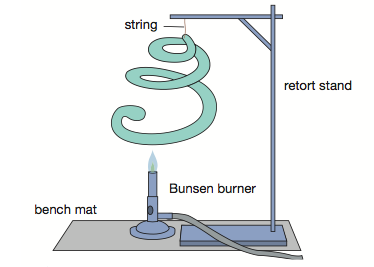
**GENERAL INTEGRATED SCIENCE– UNIT 2**

**TASK 12 – Motion & Energy test**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 5% MARK: /46**

**Equations**

**Part A - Multiple Choice (10 marks)**

1. Which of the following is the **best** definition of energy?
2. Energy is what you need to run
3. Energy allows things to do work
4. Energy is a force to produce change
5. Energy makes objects change shape
6. Which of the following is NOT a form of energy?
7. Newtons
8. Mechanical
9. Electrical
10. Chemical
11. Which of the following is a form of kinetic energy?
12. Sound
13. Elastic
14. Gravitational
15. Chemical
16. 457 Joules is equivalent to:
17. 457 000 kJ
18. 4 570 kJ
19. 0.457 kJ
20. 4.57 kJ
21. A student cut out a spiral from cardboard and set up the following apparatus.

After the Bunsen burner had been lit, the snake started to spin around. The most likely explanation for this was:

1. The kinetic energy stored in the snake was transformed into potential energy
2. There was a breeze in the room
3. Energy was being transferred to the snake from the retort stand
4. The heat energy from the flame was transformed into motion energy
5. Which of the following statements is NOT true?
6. Nuclear energy is classified as a type of potential energy
7. In an energy transfer some energy is always lost as heat
8. One source of energy can be converted into many different forms of energy
9. New energy is constantly being made
10. When calculating energy, the mass must always be in which unit?
11. Milligrams
12. Grams
13. Kilograms
14. Tonnes
15. What is the push or pull on an object that can cause it to accelerate called?
16. Mass
17. Force
18. Density
19. Speed

Question 9 and 10 refer to the information below.

Sophie conducted an experiment about rocket flight. She made 3 water-bottle rockets from an empty 2L fizzy-drink bottle, and each had 5 identical fins. She filled the rockets with different amounts of water and launched each rocket. Her results are found in the table below.

|  |  |  |
| --- | --- | --- |
| **Rocket** | **Amount of water (ml)** | **Maximum height (m)** |
| 1 | 200 | 8 |
| 2 | 400 | 23 |
| 3 | 800 | 37 |

1. The following are some of the controlled variables in this experiment:
2. bottle size, number of fins, amount of water
3. Fin size, number of fins, bottle size
4. bottle size, wind conditions, mass of bottle
5. number of fins, wind conditions, amount of water
6. A fair conclusion that can be made from the results of this experiment is that
7. increasing the number of fins will cause a water-bottle rocket to fly higher
8. a water-bottle rocket that contains less water will fly higher
9. a water-bottle rocket that contains more water will fly higher
10. the quantity of water contained in a water-bottle rocket has no effect on altitude reached

**Part B – Short Answer (36 marks)**

**Question One (10 marks)**

1. Explain how you would increase the gravitational potential energy of a book on the floor. *(1 mark)*

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1. If a 0.457kg book is sitting 2.04m above the ground, how much gravitational potential energy does it have? *(3 marks)*
2. The book from Part (b) was knocked off of the shelf by a poorly aimed soccer ball. The soccer ball weighed 0.4kg. It travelled 6m, from where it was kicked to where the book was sitting, in 3 seconds. How much kinetic energy did the ball have? *(4 marks)*
3. Describe the difference between an energy transformation and an energy transfer. *(2 marks)*

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**Question Two (10 marks)**

1. The sun shines on a farm, allowing wheat to grow. The wheat is used to make bread. An athlete eats the bread, and then goes for a run around an oval. Create an energy flow diagram to show how energy **transforms** from the sun into the runner moving. *(2 marks)*
2. Using this athlete as an example, explain the difference between a vector and a scalar quantity

*(2 marks)*

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1. If the runner jogs at 1.5m/sec for 2 minutes, what distance have they covered?

*(3 marks*)

1. One day, the runner decides to test how far they can run at a full sprint. They begin their sprint at the start line of a 450m oval. After running at 10m/s for 40 seconds, the runner collapses. What is the displacement of the runner from the start line? *(3 marks)*

**Question Three (10 marks)**

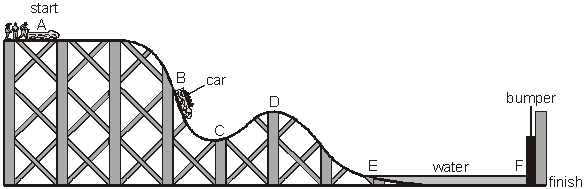
Ashley and James were playing with a remote-control car. After playing with their car for a long time, Ashley noticed that the car was not responding well to the remote control. James replaced the old batteries with brand new ones and the toy began to work again.

1. State the type of energy found in the battery. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *(1 mark)*
2. Draw the energy flow diagram for the energy transfer that occurs when the toy car is working normally. *(2 marks)*
3. Explain what is meant by the term useful energy? *(1 mark)*

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1. Imagine that the car battery contains 260 Joules of energy. If the toy car is only 35% efficient, calculate how much useful energy the car engine will produce? *(3 marks)*
2. If instead the toy car was receiving an input of 180 joules and produced a useful output of 129 joules of kinetic energy, how energy efficient was the car?  *(3 marks)*

**Question Four (6 marks)**

The following diagram shows a rollercoaster ride. The car starts from A and travels to F, where it stops by hitting a bumper. At E, the car enters a trench filled with water. Use the letters to answer the questions.

1. At which **TWO** points does the car have **NO** kinetic energy? *(2 marks)*

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1. At which point does the car have the **MOST** gravitational potential energy? *(1 mark)*

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1. At which point does the car have **SOME** kinetic energy and the **LEAST** gravitational potential energy?

*(1 marks)*

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1. Justify why there needs to be the moat of water at the end of the ride rather than just the bumper using your knowledge of forces, types of energy and Newton’s Laws. *(2 marks)*

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**Extension:**

The rollercoaster weighs 1.2T. The combined weight of the riders is 620kg. If the rollercoaster is accelerating at 4.5m/s/s at point B, what is the total force of the rollercoaster at point B?

Calculate the total displacement of Suzie if she ran north for 2.1 minutes at a speed of 3m/sec, then turned around and ran south for 118sec at 12.6km/hr.