

IZMIR UNIVERSITY OF ECONOMICS - CHEM 100: GENERAL CHEMISTRY

2020-21 SPRING SEMESTER – MIDTERM I

11.12.2021

Name & Surname:

Section Number:

Signature:

Duration: 90 minutes

GROUP A

1) When aqueous solutions of _____ are mixed, a precipitate forms.

A) Na₂SO₄ and CoCl₃

B) CsI and LiBr

C) CuBr₂ and AgNO₃

D) KOH and Ba(NO₃)₂

E) Li₂CO₃ and CsI

2) Silver nitrate and aluminum chloride react with each other by exchanging anions:



What mass in grams of AgCl is produced when 2.0 g of AgNO₃ react with 2.0 g of AlCl₃?

A) 1.69

B) 17.6

C) 24.9

D) 3.56

E) 11.9

3) A 25.00-mL sample of an aqueous solution of barium hydroxide is neutralized by 70.00 mL of 0.150 M HCl(aq). What is the molarity of the calcium hydroxide solution?

A) 0.11

B) 0.21

C) 0.42

D) 0.84

E) 1.25

4) Of the species below, only _____ is not an electrolyte.

A) HI

B) Cs₂SO₄

C) Mg(OH)₂

D) NaCl

E) CH₄

5) What volume of stock 0.24 M KI is needed to prepare 75 mL of 0.1 M KI?

A) 180

B) 0.48

C) 37.75

D) 31.25

E) 18

6) When nickel metal is placed in a solution of magnesium nitrate, will a reaction occur? If so, what is the balanced equation for the reaction?

- A) Yes. $\text{Ni}(s) + \text{Mg}(\text{NO}_3)_2(aq) \rightarrow \text{Ni}(\text{NO}_3)_2(aq) + \text{Mg}(s)$
B) Yes. $\text{Ni}(s) + \text{Mg}(\text{NO}_3)_2(aq) \rightarrow \text{Ni}(\text{NO}_3)(aq) + \text{MgNO}_3(aq)$
C) Yes. $\text{Ni}(s) + \text{Mg}_2\text{NO}_3(aq) \rightarrow \text{NiNO}_3(aq) + \text{Mg}(aq)$
D) Yes. $\text{Ni}(s) + \text{Mg}_2\text{NO}_3(aq) \rightarrow \text{NiNO}_3(aq) + 2\text{Mg}(aq)$
E) No reaction will occur.

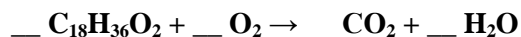
7) Which compound has the atom with the highest oxidation number?

- A) PCl_5
B) Li_3N
C) MgSO_3
D) $\text{Co}(\text{ClO}_4)_3$
E) NH_4Br

8) An atom of the isotope chlorine-37 consists of how many protons, neutrons, and electrons? (p = proton, n = neutron, e = electron)

- A) 17 p, 37 n, 17 e
B) 17 p, 20 n, 17 e
C) 17 p, 17 n, 20 e
D) 37 p, 20 n, 20 e
E) 17 p, 17 n, 17 e

9) What is the coefficient preceding O_2 when the following combustion reaction of a fatty acid is properly balanced using the smallest set of whole numbers?



- A) 1
B) 8
C) 9
D) 26
E) 27

10) What is the molecular weight of copper (II) nitrate trihydrate?

- A) 94.5 g/mol
B) 102.5 g/mol
C) 125.5 g/mol
D) 187.5 g/mol
E) 241.5 g/mol

11) What is the percentage of nitrogen, by mass, in dinitrogen pentoxide?

- A) 25.9%
B) 46.7%
C) 14.9%
D) 53.3%
E) 74.1%

12) How many moles are in 16 grams of nitrogen molecule?

- A) 0.19 mol
B) 0.32 mol
C) 0.57 mol
D) 1.14 mol
E) 1.75 mol

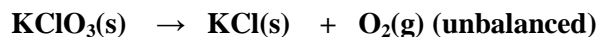
13) What is the number of lithium ions in a 23-g sample of Li_2O ?

- A) 0.77
D) 9.27×10^{23}
- B) 1.54
E) none of the above
- C) 4.63×10^{23}

14) Aspirin contains 60.001% C, 4.476% H, and 35.523% O by mass. What is the empirical formula of ascorbic acid?

- A) CHO
D) $\text{C}_7\text{H}_{16}\text{O}_4$
- B) CH_3O
E) $\text{C}_9\text{H}_8\text{O}_4$
- C) $\text{C}_3\text{H}_7\text{O}_2$

15) Potassium chlorate decomposes upon slight heating in the presence of a catalyst, according to the reaction below.



In a certain experiment, 25.0 g KClO_3 is heated until it completely decomposes. The experiment is performed, the oxygen gas is collected, and its mass is found to be 5.8 g. What is the percent yield for the reaction?

- A) 51.4
D) 65.8
- B) 54.1
E) 71.2
- C) 59.2

16) Lithium forms compounds which are used in dry cells, storage batteries, and in high-temperature lubricants. It has two naturally occurring isotopes, Li-6 (isotopic mass = 6.015123 amu) and Li-7 (isotopic mass = 7.016005 amu). Lithium has an atomic mass of 6.9412 amu. What is the percent abundance of lithium-6?

- A) 92.53%
D) 7.47%
- B) 86.65%
E) 6.015%
- C) 49.47%

17) The formula for the compound formed between iron (II) ions and sulfate ions is _____.

- A) FeSO_4
- B) $\text{Fe}(\text{SO}_4)_2$
- C) $\text{Fe}(\text{SO}_3)_2$
- D) $\text{Fe}_2(\text{SO}_4)_3$
- E) FeS

18) The correct name for Cs_3N is _____

- A) Cesium nitride
- D) Cesium trinitrate
- B) Cesium nitrate
- E) Cesium nitroxide
- C) Tricesium mononitrate

19) Strontium reacts with a certain element to form a compound with the general formula SrX . What would the most likely formula be for the compound formed between lithium and element X?

- A) LiX B) LiX_2 C) Li_2X_3 D) Li_2X E) Li_2X_2

20) Calculate the volume of 0.05 kg of liquid methanol (wood alcohol) if its density is 0.791 g/mL.

- A) 39.6 ml B) 63.2 ml C) 15.82 ml
D) 0.396 ml E) 82.1ml

21) Which of the following elements is chemically similar to calcium?

- A) rubidium B) scandium C) krypton
D) barium E) cerium

22) What is the term for the total number of neutrons and protons in the nucleus of each atom of an element?

- A) Isotope number B) Atomic mass units C) Mass-to-charge ratio D) Atomic number
E) Mass number

23) 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

24) Report the following calculation with correct number of significant figures

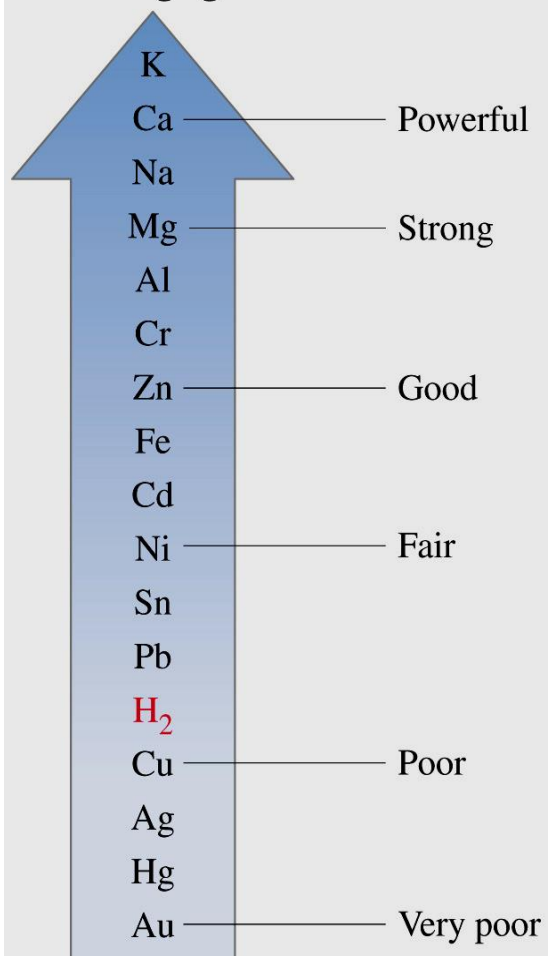
$$0.71 \times 2.15$$

- A) 1.5265 B) 1.527 C) 1.53 D) 1.5 E) 1

25) Which of the formulas below does not represent a compound that actually exists?

- A) Na_3PO_4 B) $Sr(NO_3)_2$ C) $CuSO_4 \cdot 5H_2O$ D) K_2O_2 E) $Ag(ClO_4)_2$

**Strength as a
reducing agent**



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General Guidelines for the Water Solubilities of Common Ionic Compounds

1- a) Group 1A metal (Li^+ , Na^+ , K^+ , ...) salts,

b) ammonium (NH_4^+) salts,

c) almost all nitrates (NO_3^-),

d) almost acetates (CH_3COO^-) and

e) almost perchlorates (ClO_4^-) are SOLUBLE.

2- Most chlorides (Cl^-), bromides (Br^-) and iodides (I^-) are SOLUBLE.

Exceptions: those of Ag^+ and Pb^{2+} .

3- Most sulfates (SO_4^{2-}) are SOLUBLE.

Exceptions: those of Sr^{2+} , Ba^{2+} and Pb^{2+} .

4- Most a) carbonates (CO_3^{2-}), b) hydroxides (OH^-), c) phosphates (PO_4^{3-}) and d) sulfides (S^{2-}) are INSOLUBLE.

Exceptions: Group 1A metal salts and Ammonium salts of any of those anions are soluble; Ca^{2+} , Sr^{2+} and Ba^{2+} hydroxides and sulfides are slightly to moderately soluble.

Periodic Table of the Elements

Atomic Number
Symbol
Name
Atomic Mass

1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941																	4 Be Beryllium 9.012
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 84.798
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.294
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [289]	109 Mt Meitnerium [288]	110 Ds Darmstadtium [289]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 F1 Flerovium [289]	115 Uup Ununpentium unknown	116 Lv Livermorium [298]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown

57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]