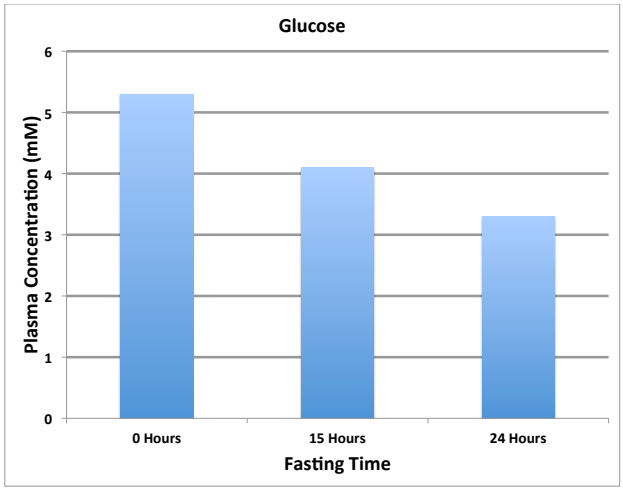
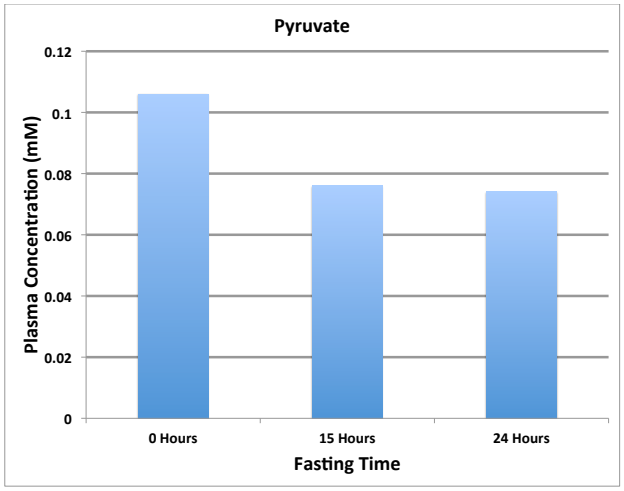
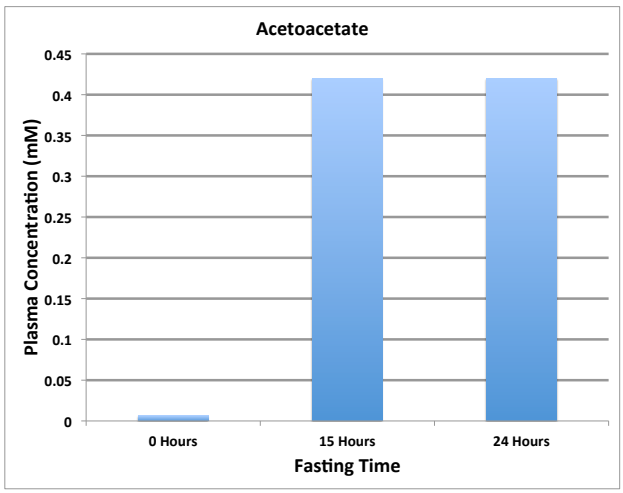
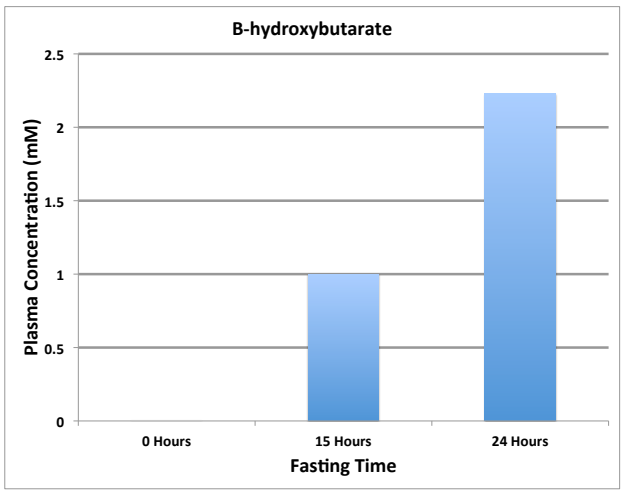
NAME:_____ **Exam 3**

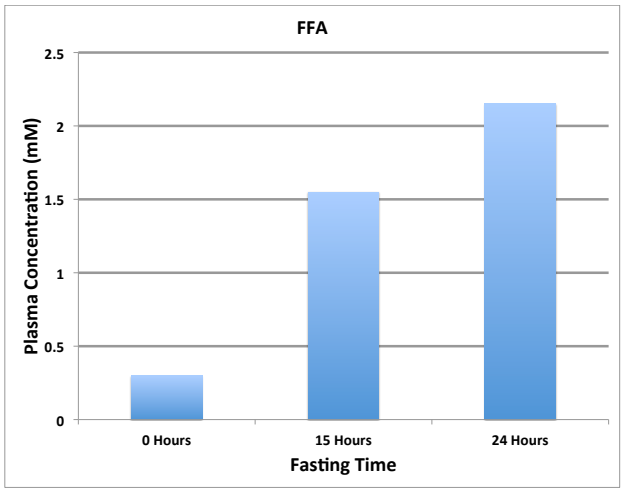
Answer 3 questions

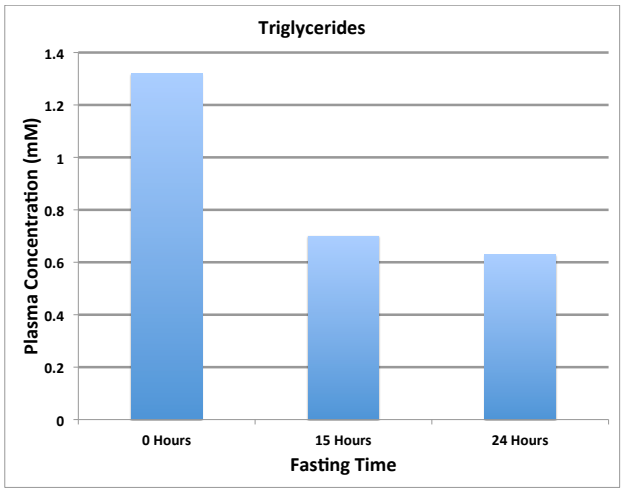

Glucose
Plasma Concentration (mM)
6
5
4
3
2
1
0
0 Hours
15 Hours
24 Hours
Fasting Time


Pyruvate
Plasma Concentration (mM)
0.12
0.1
0.08
0.06
0.04
0.02
0
0 Hours
15 Hours
24 Hours
Fasting Time


Acetoacetate
Plasma Concentration (mM)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 Hours
15 Hours
24 Hours
Fasting Time


B-hydroxybutarate
Plasma Concentration (mM)
2.5
2
1.5
1
0.5
0
0 Hours
15 Hours
24 Hours
Fasting Time


FFA
Plasma Concentration (mM)
2.5
2
1.5
1
0.5
0
0 Hours
15 Hours
24 Hours
Fasting Time


Triglycerides
Plasma Concentration (mM)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0 Hours
15 Hours
24 Hours
Fasting Time

1.) The charts on the previous page summarize the results obtained by van Veen and coworks while studying metabolic profiles in fasting infants between 0 and 24 months of age. For each set below, explain why the trend is observed. Include any relevant hormonal regulation. [van Veen, MR; van Hasselt, PM; Velden, MGM; Verhoeven, N; Hofstede, FC; de Koning, TJ; and Visser, G. (2011). *Pediatrics* **127:** 1021-27.]

a.) Glucose/Pyruvate

b.) Acetoacetate/β-hydroybutarate

c.) Freed Fatty Acids (FFA)/Triglycerides

2.) Besides statin drugs that we studied in class, bile salt sequestering resin is also utilized to lower blood LDL levels. Bile salt sequestering resin absorbs cholesterol and cholesterol derivatives in the intestinal track and is eventually passed out of the body in fecal matter. These resins have been shown to reduce the chances of stoke and heart attack in patients with atherosclerosis (buildup of lipid plaques in and on artery walls).

Imagine that you have just begun working at the Museum of Science and Industry in Chicago and your first project is to build an exhibit explaining to the general public how bile salt sequestering resin lowers blood LDL levels and leads to reduced risk of heart attack and stroke. Draw out a plan for your exhibit. Labeling text will be read; descriptive paragraphs will not.

3.) Imagine examining metabolism in two adjacent muscle cells. One cell absorbs β-hydroxybutarate, while the other cell absorbs the fatty acid 4:0. Compare (i) the method by which each cell will breakdown the select molecule to extract energy and (ii) the amount of ATP (and GTP) that each cell will gain.

β-hydroxybutarate

fatty acid 4:0

4.)Imagine that you observed the following during the Lipase Activity Lab that you performed:

1. Prepare 65 mL of a solution that contains:
   10 mM Tris buffer
   40% (v/v) olive oil emulsion

2. Aliquot 4.333 mL of the above solution into twelve labeled glass test tubes.

3. Record the mass of mouse organ used.

4. Grind a mouse assigned mouse organ well in a chilled mortar with 5 mL of water.

5. Transfer the liquid to a 2 mL microfuge tubes.

6. Spin the balanced tube at 5,000 rpm for 1 min.

7. Place as much of the supernatant into a clean 15 mL conical tube as possible.

8. Check that you have 5 mL mouse organ extract. Add water to make up the difference. Don't forget to mix well.

9. Place 2.5 mL of the mouse organ extract into a clean, small glass test tube and heat to >90°C for 10 minutes. Cool tubes to room temp.

10. Add 666 uL of:
    dH_2O (Tubes 1-3)
    1000 units/mL lipase solution (Tube 4)
    2000 units/mL lipase solution (Tube 5)
    3,000 units/mL lipase solution (Tube 6)
    Heat-treated mouse organ extract (Tubes 7 through 9)
    Mouse organ extract (Tubes 10 through 12)

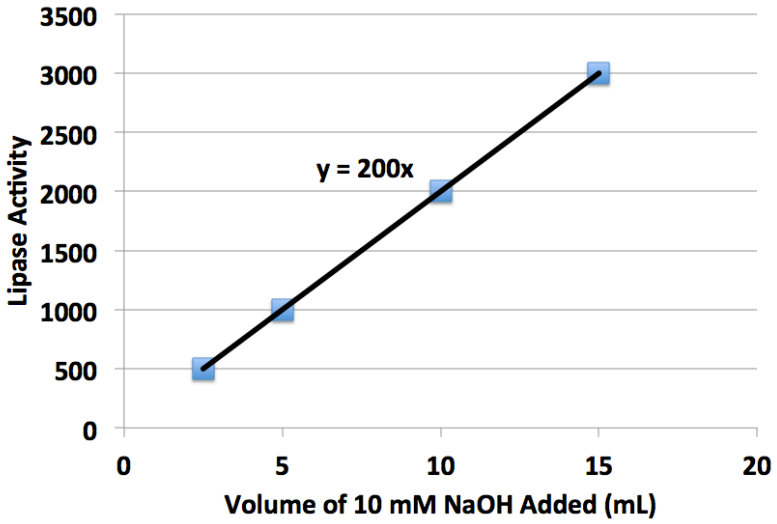
11. Mix each test tube by covering with parafilm and inverting multiple times.

12. Incubate tubes at 37°C for exactly 30 minutes.

13. After 30 minutes, transfer the contents of each test tube to a clean, labeled 125 mL Erlenmeyer flask. Immediately, add 2.0 mL of 95% ethanol to each flask to quench the reactions.

14. Add 4-5 drops of thymolphthalein indicator solution to each flask.

15. Titrate with NaOH until a light blue color appears being careful to continue mixing well.



Temperate adipose tissue required 1.10 mL of 10 mM NaOH
Heated adipose tissue required 1.00 mL of 10 mM NaOH
Temperate pancreatic tissue required 13.00 mL of 10 mM NaOH
Heated pancreatic tissue required 1.20 mL of 10 mM NaOH
Initial pancreatic mass used was 0.2000 g
Initial adipose tissue used was 0.2000 g

A. **Determine the Lipase activity of the adipose and pancreatic tissues per g of tissue.**

B. **Both tissues express lipases. Why can you detect the enzyme activity in pancreatic tissue but not in the adipose tissue?**

C. **How many fatty acids are freed in the 1 mL reaction tube at 37°C per minute by one unit of lipase activity?**

5.) When a protein folds into a 3-D shape some of the amino side chains are buried, while others remain exposed to the surrounding solvent (mostly water). Group the 20 naturally occurring amino acids into two groups; ones that contain side chains likely to be buried and ones that contain side chains likely to remain exposed. What types are intermolecular forces characterize the two groups?