Form 4S **Physics**
Due date: 20th April, 2020

Instructions

1. *Complete ALL Questions in Exercise books.*
2. *There is no need to rewrite questions, just number them correctly and answer in complete sentences where necessary. This handout should be printed and placed in your book if possible.*
3. *All working should be shown.*

Question 1 (15 Marks)

a) Define the term 'energy' and state its SI unit.

(2 marks)

(i) Complete Table 3 to show the MAIN form of energy associated with EACH of the following examples.

TABLE 3

Forms of Energy	Example
	Radioactive decay
	Radio waves, X-rays
	Objects in motion

(3 marks)

(ii) State the MAIN energy conversions taking place when a flashlight is turned on.

(2 marks)

b) Figure 4 shows a pendulum of mass 0.5 kg oscillating in a vacuum. X is the lowest position of the pendulum, where its maximum speed is 1.8 ms^{-1}.

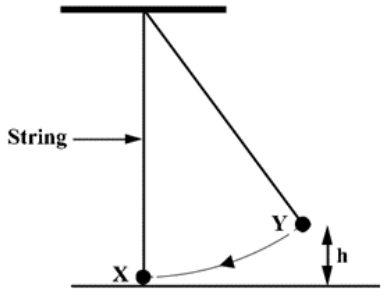

Figure 4. Simple pendulum

(i) Calculate the maximum kinetic energy of the pendulum. **(3 marks)**

(ii) Use the principle of conservation of energy to find the maximum gravitational potential energy of the pendulum.

(2 marks)

Question 2 (15 Marks)

(a) For a popular amusement park ride, patrons board a carriage at the top of a high tower and are subjected to a wild ride of 'terror'.

Name and state the Newton's Law which applies if the:

(i) Carriage is moving horizontally at a constant speed in a straight line

(3 marks)

(ii) Carriage is in free fall.

(3 marks)

b) (i) Calculate the length of time that the carriage in Part (a) is allowed to free fall if it reaches a speed of 64.8 km h^{-1} from rest. **[Use g = 10 ms^{-2}]**

(5 marks)

(ii) Determine the distance the carriage falls in (b) (i).

(4 marks)

Question 3 (15 marks)

(a) (i) Fill in the blanks in the following passage about the moments of forces.

The _____ of moments states that when a body in equilibrium the sum of the _____ about any _____ is equal to the sum of the _____ about the same _____.

(4 marks)

(ii) Apart from the 'seesaw', identify TWO situations in which a force will result in a turning effect.

(2 marks)

(b) Figure 2 shows Kyle and Keion balanced on a seesaw. Kyle's weight is 500 N and Keion's weight is 300 N. The seesaw is made of a uniform plank of weight 800 N which is 4 m long, pivoted at its centre.

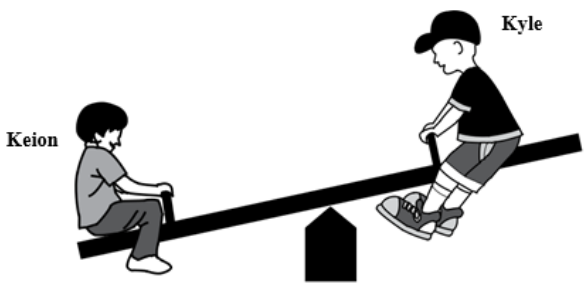

Figure 2

(i) By taking moments about the pivot, calculate the distance, x, that Keion must sit from the pivot to balance the plank if Kyle sits 1 m from one end of the plank.

(4 marks)

(ii) If balanced, calculate the reaction force at the pivot.

(4 marks)

(iii) What is the moment of the reaction force about the pivot?

(1 mark)

Question 4 (15 Marks)

(a) A student was given a sample of candle wax in a test tube located in a water bath. She was asked to demonstrate that temperature remains constant during a phase change.

(i) Describe the procedure she should use.

(6 marks)

(b) In Dominica, hydroelectricity is used to supply energy on a large scale.

(i)Describe how electricity is generated using the process of hydroelectricity.

(3 marks)

(ii)Discuss the rationale for the application of hydroelectricity as a viable alternative energy source in Dominica.

(6 marks)

Question 5 (15 marks)

(a) i) Table 2 shows the type of thermometer, design feature and the reason for the design feature. Complete the table by inserting the appropriate information.

TABLE 2

Type of Thermometer	Design Feature	Reason For Design Feature
Mercury-in-glass laboratory thermometer	Narrow bore	
	Constriction in bore	Retaining a measured temperature
Thermocouple		Ability to measure rapidly changing temperatures

(3 marks)

ii) Define the upper and lower fixed points on the Celsius temperature scale and state their respective values on that scale.

(4 marks)

(b) Figure 2 shows a sealed flask which contains a fixed mass of gas held at constant volume.

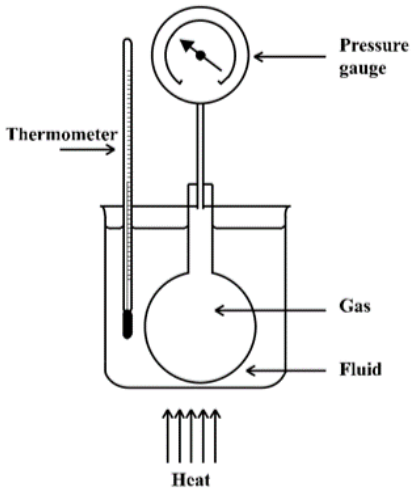

Figure 2

When heated, the temperature and pressure of the gas increase as shown in Table 3.

TABLE 3

Pressure (Pa)	Temperature (°C)	Temperature (K)
1.1 × 10^5	35	
1.2 × 10^5	63	
1.3 × 10^5	91	

i) Complete the table above by converting Celsius to Kelvin.

(3 marks)

ii) Is the 'Pressure Law' supported by this set of data? Explain.

(5 marks)