



King Abdulaziz University

Faculty of Science - Chemistry Department

Tuesday 03 /12 /1434 H

Chem-110, First Exam

Time: 90 minutes

Name: _____ Number: _____ Section: _____

•Useful information:

Speed of light, $C = 3.0 \times 10^8$ m/s
Planck's const., $h = 6.626 \times 10^{-34}$ J.s
Avogadro's No., $N_{av} = 6.022 \times 10^{23}$ mol⁻¹
Rydberg const. for H atom $R_H = 2.18 \times 10^{-18}$ J
Mass of the electron, $m_e = 9.11 \times 10^{-31}$ kg
Gas constant, $R = 0.082$ L atm K⁻¹ mol⁻¹

1

H

Hydrogen

1

7

Li

Lithium

3

9

Be

Beryllium

4

23

Na

Sodium

11

24

Mg

Magnesium

12

39

K

Potassium

19

40

Ca

Calcium

20

45

Sc

Scandium

21

48

Ti

Titanium

22

51

V

Vanadium

23

52

Cr

Chromium

24

55

Mn

Manganese

25

56

Fe

Iron

26

59

Co

Cobalt

27

59

Ni

Nickel

28

63.5

Cu

Copper

29

65

Zn

Zinc

30

70

Ga

Gallium

31

72.5

Ge

Germanium

32

75

As

Arsenic

33

79

Se

Selenium

34

80

Br

Bromine

35

84

Kr

Krypton

36

85.5

Rb

Rubidium

37

86

Sr

Strontium

38

89

Y

Yttrium

39

91

Zr

Zirconium

40

93

Nb

Niobium

41

96

Mo

Molybdenum

42

(96)

Tc

Technetium

43

101

Ru

Ruthenium

44

103

Rh

Rhodium

45

106

Pd

Palladium

46

108

Ag

Silver

47

112

Cd

Cadmium

48

115

In

Indium

49

119

Sn

Tin

50

122

Sb

Antimony

51

128

Te

Tellurium

52

127

I

Iodine

53

131

Xe

Xenon

54

133

Cs

Cesium

55

137

Ba

Barium

56

139

La

Lanthanum

57

178.5

Hf

Hafnium

72

181

Ta

Tantalum

73

184

W

Tungsten

74

186

Re

Rhenium

75

190

Os

Osmium

76

192

Ir

Iridium

77

195

Pt

Platinum

78

197

Au

Gold

79

201

Hg

Mercury

80

204

Tl

Thallium

81

207

Pb

Lead

82

209

Bi

Bismuth

83

(210)

Po

Polonium

84

(210)

At

Astatine

85

(222)

Rn

Radon

86

(223)

Fr

Francium

87

(226)

Ra

Radium

88

(227)

Ac

Actinium

89

(261)

Rf

Rutherfordium

104

(262)

Db

Dubnium

105

(266)

Sg

Seaborgium

106

(264)

Bh

Bohrium

107

(265)

Hs

Hassium

108

(268)

Mt

Meitnerium

109

140

Ce

Cerium

58

141

Pr

Praseodymium

59

144

Nd

Neodymium

60

145

Pm

Promethium

61

150

Sm

Samarium

62

152

Eu

Europium

63

157

Gd

Gadolinium

64

159

Tb

Terbium

65

162.5

Dy

Dysprosium

66

165

Ho

Holmium

67

167

Er

Erbium

68

169

Tm

Thulium

69

173

Yb

Ytterbium

70

175

Lu

Lutetium

71

232

Th

Thorium

90

231

Pa

Protactinium

91

238

U

Uranium

92

237

Np

Neptunium

93

244

Pu

Plutonium

94

(243)

Am

Americium

95

(247)

Cm

Curium

96

(247)

Bk

Berkelium

97

(251)

Cf

Californium

98

(252)

Es

Einsteinium

99

(257)

Fm

Fermium

100

(258)

Md

Mendelevium

101

(259)

No

Nobelium

102

(262)

Lr

Lawrencium

103

Key

Relative atomic mass to nearest whole number

Symbol

Atomic number

A

Choose the correct answer

A-1 Which of the following is not a SI base unit?

- a) Kilometer b) Kilogram c) Ampere d) Kelvin

A-2 What is 0.21 nm when converted to Km?

- a) 2.1×10^{-13} Km b) 2.1×10^{-12} Km c) 2.1×10^{10} Km d) 2.1×10^{12} Km

A-3 The SI prefixes mega and micro represent, respectively:

- a) 10^9 and 10^6 b) 10^6 and 10^9 c) 10^6 and 10^{-6} d) 10^3 and 10^{-6}

A-4 A piece of platinum metal with a density of 21.5 g/cm^3 has a volume of 4.49 cm^3 . What is its mass?

- a) 96.5g b) 0.0965g c) 4.79g d) 0.209g

A-5 The smallest unit of matter that maintains its chemical identity is

- a) Atom b) Negative ion c) Molecule d) Compound

A-6 The element in group 5A and period 4 is:

- a) P b) As c) V d) Db

A-7 How many protons and electrons are in Fe^{3+} ?

- a) 26p – 23e b) 26p – 26e c) 23p – 26e d) 56p – 53e

A-8 Predict the formula of a compound consists of Al and P?

- a) Al_3P_2 b) AlP_3 c) Al_3P_3 d) AlP

A

A-9 The right example for a molecule is :

a) N_2

b) N

c) O

d) Air

A-10 Phosphorus pentachloride has the following formula:

a) P_2Cl_5

b) PCl_5

c) PCl_6

d) P_3Cl_5

A-11 The compound with formula Mn_2O is named:

a) Manganese (I) oxide

b) Manganese oxide

c) Magnesium oxide

d) Manganese (II) oxide

A-12 The compound with formula $NaHSO_4$ is named:

a) Sodium (I) bisulfate

b) Sodium sulfate

c) Sodium sulfide

d) Sodium bisulfate

A-13 The anion in the formula Li_2S is:

a) S^-

b) S^{2-}

c) Li^{2+}

d) Li^+

A-14 The specie that has 79 protons and 78 electrons is:

a) Au

b) Au^+

c) Pt^+

d) Pt^-

A-15 How many sodium atoms are there in 3.0 g of Na_2CO_3 ?

a) 3.41×10^{22} atom

b) 3.41×10^{25} atom

c) 4.71×10^{21} atom

d) 5.41×10^{22} atom

A-16 What is the mass, in grams, of one copper atom?

a) 6.84×10^{-23} g

b) 32.7×10^{-23} g

c) 10.55×10^{-23} g

d) 3.82×10^{-23} g

A

A-17 For a sample of compound contains carbon ,hydrogen and nitrogen have 53.33% C and 15.56% H, the emprical formula of this compound is:

- a) C_2H_7N b) C_3H_9N c) C_3H_4N d) C_6H_7N

A-18 Of the following, the only empirical formula is

- a) N_2F_2 b) H_2C_2 c) N_2F_4 d) HNF_2

A-19 An organic compound which has the empirical formula CHO has a molar mass of 232. Its molecular formula is:

- a) CHO b) $C_4H_4O_4$ c) $C_2H_2O_2$ d) $C_8H_8O_8$

A-20 Which of these quantities does not represent 1.00 mol of the indicated substance?

- a) 6.02×10^{23} C atoms b) 16g S c) 12 g C d) 65 g Zn

A-21 Boron consists of two isotopes. They are boron-10 and boron-11 with atomic masses of 10.013 amu and 11.009 amu, respectively. The average atomic mass of boron is 10.81 amu . Which isotope of boron is more abundant, boron-10 or boron-11?

- a) This cannot be determined from data given.
b) Boron-10
c) Neither, their abundances are the same.
d) Boron-11

A

A-22 What information would you need to calculate the average atomic mass of an element?

- a) The number of neutrons in the element.
- b) The atomic number of the element.
- c) The atomic mass and abundance of each isotope of the element.
- d) The position in the periodic table of the element.

A-23 Balance the following equation:



- a) $a=2, b=27, c=20, d=14$
- b) $a=2, b=25, c=14, d=10$
- c) $a=1, b=27, c=20, d=10$
- d) $a=1, b=27, c=14, d=14$

A-24 Ammonia reacts with diatomic oxygen to form nitric oxide and water vapor:



When 40.0 g NH_3 and 50.0 g O_2 are allowed to react, which is the limiting reagent?

- a) NH_3
- b) O_2
- c) NO
- d) H_2O

A-25 If the actual yield for the experiment in the above question produced 30.0g of nitric oxide (NO), what is the percentage yield?

- a) 80.0%
- b) 84.9%
- c) 72.8%
- d) 63.7%

A-26 How many grams of silver nitrate (AgNO_3) are necessary to react completely with 7 moles of copper, Cu?



- a) 2380 g
- b) 96.3 g
- c) 3400 g
- d) 172.8 g

A

A-27 What is the mass of sulfur in 2.0 g sulfur dioxide (SO_2)?

- a) 2.0 g b) 1.0 g c) 1.5 g d) 0.5 g

A-28 What mass of K_2CO_3 is needed to prepare 200. mL of a solution having a potassium ion concentration of 0.150 M?

- a) 4.15 g b) 10.4 g c) 13.8 g d) 2.07 g

A-29 A 20.00 mL sample of 0.1015 M nitric acid is introduced into a flask, and water is added until the volume of the solution reaches 250. mL. What is the concentration of nitric acid in the final solution?

- a) 1.27 M b) 8.12×10^{-3} M c) 0.406 M d) 3.25×10^{-2} M

A-30 If one mole of calcium hydroxide $\text{Ca}(\text{OH})_2$ is dissolved in enough water, the solution will contain:

- a) 2 mol of Ca^{++} and 2 mol of OH^- b) 2 mol of Ca^{++} and 1 mol of OH^-
c) 1 mol of Ca^{++} and 2 mol of OH^- d) 1 mol of Ca^{++} and 1 mol of OH^-