

The St. George's Institute

Michaelmas Term

End of Term Assessment

2021



Subject: CHEMISTRY

Course: CHM 101

Date: Friday November 26th 2021

Time: 8:30 a.m. – 10:30 a.m.

Paper: 2 & 1

Instructions:

1. Ensure you have all materials required for the assessment: laptop (fully charged), pen, pencil, calculator, geometry set, ruler, and eraser.
2. This paper consists of TWO sections, Section A is your Paper 2 and Section B is your Paper 1. Complete Section A on file paper, and Section B on the answer sheet provided.
3. Answer ALL questions.

You are advised to take some time to read through the paper and plan your answers.

PAPER 2

Section A

Question 1

a) Jamelia is in her room studying and smells the scent of curry coming from her mom's cooking in the kitchen area. She thinks to herself, "Ah! Diffusion at work!"

i. Define the term 'diffusion'.

.....
.....
.....
.....

(2 marks)

ii. Explain how the diffusion of the scent of the curry supports the particulate theory of matter

.....
.....
.....
.....

(2 marks)

iii. Diffusion is a process that can also occur in liquids. State how the arrangement of particles in a liquid differs from that in a solid and a gas.

.....
.....
.....
.....
.....

(3 marks)

iv. Apart from diffusion, identify ONE process that supports the particulate theory of matter and state ONE example of such a process.

Process

Example

.....

(2 marks)

b) Jamelia's mom showed her that in order to cook with curry she first had to mix the curry powder with water. Jamelia observed that the mixture resembled a chalk and water mixture she had seen in class, except the curry mixture was brown in colour.

i. State whether the mixture of curry powder and water is a suspension or colloid.

..... (1 mark)

ii. State the MOST appropriate technique that could be used in a school laboratory to separate this mixture

..... (1 mark)

iii. Draw a clearly labelled diagram of the apparatus that could be set up in the school laboratory to separate the mixture of curry powder and water. In your diagram, show the location of the separated components

(4 marks)

TOTAL: 15 marks

Question 2

a) Define EACH of the following terms:

i. Atomic number

.....
.....

ii. Mass number

.....
.....

(2 marks)

(a) Atoms are the smallest particles of elements; however, they are made up of three distinct subatomic particles.

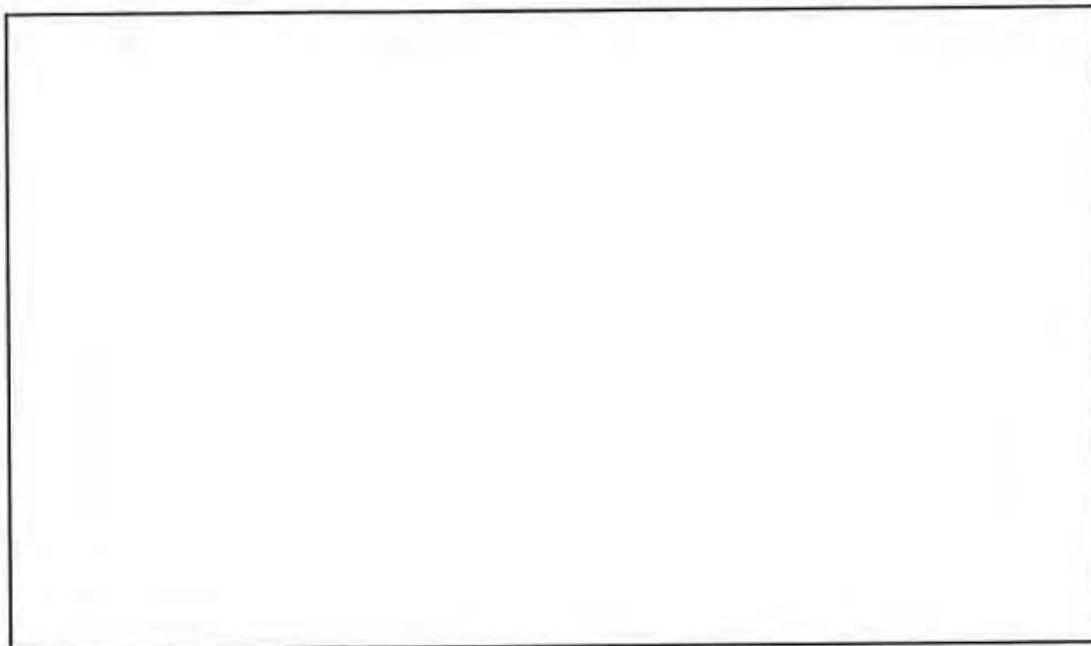
(i) Complete Table 3 which shows the three subatomic particles and their properties.

TABLE 3: SUBATOMIC PARTICLES AND THEIR PROPERTIES

Particle	Mass	Charge
Electron		-1
	1	

(4 marks)

- (ii) Consider the notation of an atom of an unknown element, ${}^{29}_{14}\text{A}$. Draw a labelled diagram to illustrate the location, arrangement and number of EACH type of subatomic particle in Element ${}^{29}_{14}\text{A}$.



(5 marks)

- iii. What group and period is ${}^{29}_{14}\text{A}$ in?

Group

.....

(1 mark)

Period

.....

(1 mark)

- iv. Identify the element 'A' (Name and Symbol)

.....

(2 mark)

TOTAL: 15 marks

Question 3

Figure 2 shows a section of a periodic table with two unknown elements represented as X and Y. Use the figure to answer the questions that follow.

N.B. You are not required to identify X and Y.

Na	Mg		Al	Si	P	S	Cl	Ar
	X						Y	

Figure 2. Section of the periodic table

- a) Compare Mg and X in terms of the ease of ionization (lower ionization energy required) and Cl and Y in terms of the electronegativity. Provide a suitable explanation for your answer in EACH case.

- i Comparison of Mg and X according to ease of ionization

.....

..... (1 mark)

Explanation

.....

.....

(2 marks)

- ii Comparison of Cl and Y according to electronegativity

.....

.....

(1 mark)

Explanation

.....

.....

(2 marks)

- iii State which element between **X** and **Y** has a greater atomic radius, and which is more electronegative

Greater atomic radius

More electronegative.....

(2 marks)

(b)Sodium is a metal with an atomic number of 11 and mass number of 23.

- i Draw a diagram to show the arrangement of electrons in a sodium atom



(5 marks)

- ii State the period and group to which the element sodium belongs in the periodic table.

Group

Period

(2 marks)

- iii State an element in the same **period** as Sodium, that has a **smaller** atomic radius

.....

(1 mark)

- iv Give the electronic configuration of Na if it were to lose 1 electron, as well as the new charge of the Na ion

Electronic Configuration

Charge

(2 marks)

v. State whether the Na ion is a cation or an anion, and why

.....

.....

(2 mark)

TOTAL: 20 marks

Section B

- Which characteristic does a pure substance show?
 - It has no distinct chemical properties
 - It is heterogenous
 - It has a constant composition
 - It has a range of melting and boiling points
- Which of the following provide(s) evidence that matter is made of particles?
(I) Osmosis
(II) Decomposition
(III) Diffusion
 - (I) and (II)
 - (I) and (III)
 - (III) only
 - (II) only

Items 3–4 refer to the four sets of properties represented by the options, A, B, C and D, below.

	Relative Charge	Approximate Mass
(A)	+1	1
(B)	0	1
(C)	-1	0
(D)	0	2

- Which set of properties above refers to a neutron?
 - Which set of properties refers to a proton?
- Particles in a solid:
 - are packed closely together
 - are capable of random movement
 - have large spaces between them
 - have weak forces of attraction between them.
 - Liquids differ from gases in that:
 - the particles in a liquid can move more freely than those in a gas
 - the particles in a gas are closer together than those in a liquid
 - the particles in a liquid possess more kinetic energy than those in a gas
 - the particles in a gas have weaker forces of attraction between them than those in a liquid.
 - The conversion of a gas to a liquid is described as:
 - melting
 - evaporation
 - condensation
 - boiling.
 - 'Mass number' is the number of
 - Neutrons plus protons
 - Neutrons minus protons
 - Electrons
 - Electrons plus protons

9. Which of the following is correct?
- The components of a mixture can be separated by physical means.
 - A mixture contains two or more pure substances chemically combined together.
 - A mixture has a fixed melting point.
 - The component parts of a mixture are in a fixed ratio.

10. The solubility of a solid in water usually:

- increases as temperature increases
- increases as temperature decreases
- remains constant as temperature increases
- decreases as temperature increases

11. Which of the following mixtures are arranged in order of INCREASING particle size?

- Solutions, colloids, suspensions
- Solutions, suspensions, colloids
- Colloids, solutions, suspensions
- Suspensions, colloids, solutions

12. Two particles have the following compositions:

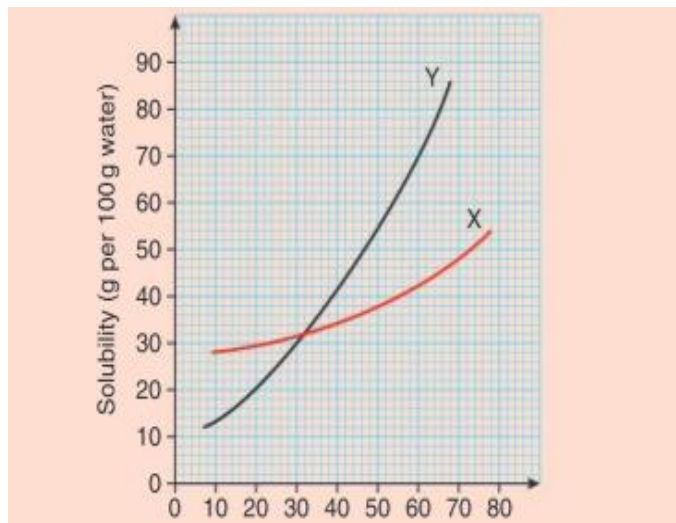
- 10 protons, 12 neutrons, 10 electrons
- 10 protons, 11 neutrons, 10 electrons

Therefore, BOTH particles are:

- Anions
- Isotopes
- Cations
- Metals

13. In the notation $^{35}_{17}\text{Cl}$ number '17' represents the:

- charge
- mass number
- oxidation state
- atomic number



14. The mass of Y that crystallizes from a saturated solution with 100 g of water if the solution is cooled from 60°C to 20°C:

- 70g
- 50g
- 12g
- 20g

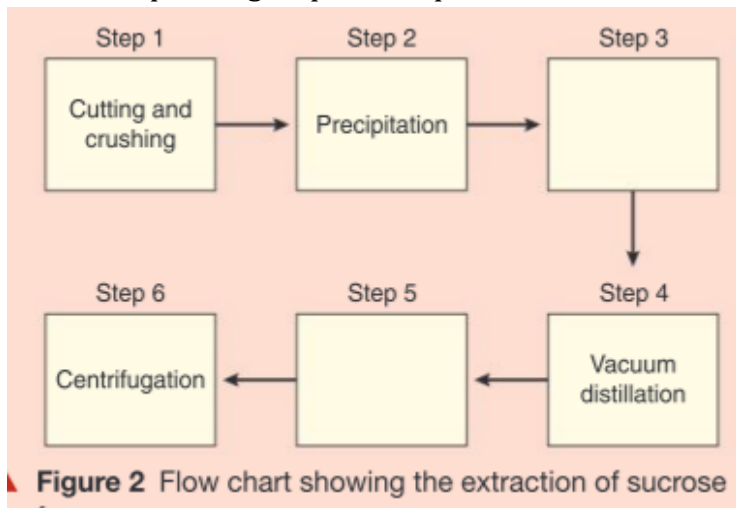
15. Which characteristic does a pure substance show?

- It has no distinct chemical properties
- It is heterogenous
- It has constant composition
- It has a range of melting and boiling points

16. What is a compound?

- A suspension or a colloid
- It is made up of two or more substances chemically combined together
- It is made up of a solvent and a solute
- It is a heterogenous substance

17. Fill in the blanks with the corresponding steps in the process of



sucrose extraction:

- a) 3- Filtration, 5- Crystallization
 - b) 3- Crystallization, 5- Filtration
 - c) 3- Extraction, 5- Collection
 - d) 3- Clarification, 5- Extraction
18. Given a mixture of sugar, water, and insoluble coffee grounds, what steps should I take to extract the sugar?
- a) First filter the mixture, and then evaporate the remaining solution
 - b) Evaporate the mixture to remove the water
 - c) Allow the sugar to crystallize over time
 - d) Distill the sugar from the mixture
19. Isotopes of an element contain
- a) Different numbers of protons
 - b) The same number of neutrons
 - c) The same number of electrons as neutrons
 - d) The same number of protons as electrons

20. An element, X, has an electronic configuration of 2:8:1. At which of the following positions is the element in the periodic table?

- a) Period 1 Group II
- b) Period 1 Group I
- c) Period 3 Group II
- d) Period 3 Group I

21. Which of the following properties increases across Period 3 of the periodic table?

- a) Atomic radius
- b) Atomic number
- c) Number of electron shells
- d) Metallic nature

22. Element 'Y' contains 19 electrons in its shells naturally. What is element Y?

- a) Aluminium
- b) Potassium
- c) Sulfur
- d) Calcium

23. A group in the Periodic table is:

- a) A horizontal row of elements
- b) A vertical column of elements
- c) A random selection of elements
- d) Another name for an element

24. What happens to electronegativity as we go across a period?

- a) It increases
- b) It decreases
- c) It fluctuates
- d) It remains constant

25. Which of the following is not a use of radioactive isotopes?

- a) Energy generation
- b) Carbon dating
- c) Radiotherapy
- d) Agriculture

26. Particles are furthest apart in which of the following?

- a) Liquids
- b) Solids
- c) Supersolids
- d) Gases

27. If the mass number of an atom is 59 and the number of neutrons in the nucleus of the atom is 32, then the atomic number is:

- a) 27
- b) 32
- c) 59
- d) 91

28. Elements in the modern periodic table are arranged in order of increasing:

- a) Mass number
- b) Chemical reactivity
- c) Atomic number
- d) Relative atomic mass

29. In which group of the periodic table are the noble (inert) gases found?

- a) Group II
- b) Group 0
- c) Group IV
- d) Group VII

30. Which of the following statements BEST describes the difference between an atom and an ion?

- a) An atom is electrically neutral but an ion is positively charged.
- b) An atom is electrically neutral but an ion is negatively charged.
- c) An atom contains equal numbers of protons and electrons whereas an ion contains more electrons than protons.
- d) An atom contains equal numbers of protons and electrons whereas an ion contains unequal numbers of protons and electrons.

END OF EXAM