

RESEARCH ASSIGNMENT

Purpose

To get learners to extract, process, analyse, and synthesise information, and to communicate the results of these processes. They do this individually and collaboratively.

Procedure

Estimated time	Description	Resources
Class time: 1 lesson	<ul style="list-style-type: none"> Explain the assignment to the learners. Divide learners into groups of four members each. Assign an industry to each group. Give each group their overarching controversial question (below), and allow them to conduct an initial brainstorm on this question, in their groups. Assign a number to each learner. Give each learner the learner sheets and guiding questions corresponding to their industry and learner number. 	<ul style="list-style-type: none"> Instructions (p.34) Overarching controversial questions (below) Guidance questions (p.34) Learner sheets (see p.34 for list)
Homework: 2 hours	<ul style="list-style-type: none"> Learners read and summarise the information assigned to them. They answer their guiding questions in rough. 	
Class time: 2 lessons	<ul style="list-style-type: none"> Learners share information with one another. They draw a group mindmap. Learners discuss the group questions, given in the guidance table (p.34), and agree on their answer to the overarching controversial question. 	Large sheets of paper (A3, A2 or A1) Group guidance questions (p.34)
Homework: 2-4 hours	Learners prepare to present a presentation / write a report.	Notes: reports and presentations (pp. 35-36)
Class time: 2 lessons	<ul style="list-style-type: none"> Each learner presents a section of a presentation / writes a section of a report, corresponding to their guiding questions (p.34), and related to their group's overarching controversial question (below). Collaboratively learners provide introductory and concluding statements in their presentation / report, which answers the overarching controversial question, and links the individuals' arguments to this. The teacher marks this work. 	Rubrics (pp. 36-38)

Overarching controversial questions

Do you agree / disagree / partially agree with these statements? Justify your opinion.

The Fertiliser Industry

In the future fewer South Africans will be able to live in cities because inorganic fertilisers are not sustainable.

The Battery Industry

Battery technology has already changed our lifestyles hugely. In the future batteries are going to have an even bigger effect on us.

The Chlor-alkali Industry

Chlor-alkali cells in general, and the membrane cell in particular, affect people's lives mainly for the better.

The Petrochemical Industry

SASOL has contributed significantly to South Africa's development and prosperity in the past, and will continue to do so in the future.

Learner instructions

You will work in a group of four learners. Your group's task is to answer one of the controversial questions on p. 33. You will do so by each writing part of a research report / presenting part of an oral presentation, and collaborating, as a group, on other parts.

- 1 Each learner in your group should have a number. Take the learner sheets, and note the guiding questions, corresponding to that number (see table below).
- 2 Read your learner sheets, and answer your guiding questions in rough.
- 3 Share what you have learnt with your group members. Draw a group mindmap. Discuss the group guidance questions (see table below). Discuss your controversial question.
- 4 Go through the notes on pages 35-36 and revise the information relevant to your topic. Your teacher may tell you to omit certain headings in the research report if time is limited. Note the rubrics.
- 5 Write a report / give an oral presentation. Collaboratively produce the introduction and conclusion. Individually produce the work related to your particular section.

Guidance

Industry	Learner	Guidance	Learner sheets
Fertiliser	1	How has the fertiliser industry developed? Where is it going? Is it sustainable?	F2,F8,F9
	2	How have we developed faster ways to provide what plants need to grow? Why has our need for fertilisers increased? What are the consequences of this?	F4,F5,F7
	3	The world needs more farmers. What do farmers need to know about fertilisers and farming to become financially successful and produce good crops?	F1,F3,F10
	4	Does manufacturing fertilisers now create problems for the future? How does the fertiliser industry affect the environment? Is it sustainable?	F6,F11,F12
	group	What do fertilisers have to do with people living in cities? What are inorganic fertilisers? Are they sustainable? Why/ why not? If they are not sustainable, will this affect city life? Why? / Why not?	
Battery	1	Explain the workings of an electrochemical cell. How have batteries developed over time? How do they affect our lives?	B1,B2,B10
	2	Compare battery types. How do we use each? Discuss the strengths and weaknesses of each. How do you predict batteries will develop in the future?	B3,B4,B6
	3	Different battery technologies have different uses and limitations. What are the challenges that the different technologies have faced and how have they tried to deal with these? Why have so many different technologies been developed?	B5,B7,B8
	4	How can battery sustainability be improved? Refer to recycling, battery alternatives and correct battery handling, use and disposal.	B9,B11,B12
	group	How has battery technology already changed our lifestyles? Is it sustainable? What possibilities are there for the future? Do you think these possibilities will affect us much? Why / why not?	
Chlor-alkali	1	How is salt electrolysed to form products? What are the consequences of this process? Who has benefited? How? Who has been harmed? How?	C1,C11,C12
	2	Salt, caustic soda and many soaps contain sodium. What other links can be drawn between these three substances? Explain the history, sourcing, production and uses of each. Highlight the links between the three.	C2,C6,C7
	3	Chlorine is found in ionic form in salt. Hydrogen is bonded to oxygen in water. Both Cl and H are common elements that affect our everyday lives. How are these elements used? Why are they so important to us?	C3,C4,C5
	4	Discuss similarities, differences, strengths and weaknesses of the various cells used to electrolyse brine. Why have several techniques been developed?	C8,C9,C10
	group	In what way do chlor-alkali cells improve our lives? Do they have any negative effects? How does the membrane cell differ from the rest? Does it improve our lives more than the other cells do?	
Petrochemical	1	Compare petrol and diesel referring to their structures and their economic viability as fuels. How does our dependence on these affect the environment?	P1,P5,P6
	2	Why does the petrochemical industry consist of so many different types of industrial processes? Identify some of these processes. Explain how they work. What products are formed? What are the products' uses?	P4,P8,P9
	3	Fossil fuels are natural sources of energy. Give two examples of fossil fuels. Explain what they are and how we obtain them. How do they affect our lives?	P2,P3,P7
	4	The petrochemical industry is big business. How and why is this so? Who are the role players in South Africa and why are they so influential in everyday life?	P10,P11,P12
	group	How has and does SASOL contribute to South Africa's development and prosperity? Is the industry sustainable? What changes in energy usage do you think might happen in the future? Why? Will SASOL's contribution to South Africa change? If so, how and why? If not, why not?	

Researching and presentation notes

Research

- **Do not** copy information directly from your sources. This is plagiarism, which is wrong. As you read, write a list of keywords. Then put away your sources and use your keywords to help you to explain what you have read, using your own words.
- Interpret the findings and state conclusions. Form an **opinion of your own**. Make suggestions and recommendations of your own.

Oral presentation

- Imagine you are teaching the class this topic. How can you be **interesting and informative**? You cannot cover everything, so carefully **choose what you will present**.
- **Plan** what you will say. Choose only a few main arguments. Each **argument** should consist of:
 - a **claim** (a statement) and
 - **backing** (support to convince people the claim is true).

Where appropriate, also give **counterarguments** (arguments against your view point), and **rebuttals** to these (how you would answer back against these counterarguments).

Use appropriate **linking words** to make your argument clear, logical and cohesive. Some linking words you could use are: firstly, secondly, as we have seen, on one hand, on the other hand, consequently, therefore, however, because, in the past, in the future, at present, instead, even though, in summary.

- **Practice** your presentation. Speak, don't read. Time yourself. Listen to yourself. Are you interesting and clear? Are you enthusiastic? Are you speaking clearly and confidently? Be sure to make eye contact with your audience.
- Use appropriate language. **Do not read** off notes. **Do not recite** a prepared speech. Talk to the class about what you have found and what you have learned as if you are **teaching** the material.

Written report

- **Check** your writing for spelling and grammar errors. Check if your writing is logical, clear and cohesive (links together well). Correct your draft and rewrite it.
- Make sure you **reference** your sources. See the notes on how to do a reference list (p.36).

Report headings

Abstract

A **summary** of your main argument. 200 words or fewer. No references.

Title page

Title, authors' **names**, **date** of completion. Include here which group member was responsible for which section.

Introduction

What is the research **question**? Why is this **important**? What topics will be dealt with, and in what **sequence**? (How is the argument which follows structured?)

Report of the research project

Each paragraph should deal with one main idea, or **argument**. Each argument should consist of:

- a **claim** (a statement) and
- **backing** (support to convince people the claim is true).

Where appropriate, also give **counterarguments** (arguments against your view point), and **rebuttals** to these (how you would answer back against these counterarguments).

Use appropriate **linking words** to make your argument clear, logical and cohesive. Some linking words you could use are: firstly, secondly, as we have seen, on one hand, on the other hand, consequently, therefore, however, because, in the past, in the future, at present, instead, even though, in summary.

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Conclusion

The research question is **answered**. This answer is supported with a brief **summary** of the strongest arguments given in the report. Suggestions for **additional research** are given.

References

A list of resources used. For more than one author, write '&' before the last one.

Books

Author's surname, Initial. (Year of publication). Title. City of publication: Publisher.

Journals / Magazines

Author's surname, Initial. (Year of publication). Title. Journal, Volume (Number), Pages.

Web sources

Author's surname, Initial. (Year of publication). Title. [Online]. Available from URL. [Date of retrieval].

Example

Black, J. (2001). Battery manufacturers in South Africa. [Online]. Available from <http://www.howstuffworks.com/Batteries/South Africa.htm>. [22 September 2010].

Naidoo, P. G. (1992). Teaching Physical Sciences in the South African classroom. *Science Education*, 1(1), 34-36.

Smith, D., Green, R. S. & Gumede, A. (1986). *Chemicals and their uses*. Cape Town: First Publishers.

Appendix

Include:

- a **glossary** of the terms relevant to the project.
- relevant **diagrams** or pictures.
- a **mind map** or flow diagram that was used to plan the research report.

Rubrics

Oral presentation

Group mark	Not achieved	Moderate	Adequate/ Substantial	Outstanding
• The group presented its answer to the controversial question clearly and convincingly .	0	1	2	3
• The group supported its answer to the controversial question thoroughly and logically .	0	1	2	3
• The collaborative and individual sections of the presentation were well integrated and linked to make a cohesive whole.	0	1	2	3
Individual mark				
• A highly enthusiastic learner. The presentation is interesting, capturing attention.	0	1	2	3
• Accurate information was presented. It is clear that the learner has mastered the content.	0	1	2	3
• Arguments are clear and logical. Claims are supported thoroughly and logically.	0	1	2	3
• Counterarguments and rebuttals are included in a fair-minded manner.	0	1	2	3
• The learner is able to converse in a scientific language.	0	1	2	3
• The learner presents the topic without reading. He/she keeps to time limits.	0	1	2	3
• The most important and relevant content was presented. This is done in a well-organised sequence.	0	1	2	3
Total	/30			

Written report

Criterion	Level Descriptors				
Abstract (6 marks) (Group mark)	No abstract is included or abstract is not appropriate or abstract is relevant but none of the statements are satisfactory.	Any one of: Research concept is stated clearly. Essential research findings are summarised. Conclusion is stated. Fewer than 200 words are used.	Any two of: Research concept is stated clearly. Essential research findings are summarised. Conclusion is stated. Fewer than 200 words are used.	Any three of: Research concept is stated clearly. Essential research findings are summarised. Conclusion is stated. Fewer than 200 words are used.	Research concept is stated clearly. Essential research findings are summarised. Conclusion is stated. Fewer than 200 words are used.
	0-1 marks	2-3 marks	4 marks	5 marks	6 marks
Title page (1 mark) (Group mark)	No title page is included or title page is inappropriate or title page is incomplete.	The following are given: Research report title. Authors' names. Completion date. A list of which learner was responsible for which section.			
	0 marks	1 mark			
Introduction (7 marks) (Group mark)	No introduction or introduction is inappropriate or it is relevant but not satisfactory.	Any one of the following: The research question is given. It is clear why the research is important. The argument sequence is mapped out.	Any two of the following: The research question is given. It is clear why the research is important. The argument sequence is mapped out.	All of the following: The research question is given. It is clear why the research is important. The argument sequence is mapped out.	
	0-1 marks	2-3 marks	4-5 marks	6-7 marks	
Report (20 marks) (Individual mark)	No report is included or the report is inappropriate or the report is relevant but not satisfactory, or plagiarism is present.	Any one of the following is appropriate: Findings are in learner's own words. Scientific terms and concepts are correctly used. Resources used / consulted are cited. The report is well researched. The guiding questions are answered thoroughly and correctly.	Any two of the following are appropriate: Findings are in learner's own words. Scientific terms and concepts are correctly used. Resources used / consulted are cited. The report is well researched. The guiding questions are answered thoroughly and correctly.	Any three of the following are appropriate: Findings are in learner's own words. Scientific terms and concepts are correctly used. Resources used / consulted are cited. The report is well researched. The guiding questions are answered thoroughly and correctly.	More than three of the following are appropriate: Findings are in learner's own words. Scientific terms and concepts are correctly used. Resources used / consulted are cited. The report is well researched. The guiding questions are answered thoroughly and correctly.
	0-2 marks	3-6 marks	7-10 marks	11-14 marks	15-20 marks

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Argument quality (12 marks) (Individual mark)	Claims are not clear and not thoroughly and logically supported. Counterarguments and rebuttals are not given, or not suitable. Linking words are lacking and used inappropriately.	Any one of: Claims are clear and thoroughly and logically supported. Counterarguments and rebuttals are given and integrated well in a coherent, fair-minded manner. Linking words are used logically to hold the argument cohesively together.	Any two of: Claims are clear and thoroughly and logically supported. Counterarguments and rebuttals are given and integrated well in a coherent, fair-minded manner. Linking words are used logically to hold the argument cohesively together.	All three of: Claims are clear and thoroughly and logically supported. Counterarguments and rebuttals are given and integrated well in a coherent, fair-minded manner. Linking words are used logically to hold the argument cohesively together.	
	0-2 marks	3-6 marks	7-9 marks	10-12 marks	
Conclusion (7 marks) (Group mark)	No conclusion is included or the conclusion is inappropriate or the conclusion is relevant but not satisfactory.	Any one of: The research question is answered clearly. This is supported by a brief summary of the strongest arguments. Suggestions for further research are given.	Any two of: The research question is answered clearly. This is supported by a brief summary of the strongest arguments. Suggestions for further research are given.	All three of: The research question is answered clearly. This is supported by a brief summary of the strongest arguments. Suggestions for further research are given.	
	0-1 marks	2-3 marks	4-5 marks	6-7 marks	
References (4 marks) (Group mark)	No reference list is included, or none of the sources is appropriately referenced.	Any one of: Appropriate resources are cited. The reference list is appropriately extensive. Sources are all correctly referenced.	Appropriate resources are cited. The reference list is appropriately extensive. Some, but not all, resources are correctly referenced.	All three of: Appropriate resources are cited. The reference list is appropriately extensive. Sources are all correctly referenced.	
	0 marks	1 mark	2 marks	3-4 marks	
Appendix (3 marks) (Group mark)	No appendix is included or the appendix is inappropriate or it is relevant but not satisfactory.	Any one of: Relevant terms are correctly explained. Relevant diagrams/pictures are included. There is a relevant concept map / flow diagram.	Any two of: Relevant terms are correctly explained. Relevant diagrams/pictures are included. There is a relevant concept map / flow diagram.	Relevant terms are correctly explained. Relevant diagrams/pictures are included. There is a relevant concept map / flow diagram.	
	0 marks	1 mark	2 marks	3 marks	
Writing quality (10 marks) (Individual mark)	There are very many grammatical, spelling, typographic and / or scientific errors.	There are a significant number of grammatical, spelling, typographic and / or scientific errors.	There are a fair number of grammatical, spelling, typographic and / or scientific errors.	There are few grammatical, spelling, typographic and / or scientific errors.	There are no grammatical, spelling, typographic, or scientific errors.
	0-1 mark	2-4 marks	5-6 marks	7-8 marks	9-10 marks
Total					/70