

## Sample Chemistry 118 Final Exam Answers

### Part I- Multiple Choice

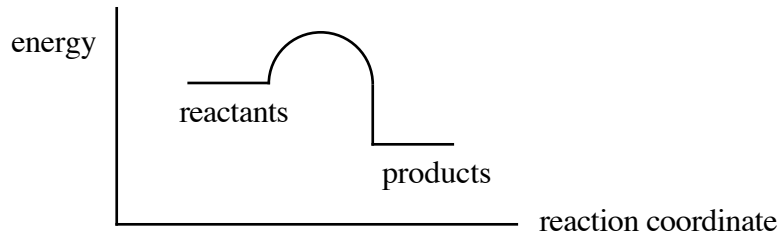
- 1C
- 2C
- 3A
- 4B
- 5D
- 6B
- 7C
- 8A
- 9D
- 10B
- 11C
- 12D
- 13C
- 14B
- 15B
- 16D
- 17B
- 18A
- 19D
- 20D
- 21B
- 22B
- 23C
- 24D
- 25D
- 26A
- 27C
- 28D
- 29D
- 30D

### Part II- Short Answer

1. a) Write a balanced equation for this process.



- b) Draw an energy diagram showing the relative energies of the reactants and products of this reaction.



c) What is the product when glucose is metabolized **anaerobically** in the muscles?

Lactic acid

2. a) A,B,O blood typing and protein polymorphism are "exclusionary only". What does this mean?

A sample can only be said not to match definitively.

b) Briefly, what are the steps in obtaining a "DNA profile"?

Isolation of DNA, amplification via PCR, electrophoresis to determine size of fragments.

c) Which is more definitive, DNA evidence or an eyewitness? Explain.

Many factors can confound eyewitnesses. Unless there is some type of misconduct, DNA is more reliable.

3. a) You have just been exposed to smallpox.

See your doctor immediately to be vaccinated.

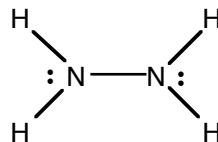
b) The Olympic Trials in the marathon are being held in Denver (with the finish line at Mile High Stadium) and you hope to win.

Train at altitude, take EPO, or use blood doping.

c) You are Oprah Winfrey and "Jenny Craig" will pay you \$1,000,000.00 if you lose 50 pounds as their spokesperson.

Don't diet! Exercise to change your set-point.

4. a) Draw an electron dot structure for  $N_2H_4$ .



b) What type of bonds are the N-H bonds (i.e., ionic, nonpolar covalent, polar covalent)?

Polar covalent

c) Would you expect this compound to dissolve in water? Explain.

Yes, it should be a good hydrogen-bonding compound, and like dissolves like.

5. a) You immediately realize that you can identify two of the bottles right away. Which two bottles, what do they contain, and how do you know?

The faint light is from the weak acid, which doesn't dissociate much (bottle C = citric acid).  
The brightest light is from the  $\text{CaCl}_2$ , which contains the most ions (bottle A =  $\text{CaCl}_2$ ).

- b) To identify the other two bottles, you can perform one more simple test. What test would you do and why?

Potassium chloride (KCl) and sodium hydroxide (NaOH) should produce the same number of ions (both dissociate fully), so bottles B and D can't be assigned without a pH test (litmus paper/pH meter).

6. Circle all the chemical changes below.

- Food is metabolized to release energy.
- A red substance is decomposed by heat to mercury and oxygen.
- Sodium dropped in water forms sodium hydroxide and hydrogen gas.
- Water boils on the stove.
- A hydrogen balloon ignites in the presence of oxygen to form water.
- Salt dissolves in water.

7.

Atom	He-4	An isotope of He-4 with 2 more neutrons	? <b>S-34</b>
# protons	? <b>2</b>	? <b>2</b>	? <b>16</b>
#neutrons	? <b>2</b>	? <b>4</b>	? <b>18</b>
#electrons	? <b>2</b>	? <b>2</b>	16
mass number	? <b>4</b>	? <b>6</b>	34

8. Circle any of the questions that microscopy could be useful to address.

Whose fingerprints were on the weapon? Is the white powder cocaine?

Did the suspect's gun fire the bullet? What type of fibers were on the body?

Are the metal fragments pure gold? Was gasoline used to start the fire?

9. Classify each of the following as an element, compound, or mixture (circle).

Blood	element	compound	mixture
Salt	element	compound	mixture
Gold	element	compound	mixture
Glass	element	compound	mixture
Hydrogen peroxide	element	compound	mixture

10. Circle any of the following that could be an acid. A solution that:

tastes bitter

turns litmus red

reacts with sodium hydroxide to produce salt water

dissolves in water to produce OH<sup>-</sup>

reacts with sodium to produce H<sub>2</sub>

has a pH = 7.0

11. For each of the following molecules of life, fill in the letter(s) of the appropriate function(s). (A molecule may have more than one function, and a function may be used more than once.)

B, D Lipid

A) Molecule of heredity

B Carbohydrate

B) Energy storage

C Protein

C) Cellular catalyst

A, E Nucleic Acid

D) Structural basis of membranes

E) Codes for polypeptides

12. a) component of cell membranes and steroid precursor; linked to arteriosclerosis.

b) used to treat patients with wasting diseases; anabolic steroid.

c) kills disease-carrying mosquitoes; contributed to decline of the bald eagle.

13. a) Fast-twitch muscles perform anaerobic metabolism; slow-twitch muscles perform aerobic metabolism.

b) Sprinting

c) Distance running

d) creatine (replenishes ATP stores as phosphocreatine); steroids (build bigger muscles)

e) Epo (increases red blood cells); carnitine (increases rate of fat mobilization)

14. a) Increase temperature, add a catalyst, increase concentration of reactants.

b) Increase reactants (deliver more O<sub>2</sub> and glucose to muscles); add catalysts

c) Saturated fats are linked to heart disease and cancer. Furthermore, obtaining more energy is no longer desirable in modern society.

### Part III- Problems

1. A Big Mac provides 600 kcal of energy.

a) For how long would you have to walk to burn one off? [Walking expends 0.073 kcal/min-kg.]

$$55 \text{ kg (this varies with individual)} \times 0.073 \text{ kcal/min-kg} = 4 \text{ kcal/min}$$

$$1 \text{ min}/4 \text{ kcal} * 600 \text{ kcal} = 150 \text{ minutes}$$

b) For how long would you have to study to burn one off? [Studying expends 1.7 kcal/min.]

$$55 \text{ kg (this varies with individual)} \times 0.025 \text{ kcal/min-kg} = 1.4 \text{ kcal/min}$$

$$1 \text{ min}/1.4 \text{ kcal} * 600 \text{ kcal} = 429 \text{ minutes}$$

2. Could the material be a pure compound? Explain.

No, the percent composition is variable.

3. Nitric acid ( $\text{HNO}_3$ ) can be made from ammonia ( $\text{NH}_3$ ) and oxygen ( $\text{O}_2$ ). The other product is water.

a) Write a balanced equation for this reaction.



b) What mass of nitric acid can be made from 971 grams of ammonia?

$$(971 \text{ g NH}_3 / 17 \text{ gram NH}_3/\text{mol NH}_3) \times (1 \text{ mole HNO}_3/\text{mole NH}_3) \times (63 \text{ g HNO}_3/\text{mole HNO}_3) = 3598 \text{ g}$$

4. a) Write the equation for the reaction of 1 mole of calcium hydroxide with 2 moles of hydrochloric acid.



b) What is the pH of the solution following completion of this reaction?

This is an example of a neutralization reaction, so the pH= 7.

5. The combustion of one mole of  $\text{CH}_4$  releases 803 kJ of energy.

a) Write an appropriate balanced equation for this reaction, including the energy term.



b) How much energy would be released during the combustion of 32 moles of  $\text{CH}_4$ ?

$$32 \text{ mol CH}_4 \times 803 \text{ kJ}/1 \text{ mol CH}_4 = 25,696 \text{ kJ}$$