CHEMISTRY 101 EXAM 1

SECTIONS 572-580
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FORM 1N

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Directions:

1. Fill out your scantron sheet.
    a. Do not forget to include your **SIGNATURE and ID number**.
    b. Dept = CHEM, Course No. = 101
    c. If you want your scores posted, mark A under the option column

2. Use a #1 or #2 pencil for marking the answer sheets. Fill in the appropriate circles completely.

3. DO NOT write on the envelope.

4. Read each question **carefully**, then choose the **best answer** for each question. There is no penalty for guessing.

5. You may write on the exam questions. The last page is a sheet of scrap paper.

6. When finished, put the scanning sheet back in the envelope and turn it in. You may keep the exam questions.

7. This examination consists of 10 True/False questions (3 points each) and 20 multiple choice questions (6 points each). The total point value for the exam is **150 points**.

True (a) or False (b) (3 points each).

1. Energy is the capacity to do work or transfer heat.
2. In an endothermic process, heat energy is consumed.
3. $FeCl_3$ is an empirical formula.
4. Combustion is an example of a combination reaction.
5. A solute is a homogeneous mixture of two or more substances.
6. 1 formula unit of $FeCl_3$ contains 1 cation and 3 anions.
7. A weak acid dissociates completely in water.
8. $FeCl_3$ is an ionic compound.
9. The volume of a gas does not change much with pressure and temperature.
10. Celsius can be converted to Fahrenheit by the following equation:

$$\frac{(X)\ ^oC \times 9}{5} + 32 = (Y)\ ^oF$$

Multiple choice (6 points each)

11. The law of conservation of matter (mass) implies that:

a) light bulbs emit energy as heat and light
b) Atoms can be created or destroyed
c) there are the same number of atoms of each element in the products as in the reactants
d) The molar mass of a substance depends on what elements are present in it

12. Which of the following are examples of a heterogeneous mixture?

I. ethanol
II. aluminum foil
III. chicken noodle soup
IV. table salt dissolved in water

a) I and II
b) I
c) III and IV
d) III

13. Which statement is **INCORRECT**? In one mole of $(NH_4)_2CO_3$ there are

a) 8 atoms of hydrogen
b) 28 g nitrogen
c) 6.022×10^{23} formula units
d) 6.022×10^{23} C atoms
e) 3 moles of oxygen

14. Which one of the following is a strong acid?

a) HNO_2
b) H_2SO_3
c) HF
d) HClO
e) HBr

15. The law of constant composition says that

a) chemical equations must be balanced
b) the empirical formula is the same as the molecular formula
c) the weight of each element in a substance is always the same
d) the relative amounts of each element in a substance are always the same

16. which of the following pairs is **INCORRECT**:

a) combination reaction $Mg + Cl_2 \rightarrow MgCl_2$
b) decomposition reaction $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$
c) neutralization reaction $K_2SO_{4\,(aq)} + BaBr_{2\,(aq)} \rightarrow 2KBr_{(aq)} + BaSO_{4\,(s)}$
d) precipitation reaction $K_2SO_{4\,(aq)} + BaBr_{2\,(aq)} \rightarrow 2KBr_{(aq)} + BaSO_{4\,(s)}$
e) metathesis reaction $K_2SO_{4\,(aq)} + BaBr_{2\,(aq)} \rightarrow 2KBr_{(aq)} + BaSO_{4\,(s)}$

17. Which of the following name and formula combinations is **INCORRECT**?

a) potassium phosphate K_3PO_4
b) calcium hydroxide $Ca(OH)_2$
c) methanol CH_3OH
d) hydrochloric acid $HClO_4$
e) hydrogen peroxide H_2O_2

18. Consider the following mathematical operation: $\frac{(12.67 \times 4.2)}{23.42}$
The number of significant figures in the answer is

a) 1
b) 2
c) 3
d) 4
e) 5

19. How many millimeters are there in 300 inches? (1 meter = 39.37 inches)

a) 7.6×10^2 mm
b) 7.6×10^3 mm
c) 2.6×10^3 mm
d) 1.2×10^3 mm
e) 1.3×10^2 mm

20. Calculate the number of moles in 31.0 g of calcium phosphate.

a) 0.100 mol
b) 0.271 mol
c) 0.118 mol
d) 0.159 mol
e) 0.107 mol

21. The coefficients of O_2 and H_2O in the balanced equation for the combustion of butane are:

$$\_C_4H_{10} + \_O_2 \rightarrow \_CO_2 + \_H_2O$$

a) 39 15
b) 18 15
c) $^{13}/_2$ 10
d) 13 10
e) 6 5

22. Elemental analysis of an unknown compound yielded the following percent composition: 92.26 % C, 7.74 % H. Its molar mass was found to be 78.1 g/mol. The molecular formula for the compound is

a) C_2H_2
b) $C_{7.68}H_{7.68}$
c) C_6H_6
d) CH

23. The percent composition of sodium carbonate is

a) Na 23.0 % C 12.0 % O 48.0 %
b) Na 27.7 % C 14.5 % O 57.8 %
c) Na 43.4 % C 11.3 % O 45.3 %
d) Na 21.7 % C 11.3 % O 45.3 %
e) Na 16.1 % C 16.8 % O 67.1 %

24. Consider the following reaction:

$2MoS_2 + 7O_2 \rightarrow 2MoO_3 + 4SO_2$

molar mass MoS_2 = 160 g/mol molar mass SO_2 = 64.1 g/mol
molar mass MoO_3 = 144 g/mol molar mass O_2 = 32.00 g/mol

what is the mass of SO_2 produced when 16.0 g of O_2 is reacted with excess MoS_2 (assume that the reaction goes to completion)?

a) 10.4 g
b) 18.3 g
c) 12.8 g
d) 6.4 g

25. consider the reaction given in problem # 24. If 2 moles of MoS_2 are mixed with 6 moles of O_2, which component is the limiting reactant? (assume the reaction goes to completion.)

a) MoS_2
b) O_2
c) MoO_3
d) SO_2

26. Consider the reaction given in problem #24. If the theoretical yield of MoO_3 is 5.00 g, and the observed yield is 3.00 g, what is the percent yield of the reaction?

a) 167%
b) 60%
c) 40%
d) none of the above

27. If a 28.0 g mass of sample of unknown metal displaces 7.00 mL of water in a graduated cylinder, what is the density of the metal?

a) 4.00 g/mL
b) 0.25 g/mL
c) 2.80×10^{-2} g/mL
d) 28.0 g/mL
e) 4.00×10^{-3} g/mL

28. The density of a 34.0 % solution of NaBr is 1.33 g/mL. How many grams of NaBr are in 100 mL of solution?

a) 34.0 g
b) 35.0 g
c) 137 g
d) 45.2 g
e) 25.6 g

29. What mass of KF must be used to produce 1000 mL of 1.25 M KF?

a) 58.1 g
b) 72.6 g
c) 46.5 g
d) 125 g
e) 155 g

30. How many grams of $HClO_4$ are required to neutralize 50. mL of a 2.5 M solution of $Sr(OH)_2$?

$$2HClO_{4\,(aq)} + Sr(OH)_{2\,(aq)} \rightarrow 2H_2O_{\,(l)} + Sr(ClO_4)_{2\,(aq)}$$

a) 12.5 g
b) 25. kg
c) 10. kg
d) 25. g
e) 50. g

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