# CHM 1001 General Chemistry

Assignment 6

- 20 multiple-choice questions + 4 short answer questions.

- There is only one correct answer for each multiple-choice question.

- Please write your answers in the Assignment Answers Template.

- Upload your answer into Blackboard before the deadline, only word and PDF format are allowed.

- No late submission is allowed.

Deadline: 23:59 pm, December 19th (UTC+8)

Part 1: Multiple-choice questions

1) Why are chlorofluorocarbons so damaging to the ozone layer when they are such stable molecules?
A) They contain a double bond that ozone readily attacks, resulting in the destruction of the ozone.
B) They are very light molecules that rapidly diffuse into the upper atmosphere and block the radiation that causes formation of ozone.
C) They are greenhouse gases that raise the temperature above the dissociation temperature of ozone.
D) The radiation in the stratosphere dissociates them producing chlorine atoms that catalytically destroy ozone.
E) CFCs do not damage the ozone.

2) Water containing high concentrations of _____ cations is called hard water.

A) Ca^{2+}

B) Mg^{2+}

C) Na^+

D) K^+

E) Ca^{2+} or Mg^{2+}

3) Ozone is a(n) _____ of oxygen.
A) isomer
B) allotrope
C) isotope
D) resonance structure
E) atomic form

4) The sterilizing action of chlorine in water is due to what substance?

A) Cl^-

B) Cl_2

C) HCl
D) $HClO$

E) H^+

5) The ionization energy of O_2 is 1205 kJ/mol:

$$O_2 + h\nu \longrightarrow O_2^+ + e^-$$
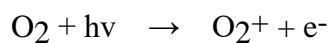
The maximum wavelength of light capable of causing the ionization of O_2 is

_____ nm.

A) 4017

B) 9.94×10^{-5}

C) 9.94×10^{-8}

D) 99.4

E) 9.94×10^4

6) How many grams of Cu are obtained by passing a current of 12 A through a solution of $CuSO_4$ for 30 minutes?

A) 0.016
B) 7.1
C) 14
D) 28
E) 3.6

7) A voltaic cell is constructed with two Zn^{2+}-Zn electrodes, where the half-reaction is

$$Zn^{2+} + 2e^- \longrightarrow Zn \text{ (s)} \quad E° = -0.763 \text{ V}$$

The concentrations of zinc ion in the two compartments are 5.50 M and 1.11×10^{-2} M, respectively. The cell emf is _____ V.
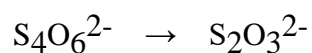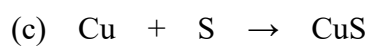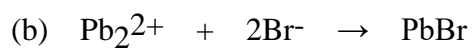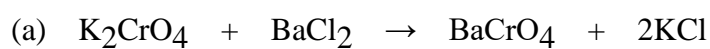
A) -1.54×10^{-3}

B) -378
C) 0.0798
D) 0.160
E) -0.761

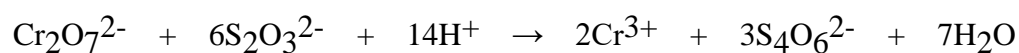8) _____ electrons appear in the following half-reaction when it is balanced.

$$S_4O_6^{2-} \rightarrow S_2O_3^{2-}$$

A) 6
B) 2
C) 4
D) 1
E) 3

9) Which of the following reactions is a redox reaction?

(a) K_2CrO_4 + $BaCl_2$ $\rightarrow$ $BaCrO_4$ + $2KCl$

(b) Pb_2^{2+} + $2Br^-$ $\rightarrow$ $PbBr$

(c) Cu + S $\rightarrow$ CuS

A) (a) only
B) (b) only
C) (c) only
D) (a) and (c)
E) (b) and (c)

10) _____ is reduced in the following reaction:

$$Cr_2O_7^{2-} + 6S_2O_3^{2-} + 14H^+ \rightarrow 2Cr^{3+} + 3S_4O_6^{2-} + 7H_2O$$

A) Cr^{6+}

B) S^{2+}

C) H^+

D) O^{2-}

E) $S_4O_6^{2-}$

11) All atoms of a given element have the same _____.
A) mass number
B) number of nucleons
C) atomic mass
D) number of neutrons
E) atomic number

12) What happens to the mass number and the atomic number of an element when it undergoes beta decay?
A) Neither the mass number nor the atomic number change.
B) The mass number decreases by 4 and the atomic number decreases by 2.
C) The mass number does not change and the atomic number increases by 1.
D) The mass number does not change and the atomic number decreases by 2.
E) The mass number increases by 2 and the atomic number increases by 1.

13) Which one of the following is a correct representation of a positron?

A) $^{4}_{2}e$

B) $^{1}_{0}\beta$

C) $^{0}_{1}e$

D) $^{0}_{-1}e$

E) $^{2}_{4}\beta$

14) What is the missing product from this reaction?

$$^{32}_{15}P \rightarrow \ ^{32}_{16}S \ + \ \_\_\_\_$$
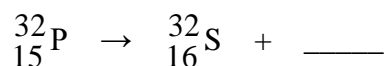
A) $^{4}_{2}He$

B) $^{0}_{-1}e$

C) $^{0}_{0}\gamma$

D) $^{0}_{1}e$

E) $^{0}_{1}p$

15) Cesium-137 undergoes beta decay and has a half-life of 30.0 years. How many beta particles are emitted by a 14.0-g sample of cesium-137 in three minutes?

A) 6.1×10^{13}

B) 6.2×10^{22}

C) 8.4×10^{15}

D) 1.3×10^{-8}

E) 8.1×10^{15}

16) Which substance would be the most soluble in gasoline?
A) water

B) $NaNO_3$

C) HCl
D) hexane
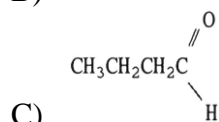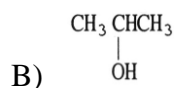E) NaCl

17) Pentane has _____ structural isomers.
A) 0
B) 1
C) 2
D) 3
E) 4

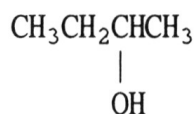18) Which one of the following compounds is an isomer of $CH_3CH_2CH_2CH_2OH$?

A) $CH_3CH_2CH_2OH$

B)
$$CH_3 \underset{\underset{OH}{|}}{CHCH_3}$$

C)
$$CH_3CH_2CH_2C\overset{O}{\underset{H}{\diagdown}}$$

D)
$$CH_3CH_2\underset{\underset{OH}{|}}{CHCH_3}$$

E) CH_3OH

19) Which structure below represents an ether?
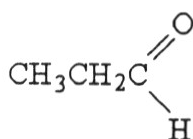
A)

$$CH_3CH_2 \text{—} O \text{—} CH_2CH_3$$
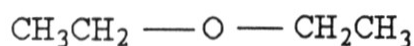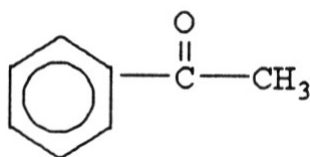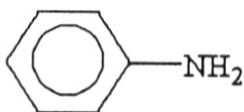
B)
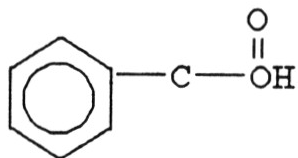
C)

D)

E)

20) The tertiary structure of proteins is maintained by _____ bonds.
A) hydrogen
B) dipole-dipole
C) ion-dipole
D) covalent
E) all of the above

Part 2: Short answer questions
1.   List two types of chemical compounds present in the air will cause for the formation of photochemical smog. What are the most common sources of these compounds?

2.   In a galvanic cell the cathode is an Ag^+(1.00 M)/Ag(s) half-cell. The anode is a standard hydrogen electrode immersed in a buffer solution containing 0.10 M benzoic acid (C_6H_5COOH) and 0.050 M sodium benzoate ($C_6H_5COO^-Na^+$). The measured cell voltage is 1.030 V. What is the pKa of benzoic acid?

3.   The thorium-232 radioactive decay series, beginning with ^{232}Th and ending with ^{208}Pb, occurs in the following sequence: α, β^-,β^-,α,α,α,α,β^-, β^-,α. Write an equation for each step in this series.

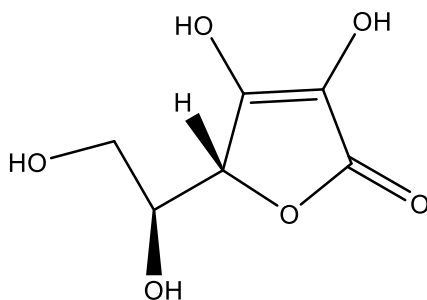4. (a) Name the following compound

(i) $ICH_2(CH_2)_4CH_2Cl$
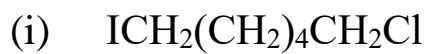
(ii)
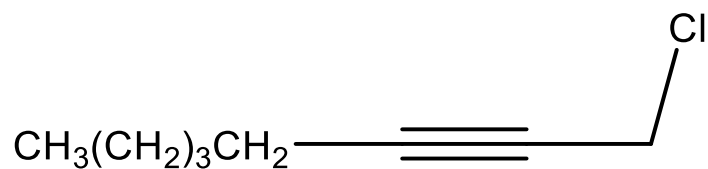
(b) Draw the structural formula of (i)3,7-Dimethyl-1-octene (ii) heptyl-butanoate

(c) (i) How many chiral centres in the following compound. Indicate the chiral centre(s) with an asterisk (*)

    Ascorbic acid

(ii) How many chiral carbons in the aldehyde form of glucose below?
    What are they? (C?)