**GENERAL INTEGRATED SCIENCE– UNIT 2**

**TASK 13 – Rocket Design Extended Response**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 7.5% MARK: /30**

**Conditions:**

* Notes are not allowed and must be handed in prior to commencing.
* 40 minutes to complete test.
* Test is worth 80% of mark for this assessment.

1. Rockets are a great example of how forces interact with each other to produce motion.
   1. **List** four forces that need to be considered when designing a rocket to fly as far as possible. (2 marks)

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* 1. **Describe** how these forces work together to make the rocket fly. (4 marks)

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1. A rocket starts off stationary at a launching pad.
   1. **Describe** the rocket taking off in terms of Newton’s Third Law. (2 marks)

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* 1. If a rocket has a payload of 82 tonnes, use Newton’s First Law to **explain** why the total take-off weight of the rocket is 350 tonnes. (3 marks)

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1. The shape of the rocket is a key component that affects the flight path and distance travelled. It can greatly improve the rocket’s efficiency, or drastically affect its performance.
   1. In the space below, draw a quick **sketch** of a rocket. On the sketch, **label** the main features of a rocket. (5 marks)
   2. You have just drawn and labelled the different features of a rocket. In the space below, **describe** how the structural system of a rocket could be designed to maximise flight distance. (3 marks)

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* 1. **Explain** why titanium is used as a main component in the construction of rockets, but gold is not. (3 marks)

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1. In order to launch heavy rockets into space to deliver their payloads, a significant amount of force must be generated by the rocket’s engine(s).
   1. Most rockets use both a liquid fuel and a solid fuel. The liquid fuel is used to launch the rocket into space, and the solid fuel is then used to adjust movements in space. **List** one advantage and one disadvantage of solid fuels. (2 marks)

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* 1. There is a lot of research being conducted into the liquid fuel that rockets use, and new fuels are currently being developed and tested. In the space below, **describe** two reasons why new fuels are needed. (2 marks)

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* 1. Solid, metallic hydrogen was recently created in a lab. This revolutionary creation may change rocket fuel forever. Using your knowledge of hydrogen’s properties, **discuss** why metallic hydrogen is regarded as the future of rocket fuel. (3 marks)

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* 1. Many people believe that space travel is the future of our species. Companies like Space X are planning colonies on Mars, and China have discussed plans to mine helium from the moon. Many other people believe that it is unethical for humans to consider colonising another planet. In the space below, describe one argument for **or** one argument against colonising Mars. (1 mark)

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