**Task 11: Extended Response**

Vehicle Safety

Validation

Name: ­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mark: ­­­­\_\_\_/16  
Comment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Assessment type:** Extended Response

**Conditions**

4 periods of research

1 period of validation

**Task weighting**

10% of the school mark for this pair of units

*For questions 1-4, describe how each principle can minimise injury (link to your knowledge of Physics) and give an example of a modern car feature that uses this principle and how it does so.*

**Question 1 (3 marks)**

***Principle A: Increase the time of the collision or the time the occupants take to stop***

a) How this can minimise personal injury (1 mark):

Reduce the force that impacts the person (or similar)

b) Which Physics ideas or equations support this principle? (1 mark)

Impulse (I=Ft)

c) Example of a modern car **feature** using Principle A (1 mark):

Crumple zones

**Question 2 (5 marks)**

*Principle B is split into two parts-*

***Principle B Part 1: Spread the forces of impact over the largest possible area***

a) How this can minimise personal injury (1 mark):

Less force on an individual point

b) Example of a modern car **feature** using Principle B Part 1 (1 mark):

Crumple zones (or equivalent)

***Principle B Part 2: Ensure stability of the vehicle***

c) How this can minimise personal injury (1 mark):

Stop the car from rolling

d) Which Physics ideas or equations support this principle? (1 mark)

lower centre of mass/gravity

e) Example of a modern car **feature** using Principle B Part 2 (1 mark):

Cars lower to the ground

**Question 3 (3 marks)**

***Principle C: Minimize contact of the person with the vehicle interior***

a) How this can minimise personal injury (1 mark):

Stops energy being transferred from the crash to the occupant

b) Which Physics ideas or equations support this principle? (1 mark)

Transfer of energy

c) Example of a modern car **feature** using Principle C (1 mark):

Seat belts/airbags\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 4 (3 marks)**

**Principle D: Keep the person inside the vehicle**

a) How this can minimise personal injury (1 mark):

Stops person from flying out of vehicle

b) Which Physics ideas or equations support this principle? (1 mark)

Law of Inertia (Newton’s First Law)

c) Example of a modern car **feature** using Principle D (1 mark):

Seat belts

**Question 5 (2 marks)**

A crash in an early model car (pre-1970) was very unsafe. This is because it did not have the safety principles listed in questions 1-4.

1. Describe one feature (or lack of a feature) an early model car had which made it unsafe   
   (1 mark).

\_Any appropriate feature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which physics ideas shows that the feature above (or lack of feature) is unsafe? (1 mark)

\_\_With equivalent physics principle. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_