

Research Tasks-

Take a note for your SALs Booklets

Welcome to the Lockerbie Academy Additional Work Sheet. Hopefully you'll be working your way through the power point on TRANSPORT 1 -SPEED, which I am in the middle of updating. I'll put it on Teams and Mrsphysics as soon as it's done (which I hope will be late tomorrow).

There are plenty of speed distance time calculations you can do and I'll find some work on calculators for you to try to. I'll add this to teams but they're already on mrsphysics

Why don't you make some suggestions about where Physics and Road Safety meet?

Choose 1 or more of the following 8 tasks to complete. Don't complete the practical until I've uploaded the full risk assessment.

1. Road Safety Statistics

Are you bored already and need something to get your teeth into?

- <https://roadtraffic.dft.gov.uk/custom-downloads/road-accidents>
- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/848485/road-casualties-year-ending-june-2019.pdf
-

Why don't you select a group of road users, years, speed limits, type of road users, country, Region and research to see if you can find out some of the following

- a) On which roads do most road deaths occur?
- b) Which group of road user have the highest death toll?
- c) Which part of Great Britain has the highest injuries and why?
- d) Why are most deaths on roads with speed limits of 21-30 mph?
- e) Are there differences between male and female drivers? Are there enough details for you to say who is a safer driver?

Ask yourself some questions to answer

Make sure you try to show your results in a table, graph or pie chart. Why not have a play with EXCEL? I'll try to update the Excel for 2016 a.s.a.p. but I've other things to do first.

2. Road Signs

How about trying to learn your road signs? I'll be well impressed if you can get to the end of this test. Here is a clue, that I missed at the beginning, if you are stuck read the information in the blue dotted box. I'm only on question 90 and I've got 2 wrong, but one was an accident! The questions repeat but I'm above the 85% correct- with 97%

- <https://highwaycodetest.co.uk/road-traffic-signs/>

If you can't face doing 157 questions try some of these tests.

<https://www.driving-school-beckenham.co.uk/mocktheory5.html>

<https://theorypass.co.uk/road-traffic-signs-2/>

3. Reaction Time When Driving

If you are doing this task you'll need to graph your results. Do your reactions improve as you play the game? Can you get the scores of your friends and plot data from you and your friends. Do older students have better reactions?

<https://www.justpark.com/creative/reaction-time-test/>

<https://www.humanbenchmark.com/dashboard/reactiontime>

4. SPEED SURVEY

 **Activities**

There are many reasons and excuses for speeding (such as "I was late", "everyone else does it" and "I enjoy driving fast").

In a pair:

- Make a list of all the reasons you can think of
- Create a questionnaire (example opposite)
- Ask people you know who drive (parents, their friends, teachers, etc) to complete the questionnaire
- Keep the questionnaires anonymous, but record whether the respondents are male or female and their age
- Collate all the responses together.

Speeding Questionnaire

Produce a report analysing the results and identifying the most common reasons for speeding and any differences between men and women and between age groups.



Respondent 1	Male	Female	Age	
Reason for Speeding	Never	Sometimes	Often	Always
Late				
Other drivers speeding				
I think it's safe to speed				

Discussion Points In small groups:

- Brainstorm the best ways of raising awareness about the dangers of speeding.
- What methods would you use e.g. TV adverts, posters, something else?
- Where would you target publicity? (locations/events)





Activities

Design an awareness raising campaign to include a leaflet, poster and press release.

Who do you think are the key target groups? Think about age, sex, and also social activities. Also take into consideration those locations and times where speeding is more common. Decide whether to cover all drivers or a specific group (does your decision change the method you would use, your target group or where you would locate the campaign?)

Think about campaigns used by other groups and try to make yours effective for your target audience. Run your campaign either in school or in your local community, make sure that you establish a way to evaluate the success of the campaign. Set a time limit for the campaign, this could be a couple of days or a week or more. You will need to

draw up a plan of action to ensure the smooth running of the campaign and source all the materials that you need to set it up. Have you ever been a passenger in a car and been concerned that the driver is going too fast? Look at www.brag.org.uk to see how one group of young people have dealt with this issue.



Take it further...

Did you know?

In 2004 a survey of vehicle speeds in Britain:

- 53% of car drivers exceed the speed limit on 30 mph roads in built-up areas
- On 40 mph roads, 27% of car drivers exceed the speed limit
- On motorways, 56% of car drivers exceed the speed limit
- On dual carriageways in non-built up areas, 49% of car drivers exceed the speed limit
- 48% of motorcyclists exceed the speed limit on 30 mph roads in built up areas.



Activities

In the future, cars may not be able to exceed the speed limit. Using the Useful Links section, find out about Intelligent Speed Adaptation (ISA). Organise a class debate. Have one or two people to speak for and against the motion "This class calls for all cars to be fitted with technology to stop them exceeding the speed limit". Think about the advantages and disadvantages of taking the control away from the driver. What is best for society?

5. DRIVER ALERTNESS / PERCEPTION

Will you be an alert driver? Can you spot and react to the hazards. Write a report about what you found out.

<https://www.driving-test-success.com/theory-test-alertness/theory-test-alertness.htm>

<https://www.theory-test-online.co.uk/free-hazard-perception-test-demo.htm>

<https://highwaycodetest.co.uk/alertness/>

<https://www.youtube.com/watch?v=Rtd0cYgaNcE>

https://www.youtube.com/watch?v=FdV_akxUnEM

<https://www.youtube.com/watch?v=eGn6bzkgHGac>

6. Practice Excel

Did you know?

A pedestrian hit by a car at:

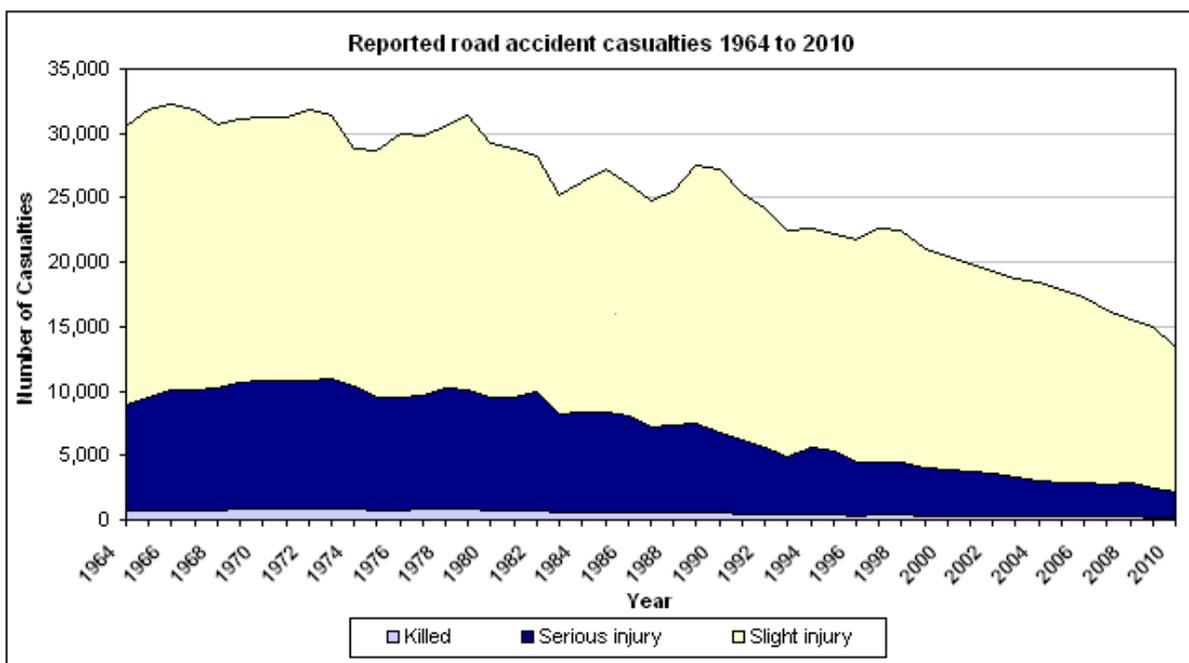
- 20 mph, has a 97% chance of surviving (almost all live)
- 35 mph, has a 50% chance of surviving (half live, half die)
- Small increases in speed have massive effects
- 30 mph, has a 80% chance of surviving (most live)
- 40 mph, has only a 10% chance of surviving (almost all die).

Speed (mph)	Thinking Distance (metres)	Braking Distance (metres)	Total Stopping Distance (metres)	Total Stopping Distance (feet)	Total Stopping Distance (car lengths)
20	6	6	12	40	3
30	9	14	23	75	6
40	12	24	36	120	9
50	15	38	53	175	13
60	18	55	73	240	18
70	21	75	96	315	24

Can you plot this data in EXCEL in a graph? Make it a stacked graph. Search online for a better diagram.

7. Road Safety Analysis

Look at the road statistics below. State what you can see in the data and can you give reasons for the massive changes since 1964 in the numbers of road deaths, injuries and severe injuries.



8. AIR BAG PRACTICAL

If you have this material in the house you might want to try this, but you ought to wear goggles and you **MUST** check with an adult before completing. You'll need a tray underneath as this could make rather a big mess.

<http://sciencenetlinks.com/lessons/its-a-crash-test-dummy/>

It's a Crash Test, Dummy

Student Lab

Part 1

Background:

In a real automobile safety restraint system, the air bag is a large plastic bag of about 65.0 L which fills with nitrogen as soon as a sensor tells it that the car's forward momentum has been drastically lowered. The nitrogen is produced by the rapid decomposition of sodium azide (NaN_3), which produces nitrogen gas (N_2). In this lab, we will create our own air bag technology utilizing sodium bicarbonate (baking soda) and acetic acid (vinegar). Your task is to find the correct amounts of sodium bicarbonate and acetic acid to use to create the right amount of gas (carbon dioxide) to fill the bag. If done correctly, your bag should fill up, but not pop open. There also should not be any sodium bicarbonate or acetic acid left in the bag.

Procedure:

Before starting, look at the data table on the next page in which you will record the amount of acid, the amount of sodium bicarbonate, a description of how the bag inflated, and whether there was acetic acid or sodium bicarbonate left over.

1. To keep it simple, you are always going to have the same amount of acetic acid in the bag: 25 ml. Add 25 ml of acid to the bag.
2. Then measure 0.5 grams of sodium bicarbonate and record it in the data table. Place the sodium bicarbonate in a small piece of tissue.
3. Drop the sodium bicarbonate wrapped in tissue into the bag. Flatten the bag to remove the air and seal the bag as quickly as possible. As soon as the acetic acid soaks through the tissue, the chemicals will begin to react and bubble; the gas that is produced is carbon dioxide (CO_2). The bag should begin to inflate.
4. When the bubbling stops, mix the ingredients around to be sure that the reaction is complete.
5. Then test how inflated the bag is by pinching it. Write a description in the data table.
6. If all of the sodium bicarbonate seems to be gone, open the bag and add a small amount of sodium bicarbonate to see if more bubbles form. If they do, then there was still some acetic acid left in the bag. If not, then all of the acetic acid reacted. Make a note in the data table if there was acetic acid left in the bag.
7. Repeat this process by increasing the amount of sodium bicarbonate by 0.5 grams until all of the acetic acid is used up, indicated by the presence of sodium bicarbonate in the bag (because there was no acetic acid left to react with it).

DATA TABLE

Total amount of acetic acid in the bag	Total amount of sodium bicarbonate	Description of Pinch Test	Acetic Acid left?	Sodium Bicarbonate Left?
25 ml				

25 ml				

Part 2

Now you will put this knowledge to the test: a crash test. You will design and build a “vehicle” for your crash test dummy, a raw egg. The goal here is to build your vehicle so that it will protect the egg from breaking, even when dropped from a height of 2 metres.

The only materials you can use are:

- a container for the egg (e.g., a small cardboard box or large butter tub)
- two plastic bags
- acetic acid
- sodium bicarbonate
- tape
- a graduated cylinder
- a balance
- a metre stick

Procedure:

Follow the steps below using the ratio of sodium bicarbonate to acetic acid that inflated the bag, with no acetic acid or sodium bicarbonate left over. (You wouldn't want acid in your air bag, would you?)

1. Inflate one or both bags, whichever you think would work best.
2. Place the inflated bag(s) and the egg in the container.
3. Drop from 2 metres.
4. Check your passenger. Did it survive the crash?

Analysis and Conclusions:

1. How much sodium bicarbonate had been added when there appeared to be no acetic acid or sodium bicarbonate left after the reaction?
2. Did this amount of sodium bicarbonate (when there was no acetic acid or sodium bicarbonate left) inflate the bag fully? If not, how could you change the amounts of sodium bicarbonate and acetic acid so that the bag is full, but with no reactants left over?

3. What are reactants? Use question #2 to help you form a definition for “reactants.”

Science NetLinks Student Sheet - It's a Crash Test, Dummy

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