



FACULTY OF SCIENCE

DEPARTMENT OF CHEMICAL SCIENCES

B Eng Tech in Engineering Metallurgy / Extraction Metallurgy

MODULE CETM1A1

CAMPUS DFC

MAJOR TEST 1

DATE: 10/05/2021

SESSION: 08H00 – 10:30

ASSESSOR

Dr. MC FOTSING

INTERNAL MODERATOR

MR P.P MONAMA

DURATION 180 MINUTES

TOTAL MARKS 80

NUMBER OF PAGES: 4 PAGES, INCLUDING 1 ANNEXURE

INSTRUCTIONS: ANSWER ALL QUESTIONS IN THE ANSWER SCRIPT PROVIDED.

**GIVE ALL NUMERICAL ANSWERS TO THE CORRECT NUMBER OF
SIGNIFICANT FIGURES AND WITH APPROPRIATE UNITS.**

**CONSULT THE DATA SHEET AND THE PERIODIC TABLE FOR ALL
SUPPLEMENTARY INFORMATION.**

CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT).

REQUIREMENTS: ANSWER SCRIPT

QUESTION 1

Choose the correct answer.

- 1.1 Solids have a _____ shape and are not appreciably _____.
- A) definite, compressible
 - B) definite, incompressible
 - C) indefinite, compressible
 - D) indefinite, incompressible
 - E) sharp, convertible
- 1.2 A combination of sand, salt, and water is an example of a _____.
- A) homogeneous mixture
 - B) heterogeneous mixture
 - C) compound
 - D) pure substance
 - E) solid
- 1.3 Which one of the following has the element name and symbol correctly matched?
- A) P, potassium
 - B) C, copper
 - C) Mg, manganese
 - D) Ag, silver
 - E) Sn, silicon
- 1.4 Which one of the following is a pure substance?
- A) concrete
 - B) wood
 - C) salt water
 - D) elemental copper
 - E) milk
- 1.5 Which one of the following is not an intensive property?
- A) density
 - B) temperature
 - C) melting point
 - D) mass
 - E) boiling point

1.6 Which of the following are chemical processes?

1. rusting of a nail
2. freezing of water
3. decomposition of water into hydrogen and oxygen gases
4. compression of oxygen gas

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

1.7 _____ and _____ reside in the atomic nucleus.

- A) Protons, electrons
B) Electrons, neutrons
C) Protons, neutrons
D) none of the above
E) Neutrons, only neutrons

1.8 The atomic number indicates _____.

- A) the number of neutrons in a nucleus
B) the total number of neutrons and protons in a nucleus
C) the number of protons or electrons in a neutral atom
D) the number of atoms in 1 g of an element
E) the number of different isotopes of an element

1.9 The _____ subshell contains only one orbital.

- A) 5d
B) 6f
C) 4s
D) 3d
E) 1p

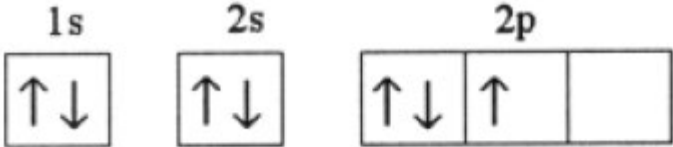
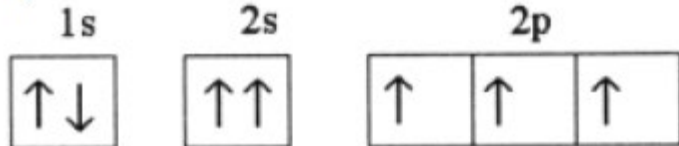
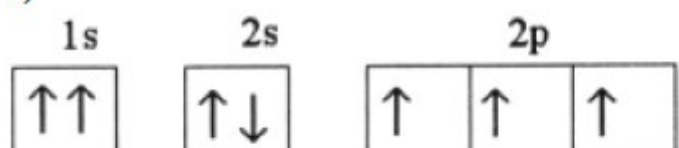

1.10 _____-orbitals are spherically symmetrical.

- A) s
B) p
C) d
D) f
E) g

1.11 Each p-subshell can accommodate a maximum of _____ electrons.

- A) 6
- B) 2
- C) 10
- D) 3
- E) 5

1.12 Which one of the following is the correct electron configuration for a ground-state nitrogen atom?

- A) 
- B) 
- C) 
- D) 
- E) None of the above is correct.

1.13 The ground state electron configuration of Ga is _____.

- A) $1s^2 2s^2 3s^2 3p^6 3d^{10} 4s^2 4p^1$
- B) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^1$
- C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
- D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4d^1$
- E) $[Ar]4s^2 3d^{11}$

1.14 In general, as you go across a period in the periodic table from left to right:

- (1) the atomic radius _____;
- (2) the electron affinity becomes _____ negative; and
- (3) the first ionization energy _____.

- A) decreases, decreasingly, increases
- B) increases, increasingly, decreases
- C) increases, increasingly, increases
- D) decreases, increasingly, increases
- E) decreases, increasingly, decreases

1.15 Most of the elements on the periodic table are _____.

- A) gases
- B) nonmetals
- C) metalloids
- D) liquids
- E) metals

1.16 In which set of elements would all members be expected to have very similar chemical properties?

- A) O, S, Se
- B) N, O, F
- C) Na, Mg, K
- D) S, Se, Si
- E) Ne, Na, Mg

1.17 Which element would be expected to have chemical and physical properties closest to those of fluorine?

- A) S
- B) Fe
- C) Ne
- D) O
- E) Cl

1.18 Atomic radius generally increases as we move _____.

- A) down a group and from right to left across a period
- B) up a group and from left to right across a period
- C) down a group and from left to right across a period
- D) up a group and from right to left across a period
- E) down a group; the period position has no effect

1.19 Which ion below has the largest radius?

- A) Cl^-
- B) K^+
- C) Br^-
- D) F^-
- E) Na^+

1.20 Of the following elements, _____ has the most negative electron affinity.

- A) Na
- B) Li
- C) Be
- D) N
- E) F

[40]

QUESTION 2

Suggest a method of separating each of the following mixtures into two components:

- 2.1 Sugar and sand (5)
- 2.2 Iron and sulfur (5)

[10]

QUESTION 3

Only two isotopes of copper occur naturally. ^{63}Cu (atomic mass = 62.9296 amu; abundance 69.17 %) and ^{65}Cu (atomic mass = 64.9278 amu; abundance 30.83 %).

- 3.1 Calculate the atomic mass weight (average atomic mass) of copper. (6)

[6]

QUESTION 4

For each of the following elements, write its chemical symbol, determine the group to which it belongs, and indicate whether it is a metal, metalloid, or non metal

- | | | |
|-----|-----------|-----|
| 3.1 | Potassium | (3) |
| 3.2 | Iodine | (3) |
| 3.3 | Magnesium | (3) |
| 3.4 | Argon | (3) |
| 3.5 | Sulfur | (3) |

[15]

QUESTION 5

For each element, indicate the number of valence electrons, core electrons, and unpaired electrons in the ground state:

- | | | |
|-----|------------|-----|
| 4.1 | Carbon | (3) |
| 4.2 | Phosphorus | (3) |
| 4.3 | Neon | (3) |

[9]

TOTAL MARKS : 80

Atomic Number

2
He
4.0026

Atomic Weight

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce <i>140.12</i>	Pr <i>140.91</i>	Nd <i>144.24</i>	Pm <i>146.92</i>	Sm <i>150.36</i>	Eu <i>151.97</i>	Gd <i>157.25</i>	Tb <i>158.93</i>	Dy <i>162.50</i>	Ho <i>164.93</i>	Er <i>167.26</i>	Tm <i>168.93</i>	Yb <i>173.04</i>	Lu <i>174.97</i>
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th <i>232.04</i>	Pa <i>231.04</i>	U <i>238.03</i>	Np <i>237.05</i>	Pu <i>(244)</i>	Am <i>(234)</i>	Cm <i>(247)</i>	Bk <i>247</i>	Cf <i>(251)</i>	Es <i>(252)</i>	Fm <i>(257)</i>	Md <i>(258)</i>	No <i>(259)</i>	Lr <i>(260)</i>