

OLABI SI ONABANJO UNIVERSITY AGO-IWOYE
2010/2011 RAIN SEMESTER UNIVERSITY EXAMINATIONS
B.Sc/B.Ed DEGREE EXAMINATIONS;; CHEMICAL SCIENCES

CHM 102:: GENERAL CHEMISTRY II

OCTOBER/NOVEMBER, 2011

TIME ALLOWED: 45 mins.

INSTRUCTION: ATTEMPT ALL QUESTIONS. Write the letter to the correct answer in the box provided.

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	

1. One of these is a non-metal (A) Kr (B) Si (C) S (D) Na
2. One of these is a metalloid (A) Ge (B) C (C) Si (D) Sn
3. One of these is inert (A) Kr (B) Si (C) S (D) Na
4. Alkali earth elements include (A) Na, K, Al, Ca (B) Ca, Mg, Be, Ba (C) Na, K, Rb, Cs (D) Be, B, Mg, Ca.
5. Most electronegative element on the periodic table is (A) O (B) Se (C) V (D) F
6. One of these is a transition metal (A) O (B) Se (C) V (D) F
7. Which of following mixture exhibit ion-dipole forces? (A) $\text{Ca}(\text{NO}_3)_2/\text{H}_2\text{O}$ (B) $\text{PbNaKd}/\text{H}_2\text{O}$ (C) $\text{CH}_3\text{OH}/\text{H}_2\text{O}$ (D) $\text{CO}_2/\text{H}_2\text{O}$
8. The temporary dipole that an atom induces on another adjacent atom due to electron movement occurring at an instant is (A) London dispersion forces (B) Ion dipole forces (C) Dipole-dipole forces (D) Magnetic forces.
9. Choose the correct statement: (A) Intermolecular forces > Intramolecular forces
 (B) Intermolecular forces < Intramolecular forces (C) Intermolecular forces = Intramolecular forces (D) None of these
10. Covalency is about electron (A) taking & giving (B) Sharing & giving
 (C) donation & giving (D) donation & sharing.
11. In a stable compound, chemical bond between two atoms of two elements with atomic numbers 12 and 8 is (A) electrovalent bond (B) covalent bond (C) coordinate bond (D) metallic bond.
12. Element with atomic number Z= 18 is a (A) noble element (B) metal (C) non-metal (D) transition element.
13. Which of the statement is most appropriate? (A) There are 8,8,16 elements respectively in periods 2,3, & 4 of the periodic table (B) There are 8,8,20 elements respectively in periods 2,3, & 4 of the periodic table (C) There are 8,8,18 elements respectively in periods 2,3, & 4 of the periodic table (D) All of the above.
14. The three elements with atomic numbers 5,13,31 belong to group (A) IV (B) II (C) V (D) III.
15. Nuclear pull on electrons of outermost shell (A) decreases down a group, and increases left to right across the period (B) equalizes down a group, and decreases left to right across the period (C) bombards the shells to reveal the electrons (D) increases down a group, and decreases left to right across the period.
16. Choose the most correct: Intermolecular forces of molecules with almost same size and molecular weights (A) decrease with increasing polarity. (B) equalize with decreasing polarity (C) increase with decreasing polarity (D) increase with increasing polarity.
17. Transition metals on the periodic table are (A) d- & f-block elements located between s- &

I	II	III	IV	V	VI	VII	He
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	Ne
K	Ca						Ar

metalloids = semi-metals

p-block elements. (B) s- & d-block elements located between f- & p-block elements. (C) & p-block elements located between s- & d-block elements. (D) s- & f-block elements located between d- & p-block elements.

18. Representative elements are (A) p- & d-block elements (B) s- & p-block elements (C) d- & f-block elements (D) s- & f-block elements.
19. Transition metals appear on the periodic table as from period (A) 2 (B) 3 (C) 4 (D) 5
20. Cations of transition metals (A) have electrons in their d-orbital (B) are not similar in electronic configuration to noble elements (C) are all of the above (D) none of the above.
21. The simplest formula which expresses its % composition and does not indicate the actual number of atoms of each elements is called (A) relative molecular mass (B) molecular formula (C) atomic mass (D) empirical formula.
22. The formula which expresses the actual number of atoms of each elements present in its molecule is known as (A) molecular formula (B) relative molecular mass (C) empirical formula (D) atomic mass.
23. When starch is boiled with dilute sulphuric acid, X is formed. X represents (A) disaccharides (B) monosaccharides (C) A and B (D) polysaccharides.
24. To a portion of the clear filtrate obtained from Lassaigne's test was added a few drops of cold freshly prepared dilute solution of sodium pentacyanonitrosyl ferrate. The presence of a rich purple colouration indicates the presence of (A) P (B) N (C) S (D) Cl
25. A positive test was obtained for the presence of halogen in an organic sample: a further portion of the alkaline (from sodium fusion test) was acidified with dilute HNO_3 before adding small amount of AgNO_3 . A yellow precipitate confirms the presence of (A) Br (B) I (C) Cl (D) F.
26. The following are organic reactions except one. (A) Oxidation (B) Elimination (C) Addition (D) Substitution.
27. An organic compound was shown on quantitative analysis to contain 40% carbon, 6.7% hydrogen and 53.3% oxygen. If the vapour density of the compound is 35, what is the molecular formula of the compound? ($\text{C}=12, \text{H}=1, \text{O}=16$) (A) CH_2O (B) $\text{C}_6\text{H}_{12}\text{O}_6$ (C) $\text{C}_2\text{H}_3\text{O}$ (D) $\text{C}_2\text{H}_4\text{O}_2$.
28. The two main functional groups in a carbohydrate are (A) alcohol hydroxyl groups and carboxyl carbonyls (B) ketone ketone or aldehyde carbonyls and alcohol hydroxyl groups (C) aldehyde and (D) B and C.
29. Hydrolysis of magnesium nitride gives (A) NH_4OH (B) MgO (C) MgH_2 (D) NH_3
30. The following is a disaccharide except (A) lactose (B) maltose (C) cellulose (D) sucrose
31. The following are types of lipids except (A) fat and oil (B) wax (C) steroid (D) protein.
- Use this information to answer Question 32 – 34.
- Palmitoleic acid is a fatty acid with the following formula $\text{CH}_3-(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
32. How many carbon atoms are in palmitoleic acid? (A) 12 (B) 15 (C) 16 (D) 17.
33. What kind of fatty acid is it? (A) saturated (B) disaturated (C) polysaturated (D) unsaturated.
34. What is its state at room temperature? (A) gas (B) aqueous (C) solid (D) liquid
35. The bond formed between two monosaccharides is called (A) glycosidic linkage (B) glycogen linkage (C) condensation bond (D) A and B.

ANSWER TO 2010/2011

CHM 102

RAIN SEMESTER EXAM. (REGULAR)

1. C (Sulphur is a non-metal.)
2. A and C (Metalloids are chemical elements that show the properties of both metals and non-metals. They include boron, silicon, germanium, arsenic, tellurium and protontum.)
3. A (Krypton and other noble gases are also known as inert gases and rare gases.)
4. B (Group II A elements are collectively called Alkaline earth metals or elements because they form weak alkalis.)
5. D (Fluorine has the highest electronegative value of 4.0.)
6. C (Nanadium belongs to the first transition metals series in the Periodic Table.)
7. A (Ion-dipole force occurs between an ion and a dipolar molecule, especially during dissolution or hydrolysis.)
8. A (London dispersion forces, named after the German physicist Fritz London, exist in non-polar molecules and are also regarded as induced dipole-induced dipole forces or interactions.)
9. B [Intramolecular forces hold atoms together to form mo-

leculles. They are also regarded as bonding forces such as covalent, ionic and metallic forces or bonds. Intramolecular forces are stronger than intermolecular forces (such as intermolecular hydrogen bonds, dipole-dipole interactions, etc.).]

10. D (Sharing of equal number of valence electrons occurs in ordinary covalent bonding and donation of lone pairs of electrons by donors occurs in coordinate covalent or dative bonding.)
11. A ($_{12}^{24}\text{Mg}$ and $_{8}^{16}\text{O}$ combine together to form MgO by electrovalent or ionic bonding which involves valence electrons giving and taking respectively.)
12. A ($Z = 18 \Rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6$, an octet electron configuration.)
13. C (In the modern periodic table, there are 2, 8, 8, 18, 18, 32 and >19 elements respectively in periods 1, 2, 3, 4, 5, 6 and 7.)
14. D (The three elements with $Z = 5, 13$ and 31 have valence electrons distributed as $2s^2 2p^1, 3s^2 3p^1$ and $4s^2 4p^1$ respectively \Rightarrow Group III A.)
15. A (Number of shells and atomic radius increase down the Group causing decrease in nuclear pull on valence electrons, unlike across the period.)
16. D (Increase in molecular polarity causes an increase in intermolecular forces, and vice versa.)

17. A (Transition elements, which are metals, comprise pure transition metals in d-block and inner-transition elements (lanthanides and actinides) in f-block, and they lie between Groups IIA and IIIB or s- and p-block elements.)

18. B (s- and p-block elements are called representative elements due to their chemical properties and physical nature.)

19. B (Transition elements are found in periods 3, 4, 5, 6 and 7.)

20. C (Transition metals' cations are not isoelectronic with any of the noble gases and their $(n-1)d$ valence electrons have a greater energy than their ns valence electron(s) due to quantum effect.)

21. D (Read up empirical, molecular, chemical and structural formulae.)

22. A (As in 21 above.)

23. B (Acid hydrolysis of polysaccharides such as starch yields monosaccharides.)

24. C (Read up the Lassaigne test for sulphur using sodium pentacyanoferrate (II) [nitroprusside] solution, $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]_{(\text{aq})}$.)

25. B (Cl^- gives white precipitate and Br^- shows pale yellow precipitate.)

26. A (Oxidation is not classified as a major type of organic

reaction.)

27. D (Read up quantitative analysis of organic compounds)

Criterion	C	H	O
% composition by mass	40	6.7	53.3
R.A.M.	12	1	16
No. of moles	$\frac{40}{12} = 3.33$	$\frac{6.7}{1} = 6.7$	$\frac{53.3}{16} = 3.33$
Divide by the smallest value in whole numbers	$\frac{3.33}{3.33} = 1$	$\frac{6.7}{3.33} = 2$	$\frac{3.33}{3.33} = 1$
Mole ratio	1 : 2	2 : 1	

∴ the empirical formula ($E \cdot F$) is CH_2O
But $n(E \cdot F) = \text{relative molecular mass}$,
 $\Rightarrow n(\text{CH}_2\text{O}) = 2 \times \text{vapour density}$.
 $\therefore n(12 + 2 + 16) = 2 \times 30$
 $\therefore 30n = 60$, or $n = 2$

Thus, the molecular formula of the organic compound is $\text{C}_2\text{H}_4\text{O}_2$.

28. B ($>\text{C=O}$ or $-\text{C}=\text{O}-\text{H}$ and $-\text{OH}$ are the major functional groups in monosaccharides.)

29. D ($\text{Mg}_3\text{N}_2 + 6\text{H}_2\text{O} \rightarrow 3\text{Mg}(\text{OH})_2 + 2\text{NH}_3$)

30. C (Cellulose is a polysaccharide.)

31. D (Read up biopolymers.)

32. C (Palmitoleic acid is 9-cis-hexadecenoic acid, a monounsaturated fatty acid with C16:1w7.)

33. D (See 32 above.)

34. D (All unsaturated fatty acids are liquids at room temperature, while saturated fatty acids are solids.)

35. A (Glycosidic linkage or bond joins two monosaccharides together to form a disaccharide, etc.)