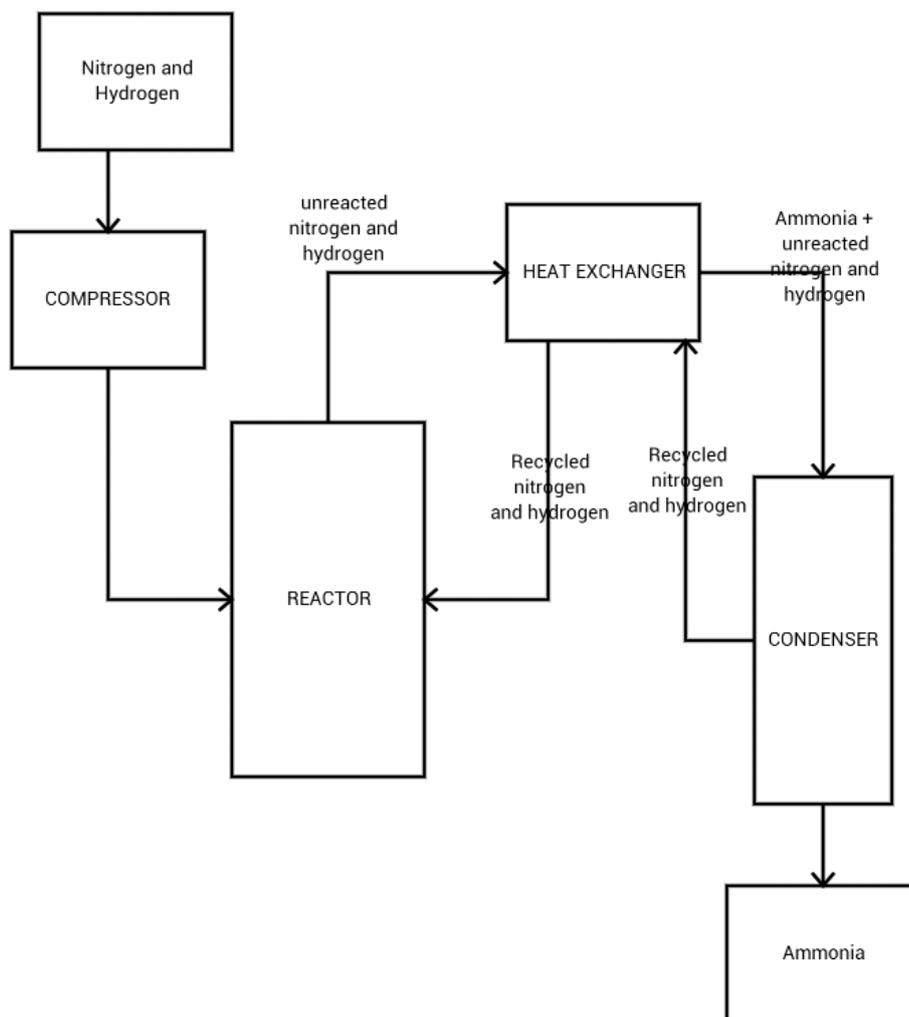
Write five cause and effect sentences explaining the importance of chemical changes and new substances in our lives. Use connectives such as *because of*, *as a result*, *etc.*

Example: As a result of the invention of semiconductors, we have small and fast computers.

5 Chemical reactions

Activity 26

The diagram below represents the production of ammonia, one of the most important chemical industry processes.



Put these sentences in the correct order, using the diagram to help you.

- Nitrogen and hydrogen react partially in the reactor, producing ammonia.
- Liquid ammonia condenses in a condenser, separating from the remaining hydrogen and nitrogen.
- The resulting mixture of nitrogen, hydrogen and ammonia is passed through a heat exchanger.
- Recycled nitrogen and hydrogen are sent to a heat exchanger, where they are preheated and introduced into the reactor.

- e. Liquid ammonia is collected after condensing.
- f. A mixture of nitrogen and hydrogen is compressed to 300 atm.
- g. The compressed mixture enters the reactor.

Activity 27

Tell me what you know

Walk around the classroom and find a classmate who can give you an example of an object usually made with these materials. Write the example, the name of the person who gave you the answer and state if it is a natural, manufactured or synthetic material. The first one has been done for you.

Material	Example	Name of classmate	Type of material
Steel	Keys	Laura	Manufactured
Wood			
Plastic			
Paper			
Spandex			
Glass			
Aluminium			

Activity 28

Do you recognise me?

Working in pairs, write an easy and a difficult definition for each word below. An example has been done for you.

Steel: A metallic mixture made of iron and carbon.

Steel: An iron-based alloy that has a variable proportion of carbon and can contain other metallic elements such as vanadium, chromium, manganese, etc. Its different composition determines its properties and applications.

pottery - copper - papyrus - oil - plastic - Teflon - semiconductors - nylon

5 Chemical reactions

Activity 29 Acid rain

Look at the picture that illustrates acid rain in your textbook.

1. Name two pollution generators in the picture and two locations affected by pollution.
2. Indicate the place where acids are produced.
3. What substances generate these pollutants?
4. Can you name another possible source of these pollutants?
5. What does N_xO_y stand for?
6. What other living beings, apart from trees, die because of acid rain?

Activity 30 Greenhouse effect

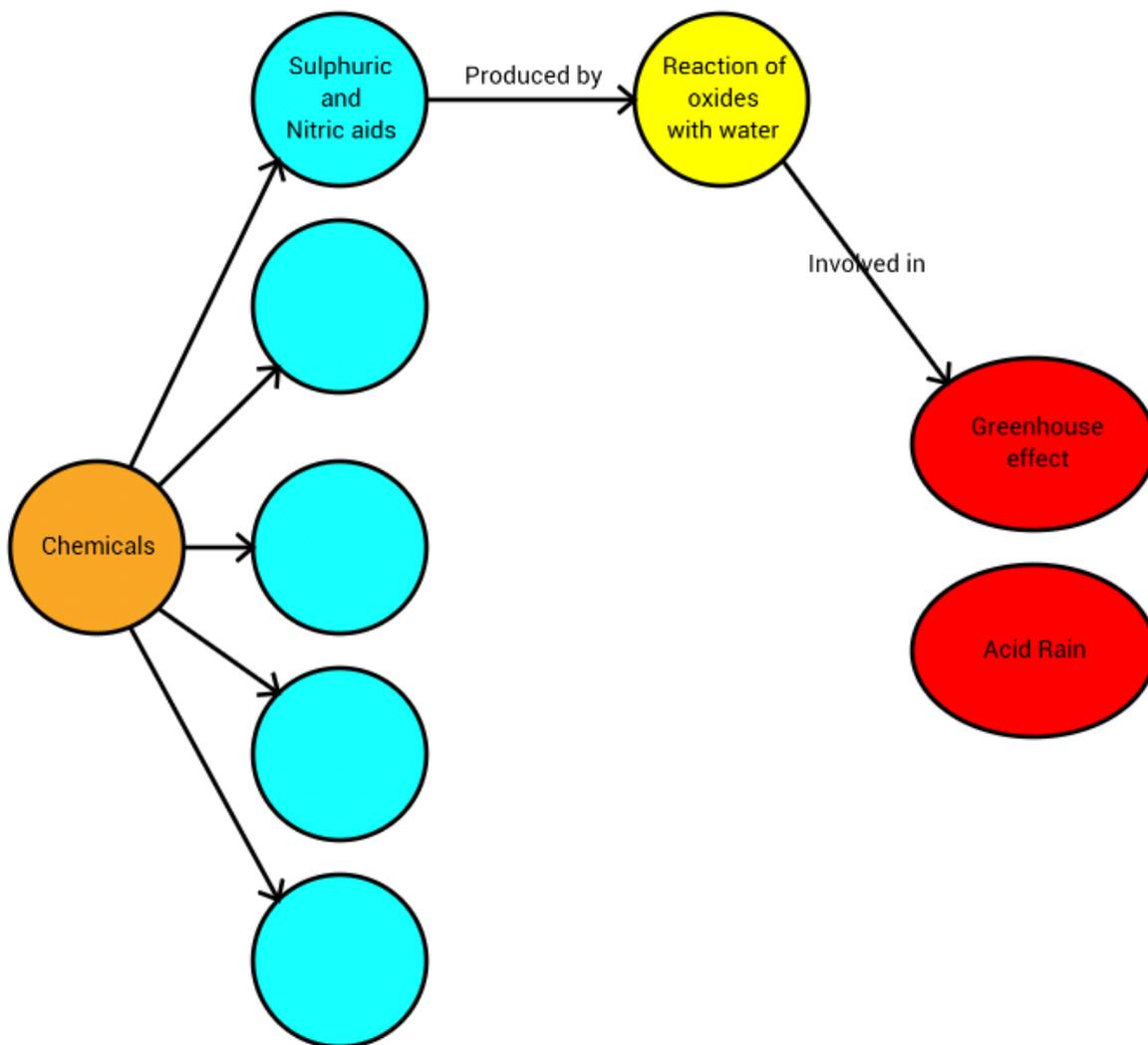
Using the present tense: The present tense of verbs can have different meanings. Look at the table and the examples, and fill in the last column with examples related to the greenhouse effect.

Use of the present form	Example	Greenhouse effect
An action happening now	I am watching TV.	
A changing situation	The economy is getting better.	
A general truth	Giraffes are mammals.	
A process	Electrons flow through the circuit.	

5 Chemical reactions

Activity 31

Fill in this mind map about the chemicals involved in the greenhouse effect and acid rain. The first one has been completed for you.



Activity 32

Talking about purpose

Look at the example and make sentences to explain the purpose of some actions we can do to protect the environment.

EXAMPLE: We must recycle electronic devices to minimise mineral extraction.

We must reduce plastic use to....

We must use fertilisers appropriately to....

Make three more sentences using your textbook.

Activity 33

Protection against the sun

'Slip, slop, slap, seek'

Watch the video at https://www.youtube.com/watch?v=LtN_u5Gnzqw (0:53 – 1:23) and prepare a presentation of 5 slides, one for each verb shown in the video, with a picture illustrating the action. Explain the meaning of the verb with a sentence.

Activity 34

Persuasion

When you try to convince someone about your point of view, there are strategies that can help you to achieve your goal. Make a speech to convince someone that it is important to recycle. Your speech should have the following elements:

- An opening statement to get the listener's attention
- Present tenses
- Suggesting: *should*, *must*

Your speech should include some word features such as:

- Adjectives (comparative and superlative forms)
- Strong adjectives for emotional effect
- Personal pronouns (*you*)

Work in pairs to create your speech and give it to the rest of the classroom.