UNSW Global
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA

PAPER G

Practice Questions

ICAS International Competitions and Assessments for Schools

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 2B or B pencil.
Do **NOT** use a pen.
Rub out any mistakes completely.

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

SCIENCE

Mark only **ONE** answer for each question.
Your score will be the number of correct answers.
Marks are **NOT** deducted for incorrect answers.

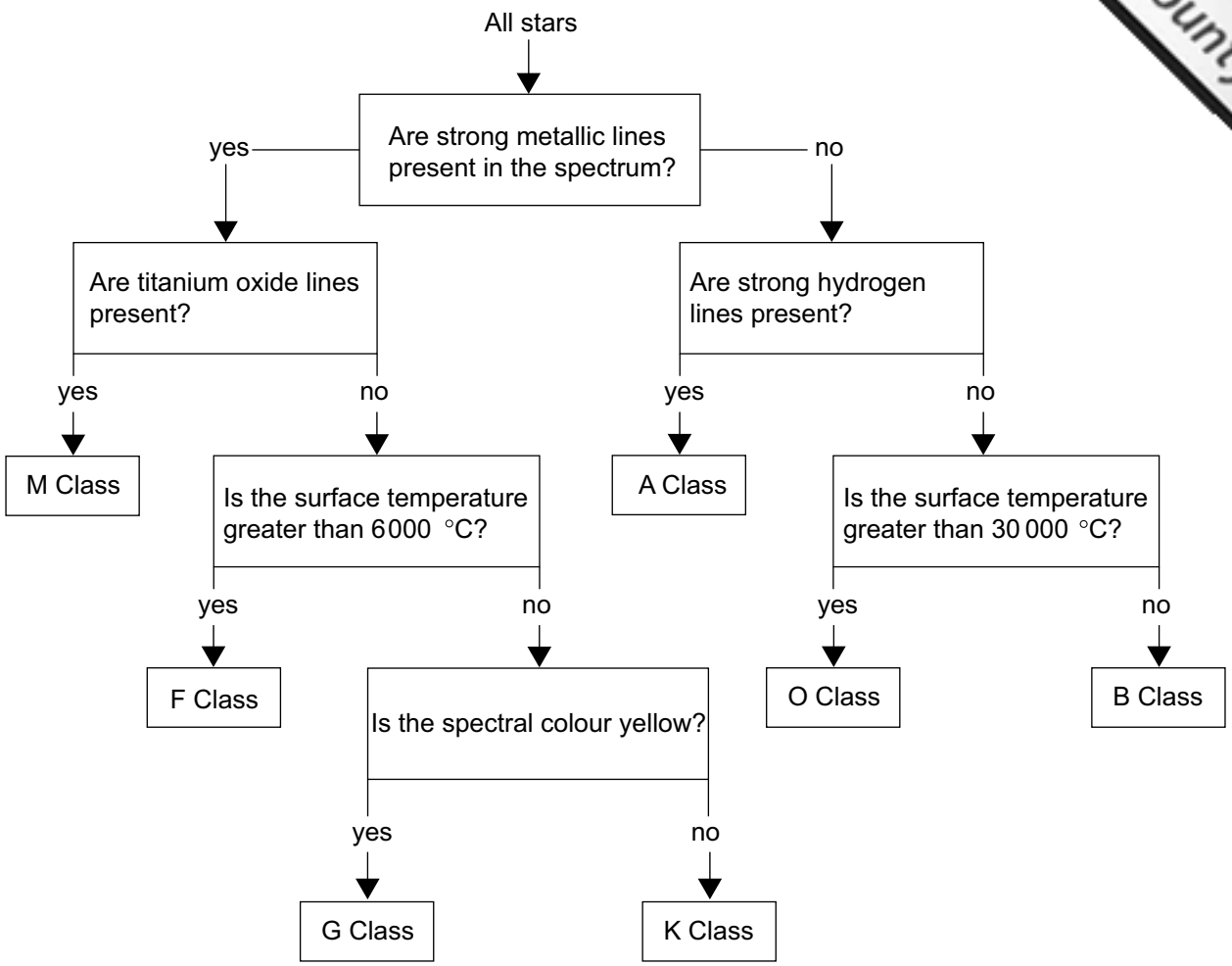
Use the information provided to choose the **BEST** answer from the four possible options.
On your **ANSWER SHEET** fill in the oval that matches your answer.

You may use a calculator and a ruler.

Educational Assessment

For questions 1 and 2 use the information below.

The flow chart distinguishes between some classes of stars.



1. The Sun is a G Class star. What are some characteristics of the Sun?

   (A) titanium oxide and strong hydrogen emission lines present, surface temperature greater than 6000 °C
   (B) strong metallic lines present, surface temperature greater than 6000 °C
   (C) strong metallic lines present, spectral colour yellow
   (D) strong titanium oxide lines present, spectral colour yellow

2. Sirius is a white star which has a surface temperature of 10000 °C. Its spectrum has hydrogen but no strong metallic lines.

   What class of star is Sirius?

   (A) A Class
   (B) B Class
   (C) F Class
   (D) O Class

3. The table compares the tensile strength of some common materials.

Material	Tensile strength (MN/m^2)
muscle	0.1
cartilage	3
house brick	7
tendon	82
bone (elderly)	85
bone (young adult)	110
glass	175
nylon thread	1050

Approximately how many times stronger is nylon thread than tendon?

(A) 0.08
(B) 13
(C) 82
(D) 1050

4. In order to X-ray the digestive system, it is necessary to swallow a dense and very insoluble substance which will not react with the chemicals (mainly water and hydrochloric acid) in the stomach.

Information about some substances is given in the table.

Substance	Density (g/cm^3)	Solubility in water (g/100 mL)	Reaction to hydrochloric acid
caesium carbonate	4.0	2.6×10^{17}	reacts to form carbon dioxide
iron(III) hydroxide	3.9	9.9×10^{-18}	reacts to form iron (III) chloride
barium sulfate	4.5	2.5×10^{-4}	does not react
magnesium sulfate	2.7	3.6×10^{1}	does not react

Which substance shown would be most suitable for use when X–raying the digestive system?

(A) caesium carbonate
(B) iron(III) hydroxide
(C) barium sulfate
(D) magnesium sulfate

5. A scientist wanted to investigate the effects of two types of antibiotics, X and Y, on the [illegible]acterium, *E. coli*. He grew five cultures of the bacterium in a growth medium placed on separate Pe[illegible] the one shown.

Information about the preparation of the five dishes is shown in the table.

	Petri Dish				
Experimental Condition	**I**	**II**	**III**	**IV**	**V**
Amount of growth medium in dish (mL)	10	15	10	20	15
Type of antibiotic added to dish	X	X	Y	X	Y
Amount of antibiotic added to dish (mL)	3	2	2	2	2
Temperature at which dish is kept (°C)	30	25	30	30	25

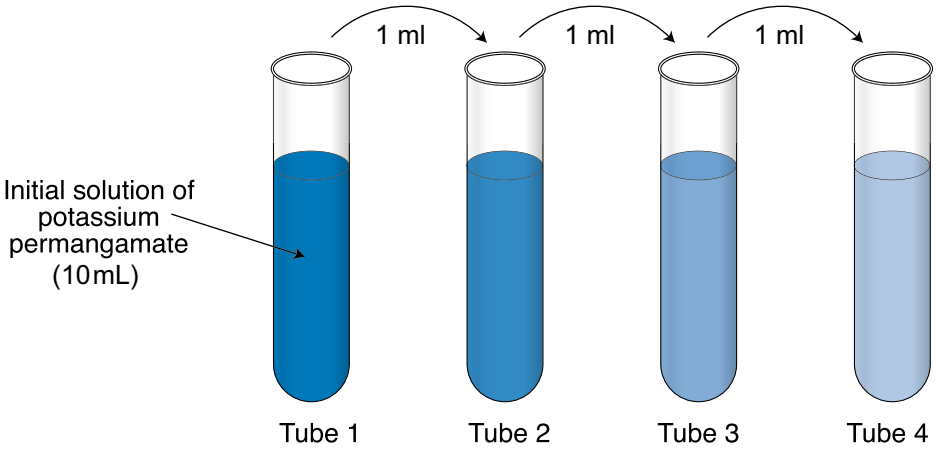
Which two dishes should he use to compare the effects of X and Y on the growth of the bacteria?

(A) I and III
(B) II and V
(C) III and IV
(D) IV and V

For questions 6 and 7 use the information below.

Serial dilution is a procedure used to make a very dilute solution.

The procedure for diluting a solution of copper sulfate is shown.



6. How many times more concentrated is the initial solution than the solution in tube 4?

(A) 10 000 times
(B) 1 000 times
(C) 100 times
(D) 10 times

7. A student estimated that there were 1 000 000 particles of the dissolved substance in the initial solution. How many dilutions would she have to perform to obtain a solution with approximately 100 particles of the dissolved substance?

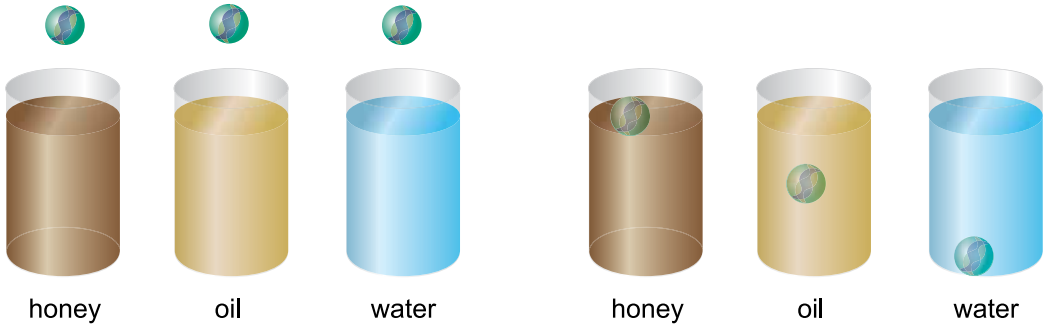
For questions 8 and 9 use the information below.

Reports about science experiments often include:

- a title
- an introduction
- an aim
- a method of how the experiment was to be carried out
- results (what was observed)
- a discussion of the results
- a conclusion

A student wrote a report containing a number of points.

1) 'Which liquid is the most viscous?'
2) The viscosity of the liquid is how 'thick' it is. The more viscous the liquid, the slower the marble will pass through it.
3) To determine the most viscous: honey, oil or water.
4) Set up three identical jars filled with the different liquids.
5) Drop a marble in each jar at the same time and record the marble's position after one second.
6)



time = 0 seconds **time = 1 second**

7) The marble in the honey was near the top of the jar while the marble in the water was at the bottom of the jar.
8) Water was the most viscous liquid tested.

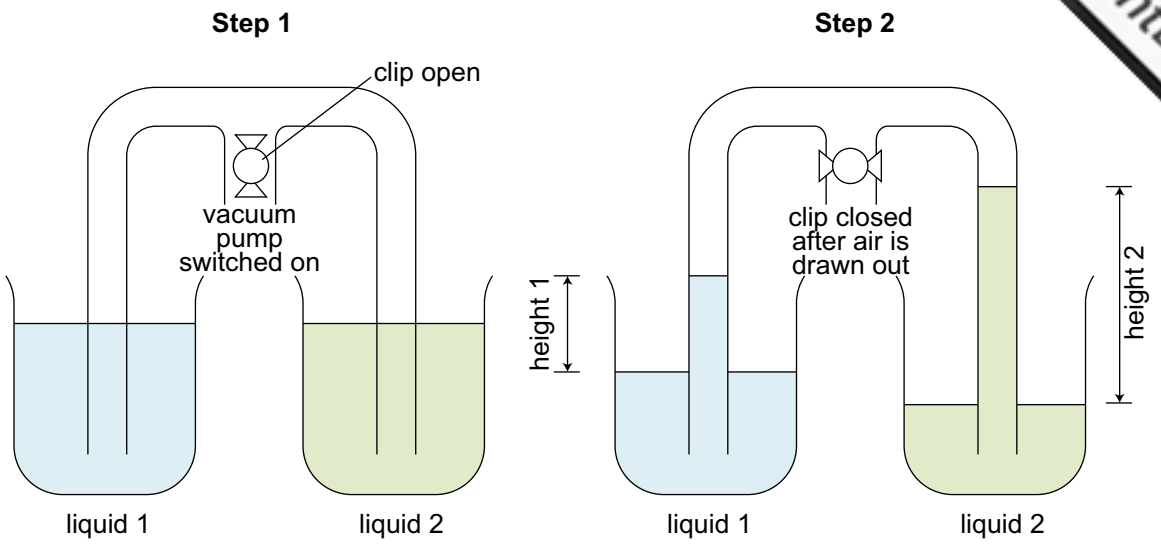
8. Which points are the student's results?

(A) 4 and 5
(B) 5 and 6
(C) 6 and 7
(D) 7 and 8

9. Was the student's conclusion correct? Why?

	Conclusion correct?	Reason
(A)	no	The marble went through the water the slowest.
(B)	yes	The marble went through the water the slowest.
(C)	yes	The marble went through the honey the slowest.
(D)	no	The marble went through the honey the slowest.

10. Hare's apparatus is used to compare the densities of two liquids.



The height that the liquids rise can be calculated from:

$$\frac{\textbf{density (liquid 1)}}{\textbf{density (liquid 2)}} = \frac{\textbf{height (liquid 2)}}{\textbf{height (liquid 1)}}$$

A student performed an experiment with Hare's apparatus using dichloromethane (density 1.32 g/cm^3) and trichloromethane (density 1.98 g/cm^3).

Which of the following could be the height each liquid rose in the tube?

	Height of dichloromethane (mm)	**Height of trichloromethane (mm)**
(A)	40	60
(B)	60	40
(C)	90	110
(D)	110	90

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The following year levels should sit THIS Paper:

Australia	Year 9
Brunei	Form 4
Hong Kong	Form 3
Indonesia	Year 10
Malaysia	Form 3
New Zealand	Year 10
Pacific	Year 9
Singapore	Secondary 2
South Africa	Grade 9

PAPER **G**

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PAPER **G** | **SC**

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UNSW THE UNIVERSITY OF SYDNEY

HOW TO FILL OUT THIS SHEET:

USE 2B OR B PENCIL

- Rub out all mistakes completely.
- Print your details clearly in the boxes provided.
- Make sure you fill in only one oval in each column.

EXAMPLE 1: Debbie Bach

FIRST NAME	LAST NAME
DEBBIE	BACH

EXAMPLE 2: Chan Ai Beng

FIRST NAME	LAST NAME
CHAN	AI BENG

EXAMPLE 3: Jamal bin Abas

FIRST NAME	LAST NAME
JAMAL	BIN ABAS

FIRST NAME to appear on certificate

LAST NAME to appear on certificate

Are you male or female?

○ Male ○ Female

Does anyone in your home usually speak a language other than English?

○ Yes ○ No

School name: _____

DATE OF BIRTH

Day	Month	Year
01–31	01–12	00–06

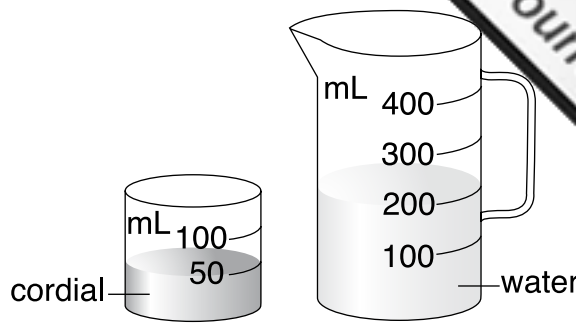
CLASS (optional)

A B C D E F G H I J K L M N O P Q

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.

Ⓐ Ⓑ Ⓒ ●

USE 2B OR B PENCIL

START

1 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓐ Ⓑ Ⓒ Ⓓ
3 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓐ Ⓑ Ⓒ Ⓓ
5 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓐ Ⓑ Ⓒ Ⓓ
7 Ⓐ Ⓑ Ⓒ Ⓓ
8 Ⓐ Ⓑ Ⓒ Ⓓ
9 Ⓐ Ⓑ Ⓒ Ⓓ
10 Ⓐ Ⓑ Ⓒ Ⓓ

PAPER

QUESTION	KEY	KEY REASONING	EL OF CULTY
1	C	Working backwards from G Class: the Sun is **spectral colour yellow**, has a surface temperature < 6000 °C (so A and B are wrong), does not have titanium oxide lines (so A and D are wrong) but it does have **strong metallic lines** present in the spectrum.	Eas
2	A	Sirius does not have strong metallic lines but has strong hydrogen lines. The temperature is irrelevant to this question.	Easy
3	B	$\frac{1050}{82} = 12.8 \approx 13$	Easy
4	C	In order to X-ray the digestive system, it is necessary to swallow a dense and very insoluble substance. From the table, barium sulfate has the highest density and lowest solubility; it also does not react with hydrochloric acid. Only the last two chemicals do not react with hydrochloric acid, so answers A and B are wrong. Magnesium sulfate is less dense and more soluble than barium sulfate, so D is wrong.	Medium
5	B	To compare the effect of the two types of antibiotics on the growth of bacterium, *E. coli*, the scientist needs to make sure that all other possible variables were kept the same except for the antibiotic used. This only happens in petri dishes II and V.	Medium
6	B	Each test tube changes by a factor of 10 $\left(1\,\text{mL in } 10\,\text{mL or } \frac{1\,\text{mL}}{10\,\text{mL}}\right)$. Tube 3 is 10 times more concentrated than tube 4. Tube 2 is 100 times more concentrated that tube 4 while tube 1 is 1000 times more concentrated than tube 4.	Medium/Hard
7	B	Each dilution reduces the concentration by a factor of 10. Therefore to reduce 1 000 000 to 100 we have to divide 1 000 000 four times by 10.	Medium/Hard
8	C	Results are 'observations' made using our five senses, particularly sight. We can see the marbles above the jars at time = 0 s, and we can see the jars with the marbles in them at t = 1 s, at different positions within the liquids. So point 6 and point 7 of the report are observations. Note that which liquid is the most or least viscous is an inference which is based on observations. It itself is not an observation.	Medium/Hard
9	D	The more viscous the liquid, the slower the marble will pass though it. After 1 s the slowest marble will have moved the smallest distance. This occurs in honey; therefore, it is the most viscous of these liquids.	Medium
10	B	$\frac{\rho_1}{\rho_2} = \frac{1.98}{1.32} = 1.5 = \frac{h_2}{h_1} = \frac{60\,\text{mm}}{40\,\text{mm}}$ where ρ is density and h is height	Hard

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.