

Physics		Lesson 18: Car crash safety!	
Curriculum Key:		Present in Additional Science specifications	
Objective(s) 1. Know several devices designed to promote safety in the event of a car crash. 2. Understand that these devices work because they increase the time of an impact. 3. Understand that increasing the time of an impact reduces its force.		Resources needed: PowerPoint Graph paper..	
Starter: 15 minutes Use PowerPoint slides to promote class discussion about safety features (crumple zones, inertia-reel seat belts, air-bags).		Teacher input/assessment Steer discussion towards what about the collision is changed by the safety feature (e.g. time of impact, area of force).	
Main Activity 1: 20 minutes Students plot graphs of velocity versus time for the two collisions and answer questions. If time is short the next slide gives graphs. A version which requires calculations is available for higher ability students.		Teacher input / assessment May need to remind students that acceleration is the gradient of $v - t$ graph.	
Main Activity 2: 15 minutes Students annotate outline diagram of car with various safety features. For each feature they must explain how the force on the passengers is reduced (i.e. by increasing the area of impact or increasing the time of the impact).		Teacher input / assessment Circulate and prompt. Some safety features are about prevention (e.g. hazard lights) but less able students should be encouraged to include these.	
Plenary: 15 minutes Use the untitled/unlabelled graphs as the basis for discussion. Given some simple graphs (see attached graph sheet or last slide of PowerPoint) ask the students to describe what the graphs show.		Teacher input / assessment For lower ability students the teacher could add some X and Y axis labels (e.g. distance and time, or comedy ones like number of drinks and visits to the toilet). The teacher could lead a group discussion. For higher ability students the teacher could ask them to apply their own labels for the X and Y axes and decide what the graph is saying.	
Learning Outcomes: All students must: understand that many car safety features work because they reduce forces. Most students should: explain how the features reduce forces. Some students could: calculate the size of accelerations and forces give the relevant data.			
Key Skills: interpreting graphs, understanding reciprocal relationships Key words: acceleration, deceleration, force Homework: Investigate the 'g'- forces experienced by astronauts on take-off.		Differentiation: More able: Can calculate accelerations and forces from data or graphs. Less able: Can describe safety design features and explain that they work by reducing forces.	