PHYSICS YEAR 11 2019: **CAR CRASH SAFETY INVESTIGATION:**

Suggested resources :

Textbook Pearson, 283-286, Nelson p 303 to p 306, including worked examples

Website: Hyperphysics –car crashes (includes an on-line calculation simulation)

List at least 3 other sites

Your task is to design an experiment to investigate an aspect of car-safety. You can be as creative as you like with this.

**PART A: PRE-LAB**

Your first step is to identify and explain different aspects of car-safety during collisions.

*Your investigations and explanations should include force, momentum, impulse, kinetic energy, potential energy, conservation of energy, work and pressure, and equations where appropriate.*

Ensure you have an understanding of the following.

1. **CRUMPLE ZONES, HELMETS AND CRASH BARRIERS:**  Have you ever noticed that if an older car is hit by a newer car, the newer car is likely to crumple up more and require a much more expensive visit to the panel beater to fix. (This happened to me in a low impact collision, my old Toyota had some minor damage to the rear bumper but the whole front fender of the newer 4WD was crushed!). Ensure you look at materials as well.
2. **SEATBELTS:** Investigate the physics of how these work? Discuss in terms of work-energy and impulse-momentum. Briefly investigate the advantages/disadvantages of different seatbelt types.
3. **AIRBAGS**: Investigate the physics of how these work? Discuss in terms of work-energy and impulse-momentum.
4. **SEATBELTS/AIRBAGS:** Compare the effectiveness and discuss advantages/disadvantages of having a seatbelt only, airbag only or the combined system. Why is it recommended young children do not sit in the front seat of a car with an airbag?
5. **SPEED AND REACTION TIME**

**PART B: EXPERIMENT DESIGN (Due Monday September 16th)**

Design an experiment that tests one aspect of car-safety or collision safety.

Ensure your experimental design includes

Hypothesis

Aim

Method

Equipment needed

Independent, Dependent and Control variables

Ensure it is valid, tests the hypothesis stated

Reliable, includes repeated trials.

Design a suitable table for recording your results.

**PART C: CONDUCTING (Tuesday September 17th)**

**PART D: ANALYSIS**

Analyse your results, produce suitable graphs.

Perform calculations that demonstrate the effectiveness of your car safety feature

Discuss uncertainties/errors in your experiment and distinguish between random and systematic errors.

Discuss how you could improve your experiment.

**PART E: CONCLUSION**

Summarise your experiment

Summarise the main results and analysis

State whether your results support your hypothesis

**FINAL EXPERIMENT Due: Wed September 25th, 2019 (Week 10)**