2023/10123
Web version of 2022/56908

Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course examination, 2022

Question/Answer booklet

INTEGRATED SCIENCE

Please place your student identification label in this box

WA student number: In figures

In words

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer booklet
Multiple-choice answer sheet

Number of additional answer booklets used (if applicable):

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination
Section One Multiple-choice	20	20	30	20	20
Section Two Short response	5	5	90	96	50
Section Three Extended response	2	2	60	60	30
				Total	100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2022: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

   Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Sections Two and Three: Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens.

3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

See next page

Section One: Multiple-choice **20% (20 Marks)**

This section has **20** questions. Answer **all** questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 30 minutes.

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1. The form of heat transfer involving atoms vibrating and causing nearby atoms to vibrate is called

   (a) convection.
   (b) radiation.
   (c) conduction.
   (d) evaporation.

2. Which of the following are components of a dry cell?

   (a) zinc anode, graphite rod, electrolyte paste
   (b) zinc cathode, graphite paste, electrolyte rod
   (c) graphite anode, zinc rod, electrolyte paste
   (d) graphite cathode, zinc paste, electrolyte rod

3. The storage of radioactive material requires long-term management. What factor/s need to be considered in choosing a suitable storage location?

   (a) located within a geologically stable environment
   (b) located within a low oxygen environment
   (c) located within a low permeability substance such as clay
   (d) all of the above

4. Diversity and abundance of aquatic life is affected by the physical and chemical conditions of water. Which of the following are chemical factors that can affect aquatic organisms?

   i dissolved oxygen
   ii producers
   iii light
   iv turbidity
   v salinity

   (a) i and iii
   (b) iii and iv
   (c) i and v
   (d) ii and iv

See next page

5. The **main** factor that would change the buoyancy of an object floating in water is the

   (a) shape of the object.
   (b) width of the object.
   (c) depth of the water.
   (d) density of the water.

6. Engine designs and fuel sources are changing to meet environmental concerns. Which of the following statements is correct?

   (a) All hydrogen fuel cells have a low environmental impact.
   (b) The production of all hydrogen fuel cells relies on fossil fuel sources.
   (c) Green hydrogen is produced without fossil fuel sources.
   (d) Hydrogen fuel cells are more environmentally efficient than traditional fossil fuel cells.

7. Why are food chains usually limited to four or five trophic levels? There

   (a) are very few top order consumers found in ecosystems.
   (b) is loss of energy at each transfer in a food chain.
   (c) are not enough organisms to support higher trophic levels.
   (d) is not enough biomass to support higher trophic levels.

8. What is the name given to the process by which pesticides build up in an organism's body?

   (a) biomagnification
   (b) eutrophication
   (c) osmoregulation
   (d) energy transfer

9. The pH levels in many large lakes throughout the world have been measured on a yearly basis for the last twenty years. During this time, pH levels of lakes have steadily decreased. Which of the following would have had the **greatest** impact on this changing pH?

   (a) decreased deforestation and land clearing
   (b) increased combustion of fossil fuels
   (c) increased use of insecticides
   (d) decreased use of fertilisers containing nitrogen

10. Which of the following sources used to generate electricity is the **most** sustainable?

    (a) solar cells installed on roofs of buildings
    (b) burning of biomass
    (c) combustion of natural gas
    (d) coal fired power plants

See next page

Question 11 refers to the table and formula below about appliances that use electricity.

$$P = \frac{E}{t}$$

Appliance	Power rating (watts)	Operating time (seconds)
Phone charger	60	9000
Hair dryer	1200	900
Air fryer	1500	240
Iron	1600	480

11. For the given operating times, which appliance used the **most** energy?

(a) phone charger
(b) iron
(c) air fryer
(d) hair dryer

12. Which of the following statements **best** describes a polar molecule?

(a) equal sharing of electrical charge over a molecule
(b) equal sharing of electrons between atoms
(c) unequal sharing of electrical charge over a molecule
(d) unequal sharing of electrons between atoms

13. The term used for the process that marine and freshwater fish use to regulate the amount of water in their bodies is

(a) biomagnification.
(b) gas exchange.
(c) osmoregulation.
(d) desalination.

14. Water has a high specific heat capacity. Why is this an advantage to aquatic organisms?

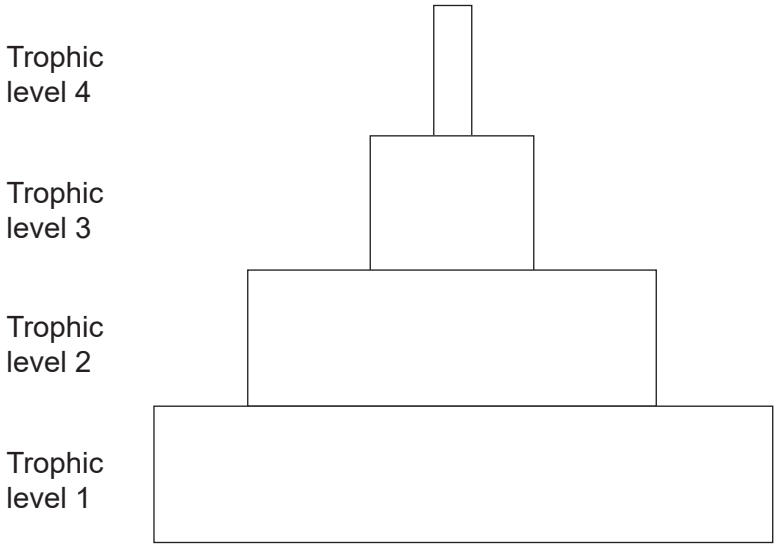
(a) Organisms can obtain more oxygen from the water.
(b) The water temperature will remain reasonably constant day and night.
(c) The water balance inside the organism's body is maintained.
(d) Nutrients would be easier to absorb from the water.

15. In which of the following processes does water get converted into a gaseous state?

(a) transpiration
(b) condensation
(c) melting
(d) precipitation

See next page

Questions 16 and 17 refer to the diagram below of an energy pyramid.



16. Approximately what percentage of the energy fixed in the bodies of primary producers in the energy pyramid will be available to the first order consumers?

(a) 100%
(b) 10%
(c) 1%
(d) 0.1%

17. Which of the following food chains could be represented by the diagram?

(a) grasshopper → tree frog → snake → kookaburra
(b) wheat → mouse → snake → kookaburra
(c) grasshopper ← tree frog ← snake ← kookaburra
(d) wheat ← mouse ← snake ← kookaburra

18. The principle of electromagnetic induction involves which of the following?

(a) electricity + movement → coil + magnetic field
(b) electricity + coil + magnetic field → movement
(c) movement + coil + magnetic field → electricity
(d) movement + magnetic field → coil + electricity

19. A student was heating 250 mL (250 g) of water in a beaker for use in an experiment. Over the course of 10 minutes, the temperature of the water went from room temperature (20 °C) to 99 °C. How much heat energy was required to increase the temperature to 99 °C? Use the formula $Q = mc\Delta T$, the specific heat of water is 182 J kg^{-1} $°C^{-1}$.

(a) 82.59 kJ
(b) 825.9 kJ
(c) 8.259 kJ
(d) 8259 kJ

See next page

20. Most household appliances have star rating labels attached to them, like the one shown below.

What does the star rating show about an appliance?

(a) how much power it produces when compared to other brands
(b) how efficient it is when compared to models of the same size
(c) how well it converts energy from one form to another
(d) how much money it will cost to use it over the course of a year

End of Section One

See next page

Section Two: Short response **50% (96 Marks)**

This section has **five** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e., give the page number.

Suggested working time: 90 minutes.

Question 21 **(22 marks)**

Energy from the Sun was converted in the past to non-renewable energy resources and can now be converted into renewable energy resources.

(a) Define the terms 'renewable resource' and 'non-renewable resource' and provide **two** examples of each. (6 marks)

Renewable resource: _____

_____

_____

_____

One: _____

Two: _____

Non-renewable resource: _____

_____

_____

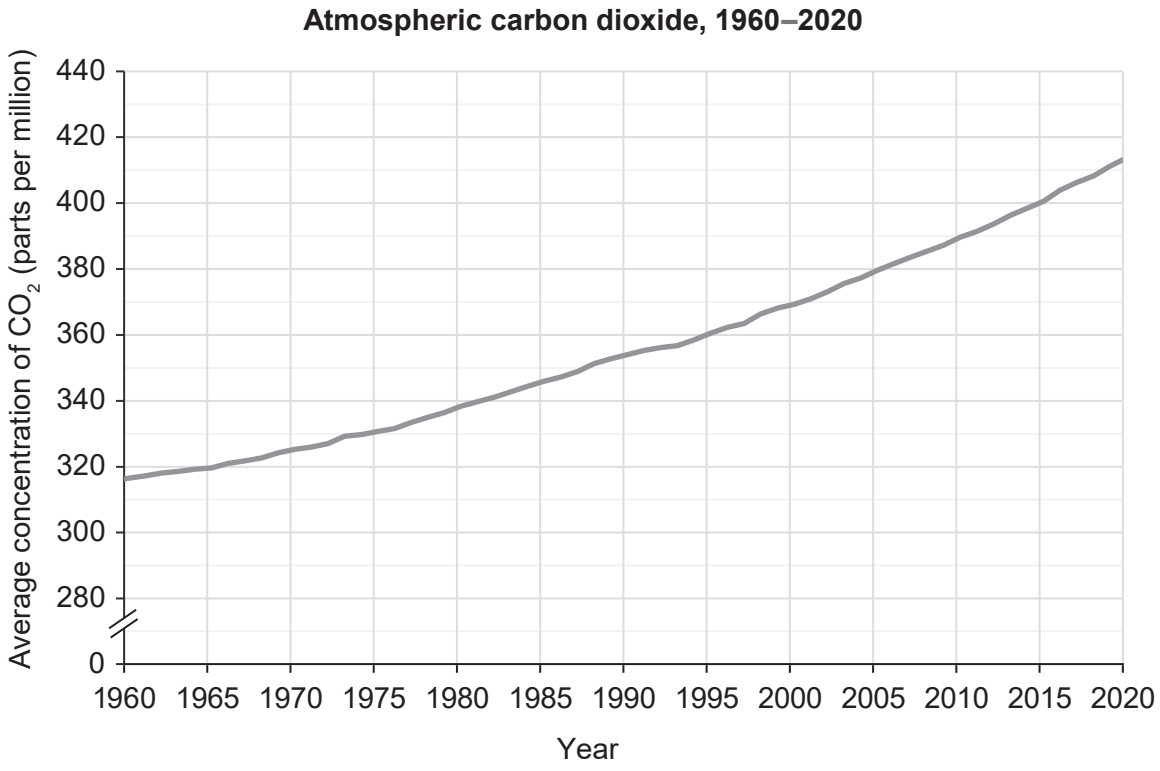
_____

One: _____

Two: _____

(b) The burning of fossil fuels releases greenhouse gases into the atmosphere. Explain how an increase in these greenhouse gases has contributed to the enhanced greenhouse effect. (3 marks)

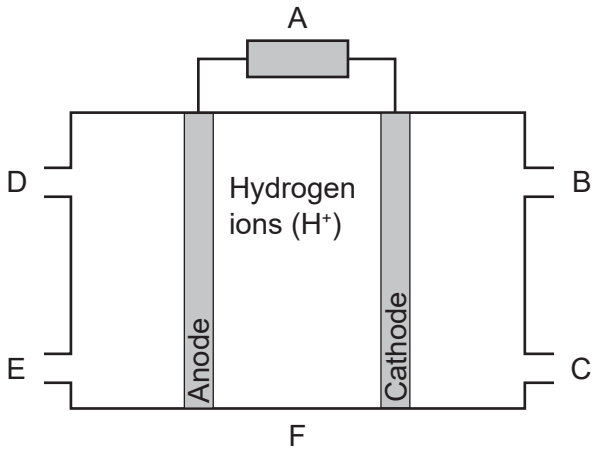
The graph below shows the average carbon dioxide (CO_2) concentration in the air from 1960 until 2020.



(c) Describe **one** conclusion that can be drawn from the data in the graph. (2 marks)

Question 21 (continued)

As the need to reduce carbon emissions increases, so too does the need to explore and develop alternative fuel sources. The following diagram shows a hydrogen fuel cell.



(d) Using the diagram above, complete the table below, to indicate which letter A, B, C, D, E or F, in the diagram corresponds with the location given. (3 marks)

Location	Letter
Where hydrogen enters the cell	
Where oxygen enters the cell	
Where the electrolyte would be located	

(e) Explain why water is formed as a waste product. (6 marks)

(f) List **two** benefits of using a hydrogen fuel cell. (2 marks)

One: _____

Two: _____

See next page

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See next page

Question 22 **(21 marks)**

Students tested the solubility of four salts at different temperatures. The salts tested were Sodium Chloride (NaCl) and three others that are found in fertilisers: Sodium Nitrate ($NaNO_3$), Potassium Nitrate (KNO_3) and Potassium Chloride (KCl). The results are recorded in the table below.

	Solute dissolved per 100 mL of water (g)			
Temperature (°C)	**NaCl**	**$NaNO_3$**	**KNO_3**	**KCl**
0	38	72	13	28
10	38.2	80	21	30
20	38.5	88	33	32
30	38.5	97	49	38
40	39	106	63	40
50	39	115	82	41
60	39.5	126	110	45
70	39.5	135	136	49
80	40	150	168	51
90	40	161	204	55
100	40.5	178	245	58

(a) Define the term ‘solubility’. (1 mark)

(b) Identify the following for this investigation: (2 marks)

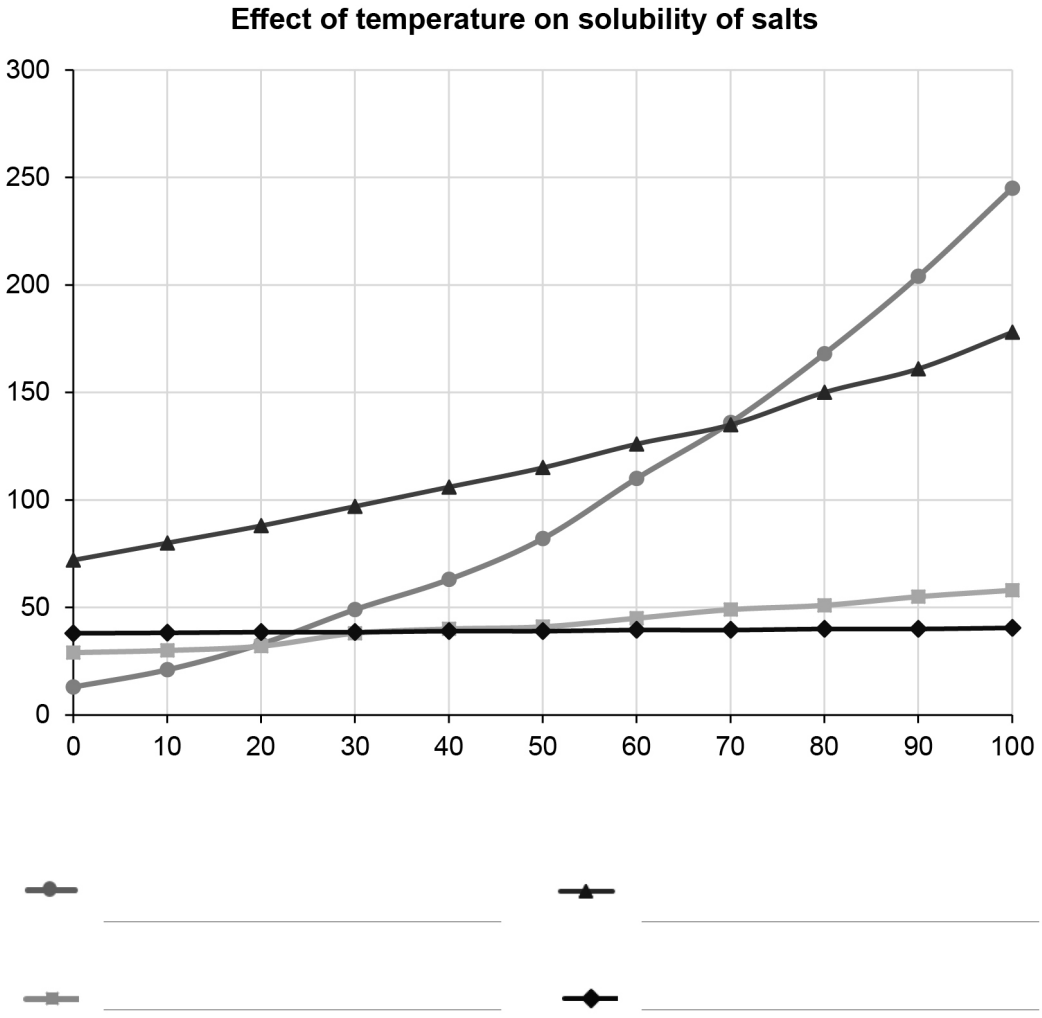
Independent variable: _____

Dependent variable: _____

(c) Write a possible hypothesis for this investigation. (1 mark)

See next page

A graph of the data is shown below; however, some required information is missing.



(d) For the graph above:

(i) add labels to both of the axes (2 marks)

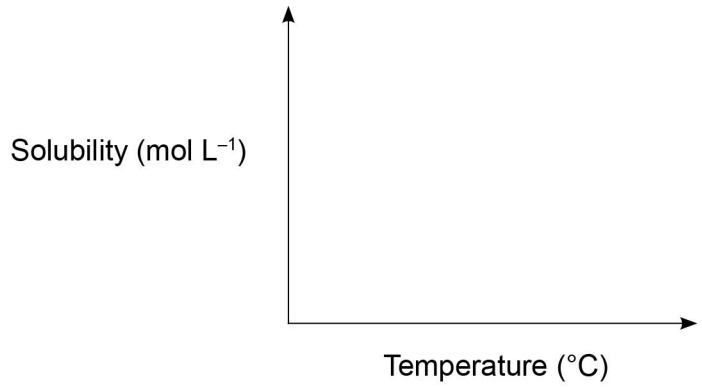
(ii) complete the key to identify which line represents which solute. (2 marks)

(e) State a conclusion for the investigation. (1 mark)

Question 22 (continued)

Average sea water temperatures are expected to be 2–3 °C higher at the end of this century due to the impact of rising levels of greenhouse gases. Changes in water temperature can affect the efficiency with which fish exchange respiratory gases.

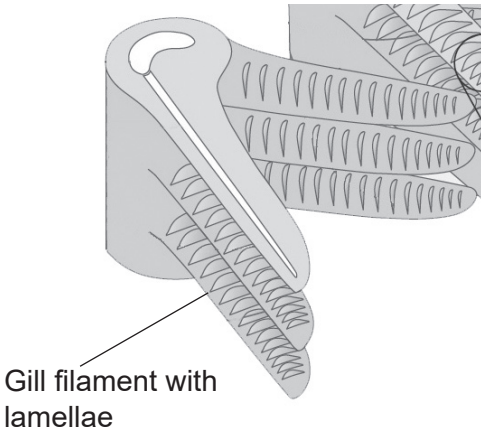
(f) (i) On the graph below, sketch a line that shows how increasing water temperature affects the solubility of oxygen. (2 marks)

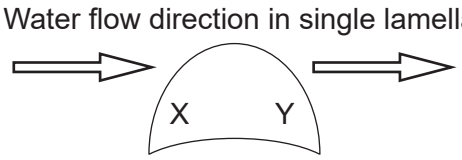


(ii) Explain the impact that increasing water temperature has on gas exchange in fish. (3 marks)

(g) Name and describe the process by which fish extract oxygen from water. (3 marks)

The diagrams below are a representation of a fish gill filament with lamellae and a single lamella.





(h) (i) Circle the correct direction of blood flow through the lamella. (1 mark)

From X to Y From Y to X

(ii) Justify your choice. (3 marks)

Question 23 **(23 marks)**

Energy companies have partnered for drilling exploration and possible hydraulic fracturing (fracking) in the Canning Basin of Western Australia's Kimberley region.

(a) State which **two** fossil fuels are extracted using fracking. (2 marks)

One: _____

_____

Two: _____

_____

(b) Describe the process of fracking. (2 marks)

_____

_____

_____

_____

(c) Outline why fracking increases the resource lifetime for the fossil fuels it is designed to extract. (1 mark)

_____

_____

(d) State **one** impact that fracking would have on the Kimberley air **and** land environment. (2 marks)

Air: _____

_____

Land: _____

_____

See next page

The Kimberley region is home to many unique marine ecosystems, including coral reefs, estuaries, and sea grass beds. The following table shows some of the common marine organisms that are found in this area and what they eat.

Organism	What the organism eats
Seagrass and algae	Make their own food via photosynthesis
Prawns	Algae, small invertebrates
Small invertebrates	Algae, seagrass
Small fish	Prawns, small invertebrates
Green turtle	Seagrass
Blue swimmer crab	Small invertebrates, seagrass
Dugong	Seagrass
Tiger shark	Small fish, dugongs, green turtles
Humans	Prawns, blue swimmer crab, small fish

(e) Using the information from the table above, draw a food web for this ecosystem. (5 marks)

See next page

Question 23 (continued)

(f) Describe what the arrows within a food web represent. (2 marks)

(g) Distinguish between the terms 'primary consumer' and 'secondary consumer' and give **one** example of each from your food web drawn in part (e). (4 marks)

One of the effects of fracking is said to be the possibility of oil spills that could affect marine ecosystems. Green turtles, in particular, can be affected by physical contact and ingestion of crude oil.

(h) Describe what impact a reduction in green turtle numbers would have on the food web drawn in part (e). (3 marks)

(i) State **two** impacts an oil spill might have on ecosystem services used by humans in the Kimberley region. (2 marks)

One: _____

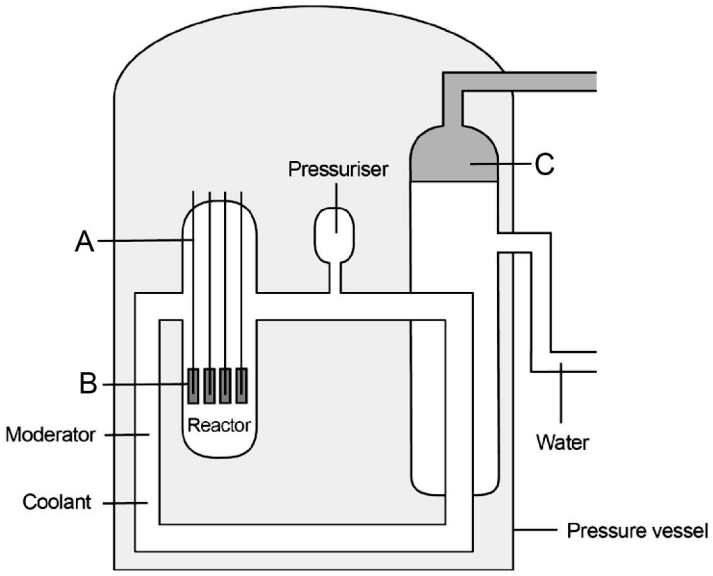
Two: _____

See next page

Question 24 **(11 marks)**

Nuclear energy is created in pressurised water reactors for electricity generation in 31 countries around the world.

The diagram below shows the main components of a pressurised water reactor.



(a) Using the diagram above, identify the parts of a pressurised reactor in the table below. (2 marks)

Label	Part
A	
C	

The component labelled B contains a fuel source.

(b) (i) State the name of this fuel. (1 mark)

_____

This fuel undergoes a process known as nuclear fission.

(ii) Describe the process of nuclear fission. (3 marks)

_____

_____

_____

_____

_____

_____

See next page

Question 24 (continued)

In 1986 there was a meltdown and subsequent explosion at the Chernobyl power station in Eastern Europe, while in 2011 the Fukushima power station in Japan was damaged by a tsunami. In both cases, radioactive material was released.

(c) State **three** effects exposure to high levels of radiation can have on the human body. (3 marks)

One: _____

_____

Two: _____

_____

Three: _____

_____

(d) Identify **two** advantages that nuclear power stations have over coal-fired power stations. (2 marks)

One: _____

_____

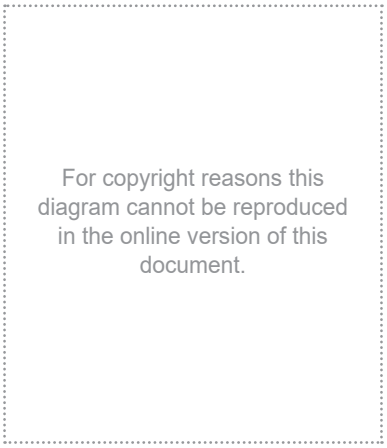
Two: _____

_____

See next page

Question 25 **(19 marks)**

A baseball is thrown up into the air by the left hand of a player and is caught by their right hand. The ball travels in an arc as shown below.



(a) State how we know that work is being done in the process of the ball being thrown. (1 mark)

Energy can be categorised as potential or kinetic.

(b) Outline the difference between these forms of energy. (2 marks)

(c) On the diagram above label where the ball has (2 marks)

- maximum potential energy, and
- maximum kinetic energy.

See next page

Question 25 (continued)

Coal-fired power stations are a principal source of energy in Australia.

(d) Draw a flow chart to show all the energy transformations that occur in the process of generating electrical energy from coal. (4 marks)

The energy efficiency of a coal-fired power station is often stated as being less than 30%.

(e) Define the term ‘efficiency’. Support your answer with an appropriate mathematical formula. (2 marks)

A transformer in a coal-fired power station is supplied with 220 000 W of energy and has an output of 120 000 W.

(f) (i) How efficient is this transformer? Show your working. (3 marks)

See next page

(ii) How much more efficient is this transformer than the coal-fired power station transformer mentioned in part (e)? (1 mark)

(iii) Why is it not possible to have an efficiency greater than 100%? Justify your answer by referring to the law of conservation of energy. (2 marks)

The *Paris Agreement* is a legally binding international treaty on climate change that was adopted by 196 different parties on 12 December 2015 and began to be enforced on 4 November 2016. The goal of the agreement is to limit global warming. The Australian Government has signed the *Paris Agreement* and committed to reduce carbon emissions by 26% based on 2005 levels by 2030. To help meet this target, the Australian Government has pledged to stop using coal-fired power stations.

(g) State **one** positive and **one** negative economic **or** social impact from the closure of a coal-fired power station. (2 marks)

Positive	Negative

End of Section Two

Section Three: Extended response **30% (60 Marks)**

This section contains **two** questions. You must answer **both** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 60 minutes.

Question 26 **(26 marks)**

To increase the amount of available land for cropping, a farmer cleared two paddocks of large eucalypt trees. The paddocks were then fertilised regularly using an inorganic nitrate-based fertiliser and irrigated using water from the river that ran through the paddocks. After some time, the farmer noticed a decline in the river water quality and his crops began to die.

The farmer tested the turbidity, dissolved nitrate and oxygen levels, to determine the possible cause of the decline in river water quality.

(a) State the equipment/test that would be required to test for each of the following. (3 marks)

Turbidity: _____

Dissolved nitrate concentration: _____

Dissolved oxygen level: _____

See next page

The tables below show both the standard Australian and New Zealand Environment and Conservation Council (ANZECC) measurements for tests carried out on water samples, and the test results obtained by the farmer.

Water quality guidelines

Parameter	ANZECC trigger values for fresh surface water
pH	7.0–9.5
Salt concentration	0.3–1.5 m S cm^{-1}
Turbidity	10–100 NTU
Dissolved oxygen	90–120%
Phosphates	0.03 mg L^{-1}
Nitrate concentration	0.1 mg L^{-1}

Farmer's results from his testing site

Water quality test	Test reading
Turbidity	230 NTU
Nitrate concentration	0.08 mg L^{-1}
Dissolved oxygen	92%

(b) Comment on each reading taken by the farmer and propose a cause for the decline in river water quality on the farm. (4 marks)

See next page

Question 26 (continued)

(c) Describe **two** ways increased turbidity can affect aquatic organisms. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

The availability and distribution of potable water resources in Western Australia is affected by the average annual rainfall. The river that flows through the farmer's property is replenished by rainfall.

The table below shows the amount of rainfall, in millilitres, received each season in Western Australia.

	Amount of rainfall (mL)				
Year	**Summer**	**Autumn**	**Winter**	**Spring**	**Total**
2021	9.2	65.2	415.0	70.0	559.4
2020	38.4	155.6	298.4	177.8	670.2
2019	147.0	90.6	464.4	78.4	780.4
2018	43.2	194.8	421.8	233.0	892.8
Average (1876–2017)	35.3	180.6	473.7	154.9	844.5

(d) (i) Using the data from the table, predict the rainfall total for 2022. (1 mark)

_____

(ii) State **one** impact this reduced rainfall may have on the farmer's ability to produce crops. (1 mark)

_____

_____

(iii) List **two** possible alternative sources of water available to the farmer, excluding accessing the town's water supply or the river system. (2 marks)

One: _____

Two: _____

See next page

(e) Explain how the clearing of land by the farmer to plant crops may have contributed to an increase in dry land salinity. (4 marks)

Management strategies for water catchment areas are utilised to prevent dry land salinity, eutrophication and erosion.

(f) (i) Propose **two** management strategies the farmer could implement to prevent dry land salinity, eutrophication, or erosion on his land. (2 marks)

One:

Two:

(ii) Outline **two** strategies that government authorities could implement to manage the water resources sustainably. (2 marks)

One:

Two:

See next page

Question 26 (continued)

The main sources of potable drinking water in Perth are from desalinated sea water and ground water.

(g) Outline how each of the following processes enables potable water to be produced in a desalination plant. (3 marks)

Screening: _____

_____

Reverse osmosis: _____

_____

Post treatment procedures: _____

_____

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See next page

Question 27 **(34 marks)**

Thermal mass is the ability of a material to absorb, store and release heat. Materials such as concrete, bricks and tiles have a high thermal mass because they absorb and store large amounts of heat.

Students were investigating how the materials used to construct a house can help to conserve heat. Three materials were tested by the students: wood chips, crushed bricks and crushed concrete. Equal quantities of the materials were placed into beakers and thermometers were inserted into the test materials. The beakers were then placed into a water bath that contained water at 85 °C.

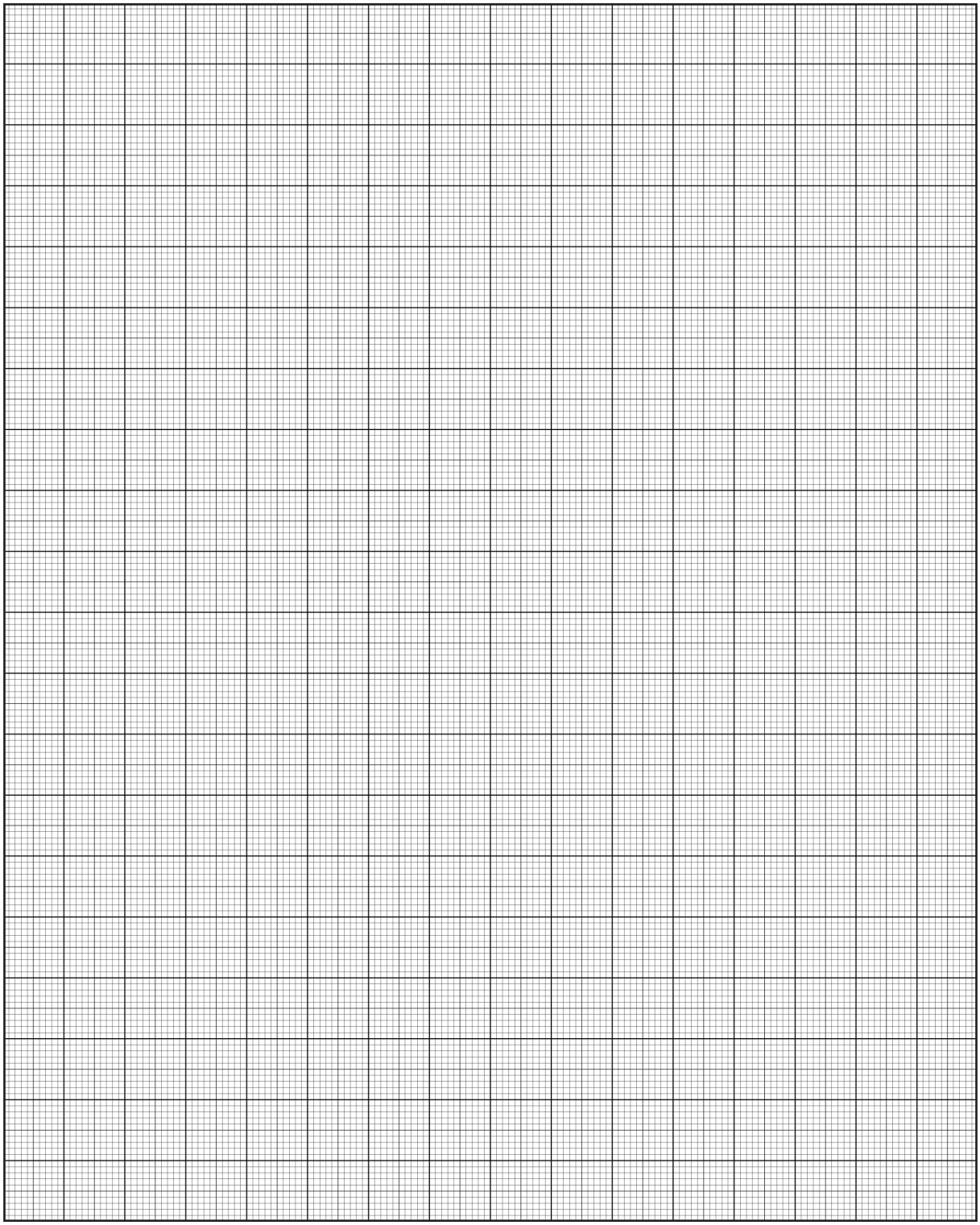
The experimental setup is shown below.

Temperature readings for each of the test materials and the water bath, were taken every minute for 10 minutes. The results are shown below.
(Note: the data are incomplete.)

	Temperature (°C)			
Time (minutes)	**Beaker 1 Wood chips**	**Beaker 2 Crushed bricks**	**Beaker 3 Crushed concrete**	**Water bath**
0	35	35	35	85
1	37	35	35	
2	39	35	36	75
3	40	35	36	70
4	43	35	36	63
5	44	35	36	60
6	45	36	37	58
7	45	36	37	
8	45	37	37	52
9	46	37	37	50
10	46	37	38	50

See next page

(a) Graph the data for Beaker 1 **and** the water bath in the table on page 30 on the grid below. (6 marks)



A spare grid is provided at the end of this Question/Answer booklet. If you need to use it, cross out this attempt and indicate that you have redrawn it on the spare grid.

See next page

Question 27 (continued)

The students forgot to take the reading for the water bath at 1 minute and at 7 minutes.

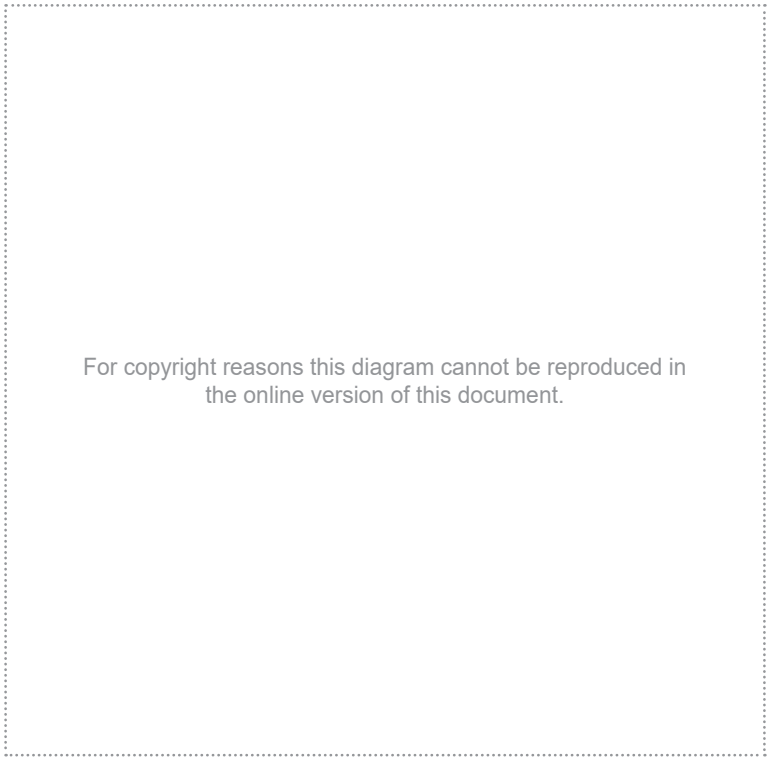
(b) Use your graph to complete the missing data for the water bath in the table on page 30. (2 marks)

(c) Using your knowledge of heat transfer, explain why the material in Beaker 1 gained heat while the water bath lost heat. (4 marks)

(d) State which of the three materials tested would be the best to use in the walls of a passive solar house. Use the available data to explain your choice. (4 marks)

See next page

Passive solar design utilises a variety of principles for the purpose of heating. The diagram below shows the outline of a passive solar designed house.



(e) Using the diagram above, identify which arrow A, B or C, shows the summer and winter sun rays.

(2 marks)

Sun rays	Arrow
Summer	
Winter	

(f) Outline how each of the following components of a house can be utilised to conserve heat during the winter months.

(i) Insulation (1 mark)

_____

_____

(ii) Windows (1 mark)

_____

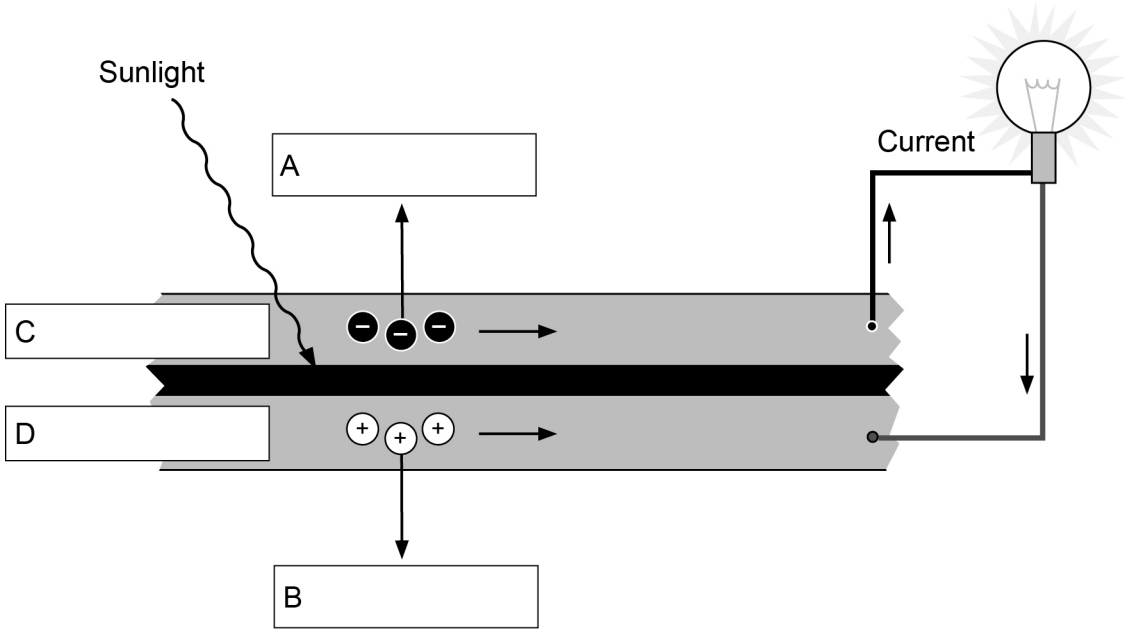
_____

See next page

Question 27 (continued)

Many passive solar design homes generate electricity for use in the home from solar cells located in panels mounted on the roof.

(g) (i) Label A to D on the diagram below showing how a photovoltaic solar cell produces electricity. (4 marks)



(ii) Explain how photons produce an electric current in a solar cell. (6 marks)

See next page

(h) State **two** reasons why the installation of rooftop solar cells has increased over the last few years. (2 marks)

One: _____

_____

Two: _____

_____

There has been an increase in the installation of technology for electricity production using renewable energy; however, there is still a need for electricity to be supplied from conventional large-scale power stations fuelled by fossil fuels such as coal and gas.

(i) Outline **two** reasons why fossil fuels are still used as the primary fuel source in power stations. (2 marks)

One: _____

_____

Two: _____

_____

End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

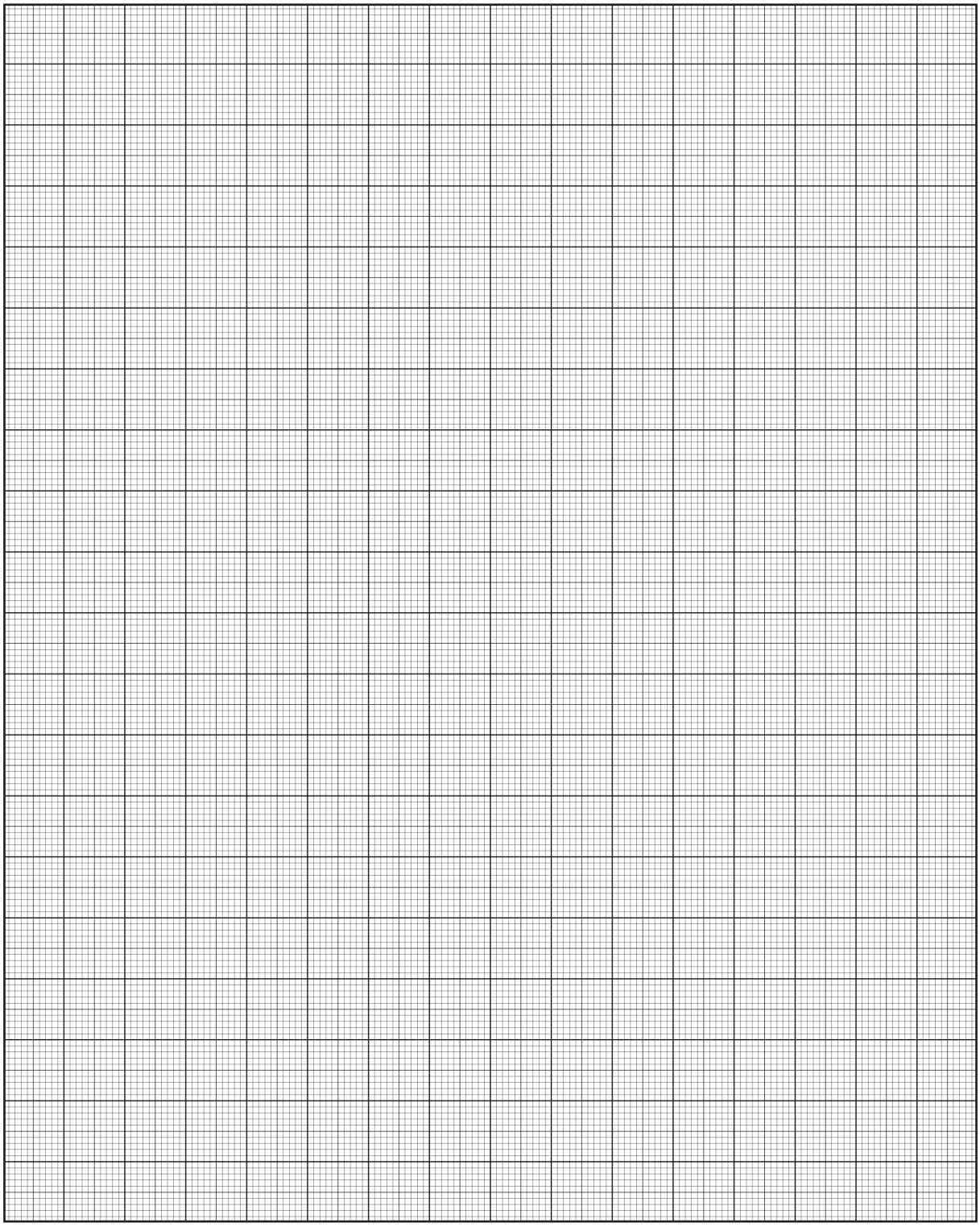
Supplementary page

Question number: _____

Supplementary page

Question number: _____

Spare grid for Question 27(a)



ACKNOWLEDGEMENTS

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Question 21(c) Graph data from: Tans, P., & Keeling, R. (2022). *Manua Loa CO_2 annual mean data*. Retrieved April, 2022, from https://gml.noaa.gov/ccgg/trends/data.html

Question 22(h) Left diagram adapted from: Shao. (2005). *Fishgills2* [Diagram]. Retrieved April, 2022, from https://en.wikipedia.org/wiki/File:FishGills2.jpg

Question 25(a) Image adapted from: [Diagram of baseball throwing arc]. (n.d.). Retrieved April, 2022, from https://energytalk.weebly.com/kinetic-and-potential-energy.html

Question 25(g) Introduction paragraph (sentences 1–2) adapted from: United Nations Framework Convention on Climate Change. (n.d.). *The Paris Agreement*. Retrieved April, 2022, from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

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Question 26(d) Table adapted from: Water Corporation. (2022). [Seasonal rainfall table]. Retrieved April, 2022, from https://www.watercorporation.com.au/Our-water/Rainfall-and-dams/Rainfall

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Question 27(e) Diagram adapted from: [Diagram of passive solar heating]. (n.d.). Retrieved April, 2022, from https://signaturesustainability.com/passivehaus-passive-house/

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