

CHM104

#100

COLLEGE (DEPARTMENT) _____
 MATRIC NO: _____
 NAMES _____

FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA
 COLLEGE OF PHYSICAL SCIENCES
 DEPARTMENT OF CHEMISTRY
 2016/2017 SECOND SEMESTER CAT
 CHM 104: Introductory Inorganic Chemistry

TIME: 15 mins

1. The dissolution of alkali metal in water gives
 (A) acidic solution (B+) alkaline solution (C) neutral solution (D) none of the above
2. Which of the following group IA metals reacts with oxygen to form 1 normal oxides at room temperature except
 (A) Li (B) Cs (C) Na (D) K
3. Which of the following metals does not react vigorously with water
 (A) Al (B) Na (C) K (D) Cs
4. _____ gas is liberated on dissolution of alkali metals in water
 (A) steam (B) carbon dioxide gas
 (C) hydrogen gas (D) metal vapour
5. Which of the following is not an s block element?
 (A) Francium (B) Caesium (C) Strontium (D) Germanium
6. Variable oxidation states in transition metals enable them to take part in _____ reactions
 (A) Polymerization (B) Addition (C) Redox (D) Substitution
7. The stable electronic configuration of ${}_{24}\text{Cr}$ is _____
 (A) $[\text{Ar}]3d^44s^2$ (B) $[\text{Ag}]3d^54s^1$ (C) $[\text{Ag}]3d^44s^2$ (D) $[\text{Ar}]3d^54s^1$
8. In the extraction of iron, Limestone is added along with ore and coke. What is the function of the limestone?
 (A) To increase temperature (B) To act as fuel (C) To reduce temperature (D) To remove impurities
9. Aluminium occurs commonly as bauxite with the chemical formula _____ (A) Al_2O_3 (B) $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (C) Al_2O^- (D) $\text{Al}(\text{OH})_3$
10. Calculate the N/P ratio of ${}^{14}_6\text{C}$ _____
 (A) 1.33 (B) 0.43 (C) 0.75 (D) 2.33

DOLA

FUNAABSU

001

1

#SUCCESS

11. The mixing of 2s atomic orbitals gives

- (A) antibonding (B) π -bond (C) σ -bond
(D) σ^*

12. _____ is an example of sp^2 hybridization.

- (A) BeF_2 (b) BF_3 (c) CH_4 (d) NH_3

13. How many pair(s) of electron is contained in H_2O molecule.

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

14. BF_3 exhibit _____ shape.

- (A) linear (B) tetrahedral (C) trigonal pyramid (D) trigonal planar

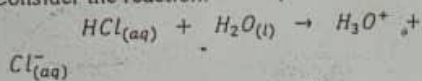
15. Which of the following elements belong to Group IVA?

- (A) Si, N (b) Ga, C (c) Ge, Sn (d) C, Ti

16. The _____ acid-base behavior that explains reactions of protonic acids with metal hydroxides is

- (A) Lewis theory (B) Bronsted-Lowry theory (C) Neutralization reaction (D) Arrhenius theory

17. Consider the reaction:



- Water acts as
(A) acid (B) proton acceptor (C) acidic solution (D) electron acceptor

18. Which of the following is false?

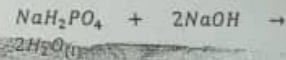
- (A) Arrhenius acids and bases are also Bronsted-Lowry acids and bases
(B) Bronsted-Lowry acids and bases are also Lewis acids and bases

- (C) Lewis acids and bases are also Bronsted-Lowry acids and bases
(D) Lewis theory describes neutralization reactions as that involving coordinate bond formation

19. Basic salts arise when

- (A) less than stoichiometric amount of acids react with polyhydroxy bases
(B) equal stoichiometric amounts of acids and bases react
(C) less than stoichiometric amount of bases react with polyprotic acids
(D) more than stoichiometric amount of acids react with polyhydroxy bases

20. Consider the reaction:



Identify Q and name the salt type.

- (A) $NaHPO_4$, acidic (B) Na_3PO_4 , normal (C) Na_2CO_3 , Normal (D) $Na_2(OH)PO_4$, basic

COLLEGE (DEPARTMENT)

MATRIC NO:

NAMES:

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

CGWYEM! AYODEJI ANTHONY
Jossy Barua Apochi
07033409988

Instruction: answer all. Time allowed 30mins.

1. SiCl_4 , PCl_3 , SiF_6^{2-} and PCl_5 are compounds which can be hydrolyzed by water to give strongly acidic solutions, which of these molecules possess the sp^3d hybrid orbital type?

- (a) SiCl_4 (b) PCl_3 (c) PCl_5 (d) SiF_6^{2-}

2. Elemental analysis of a chloride of phosphorus gave 23.4% ^{31}P and 79.6% of $^{35.5}\text{Cl}$. By determining the molecular formulae of this compound, suggest the type of hybridization present in the molecule. (Note, $E F = M F$)

- (a) sp^3d (b) sp^2 (c) sp^3 (d) sp

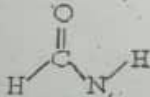
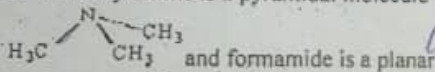
3. An example of physical means of separating an ore from unwanted rocky material is

- (a) Froth flotation (b) Decantation (c) Sedimentation (d) Bath coagulation

4. Which type of hybridization is present in SF_6 ?

- (a) sp^3 (b) sp^3d (c) sp^3d^2 (d) sp

5. Trimethylamine is a pyramidal molecule



molecule. The hybridization of nitrogen in both is

- (a) sp^2, sp^2 (b) sp^3, sp^2 (c) sp^3, sp (d) sp^3, sp^3

6. Why is limestone added to the blast furnace during extraction of iron?

- (a) it helps to reduce the ore at high temperature
(b) it helps to convert some of the iron ore to wrought iron

(c) it helps to convert silicon dioxide present in the ore to slag
(d) It purifies the iron

7. In the compound $\text{H}_2\text{C}=\text{CH}-\text{C}\equiv\text{CH}$, which of the following represents the given mode of hybridization from left to right?

- (a) $\text{sp}^3-\text{sp}^2-\text{sp}^2-\text{sp}^2$ (b) $\text{sp}^2-\text{sp}^2-\text{sp}-\text{sp}$
(c) $\text{sp}^2-\text{sp}^2-\text{sp}-\text{sp}$ (d) $\text{sp}^2-\text{sp}^2-\text{sp}^2-\text{sp}^2$

8. $^{232}_{90}\text{Th}$ emits a total of six alpha-particles and four beta-particles in its natural decay sequence. What is the atomic number, mass number and symbol of the final product.

- A. $^{208}_{82}\text{Pb}$ B. $^{208}_{82}\text{Pb}$ C. $^{212}_{84}\text{Po}$ D. $^{208}_{84}\text{Po}$

9. Choose the One statement that is true about gamma radiation;

- A. They exert strong ionizing effect during collision
B. It can be diffracted by the lattice of a crystal
C. It is markedly deflected towards a positive plate in an electrostatic field
D. It has a relatively small mass.

10. Nucleons are

- A. Electrons + Neutrons B. Protons + Electrons
C. Protons + Neutrons D. Protons + Electrons + Neutrons

11. Calculate the energy released when $0.0303 \times 10^{-3}\text{kg}$ of mass is lost in a nuclear reactor. ($c = 3 \times 10^8\text{ms}^{-1}$)

- A. $4.5 \times 10^{11}\text{J}$ B. $4.5 \times 10^{12}\text{J}$
C. $2.7 \times 10^{12}\text{J}$ D. $2.7 \times 10^{10}\text{J}$

12. One of the following statements is not true about Group IV elements on descending the group;

- A. The 2-valent state becomes more stable relative to 4-valent state.
B. The nature of the dioxides changes from acidic to amphoteric

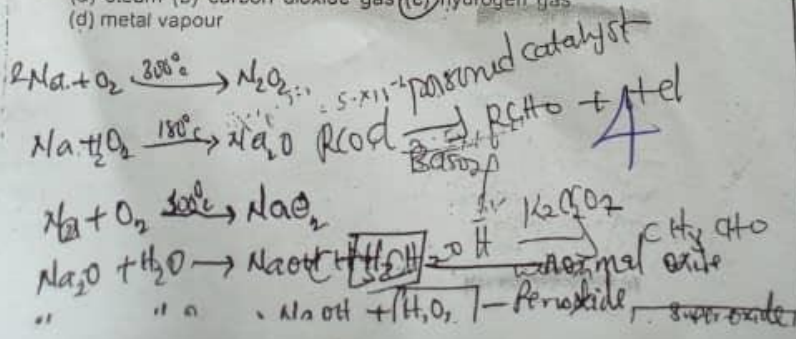
Handwritten notes and calculations:

- $E = mc^2 = 0.0303 \times 10^{-3} \times (3 \times 10^8)^2$
- Group 1 ns^1 , Group 2 ns^2 , Group 4 $ns^2 np^2$
- $^{232}_{90}\text{Th} \rightarrow ^{208}_{82}\text{Pb} + 6\alpha + 4\beta$
- Notes on hybridization: $\text{sp}^3, \text{sp}^2, \text{sp}$
- Notes on radiation: α, β, γ
- Notes on Group IV: $\text{Sn}, \text{Pb}, \text{SnO}_2, \text{PbO}_2$

Instruction: answer all question

TIME 25min

- $^{92}_{44}\text{Mo} + ^1_0\text{n} \rightarrow ^{92}_{43}\text{Tc} + \gamma$ What is the atomic number, mass number and symbol of the X?
 A. $^{92}_{44}\text{Zr}$ B. $^{92}_{43}\text{Mo}$ C. $^{92}_{43}\text{Tc}$ D. $^{92}_{41}\text{Nb}$
- One of the following statements is not true about Group IV elements on descending the group:
 A) The bonding in compounds changes from covalent to ionic. B) The elements change from non-metallic to metallic. C) The 2-valent state becomes more stable relative to 4-valent state.
 D) Their ability to catenate increases
- One of the following is not an application of radioactivity and radioisotopes?
 A. Diagnostic imaging B. Sterilization of surgical equipments C. Polymerization of organic compounds D. Structural analysis
- Choose the One statement that is true about beta radiation:
 A. It can penetrate several centimeters of lead. B. It can be diffracted by the lattice of a crystal. C. It is markedly deflected towards a negative plate in an electrostatic field. D. It has a relatively small mass.
- Calculate the energy released when 0.005g of mass is lost in a nuclear reactor ($c=3 \times 10^8 \text{ms}^{-1}$)
 A. $4.5 \times 10^{11} \text{J}$ B. $4.5 \times 10^{14} \text{J}$ C. $1.5 \times 10^{11} \text{J}$ D. $1.5 \times 10^{17} \text{J}$
- Graphite is exploited commercially for the following reasons except
 A. its inertness B. high thermal stability C. hardness D. thermal conductivities.
- A radioactive element decays with a rate constant of $2.02 \times 10^{-4} \text{min}^{-1}$. How long will it take for 90g of the substances to decay to 10g?
 A. $1.30 \times 10^6 \text{min}$ B. $6.53 \times 10^5 \text{s}$ C. $1.30 \times 10^6 \text{s}$ D. $6.53 \times 10^5 \text{min}$
- One of the following statement is NOT TRUE about this equation: $\text{PbO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \rightarrow \text{PbCl}_2(\text{aq}) + \text{Cl}_2 + 2\text{H}_2\text{O}(\text{l})$
 A. Lead dioxide is being oxidized. B. HCl is oxidised to the chloride. C. The oxidation state of Pb changes from +4 to +2. D. The oxidation state of Cl changes from -1 to 0
- Which of the following is false of group IA? (a) they react with water to form alkali (b) their hydroxides are soluble in water (c) they are the most electropositive metals (d) they are generally unreactive
- Which of the following is not an s block element? (a) Francium (b) Cesium (c) Strontium (d) None
- The general grand state configuration of group IA valence shell is? (a) ns^1 (b) ns^2 (c) ns^2p^2 (d) ns^1p^1
- The dissolution of alkali metals lead to evolution of?
 (a) steam (b) carbon dioxide gas (c) hydrogen gas (d) metal vapour
- Which of the following is better preserved hydrocarbon solvent to prevent spontaneous polymerization with air?
 (a) Pb (b) Sn (c) Na (d) Be
- Li metal burns in oxygen to form? (a) normal oxide (b) peroxide (c) superoxide (d) mixture of normal oxide and peroxide
- A temperature control oxidation of sodium metal with limited oxygen produces what type of sodium oxide?
 (a) Na_2O (b) Na_2O_2 (c) NaO (d) Na_2O_4
- KO_2 reacts with water to give? (a) KOH and H_2O_2 (b) KOH , H_2O and O_2 (c) KOH and O_2 (d) KOH and H_2 only
- Which of the following is not the common application of NaOH ? (a) absorption of CO_2 and acidic acid gases (b) drying agent (c) production of pulp and paper (d) production of soap
- The group IA metals are called? (a) alkali metal (b) alkali earth metal (c) halometal (d) metalloid
- Which of the following is a monoprotic acid <A> H_2SO_4 CH_3COOH <C> NaHSO_3 <D> H_3PO_4
- Arrhenius concept of acid and base did not recognize one of the following ions (a) H_3O^+ (b) H^+ (c) OH^- (d) None of the above
- At 25°C , the value of K_w for pure water is 1.0×10^{-14} . What is the value of $\text{p}K_w$? <A> 10^{-14} $1/14$ <C> 14 <D> -14
- A buffer solution contains 0.5M NH_3 and 0.8M NH_4Cl . calculate the pH of the solution. (K_b for $\text{NH}_3 = 1.8 \times 10^{-5}$) <A> 13.6 9.06 <C> 10.2 <D> 14
- The K_a of propionic acid is 1.34×10^{-5} . What is the pH of a solution containing 0.5M propionic acid, and 0.5M sodium propionate? <A> 4.87 4.26 <C> 1.34 <D> 3.85
- If a solution has a pH of 5.5 at 25°C , what is its $[\text{OH}^-]$? <A> 8.50M $2.3 \times 10^{-3}\text{M}$ <C> $3.2 \times 10^{-9}\text{M}$ <D> $1.56 \times 10^{-8}\text{M}$
- The pH of 0.20M NaOH solution is <A> 7 1 <C> 13 <D> 13.3
- Which of the following pair is NOT a Bronsted-Low acid and base? <A> HCl & NH_3 MgO & SCl_2 <C> H_2S & H_2O <D> CH_3COOH & H_2O
- A solution at 25°C contains 0.1M sodium acetate and 0.03M acetic acid, what is its pH? ($\text{p}K_a$ of $\text{CH}_3\text{COOH} = 4.57$) <A> 4.21 4.05 <C> 5.1 <D> 6.25
- The pH of a 0.02M $\text{Mg}(\text{OH})_2$ solution is <A> 12 9.8 <C> 10.5 <D> 13.1
- The group IIA metals are called? (A) alkali metal (B) alkali earth metal (C) halometal (D) metalloid
- The general grand state configuration of group I valence shell is? (a) ns^1 (b) ns^2 (c) ns^2p^2 (d) ns^1



Lithium
 It is very light metal
 used for construction of
 It is used as catalyst.
 It is a reducing agent.
 It is an important compound.

- The electronic configuration of chromium is _____. a. $[\text{Ar}]3d^4 4s^2$ b. $[\text{Kr}]3d^4 4s^2$ c. $[\text{Kr}]3d^5 4s^1$ d. $[\text{Ar}]3d^5 4s^1$
- Which of the following member of group IV is poisonous? a. Lead b. Carbon c. Germanium d. Tin
- Why does the chemical reactivity of the elements in group 1A increase from Li to Cs? a. Size of the element from Li to Cs b. valence electron is farther away from the nucleus Li to Cs c. size of the element from Li to Cs b. Valence electron is farther away from the nucleus from Li to Cs c. Decrease in ionization energy from Li to Cs d. None of the above
- The general ground state configuration of the group IIA valence shell is _____. a. ns^1 b. ns^2 c. $ns^2 p^2$ d. $ns^1 p^1$
- Identify Y in the following equation: ${}_8^{16}\text{O} + {}_0^1\text{n} \rightarrow {}_{13}^{13}\text{C} + \text{Y}$ a. ${}_{-1}^0\text{e}$ b. ${}_2^4\text{He}$ c. ${}_1^1\text{H}$ d. ${}_0^0\text{Y}$
- Which of the following is an S-block element? a. Caesium b. Radium c. Barium d. Chromium
- Hybridization of the central atom in SF_6 leads to the formation of _____ shape. a. Tetrahedral b. Octahedral c. Pentahedral d. Collinear
- The anode in Downs cell is made of _____. a. Copper b. Iron c. Graphite d. Sodium
- ${}_{90}^{232}\text{Th}$ emits a total of six alpha particles and four beta particles in its natural decay sequences. What is the atomic number, mass number and symbol of the final product a. ${}_{78}^{208}\text{Pt}$ b. ${}_{84}^{212}\text{Po}$ c. ${}_{74}^{208}\text{W}$ d. ${}_{82}^{208}\text{Pb}$ # SUCCESS
- An example of physical means of separating an ore from unwanted rocky materials is a. Froth floatation b. Decantation c. Sedimentation d. Bath coagulation
- What is the pH of 0.0001M of HNO_3 ? a. 3 b. 4 c. 5 d. 2
- A weak acid has a _____. a. weak conjugate acid b. Strong conjugate base c. Strong conjugate acid d. Weak conjugate base
- Vitamin C has a pK_a value of 4.17, What is its K_a value? a. 4.53×10^{-6} b. 3.47×10^{-3} c. 2.1×10^{-4} d. 6.76×10^{-5}
- In an α -decay, the atomic number is reduced by _____ & mass number by _____. a. 3&4 b. 2&4 c. 4&2 d. 1&3
- Group II elements are called _____. a. Alkali metals b. Metalloids c. Alkali earth metals d. Halic metals
- Which of the following is used for making gunpowder a. NaOH b. KOH c. KNO_3 d. KCl
- 120g of the substances to decay to 10g. a. 2698s b. 6314s c. 5750s d. 6212s
- K metal burns in oxygen to form a. Normal oxides b. Super oxides c. Peroxides d. None of the above
- Which of these is better preserved under hydrocarbon solvent? a. Pb b. Sn c. Na d. Be

20. Predict the shape of CH_4 according to VSEPR theory. a. Octahedral b. Tetrahedral c. Trigonal d. Trigonal bipyramidal
21. The dissolution of alkali metals lead to evolution of _____. a. Steam b. Water vapour c. Hydrogen gas d. Carbon dioxide gas
22. Calculate the PH of a buffer solution that is 0.25 M in formic acid and 0.1 M in sodium formate (K_a for formic acid is 1.8×10^{-4}). a. 4.87 b. 3.35 c. 3.68 d. 4.77
23. Which of the rays has the highest ionizing effects? a. α -rays b. β -rays c. x-rays d. γ -rays
24. A process in which the nucleus of a heavy elements is split into two nuclei of nearly equal mass with release of energy is _____. a. Nuclear fission b. Nuclear fusion c. Thermo nuclear reaction d. Nuclear reaction
25. The presence of unpaired electron(s) is _____. a. Paramagnetic property b. Diamagnetic property c. Magnetic property d. Ferromagnetic property
26. How many d electrons can be found in Sc^{3+} . a. 5 b. 0 c. 2 d. 1
27. If a solution has a PH of 7.41. What is its $[\text{H}^+]$? a. $1.9 \times 10^{-8} \text{M}$ b. 9.3×10^{-6} c. 3.2×10^{-8} d. 3.9×10^{-8}
28. The relationship between PH, pK_a and $\log(\text{salt/acid})$ is known as _____. a. Ostwald equation b. Arrhenius equation c. Henderson-Hasselbach equation d. Brewsted-Lowry equation
29. Which of the following is a diprotic acid? a. CH_3COOH b. H_3PO_4 c. H_2SO_4 d. HCl
30. If a proton changes into a neutron, a _____ is emitted. a. positron b. β -rays c. electron d. γ -rays
31. The PH value of two equimolar solutions of two monoprotic acids A and B are 2 & 4 respectively. which is more acidic a. A b. B c. Both d. None of the above
32. _____ helps in the extraction of impurities during extraction of iron. a. Quick lime b. Aluminum c. Lime water d. Limestone
33. Which of the following is a metalloid? a. Carbon b. Lead c. Germanium d. Tin
34. The strength or degree of dissociation of 0.001M propanoic acid is (K_a for propanoic acid is 1.5×10^{-5}). a. 1.34×10^{-4} b. 1.8×10^{-4} c. 1.22×10^{-4} d. 1.96×10^{-3}
35. Which of the following compound of group II elements is covalent in nature? a. BeCl_2 b. MgCl_2 c. CaCl_2 d. None of the above
36. Which of the following method(s) can be used to purify pure metals like gold from their ores? a. Smelting b. Floatation c. Panning d. Hall-heroult
37. Which of the following group 1 elements can form nitride with nitrogen? a. Na b. Li c. K d. Cs
38. Which of the following is not a correct property of transition metals. a. Para magnetism b. Variable oxidation states c. Formation of complex ions d. None of the above
39. The bond angle in a trigonal bipyramidal molecule is _____. a. 180° b. 120° c. 109° d. 104°

40. The PH of a solution of HCl is 2, the amount of acid present in a litre of the solution is _____ a. 2g/l b. 3.65g/l c. 0.365g/l d. 36.5g/l
41. _____ is the hardest known allotropes of carbon .a. Graphite b. Diamond c. Fullerene d. None of the above
42. Which of the following pair crystallize with the same structure as a diamond? a. Si and Sn b. Si and Pb c. Si and Ge d. Ge and Sn
43. What type of sodium oxide is produced at limited temperature ? a. Na₂O b. Na₂O₂ c. NaO d. NaO₂
44. _____ is the number of donor groups of ligand that are co-ordinated .a. Ambidentate b. Denticity c. Polydentate d. Chelates
45. Gamma rays is neither deflected in a magnetic field because it is _____ a. Positive charge b. Negative c. Neutral d. None of the above
46. Sc³⁺ compound are colourless because of _____ a. Half filled electron b. Complete filled electron c. Absence of electron in their d orbital d. None of the above
47. Melting point _____ down a group .a. Decrease b. Increase c. Low d. Remain constant
48. The transition elements comprises group __ to __ a. 3,9 b. 2,10 c. 3,12 d. 2,4
49. _____ is used in atomic clock. a. Cs b. Rb c. K d. Ba
50. Which of the following is not a bronsted -Lowry concept? a. H₂O & HCl b. MgO & SO₃ c. NH₃ & HCl d. All of the above
51. Nitrites and thiol cyanate can co-ordinate a metal face to donate two or more atoms .They are known as _____ a. Monodentate b. Polydentate c. Homopletic d. Ambidentate
52. The most abundant compounds of iron -Fe₂O₃ is known as _____ a. Haematite b. Pyrite c. Ignite d. Rutile
53. _____ is the overlapping of two p atomic orbital to form molecular orbitals a) pi bond b) sigma bond c) dative bond d) co ordinate bond
54. _____ is the negative of base 10 logarithm of hydrogen ion concentration a) pOH b) pH c) kw d) H⁺
55. The concentration of H⁺ 1.5 × 10⁻⁶. Find the concentration of OH⁻ and state if it is acidic or base a) 6.67 × 10⁻⁹/acidic b) 2.3 × 10⁻⁹/ basic c) 6.67 × 10⁻⁹/basic d) 2.3 × 10⁻⁹/acidic
56. _____ causes fluorescence in anthracene a) α-rays b. γ-rays c. β-rays d. x-rays
57. _____ is an ore of aluminum .a. Haematite b. Rutile c. Bauxite d. Pyrite
58. Write the condensation form of the equation below ${}^9_4\text{Be} + {}^4_2\text{He} \rightarrow {}^{12}_6\text{C} + {}^1_0\text{n} + \gamma$ a. ${}^9\text{Be}(\alpha, n){}^{12}\text{C}$ b. ${}^{12}\text{C}(\gamma, n){}^9\text{Be}$ c. ${}^{12}\text{C}(\alpha, n){}^9\text{Be}$ d. ${}^9\text{Be}(\gamma, \beta){}^{12}\text{C}$
59. An elements with the electronic configuration [Ne]3s²3p⁴ belongs to _____ group and _____ block in the periodic table. a. vi & p b. v & s c. iv & d d. iv & p
60. The structure and hybridization of H₂O is _____ a. Bent, sp³ b. Trigonal, sp² c. Trigonal bipyramidal, sp³ d. None of the above

Handwritten signature or initials.

61. The PH of a solution at 25°C is 5.27 and it contains 0.1M of sodium acetate, what is the concentration of the acetic acid? (pKa for CH₃COOH = 4.75). a. 0.2 b. 0.3 c. 0.15 d. 0.03
62. Which of the following is a radioactive elements .a. Ca b. Na c. Ba d. Ra
63. What is the PH of the 0.1M of NaOH solution? a. 7 b. 0.8 c. 13 d. 8
64. _____ is an isotopes of carbon used in radioactivity. a. ¹⁴C b. ¹³C c. ¹⁵C d. ¹²C
65. Calculate the half life for an element to disintegrate with a decay constant of 1.24×10^{-4} a. 5570 b. 5730 c. 5589 d. 5370
66. _____ substances are molecules of ion that can behave both as bronsted-acid & base . a. Amphiprotic b. Monoprotic c. Heteroleptic d. None of the above
67. Nucleons are _____ a. Electrons +Neutrons b. Protons+Electrons c. Protons +Neutrons d. All of the above
68. _____ is the most abundance elements in group iv .a. Silicon b. Carbon c. Tin d. All of the above
69. _____ is an impure allotropes of carbon .a. Amorphous carbon b. Charcoal c. Graphite d. None of the above
70. The following are transition elements except _____ a. Scandium b. Yttrium c. Chromium d. None of the above

IMPOSSIBILITY
 IS NOTHING
 DOLA
 #SUCCESS
 FUNNABBSU
 001
 22

INFINIX HOTEL
ARTIST Ise BKUWA (a) COL PLANT UPS 10/11/14

1104/CHM 102

University of Agriculture, Abeokuta
College of Natural Sciences
Department of Chemistry
Time: 20mins

ITU BARRA

INSTRUCTIONS: SHADE THE CORRECT ANSWER ON THE SPACE PROVIDED ON THE BACK PAGE

Name: Agnes Akoko Ireda
Matric No: _____ Dept: _____

- Why are the elements in group IIA harder than those in group IA?
(A) strong ionic bonding in group IIA (B) strong polymerism in group IIA
(C) strong metallic bonding in group IIA (D) strong Grignard reagent equilibria in group IIA
- Why does the chemical reactivity of the elements in group IA increase from Li to Cs?
(A) decrease in ionization energy from Li to Cs (B) valence electron is farther away from the nucleus from Li to Cs (C) size of the element from Li to Cs (D) all are correct
- Li exhibit high covalent character as against the known ionic character of group IA elements due to...
(A) its very high charge density (B) its high negative standard potential (C) its high boiling point (D) its low density
- The general ground state configuration of the group IA valence shell is...
(A) ns^1 (B) ns^2 (C) ns^2p^2 (D) ns^2p^1
- Formation of M^2+ is difficult in group IA because of...
(A) High ionic bonding (B) large atomic radii in their period (C) high second ionization energy (D) high boiling point
- Oxides of alkali metals are different from alkali metals in that they...
(A) react vigorously with water (B) form hydroxides (C) are of higher reactivity (D) have a duller appearance
- What difference causes the slight chemical changes between groups IA and IIA elements?
(A) electron configuration (B) ionic character (C) intense radioactivity (D) none of the above
- A radioactive element decays with a rate constant of $4.0 \times 10^{-4} s^{-1}$. How long will it take for 120g of the substance to decay to 60%?
(A) 4023s (B) 2291s (C) 2698s (D) 1277s
- Calculate the energy released when 0.205amu of mass is lost in a nuclear reactor ($c=2.998 \times 10^8 ms^{-1}$, $1amu=1.66054 \times 10^{-27} kg$)
(A) $4.5 \times 10^{11} J$ (B) $3.1 \times 10^{14} J$ (C) $3.1 \times 10^{11} J$ (D) $1.5 \times 10^{17} J$
- Nucleons are
(A) Electrons + Neutrons
(B) Protons + Electrons
(C) Protons + Neutrons
(D) Protons + Electrons + Neutrons
- Identify Y in the following equation:
 ${}^{16}_8O + {}^1_0n \rightarrow {}^{13}_6C + {}^4_2He$
(A) ${}^0_{-1}e$ (B) 1_1H (C) 1_0n (D) ${}^0_0\gamma$
- If 9_4Be is bombarded by a neutron, which of the following products/emissions are formed?
(A) One deuterium and Three neutrons
(B) Three hydrogen and One helium
(C) Two helium and One deuterium
(D) One tritium, One deuterium, and one helium
- One of the following represents the electronic arrangement of silicon:
(A) $[Ne]3s^23p^2$ (B) $1s^22s^22p^63s^23p^1$
(C) $[Ar]4s^44p^1$ (D) $1s^22s^22p^2$
- Which of the following member of group IV can be referred to as a metalloid?
(A) Lead (B) Carbon (C) Germanium (D) Tin
- One of the following statements is NOT true about d block elements
(A) They are in the central block of the periodic table.
(B) There are three rows of elements of the periodic table.
(C) Each row contains ten metallic elements and (D) Their arrangement corresponds to the filling of s-orbital in these atoms.
- The electronic configuration of Chromium is
(A) $[Ar]3d^44s^1$
(B) $[Kr]3d^44s^2$
(C) $[Kr]3d^54s^1$
(D) $[Ar]3d^44s^1$
- Calculate the base-dissociation constants K_b for the F^- . Given that $K_a = 6.8 \times 10^{-4}$
(A) 5.6×10^{-10} (B) 1.5×10^{-11} (C) 3.8×10^{10} (D) 7.9×10^{-10}
- What is the pH of a buffer that is 0.12M in lactic acid [$HC_3H_5O_3$] and 0.10M in sodium lactate [$NaC_3H_5O_3$]? Given that K_a (lactic acid) = 1.4×10^{-4}
(A) 3.77 (B) 3.85 (C) 4.00 (D) 4.42
- Which of the following is a monoprotic acid
(A) H_2SO_4 (B) CH_3COOH (C) $NaHSO_3$ (D) H_3PO_4
- The pH of a 0.02M $Mg(OH)_2$ solution is
(A) 12.6 (B) 9.8 (C) 10.5 (D) 13.1
- Calculate the dissociation constant for nitrous acid ($K_b = 2.0 \times 10^{-11}$)
(A) 5.0×10^{-4} (B) 2×10^{-4} (C) 3.6×10^{-4} (D) 1.8×10^{-4}
- Vitamin C has a pK_a value of 4.17. What is its K_a value?
(A) 4.53×10^{-6} (B) 3.4×10^{-3} (C) 2.1×10^{-4} (D) 6.76×10^{-6}

DOLA

11
 $\alpha = 1.4 \times 10^{-4}$
 $pK_a = 4.17$
 $K_a = 10^{-4.17}$

Download more at Learnclax.com

<34> There is a depopulation of electron density in the region between the nuclei because of the overlap of the two valence orbitals

<35> SiCl_4 , PCl_5 , SiF_6^{2-} and PCl_3 are compounds which can be hydrolyzed by water to give strongly acidic solutions, which of these molecules possess the sp^3 hybrid orbital type?

<A> SiCl_4 and SiF_6^{2-} PCl_3 and PCl_5 <C> PCl_3 <D> SiCl_4 and PCl_5

<36> A radioactive element decays with a rate constant of $4.0 \times 10^{-4} \text{ s}^{-1}$. How long will it take for 120g of the substance to decay to 10g

<A> 4023s 5756s <C> 2698s <D> 6212s

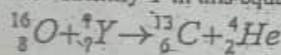
<37> _____ is defined as the energy required to separate a nucleus into individual nucleons.

<A> Binding Energy Radioactive Energy <C> Nuclear energy <D> Kinetic energy

<38> When an element undergoes radioactivity, it is said to undergo

<A> radioemission nuclear deformation <C> nuclear transformation <D> poly-nucleation

<39> Identify Y in this equation:



<A> ${}^0_{-1}\text{e}$ ${}^0_0\text{n}$ <C> ${}^1_1\text{H}$ <D> ${}^0_0\gamma$

<40> Identify Z in this equation: ${}^{238}_{92}\text{U} \rightarrow {}^Z_Z + 4{}^4_2\text{He}$

<A> ${}^{238}_{82}\text{Pb}$ ${}^{238}_{90}\text{Cm}$ <C> ${}^{234}_{90}\text{Th}$ <D> ${}^{234}_{92}\text{U}$

<41> Which of the following statement is incorrect?

<A> During a nuclear reaction one element may be converted either by radioactive decay or by atomic fission or fusion.

 Chemical reactions involve only the outer parts of atoms while nuclear reactions involve the nucleus

<C> Energy changes in chemical reactions are usually greater than those in nuclear reactions

<D> During chemical reactions, electrons are redistributed either by transfer from one atom to another or by sharing between atoms.

<42> Nuclear reactor uses _____

<A> Fission reactions Fusion reaction <C> Freezing reaction <D> Chemical reaction

<43> The following is not an application of radioisotopes;

<A> Sterilization of surgical equipments Treatment of cancer <C> To monitor underground leakages in pipes <D> To measure engine capacity

<44> One of following represents the electronic arrangement of silicon

<A> $[\text{Ne}]3s^2 3p^2$ $1s^2 1s^2 2p^6 3s^2 3p^1$ <C> $[\text{Ar}]4s^2 4p^2$ <D> $1s^2 2s^2 2p^6 3s^2 3p^2$

<45> The structure changes for Group IV elements is from

<A> giant molecular lattices in germanium only to giant metallic structure in tin and lead

 The structure changes from giant metallic structure in carbon and silicon to giant molecular lattices in tin and lead.

<C> The structure changes from giant molecular lattices in carbon and silicon to giant metallic structures in tin and lead.

<D> The structure changes from giant atomic lattices in carbon and silicon to giant molecular structure in tin and lead.

<46> The ability of carbon to catenate results from the fact that

<A> the C-C bond is stronger than the C-O bond

 the C-C bond is almost as strong as the C-O bond

<C> the oxidation of the silicon compounds to carbon dioxide and water, less energetically favorable than carbon

<D> they have ability to form stable compounds containing long chains and rings of carbon atoms

<47> One of the following is not a property of SnH_4 and PbH_4 :

<A> They have low melting points and boiling points

 They are gases at room temperature

<C> They are tetrahedral in shape

<D> They form volatile liquids at room temperature

<48> The structure of diamond is

<A> A three dimensional array of carbon atoms, each atom surrounded tetrahedrally by four other carbons.

 A two dimensional array of carbon atoms, each atom surrounded tetrahedrally by three other carbons.

<C> A three dimensional array of carbon atoms, each atom surrounded trigonally by four other carbons.

<D> A two dimensional array of carbon atoms, each atom surrounded trigonally by three other carbons.

<49> Group IV elements exhibit inert pair effect which is when

<A> the two electrons in the s-orbital are held more strongly by the increased positive charge in the p-orbital

 the two electrons each are removed from p and s orbital

<C> the two electrons is removed from p orbital, the remainder in the s-orbital are held more strongly by the increased positive charge in the s-orbital

<D> the one electron each is removed from p orbital and s-orbital the remainder are held more strongly by the increased positive charge.

<50> The first Ionization energy decrease greatly between carbon and silicon but decreases very little for the other elements because

13

<A> there is a larger decrease in nuclear charge due to the filling of 'd' and 'f' orbital which counterbalances the decrease in atomic radii.
 there is a larger increase in number of electrons due to the presence of 'd' and 'f' orbital which counterbalances the decrease in atomic radii.
 <C> there is a larger increase in number of electrons due to the filling of 's' and 'p' orbital which counterbalances the increase in atomic radii.
 <D> there is a larger increase in nuclear charge due to the filling of 'd' and 'f' orbital which counterbalances the increase in atomic radii.

<51> Which of the following pair crystallize with the same structure as diamond?
 <A> Si and Sn Si and Pb <C> Si and Ge <D> Ge and Sn

<52> Li metal burns in oxygen to form
 <A> normal oxide peroxide <C> superoxide <D> mixture of normal oxide and superoxide

<53> A temperature controlled oxidation of sodium metal at 180°C produces what type of sodium oxide?
 <A> Na₂O Na₂O₂ <C> NaO₂ <D> Na₂O₄

<54> Na₂O₂ reacts with water to give
 <A> NaOH and H₂O₂ only NaOH, H₂O₂ and O₂ <C> NaOH and O₂ only <D> NaOH and H₂ only

<55> Metals in group IIA reacts with oxygen to form oxides at room temperature except
 <A> Li Be <C> Ca <D> Mg

<56> Magnesium reacts with boiling water or steam to form
 <A> Mg(OH)₂ and H₂ Mg(OH)₂ only <C> MgO + H₂ <D> no reaction

<57> Which of the following metals can form nitrides with nitrogen?
 <A> Li Na <C> K <D> Cs

<58> CaO is commonly used in the following processes except
 <A> Drying of ammonia removal of impurities of slag in metallurgical processes <C> Isolation of Mg from sea water <D> None of the above

<59> Which of the following is not an s block element?
 <A> Francium Cesium <C> Strontium <D> Germanium

<60> Which of these is better preserved under hydrocarbon solvent?
 <A> Pb Sn <C> Na <D> Be

<61> Which of the following is not a transition metal?
 <A> Pb Fe <C> V <D> Co

<62> Which of the following is the correct electronic configuration of Cr?
 <A> [Ar]3d⁴4s² [Ar]3d⁵4s¹ <C> [Ar]3d⁵4s² <D> [Ar]3d⁶4s⁰

<63> Which of the following is not a correct property of transition metals
 <A> They are paramagnetic They have catalytic nature <C> They possess only one single oxidation state <D> They are capable of forming coloured compounds

<64> Which of the following is not a correct property of group IA metals?
 <A> they are strong oxidizing agent They have low melting point <C> They are soft, malleable and ductile <D> They are good conductors of electricity

<65> Which of the following metals does not react vigorously with water?
 <A> Al Na <C> K <D> Cs

<66> _____ is an oxide of group IA that is used in space capsule, submarine and some other self-contained breeding equipment to absorb exhaled CO₂ and H₂O with the release of O₂.
 <A> KO₂ Na₂O₂ <C> MgO <D> NaOH

<67> Superoxides of group IA metals reacts with acids at 0°C to produce
 <A> Metal halide and H₂O₂ Metal halide and H₂O <C> Metal halide, H₂O₂ and O₂ <D> metal hydroxide, H₂O₂ and O₂

<68> Which of the following is deliquescent?
 <A> KNO₃ NaNO₃ <C> H₂SO₄ <D> Ca(OH)₂

<69> The structure and hybridization of SiCl₄ is
 <A> bent, sp tetrahedral, sp³ <C> octahedral, sp³d <D> trigonal planar, sp²

<70> Identify X in this equation:
 $^{14}_7\text{N} + ^4_2\text{He} \rightarrow ^A_Z\text{X} + ^1_1\text{H}$
 <A> $^{17}_9\text{F}$ $^{17}_8\text{O}$ <C> $^{18}_9\text{F}$ <D> $^{18}_8\text{O}$

Handwritten notes and chemical equations:
 $\text{Na}_2\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2\text{O}_2$
 $\text{H}_2\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{O} + \text{H}_2\text{O}_2$
 $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$
 $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2$
 $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
 $\text{C} + \text{H}_2\text{O} \rightarrow \text{CO} + \text{H}_2$

Trigonal bipyramidal Tetrahedral Trigonal Planar Octahedral

20. Elements X exists as an oxide ore which is normally stable and requires high temperature for its extraction. In order to minimize thermal cost and reduce the risk of explosion, suggest the best possible extraction method for this element.
 Carbon reduction Electrolysis Reduction by magnesium Bayer process

21. Which of these elements can not be suitably extracted by electrolytic reduction method; Na, Mn, Al, Mg, Sn and Cu?
 Na and Mn Mg, Al and Mg Mg, Sn and Cu Mn and Sn

22. Liquid ammonia can autoassociate according to the equilibrium below:



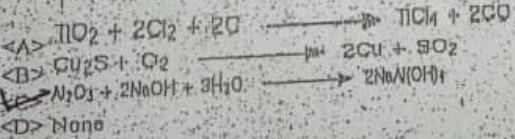
Predict the molecular structures of the ammonium ion in the equilibrium.
 Tetrahedral Pyramidal Planar Bent

23. Electrolytic reduction method for metal extraction gives pure product, in which electrode compartment does reduction occur?
 Anode Anode and cathode Cathode None

24. Given a rutile ore, carefully select the most applicable extraction method and mention the metal that can be extracted from it.
 Reduction using more reactive element/Ti Carbon reduction/Fe Reduction by electrolysis/Al Reduction by magnesium/Ag

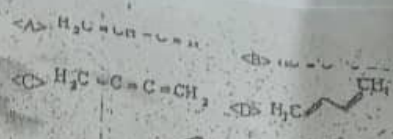
25. In the extraction of iron from iron ore using a blast furnace, what is the main reducing agent in this furnace?
 carbon carbon dioxide lime stone carbon monoxide

26. Which of these equations represent the first step of Bayer process?



27. In choosing a method of reduction for a particular ore, the following factors must be considered except
 The cost of the reducing agent energy costs
 Atomic weight of reducing agent The desired purity of the metal

28. Which of the following represents the given mode of hybridization $sp^3 - sp^2 - sp - sp$ from left to right?



29. In piperidine, the hybrid state assumed by N is
 sp^3 sp^2 sp sp^1

30. In the electrolysis of aluminium oxide, why does the anode need to be replaced regularly?
 The aluminium oxide is electrolyzed in solution in molten cryolite
 regular anodic replacement will allow the produced aluminium anodized

31. In the electrolytic process, to produce 1 mole of aluminium which only weighs 27 g, 3 moles of electrons is required
 at the temperature of the cell, the carbon anodes burn in the oxygen which is initially produced at the anode to give carbon dioxide and carbon monoxide

31. Suggest a reason why the blast furnace can not be used to make aluminium?
 Pure form of the product will be difficult to attain
 the temperatures needed are too high to be economic

32. Aluminium is too brittle
 It is only designed for extraction of iron

32. Give reason why titanium can not be extracted by reducing the ore using carbon as a cheap reducing agent?
 titanium forms carbide if it is heated with carbon
 Traces of oxygen or nitrogen in the titanium tend to make the metal brittle

33. High temperatures are needed in both stages of the reaction.
 titanium is produced by reacting titanium(IV) chloride only after its conversion from its oxide.

33. The carbon-carbon triple bond consists of:
 two sigma bond and one pi bond
 one sigma bond and two pi bonds
 two sigma bond and two pi bonds
 one sigma bond and one pi bond

34. All of the following are correct except:
 A valence orbital on one atom occupies a portion of the same region of space as a valence orbital on the other which is referred to as orbital overlap
 Orbitals bond in the direction in which they protrude or point, to obtain maximum overlap.
 The total number of electrons in the overlapped orbitals is no more than two, and they must have opposite spins

415 k, Mg, Ca, Ag, Al

Infinix HOT 6

UNIVERSITY OF AGRICULTURE, ABEOKUTA
2003/2004 SECOND SEMESTER EXAMINATION
DEPARTMENT OF CHEMISTRY

CHM 104: INTRODUCTORY INORGANIC CHEMISTRY

TIME: - - HR.

1. There are three types of carbides --- and ---
- (a) Metallic, Salt like, and ionic
 - (b) Interstitial, Metallic and Ionic
 - (c) Covalent, interstitial and Salt like
 - (d) Ionic, electrovalent, and Metallic
2. Diamond is colourless and utilizes ----- hybrid orbitals to form bond.
- (a) sp^2 (b) s (c) sp (d) sp^3
3. Graphite forms a ----- sheet like polymeric structure.
- (a) Two-dimensional (b) Five-dimensional
 - (c) Four-dimensional (d) Three-dimensional
4. Carbon dioxide gas (CO_2) is detected by its reaction on lime water and Baryta-water which are represented as ----- and -----
- (a) $Ca(OH)_2$ and $Ba(OH)_2$
 - (b) $Ba(OH)_2$ and $Ca(OH)_2$
 - (c) $Ca(OH)_2$ and $BaCO_3$
 - (d) $Ca(OH)_2$ and $Ba(OH)_2$
5. The oxides of carbon differ from other elements because they contain multiple bonds between C and O.
- (a) $\sigma\pi - \pi\pi$ (b) $\sigma - \pi\pi - \pi\pi$
 - (c) $\pi\pi - \pi\pi$ (d) $\pi\pi - \pi\pi$
6. Carbon monoxide is a poisonous gas, sparingly soluble in water and formed by the following equation. -----
- (a) $HCOOH_2 + HSO_3 \rightarrow CO + H_2O$
 - (b) $H_2COO + HSO_3 \rightarrow CO + H_2O$
 - (c) $HCOOH + H_2SO_4 \rightarrow CO + H_2O$
 - (d) $H_2COOH + HSO_4 \rightarrow CO + H_2O$
7. The tetrahalides are tetrahedral, volatile and covalent except ----- and -----
- (a) SnF_4 and PbF_4
 - (b) PbF_2 and SnF_2
 - (c) SnF_3 and PbF_3
 - (d) PbI_2 and SnF_4
8. Carbon differs from the other elements in its limitation to a coordination number of four because there are no ----- in the second shell.
- (a) f -orbital (b) d -orbital
 - (c) s -orbital (d) p -orbital
9. The electronic structure of lead (Pb) is -----
- (a) $(Ar)3d^{10}4s^24p^2$
 - (b) $(Kr)4d^{10}5s^15p^2$
 - (c) $(Xe)4f^{14}5d^{10}6s^26p^2$
 - (d) $(Kr)4d^{10}5s^25p^2$
10. The alkali earth elements burn in nitrogen and form nitrides as -----
- (a) M_2N_2 (b) M_3N_2 (c) M_3N_4
 - (d) M_3N_2
11. All metals combine with the halogens at an appropriate temperature forming halides.
- (a) M_2X_2 (b) M_3X_2 (c) XM_2
 - (d) MX_2
12. Lithium aluminium hydride is -----
- (a) A reductant
 - (b) A strong oxidizing agent
 - (c) A strong reducing agent
 - (d) All of the above
13. The solubility of the sulphate in water decreases down the group as follows.
- (a) $Be > Sr > Mg > Ca > Ba$
 - (b) $Be > Ba > Sr > Mg > Ca$
 - (c) $Ba > Ca > Sr > Mg > Be$
 - (d) $Be > Mg > Ca > Sr > Ba$
14. The hydrated energies of the ions are four or five times greater than the group I elements because of their ----- and -----

D.O.H.A

FREEZING MAN!

Download more at Learnclax.com

25. Lewis acids and bases are
 (a) electron-pair donor & acceptors respectively
 (b) electron-pair acceptor & donor respectively, (c)
 proton donor & acceptor respectively (d) proton
 acceptor & donor respectively.
26. A weak base has a
 (a) weak conjugate acid (b) weaker conjugate acid
 (c) strong conjugate acid (d) All of the above
27. The apparatus used in measuring the pH of a given
 solution is (a) Speedometer (b) Potentiometer
 pH meter (d) Barometer.
28. Two hypothetical acids HA and HD have the
 dissociation constants 1×10^{-3} and 1×10^{-4} respectively
 in water at 25°C . Calculate the strength of HA with
 respect to HD.
 (a) 1 (b) 10^3 (c) 100 (d) 15
29. At 25°C , the value of K_w for pure water is 1.0×10^{-14} .
 What is the value of pH ?
 (a) 10^{-14} (b) 10^{-7} (c) 14 (d) 7
30. Calculate the pH of 0.1M NH_3 solution (K_b for
 $\text{NH}_3 = 1.8 \times 10^{-5}$)
 (a) 11.13 (b) 12.60 (c) 13.80 (d) 10.35
31. A solution which maintains its pH fairly constant
 even upon the addition of small amount of acid or
 base is
 (a) an indicator (b) a neutral solution (c) a buffer
 solution (d) an acidic solution
32. Which of the following is a monoprotic acid?
 (a) H_2SO_4 (b) CH_3COOH (c) H_3PO_4 (d) H_2SO_3
33. If a proton changes into a neutron, a -----
 emitted
 (a) positron (b) electron (c) β -rays (d) γ -rays
34. The application of nuclear chemistry, includes all
 these except
 (a) medical production (b) sterilization (c)
 dating technique
35. Balance all these nuclear reactions:
 ${}^1_1\text{H} + {}^1_0\text{n} \rightarrow {}^2_1\text{H} + \gamma$
 (a) ${}^1_1\text{P}$ (b) ${}^1_1\text{H}$ (c) ${}^2_1\text{He}$ (d) ${}^1_0\text{n}$
36. ${}^{60}_{29}\text{Cu} \rightarrow {}^{60}_{28}\text{Ni} + \gamma + \text{e}^-$
 (a) ${}^{60}_{29}\text{K}$ (b) ${}^{60}_{28}\text{K}$ (c) β -particles (d)
 α -particles
37. The dissolution of alkali metal in water gives
 (a) acidic solution (b) alkaline solution (c) neutral
 solution (d) none of the above
38. The pH of 0.10M NaOH solution is (a) 7 (b) 12
 (c) 13 (d) 8

39. If a solution has a pH of 3.50 at 25°C , what is its
 $[\text{OH}^-]$?
 (a) 8.50M (b) 8.50M (c) $2.3 \times 10^{-9}\text{M}$ (d) $2 \times 10^{-9}\text{M}$
40. The pH value of two equimolar solutions of two
 monoprotic acids A and B are 2 and 4 respectively.
 Which is more acidic?
 (a) A (b) B (c) Both (d) C
41. The pH of a solution of HCl is 2; the amount of
 acid present in a litre of the solution is
 (a) 2g/L (b) 36.5g/L (c) 0.365g/L (d) 365g/L
42. The pH of a 0.02M H_2SO_4 solution is (a) 8.2
 (b) 9.8 (c) 10.3 (d) 12.6
43. Which of the following pair is NOT a Brønsted-
 Lowry acid and base
 (a) HCl & NH_3 (b) H_2O & HCl (c) H_2O & SO_2 (d)
 Cl_2 , COOH & H_2O
44. What is the pH of 0.001M HCl
 (a) 1 (b) 2 (c) 3 (d) 0
45. If a solution has a pH of 7.41, what is its $[\text{H}^+]$?
 (a) $3.9 \times 10^{-8}\text{M}$ (b) $3.9 \times 10^{-8}\text{M}$ (c) $3.2 \times 10^{-8}\text{M}$ (d) 6.2
 $\times 10^{-8}\text{M}$
46. A solution at 25°C contains 0.10M Sodium acetate
 and 0.01M acetic acid, what is its pH? ($\text{p}K_a$ for
 $\text{CH}_3\text{COOH} = 4.75$)
 (a) 6.0 (b) 5.09 (c) 4.21 (d) 4.50
47. The relationship between pH, $\text{p}K_a$ and \log
 $\frac{[\text{salt}]}{[\text{acid}]}$ is known as
 (a) Ostwald equation (b) Henderson-Hasselbalch
 equation (c) Brønsted-Lowry equation (d)
 Arrhenius equation
48. Calculate the concentration of sodium formate that
 must be present in a 0.10M solution of formic acid to
 produce a pH of 3.80 (K_a for formic acid is 1.8×10^{-4}).
 (a) 0.226M (b) 0.066M (c) 0.380M (d) 0.13M
49. Arrhenius concept of acid and base did NOT
 recognize one of the following ions.
 (a) H_3O^+ (b) H^+ (c) OH^- (d) All of the above
50. The hydrogen ion concentration of a solution is 2.5
 $\times 10^{-3}\text{M}$. What is its pH?
 (a) 2.60 (b) 5.96 (c) 5.45 (d) 4.77
51. Conditions necessary for the reaction below are:
 $\text{TiCl}_4 + 4\text{Na} \rightarrow \text{Ti} + 4\text{NaCl}$
 (a) Ar, 600°C (b) H_2 at 600°C (c) Al at 800°C (d) Ar 850°C

Handwritten notes and calculations:

$\text{pH} = 3.50$
 $[\text{H}^+] = 10^{-3.50} = 3.16 \times 10^{-4}\text{M}$
 $[\text{OH}^-] = \frac{10^{-14}}{3.16 \times 10^{-4}} = 3.16 \times 10^{-11}\text{M}$

$\text{pH} = 2$
 $[\text{H}^+] = 10^{-2} = 0.01\text{M}$
 $[\text{OH}^-] = 10^{-12}\text{M}$

$\text{pH} = 7.41$
 $[\text{H}^+] = 10^{-7.41} = 3.9 \times 10^{-8}\text{M}$

$\text{pH} = 3.80$
 $[\text{H}^+] = 10^{-3.80} = 1.58 \times 10^{-4}\text{M}$

$\text{pH} = 3.80$
 $\text{p}K_a = 4.75$
 $\text{pH} = \text{p}K_a + \log \frac{[\text{salt}]}{[\text{acid}]}$
 $3.80 = 4.75 + \log \frac{[\text{salt}]}{0.10}$
 $\log \frac{[\text{salt}]}{0.10} = 3.80 - 4.75 = -0.95$
 $\frac{[\text{salt}]}{0.10} = 10^{-0.95} = 0.112$
 $[\text{salt}] = 0.112 \times 0.10 = 0.0112\text{M}$

$\text{pH} = 3.80$
 $\text{p}K_a = 4.75$
 $\text{pOH} = 14 - 3.80 = 10.20$
 $[\text{OH}^-] = 10^{-10.20} = 6.3 \times 10^{-11}\text{M}$

$$\ln\left(\frac{N_0}{N}\right) = kt$$

- (a) Smaller size and decreased charge
- (b) Bigger size and decreased charge
- (c) Smaller size and increased charge
- (d) Bigger size and increased charge

Alkali metals replace hydrogen in organic acids forming salts such as --- and ---

- (a) CH_3COONa and $\text{C}_6\text{H}_5\text{COOK}$
- (b) CH_3CONa and $\text{C}_6\text{H}_5\text{COOK}$
- (c) CHCOONa and $\text{C}_2\text{H}_5\text{COOK}$
- (d) CH_3COONa and $\text{C}_2\text{H}_5\text{COOK}$

When the metals of group I elements are burnt in air lithium and sodium form --- and ---

- (a) Li_2O and Na_2O
- (b) Li_2O and Na_2O_2
- (c) Li_2O_2 and Na_2O_2
- (d) LiO and NaO

--- metals are typically soft, highly reactive, univalent and forms colourless ionic compounds

- (a) Group II
- (b) Group I
- (c) Group IV
- (d) Group III

Artificially produced radioactive isotope decomposes according to the first order rate law with a half-life period of 270 min. How long will it take for 60% of the sample to disappear?

- (a) 95 hrs
- (b) 4.5 hrs
- (c) 0.95 hrs
- (d) 5.4 hrs

Decomposition of a compound follows first order rate law with a rate constant equal to $5.37 \times 10^{-3} \text{ hr}^{-1}$. In what time will 80% of the sample to degrade completely.

- (a) 500 hrs
- (b) 25 hrs
- (c) 50 hrs
- (d) 5 hrs

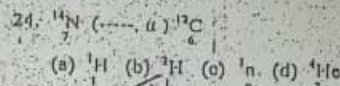
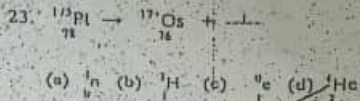
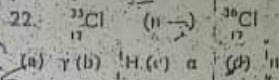
In the nucleus of a ^{209}Bi atom captures an α particle and the product undergoes beta decay, the product is

- (a) ^{210}Po
- (b) ^{209}Pb
- (c) ^{209}Bi
- (d) ^{210}Bi

Identify the unknown in equations 21-24

- (a) ^{40}Ar
- (b) ^{40}Ca
- (c) ^{41}K

None of the above



25. The half-life of ^{13}N is 10.1 min. Starting with 1000 atoms of ^{13}N , how many atoms would remain after 1 hr?
 (a) 1 atom (b) 16 atoms (c) 162 atoms (d) 2 atoms

26. When nuclear fission occurs,
 (a) A great deal of energy is gained
 (b) A great deal of energy is released
 (c) Electricity is generated
 (d) α particles are emitted

27. The compound ZnSO_4 is white, because
 (a) ZnSO_4 compound is naturally white
 (b) It is not possible to promote electrons within the d-orbitals in Zn^{2+} as it is full.
 (c) Electrons are easily promoted in d-orbitals of Zn^{2+}
 (d) It is not possible to promote electrons within the d-orbitals in Zn^{2+} as it is empty.

28. Transition metals form a large number of complexes because of
 (a) the possession of catalytic ability
 (b) the presence of completely filled orbitals
 (c) the presence of vacant orbitals which can accept electrons from donors
 (d) None of the above.

Handwritten: D.O.A

$$0.693 / 270$$

$$0.693 \times 10$$

$$N_0 = 1000$$

$$N = 1000 \times e^{-5.37 \times 10^{-3} \times 60}$$

$$N = 1000 \times e^{-0.3222} = 1000 \times 0.724 = 724$$

$$0.693 / 10.1 = 0.0686$$

$$\ln\left(\frac{N_0}{N}\right) = kt$$

$$\ln\left(\frac{1000}{N}\right) = 0.0686 \times 60$$

$$\ln\left(\frac{1000}{N}\right) = 4.116$$

$$\frac{1000}{N} = e^{4.116} = 60.9$$

$$N = \frac{1000}{60.9} = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

$$N = 16.4$$

UNIVERSITY OF AGRICULTURE, ABEOKUTA
2002/2003 SECOND SEMESTER EXAMINATION
DEPARTMENT OF CHEMISTRY

CHM 104 (INTRODUCTORY INORGANIC CHEMISTRY) TIME: 1 1/2 HOURS

INSTRUCTIONS: Answer ALL Questions

CAT: QUESTIONS 1-15

1. Which of these statements is true?
 - (A) Ionization energy increases down the group
 - (B) Ionization energy increases across the period
 - (C) Metallic radii increases across the periodic
 - (D) Na^+ is bigger than Na

2. Group I elements form ionic compounds because the heat of formation is
 - (A) Partially positive
 - (B) Partially negative
 - (C) Positive
 - (D) Negative

3. Carbides are _____ and _____
 - (A) ionic, interstitial and covalent
 - (B) Non-metallic, interstitial and electrovalent
 - (C) Metallic, interstitial and covalent
 - (D) ionic, Non-metallic and covalent

B O L A

4. An element with the electronic configuration $[\text{Ne}] 3s^2 3p^4$ belongs to _____ group and _____ block in the periodic table.
 - (A) VI and p
 - (B) VI and s
 - (C) IV and p
 - (D) IV and s

5. The transition metals are paramagnetic due to:
 - (A) The presence of completely filled d-orbitals
 - (B) The ability to form both covalent and metallic bonds
 - (C) The ability to attract iron filings
 - (D) The presence of unpaired electrons in their ions.
 - (E) None of the above.

15, 18
218

6. The first ionization energy of Phosphorus is higher than that of sulphur because:
 - (A) 3p orbital in Sulphur is half filled
 - (B) 3p orbital in Phosphorus is fully filled
 - (C) 3p orbital in Phosphorus is half filled
 - (D) 3s orbital in Phosphorus is half filled

15 15 3p

7. All these: Zn, Co, Fe and Ar are d-block elements except _____
 - (A) Fe
 - (B) Zn
 - (C) Co
 - (D) Ar

8. A triple bond involves sharing _____ electrons
 - (A) 16
 - (B) 6
 - (C) 4
 - (D) 8

6

9. The oxides of carbon differ from those of the other elements because they contain
 (A) $pi - pi$ multiple bonds (B) $\sigma\pi - \sigma\pi$ multiple bonds (C) $pi - pi$ single bonds
 (D) $\sigma\pi - \sigma\pi$ single bonds
10. The transition metals exhibit variable oxidation states except:
 (A) Vanadium (B) Iron (C) Cobalt (D) Zinc (E) Nickel
11. Carbondioxide is _____
 (A) An amphoteric oxide (B) An acidic oxide (C) A basic oxide (D) Neutral
12. The oxidation states of Germanium and carbon are _____ and _____
 (A) II, III and IV (B) II, IV and II (C) II, IV and IV (D) II, IV and I
13. The rate of reaction in the hydrogenation of unsaturated hydrocarbons is enhanced as catalyst:
 (A) Iron (B) Vanadium (C) Molybdenum (D) Nickel (E) Zinc
14. The metals in the first transition row are white except:
 (A) Sodium (B) Iron (C) Copper (D) Titanium
 (E) Zinc
15. The first row transition metals have stronger metallic bonding than the s-block elements because:
 (A) They are paramagnetic
 (A) They are malleable
 (B) They have variable oxidation states
 (C) The d-electrons take part in the bonding
 (E) Their outermost electrons form the metallic bond.

#SUCCESS

EXAMINATION QUESTIONS 1 - 35

1. Arrange the following in the order of increasing size. $Al, Al^{1+}, Al^{2+}, Al^{3+}$
 (A) $Al^{2+} > Al^{3+} > Al^{1+} > Al$
 (B) $Al^{3+} > Al^{2+} > Al^{1+} > Al$
 (C) $Al^{1+} < Al^{2+} < Al^{3+} < Al$
 (D) $Al > Al^{3+} > Al^{2+} > Al^{1+}$
2. _____ states that electrons will enter the possible orbital in the order of a energy.
 (A) Hund's (B) Pauli (C) Bohr (D) Aufbau
3. The atomic numbers of Beryllium and Barium are _____ and _____
 (A) 4 and 56 (B) 4 and 46 (C) 4 and 66 (D) 4 and 36

7

2

Identify the element with a doubly charged positive ion of electronic configuration $2p^6 3s^2 3p^4 3d^2$

- (A) Scandium (B) Sodium (C) Copper (D) Titanium

What is the maximum number of electrons in the orbital that has the following quantum numbers ($n=3, l=0, m=0$)?

- (A) 4 (B) 2 (C) 1 (D) 6

The s orbital has a _____ shape

- (A) Spherical (B) Tetrahedral (C) Dumb bell (D) Oval

Lithium liberates more energy than others when it reacts with water because of _____ and _____

- (A) Low hydration energy and standard electrode potential
 (B) High hydration energy and standard electrode potential
 (C) Low hydration energy and low electrode potential
 (D) High hydration energy and High electrode potential

The electronic structures of Radium and Strontium are _____ and _____

- (A) $[Xe] 6s^2$ and $[Ar] 4s^2$ (B) $[Rn] 7s^2$ and $[Ar] 4s^2$
 (C) $[Kr] 5s^2$ and $[Xe] 6s^2$ (D) $[Rn] 7s^2$ and $[Kr] 5s^2$

Grignard reagent is formed as follows

- (A) $Mg + C_2H_5Cl \rightarrow C_2H_5MgCl$
 (B) $Mg + C_2H_5OCl \rightarrow CH_3MgCl + CH_2$
 (C) $Mg + CH_3OCl \rightarrow CH_3MgCl + \frac{1}{2}O$
 (D) $Mg + CH_3H \rightarrow C_2H_5Mg$

Which of these would have the highest first ionization energy?

- (A) $1s^2 2s^2$ (B) $1s^2 2s^2 2p^6$ (C) $1s^2 2s^2 2p^3$ (D) $1s^2 2p^2$

What is the half life of the decay of ^{14}C for which the rate constant is $1.244 \times 10^{-4} \text{ yr}^{-1}$

- (A) 7045 yrs (B) 5750 yrs (C) 5570 yrs (D) 4055 yrs (E) 7550 yrs

Predict the shape of PCl_5 according to VSEPR

- (A) Trigonal (B) Trigonal bipyramidal (C) Octahedral (D) Linear

The half life of ^{125}Ag is 4.5 hrs. How long will it take for 60% of a sample to disappear

- (A) 950 hrs (B) 5.95 hrs (C) 450 hrs (D) 590 hrs (E) 509 hrs

Handwritten calculations for question 13:

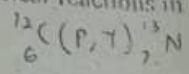
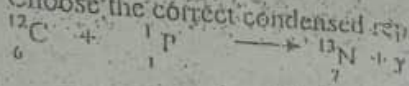
$$k = \frac{0.693}{4.5} = 0.154 \text{ hr}^{-1}$$

$$\ln \frac{N_0}{N} = kt$$

$$\ln \frac{100}{40} = 0.154 \times t$$

$$t = \frac{\ln(2.5)}{0.154} = 3.3 \text{ hrs}$$

14. Choose the correct condensed representation of the nuclear reactions in questions



- (A) ${}^{12}_6\text{C}(\gamma, \text{p}){}^{13}_6\text{C}$ (B) ${}^{13}_7\text{N}(\text{p}, \gamma){}^{12}_6\text{C}$

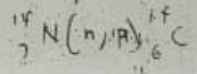
- (C) ${}^{12}_6\text{C}(\text{p}, \gamma){}^{13}_7\text{N}$ (D) ${}^{12}_6\text{C}(\text{n}, \gamma){}^{13}_7\text{N}$

- (E) ${}^{13}_7\text{N}(\text{p}, \gamma){}^{12}_6\text{C}$

DOA



- (A) ${}^{14}_7\text{N}(\text{n}, \text{p}){}^{14}_8\text{O}$ (B) ${}^{14}_7\text{N}(\alpha, \text{p}){}^{17}_8\text{O}$ (C) ${}^{14}_7\text{N}(\text{n}, \alpha){}^{16}_8\text{O}$
 (D) ${}^{14}_7\text{N}(\text{p}, \alpha){}^{17}_8\text{O}$ (E) ${}^{14}_7\text{N}(\gamma, \text{n}){}^{17}_8\text{O}$



- (A) ${}^{14}_7\text{N}(\alpha, \text{p}){}^{14}_6\text{C}$
 (B) ${}^{14}_7\text{N}(\text{n}, \text{p}){}^{14}_6\text{C}$
 (C) ${}^{14}_7\text{N}(\text{p}, \alpha){}^{14}_6\text{C}$
 (D) ${}^{14}_7\text{N}(\gamma, \text{p}){}^{14}_6\text{C}$
 (E) None of the above

DOA

17. A bond formed by electron sharing between non-metal elements is called
 (A) Electrovalent (B) Covalent (C) Hydrogen (D) Metallic

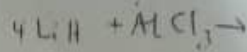
18. Which of these molecules, CH_4 , NH_3 , H_2O and CO_2 has the highest bond angle?
 (A) NH_3 (B) H_2O (C) CH_4 (D) CO_2

19. Identify the element with an excited state of: $1s^2 2s^2 2p^5 3s^1$
 (A) Neon (B) carbon (C) Argon (D) Sodium

20. Beryllium hydroxide is
 (A) BeOH_2 (B) $\text{Be}(\text{OH})_2$ (C) BeO_2H_2 (D) $\text{Be}(\text{OH})_2$

21. Which of the following statements is true?
 (A) Alpha rays are neutral while beta rays are positive
 (B) Gamma rays are positive while beta rays are negative.
 (C) Alpha rays are positive while gamma rays are neutral.
 (D) Alpha rays are positive while gamma rays are negative.
 (E) None of the above.

9



- (C) Paired, paramagnetic and coloured
 (D) Unpaired, paramagnetic and coloured

32. What is the product of this equation: $4LiH + AlCl_3 \rightarrow$?

- (A) $Li(AlH_4) + 3LiCl$ (B) $Li(AlH_4) + 2LiCl$
 (C) $Li(AlH_4) + Li_2Cl_2$ (D) $Li(AlH_4) + LiCl$

33. The right order for the conductivity measurements is _____ in aqueous solution

- (A) $Cs^+ > K^+ > Rb^+ > Li^+ > Na^+$ (B) $Cs^+ > Li^+ > K^+ > Na^+ > Rb^+$
 (C) $Cs^+ > Rb^+ > K^+ > Na^+ > Li^+$ (D) $Li^+ > K^+ > Cs^+ > Rb^+ > Na^+$

34. The decrease in the melting point on descending the group IV is because _____

- (A) M-M bond becomes weaker as the size increases
 (B) M-M bond becomes stronger as the size increases
 (C) M-M bond becomes weaker as the size decreases
 (D) M-M bond becomes stronger as the size decreases

35. ^{238}U has a half-life of 5.3×10^7 yrs. What is the rate constant for the process of the decay.

- (A) $1.54 \times 10^{-10} \text{ yr}^{-1}$ (B) $1.308 \times 10^{-8} \text{ yr}^{-1}$ (C) $2.51 \times 10^{-9} \text{ yr}^{-1}$
 (D) $3.45 \times 10^{-11} \text{ yr}^{-1}$ (E) $1.36 \times 10^{-7} \text{ yr}^{-1}$

Handwritten Notes:

$N = \text{avogadro no.} \times \text{mass} / \text{molar mass}$

$N = 2.53 \times 10^{21}$

$N = \frac{6.02 \times 10^{23}}{238}$

$N = 2.53 \times 10^{21}$

$k = \frac{0.693}{t_{1/2}}$

$k = \frac{0.693}{5.3 \times 10^7}$

$k = 1.31 \times 10^{-8} \text{ yr}^{-1}$

$D = kN$

$D = 1.31 \times 10^{-8} \times 2.53 \times 10^{21}$

$D = 3.31 \times 10^{13} \text{ yr}^{-1}$

THE WILL TO END A JOURNEY SUCCESSFULLY IS GREATER THAN THE WILL THAT STARTED IT.

I BELIEVE IN YOU.

YOU CAN AND YOU WILL..... IMPOSSIBILITY IS NOTHING

STAY STRONG STAY DETERMINED

STAY INSPIRED STAY POSITIVE

THINK D'OLA THINK FUNAABSU 001

LET'S MAKE A NOBLE HISTORY TOGETHER

THINK GREATNESS THINK YOURSELF