Final Exam Review – Short Answer

Section 3A

1) Draw Lewis dot structures and determine the shape and polarity of the following compounds:

a) carbon tetrachloride

b) sulfur difluoride

c) phosphorous tribromide

d) formaldehyde (CH_2O)

2) Draw structural diagrams for two isomers of pentane.

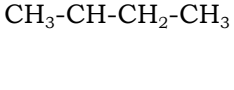
Section 3B

$$2\ C_2H_6\ (g) + 7\ O_2\ (g) \rightarrow 4\ CO_2\ (g) + 6\ H_2O\ (g) \quad \Delta H = -2870\ kJ$$

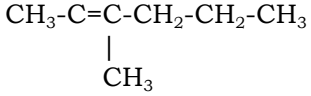
3a) How many kJ of energy would be released by burning 7.82 grams of C_2H_6?

3b) How many grams of oxygen is needed to release -3690 kJ of energy?

4) Give the names for the following structures:

a)


b) $CH{\equiv}C\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_3$

c)


5) Draw structural diagrams for the following substances.

a) 2-pentanoic acid

b) 2-methylpropane

c) 2,4 decadiene

Section 3C

6) A person's diet is 2525 Calories. 60% of those Calories are carbohydrates, 15% are fats and 25% are proteins. How many grams of each did the person eat?

7) Another person's diet consists of 73 grams of carbs, 25 grams of proteins and 68 g of fats. How many Calories doe the person consume in a day?

Section 4A

8) The local atmospheric pressure is 560 mmHg. What is the pressure in Pascals?

9) A 5.0 L tank of oxygen gas is at a pressure of 3.0 atm. What volume of oxygen will be available if the oxygen is reduced to 1.0 atm of pressure?

10) A 7.0 L balloon at 22 ^{O}C contains hydrogen gas. If the balloon is carried outside to a temperature at -3 ^{O}C. What volume will the balloon occupy?

11) Nitrogen (80.0 kPa), oxygen (21.0 kPa), carbon dioxide (0.03 kPa) and water vapor (2.0 kPa) are the usual atmospheric pressures. What is the total pressure?

12) What is the pressure of 3.50 moles of helium at -50.0 ^{O}C in a rigid container whose volume is 25.0 L?

13) How many grams of oxygen (O_2) must be placed in a 50.0 L container to produce a pressure of 4.50 atm at standard temperature?

14) What is the resulting volume of 0.825 L of a gas when it is cooled from 50.0 ^{O}C to 20.0 ^{O}C and subjected to a pressure change from 1.45 atm to 1.00 atm?

15) What is the molar mass of a gas that has a density of 2.32 g/L at 684 mmHg and 25 ^{O}C?

Section 4B

16) 100 g of water is slowly heated from 35.5^{O}C to 48.5^{O}C. How much heat is absorbed by the water?

17) What is the specific heat of a 400 g metal piece that absorbs 670 J of energy to increase the temperature from 16 ^{O}C to 25 ^{O}C?

18) How much energy is released by 30 g of water when the temperature of some water vapor at 116 ^{O}C is cooled to solid ice at -23 ^{O}C?

Section 4C

19) What is the molarity of a solution prepared by dissolving 5.68 g of NaOH is enough water to make a 400 mL solution?

20) How many grams of HCl is required to prepare 250 mL of a 0.158 M solution?

21) Calculate the pH of a 6.42×10^{-4} M solution of HCl.

22) A titration of an unknown HCl solution requires 43.25 mL of 0.2134 M NaOH to neutralize 50.00 mL of acid. What is the HCl concentration?

23) What is the pH of a solution where [OH-] = 6.42×10^{-6} M? Is it acidic or basic?

24) Name or write the formula for the following acids and bases:

a) H_2S
b) $Fe(OH)_3$
c) $HClO_2$
d) carbonic acid
e) sulfous acid
f) ammonium hydroxide

Section 4D

25) A fossilized rock is found with bone fragments in it. Testing shows that the carbon-14 (half-life of carbon-14 = 5730 y) amount in the sample is 1/32 of it's original amount. What is the age of the fossil?

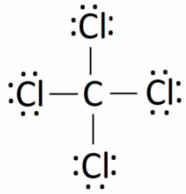
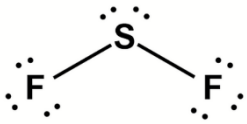
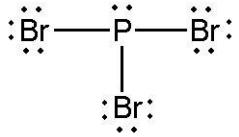
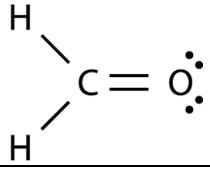
26) If you start with 500.0 g of a radioisotope with a half-life of 3.0 days, how much of the original isotope will still be in the sample after 18 days?

Section 4E

27) 15 grams of $MgCl_2$ is dissolved in 100 grams of water.

a) What is the molality of the solution?
b) What is the mole fraction of $MgCl_2$ in the solution?
c) At what temperature will the solution boil at?
d) At what temperature will the solution freeze at?

Answers:

1a)		Tetrahedral	Nonpolar
1b)		Bent	Polar
1c)		Pyramidal	Nonpolar
1d)		Trigonal planar	Polar

2) CH_3-CH_2-CH_2-CH_2-CH_3 or CH_3-CH_2-CH(-CH_3)-CH_3 or CH_3-C(CH_3)(CH_3)-CH_3

3a) -376 kJ
3b) 288 g
4a) 2-butanol
4b) 1-heptyne
4c) trans 2,3 dimethyl-2-hexene
5a) CH_3-CH(-C(=O)-OH)-CH_2-CH_2-CH_3
5b) CH_3-CH(CH_3)-CH_3
5c) CH_3-CH=CH-CH=CH-CH_2-CH_2-CH_2-CH_2-CH_3

6) 379 g carbs, 42 g fats, 158 g proteins
7) 1004 Cal

8) 74660 Pa
9) 15.0 L
10) 6.4 L
11) 103.03 kPa
12) 2.56 atm
13) 321 g
14) 1.09 L
15) 63 g/mol

16) 5440 J
17) 0.186 J/g^{O}C
18) 98.1 kJ

19) 0.343 M
20) 1.44 g
21) 3.19
22) 0.185 M
23) 8.81
24a) hydrosulfic acid
24b) iron (III) hydroxide
24c) chlorous acid
24d) H_2CO_3
24e) H_2SO_3
24f) NH_4OH

25) 28,650 y
26) 7.813 g

27a) 1.57 m
27b) 0.0276
27c) 102.4 ^{O}C
27d) -8.8 ^{O}C