Sc!ence

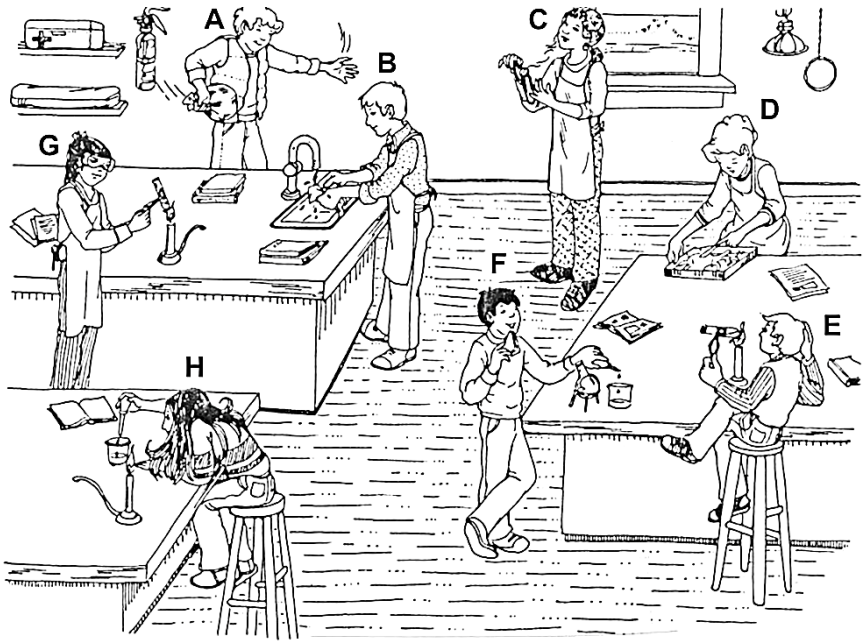
Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

An Introduction to Laboratory Safety and Experimental Techniques

- **Laboratory Safety:**



a) Study the laboratory scene with the eight students, **A** – **H**, shown above. Consider the actions of each student and briefly comment on whether their behaviour is safe or hazardous.

A: ……...

……...

B: ……...

……...

C: ……...

……...

D: ……...

……...

E: ……...

……...

F: ……...

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G: ……...

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H: ……...

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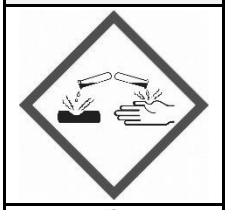
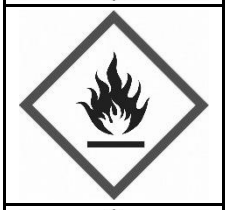
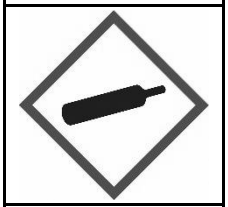
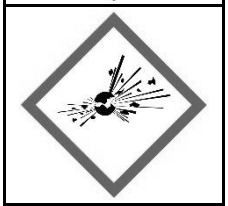
b) Hazard symbols: Draw lines matching the hazard symbol to the description of the hazard.

Hazard Symbol	Description of Hazard	Safety Precaution
	**Flammable** Catches fire easily.	Keep the chemical away from an open flame or flammable sources.
	**Acute Toxicity** Causes toxic or harmful effects to the body when breathed in, swallowed or in contact with skin.	Wear gloves and eye protection when using the chemical.
	**Harmful** May cause cancer or damage to organs over time.	Wear appropriate protective clothing to prevent body parts (*e.g.*, eyes, skin and lungs) from coming into contact with the chemical.
	**Compressed Gas** May explode when heated, or cause breathing difficulties when leaked in an enclosed space.	Avoid tampering with or damaging the cylinder that contains the chemical.
	**Corrosive** May cause damage to body parts (eyes and skin) when it comes in contact with them.	Wear gloves and eye protection when using the chemical.
	**Oxidising** Releases oxygen easily and aids burning.	Keep the chemical away from open flames.
	**Explosive** Explodes easily, especially when heated.	Avoid tampering with or damaging the container that contains the chemical.
	**Irritant** Causes irritation to the body.	Wear appropriate protective clothing to prevent body parts (*e.g.*, eyes, skin and lungs) from coming into contact with the chemical.
	**Dangerous to the Environment** Causes harm to plants and animals.	Replace the chemical with another chemical that does not harm plants and animals. Dispose of the chemical responsibly.

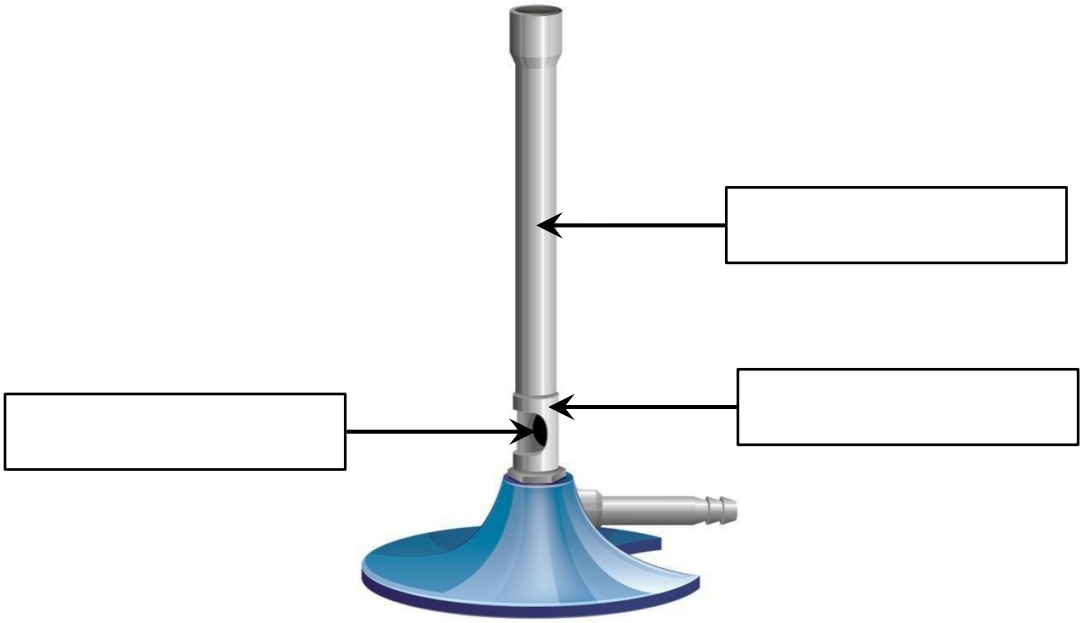
• **Common Laboratory Glassware:** Complete the scientific drawing and match to the description.

Diagram of Glassware	Scientific Drawing of Glassware		Description of Glassware
		•	• A **filter funnel** consists of a wide cone connected to a narrow stem. The wide opening allows mixtures to be poured into the funnel easily without spillage. The filter funnel is often used along with filter paper.
		•	• A **boiling tube** is glassware used to contain chemicals for strong heating. Its transparent body allows for easy observation.
		•	• A **test tube** is glassware commonly used to hold chemicals. Its curved base allows for even heating and reduces the amount of chemicals left behind after pouring them out. Its transparent body allows for easy observation.
		•	• A **conical flask** is glassware with a flat bottom and a conical body that tapers upwards to a short vertical neck. Its narrow mouth allows a stopper or filter funnel to fit into it. Its conical body allows for easy mixing of liquids without spillage.
		•	• A **tripod stand** is usually used with a wire gauze on it. It supports the apparatus that is being heated by a Bunsen burner.
		•	• A **measuring cylinder** is a narrow glass or plastic cylindrical tube with a graduated scale along its length. The scale is marked in millilitres (m*l*) or cubic centimetres (cm^3) which allows for precise measurement of volumes.
		•	• A **beaker** has a cylindrical shape with a flat bottom and a spout for pouring liquids. Beakers are versatile and can be used for mixing, heating, and storing liquids during experiments.

- **Bunsen Burner:**

The Bunsen burner is a common piece of laboratory apparatus that is used to heat chemicals to temperatures of up to 1000°C.

1. Identify and label the parts of the Bunsen burner shown in the diagram below.



2. Connect the Bunsen burner to the laboratory's gas tap using the rubber tubing. Check to ensure that there are no cuts or holes in the rubber tubing.

3. Turn the collar of the Bunsen burner to ensure that the air-hole is fully closed.
Note: Closing the air-hole prevents oxygen entering at the base of the Bunsen burner. If air enters at the base of the Bunsen burner, then a phenomenon known as *strike back* could occur. During strike back, the flame burns within the barrel of the Bunsen burner instead of at the top of the barrel.

4. Test the lighter to ensure that it works.

5. Turn on the gas tap. **Note:** You might have to pull the gas tap *upwards* before you can turn it. Place the lighter just above the top of the barrel and light the Bunsen burner.

6. If the Bunsen burner does not light after 3 clicks, turn off the gas and wait for 10 seconds.

7. Observe the flame that is obtained. This is called the *luminous flame*.

- What colour is the luminous flame? ……
- Is the luminous flame steady or unsteady? ……
- Is the luminous flame quiet or loud? ……

8. Turn the collar to fully open the air hole. The air hole should be opened *slowly* to avoid strike back. Observe the flame that is obtained. This is called the *non-luminous flame.*

- What colour is the non-luminous flame? ……
- Is the non-luminous flame steady or unsteady? ……
- Is the non-luminous flame quiet or loud? ……

9. Which flame, luminous or non-luminous, should be used for heating? Explain you answer.

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10. If the Bunsen burner is to be left unattended for a *short* period of time, what type of flame should be used? Explain your answer.

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11. What other safety precautions should students take when using a Bunsen burner in the school laboratory? Look back at the laboratory scene on page 1 to refresh your memory.

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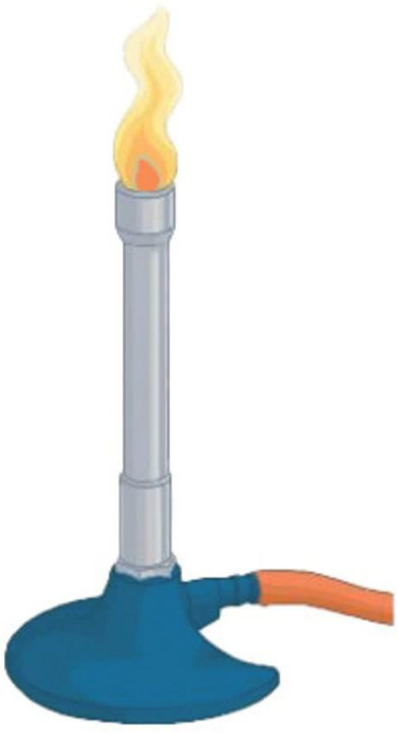
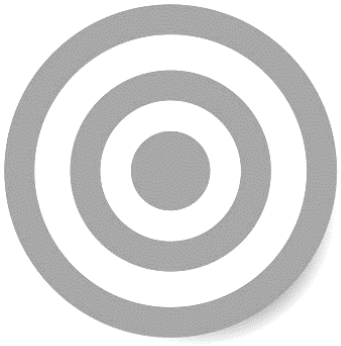
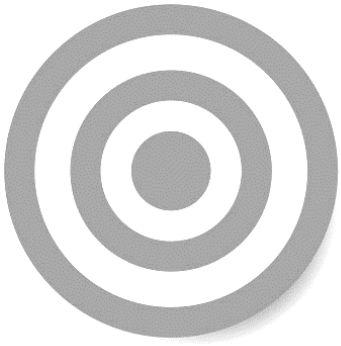
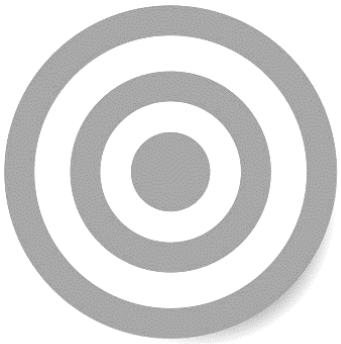
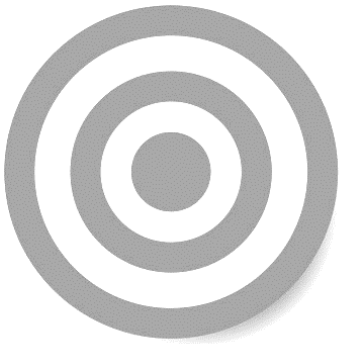


- Bunsen burner, air-hole closed.

- Bunsen burner, air-hole open.

• **Errors in Scientific Measurements:**

a) An archer fired six arrows that hit a target. Use crosses (×) to show what the target would look like if the archer were…

• Not accurate and not precise 	• Not accurate but precise 
• Accurate but not precise 	• Both accurate and precise 

b) Claire and Sarah each took a 100.0 g mass and weighed it, each student using a different electronic balance. Their results are shown in the table below.

Student	Mass / g			
	Reading 1	**Reading 2**	**Reading 3**	**Average Reading**
Claire	99.6	100.1	99.8	99.8
Sarah	103.1	103.1	103.2	103.1

i) Who had the more accurate results, Claire or Sarah? Explain you answer.

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……...

ii) Who had the more precise results, Claire or Sarah? Explain your answer.

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……...

c) **i)** Claire realised that the electronic balance she was using gave a reading of 3.0 g even though there was nothing on it. What type of error is this, a zero error or a parallax error?

……...

ii) Can the error that Claire is experiencing be corrected? If it can, then briefly explain how it can be corrected.

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iii) Is the error that Claire is experiencing with the electronic balance unpredictable or consistent? Briefly explain your answer.

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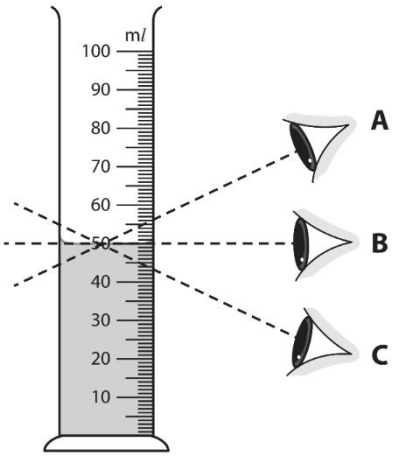
d) Sarah measured 50 m*l* of water using a 100 m*l* measuring cylinder. She read the measuring cylinder from three different positions **A**, **B** and **C** as shown in the diagram below.



i) At which position should Sarah take the reading to ensure an accurate measurement?

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ii) What type of error is Sarah avoiding when she reads the measuring cylinder at the correct position?

……...

iii) The smallest division on the measuring cylinder is 1 m*l*. To what precision can Sarah record her results?

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- Scan the QR Code below to view the answers to this assignment.

http://www.nygh.sg/lower_secondary_science/sec_one_science/sec_one_chemistry/lab_safety_ans.pdf