

PROPERTIES OF FLOOR WAX MEMO

Purpose

- Learners are guided through the basic aspects of an experimental investigation.
- Learners plan an additional investigation of their own.

Suggested teaching approach

Estimated time	Description	Resources
Class time: 1 lesson	<ul style="list-style-type: none"> • Explain the necessary theory about wax and about the scientific method. • Show learners the movie or perform the investigation yourself. • Discuss the investigation. Refer to: variables, focus question, hypothesis, results, conclusion, discussion. 	Properties of floor wax movie Worksheet (p.47-50)
Homework: ½ lesson	<ul style="list-style-type: none"> • Learners answer questions 1-16 in writing. 	Worksheet
Class time: 1 lesson	<ul style="list-style-type: none"> • Go through the answers to questions 1-16 with the learners. • Conduct a class discussion on further investigation possibilities (questions 17-22). Note that a number of possibilities could be correct, not only the one suggested here. 	Memo Worksheet
Homework: ½ lesson	<ul style="list-style-type: none"> • Learners complete worksheet questions 17-22. 	Worksheet

Check learners' work.

Additional time should be allowed if you wish to perform the experiment in class.

Practical preparation and tips

- You need: a candle, paraffin, a measuring cylinder, a stove / hot plate, heat-resistant containers (e.g. beakers) containers to store the polish in, cloths, planks, a protractor, a sliding object.
- If you cut a standard candle into 1cm strips, each piece will have a mass of approximately 4g.
- Do not heat the paraffin. Add hot, molten candle wax to the paraffin and mix.
- You will probably find quite a lot of variation in your data. You will also probably find it difficult to decide when to stop tilting the plank, especially for the higher wax content polishes. This provides an excellent opportunity for you to discuss limitations, experimental error, variation in data, reliability and validity, with your learners.

Suggested answers to questions

Variables

- 1 **Independent** variable. **A polish's amount of candle wax**
(Cause. What the investigator made different between the treatments.)
- 2 Indicator of the dependent variable. **Minimum angle causing sliding**
(Measurement of effect. What the investigator measures to show the investigation outcome.)
- 3 **Dependent** variable. **Amount of friction the polish gives**
(Effect. Different between the treatments because they had been treated differently from the start.)
- 4 **Controlled** variables (list at least three). (Must be kept the same between treatments for a fair test.)
Thickness of layer of polish applied. **Mass of sliding objects.**
Material type and degree of smoothness of planks. **Temperature.**
Material type and degree of smoothness of sliding objects' bottom surfaces.

Focus question

- 5 How does a **polish's amount of candle wax** affect **the amount of friction the polish gives**?

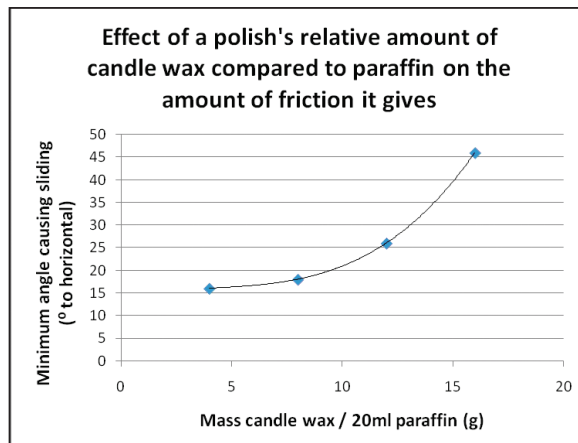
Theory

- 6 What is friction? **A force which resists motion.**
- 7 How can friction between two surfaces be reduced? **By making the object lighter, tilting the surface, or by making the surfaces smoother.**

- 8 Why do we want polish with more friction? **Friction reduces slipping. We want to shine and waterproof a floor with polish, but don't want this to make us slip.**
- 9 How does candle wax differ from paraffin?
 - Candle wax **consists of longer hydrocarbon chains.**
 - whereas paraffin wax **consists of shorter hydrocarbon chains.**

Graph

10 Represent the findings graphically.



Check. Has the learner:

- given a suitable graph heading?
- plotted the independent variable on the x (—) axis?
- plotted the indicator of the dependent variable on the y (|) axis?
- labelled each axis and given units where appropriate?
- accurately plotted data points with small circled dots?
- drawn a smooth trend line?

Tick if done:

11 It would be wrong to make this graph's line cut the origin (0,0). Why? **The sliding object would not slide at 0° to the horizontal if the polish contained 0g candle wax.**

Interpretation

12 Circle the correct option to analyse the data.

Amount of candle wax	Minimum angle causing sliding	Amount of friction polish gives
high	was found to cause → a [higher / lower] sliding angle	indicates → [more / less] friction
low	was found to cause → a [higher / lower] sliding angle	indicates → [more / less] friction

13 Interpret the results in your own words.

The more candle wax there is in the polish the more friction the polish gives.

Conclusion

14 Answer the focus question in your own words.

In learner's words. E.g. More candle wax, more friction.

15 Complete for a shorter way of writing the conclusion.

Increasing a polish's amount of candle wax [increases / decreases / doesn't affect] the amount of friction the polish gives.

Discussion

16 Suggest a reason for your findings, referring to the background theory.

The candle wax consists of longer-chained hydrocarbons. It is therefore more viscous than the paraffin, and so is more sticky, and therefore gives more friction.

