Mission Heights Junior College

Subject: Year 10 Science CAT 2020

Time: 1 hour

Name: _____ Whanau/Class : _____

Instructions:

- The time allowed for this CAT is 1 hour
- There are 2 sections, spend 30 minutes for each section.
- You should attempt all the questions provided in sections.
- Start writing when you are instructed to do so.
- You have 5 minutes of reading time before you start writing.
- Use the space provided after each question to write all your answers. The last 2 pages are provided should you need extra paper
- Check that this booklet has 16 pages in the correct order with an additional coloured insert, and the last two pages are blank.

YOU MUST HAND THIS BOOKLET TO THE TEACHER AT THE END OF THE TEST.

Grade Allocation Table- For marking purposes only

	Section 1	Section 2
1		
2		
3		
4		
Total		
Grade		
Final grade		

Section 1 (30 minutes)

1. Draw a line to match the terms to their correct definition [AT]

1. Hypothesis	A. The variables that you keep constant in a scientific experiment
2. Independent variable	B. The variable that is measured in a scientific experiment
3. Dependant variable	C. The variable that is changed in a scientific experiment.
4. Control variables	D. An "educated guess," based on prior knowledge and observation.

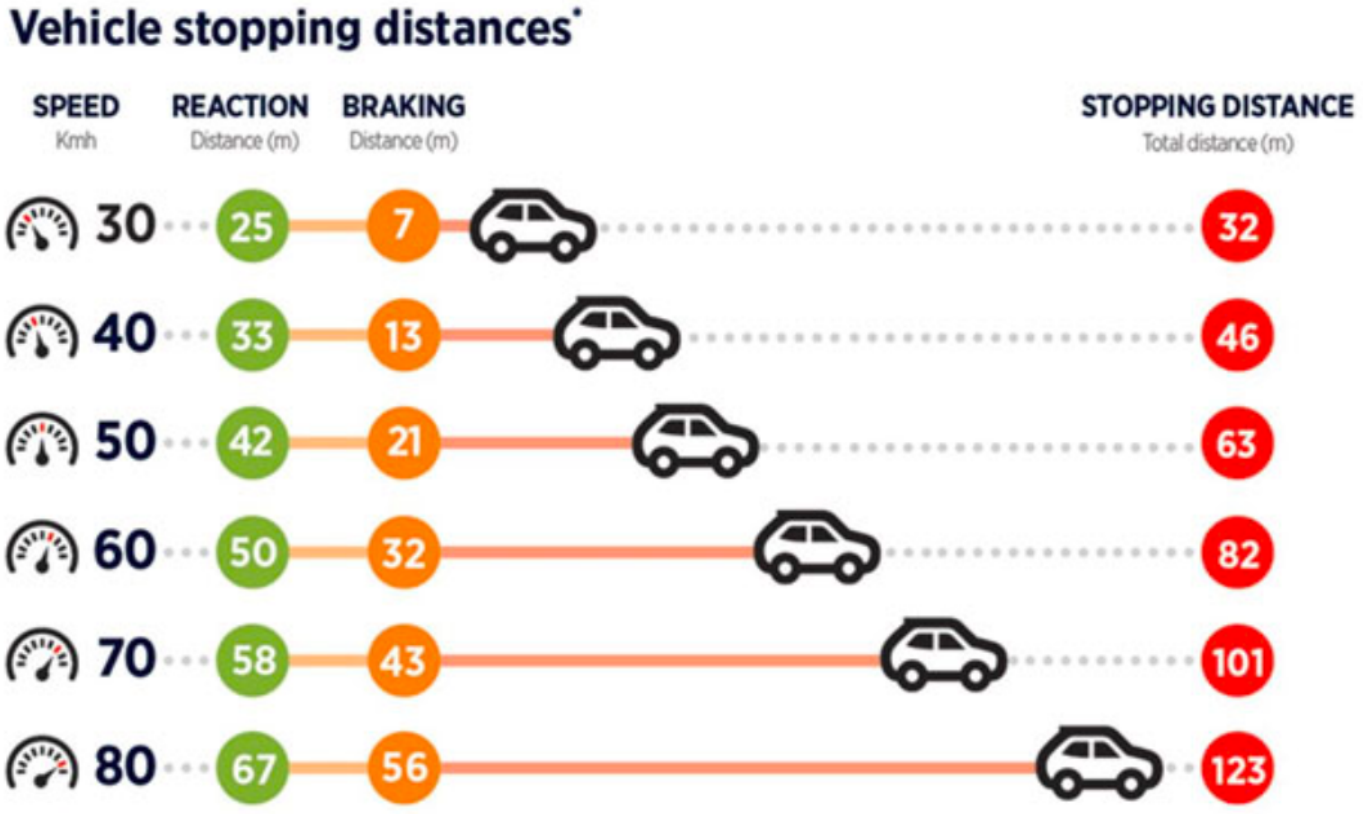
2. Speed vs Stopping Distances

Key facts

- Overspeeding or travelling too fast for conditions was recorded as a contributory factor in 25% of fatal crashes in 2017.
- More than half of the crashes where 15-19 year olds were killed have speed as a contributing factor.

Marlborough District Council conducted a study. Their aim was to determine how speed affects braking distance of a car with no brake or tyre defects. The diagram below illustrates the results of their study.

Diagram A- refer to coloured insert provided



***Assumes average driver attention in good weather conditions and car has no brake or tyre defects**

Data taken from these online resources for CAT purposes

- http://www.brake.org.nz/info-resources2/1312-speed-speed-limits-and-stopping-distances
- https://www.marlborough.govt.nz/services/roads-and-transport/speed-limits/speed-limit-review/braking-distances

a) Write down the aim of the study. [AT]

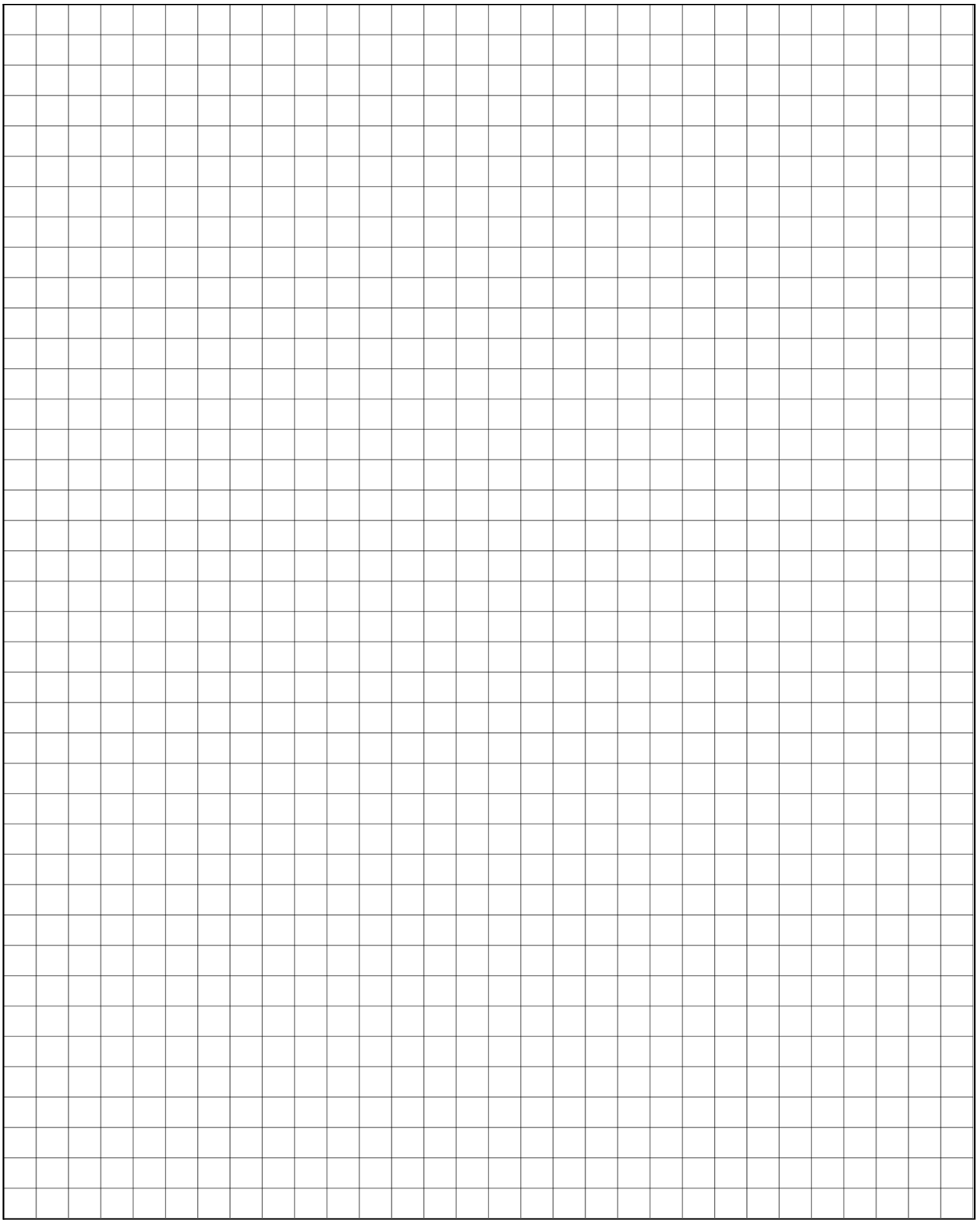
b) Why do you think the Marlborough District Council conducted this study? [AT / A]

c) Using the table below, determine the independent, dependent, and control variables of this study. [AT]

Independent variable	
Dependent variable	
Control variables	

d) What type of graph would be best suited to the data in Diagram A? [AT]

e) Using the information on Diagram A, draw an appropriately labelled graph of speed and total stopping distance. Remember your graph-drawing rules. Include a line of best fit. [AT / A]



3. Graph analysis

a) Using your graph, predict the stopping distance on the motorway of a car travelling at 100km/h. Mark this on your graph so that we can see how you got your answer. [AT]

b) Describe the relationship between braking distance and speed. Pick and choose from the words below to discuss and analyse your graph. *(Suggested keywords - shape, linear, non linear, positive/negative/no correlation, trend, strength of correlation, line of best fit)* [AT / A]

4. Write a discussion for the study.

Include the following in your response. [AT / A / B]

- Why was it important to measure reaction distance?
- What other factors could affect the stopping distance?
- To increase the validity of this study, suggest a suitable experiment that could further increase driver awareness of speed and safety. Detail the aim, hypothesis, independent and dependent variables.

Section 2 (30 minutes)

Read and understand background information from these scientific articles.

CO_2 and other greenhouse gases

By: Sarah Zielinki

Science News for Students September 20, 2018

***The article has been modified for the purpose of this exam.*

Many different gases make up Earth's atmosphere. While many pose no issues, the **greenhouse gases** act as a blanket, warming up the Earth. There are four main greenhouse gases to worry about. The best known is carbon dioxide (CO2). The others are methane, nitrous oxide and a group that contains chlorofluorocarbons (CFCs) and their replacements.

Like the windows in a greenhouse, the greenhouse gases trap energy from the sun as heat. The trapped heat warms the Earth in a process called the **greenhouse effect**. Without it, global temperatures would average around -18°C. Instead, the surface of our planet averages around 15°C, making it a comfy place for life.

CO_2 emissions have nosedived as COVID-19 keeps people home

By Carolyn Gramling

Science News for Students May 27, 2020

***The article has been modified for the purpose of this exam.*

Stay-at-home orders have curbed the spread of COVID-19 in many places. Those limits on travel also have had an environmental benefit: cleaner air.

The coronavirus lockdowns grounded planes, cut traffic and changed peoples' patterns of energy use. Air traffic fell by 75 percent and car and truck traffic dropped by about 50 percent. The result was a sharp drop in daily global emissions of greenhouse gases caused by burning fuels (natural gas, coal, oil). The primary gas among these is carbon dioxide. By early April, releases of CO_2 emissions had dropped 17% from the 2019 average.

Figuring out how lockdown impacted on greenhouse gases was tricky. Climate scientists had to be clever, estimating a country's **carbon footprint** by looking at data on traffic congestion, smart meters in homes and other measures of energy use.

a)

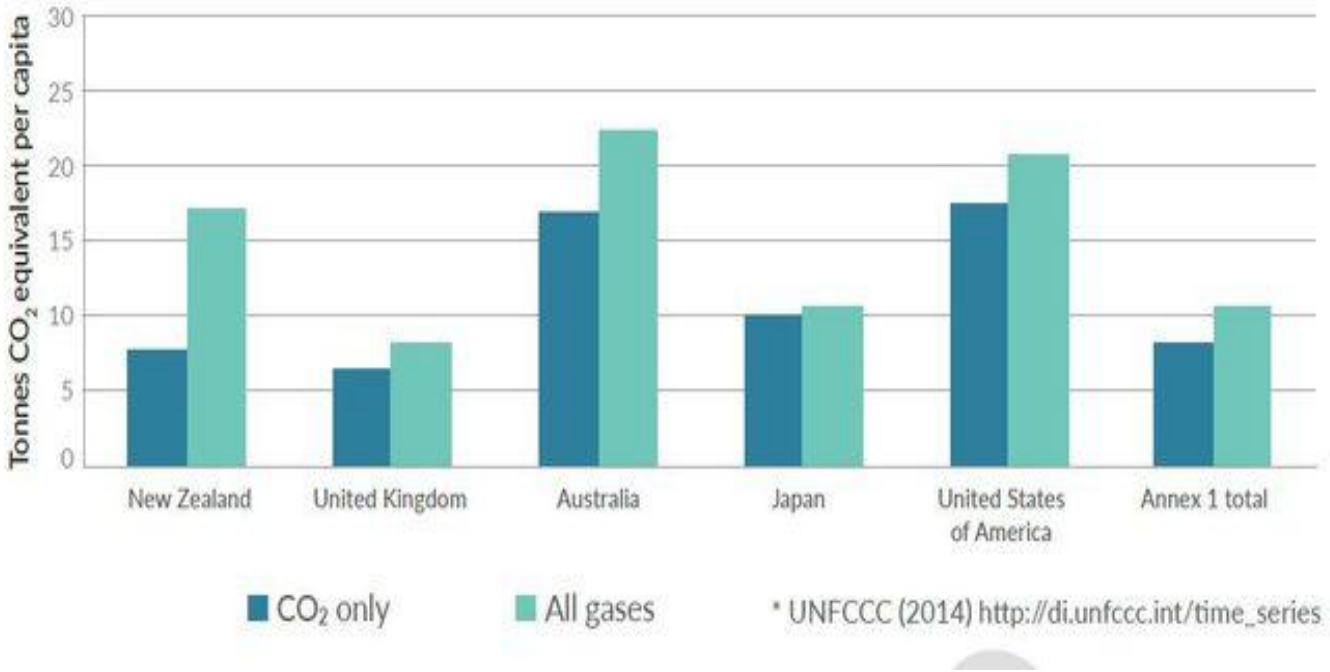
1. **With reference to the 2 articles provided:**

a) What are greenhouse gases? Give two examples of greenhouse gases. [AT]

b) What specifically was the change in **people's behaviour** during lockdown that has caused a reduction in greenhouse gases? How was the impact measured? [AT / A]

This graph is provided in colour- refer to the coloured insert

Figure 6: International comparisons for per capita emissions in 2014.*



2. **Using the graph and previous articles above**, identify a country that has *lower CO_2 emissions* than NZ **and** another country that has *higher CO_2 emissions* than NZ. Give reasons that may contribute to these differences?

[AT / A]

This graph is provided in colour- refer to coloured insert

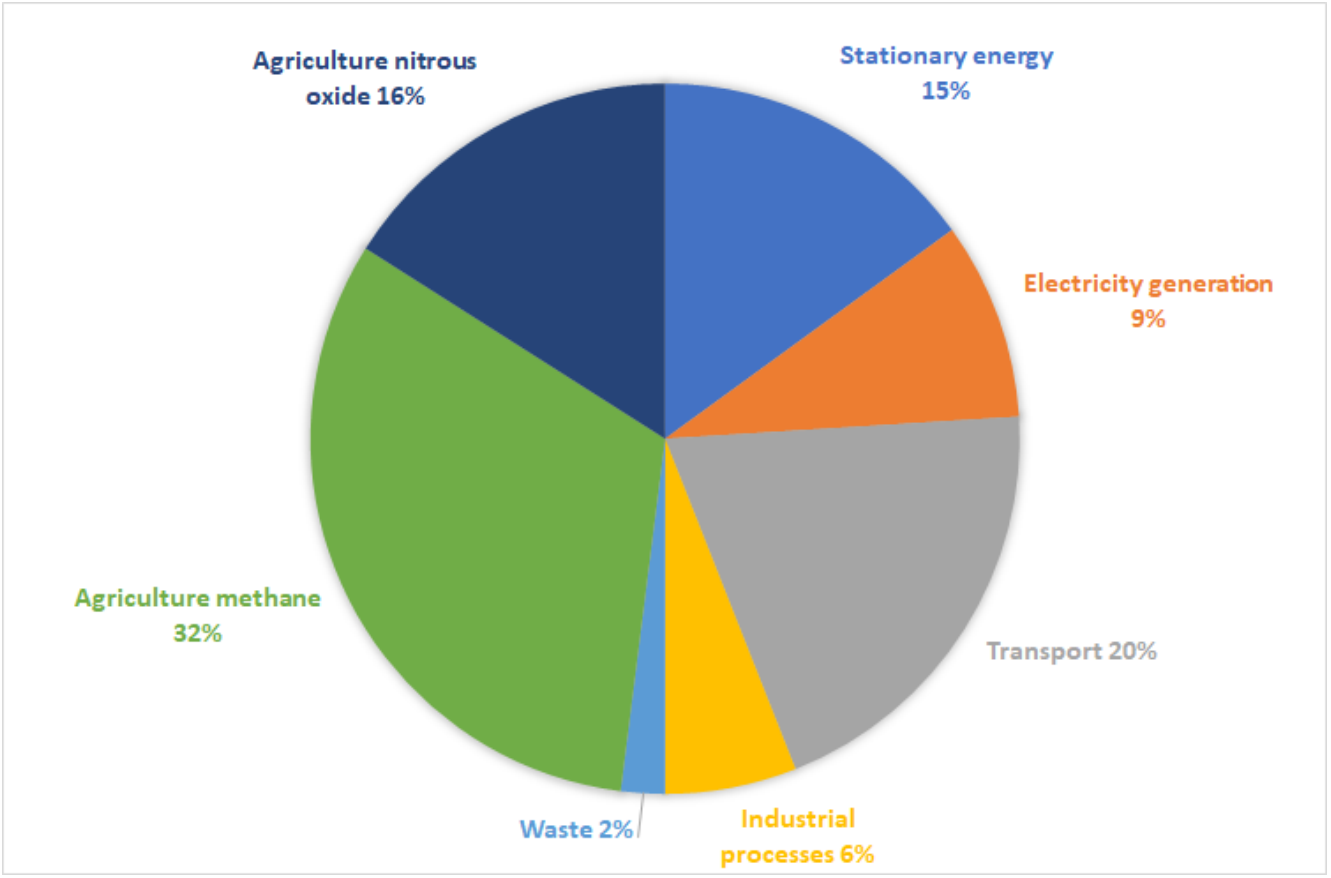


Figure 2: New Zealand's greenhouse gas emissions by sector: 2007

3. The Paris Agreement is an agreement where several countries have banded together collectively trying to fight against global warming. The goal is to get our annual global warming to under 2°C by 2100.

On the next page, write a short paragraph to Jacinda Ardern suggesting several ways NZ could reduce their CO_2 emission figures in an attempt to meet the Paris Agreement goal. Use Figure 2 to support your ideas. [AT / A / B]

In your paragraph you should include:

- Your stance on global warming
- Justification for your suggestions
- Whether you think we can achieve the Paris Agreement goal

(Do not spend longer than 10 minutes on this answer)

Please check all your answers

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