Student Number _____

Caringbah High School
Year 12 Investigating Science
Trial Exam 2024

Write all your answers in this answer booklet.

Use pen for written responses and pencil for diagrams and graphs.

Total Marks:

Task Length: 3 hour + 5 minutes reading time

PART A: Multiple Choice Questions (20 marks)

PART B: Longer Response Questions (80 marks)

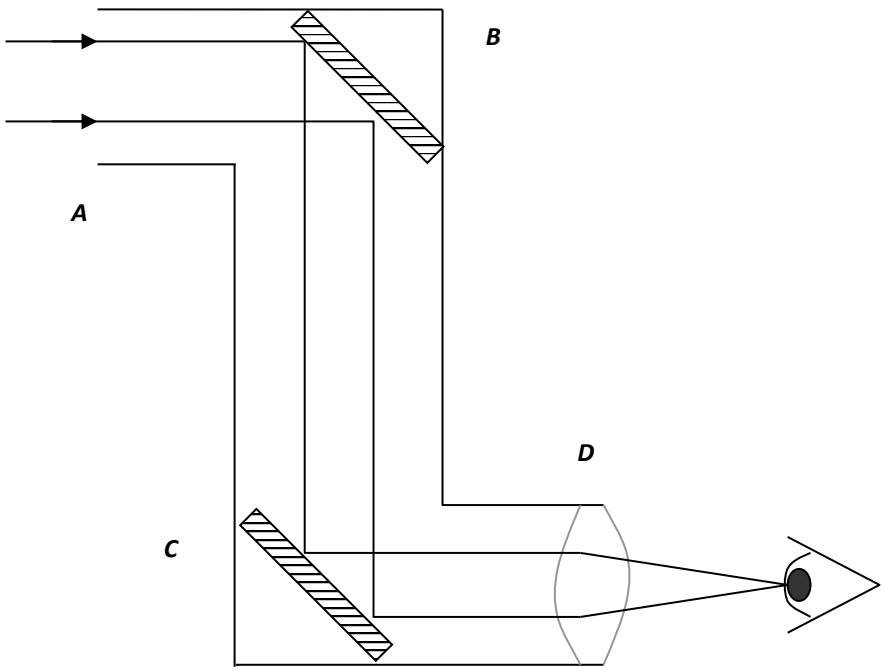
OUTCOME	*MARK*
Knowledge and Understanding	*/ 80*
Working Scientifically *3, 4, 5, 14, 18, 19, 23a-c, 25a, 26a, 19a*	*/ 20*
Total	*/100*

PART A: Answer the multiple-choice questions HERE. Circle the letter of the BEST answer.

Do NOT detach this page from the rest of the task.

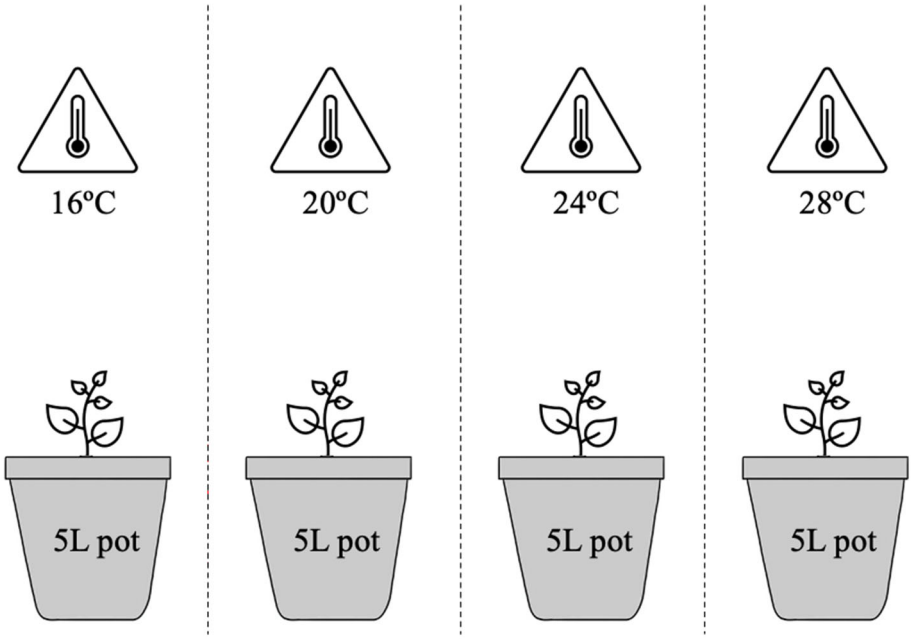
1	A B C D	11	A B C D
2	A B C D	12	A B C D
3	A B C D	13	A B C D
4	A B C D	14	A B C D
5	A B C D	15	A B C D
6	A B C D	16	A B C D
7	A B C D	17	A B C D
8	A B C D	18	A B C D
9	A B C D	19	A B C D
10	A B C D	20	A B C D

PART A: Circle the letter of the BEST answer on the grid (20 marks)

1.	*Crystal healing asserts that crystals and gemstones possess healing properties that influence physical, emotional, and spiritual well-being. Crystal healers may use terms like "energy fields", "vibrational frequencies" and "chakra balancing" to convey a sense of scientific legitimacy.* *What is this an example of?* *A. Pseudo-scientific claim.* *B. The theory of relativity.* *C. The halo effect.* *D. Emotive advertising.*	
2.	*The drawing below is a periscope. It allows a view to see over a wall.*  *At which point does refraction occur?* *A. A* *B. B* *C. C* *D. D*	

3. *Sam observed that his tomato plant produced three times the number of tomatoes this year compared to last year. Last year he placed the plants outside where the average temperature was 16°C. This year the plant was placed inside where the average temperature was 25°C.*

Sam decided to set-up an experiment to investigate his observations further.

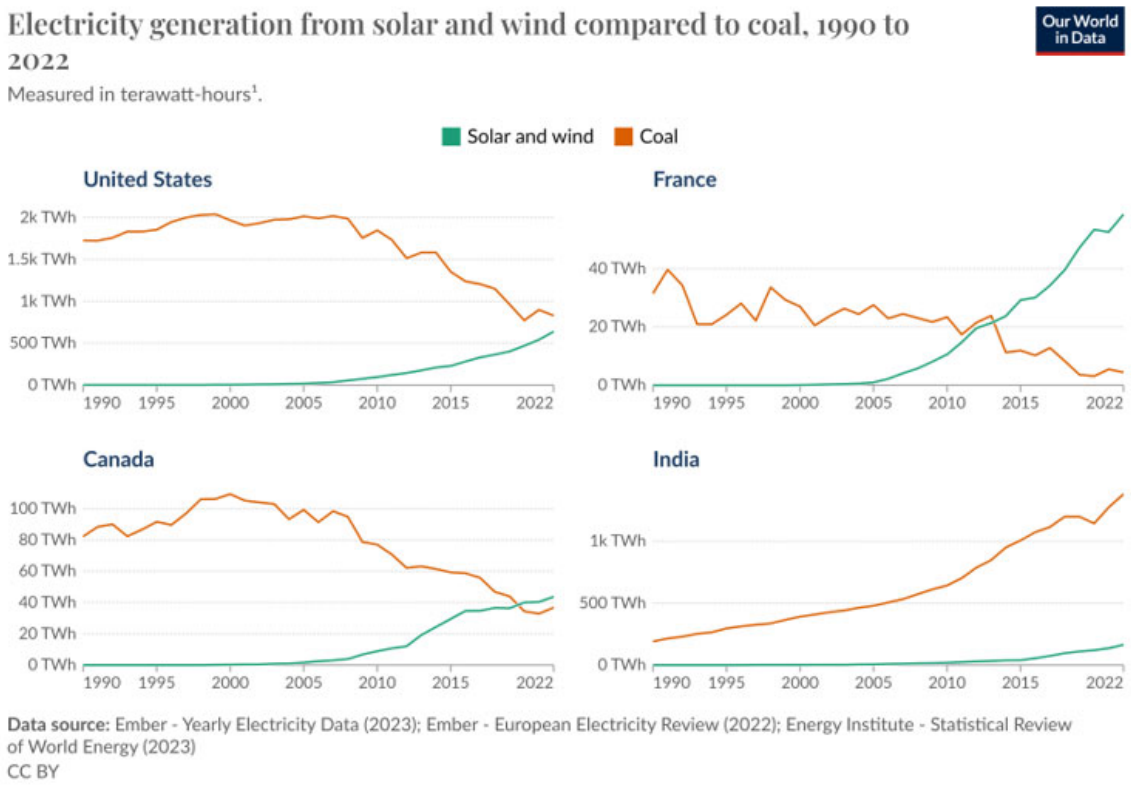


Which of the following would be a suitable hypothesis for this experiment?

A. The more water that is provided to the tomato plant, the more fruit the tomato plant will produce.
B. If the temperature of the environment is higher, the tomato plant will produce more fruit.
C. The tomato plant will produce more fruit if it is watered more regularly.
D. If the tomato plant is exposed to more sunlight, it will grow taller.

4. *Refer to the following information for questions 4 and 5.*

Below is a series of graph showing the electricity generation of solar and wind compared to coal across 4 countries.



Which country produced the most solar and wind energy in 2022?

A. United States
B. France
C. Canada
D. India

5. *The pattern of coal use for electricity generation in France is best described as:*

A. Steady decline
B. Irregular decline
C. Steady rise
D. Irregular rise

6. *Refer to the following information for questions 6 to 8.*

Below are the results of a famous experiment.

	Mass (kg) at start of the experiment	*Mass (kg) after 5 years*
Tree	*2.27*	*76.74*
Soil	*90.72*	*90.76*

Who was the scientist responsible for this experiment and what was their main inference from the experiment?

A. Van Helmont- Growth can be attributed to the addition of fertilisers.
B. Spencer- Growth can be attributed to the addition of water.
C. Van Helmont- Growth can be attributed to the addition of water.
D. Spencer- Growth can be attributed to the addition of fertilisers.

7. *What is the total weight change (both tree and soil) from the mass at the start of the experiment compared to the mass after 5 years?*

A. 74.47 kg
B. 0.04 kg
C. 74.51 kg
D. 14.02 kg

8. *Why was this experiment considered a deviation away from the traditional scientific methodology?*

A. The scientist tested the finding on themselves to establish their results.
B. The experiment only used one sample in the investigation.
C. The experiment was based on a pseudo-scientific claim.
D. The experiment faced ethical issues due to the use of live biological samples.

9. *Refer to the following information for questions 9 and 10.*

Below is a scaffold for a scientific journal article awaiting publication.

Report title	*Increasing incidence of learning disability caused by the X-virus vaccine 2013-2014*
Type of information	*Primary data*
Summary of report	*The X-virus vaccine has been administered across Australia and it has led to the development of learning disabilities in hundreds of children*
What is the purpose of the report?	*To prompt health authorities and governments to reconsider their vaccination programs*
What measures were taken to reduce error?	*Large sample size*
What language style used?	*Formal scientific*
How was the report structured?	*Abstract* *Methodology, data and analysis explained* *Results presented in tables and graphs* *Discussion about results* *No reference listed*

What is the main aim of this report?

A. To prompt health authorities and the government to reconsider their vaccination programs.
B. To act as propaganda and to scare people out of getting vaccinated.
C. To test Australia's rate of learning disability.
D. Increasing incidence of learning disability caused by the X-virus vaccine in 2013-2014.

10. *Using this scaffold as a guide and your knowledge of the requirements for scientific report publications. Will this report likely get published?*

A. Yes – It uses a large sample size.
B. Yes – It uses a formal language.
C. No – It uses no references.
D. No – It uses primary data.

11. *What is the purpose of an abstract in a Scientific Report?*

A. To provide a summary of the key findings and conclusions of the study.
B. To include detailed experimental procedures and methods.
C. To offer a personal opinion of the results quality.
D. To list references and citations used in the study.

12. *A balloon was blown up in a room at 25 °C and then placed in the fridge.*

Assuming no air can leak from it, and the fridge is kept at a constant 4 °C, what will happen to the balloon after 2 hours?

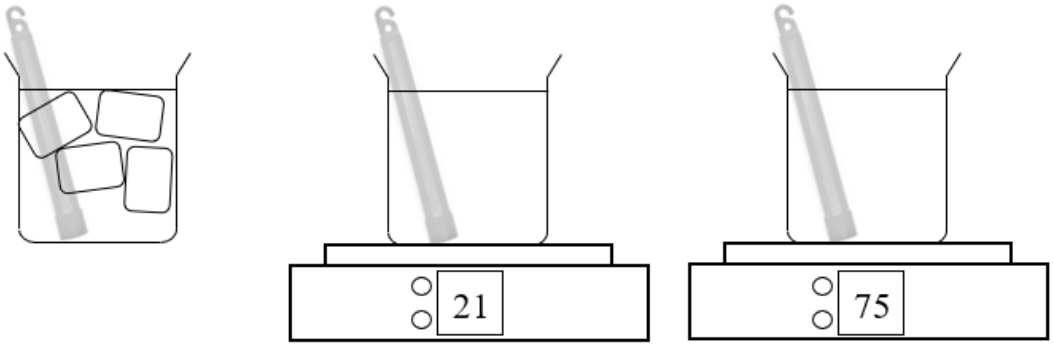
A. The balloon will decrease in volume.
B. The balloon will increase in volume.
C. The balloon will show no change in volume.
D. The balloon will burst.

13. *Which of the following statements best compares the cost of space exploration to investments in the global food supply?*

A. The returns from space exploration are significantly higher than investments, making space exploration the most practical use of resources.
B. Both space exploration and investment in the global food supply require substantial funding, but they serve different purposes and contribute to different aspects of human development.
C. Investments in the global food supply are much higher than the costs of space exploration, indicating that fewer resources should be allocated to space exploration.
D. Space exploration costs are relatively low compared to investments in the global food supply, suggesting that more resources should be allocated to space exploration.

14. *Refer to the following information for questions 14 to 15.*

Alex decided she would like to set up an investigation to determine why a glowstick light glows less brightly in colder temperatures. She set up three tests shown in the diagram below.



Test A	Test B	Test C
constant temperature of 4ºC	constant temperature of 21ºC	constant temperature of 75ºC

Which of the following should be used as a controlled variable?

A. Electric heater used.
B. Temperature of water.
C. Mass of ice
D. Colour of glowstick

15. *Alex completed the experiment and found that the glowstick in Test C shone much more brightly than A, which was dull. She concluded that temperature influenced the chemical reaction rate of the glowstick.*
Throughout her experiment, to ensure the temperatures were kept constant, Alex used two measuring technologies to measure temperature: a traditional thermometer and a data logger. She measured every 30 seconds throughout her experiment.

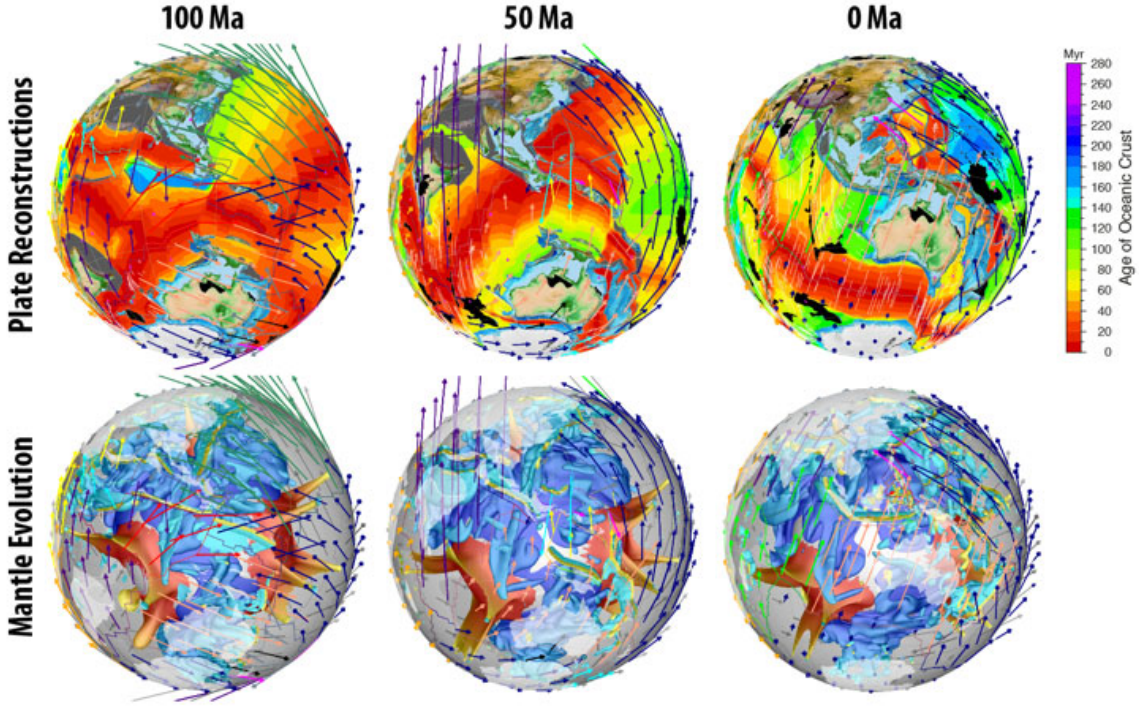
Technology	*Average temperature readings across the experiment* ***(°C)***		
Traditional thermometer	*Cold = 4 ± 1*	*Room temperature = 21 ± 1*	*Hot = 76 ± 1*
Data Logger	*Cold = 4.2 ± 0.1*	*Room temperature = 20.8 ± 0.1*	*Hot = 75.4 ± 0.1*

Which of the following statements accurately describes the comparison between temperature measurements obtained from a traditional thermometer and the data logger in the experiment given.

A. The traditional thermometer consistently provided a more precise temperature measure compared to the data logger.
B. The data logger consistently provides more precise temperature measurements compared to the traditional thermometer.
C. Both the traditional thermometer and data logger report identical temperature readings that are a precise as each other.
D. Neither the traditional thermometer nor the data logger shows precise measurements and hence you are unable to draw any conclusions.

16. *Refer to the following information for questions 16 and 17.*

The source below depicts a set of still images taken from an online simulation software developed by the University of Sydney. It is a free desktop software which can be used for interactive visualisation.



What, in this instance, is this technology modelling?

A. Modern climate patterns.
B. Historical migration patterns of early humans.
C. Plate tectonics and continental drift.
D. Evolutionary changes in species over time.

17. *Using this modelling technique, scientists have been able to validate theories or laws concerning the geological history of the Earth.*

Which row below correctly links the theory to the technology that has helped develop it in relation to the simulation software shown.

	Theory	*Technology*
A.	*Theory of plate tectonics*	*Global positioning systems (GPS) on crust*
B.	*The atomic theory*	*Large Hadron Collider*
C.	*Theory of plate tectonics*	*X-ray diffraction on plate boundaries*
D.	*The big bang theory*	*The Hubble telescope*

18.

Refer to the following information for questions 18 to 20.

This is an excerpt of the finding from an article published by the BMC Public Health Journal.

"Chinese (55) and American (57) undergraduate students in Changsha, Hunan, China and Honolulu, Hawai'i, U.S.A. composed one- to two-paragraph responses to the following prompt: "What does the phrase 'a healthy diet' mean to you?"

Chinese students mentioned physical outcomes, such as maintaining immunity and digestive health. Timing of eating, with regular meals and greater intake during day than night, was emphasized. American students described balancing among food groups and balancing consumption with exercise, with physical activity considered essential."

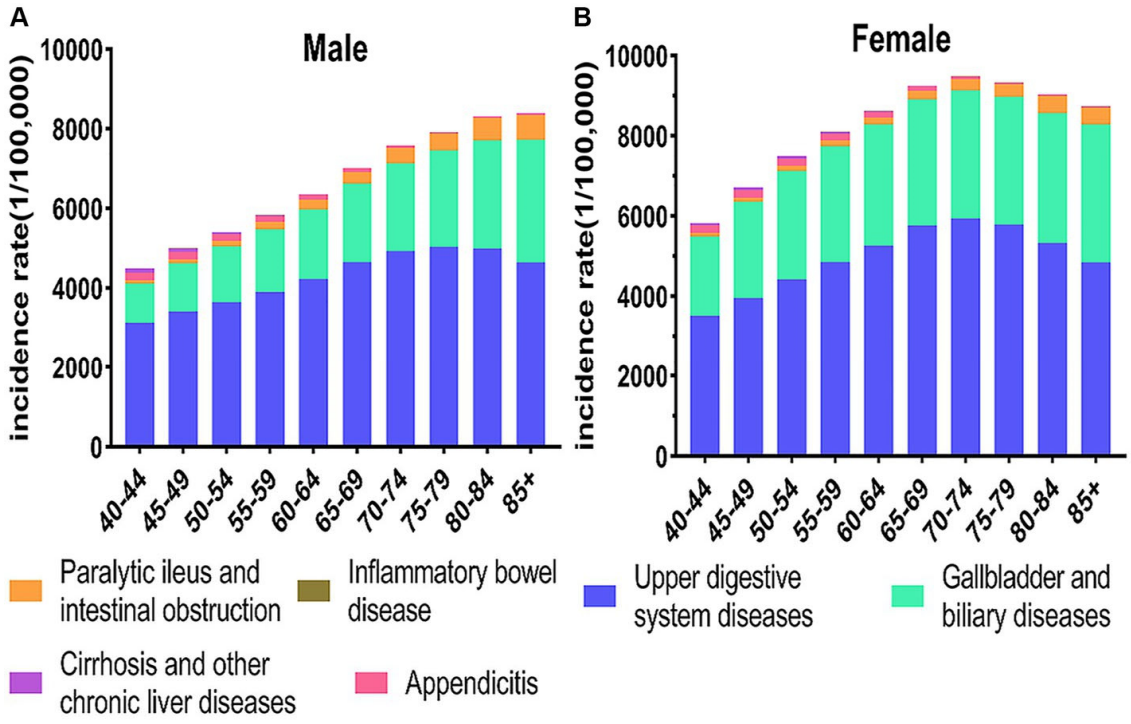
Source – Banna et al., (2016) https://doi.org/10.1186/s12889-016-3680-2

The aim of this report is to determine:

A. Different cultural and socioeconomic perspectives of China and the USA.
B. Individual diet techniques in students.
C. Which country has a healthier lifestyle.
D. What type of diet trends are upcoming?

19.

The graphs below illustrate the prevalence of digestive disease among Chinese residents in the 21st century.



Which of the following is NOT true of the data presented?
A. Females 70-74 have the highest proportion of digestive diseases.
B. 'Gallbladder and biliary disease' affect more women than men on average from the ages for 40-85+
C. The 3 main digestive diseases affecting over 85-year-olds are 'Paralytic ileus and intestinal obstruction', 'Upper digestive systems diseases' and 'Gallbladder and biliary diseases.
D. Upper digestive system disease kills more women than men.

20.	*Considering both sources, this underscores the need for:* *A. Promoting American students' understanding of physical activities for health, given cultural and socioeconomic influences.* *B. Advancing research into diets reducing digestive disease risks, considering scientific impact on dietary perceptions.* *C. Educating Chinese students on varied diets and exercise benefits, respecting cultural dietary norms.* *D. Raising awareness among Americans about digestive issues, addressing diverse cultural and individual dietary perspectives.*	

PART B: Longer Answers (80 marks)

21.

a) *What is a peptic ulcer?* **1**

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b) *Discuss factors that led Marshall and Warren to investigate peptic ulcers.* **3**

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c) *How did Marshall demonstrate that H. pylori bacteria caused peptic ulcers?* **2**

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d) *Why did the scientific community take more than a decade to accept Marshall and Warren's conclusions?* **2**

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22. *A major international company was investigating a traditional medicine for a common health complaint. They used a double-blind trial to compare its effectiveness against a conventional medicine they already had in production. The scientists involved in the research published an initial report, which was subjected to peer review before any further research was carried out.*

a) Explain what a double-blind trial is and why it is used. **2**

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b) Outline what is meant by peer review and give ONE reason why it is important in science. **2**

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c) Analyse the impact of fake science journals on the public perception of science. **4**

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23.	*Scientific inquiry involves designing experiments to investigate hypotheses or explore new ideas.* *a) Outline an experiment to measure the effect of pressure on volume of gas.* …… …… …… …… …… …… …… *b) Suggest a technology to measure the dependent variable in this experiment.* …… …… *c) Label the axis and sketch a graph on the axis below of the expected result.*  *d) Based on a suitable theory, explain the shape of the graph.* …… …… …… …… ……	**3** **2** **2** **2**

24.	*Scientific investigations use technology to collect data. Use ONE example to compare the accuracy of analogue and digital technologies for making observations.* …… …… …… …… …… ……	**3**

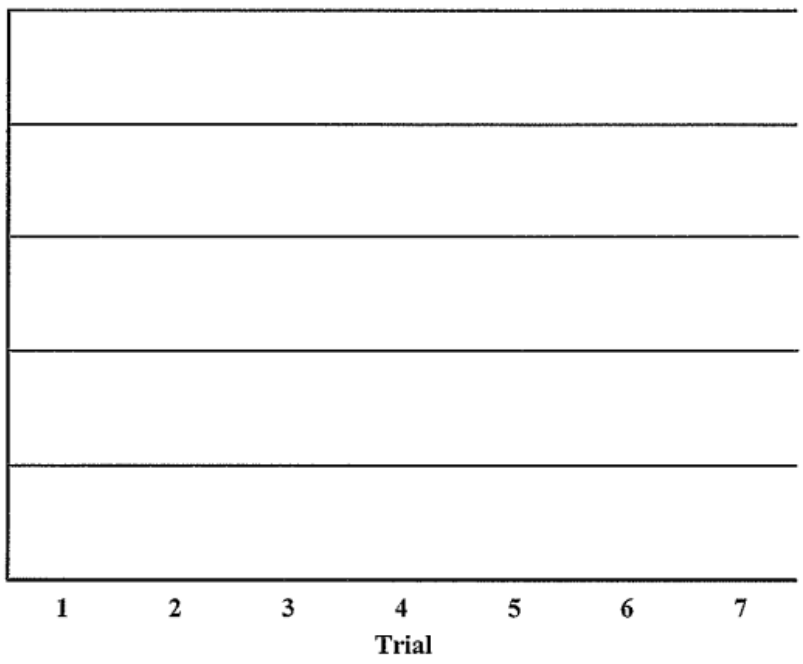
25. *An experiment was set up using a maze to test memory and spatial awareness in mice. Seven separate trials were conducted using ten mice in each trial. For each trial, one group was given a food reward, and the other group was given no reward for reaching the end of the maze.*

The results are tabulated below:

Trial number		*1*	*2*	*3*	*4*	*5*	*6*	*7*
Average time to complete maze (min)	*No reward*	*23.5*	*23*	*22*	*19.2*	*16.5*	*13.4*	*9*
	Food reward	*23.5*	*23*	*20*	*13*	*7.5*	*5.5*	*4*

a) Draw a labelled column graph that represents all the information in the table on the grid provided.

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b) Explain why a column graph is better than a line graph to represent this information. **2**

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c) Assess the ethics of conducting the investigation in terms of animal welfare. **2**

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26. *The following is part of a report submitted by a student as part of an investigation.*

Introduction

I bring in a packet of the same make of potato chips everyday as part of lunch. The packs all say they contain 30g of chips. However, I think there is a difference in the number of chips in the bag of different flavours. There always seems to be fewer of the flavours I like. I decided to carry out some scientific research to see if this is true.

Apparatus

Packet of chips containing three bags of lightly salted, salt and vinegar, BBQ, and cheese and onion.

Method

A 12-pack of chips was purchased from the local supermarket. Because no eating is allowed in the school laboratories, the initial weighing was done at home. The chips were taken to school and eaten in the playground and the empty bag was taken home and re-weighed, A set of digital scales weighing to 0.01g was purchased from eBay to do the weighing

Results

Flavour	*Mass of full bag (g)* *(Bag + chips)*	*Mass of Empty Bag (g)*	*Mass of Chips (g)*
Lightly salted	*32.91*	*1.93*	*30.98*
Lightly salted	*32.70*	*1.85*	*30.85*
Lightly salted	*32.86*	*2.09*	*30.77*
Salt and vinegar	*33.01*	*2.43*	*30.58*
Salt and vinegar	*32.64*	*2.08*	*30.38*
Salt and vinegar	*33.03*	*2.01*	*31.02*
BBQ	*32.30*	*1.97*	*30.33*
BBQ	*32.91*	*2.03*	*30.91*
BBQ	*32.49*	*2.06*	*30.43*
Cheese and Onion	*31.94*	*1.89*	*30.05*
Cheese and Onion	*33.48*	*2.05*	*31.43*
Cheese and Onion	*32.88*	*2.03*	*30.88*

Conclusion

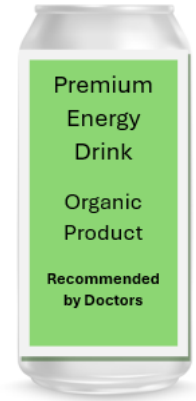
There wasn't much different between the mass of the chips

	a) Construct an initial hypothesis for this investigation	**1**
	…… …… ……	
	b) Evaluate the student's report.	**5**
	…… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… …… ……	

27.	*Advances in scientific theories and laws drive the need for further development in technology.* *a) Outline the technical advancement that led to the discovery of the structure of deoxyribonucleic acid (DNA).* …… …… …… …… …… …… …… …… *b) Discuss the use of biotechnologies used in developing genetically modified food.* …… …… …… …… …… …… …… …… …… …… …… ……	**2** **4**

28. *Advertisements continue to play an important role in building strong brand names.*

a) The following advertisement was placed in a women's health magazine for an energy drink.



Analyse the claims made by the brand on the energy drink can. ***4***

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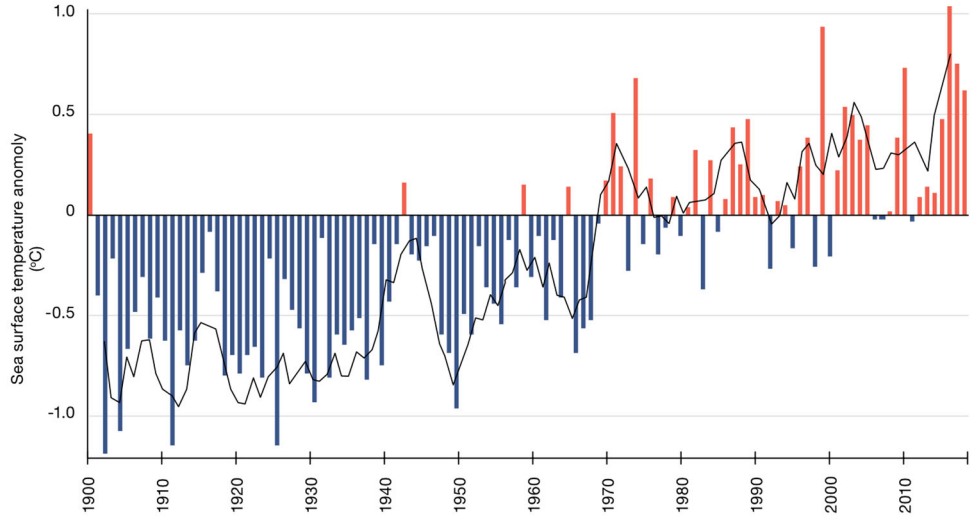
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	b) *Discuss how advertising agencies are regulated and identify one government agency that provides guidance to businesses and customers regarding false claims made by business and their products.* …… …… …… …… …… …… …… …… …… …… …… …… ……	***3***

29. *The graph below shows the sea surface temperature anomaly for the Great Barrier Reef waters from 1900-2018.*

A temperature anomaly is a measure of how much surface temperature is above or below the long-term average.



a) *Describe the trend in temperature of the sea surface temperature from 1900-2018.* **2**

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b) *Outline ONE societal and ONE economic implication of the trend revealed in this graph.* **2**

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According to the Global Carbon Report 2023, there has been a persistent escalation in the annual carbon dioxide emissions from fossil fuel combustions since the mid-20th century.

> *People who fear the solutions to climate change, such as increased regulation of industry, are more likely to deny that there is a problem in the first place – what psychologists call "motivated disbelief".*
>
> *Source – Campbell & Kay (2014) https://doi.org/10.1037/a0037963*

	c) *Referring to an example which you have studied and the quote above, discuss the conflict of interest that climate change presents for fossil fuels producers and identify actions that they have taken to try and influence the public discussion.* …… …… …… …… …… …… …… …… …… …… …… …… ……	***4***

30.

The statement below was made by Priestley following his experiment in 1774.

> *"The plant is refreshing the air"*

a) *Outline the objective set by Priestly in his experiment and describe the data collection method used.* ***2***

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b) *Explain ONE ethical issue that may be face if someone were to recreate his experiments today.* ***2***

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31. *The 2024 Taiwanese earthquake was a magnitude 7.2 quake which struck on the 3rd of April 2024. It was the region's biggest quake in 25 years. The image below is sourced from the Guardian Newspaper and shows an example of the destruction caused.*



Explain how a knowledge of Newton's Law is important when designing buildings that can withstand earthquakes. Refer to an Earthquake proofing technology to support your answer.

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32. *These two graphs have been taken from a 2010 study by the Organisation for Economic Co-operation and Development (OECD) and depict public attitudes towards nuclear power from 27 European Countries.*

Graph A depicts the percentage of people who agree to the statement:
"The use of nuclear material is sufficiently protected against misuse".

Graph B depicts the percentage of people who agree to the statement:
"It is possible to operate nuclear power plant in a safe manner" .

Figure 10: The use of nuclear materials is sufficiently protected against misuse
[*Answer: "Agree"***]**

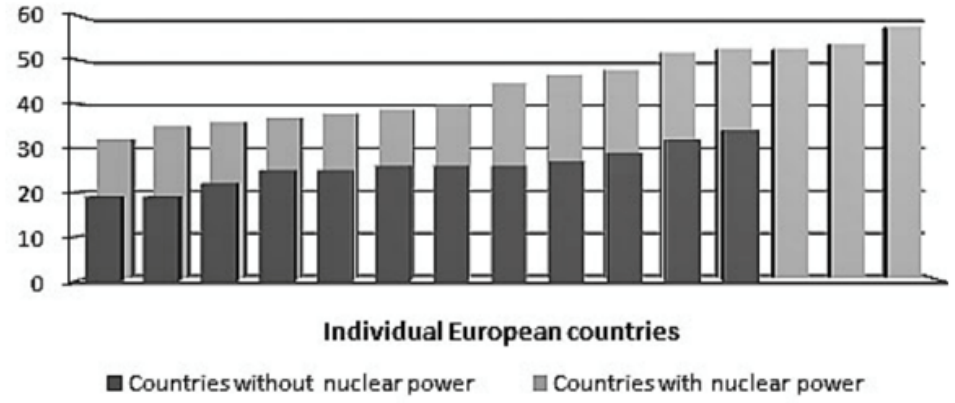
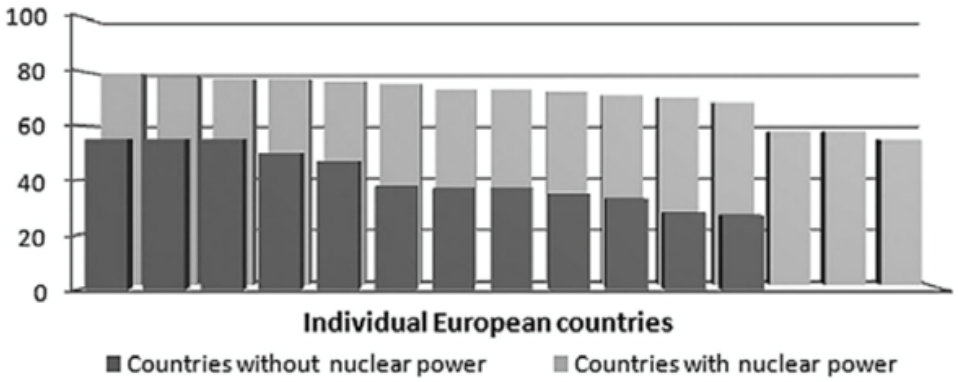


Figure 7: It is possible to operate a nuclear power plant in a safe manner
[*Answer: "Agree"*]



a) *Examine the graphs. Compare the responses of people who live in countries with nuclear power to those living in countries without nuclear power. Suggest reasons for any difference.* ***4***

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	b) *How have meltdowns of nuclear reactors influenced the public perception of science and its applications, particularly in the context of nuclear power generation and safety measures? Discuss this in relation to a nuclear reactor accident you have studied.* ……	***5***

Task Evaluation ***Name: _____***

Total Mark: *_____ out of _____*

Mark sub-totals

Multiple choice mark: _____ out of _____

Knowledge and understanding mark: _____ out of _____

Working Scientifically mark: _____ out of _____

Circle the number that best matches. Key: 1– never 2-occasionally 3-sometimes4-mostly 5- always

Aspect	*never*	*occasionally*	*sometimes*	*mostly*	*always*
I pay attention in class	*1*	*2*	*3*	*4*	*5*
I complete all my classwork	*1*	*2*	*3*	*4*	*5*
I ask the teacher when I need help	*1*	*2*	*3*	*4*	*5*
I make summary notes to study	*1*	*2*	*3*	*4*	*5*
I get distracted in class	*1*	*2*	*3*	*4*	*5*
I keep my OneNote book up to date	*1*	*2*	*3*	*4*	*5*
I provide sufficient detail in my OneNote responses/notes	*1*	*2*	*3*	*4*	*5*
I completed past papers to prepare for the test	*1*	*2*	*3*	*4*	*5*
I can communicate my understanding in tests	*1*	*2*	*3*	*4*	*5*

Questions:

1. *Do you feel that your performance in this task represents your understanding of science?*

   _____

2. *What does your teacher do that helps you understand in science?*

   _____

3. *What can your teacher do to improve your understanding in science?*

   _____

4. *What do you do to maximise your results in science?*

   _____

5. *What could you do better/differently to improve your results in science?*

   _____

6. *Is there anything else you want your teacher to know?*