

## Grade 8 Natural Science Worksheet

---

### Metals

#### Part One: Properties of metals

Fill in the gaps in the notes by choosing words from the box below.

Three quarters of all the known elements on earth are (a) . All metals share certain properties. For example, they are (b) when cut and they conduct (c) and heat. Some, like potassium, react violently with (d) while others, like (e) , do not react at all. Except for mercury, all metals are (f) at room temperature. Some metals, such as iron and nickel, are (g) . The centre of the (h) is believed to be made of iron and nickel. Some metals, like (i) , can be pulled out to make wires. These are called (j) metals. Some metals can be beaten into flat sheets. These metals are called (k) metals. Aluminium is a malleable metal. Metals form part of appliances, (l) and everyday things that you use all the time. Our lives would not be as they are today, if it were not for the fact that we have learned how to use metals.

magnetic	shiny	tools	water	earth	ductile	metals
gold	electricity	solid	copper	malleable		

[12 marks]

#### Part Two: Discovery of metals

Do some research to find out who discovered metals and what they used metal for in the ancient times.

[15 marks]

#### Part Three: Alloys

What is an alloy and what are the benefits of using alloys to make objects? Give some examples to illustrate your ideas.

[15 marks]

## Grade 8 Natural Science Worksheet

### Part Four: Practical investigation

In your classroom and at home, you will find many metal objects. You are going to investigate these objects and find out if they contain IRON. One of the characteristics of iron is that it is magnetic. You will need a magnet for this activity.

By placing the magnet on the metal, you will discover if the metal is magnetic or not.

Make up a table showing the things you tested and whether or not they were magnetic.

Some things to test: Door hinges and handles, knives and forks, gates, bicycle parts, spectacles, belt buckles, taps, pipes – the list is as long as your imagination and observation skills!

(CAUTION: DO NOT PUT YOUR MAGNET NEAR COMPUTERS OR TELEVISION SETS. YOU COULD DAMAGE THEM.)

Remember to set up your investigation as a scientific investigation.

[14 marks]

### Part Five: Mining metals

- Write an essay in which you explain logically why mining is so important to a country such as South Africa.

[30 marks]

### Rubric for writing an essay

Criteria	Level 4	Level 3	Level 2	Level 1
<b>Title</b>	Apt, reflects content. [2 marks]	Fairly apt. [1 mark]	None. [0 marks]	–
<b>Introduction</b>	Explains intention, defines terms well. [4 marks]	Fair explanation of intention, an attempt made at definitions. [3 marks]	Does not introduce essay adequately. [2 marks]	None. [0 marks]
<b>Body</b>	Logically developed and linked paragraphs.	Fair attempt at logically developed paragraphs.	Poor paragraphing and logic.	No paragraphs, essay not logically organised.

## Grade 8 Natural Science Worksheet

	[4 marks]	[3 marks]	[2 marks]	[1 marks]
<b>Conclusion</b>	Links back to intention, ends argument. [4 marks]	Fair linking back to intro, fair ending to argument. [3 marks]	Poor linking back to intro, argument not ended well. [1 mark]	None. [0 marks]
<b>Content and research</b>	Facts have been presented in great depth, then own opinion offered. [13 – 10 marks]	Facts have been presented in some depth, then own opinion offered. [9 – 6 marks]	Limited facts have been presented, then vague attempt at own opinion offered. [5 – 3 marks]	Very few facts have been presented, own opinion missing. [2 – 1 marks]
<b>Neatness and presentation</b>	Neatly presented, attention paid to grammar and spelling. [3 marks]	Fairly neatly presented, some attention paid to grammar and spelling. [2 marks]	Presentation not neat, little attention paid to grammar and spelling. [1 mark]	–
<b>Total:</b>	Possible marks: 30			

2. Imagine that you live close to a mine that mines a very important mineral for South Africa's economy. However, the mining company is not taking care of the environment. (Maybe they are pumping mining waste products into a nearby river, or polluting the air with smoke, or leaving open quarries cut into the hills.)

Write a letter to the mining company in which you acknowledge the importance of what they are mining, but you also make an urgent request for them to deal with the environmental issue.

[16 marks]

## Grade 8 Natural Science Worksheet

### Suggested Solutions

Question number	Possible marks	Solution
1	12	Three quarters of all the known elements on earth are metals. All metals share certain properties. For example, they are shiny when cut and they conduct electricity and heat. Some, like potassium, react violently with water while others, like gold, do not react at all. Except for mercury, all metals are solid at room temperature. Some metals, such as iron and nickel, are magnetic. The centre of the earth is believed to be made of iron and nickel. Some metals, like copper, can be pulled out to make wires. These are called ductile metals. Some metals can be beaten into flat sheets. These metals are called malleable metals. Aluminium is a malleable metal. Metals form part of appliances, tools and everyday things that you use all the time. Our lives would not be as they are today, if it were not for the fact that we have learned how to use metals.
2	15	<p>People living thousands and thousands of years ago probably discovered metals quite by accident. ✓ Most metals are found embedded in rock, ✓ in what is known as ore. ✓ Rocks containing the metals ores would have been heated in the fireplaces of ancient humans, ✓ and the metal would have melted out of the rock and formed a residue in the fireplace. ✓ These ancient humans discovered that the metal could be re-melted and shaped into a useful object. ✓</p> <p>The first metals worked by people were copper, gold and silver, ✓ probably because these metals are found in their pure form in ores, and not combined with other elements. ✓ These metals are also fairly soft and easy to beat into different shapes. ✓ The first kinds of objects that were made were useful objects, like bowls. ✓ Weapons like daggers and spears were made – for defence and to kill animals for food. ✓ Also, very importantly, ancient humans discovered that the metals were beautiful, and they made objects to beautify themselves, like jewellery, ✓ and objects to honour their gods. ✓</p> <p>Later, in about 3500 BC, a civilisation called the Sumerians learned how to make bronze, by combining copper and tin. ✓ Bronze is much stronger than copper or tin. ✓</p> <p>In about 1350 BC, people learned to use iron to make their tools. ✓ They also learned how to combine other metals with iron to make even more useful substances like steel. ✓</p>
3	15	The Sumerians learned how to make bronze, by combining copper and tin. Bronze is an alloy. ✓ An alloy is a mixture ✓ of two or more metals, ✓ or of a metal and some other substance. ✓ Alloys are made because the combined properties of the substances in the alloy are very

## Grade 8 Natural Science Worksheet

		<p>advantageous. ✓✓</p> <p>Maybe Metal A is a really light metal but it is weak. Metal B is heavier, and stronger. By combining small amounts of Metal B together with Metal A, you can get a lightweight metal that is stronger than Metal A. This new product is called the alloy. ✓✓</p> <p>Although making alloys was discovered by ancient civilisations, today we make great use of alloys.</p> <p>Steel is an alloy made by combining iron and carbon. ✓ Steel is strong, like iron, but easier to work into different shapes, because of the carbon. ✓ Stainless steel is made by combining steel, nickel and chromium. ✓ Stainless steel cutlery shines brightly and won't rust or tarnish. ✓</p> <p>Some shiny metals are beautiful, but too expensive to use for everyday objects. ✓ You want beautiful, shiny door knobs, but can't afford gold? Why not use brass? Brass is an alloy of copper and zinc. It just as shiny as gold, but it is much cheaper. ✓</p> <p>Aeroplane bodies are made of alloys of aluminium and titanium so that they are lightweight, ✓ but very strong. ✓</p>
4	14	<p>Encourage the learners to use this as an investigative activity. Set up the investigation according to a research question ✓✓ (what metal objects contain iron?), hypothesis ✓✓ (these objects do contain iron, while these do not), method ✓✓ (what they did), results ✓✓✓✓ (which metals did contain iron – in a table) and conclusions ✓✓ (was their hypothesis correct?). If the learners find out information from home – are the learners in agreement on the composition of similar objects? ✓✓ Science is about validation of results!</p>
5.1	30	<p>Some guidelines for marking the content of the essay:</p> <p>Rocks which contain useful metals are mined, or taken from the ground where they occur naturally. Sometimes tunnels are dug deep into the earth's surface to reach the metal ore. Sometimes, ore that is found near the earth's surface is dug out of huge open pits.</p> <p>Since the earliest times, people have realised the value of the metals that are mined from the earth. People with access to the metals gained an economic advantage over people who did not have metal. Trade between groups of people very soon reinforced the value of some metals.</p> <p>Sometimes the metal was valuable because it could be used to make a tool or a weapon; while other metals were beautiful and were valued for their beauty.</p> <p>South Africa is a country rich in metals and it has a very highly developed and sophisticated mining industry. Some of the minerals that are mined in South Africa are gold, silver, iron, diamonds, tin, titanium, uranium, platinum, coal, copper, lead and silicon. Some famous towns and cities in South Africa that originated because of the mining industry are Johannesburg, Kimberley, Witbank, Newcastle and Phalaborwa. The</p>

## Grade 8 Natural Science Worksheet

		<p>mining industry is important not only because it provides the minerals to boost our country's economy, but also because it provides jobs to thousands of people.</p> <p>However, although mining provides a country like South Africa with wealth, mining can also harm the environment. Many mining companies have come under harsh criticism for the way in which they harm the environment. Strict laws now exist to keep mining companies aware of environmental issues.</p> <p>See rubric in Appendix of Assessment Tools.</p>
<b>5.2</b>	16	<p>Letters will differ. Make sure that learner has acknowledged the importance of the mineral being mined. They may have to research this. Make sure that their complaint is well worded and that their argument is logical. More science and less passion make for a complaint that will be taken note of by the relevant authorities!</p> <p>Letter to local government:</p> <ul style="list-style-type: none"> <li>* Should look like a letter, i.e. Date, Dear ..., Yours faithfully, etc. ... [2]</li> <li>* Paragraphs and logical structuring. [2]</li> <li>* Factual content and personal opinion as described above. [10]</li> <li>* Concerned and respectful tone. [2]</li> </ul>

### Rubric for writing an essay

Criteria	Level 4	Level 3	Level 2	Level 1
<b>Title</b>	Apt, reflects content. [2 marks]	Fairly apt. [1 mark]	None. [0 marks]	–
<b>Introduction</b>	Explains intention, defines terms well. [4 marks]	Fair explanation of intention, an attempt made at definitions. [3 marks]	Does not introduce essay adequately. [2 marks]	None. [0 marks]
<b>Body</b>	Logically developed and linked paragraphs. [4 marks]	Fair attempt at logically developed paragraphs. [3 marks]	Poor paragraphing and logic. [2 marks]	No paragraphs, essay not logically organised. [1 marks]

## Grade 8 Natural Science Worksheet

<b>Conclusion</b>	Links back to intention, ends argument. [4 marks]	Fair linking back to intro, fair ending to argument. [3 marks]	Poor linking back to intro, argument not ended well. [1 mark]	None.  [0 marks]
<b>Content and research</b>	Facts have been presented in great depth, then own opinion offered.  [13 – 10 marks]	Facts have been presented in some depth, then own opinion offered.  [9 – 6 marks]	Limited facts have been presented, then vague attempt at own opinion offered. [5 – 3 marks]	Very few facts have been presented, own opinion missing.  [2 – 1 marks]
<b>Neatness and presentation</b>	Neatly presented, attention paid to grammar and spelling. [3 marks]	Fairly neatly presented, some attention paid to grammar and spelling. [2 marks]	Presentation not neat, little attention paid to grammar and spelling. [1 mark]	–
<b>Total:</b>	Possible marks: 30			