

PAPER

H

# SAMPLE



# SCIENCE

**DO NOT OPEN THIS BOOKLET  
UNTIL INSTRUCTED.**

STUDENT'S NAME:

Read the instructions on the **ANSWER SHEET** and fill in your **NAME, SCHOOL** and **OTHER INFORMATION**.

Use a pencil. Do **NOT** use a coloured pencil or a pen.

Rub out any mistakes completely.

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You **MUST** record your answers on the **ANSWER SHEET**.

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Mark only **ONE** answer for each question.

Your score will be the number of correct answers.

Marks are **NOT** deducted for incorrect answers.

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Use the information provided to choose the **BEST** answer from the four possible options.

On your **ANSWER SHEET** fill in the oval that matches your answer.

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You may use a calculator and a ruler.

For questions 1 and 2 use the information below.

The key distinguishes between types of supernova according to the light they emit.

1. Does the spectrum contain hydrogen lines?	Yes go to 4 No go to 2
2. Does the spectrum contain silicon lines?	Yes Type 1a No go to 3
3. Does the spectrum contain helium lines?	Yes Type 1b No Type 1c
4. Are helium lines dominant in the spectrum?	Yes Type 2b No go to 5
5. Does the light curve decay linearly after peak brightness?	Yes Type 2l No Type 2p

1. A supernova shows both hydrogen and helium lines in its spectrum but the helium lines are much stronger than the hydrogen lines.

What type of supernova is it?

- (A) Type 1b
- (B) Type 2b
- (C) Type 2l
- (D) Type 2p

2. Which description best fits the spectrum of a Type 1c supernova?

	Hydrogen lines	Helium lines	Silicon lines
(A)	present	absent	present
(B)	absent	absent	absent
(C)	present	present	present
(D)	absent	present	absent

3. In general, solvents with the lowest boiling points release the most vapour into the air. Flammable solvents can explode if a spark or flame is present.

The table gives facts about some commonly used solvents. The solvents listed can all enter the body through the lungs or skin or by swallowing.

Name	Boiling Point ( C )	Flammability	Toxicity	Solubility in water	Carcinogenic
acetone	57	high	low	very soluble	no
acetic acid	118	low	low	very soluble	no
carbon tetrachloride	77	nonflammable	medium	insoluble	probably
chloroform	61	nonflammable	high	insoluble	probably
ethanol	79	high	low	very soluble	yes, heavy drinkers only
ether	35	very high	medium	slightly soluble	no
methanol	65	high	high	very soluble	no

Methanol is used as a fuel in motor racing. People fuelling cars with methanol have been known to spill a large amount of fuel on themselves and catch alight.

Which option describes the best way of dealing with the fire and removing the methanol?

- (A) Allow the methanol to burn away then use the fire blanket.
- (B) Spray the person with carbon tetrachloride.
- (C) Hose the person with cold water.
- (D) Wrap the person in an airproof fire blanket.

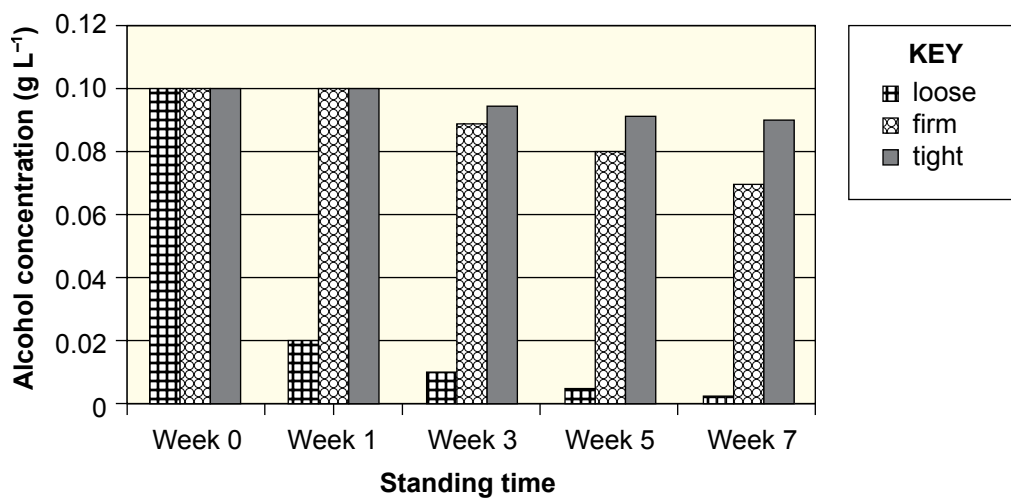
4. In forensic science, blood alcohol content is tested at the time of sampling and, if challenged in court, from a stored sample.

A student wanted to know how the tightness of the lid of a screw-topped container affected the loss of alcohol over time. He assumed alcohol behaved the same way in blood and water.

He partially filled three containers with equal quantities of  $0.1 \text{ g L}^{-1}$  alcohol solution. He then tightened the lids as follows.

- loose lid - tighten until resistance is experienced then turn lid back 1 mm.
- firm lid - tighten until resistance is just experienced.
- tight lid - tighten until resistance is just experienced then turn a further 1 mm forward. The solutions were then stored in a storage cabinet at  $30 \text{ }^\circ\text{C}$  for a number of weeks.

His results are shown in the graph.



By how many grams per litre has the concentration dropped after three weeks in the container with the tight lid?

- (A) 0.005
- (B) 0.01
- (C) 0.09
- (D) 0.095

5. Acceleration due to gravity is different on different planets. It depends on the mass and the radius of the planet, as shown in the formula.

$$g = G \frac{m}{r^2}$$

**KEY**

**g** is the acceleration of an object due to the planet's gravity  
**G** is a constant  
**m** is the mass of the planet  
**r** is the radius of the planet

The table below shows the mass and radius of some planets compared to Earth.

Planet	Mass compared to Earth	Radius compared to Earth
Mercury	0.055	0.38
Venus	0.86	0.95
Earth	1.0	1.0
Mars	0.11	0.53

Which planet has the smallest acceleration due to gravity on the surface?

- (A) Mercury                      (B) Venus                      (C) Earth                      (D) Mars

**END OF PAPER**

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<b>Brunei</b>	Form 5
<b>Hong Kong</b>	Form 4
<b>Indian Subcontinent<sup>1</sup></b>	Class 10
<b>Indonesia</b>	Year 11
<b>Malaysia</b>	Form 4
<b>Middle East<sup>2</sup></b>	Class 10
<b>New Zealand/Pacific<sup>3</sup></b>	Year 11
<b>Singapore</b>	Secondary 3
<b>Southern Africa<sup>4</sup></b>	Grade 10

1 Indian Subcontinent Region: India, Sri Lanka, Nepal, Bhutan and Bangladesh.

2 Middle East Region: United Arab Emirates, Qatar, Kuwait, Saudi Arabia, Egypt, Bahrain, Oman, Turkey, Lebanon, Tunisia, Morocco, Libya, Algeria and Jordan.

3 Pacific Region: Vanuatu, Papua New Guinea and Fiji.

4 Southern Africa Region: South Africa, Botswana, Lesotho, Swaziland, Zimbabwe and Namibia.



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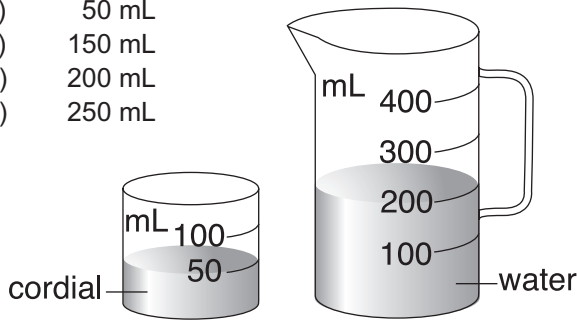


## TO ANSWER THE QUESTIONS

### Example:

Ari added cordial to water to make a jug of drink. What will be the volume of the drink in the jug?

- (A) 50 mL
- (B) 150 mL
- (C) 200 mL
- (D) 250 mL



The answer is 250 mL, so you would fill in the oval **D**, as shown.

A  B  C  D



**USE A PENCIL  
DO NOT USE A COLOURED PENCIL OR PEN**

## START

- |   |                         |                         |                         |                         |
|---|-------------------------|-------------------------|-------------------------|-------------------------|
| 1 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 2 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 3 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 4 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 5 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |

SAMPLE



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QUESTION	KEY	KEY REASONING	LEVEL OF DIFFICULTY
1	B	Start at the top, number 1. The supernova has hydrogen lines, go to number 4. It has dominant helium lines therefore it is Type 2b.	Easy
2	B	In the key, work backwards from Type 1c, starting from number 3. The supernova does not have helium lines in number 3 (so C and D are wrong). At number 2, Type 1c didn't have silicon lines in order to get to number 3 (so A and C are wrong). Finally, at number 1, Type 1c didn't have hydrogen lines in order to get to number 2 (so A and C are wrong).	Easy
3	C	Methanol is water soluble, thus removing the highly toxic chemical, would cool the person's burns, thus reducing the severity of any burns, and cool the flames, thus putting out the fire. Carbon tetrachloride is a chemical that will probably cause cancers and is also moderately toxic so should not be used to spray on people. Therefore B is wrong. Methanol is highly toxic so wrapping the spilt methanol with the person in a fire blanket would not be recommended, so D is wrong.	Medium
4	A	The tight column in the graph shows that after three weeks the concentration in the tight lidded container dropped from 0.10 gL <sup>-1</sup> to approximately 0.095 gL <sup>-1</sup> which is a difference of 0.005 gL <sup>-1</sup> . Please note that the question asks for the difference after three weeks and not seven weeks.	Hard
5	A	<p>Calculations – compared to Earth's gravity, where <math>g_E \propto \left(\frac{m_E}{r_E^2}\right) = 9.8\text{m/s}^2</math>:</p> <p>Mercury: <math>g = \frac{0.055 m_E}{(0.38 r_E)^2} = \frac{0.055}{0.38^2} \left(\frac{m_E}{r_E^2}\right) = 3.7\text{m/s}^2</math></p> <p>Venus: <math>g = \frac{0.86 m_E}{(0.95 r_E)^2} = \frac{0.86}{0.95^2} \left(\frac{m_E}{r_E^2}\right) = 9.3\text{m/s}^2</math></p> <p>Mars: <math>g = \frac{0.11 m_E}{(0.53 r_E)^2} = \frac{0.11}{0.53^2} \left(\frac{m_E}{r_E^2}\right) = 3.8\text{m/s}^2</math></p>	Medium

## LEGEND

Level of difficulty refers to the expected level of difficulty for the question.

**Easy** more than 70% of candidates will choose the correct option.

**Medium** about 50–70% of candidates will choose the correct option.

**Medium/Hard** about 30–50% of candidates will choose the correct option.

**Hard** less than 30% of candidates will choose the correct option.

