2025/7709
Web version of 2024/75499

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

ATAR course examination, 2024

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	6	6	90	96	50
Section Three Extended response	2	2	60	65	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 2024: 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.

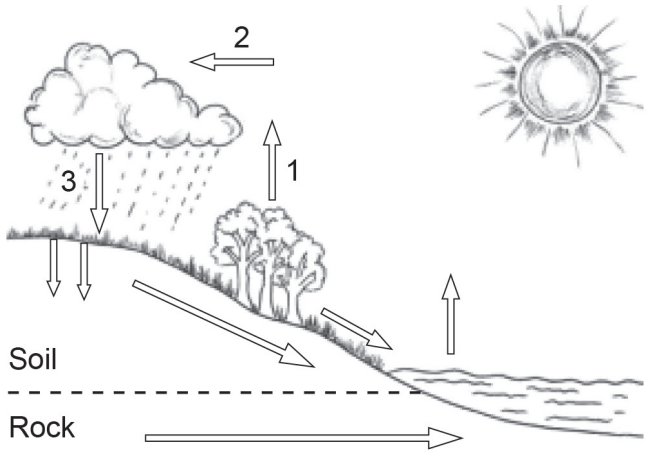
See next page

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.

Question 1 refers to the diagram below of the water cycle.



1. Which of the following rows correctly identifies the processes occurring at 1, 2 and 3?

	1	2	3
(a)	precipitation	infiltration	condensation
(b)	evaporation	precipitation	transpiration
(c)	condensation	evaporation	infiltration
(d)	transpiration	condensation	precipitation

2. In a wastewater treatment plant, the process of chlorination

   (a) reduces ion transfer.
   (b) reduces solid concentration.
   (c) kills microorganisms.
   (d) increases solid transfer.

3. An electric fan changes electrical energy into kinetic energy and sound energy. The process of changing energy from one form to another is called an energy

   (a) transformation.
   (b) transfer.
   (c) conversion.
   (d) exchange.

See next page

4. Which of the following is an advantage of the pyramid of biomass compared to the pyramid of numbers? The pyramid of biomass

   (a) will never be inverted, unlike the pyramid of numbers.
   (b) provides information about the amount of organic matter at each trophic level.
   (c) represents the available energy at each trophic level.
   (d) indicates the survival rate of organisms at each trophic level.

5. Which of the following statements about food chains is correct?

   (a) The total amount of energy available increases as you move along a food chain, but the number of organisms decreases.
   (b) The total amount of energy available decreases as you move along a food chain, but the number of organisms increases.
   (c) Both the total amount of energy available and the number of organisms increase as you move along a food chain.
   (d) Both the total amount of energy available and the number of organisms decrease as you move along a food chain.

6. Chemically, potable water is not considered pure water because it

   (a) contains low levels of microbes.
   (b) contains dissolved substances.
   (c) has undergone distillation.
   (d) has undergone pressurisation.

7. Which list below contains factors that affect the solubility of salt in water?

   (a) temperature, concentration, polarity
   (b) pressure, concentration, buoyancy
   (c) concentration, temperature, pressure
   (d) buoyancy, polarity, density

8. Oil pollution can have an impact on aquatic ecosystems, as it

   (a) increases growth of algae.
   (b) decreases photosynthesis of aquatic plants.
   (c) increases amounts of phytoplankton.
   (d) decreases biomagnification.

See next page

Question 9 refers to the information below.

A student was heating 500 mL (500 g) of water in a beaker. As the water was heating the student recorded how the temperature changed every minute for 10 minutes. The results are shown below.

Time (minutes)	Water temperature (°C)
0	18
1	22
2	27
3	38
4	50
5	58
6	65
7	72
8	83
9	90
10	99

9. How much heat energy was required to increase the temperature of the water to 99 °C? Use the formula $Q = mc\Delta T$, with c being 4.1813 J kg^{-1} °C^{-1}.

(a) 169 343 J
(b) 1693.43 J
(c) 16.9 J
(d) 169.34 J

10. What type of bond is found between hydrogen and oxygen atoms in water?

(a) hydrogen
(b) atomic
(c) structural
(d) ionic

11. Water has a lower density when it is frozen than when in liquid form. This is due to

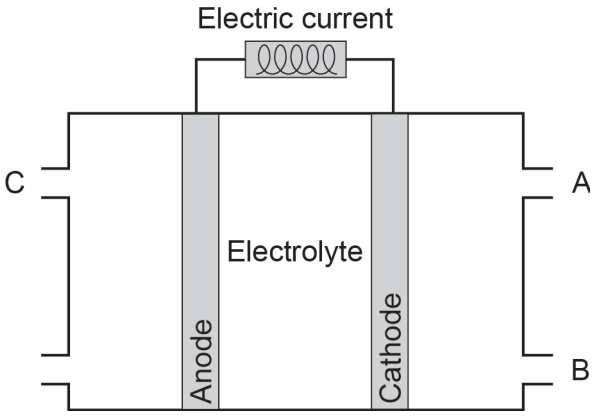
(a) a decrease in mass of the water molecules.
(b) expansion of water when frozen.
(c) surface tension.
(d) cohesion and adhesion of water molecules.

12. Most solar cells are composed of

(a) silicon, a semiconductor.
(b) carbon, an insulator.
(c) copper, a superconductor.
(d) silver, a conductor.

See next page

Question 13 refers to the following diagram of a hydrogen fuel cell.



13. Which of the following rows matches the processes occurring to the labels shown on the diagram?

	A	B	C
(a)	hydrogen leaves cell	oxidation occurs	oxygen enters cell
(b)	oxygen enters cell	hydrogen enters cell	water leaves cell
(c)	hydrogen enters cell	water enters cell	oxygen leaves cell
(d)	oxygen enters cell	water leaves cell	hydrogen enters cell

Question 14 refers to the following graph showing the solubility of oxygen in water.

14. The difference in the solubility of dissolved oxygen at 15 °C when compared to 55 °C is

(a) 5.5 mgL^{-1}
(b) 4.5 mgL^{-1}
(c) 5.0 mgL^{-1}
(d) 4.0 mgL^{-1}

See next page

15. Which of the following statements **best** describes the concept of work?

(a) any change in the rate of motion of an object
(b) the total energy transferred between objects in a system
(c) a force that causes an object to change velocity
(d) the amount of energy transferred per unit of time

Questions 16 and 17 refer to the following information.

A student was carrying out an investigation to determine if the angle of tilt of a solar panel affected the maximum energy (kWh) it was able to generate. The results of this investigation are shown in the table below.

Month	**Angle of tilt**			
	20°	**30°**	**40°**	**50°**
August	460	500	480	400
October	600	620	580	600
December	710	720	680	640
February	640	660	640	580
April	480	520	500	460
June	400	440	420	400

16. What is the independent variable for this investigation?

(a) maximum energy produced
(b) type of solar panel used
(c) angle of tilt of solar panel
(d) months of the year

17. Which of the following statements is a valid conclusion that could be drawn from the results of the investigation?

(a) During the month of February, tilt angle of the solar panels does not affect the amount of energy generated.
(b) In April, a tilt angle of 20° is 20% less efficient than a tilt angle of 40°.
(c) A tilt angle of 30° is always the optimum for generating energy.
(d) With a tilt angle of 50°, there is a 50% increase in the amount of energy generated from December to February.

18. Which of the following lists are examples of potential energy only?

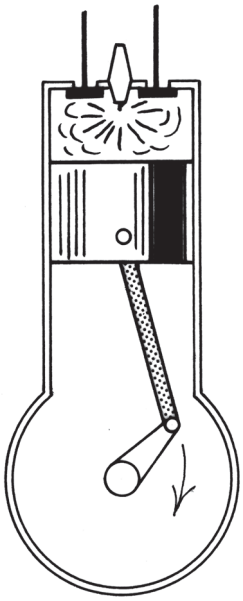
(a) chemical, gravitational, electrical
(b) gravitational, mechanical, elastic
(c) chemical, elastic, light
(d) elastic, chemical, gravitational

See next page

19. Which of the following correctly lists an advantage and a disadvantage of geothermal power stations?

	Advantage	Disadvantage
(a)	Reliable	Low CO_2 emissions
(b)	Renewable	Environmental disruption
(c)	Low CO_2 emissions	Renewable
(d)	Drilling is expensive	Reliable

Question 20 refers to the diagram below, showing a combustion engine in the power stage.



20. Which of the following occurs during this power stage?

(a) an air-fuel mixture enters the engine
(b) the air-fuel mixture is compressed
(c) burned gases are pushed out the piston
(d) an explosion forces the piston down

End of Section One

See next page

This page has been left blank intentionally

See next page

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

This section has **six** 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 **(16 marks)**

A number of strategies have been used to secure potable water resources to safeguard sufficient drinking water supplies.

(a) State **three** ways in which surface water can be stored to preserve drinking water supplies for the future. (3 marks)

One: _____

Two: _____

Three: _____

(b) Describe the steps involved in the desalination process used to produce potable water. (6 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Water occurs naturally in three states on Earth. Each state has a significant role in regulating the climate.

(c) Complete the following table by sketching a diagram showing the arrangement of particles in a liquid and a gas. (2 marks)

	Liquid	Gas
Diagram of particle arrangement		

Many scientists suggest that global warming has changed weather patterns, resulting in more intense storms and flooding.

(d) Explain the impact of global warming on changing rainfall patterns. (5 marks)

See next page

Question 22 **(21 marks)**

Explain the key processes of generating electrical current using the following technologies and state an application.

(a) (i) Electromagnetic induction in generators (4 marks)

Processes: _____

_____

_____

_____

_____

_____

Application: _____

_____

(ii) Photovoltaic effect in solar cells (4 marks)

Processes: _____

_____

_____

_____

_____

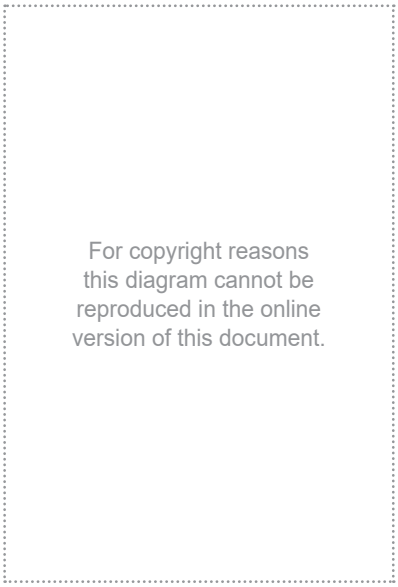
_____

Application: _____

_____

See next page

A battery uses chemical reactions to generate electrical currents. The diagram below shows a wet cell battery, similar to the kind fitted to motor vehicles.



(b) (i) Label the diagram with the following:

- anode
- cathode
- electrolyte. (3 marks)

(ii) Annotate the diagram using an arrow to show the direction of electron flow. (1 mark)

(c) Describe the chemical process that occurs at the anode. (2 marks)

See next page

Question 22 (continued)

(d) State **two** benefits a battery has over each of the other methods of electrical generation stated in part (a) on page 12. (2 marks)

One: _____

_____

Two: _____

_____

Australia's largest and most complex hydroelectricity power station is found in the mountains of New South Wales.

(e) Describe **two** features that would make a location suitable for a hydroelectric power station. (2 marks)

One: _____

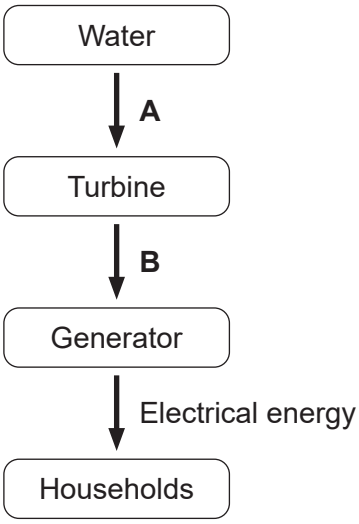
_____

Two: _____

_____

See next page

(f) The diagram below shows the process of generating hydroelectricity.



Identify the type of energy transferred at A and B. (2 marks)

Label	Energy transferred
A	
B	

(g) Outline **one** economic consideration that could influence the construction of hydroelectric power stations in other Australian states. (1 mark)

See next page

Question 23 **(19 marks)**

Architects try to incorporate passive solar design features into houses. Passive solar design takes advantage of natural sources of heating and cooling.

(a) Identify **two** economic or environmental reasons why passive solar design features are incorporated into homes. (2 marks)

One: _____

_____

Two: _____

_____

Perth has a warm temperate climate, with hot, dry summers and mild winters.

(b) Describe how the following passive solar design features can be used to keep Perth homes warm during the cooler winter months.

(i) Using materials with a high thermal mass (2 marks)

_____

_____

_____

_____

(ii) Installing roof and ceiling insulation (2 marks)

_____

_____

_____

_____

(c) An architect considers the orientation of a home on its site.

(i) State what is meant by the term ‘orientation’. (1 mark)

_____

_____

(ii) Explain why the preferred orientation of a home in Australia usually has north-facing living areas. (3 marks)

Many older Western Australian homes do not use passive solar design to help regulate internal temperature and rely on air-conditioning, gas heaters or woodfire heaters for providing warmth.

(d) (i) Name and describe **three** main methods by which heat can be transferred. (6 marks)

One:

Two:

Three:

(ii) Determine the main method by which heat is transferred from each of the following appliances. (3 marks)

Air-conditioning:

Gas heater:

Woodfire:

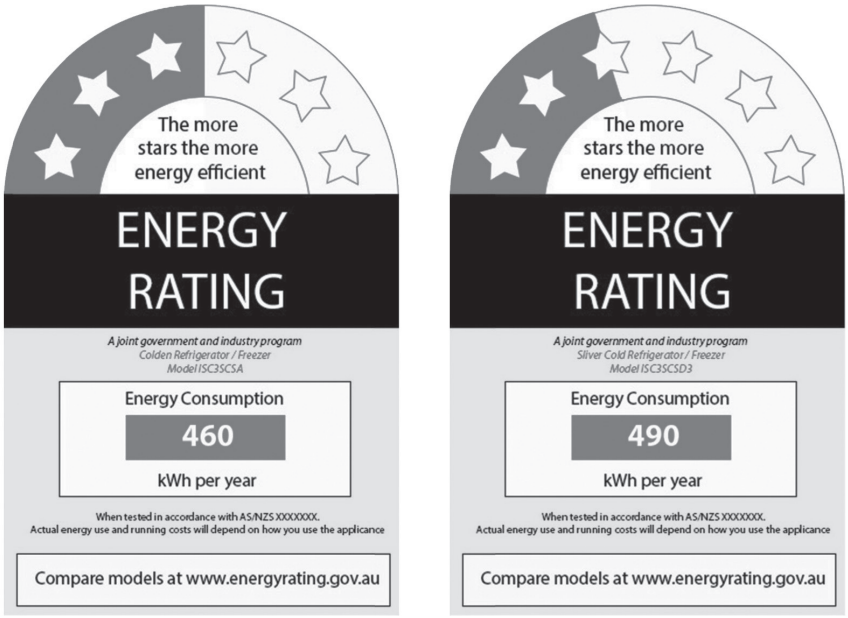
See next page

Question 24 **(12 marks)**

Energy consumption within a home can often be minimised by using energy-efficient appliances.

One appliance that runs 24 hours a day is a refrigerator and accounts for approximately 10% of a household's electricity bill.

The diagram below compares the energy rating for **two** refrigerators.



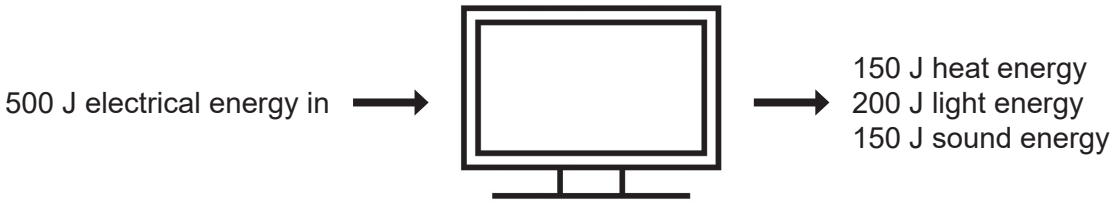
(a) Define the term 'energy efficiency'. (1 mark)

(b) If electricity costs 28 cents per kWh, calculate the cost of running the **more** efficient model for one year. (1 mark)

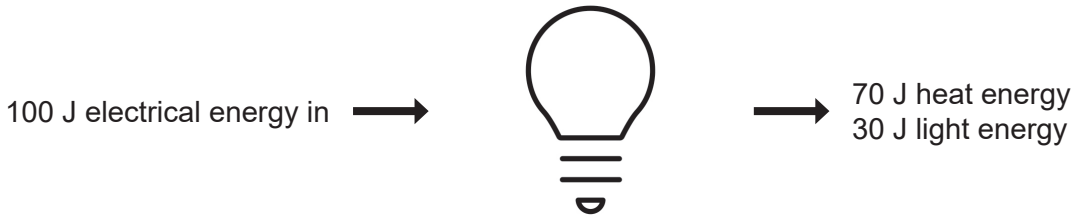
See next page

The following household appliances transform electrical energy into specific amounts of other forms of energy. The type and amount of energy going in and coming out for each appliance is shown below.

Television



Incandescent light globe



(c) State why the amount of energy produced by the appliances is the same as the energy that flows into it. (1 mark)

(d) State which appliance is the most efficient, using calculations to justify your answer. Show your workings. (3 marks)

$$\text{efficiency} = \frac{\text{energy out}}{\text{energy in}} \times 100$$

Most efficient appliance: _____

Question 24 (continued)

(e) The power consumed by an incandescent light globe is 8 W. If the light was switched on at 6 pm and turned off at 10 pm, calculate the energy used. Show **all** workings. (4 marks)

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

Answer: _____

Reducing energy use in a home may help contribute to reductions in greenhouse gas emissions.

(f) State **two** ways in which a household could save energy. (2 marks)

One: _____

_____

Two: _____

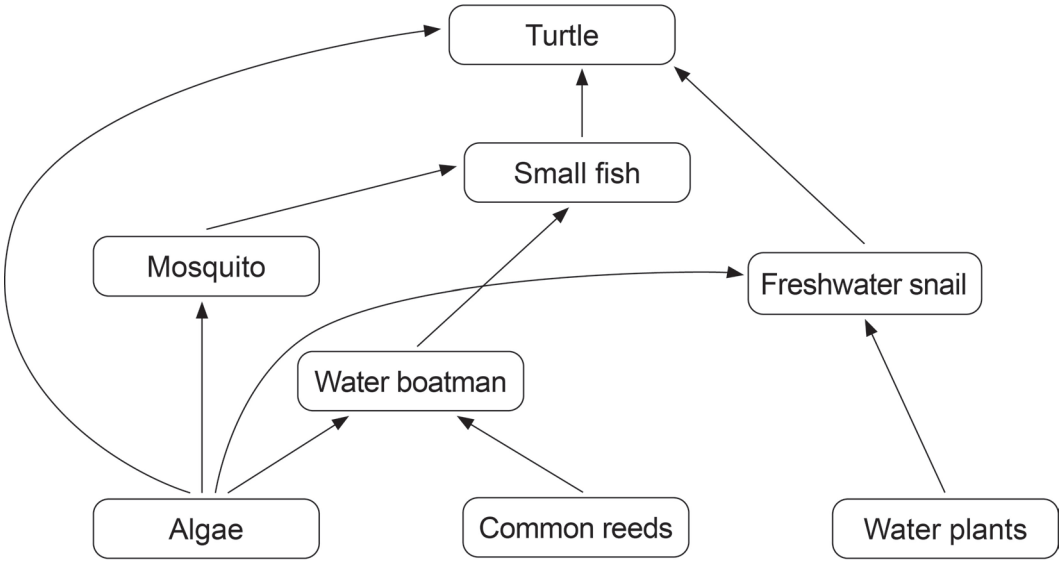
_____

This page has been left blank intentionally

See next page

Question 25 **(17 marks)**

The food web below shows some of the feeding relationships in an Australian freshwater ecosystem:



(a) Identify the trophic level to which the following organisms belong. (2 marks)

Algae:

_____

Small fish:

_____

(b) Construct an energy pyramid using the following organisms from the food web shown above. (2 marks)

- algae
- small fish
- water boatman (beetle)
- turtle

See next page

(c) Describe **three** reasons why energy transfer between trophic levels of a food web is inefficient. (3 marks)

One: _____

_____

Two: _____

_____

Three: _____

_____

The small fish shown in the food web on page 22 has adapted to survive in its freshwater environment. The concentrations of salt and water in a fish's body are maintained through a process called 'osmoregulation'. Marine and freshwater fish have different methods of achieving osmoregulation.

(d) Complete the table below to compare osmoregulation in marine and freshwater fish by indicating which is higher or lower. (6 marks)

	Marine fish (higher/lower)	**Freshwater fish** (higher/lower)
Relative volume of water consumed		
Relative volume of urine produced		
Relative concentration of urine produced		

(e) Explain why freshwater fish cannot survive in saltwater. (4 marks)

_____

_____

_____

_____

_____

_____

_____

_____

See next page

Question 26 **(11 marks)**

The availability and distribution of water resources in Western Australia is being affected by changing rainfall patterns.

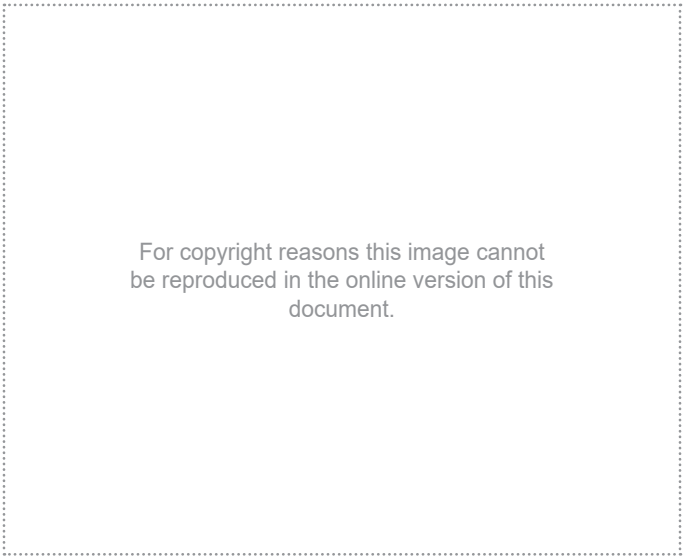
(a) State the **three** main potable water resources in Western Australia. (3 marks)

One: _____

Two: _____

Three: _____

Weather stations collect important rainfall data, which can be used to determine climatic trends. Giles Weather Station is located on the edge of the Gibson Desert near the border between Western Australian and the Northern Territory.



A sample of data collected from the Giles Weather Station is shown below:

Year	Annual Rainfall (mm)
2000	307.7
2001	143.7
2002	277.0
2003	158.2
2004	617.0
2005	315.6
2006	300.2
2007	279.6
2008	237.6
2009	167.2
2010	106.2

See next page

(b) With reference to the data provided in the table on page 24, describe the trends seen for:

(i) annual rainfall between 2000 and 2004. (2 marks)

(ii) annual rainfall between 2005 and 2010. (2 marks)

Management strategies are required to prevent issues such as dryland salinity, and erosion occurring in water catchment areas.

(c) Complete the following table by describing a management strategy that helps to prevent the issue and the impact the strategy has on the water catchment area. (4 marks)

	Dryland salinity	**Erosion**
Management strategy		
Impact on water catchment area		

End of Section Two

See next page

Section Three: Extended response **30% (65 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 27 **(29 marks)**

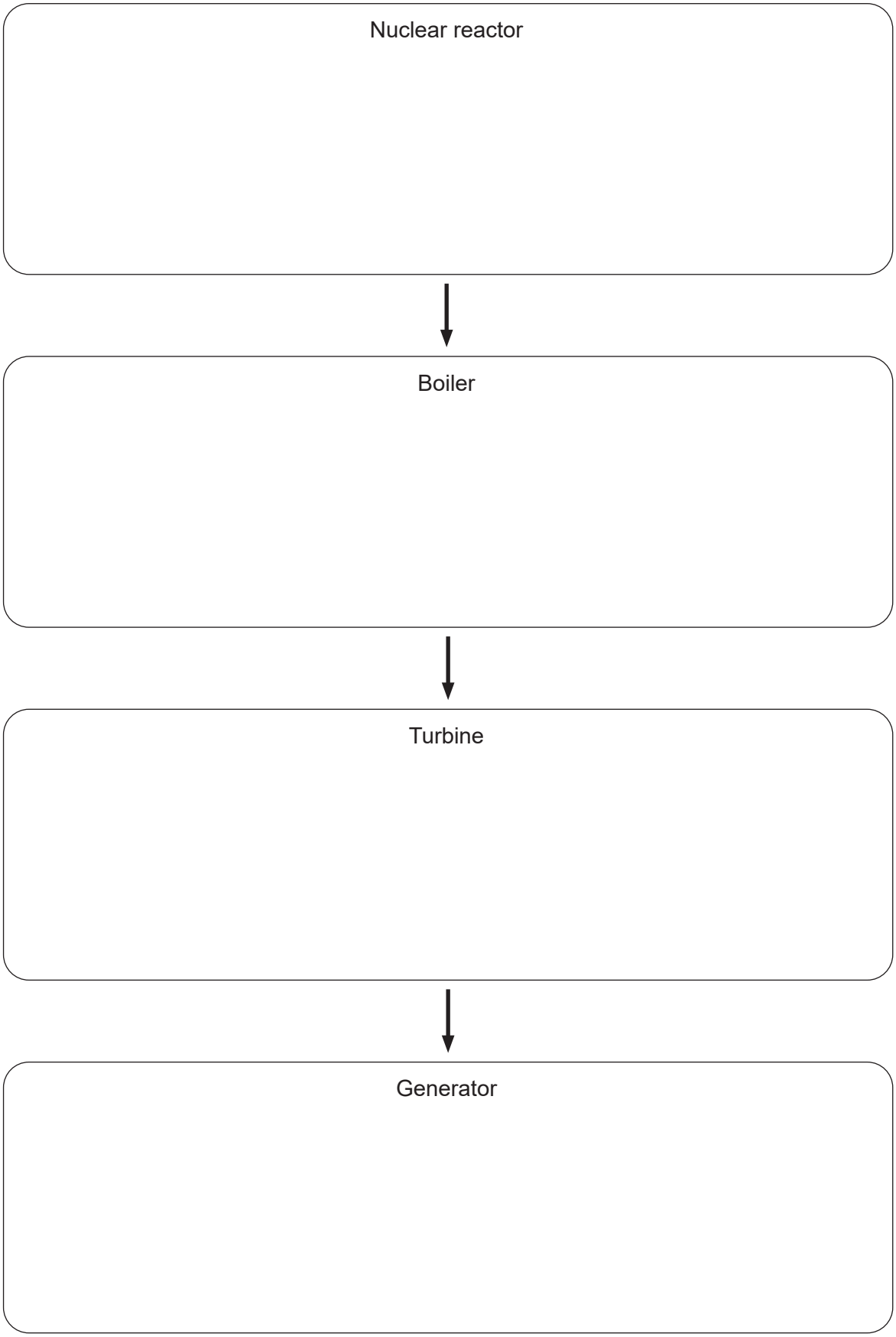
In 2011, an earthquake and tsunami in Japan led to power loss in the Fukushima Daiichi nuclear power plant. Without power, the reactor's cooling systems failed and the reactor overheated. Over the following days, several explosions released radiation into the air and ocean.

(a) State whether nuclear power is renewable or non-renewable. (1 mark)

(b) Name the specific type of primary fuel used in nuclear fission. (1 mark)

(c) State **one** potential environmental concern related to the primary fuel source named in part (b). (1 mark)

(d) The flow chart below shows a simplified layout of a nuclear power plant. Under each heading, outline what is occurring at each stage. (4 marks)



See next page

Question 27 (continued)

Ionising radiation is harmful to the body, whereas non-ionising radiation is not.

(e) Distinguish between ionising radiation and non-ionising radiation, providing an example of each. (4 marks)

(f) Describe why lead shielding is fitted around a nuclear reactor. (2 marks)

Workers at a nuclear power plant are required to wear radiation dosimeters or radiation badges. A dosimeter is usually worn on the outside of the person's clothing on their chest or torso.

(g) (i) Outline why it is important for workers at a nuclear power plant to wear a radiation dosimeter. (1 mark)

(ii) Suggest why a radiation dosimeter is usually worn on the chest or torso. (1 mark)

(h) State **three** symptoms of acute radiation sickness. (3 marks)

One: _____

Two: _____

Three: _____

See next page

(i) Explain how exposure to radiation can produce genetic mutations. (3 marks)

(j) There are no nuclear power plants in Australia. Apart from health risks, state **two** community concerns about nuclear power. (2 marks)

One:

Two:

Conventional large-scale electricity generation occurs in power stations.

(k) Explain how the process of fracking can be used to extract gas for use in power stations. (4 marks)

(l) State how the efficiency and cost of conventional electricity generation by coal-fired power stations is different from those of nuclear power stations. (2 marks)

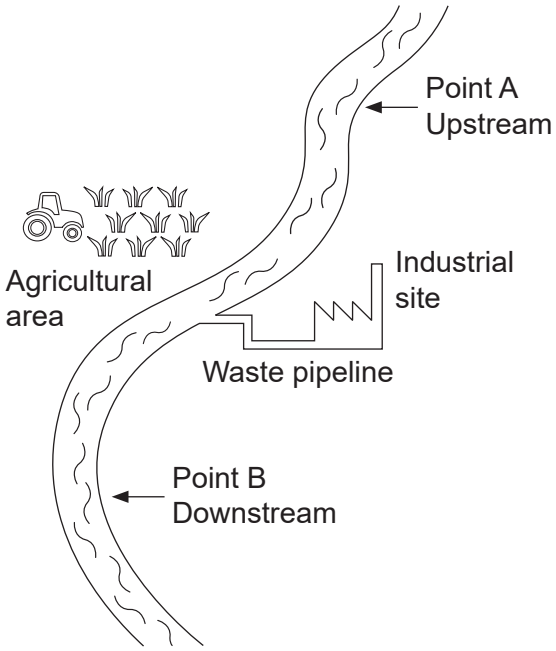
Efficiency:

Cost:

See next page

Question 28 **(36 marks)**

The diagram below shows a stream that flows through areas used for industry as well as agriculture. Annual testing from various locations along the stream is conducted to monitor water quality. The test results can be used to ensure that human activities are not affecting the aquatic ecosystem.



A range of data was collected from upstream and downstream locations. The results are shown below.

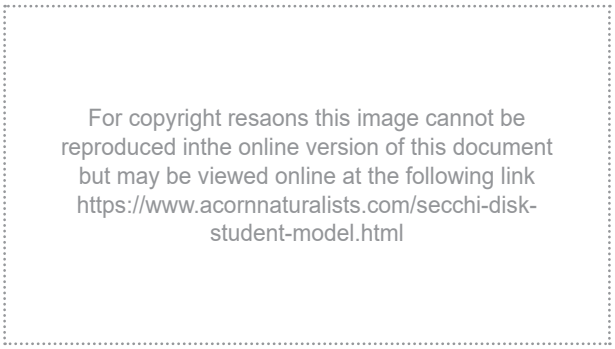
Property analysed	Point A Upstream	Point B Downstream
Colour	Clear blue	Grey
Turbidity	Low	High
Temperature	20 °C	22.5 °C
pH	7.2	9.0
Nitrates	0 ppm	4 ppm
Dissolved oxygen	6.0 mgL^{-1}	4.0 mgL^{-1}

(a) Identify **two** physical properties tested. (2 marks)

One: _____

Two: _____

One piece of equipment that can be used to take a simple measurement of water quality is shown below.



(b) (i) Name this piece of equipment. (1 mark)

(ii) State which water property the equipment shown is used to measure. (1 mark)

(iii) Describe how the equipment is used to measure the water property for which it is designed. (3 marks)

See next page

Question 28 (continued)

Small organisms known as macro-invertebrates can also provide information about water quality and the impact that changes to water quality can have on aquatic environments. Macro-invertebrates are often very susceptible to minor changes in water quality and are good indicators of changes. The amount of dissolved oxygen and pH level can be indicators of water pollution.

The table below shows some examples of macro-invertebrates that are found in aquatic ecosystems and their tolerance to pollution.

Pollution intolerant	Somewhat pollution tolerant	Pollution tolerant
Mayfly nymph	Beetle larvae	Midge fly larvae
Caddisfly larvae	Dragonfly nymph	Black fly larvae
Water-penny	Damselfly nymph	Pouch snail

(c) Name a piece of equipment and describe a sampling technique that could be used to obtain a macro-invertebrate sample from a stream. (3 marks)

Equipment: _____

Sampling technique: _____

_____

_____

_____

The macro-invertebrate sampling data that was collected from the stream at Points A and B in the diagram on page 30 is shown below.

Point A
Number of each type of macro-invertebrate counted.

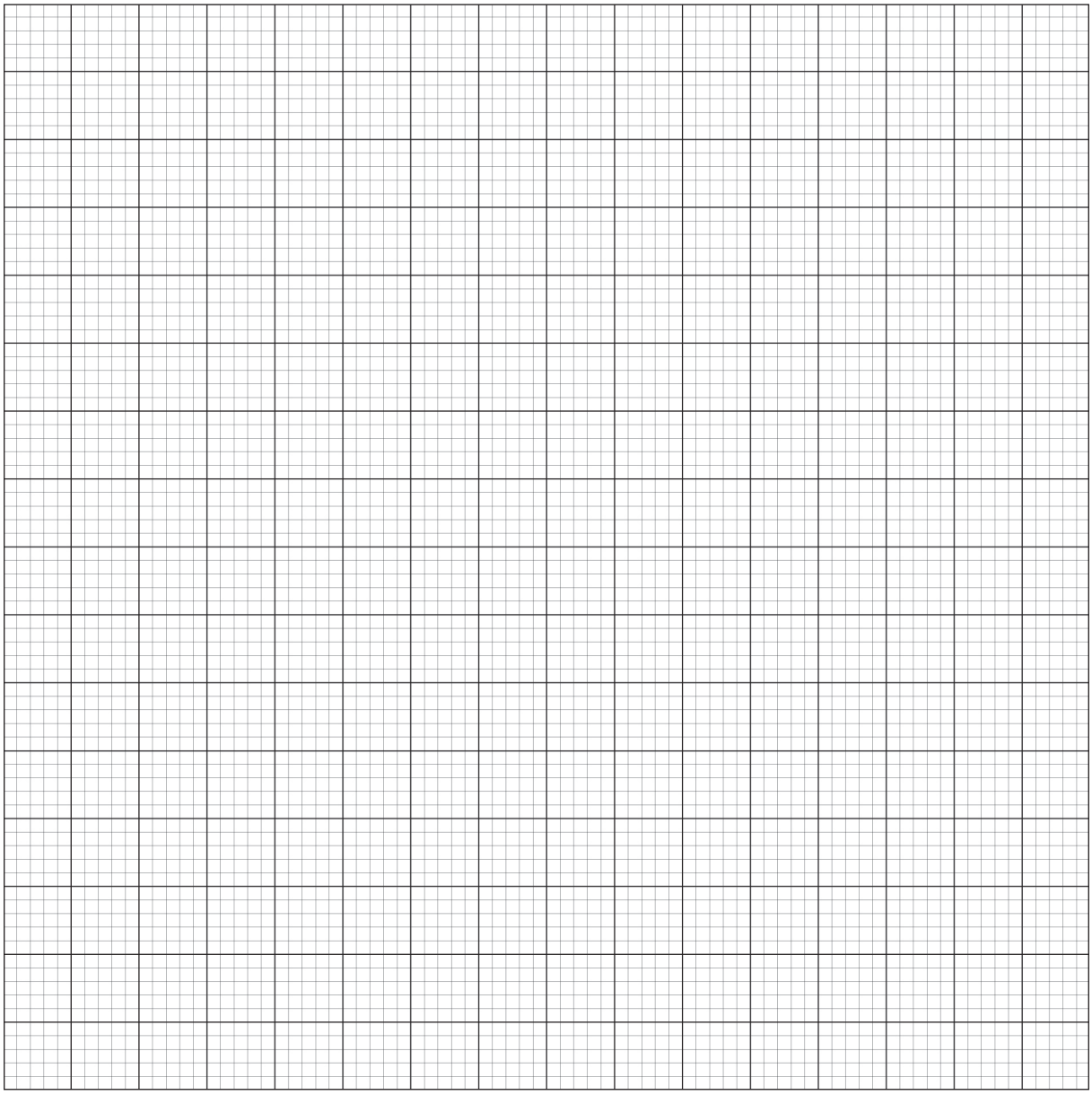
Beetle larvae	Mayfly nymph	Caddisfly larvae	Midge fly larvae	Damselfly nymph
15	23	18	7	20

Point B
Number of each type of macro-invertebrate counted.

Beetle larvae	Mayfly lymph	Caddisfly larvae	Midge fly larvae	Damselfly nymph
10	5	8	17	12

See next page

(d) Draw a graph of the sampling data on page 32 using the grid provided below. (5 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 28 (continued)

(e) Using the results from the macro-invertebrate sampling data on page 32, determine which location (Point A or Point B) appears to be the more polluted. Justify your choice. (3 marks)

Location: _____

Justification: _____

_____

_____

_____

Water tested at Point B showed a significantly higher number of nitrates than at Point A.

(f) (i) Describe **two** possible causes for this increase in nitrates at Point B. (2 marks)

_____

_____

_____

_____

(ii) Outline how an increase in nitrates in water can lead to a decrease in dissolved oxygen levels. (4 marks)

_____

_____

_____

_____

_____

_____

_____

_____

See next page

Gas exchange is more difficult for aquatic organisms because there is less oxygen in the water than air. To ensure they obtain sufficient oxygen, fish gills have filaments or lamellae to increase the rate of gas exchange. Fish also used a counter-current system to maintain the concentration of oxygen in their blood.

(g) (i) Describe **two** features of lamellae that increase the rate of gas exchange. (2 marks)

One: _____

_____

Two: _____

_____

(ii) Explain how the mechanism of counter-current exchange works to maintain the concentration of oxygen in the blood of fish. (3 marks)

_____

_____

_____

_____

_____

_____

Question 28 (continued)

Further tests were undertaken in a laboratory to determine how pH changes in water impact the water quality of an aquatic ecosystem.

Samples of macro-invertebrates were gathered from Point A in the stream. This is because the pH for that section of the stream was 7.2, which was close to neutral.

The following procedure was used to conduct this investigation:

1. 1000 mL of water was collected in a large beaker
2. A 1–2 drop sample of water from the middle of the beaker was placed onto a microscope slide using a pipette
3. The slide was viewed under the microscope and the activity levels of the macro-invertebrates was observed
4. The 1000 mL sample was then divided into five containers with each having 200 mL of the sample
5. The pH of the containers was changed by adding hydrochloric acid or sodium hydroxide. The new pH of each container is shown below

Container 1: pH of 1
Container 2: pH of 4
Container 3: pH of 7.2 (not changed)
Container 4: pH of 9
Container 5: pH of 12

6. The containers were placed in an area where they would not be disturbed for 24 hours
7. After 24 hours, a sample of water from each container was observed under the microscope.

The results are shown below.

Container number	pH	Observation of activity level
1	1	Low activity with some dead
2	4	Low activity, all still alive
3	7.2	High activity, all still alive
4	9	Moderate activity, all still alive
5	12	Low activity with some dead

See next page

(h) State a hypothesis for this investigation. (2 marks)

(i) Outline the dependent variable for this investigation. Justify your answer. (2 marks)

(j) State **one** way in which you could increase the reliability of this investigation. (1 mark)

(k) Construct a conclusion for this investigation that could be supported by the data shown in the table on page 36. (2 marks)

End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

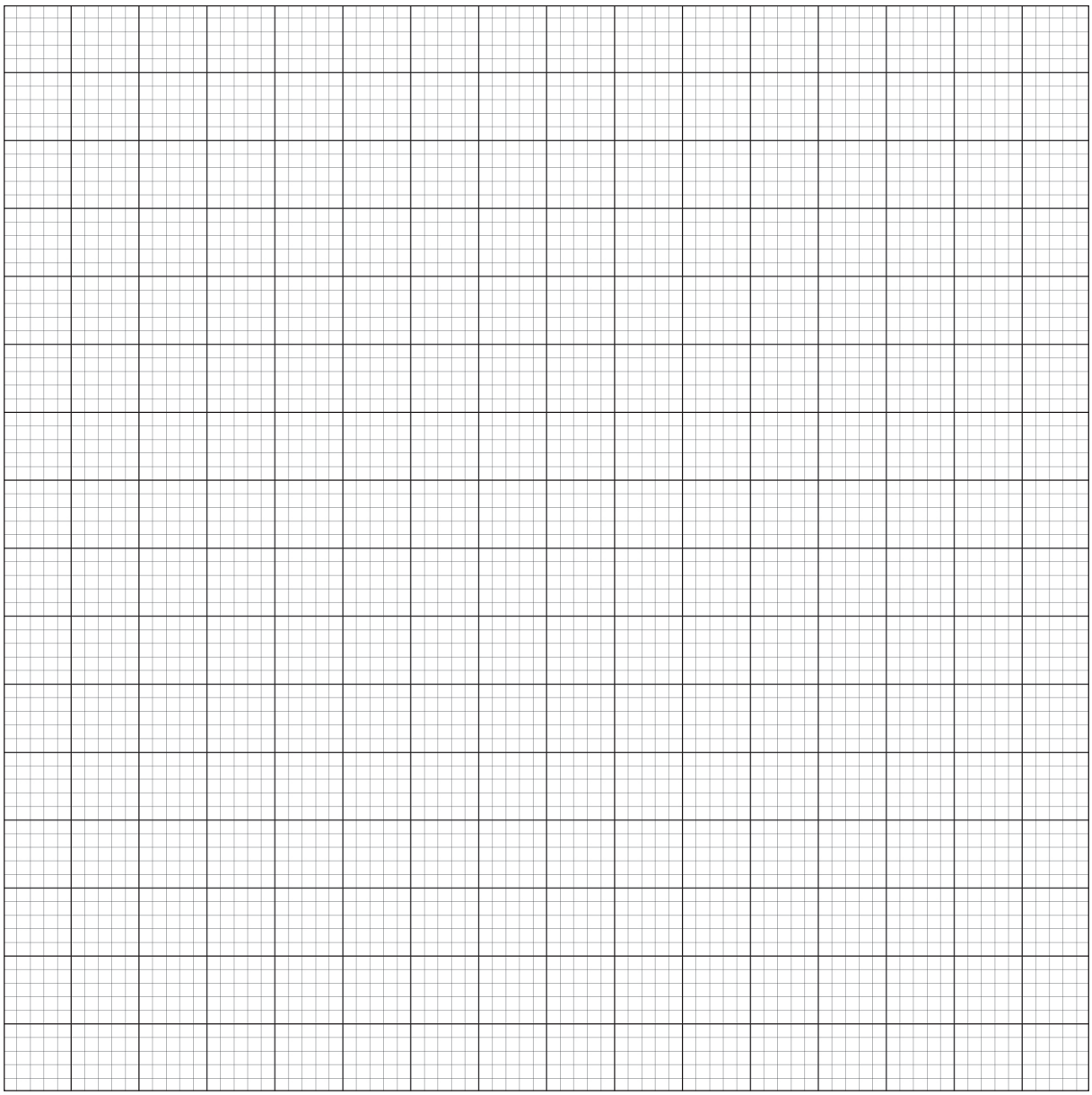
Supplementary page

Question number: _____

Supplementary page

Question number: _____

Spare grid for Question 28(d)



ACKNOWLEDGEMENTS

Question 1 Adapted from: *The Hydrological Cycle* [Diagram]. (n.d.). Retrieved May, 2024, from https://paintingvalley.com/download-image#water-cycle-sketch-8.gif
Used under Creative Commons Attribution-NonCommerical 4.0 International licence.

Question 14 Waterman, K., Adami, R. (2005, April 11). Accelerated Aging: Prediction of Chemical Stability of Pharmaceuticals (Fig. 5) [Graph]. *International Journal of Pharmaceutics, 293*(1–2). Retrieved May, 2024, from https://www.sciencedirect.com/science/article/abs/pii/S0378517305000104

Question 20 Adapted from: Pearson Scott Foresman. (2020). *Stroke* [Diagram]. Retrieved May, 2024, from https://commons.wikimedia.org/wiki/File:Stroke_(PSF).png

Question 22(b) Adapted from: Farag, M. (2013, June) Lithium-Ion Batteries: Modelling and State of Charge Estimation (Fig. 2.6) [Diagram]. Retrieved May, 2024, from https://www.researchgate.net/publication/306240899_Lithium-Ion_Batteries_Modelling_and_State_of_Charge_Estimation

Question 24 Adapted from: Energy Rating. (n.d.). *Energy Rating* [Image].Retrieved May, 2024, from www.energyrating.gov.au/
© Department of Climate Change, Energy, the Environment and Water 2023.

Question 24(c) Stock images from Microsoft 365 used with permission from Microsoft.

Question 26(a) Google. (2024). [Map showing Australia with Giles Weather Station pinpointed]. Retrieved May, 2024, from https://www.google.com.au/maps/@-26.1623149,130.2888063,5z?entry=ttu
Map data ©2023 Google

Question 28(b) United Scientific. (n.d.). *Secchi Disk (Student Model)* [Image]. Retrieved May, 2024, from https://www.acornnaturalists.com/secchi-disk-student-model.html

Published by the School Curriculum and Standards Authority of Western Australia
303 Sevenoaks Street
CANNINGTON WA 6107