

Grade 7 Natural Science Worksheet

Assessment Task: Scientific method

Thinking scientifically to solve problems

The problem:

You must make a CO₂ gas fire extinguisher which will extinguish a candle flame.

Use what you have learned about matter and materials and the following information in the box below.

Design and test a CO₂ gas fire extinguisher.

Information Box

Flames need oxygen gas in order to burn.

Flames will not continue to burn in CO₂ gas.

Your fire extinguisher must use CO₂ gas to extinguish a small candle flame.

Write up your report under the following headings:

1. The problem.
2. Knowledge and skills needed to solve this problem.
3. List of apparatus needed.
4. How I went about designing the fire extinguisher (you should include diagrams).
5. Instructions to someone else, informing them how to construct a CO₂ gas fire extinguisher for candle flames.
6. Designs that I tried which did NOT work, and the reasons why they did not work.

[20 marks]

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Suggested Solutions

Question number	Possible marks	Solution
1	2	The problem. A clear succinct statement of the problem is needed.
2	2	Knowledge and skills needed to solve this problem. Learners need to show that they are thinking about their learning and about how to go about an investigation.
3	3	List of apparatus needed. Diagrams can be credited here. All apparatus must be listed.
4	9	How I went about designing the fire extinguisher (you should include diagrams).
5		Instructions to someone else, informing them how to construct a CO ₂ gas fire extinguisher for candle flames. Simply putting a candle flame next to a saucer of bicarb reacting with vinegar will NOT extinguish the flame. Learners need to in some way trap the CO ₂ produced and then introduce it to the flame. Learners need to structure their report according to the scientific method. Observations need to be as accurate as possible. Learners need to remember that they are doing science – they need to be as accurate and empirical as possible. They must provide evidence for conclusions. Interpretation of observations: Learners should try and account for or explain what they observed. Award marks for evidence that they used their theoretical knowledge to interpret/explain their practical observations.
6	4	Designs that I tried which did NOT work – and the reasons why they did not work. Science is about finding out how to do things – if one way does not work, try another. Award marks for work that showed that learners were trying out ideas.

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A design idea that works well: Cut the top off a 2 litre plastic Coke bottle about midway up the bottle. Put a vinegar and water solution in the bottom half. Light a candle and float it on the vinegar solution. Place a small sealed plastic bag containing bicarb/baking powder in the vinegar. Replace the top of the bottle and seal with prestik/vaseline to make it airtight. Unscrew the lid and insert a piece of wire to pierce the plastic bag. Quickly reseal the bottle. The reaction takes place liberating CO_2 . This extinguishes the flame.