



# **Science in Practice**

## **General course**

### **Externally set task sample two**

### **Marking key**

**Total marks for this task: 40**

Question 1

(19 marks)

(a) State a suitable hypothesis for this investigation.

(2 marks)

Description	Marks
States a testable statement that links the independent and dependent variables	1
Includes a direction for all variables	1
<b>Total</b>	<b>2</b>
Answers could include:	
Test tubes placed into cold water lose heat faster than test tubes in air.	
Accept other relevant answers.	

(b) Identify the independent and dependent variables the investigation.

(2 marks)

Description	Marks
Independent variable: environmental condition/iced water	1
Dependent variable: temperature loss	1
<b>Total</b>	<b>2</b>

(c) State **two** variables that were controlled in the investigation.

(2 marks)

Description	Marks
Any two of	
<ul style="list-style-type: none"> <li>• size of test tube</li> <li>• original water temperature</li> <li>• amount of cling wrap around test tubes</li> <li>• type of thermometer</li> <li>• time when temperature was recorded</li> </ul>	1–2
<b>Total</b>	<b>2</b>
Accept other relevant answers.	

(d) Complete the table above by calculating the average temperatures for the test tubes in air and iced water after 20 minutes.

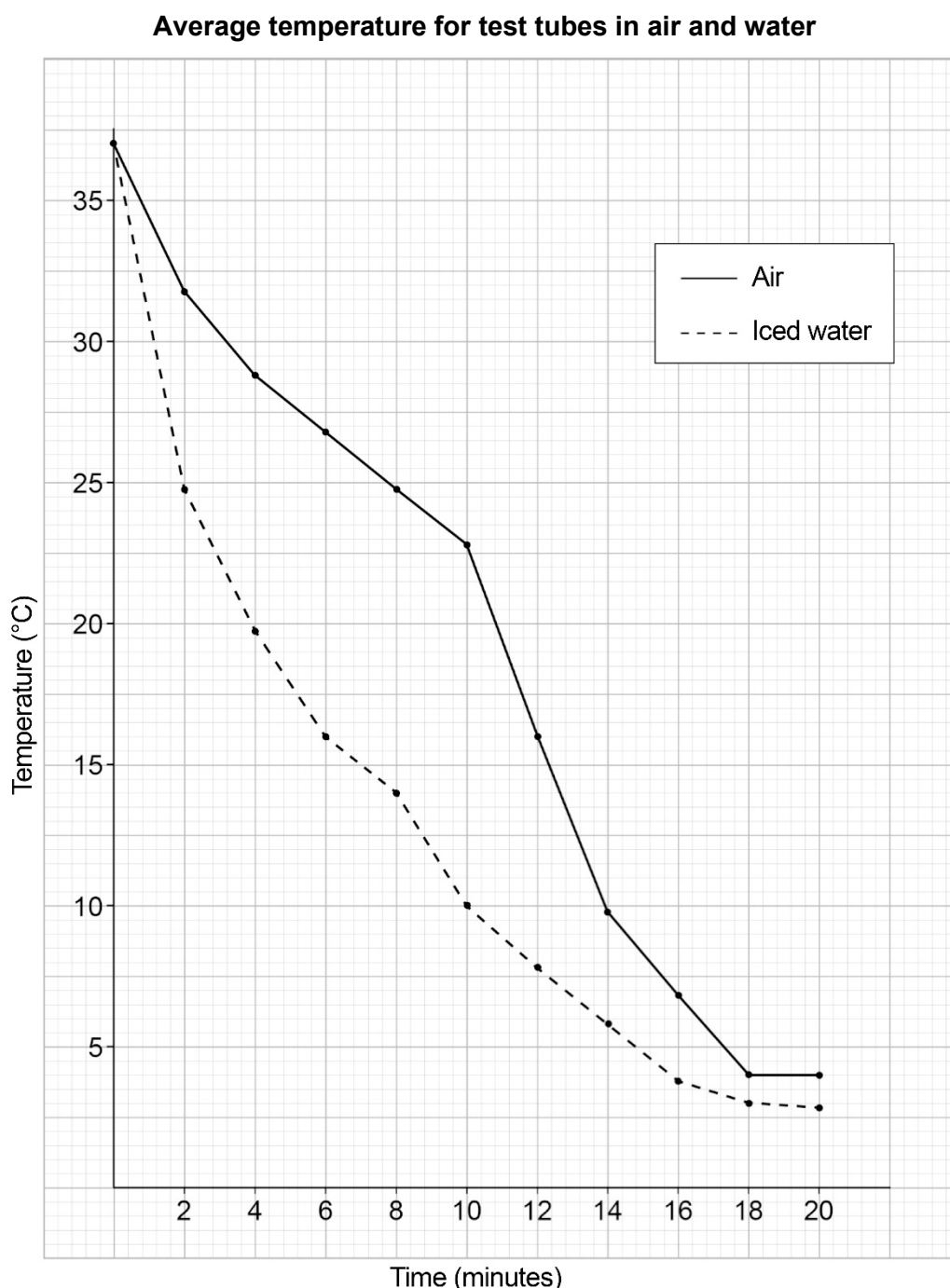
(2 marks)

Description	Marks
Average temperature for air = 4 °C	1
Average temperature for iced water = 2.7 °C	1
<b>Total</b>	<b>2</b>

- (e) Graph the average temperatures for the test tubes in air and iced water on the grid below. (6 marks)

Description	Marks
Title that includes both the independent and dependent variables	1
Axes correctly labelled, including units	1
Appropriate scale	1
Data plotted correctly	1
Line graph drawn	1
Key	1
<b>Total</b>	<b>6</b>

Answers could include:



Accept other relevant answers.

Question 1 (continued)

- (f) Propose a conclusion for the investigation that is supported by the data and your graph. (3 marks)

Description	Marks
States an appropriate conclusion	1
States whether hypothesis has been supported or not	1
Uses data from table and/or graph	1
<b>Total</b>	<b>3</b>
<p>Answers could include:</p> <p>Test tubes placed in cold water lose more heat at a faster rate than test tubes in cold air only. Therefore, the hypothesis from part (a) is supported. Over the 20 minutes heat loss by test tubes in water was 34.4 °C compared to heat loss by test tubes in air being 33 °C.</p> <p>Accept other relevant answers.</p>	

- (g) Describe **one** change the students could have made to improve their investigation in order to increase the accuracy of their results. (2 marks)

Description	Marks
Describes a way students could improve their investigation	2
States a way students could improve their investigation	1
<b>Total</b>	<b>2</b>
<p>Answers could include:</p> <p>Use a data logger/temperature probe which is more accurate than the thermometer.</p> <p>Accept other relevant answers.</p>	

**Question 2**

**(21 marks)**

- (a) Identify any change/s to the equipment list outlined on page 3 that would need to be made for this investigation. (1 mark)

Description	Marks
include insulating materials	1
<b>Total</b>	<b>1</b>

- (b) Prepare a risk assessment identifying **two** potential hazards, a risk associated with each hazard and a suggested management strategy for each hazard. (6 marks)

Description	Marks												
For each of the two hazards (2 x 3 marks)													
Identifies a potential hazard	1												
Identifies one risk associated with the hazard	1												
Suggests a management strategy for the hazard	1												
<b>Total</b>	<b>6</b>												
Answers could include:													
<table border="1"> <thead> <tr> <th>Hazard</th> <th>Risk</th> <th>Management strategy</th> </tr> </thead> <tbody> <tr> <td>Broken glassware (beaker, test tube)</td> <td>Cut from broken glass</td> <td>Keep glassware away from the edge of the table</td> </tr> <tr> <td>Broken thermometer</td> <td>Cut from broken thermometer</td> <td>Be gentle when placing the stoppers in the thermometer</td> </tr> <tr> <td>Spilt water</td> <td>Slip in water and fall</td> <td>Clean up spills immediately</td> </tr> </tbody> </table>		Hazard	Risk	Management strategy	Broken glassware (beaker, test tube)	Cut from broken glass	Keep glassware away from the edge of the table	Broken thermometer	Cut from broken thermometer	Be gentle when placing the stoppers in the thermometer	Spilt water	Slip in water and fall	Clean up spills immediately
Hazard	Risk	Management strategy											
Broken glassware (beaker, test tube)	Cut from broken glass	Keep glassware away from the edge of the table											
Broken thermometer	Cut from broken thermometer	Be gentle when placing the stoppers in the thermometer											
Spilt water	Slip in water and fall	Clean up spills immediately											
Accept other relevant answers.													

- (c) Propose a procedure for the investigation. (6 marks)

Description	Marks
Procedure written in step or numbered form	1
Risk assessment/safety issues stated	1
Controlled variables included	1
Procedure used for data collection stated	1
Implementation of independent variable stated	1
Repeat trials stated	1
<b>Total</b>	<b>6</b>
Answers could include:	
<ol style="list-style-type: none"> <li>1. Label the test tubes 1 to 6.</li> <li>2. Wrap two test tubes in foil, two test tubes in cotton and two test tubes in bubble wrap.</li> <li>3. Pour 30 mL of warm water into the wrapped test tubes.</li> <li>4. Place a thermometer through the holes in each rubber stopper, then place the stopper in each test tube.</li> <li>5. Record the starting temperature of each test tube.</li> <li>6. Place the test tubes in iced water, then place the beaker into the freezer.</li> <li>7. Record the temperature of each test tube after 20 minutes in the freezer.</li> <li>8. Repeat steps 2–7 two more times.</li> </ol>	
Accept other relevant answers.	

Question 2 (continued)

- (d) In the space below, construct a table that could be used to record the data from the procedure you proposed in part (c) on page 8. (4 marks)

Description		Marks		
Heading/title is provided		1		
Column headings (including units) are appropriate		1		
Row headings are appropriate		1		
Table matches data collected from method in part (c)		1		
<b>Total</b>		<b>4</b>		
Answers could include:				
Temperature changes in test tubes covered with different insulating materials				
	Temperature change after 20 minutes (°C)			
Test tube covering	Trial 1	Trial 2	Trial 3	Average
Aluminium foil				
Bubble wrap				
Cotton				
Accept other relevant answers.				

- (e) Describe how you could ensure validity and reliability in the investigation. (4 marks)

Description		Marks
For each of validity and reliability (2 x 2 marks)		
Describes how validity/reliability could be ensured		2
States a method that could ensure validity/reliability		1
<b>Total</b>		<b>4</b>
Answers could include:		
Validity: Control all the variables to ensure the investigation tests what is meant to be tested.		
Reliability: Use multiple trials/large sample sizes to reduce the effect of outliers/to check data collected each time is similar/so average can be calculated.		
Accept other relevant answers.		

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