Year 10 SCIENCE

**COLLISIONS RESEARCH TASK**

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| **TOPIC**: Task 1: Collision Research Task | **MARKS:** A-E |
| **SUBMISSION REQUIREMENTS:**  **Part A:** Video of initial model design and testing to be submitted on CANVAS by 11:59pm Friday 22nd March 2024  **Part B**: Submitted on CANVAS by 11:59pm Friday 22nd March 2024 | |
| **OUTCOMES TO BE ASSESSED:**  **SC5 -5WS** **Produces** a plan to investigate identified questions, hypotheses or problems, individually and collaboratively.  **SC5 -6WS** **Undertakes** first-hand investigations to collect valid and reliable data and information, individually and collaboratively.  **SC5 -9WS** **Presents** science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations.  **SC5 -10PW** **Applies** models, theories and laws to explain situations involving energy, force and motion. | |
| **DIRECTIONAL VERBS:**  **Apply:** Use, utilise, employ to a particular situation.  **Evaluate:** Make a judgement based on criteria; determine the value of.  **Present:** To develop and display.  **Processes** - A series of actions or steps taken in order to achieve a particular end.  **Produce**: Show or provide (something) for consideration, inspection, or use. | |
| **TASK DESCRIPTION:**  **Part A: Designing a Crumple Zone.**   * In small groups or individually students are required to design, construct and test a model crumple zone on a cart that demonstrates the **application** of the Laws of Motion. Students will gather data to be **processed** and **presented**. – Submission is of a VIDEO that includes the initial design, testing and recorded results.   **Part B: Evaluating the Model to Demonstrate the Laws of Motion**   * Students are required to **process** and analyse their data to provide an extended response to   ‘**Evaluate** how your model of crumple zones demonstrates Newton’s 3 Laws of Motion’. – SUBMISSION is the written response. | |
| **ASSESSMENT CRITERIA:**  **Part A:** Students will be provided with 4 periods in class to research, design, construct and test their models. *Further time may be required at home to ensure completion of the task.*   1. Research and **process** information in relation to crumple zones in cars.   Crumple zones are areas of a vehicle that are designed to crush in a controlled way. They absorb the kinetic energy of a crash and increase the time it takes for a vehicle to come to a complete stop. This reduces the force exerted on the occupants, which reduces injuries.   1. **Design,** construct and test a model to test the effectiveness of crumple zones in a head-on collision and obtain quantitative data. Evidence **presented** will be achieved through recording your model during testing.   Not all crumple zones are the same; they are constructed in many different ways and with many different materials. In this investigation you will work in a small group to design, build and test a model crumple zone.  RESTRICTIONS AND INSTRUCTIONS  • You are to design and construct a crumple zone for the front of a dynamics cart. You must test this for effectiveness and provide data. This can be done by observing the effects of a crash on a seated, unrestrained ‘passenger’ dummy made from Plasticine.  • Your crumple zone must be attached to the front of the cart.  • The cart must roll down a ramp and crash into a solid object (a brick or the wall), both with and without the crumple zone, and the results compared.  • You may want to test several different styles of crumple zone if you wish.  You will be provided with the following equipment:  1. Dynamics cart  2. Sticky tape  3. Cardboard  4. Paper (1 sheet of Newspaper)  5. Scissors  6. Ramp (timber)  7. Play-Doh  **Part B**: Will be completed at home following the testing of your model.   1. Students utilise the ALARM scaffold provided to **evaluate** their model design and draw connections to Newton’s 3 Laws of Motion. 2. Students then collate this data to complete an extended response to answer: **EVALUATE** how your model of crumple zones demonstrates Newton’s 3 Laws of Motion. | |

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| **ASSESSMENT MARKING CRITERIA** | | |
| **PART A: Research, Design and Construction of MODEL**  **SC5-5WS, SC5-6WS, SC5-9WS,** | **Mark** | **Grade** |
| A comprehensive model demonstrates a design that abides by all restrictions and instructions, utilising only the material provided and resembles the initial design. The model validly and repeatedly **produces** consistent results that allowed for quantitative data to be collected and presented. The model results in a substantial difference between crumple zone and no crumple zone affect (demonstrating the **application** of the Laws of Motion). | 5 | A |
| A thorough model demonstrates a design that abides by all restrictions and instructions, utilising only the material provided and resembles the initial design. The model allows for quantitative data to be collected and displayed. The model results in a difference between crumple zone and no crumple zone affect, although some above details or clarity is missing (demonstrating the **application** of the Laws of Motion). | 4 | B |
| A sound model demonstrates a design that abides by most restrictions and instructions, utilising only the material provided and resembles the initial design. The model allows for quantitative data to be collected. The model results in no change between crumple zone and no crumple zone affect and some above details or clarity is missing (not demonstrating the **application** of all the Laws of Motion). | 3 | C |
| A basic model demonstrates a design that abides by some restrictions and instructions, utilising only the material provided and resembles the initial design. The model allows for data to be collected. The model results in no change between crumple zone and no crumple zone affect and some above details are missing and not demonstrating the **application** of the Laws of Motion. | 2 | D |
| A limited model demonstrates a design that resembles the initial design and crumple zone. The model allowed for data to be collected. The model resulted in no change between crumple zone and no crumple zone affect and not demonstrating the **application** of the Laws of Motion. | 1 | E |

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| **ASSESSMENT MARKING CRITERIA** | | |
| **PART B: Evaluation of Model to demonstrate Laws of Motion**  **SC5-9WS, SC5-10WS,** | **Mark** | **Grade** |
| A comprehensive **evaluation** demonstrates a logical and well structured written piece. It includes clear and concise connections between their model and Newton’s 3 Laws of Motion providing quantitative data and examples to support their suggested possible solutions. The written response includes appropriate scientific terminology. | 9-10 | A |
| A thorough **evaluation** demonstrates a logical and well structured written piece. It includes clear and concise connections between their model and Newton’s 3 Laws of Motion providing quantitative data and examples to support their suggested possible solutions. The written response includes appropriate scientific terminology although some of the above may be missing or unclear. | 7-8 | B |
| A sound **evaluation** demonstrates a well structured written piece and includes connections between their model and Newton’s Laws of Motion providing data and/or examples to support their suggested possible solutions. The written response includes some appropriate scientific terminology although some of the above may be missing. | 5-6 | C |
| A basic **evaluation** demonstrates a written piece that includes some connections between their model and Newton’s Laws of Motion providing data and/or examples to support their solutions. The written response includes minimal scientific terminology. | 3-4 | D |
| A limited **evaluation** demonstrates a written piece that includes some information about their model that relates Newton’s Laws of Motion where data and/or examples to support their solutions. The written response includes little scientific terminology. | 1-2 | E |