

OCTOBER 2023
EBS 115
GENERAL CHEMISTRY THEORY I
2 HOURS

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
FIRST YEAR, END-OF-SECOND SEMESTER EXAMINATION, SEPTEMBER/OCTOBER 2023

5TH OCTOBER 2023

GENERAL CHEMISTRY THEORY I

12:00 PM – 12:40 PM

This paper consists of two sections, A and B. Answer ALL the questions in Sections A and TWO questions from Section B. Section A will be collected after the first 40 minutes.

SECTION A
(30 MARKS)

Answer ALL the questions in this Section.

For items 1 to 20, each stem is followed by four options lettered A to D. Read each item carefully and circle the letter of the correct or best option.

- The order of increasing energy for different subshells is
 - $p < d < d < f$
 - $s < d < f < p$
 - $s < p < d < f$
 - $s < p < f < d$
- Which of the following species has/have the configuration $1s^2 2s^2 2p^6$?
 - Ne
 - Mg.
 - Mg^{2+}
 - Na^{1+}
 - I, II and IV only
 - I, II, and III only
 - I, II, III and IV
 - I, III and IV only

3. The two (2) unpaired electrons in oxygen atom are found in the orbital/sub-orbitals.
 - A. 2p
 - B. 2px & 2py
 - C. 2px & 2pz
 - D. 2py & 2pz

4. The name of the person who first proposed that atoms are indivisible is
 - A. Democritus.
 - B. Neil Bohr.
 - C. Rutherford.
 - D. Schrodinger.

5. The reason why the alpha-particles of Rutherford experiment was deflected at the inner dense mass was that the inner dense mass contains
 - A. indivisible particle.
 - B. negative charge.
 - C. neutral charge.
 - D. positive charge.

6. The mass number of a neutral atom is 27 and the number of neutrons is 14. Predict the chemical symbol of the atom.
 - A. Al
 - B. Cl
 - C. Mg
 - D. S

7. The name of the valence shell of Ca^{2+} is
 - A. K-shell.
 - B. L-shell.
 - C. M-shell.
 - D. N-shell.

8. What kind of force of attraction exists in the formation of LiF?
 - A. Electronic forces
 - B. Electrostatic force
 - C. Hydrogen bond
 - D. Van der Waal

9. Calcium is the **most** abundant mineral in the body and it is found in some foods and some medicines such as antacids. Find the number atoms that are present in 5g of Ca?

[L = 6.02×10^{23} particles per mol, Ca = 40g/mol]

 - A. 0.7525×10^{23} atoms.
 - B. 5.7525×10^{23} atoms.
 - C. 7.525×10^{25} atoms.
 - D. 7.525×10^{23} atoms.

10. The existence of isotope of elements was due to the presence of differences in numbers.
 - A. atomic
 - B. electron
 - C. neutron
 - D. proton

11. A bond formed between metals and non-metal would be described as bond.
- coordinate
 - covalent
 - dative covalent
 - electrovalent
12. Why should hydrogen bonds be formed with the following only: Nitrogen (N), Oxygen (O), and Fluorine (F)? This is because these molecules
- are highly electronegative.
 - are in the same period.
 - are polar.
 - can form bond only with hydrogen.
13. The first scientific theory of atomic structure was proposed by
- John Dalton.
 - Joseph John Thomson.
 - Neils Bohr.
 - Rutherford.
14. What volume will 11.0g of CO_2 occupy at s.t.p? [$\text{CO}_2 = 44$; molar volume at s.t.p.=22.4]
- 5.6mL
 - 56mL
 - 6.5mL
 - 65mL
15. What is the bond angle in beryllium chloride molecule?
- 109°
 - 120°
 - 180°
 - 360°
16. What is the shape of methane molecule?
- Octahedral
 - Pentagonal bipyramidal
 - Square planar
 - Tetrahedral
17. Which of the following acids is likely **not** to dissociate completely in water?
- H_2CO_3
 - H_2SO_4
 - HCl
 - HNO_3
18. Two substances such as H_3O^+ and H_2O that differ from each other only by one proton are referred to as
- acid-base.
 - Bronsted-Lowry acids.
 - conjugate pairs.
 - Lewis acids.

19. The pH of pure water is 7 at 25⁰C. What is the hydrogen ion concentration at that temperature?
- 10⁻⁷M
 - 14M
 - 7.0X10⁻¹⁴M
 - 7M
20. Which of the following compounds is neutral to moist litmus paper?
- CO₂
 - H₂O
 - NO₂
 - SO₃

Items 21 to 25 are statements followed by True and False options. Read each statement carefully and indicate whether it is True or False by circling the letter of the correct option.

21. The octet rule states that elements attain a stable electronic configuration when their valence shell is fully filled with 2 electrons.
- True
 - False
22. Degenerate orbitals are sub-orbitals and they have equal energy.
- True
 - False
23. A salt is made up of an anion and a cation. The anion is from a base and cation from an acid.
- True
 - False
24. Strong bases and strong acids react to form salts and these salt are classified as neutral salts.
- True
 - False
25. Salts that is made from transition metals are more soluble than alkali earth metal salts.
- True
 - False

For items 26 to 30, write the appropriate responses in the spaces provided.

26. The discovery of the nucleus is considered to be greatest scientific work.
27. J.J. Thomson discovered the by experimenting with cathode ray, tube.
28. The assertion '*No two electrons can have all the four quantum numbers to be the same*'. Which of the rules of filling orbitals with electrons is the assertion related to?

29. The conjugate base of **H₂PO₄** is
30. The statement 'Lower energy orbitals must be filled before higher energy orbitals' is ascribed to