

SECTION I: Multiple Choice Questions

1 Louis found five unmarked bottles in a workroom. Each of the bottles contained a pure substance. He noted the following properties for each of these colourless liquids :

- 1) boiling point
- 2) mass
- 3) volume
- 4) density

Which properties does Louis need to know to identify these liquids?

- A) 1 and 2
- B) 1 and 3
- C) 2 and 4
- D) 1 and 4

2 To remove the wallpaper in her room, Stephanie uses an appliance that produces a spray of steam.

Which statement explains the change that takes place?

- A) This is a chemical change because the steam burns the wallpaper.
- B) This is a physical change because the steam burns the wallpaper.
- C) This is a chemical change because the steam dissolves the glue holding the wallpaper on the wall.
- D) This is a physical change because the steam dissolves the glue holding the wallpaper on the wall.

3 In the laboratory, you are given a pink powder in a test tube. Your teacher tells you that it is a pure substance.

When you heat the test tube, you observe that a gas is given off and a black residue forms.

What can you conclude about the original substance?

- A) It is an element.
- B) It is a compound.
- C) It is a solution.
- D) It is a mixture.

4 Which of the following statements does **not** apply to characteristic properties?

- A) To be a characteristic property, a property must apply to all substances.
- B) Characteristic properties allow the identification of substances.
- C) Characteristic properties indicate possible uses of a substance.
- D) The quantitative and qualitative characteristic properties will be constant for a given substance.

5 You are given a red powder and asked to determine its composition.

The red powder was composed of only one kind of particle. Based on this observation, which terms best describe the substance?

- A) Element and solution
- B) Compound and pure substance
- C) Element and mixture
- D) Compound and mixture

6 While operating cathode ray tube you make the following observations :

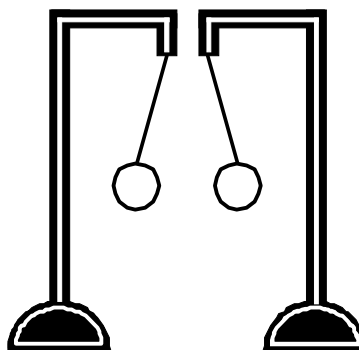
1. The cathode rays travel in straight lines from the negative cathode towards the positive anode.
2. The temperature of the cathode ray tube does not change during the experiment.
3. When a negative charge is brought near the tube the cathode rays are deflected away from the charge.
4. The tube emits a green light.
5. When a positive charge is brought near the tube the cathode rays are deflected towards the charge.

Which observations permit you to conclude that the cathode rays are negatively charged?

- A) 1, 2 and 3
- B) 1, 3 and 5
- C) 2, 3 and 4
- D) 3, 4 and 5

7 The diagram represents the interaction of charged spheres that you have observed.

Which of the following statements describes the situation in the diagram?



- A) The right-hand sphere is charged positively and the left-hand sphere negatively.
- B) The two spheres are both electrically neutral.
- C) The right-hand sphere is charged negatively and the left-hand sphere positively.
- D) The two spheres both carry the same electrical charge.

- 8 The state of four substances before and after having been heated in the laboratory is presented in the following table.

Substance	Before Heating	After Heating
1	Dark gray solid	Purple gas
2	White solid	Colourless liquid
3	Red solid	Gray liquid and colourless gas
4	Brown liquid	Orange-brown gas

According to this information, which substance was a compound before being heated?

- A) 1
- B) 2
- C) 3
- D) 4

- 9 Associate each of the following sectors with an advantage or disadvantage connected with the use of radio-isotopes.

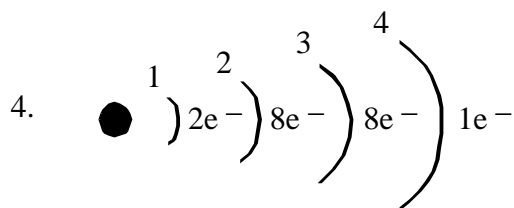
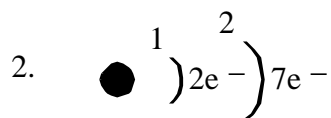
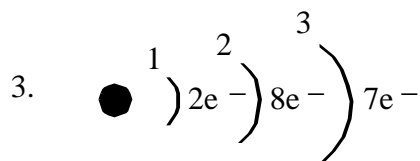
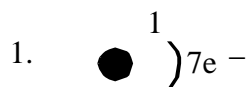
Sector	Advantage or disadvantage
1. Environment	a) Isotopes are useful tools in scientific work.
2. Industry	b) Isotopes can contaminate living things and their habitat.
3. Medicine	c) Isotopes are used to detect faults in manufacturing.
4. Research	d) Isotopes are used in the treatment of some illnesses.

- A) 1a, 2b, 3c and 4d
- B) 1b, 2c, 3d and 4a
- C) 1d, 2a, 3a and 4b
- D) 1c, 2d, 3b and 4a

10 Which of the following **cannot** be a property of a metal?

- A) It conducts an electric current.
- B) It reacts with muriatic acid.
- C) It has a metallic lustre.
- D) It has an extremely low melting point.

11 Which of the following atomic models represent elements from the halogen family?



- A) 1 and 2
- B) 3 and 4
- C) 2 and 3
- D) 1 and 4

15 A student must classify six aqueous solutions.

The student knows that all except one of the solutions must be an ACID, a BASE, or a NEUTRAL SALT.

The student writes a procedure and carries out certain tests.

The table shows the results that were obtained.

Solution	Litmus paper	Electrical conductivity
1	No effect	Good
2	Turned blue	Good
3	Turned red	Good
4	No effect	None
5	Turned blue	Weak
6	Turned blue	Good

Based on these results, which conclusion is the most appropriate?

- A) Solutions n^{os} 2, 4 and 5 are bases and solution n^o 3 cannot be classified.
- B) Solution n^o 3 is an acid and solution n^o 5 cannot be classified.
- C) Solutions n^{os} 1, 2, 3 and 6 are acids and solution n^o 4 cannot be classified.
- D) Solutions n^{os} 2, 5 and 6 are bases and solution n^o 3 cannot be classified.

16 During the electrolysis of water you wish to identify the gas produced at the cathode. Which test would you use?

- A) Flame test
- B) Lime-water test
- C) Glowing splint test
- D) Color test

17 Which of the following statements is **false**?

- A) Like acids and bases, salts conduct an electric current in an aqueous solution.
- B) Unlike acids and bases, salts do not affect neutral litmus paper in an aqueous solution.
- C) Like acids and bases, salts do not dissolve in water.
- D) Unlike acids and bases, salts conduct electricity in a solid state.

18 Which of the following are **bases**?

- 1. NaOH
- 2. HCl
- 3. LiF
- 4. NH_4OH
- 5. BeO
- 6. HI
- 7. KOH
- 8. CaCl_2

- A) 1, 4 and 7
- B) 2, 3 and 8
- C) 3, 5 and 6
- D) 1, 3 and 7

19 Which statement correctly defines an electrolyte?

- A) A substance that conducts an electric current
- B) A substance that does not conduct an electric current
- C) A substance that conducts an electric current when dissolved in an aqueous solution
- D) A substance that does not dissolve in water

20

In the course of an experiment , you note that on dissolving $\text{Al}_2(\text{SO}_4)_3$ in pure water, you obtain a solution with the following properties :

1. It conducts electricity.
2. It turns litmus paper red.
3. It neutralizes a base.
4. It liberates hydrogen in the presence of a piece of zinc.

After the experiment you conclude that the $\text{Al}_2(\text{SO}_4)_3$ was...

- A) an acid.
- B) a base.
- C) a non-neutral salt.
- D) a salt.

- 21 In order to classify three unknown solutions as acids, bases or salts, you have been given the following information :

Solution	1	2	3
Information			
Electrical conductivity	yes	yes	yes
Consistency to the touch	non-viscous	non-viscous	viscous
Production of hydrogen in the presence of magnesium	yes	no	no
Reaction of blue litmus paper	turns red	stays blue	stays blue
Reaction of red litmus paper	stays red	stays red	turns blue

On the basis of this information, how do you classify the three solutions?

- A) Solution 1 : acid Solution 2 : base Solution 3 : salt
B) Solution 1 : acid Solution 2 : salt Solution 3 : base
C) Solution 1 : base Solution 2 : acid Solution 3 : salt
D) Solution 1 : base Solution 2 : salt Solution 3 : acid

- 22 In the laboratory, you are to determine if a substance is a compound. After heating the substance in an open container, you observe that a **chemical reaction** is occurring and that the substance is undergoing certain changes.

Which of the following changes would definitely indicate that the substance was a compound before it was heated?

- A) Its colour changes.
B) Its physical state changes.
C) Its mass decreases.
D) Its texture changes.

- 23 Alice frequently uses a white cleaning powder in her home. She wants to know whether this substance is acidic, basic or neutral.

In order to determine the pH of this substance, what is the first thing she must do?

- A) Put a piece of blue litmus paper on the solid.
- B) Put a piece of red litmus paper on the solid.
- C) Verify whether the solid conducts electricity.
- D) Dissolve a small amount of the solid in water.

SECTION II: Short or Extended Answer Questions

- 24 Complete the following sentence.

When writing the formula for a compound composed of a metal and a non-metal, the symbol for the _____ is always written first.

- 25 Why is NO named "nitrogen monoxide" rather than "nitrogen oxide"?

- 26 Nuclear reactors produce large amounts of radio-isotopes. Why is this an environmental and health concern ?

- 27 The following families are found in the periodic table of the elements :

the alkali metals, the halogens, the noble (inert) gases

Within the same family we find common characteristics. What characterizes the electron arrangement of *each* of these families?

- 28 Because of their characteristic properties, certain elements are more appropriate for use in technological applications than others.

Match each application listed in the left column with the appropriate characteristic property in the right column. In each case, justify your choice.

To answer, write the pertinent number and justification beside each letter in the Answer Booklet. The same property may be used more than once.

<u>Applications</u>	<u>Characteristic Properties</u>
A) The utilisation of aluminium instead of copper in the fabrication of high-tension wires.	1. Density
B) The utilisation of helium instead of hydrogen in weather balloons.	2. Melting point
C) The utilisation of carbon (graphite) instead of aluminum in tennis rackets.	3. Boiling point
D) The utilisation of tungsten instead of iron for light bulb filaments.	4. Flammability
	5. Thermal conductivity
	6. Electrical conductivity

- 29 Potassium(K) reacts vigorously with bromine liquid(Br). Use electron arrangement to explain why this is so.

- 30 State one characteristic of how elements combine chemically that aided Dalton in his development of an atomic model.

31 Which element corresponds to each of the definitions below?

Write only the symbols of the elements in the answer booklet.

Definition

1. The element has electrons in two energy levels (shells) and the outer level is full.
2. The element has electrons in three energy levels (shells) and it has two valence electrons.
3. The element has an atomic mass of 28 and its nucleus contains 14 neutrons.
4. The element reacts vigorously with water and the electric charge of its nucleus is +19.

2- Correction key

1 D

2 D

3 B

4 A

5 B

6 B

7 D

8 C

9 B

10 D

11 C

12 C

13 C

14 A

15 Something's wrong with question

16 A

17 D

18 A

19 C

20 C

21 B

22 A

23 D

24 metal

25 There are other compounds composed of the same two non metal elements, so the “mono” removes ambiguity.

26 Most of the isotopes are radioactive and release radiation, which can be harmful to all life forms.

27 The characteristic of the electron arrangement

- of the alkali metals is the presence of one electron in the outermost energy level (or one valence electron);
- of the halogens is the presence of seven electrons in the outermost energy level (or seven valence electrons);

- of the noble (inert) gases is the presence of eight electrons in the outermost energy level except for helium (or a complete outermost energy level).

28	<u>Applications</u>	<u>Characteristic Property</u>	<u>Justification</u>
	A)	1 (Density)	The density of aluminium is less than the density of copper.
	B)	4 (Flammability)	Helium is not flammable.
	C)	1 (Density)	The density of carbon is less than the density of aluminum.
	D)	2 (Melting Point)	The melting point of tungsten is higher than that of iron.

In order to receive marks, the student must provide the appropriate property as well as a pertinent justification.

29 The bromine atom has a valence of 7. It needs 1 more electron to obtain a stable noble gas electron arrangement. Potassium has only one loosely held valence electron, which it loses to bromine.

30 The elements combine in fixed whole number ratios.

31 **Symbols**

1. Ne
2. Mg
3. Si
4. K