

Burning a fuel, such as petrol or wood, is one form of combustion. In these experiments you will explore what conditions are required for a fire to burn.

Part A: burning paper

Why doesn't a piece of paper spontaneously burn? What does it need to get started?

Teacher demonstration

Watch your teacher use a magnifying glass and sunlight to set a piece of paper on fire.

Question

- 1. What is needed to make paper burn? Why?

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Part B: burning candle

Does a candle change mass when it is burnt?

Equipment

- candle
- matches
- electronic balance

Method

- Use electronic scales to find mass of candle. Record the mass.
- Light candle and let it burn for two minutes, then blow it out.
- Allow candle to cool, then weigh it again. Record the mass.

Questions

- 2. What was the mass of the candle:

- a) before it was burnt?.....
- b) after it was burnt?
- c) Are the two masses the same or different? Why is this?

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- 3. Is burning a candle a physical or chemical change? How can you tell?

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Part C: candle in a jar

Does a candle burn in a closed container? Let's investigate.

Equipment

- 2 candles
- matches
- glass jar, tall enough to fit over a lit candle
- electronic balance

Method

- Light candle.
- Put glass jar over lit candle, taking care not to touch the flame.
- Let candle burn until it goes out.
- Repeat experiment using the second candle. This time do the experiment on an electronic balance. Record mass of whole set up as soon as you put the jar over the candle, and again when candle goes out.

Questions

4. What was the mass of the whole set up (candle and jar):
- a) as soon as you put the jar over the candle?
 - b) when the candle went out?
 - c) Are the two masses the same or different? Why is this?
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5. Why did the candle go out?
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6. Did you notice any moisture on the inside surfaces of the jar? What could this liquid be?
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7. Suggest where this liquid came from.
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Part D: limewater

What happens to limewater in a container where combustion is occurring?

Equipment

- tea light candle
- matches
- glass jar, tall enough to fit over a lit candle
- 20 mL limewater
- petri dish

Method

- Pour 20 mL of limewater into the petri dish.
- Stand candle in petri dish, then light it.
- Put glass jar over candle, being careful not to touch flame.

Questions

8. What happened to the limewater?

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9. What gas must have been produced? Where did it come from?

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Part E: what is a flame?

What is a flame?

Teacher demonstration

Watch your teacher try to light wax with and without a wick.

Questions

10. Why is a wick needed to burn wax?

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11. When the wick is lit, does the wax burn or just the wick? How can you tell?

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Part F: comparing mass of a stick

Does wood change mass when it is burnt?

Equipment

- short stick
- matches
- watch glass
- electronic balance

Method

- Place stick in a watch glass.
- Use electronic scales to measure mass of the stick and watch glass. Record the mass.
- Light stick, hold it carefully by one end until it is burning well, then place in watch glass to finish burning.
- When the fire has gone out, weigh stick in watch glass again. Record new mass.

Questions

12. Describe appearance of the stick, after it has been burnt.

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13. What has been produced?

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14. What happened to the mass of the stick?

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15. The law of conservation of mass states that no mass should be gained or lost during a chemical reaction. How can you explain the change in stick mass when it was burnt?

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16. If a stick is burnt in a closed container, would the whole system (container and contents) change mass? Explain why or why not.

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17. Does burning wood require or give off energy? Or both? Explain.

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Combustion of compounds containing carbon – putting it together

18. What things are required when compounds containing carbon burn? (These are reactants.)

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19. What things are created when compounds containing carbon burn? (These are products.)

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Part G: burning steel wool

Metals can be oxidised too. In this experiment you will see your teacher burn some steel wool and compare your observations with what happened in the combustion reactions.

Teacher demonstration

Watch your teacher use electricity to light steel wool.

Questions

20. Record your observations.

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21. Describe what happened to steel wool in the reaction. What evidence do you have that a new substance was formed?

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Part H: steel wool with limited oxygen

How well does steel wool burn in limited oxygen?

Teacher demonstration

Watch your teacher as they burn a candle in a closed container then attempt to light steel wool.

Questions

22. What happened when the steel wool was lit? How did this compare with when the steel wool was lit in unlimited oxygen? Explain why.

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Part I: comparing mass of steel wool

Does steel wool change mass when it is burnt?

Equipment

- small piece of steel wool rolled into a ball
- matches
- metal tongs
- bunsen burner
- electronic balance (needs to measure at least 2 decimal places)

Method

- Use the electronic scales to find the mass of the steel wool. Record the mass.
- Light the Bunsen burner.
- Use the metal tongs to hold the steel wool in the top of the Bunsen burner flame.
- When the steel wool has discoloured, weigh it again. Record the new mass. Be careful when handling the steel wool, remember it will be hot.

Questions

23. Describe the appearance of steel wool after it has been burnt.

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24. What has been produced?

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25. What happened to the mass of the steel wool?

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26. How can you explain this change in mass, thinking about the law of conservation of mass?

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Combustion of compounds that don't contain carbon – putting it together

29. What things are used up in a combustion reaction involving compounds that don't contain carbon? (These are the reactants.)

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30. What things are created in a combustion reaction involving compounds that don't contain carbon? (These are the products.)

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Part K: other oxidation reactions – respiration

Respiration is considered a combustion reaction, even though there is no flame, because it produces energy and occurs rapidly.

What is needed for respiration to occur? What is produced during respiration?

Equipment

- 5 mL limewater
- straw
- test tube
- small mirror

Method

- Blow into limewater. Record your observations.
- Breathe out onto the mirror. Record your observations.

Questions

31. What happened to the limewater? What does this tell you?

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32. What happened to the mirror? What does this tell you?

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