2nd Year Science, Christmas 2021
Time allowed: Double class

Mr. A. Goodison

Student Name _____

Answer all questions in the spaces provided.

Good luck!

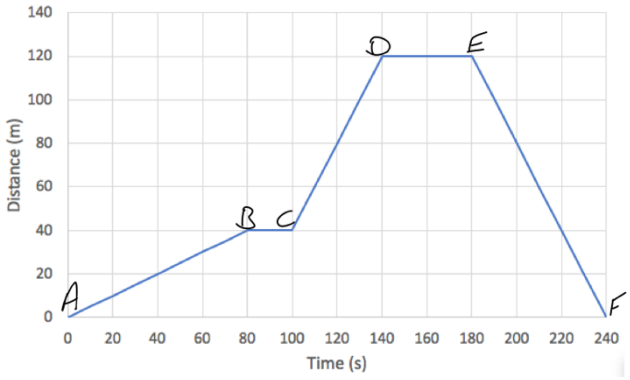
An image of comet Neowise captured over Dublin Bay taken by Antonio Martin Carrillo on the 12th of July 2020.

Question	Marks	Awarded
Total	**78**	
Grade descriptor		

Junior Cycle	
Percentage	**Grade Descriptor**
≥ 90 to 100	Distinction
≥ 75 and < 90	Higher Merit
≥ 55 and < 75	Merit
≥ 40 and < 55	Achieved
≥ 20 and < 40	Partially Achieved
≥ 0 and < 20	Not Graded (NG)

Question 1 (7 marks)

The graph represents the journey of a toy car.



(a) Name an instrument that could be used to measure the **distance** taken for the journey. (1)

(b) Calculate the average speed of the car as it travelled from point A to point B. Include the unit for your answer. (3)

(c) Describe the car's motion between points B and C of his journey. (1)

(d) The car's speed as it travelled from point A to point B was less than its speed as it travelled from point C to point D. What evidence is there in the graph to support this? (1)

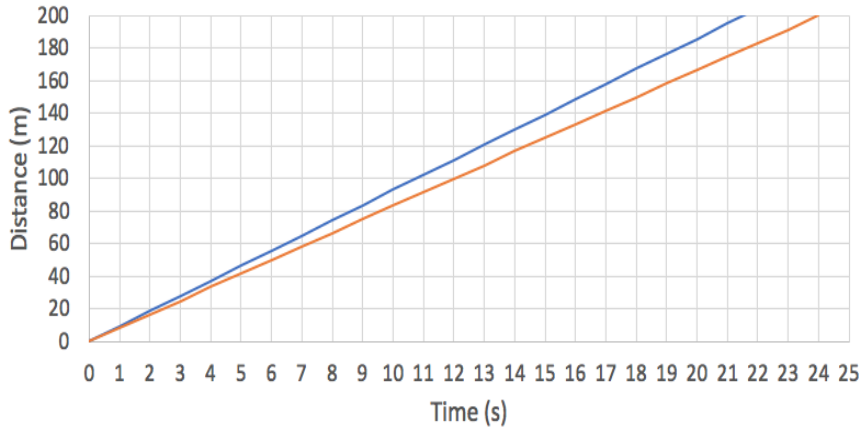
(e) How much time (in seconds) was the car stopped in total? (1)

Question 2 (5 marks)

Elaine Thompson-Herah is a Jamaican sprinter who competes in the 100 metres and 200 metres. She is a five-time Olympic champion.

(a) In the Tokyo Olympics she won the **200 m** sprint in a time of 21.53 seconds. What was her average speed? Include the unit. (3)

(b) Below is a results table and graph of the 200m final.
The graph shows the average speed of Elaine Thompson-Herah and one other runner from the 200 m 2021 Olympic final. The results table gives the times of all runners in the race.



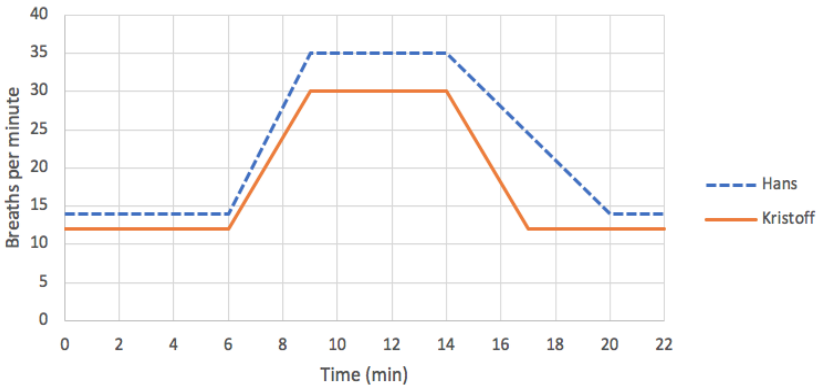
Results table

1	E. Thompson-Herah, Jamaica	21.53
2	C. Mboma, Namibia	21.81
3	G. Thomas, United States	21.87
4	S. Fraser-Pryce, Jamaica	21.94
5	M. Ta Lou, Côte d'Ivoire	22.27
6	B. Masilingi, Namibia	22.28
7	M. Kambundji, Switzerland	22.30
8	S. Miller-Uibo, Bahamas	24.00

Use the graph below and the results table to identify the name of other runner. Justify your answer. (2)

Question 3 (3 marks)
Describe what happens in the respiratory system when a person breathes in. (3)

Question 4 (5 marks)
The graph shows the breath rate for Hans and Kristoff during the same exercise.



(a) At what time did these two people start exercising? _____(1)

(b) Which person has the greatest breath rate during exercise?
_____(1)

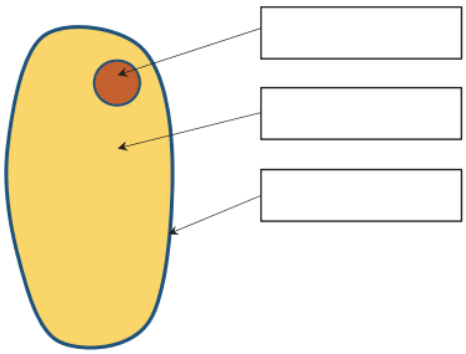
(c) After Hans stopped exercising,
how many minutes did it take for his breath rate to return to normal? (1)

(d) Who is more likely to be the fitter person? Explain your answer. (2)

Question 5 (9 marks)

(a) The diagram shows a cell. (a) Use the words provided to label the parts of the cell (3)

Cytoplasm Cell membrane Nucleus



(b) Do you think the diagram is an animal or plant cell? Justify your answer. (2)

(c) Complete the table to give the function of the following cell structures. (4)

Cell structure	**Function**
Cell membrane	
Nucleus	
Chloroplast	
Mitochondria	

Question 6 (6 marks)

(a)Describe one difference between sexual and asexual reproduction. (2)

(b) Dogs reproduce by sexual reproduction. The gene for a black dog (B) is dominant over the gene for a white dog (w). Complete a genetic cross (Punnett square) between a female dog with the genotype Bw and a male dog with the genotype (Bw). (1)

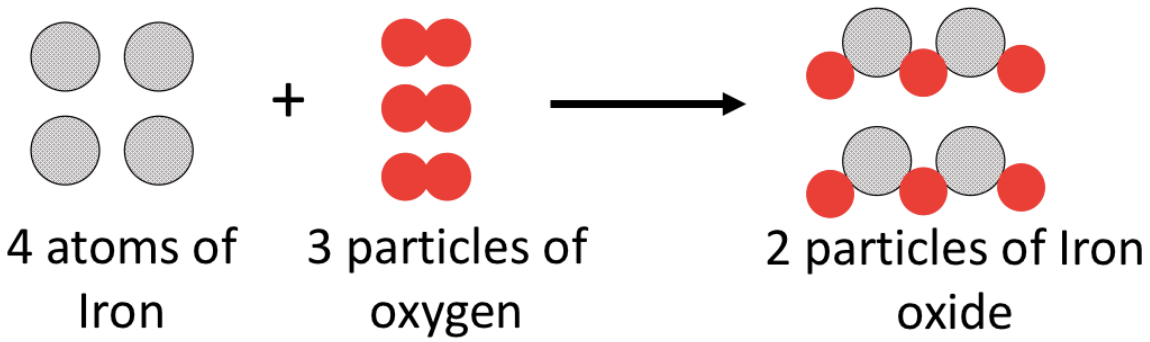
(i) What is the chance that each puppy will **carry** the gene for white fur? _____ (1)
(ii) What is the chance that each puppy will **carry** the gene for black fur? _____ (1)
(iii) What is the chance that each puppy will be white? _____ (1)

Question 7 (6 marks)

Outline the theory of evolution by natural selection. (6)

Question 8 (4 marks)

Rusting is caused by iron (Fe) reacting with oxygen (O_2) in the air to form iron oxide or rust (Fe_2O_3). The diagram below represents the reaction.



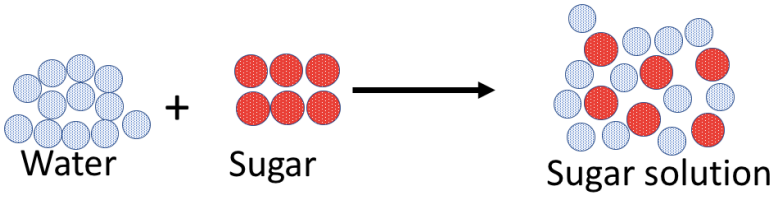
(a) Explain why this reaction is described as a chemical change (1)

(b) How many oxygen atoms are in one particle of iron oxide? (1)

(c) Mass is conserved (the same) during this reaction. From the diagram, what evidence is there for this? (2)

Question 9 (5 marks)

The below image represents the arrangement of particles when sugar is dissolved in water.



(a) Is the sugar soluble in water. Use the particle diagram above to justify your answer. (2)

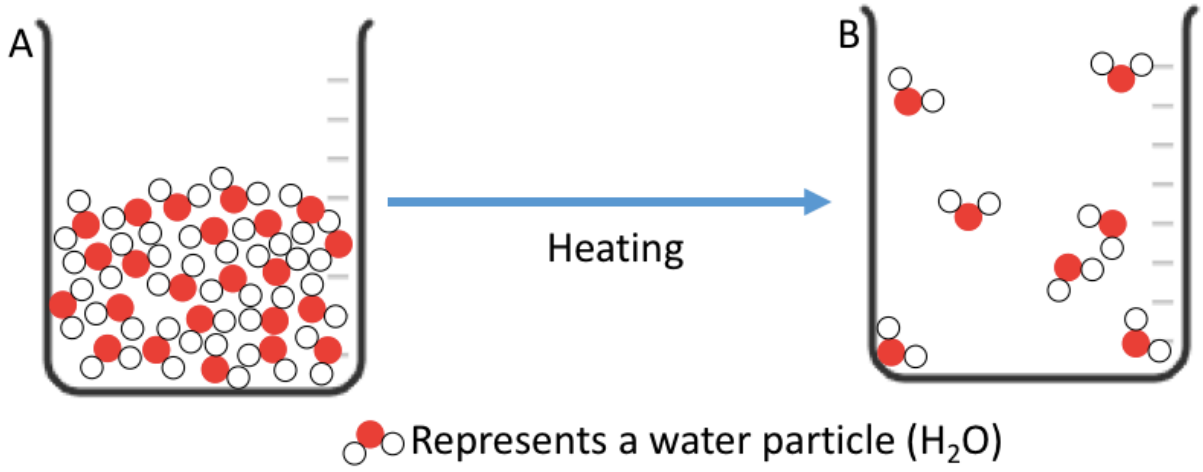
(a) Explain why this change is described as a physical change (1)

(c) The sugar solution is an example of a mixture. Explain why it is described as a mixture (1)

(d) What method could be used to separate the sugar from the water? (1)

Question 10 (6 marks)

The below diagram represents a beaker of water being heated until all of the water has changed state.



(a) What is this change of state called? (1)

(b) In what state of matter (solid, liquid or gas) are the water particles in beaker B? Justify your answer. (2)

(c) Is this a physical or chemical change? Justify your answer. (2)

(d) Mass does not appear to be conserved (the same) during this change of state. Suggest a reason why. (1)

Question 11 (4 marks)

Use the following terms to fill in the blanks of the paragraphs. (4)

Temperature, surface area, concentration, catalyst

a) Increasing the _____ of the reactants means the particles will have more energy and will move about more. This will cause more collisions and give the particles more energy for an effective collision.
b) Increasing the _____ means more reactant particles will be exposed. This means there will be more collisions between reactants causing the products to form at a faster rate
c) Increasing the _____ of reactants means there will be more particles and hence more collisions. This will cause the products to form at a faster rate
d) Adding a _____ decreases the amount of energy needed for an effective collision. Therefore, more collisions will be effective and cause the products to form at a faster rate.

Question 12 (13 marks)

Hydrochloric acid is a liquid and calcium carbonate (solid) react to form bubbles of carbon dioxide gas.

A student was asked to investigate what effect temperature had on the rate of reaction between hydrochloric acid (HCl) and calcium carbonate ($CaCO_3$).

(a) Write a suitable hypothesis for this investigation. (2)

(b) What is the independent variable for the experiment? (1)

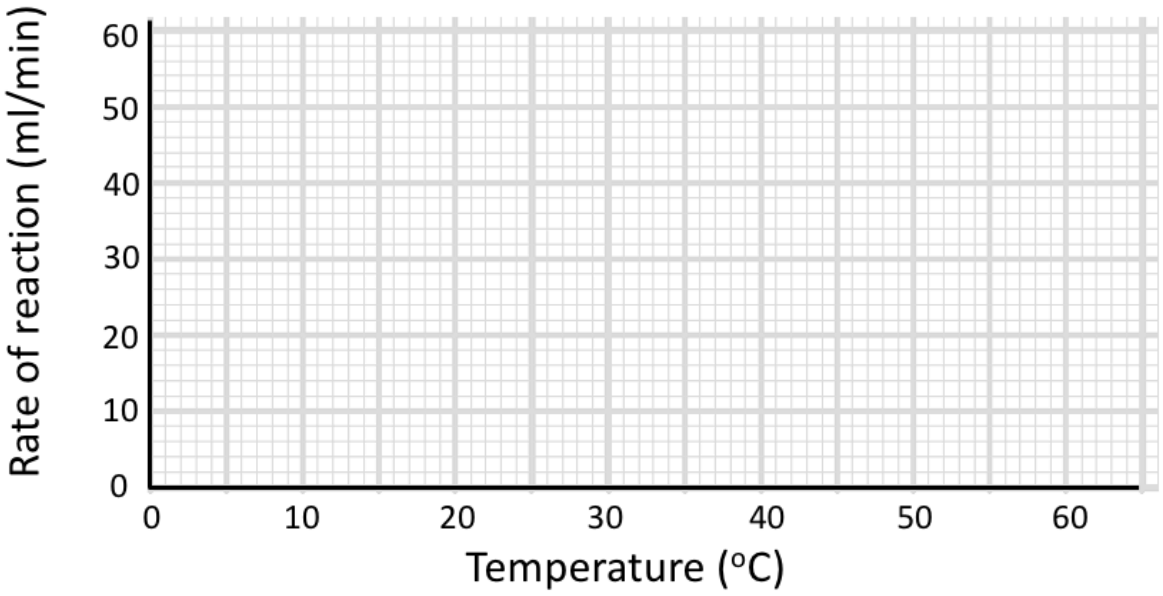
(c) What is the dependent variable for the experiment? (1)

(d) Give a control variable for the experiment? (1)

(e) What laboratory instrument could have been used to measure the temperature during the experiment? (1)

(f) The student collected the following data for the volume of gas produced per minute at various temperatures . Plot the data on the graph paper provided. (4)

Temperature (°C)	0	10	20	30	40	50	60
Rate of reaction (Volume of gas produced per minute (ml/min)	0	2	6	12	23	18	52



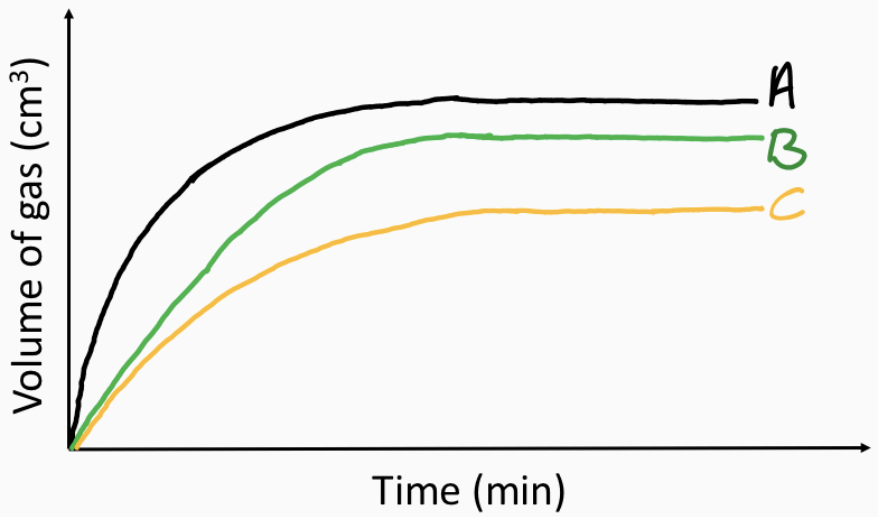
(g) One of the recorded volumes of gas produced per minute is an outlier (is inconsistent) with the others. Which one? (1)

(h) Does the data support the hypothesis you wrote? Explain your answer (1)

(i) Give one advantage of using a graph to present data. (1)

Question 13 (5 marks)

Hydrogen peroxide is a liquid which undergoes a reaction with the catalyst manganese dioxide (solid) to produce oxygen gas. Three experiments (A, B and C) of this reaction are recorded in the graph below. Study the graph and answer the following questions.



(a) Which curve (A, B or C) had the fastest rate of reaction at the beginning? Justify your answer (2)

(b) Suggest one difference between the experiments which could have caused this reaction happened at a faster rate. (1)

(c) Which curve (A, B or C) had the most reactants (eg. more hydrogen peroxide)? Justify your answer. (1)

(d) How could you test for the oxygen gas which is produced? (1)

If finished feel free to colour in this picture.

Happy Christmas to the best students!