1. **The pentose phosphate pathway**
   A) oxidizes glucose at the 6 carbon
   B) oxidizes glucose at the 1 carbon
   C) reduces NAD+
   D) generates PRPP as a product

2. **Complex I:**
   A) gets electrons from NADPH
   B) generates NADH
   C) donates electrons to succinate
   D) produces ubiquinol

3. **Lipoic acid**
   A) will accept electrons and carry an acetyl group
   B) will accept electrons
   C) will carry an acetyl group
   D) will covalently react with pyruvate

4. **Molecules A, B, and C, have reduction potentials of -.23, -0.1 and +.34 electron volts, respectively, in the cell.** If they are involved in a set of sequential reactions that allow electrons to be passed from one to the next, which order delivers the most energy?
   A) electrons are passed from B to C, then from C to A
   B) electrons are passed from A to B, then from B to C
   C) electrons are passed from C to B, then from B to A
   D) electrons are passed from A to C, then from C to B

5. **UDP-glucose**
   A) directly donates a glucose to start a glycogen chain
   B) transfers phosphate to other molecules
   C) is a substrate in the Calvin cycle
   D) accepts electrons during the Krebs cycle

6. **Glycogenin**
   A) is the form of glycogen with no branches
   B) is a relative of glycogen found in plants
   C) is a drug that inhibits glycogen production
   D) is a protein that initiates glycogen synthesis

7. **Which anapleurotic enzyme includes oxaloacetate as a product?**
   A) malic enzyme
   B) pyruvate kinase
   C) PEP kinase
   D) pyruvate carboxylase
8. The $F_0$ subunit of the ATP synthase
A) is reduced by electrons as they reach the end of the respiratory chain
B) binds both ADP and ATP
C) is found in the intermembrane space of the mitochondrion
D) transports protons across the membrane

9. There are two enzymes which we lack that allow plants and microorganisms to make glucose from fat. What are they called?
A) Isocitrate lyase and malate synthase
B) Isocitrate dehydrogenase and malate synthase
C) Isocitrate mutase and malate synthase
D) Isocitrate lyase and glyoxalate synthase

10. The PDH complex
A) is found in the cytosol of mammalian cells
B) uses PLP to convert pyruvate into alanine
C) uses TPP, lipoic acid, FAD, and NAD$^+$ as cofactors
D) does not function in absence of oxygen

11. The cofactor TPP
A) activates CO$_2$ for a number of transfer reactions
B) functions in moving amino groups from one molecule to another
C) attacks carbonyls with a nitrogen nucleophile, allowing catalysis
D) uses a carbanion to attack carbonyl groups on substrates

12. The pictured structure is part of what cofactor
A) NAD
B) PLP
C) TPP
D) biotin

13. What molecule includes this structural motif?
A) NADH
B) NADPH
C) both
D) neither

14. Which gluconeogenic step uses a glycolytic enzyme?
A) conversion of glucose-6-phosphate to glucose
B) conversion of pyruvate to phosphoenolpyruvate
C) conversion of 1, 3 bPG and NADH to G3P and NAD$^+$
D) conversion of fructose 1,6 bisphosphate to fructose 6 phosphate
15. If you knew $\Delta G^\circ$ for a reaction, what do you need to calculate the $\Delta G$ for the actual conditions in which the reaction is occurring?
   A) You’re done! It is the same
   B) You need $\Delta G^\ddagger$, the activation energy, as well
   C) You need to know the Km and Vmax for the enzyme involved
   D) You need the concentrations of all reactants and products

16. $k_{cat}$ is a measure of
   A) how tightly a ligand binds to a protein
   B) how easily an enzyme is saturated with a substrate
   C) an enzyme's maximum rate of catalysis
   D) how specific an enzyme is for its substrate

17. If the activation energy of a reaction increases by 4kJ/mole
   A) the reaction will be accelerated by a factor of $e^{4/RT}$
   B) The $\Delta G$ will be decreased by 4kJ/mole
   C) the reaction will be slowed by a factor of $e^{4/RT}$
   D) the reaction will be accelerated by a factor of 4/RT

18. An enzyme is catalyzing a reaction in a beaker, accelerating the rate by a factor of $10^7$. The solution is then placed in a microwave, which totally inactivates the enzyme. Once the beaker is back to normal temperature, what is now going on in the beaker?
   A) the forward reaction is slowed by a factor of $10^7$
   B) The reverse reaction is slowed by a factor of $10^7$
   C) The equilibrium constant is lowered
   D) Both A and B

19. Enzyme II has a Km that is twice the Km of enzyme I. What is the rate of enzyme I when its substrate concentration is equal to the Km of enzyme II
   A) 1/2 of the maximum rate
   B) 2/3 of the maximum rate
   C) 3/4 of the maximum rate
   D) 1/2 the Vmax of enzyme II

20. The picture shown is a Lineweaver-Burke plot for enzymes A and B. Which statement is the most accurate?
   A) B has a smaller Km than A
   B) B has a bigger Vmax than A
   C) A and B have the same Vmax; A has a smaller Km
   D) A and B have the same Km; A has a smaller Vmax

Breath Here….
21-27 Big Wheel Keep on Turnin', Proud Carbons Keep on Burnin..." The following questions are about the Krebs cycle and two upstream reactions, depicted in the schematic. The LETTERS refer to molecules, and the NUMBERS refer to the reactions, or the enzymes that catalyze those reactions. Each line segment or arrow is a single enzymatic step. For each question, choose the BEST answer.
Hints: Reaction 1 (A to Z) is lactate dehydrogenase; molecule D is isocitrate

21. The reaction in which the same choice of two indistinguishable prochiral groups is always selected for movement to a new carbon
A) 1
B) 8
C) 4
D) 10

22. Production of CO$_2$ occurs in which reactions:
A) 4 and 5
B) 5, 6
C) 5, 6, and 2
D) 5, 6, and 10

23. An unsaturated dicarboxylic acid(s):
A) A
B) G
C) G and H
D) H

24. Complex II of the respiratory chain
A) 1
B) 2
C) 8
D) none

25. Directly converted to PEP in gluconeogenesis
A) J
B) G
C) C
D) A

26. Shuttled out of the mitochondrion to provide acetyl groups for fatty acid and cholesterol synthesis
A) C
B) I
C) Z
D) J
27. Reactions that use CoA-SH as a substrate
A) 1
B) 2
C) 6
D) 2,6

End of “Proud Carbons” section

28. The main function of fermentation is
A) to produce ethanol for metabolism
B) to produce NADH for respiration
C) to produce NADPH for anabolism
D) to regenerate NAD⁺ for glycolysis

29. Which metabolic reaction does not occur in the mitochondrion
A) production of GTP during oxidation of α-ketoglutarate
B) reduction of cytochrome c
C) addition of H₂O across a double bond on a fatty acid during its oxidation
D) phosphorylation of ADP by transfer from PEP

30. Thermogenin
A) is a drug that moves protons across the mitochondrial inner membrane
B) improves the efficiency of ATP synthesis in newborns and hibernating bears
C) allows movement of protons across the mitochondrial membrane
D) stops the respiratory chain, allowing the NADH to be used to make heat

31. An inhibitor of complex III would
A) cause a buildup of reduced cytochrome c
B) cause a buildup of QH₂
C) activate the Krebs cycle
D) cause a buildup of oxidized quinone

32. A yeast cell with a null mutation in fructose 1,6 bisphosphatase is discovered. This strain would
A) Not undergo glycolysis and not undergo gluconeogenesis
B) Be unable to regulate glycolysis, but would still regulate gluconeogenesis
C) Not undergo gluconeogenesis, but would undergo glycolysis
D) Be unable to regulate glycolysis and unable to regulate gluconeogenesis

33. cytochrome c
A) plays a role in respiration
B) plays a role in cell death
C) plays a role in photosynthesis
D) plays a role in cell death and respiration
34-37. Breathtaking Mitochondria! The graph shows the results of an experiment where isolated mitochondria are being measured for O$_2$ consumption and ATP production. Each arrow indicates the addition of the indicated substance to the reaction mix.

Answer the following questions about the graph:

34. **The addition of succinate in this experiment**
   A) provides phosphate groups for transfer to ADP  
   B) provides electrons for transport along the respiratory chain  
   C) provides carbon skeletons for synthesis of glucose  
   D) causes the effect seen through production of NADH in the Krebs cycle

35. **If the succinate and the ADP were added in the opposite order**
   A) the line slopes would increase when the succinate was added  
   B) there would now be no effect, due to uncoupling  
   C) line slopes would increase only after the ADP was added  
   D) the thin line (O$_2$ consumption) would go flat at X

36. **What is the best description of X's effect (see picture on last page)**
   A) both H$_2$O production and ATP production are blocked  
   B) only H$_2$O production is blocked  
   C) The consumption of O$_2$ is blocked  
   D) H$_2$O production continues but ADP consumption is blocked

37. **What is the best guess of the nature of X**
   A) An oxidizing agent like the Hill reagent in photosynthesis  
   B) a specific inhibitor of ATP synthase like oligomycin  
   C) a weak organic acid with a hydrophobic protonated form  
   D) an inhibitor of pyruvate dehydrogenase

End of “Breathtaking Mito” section
38. **When fructose 2,6 bisphosphate is lowered**
   A) glycolysis is hastened
   B) gluconeogenesis is hastened
   C) glycolysis is hastened and gluconeogenesis is slowed
   D) glycolysis is slowed and gluconeogenesis is hastened

39. **The Cori cycle**
   A) is the cyclic degradation of amino acids to urea and carbon skeletons
   B) includes movement of fatty acids from adipocytes to liver where they are metabolized
   C) includes transport of muscle lactate to the liver for conversion to glucose
   D) is an alternative to the Krebs cycle that allows acetate to be synthesized into glucose with no loss of carbons

40. **A molecule of alanine is labeled on the alpha carbon with $^{14}C$. This labeled molecule undergoes transamination to make the corresponding keto acid, and then enters the Krebs cycle. What is the structure of the resulting Krebs cycle molecule that is produced during the first turn of the cycle?**

   ![Diagram of molecules](image)

41. **The pictured molecule**
   A) is formed during deamination of alanine
   B) is glyceraldehyde-3-phosphate
   C) is a pentose phosphate pathway intermediate
   D) is made by Rubisco
42. In the Calvin cycle, 5-carbon ribulose-5-P is regenerated
   A) by transaldolases and transketolases
   B) in the reduction part of the cycle
   C) by the action of RUBISCO
   D) by decarboxylation of glucose

43. Which respiratory complex is most like cytochrome b6f of photosystem II
   A) I
   B) II
   C) III
   D) IV

44. Mn^{2+} ion is most directly involved in
   A) metabolism of odd-carbon fatty acids
   B) removal of electrons from water
   C) reactions that involve transfer of phosphate from ATP
   D) transfer of electrons along the respiratory chain

45. In photosynthesis, NADPH is directly produced
   A) from electrons donated from cytb6f
   B) from electrons donated by ferredoxin
   C) by light-driven oxidation of carbohydrates
   D) by the action of RUBISCO

46. What is the strategy used by C4 plants in carbon fixation
   A) they have developed an altered version of RUBISCO that is more specific for CO₂
   B) they use an alternative reaction to generate 3-PG from ribulose bisphosphate, so that the problems with RUBISCO do not affect carbon fixation
   C) They have a separate cellular compartment for generation of CO₂
   D) they use leghemoglobin to scavenge excess O₂

47. What enzyme allows liver to release its stored glycogen into the bloodstream as free glucose
   A) Glycogen phosphorylase
   B) Glucose 6-phosphatase
   C) Glycogen hydrolase
   D) Phosphoglucomutase

48. Glucagon stimulates the liver to
   A) increase glycogen synthesis
   B) increase gluconeogenesis
   C) increase glycolysis
   D) both A and C
49. **Glucagon in the blood increases**
   A) when glucose levels decrease
   B) when fatty acids enter the bloodstream
   C) when insulin is released
   D) when glucose levels increase

50. **When the liver makes glucose by gluconeogenesis**
   A) it can use amino acids or lactate as a source of carbon
   B) it can only use amino acids as a source of carbon
   C) it can use amino acids, lactate, or acetyl-CoA as a source of carbon
   D) it can use amino acids or fatty acids as a source of carbon

51. **Insulin does NOT**
   A) increase levels of fructose 2,6 bisphosphate
   B) increase activity of glycogen synthase
   C) decrease the activity of glycogen synthase
   D) decrease the activity of the gluconeogenic pathway

52. **Which is true about tissue-specific removal of insulin receptors discussed in class:**
   A) removal of muscle insulin receptors causes diabetes
   B) removal of liver insulin receptors had no effect
   C) removal of brain insulin receptors causes obesity
   D) removal of adipocyte insulin receptors had no effect

53. **What is the first blood-born carrier of fatty acid molecules that have been taken up by the gut?**
   A) chlomicrons
   B) HDL
   C) VLDL
   D) LDL

54. **Carnitine is used in metabolism**
   A) in muscle as an acceptor of active phosphate
   B) in the synthesis of fatty acids
   C) as a cofactor in glycolysis.
   D) to transport fatty acids across a membrane

55. **Creatine is used in metabolism**
   A) in muscle as an acceptor of active phosphate
   B) in the synthesis of fatty acids
   C) as a cofactor in glycolysis.
   D) to transport fatty acids across a membrane
56. **Triglycerides consumed when eating Jack's Mini Sirloin Burgers:**
A) are absorbed directly from the gut and distributed to cells for use
B) are immediately synthesized into phospholipids in the intestinal epithelium
C) are hydrolyzed to smaller molecules by the gut which are then used to produce new di- and triglycerides before delivery to other tissues
D) are hydrolyzed to smaller molecules by the gut, which are then sent to other tissues, and used to produce new di-and tri-glycerides after delivery to other tissues

57. **Malonyl-CoA is produced**
A) when a fatty acid with an odd carbon number is oxidized by the cell.
B) during fatty acid synthesis
C) when ketone bodies are forming
D) in the Krebs cycle

58. **Drugs such as aspirin and ibuprophen**
A) inhibit the production of a class of bioactive lipids derived from a polyunsaturated fatty acid
B) block the production of numerous unsaturated fatty acids
C) decrease the action of the F1 ATPase, causing decreased electron flow through the respiratory chain
D) increase uptake of bacterial products by macrophages

59. **Citrate lyase inhibitors**
A) Inhibit the synthesis of only fatty acids
B) Inhibit the synthesis of only cholesterol
C) Inhibit the synthesis of both cholesterol and fatty acids
D) Inhibit a reaction of the Krebs cycle

60. **The statins**
A) Inhibit the synthesis of only fatty acids
B) Inhibit the synthesis of only cholesterol
C) Inhibit the synthesis of both cholesterol and fatty acids
D) Inhibit a reaction of the Krebs cycle

61. **An inhibitor of acetyl-CoA carboxylase would**
A) Inhibit the synthesis of only fatty acids
B) Inhibit the synthesis of only cholesterol
C) Inhibit the synthesis of both cholesterol and fatty acids
D) Inhibit a reaction of the Krebs cycle

62. **Citrate lyase**
A) is inhibited by statins for lowering blood cholesterol
B) is an enzyme of the glyoxylate cycle
C) produces acetyl-CoA in the cytosol
D) generates malate as a product in the cytosol
63. For what biochemical process is the enzyme isocitrate lyase required?
A) net synthesis of glucose from acetate  
B) generating AcCoA in the cytosol  
C) the Krebs cycle  
D) formation of amino acids from α-keto acids

64. A fourteen carbon fatty acid (myristic acid) is being synthesized. An acetyl group with the carbonyl carbon labeled with $^{14}$C is used in the second-to-final reaction cycle. All other reactions before and after use unlabeled acetate. Which carbon is labeled in the resulting product molecule? As you know, fatty acids are numbered with the carboxyl group being number 1.
A) carbon number 3  
B) carbon number 4  
C) carbon number 11  
D) carbon number 12

65. The best description of one cycle of fatty acid synthesis is:
A) reduction with NADPH, reduction with NADPH, removal of water  
B) reduction with NADPH, removal of $H_2O$, reduction with NADPH  
C) reduction with NADH, removal of $H_2O$, reduction with $FADH_2$  
D) oxidation with FAD, addition of $H_2O$, oxidation with $NAD^+$

66. Ketone body synthesis
A) Is caused by excessive activity of the Krebs cycle  
B) Is inhibited by citrate lyase  
C) Is caused by excessive glycolysis when Krebs cycle activity is low  
D) Occurs when there is excessive Ac-CoA in the mitochondrion

67. Look at the picture of the lipid molecule. Which statement is true?
A) This is a diglyceride with saturated fatty acids  
B) This is a diglyceride with unsaturated fatty acids  
C) These fatty acids can only be made by plants  
D) This is a monoglyceride

68. Desaturation of fatty acids
A) only occurs in mammals  
B) only occurs in plants  
C) can occur in both mammals and plants  
D) can create both cis and trans double bonds
69. What is this molecule:
A) an intermediate in ketone body production
B) a precursor of isoprenes
C) a Krebs cycle molecule
D) a urea cycle molecule

70. What is the correct order of intermediates that appear in the cholesterol synthetic pathway
A) squalene, mevalonate, AcCoA, cholesterol
B) AcCoA, squalene, mevalonate, cholesterol
C) AcCoA, mevalonate, squalene, cholesterol
D) malonyl-Coa, mevalonate, squalene, cholesterol

71. Malonyl-CoA
A) is an intermediate in ketone body synthesis
B) is made in the synthesis of fatty acids
C) is an intermediate in odd number carbon fatty acid oxidation
D) is an intermediate in the pathway of cholesterol synthesis

72. Triglycerides can be hydrolyzed into glucose and fatty acids. Which is true about these two types of molecules in mammals
A) Glucose can be made from either
B) Glucose can be made from fatty acids but not glycerol
C) Glucose can be made from neither
D) Glucose can be made from glycerol but not fatty acids

73. The Ahlborg et al. (6 men on a bike) study about people doing low-intensity exercise for 4 hours. Which of the following was observed in that experiment.
A) Glucagon levels went down several fold during exercise
B) The muscles continuously increased their usage of blood glucose during the exercise time
C) Glucagon went up several fold during exercise
D) Gluconeogenesis stayed steady during the exercise trial

74. Epinephrine has effects that are most similar to
A) Increasing glucagon
B) Increasing insulin
C) Decreasing glucagon
D) The response to a meal

75. Which of the metabolic reactions below is involved in moving electrons across a membrane by a set of shuttle reactions:
A) re-oxidation of cytochrome c by complex IV
B) oxidation of malate to oxaloacetate by NAD+
C) transfer of an H+ ion from NADH to Complex I
D) oxidation of succinate to fumarate
76. **In people, excess nitrogen is excreted**
   A) in glutamine
   B) in uric acid
   C) in alanine
   D) in urea

77. **In urea, the 2 nitrogen atoms**
   A) both come from carbamoyl phosphate
   B) come from ammonia and aspartate
   C) both come from ammonia
   D) come from ornithine and carbamoylphosphate

78. **The C in urea (pictured to the right) comes from:**
   ![Urea diagram]
   A) arginine
   B) aspartate
   C) pyruvate
   D) carbonate

79. **Carbamoyl phosphate**
   A) is used in the urea cycle
   B) is used in the urea cycle and purine synthesis
   C) is used in the urea cycle and pyrimidine synthesis
   D) is used in pyrimidine synthesis

80. **Ornithine**
   A) is most similar to the amino acid K
   B) is most similar to the amino acid R
   C) is most similar to the amino acid E
   D) is not an amino acid

81. **The disease gout**
   A) is due to abnormally low levels of xanthine oxidase
   B) is alleviated by allopurinol, an inhibitor of xanthine oxidase
   C) is alleviated by allopurinol, an allosteric activator of xanthine oxidase
   D) is a deficiency in the anabolism of purines

82. **When comparing purine and pyrimidine synthesis**
   A) the purine base is made "upon the PRPP ring"
   B) the purine base is made as a free molecule and added to PRPP
   C) the pyrimidine base is made as a free molecule and added to PRPP
   D) two of the above are true
83. **Glutamine synthetase (GS)**
A) is regulated by uridylylation of the GS protein
B) is allosterically regulated by uridine
C) is regulated by uridylylation of an adenylylation enzyme
D) is allosterically regulated by glutamine

84. **Glutamine supplies nitrogen for many anabolic reactions. What is the enzyme that transfers nitrogen from glutamine to many anabolic substrates?**
A) glutamine amidotransferase
B) glutamine transcarbamoylase
C) glutamate synthetase
D) glutamine deaminase

85. **Phenylketourea (PKU)**
A) is a disease caused by defective synthesis of phenylalanine
B) is a disease caused by defective synthesis of multiple amino acids including phenylalanine
C) is a disease caused by environmental compounds that alter amino acid catabolism
D) is a disease caused by defective catabolism of phenylalanine

86. **Ribonucleotide reductase**
A) reduces the purine ring to bases found in DNA or RNA
B) converts nucleotides into deoxynucleotides
C) converts nucleosides into deoxynucleosides
D) converts uracil, found in RNA, to thymidine, found in DNA

87. **Salvage reactions in mammals**
A) are only used to make purine nucleotides
B) are only used to make pyrimidine nucleotides
C) are used to convert purine into uric acid
D) are used to recover bases by adding them to PRPP

88. **The work by Ronald Evans discussed in class showed that expression of an active form of PPARδ in skeletal muscle**
A) Changes the muscles to a more type II fiber character
B) Changes muscles to a more type I fiber character
C) Makes mice more prone to obesity because they use more lipid as fuel
D) both B and C

89. **DAF2 in C. elegans, and is considered the worm version of which protein?**
A) The insulin receptor
B) SIR2
C) insulin
D) a mitochondrial subunit
90. A mutation in DAF2 in C. elegans
   A) accelerates aging
   B) slows aging
   C) decreases mitochondrial respiration
   D) decreases eating

91. In C. elegans, lowering mitochondrial activity
   A) will kill the worms
   B) causes them to eat less food, which makes them live longer
   C) causes an increase in lifespan
   D) causes a decrease in lifespan

92. Genetic and physiological studies of ageing indicate that
   A) diminished SIR2 activity appears to be correlated with longevity
   B) increased SIR2 activity appears to be correlated with longevity
   C) diminished SIR2 activity is a result of the ageing process
   D) increased SIR2 activity is a result of the ageing process

93. ROS such as O$_2^-$
   A) are a product of mitochondrial respiration
   B) are made in the cytosol and damage various molecules
   C) are made as a byproduct of mitochondrial respiration
   D) are made during photosynthesis

94. NEAT stands for
   A) Novel Exercise And Training
   B) Non-Exercise Activity Training
   C) Nondirected Exercise And Thermogenesis
   D) Non-Exercise Activity Thermogenesis

95. NEAT is
   A) calorie burning activities apart from exercise
   B) A measure of the calories we burn due to exercise
   C) higher in people with higher BMIs
   D) affected by weight gain or loss

96. Type I fibers in muscle
   A) Can not use lipids as fuel
   B) Are most important in high intensity exercise
   C) Have higher glycolytic capacity than other fibers
   D) Have lower glycolytic capacity than other fibers
97. **PPY and ghrelin**
   A) are drugs that inhibit purine metabolism
   B) are peptides produced in the brain that control energy metabolism
   C) are peptides produced in the gut that lower appetite
   D) are peptides produced in the gut with opposing effects on appetite

98. **The Pima indigenous people of the Southwest US and Sonora, Mexico**
   A) have a genetic predisposition for type II diabetes and obesity
   B) settled long ago in an environment where lipids were an abundant part of diet
   C) have a genetic predisposition for type I diabetes and obesity
   D) have genetically-caused hypertension that leads to diabetes

99. **Both type 1 and type 2 diabetes**
   A) have shown dramatic rises in the past 20 years
   B) are caused by defects in insulin regulation of metabolism
   C) are caused by defective production of insulin
   D) are caused by poor muscle response to insulin

100-120 Truthy or False-ish…
for each question, choose the best answer. Use bubble A for TRUE, B for FALSE

_____ 100. RUBISCO evolved before O\textsubscript{2} was abundant on Earth

_____ 101. Leptin causes increased appetite in mammals

_____ 102. Fatty acid synthesis and fatty acid \(\beta\)-oxidation are each cellular processes that have negative \(\Delta G\)’s

_____ 103. Pyruvate carboxylase is needed in the Cori cycle

_____ 104. Citrate lysase provides AcCoA for use in the cytosol

_____ 105. Citrate lyase is used by mammals to synthesize glucose

_____ 106. Hibernating bears make glucose from the fatty acids

_____ 107. The tumor cells in the citrate lysase study we discussed in class derive all their fatty acids from circulation
108. The Krebs cycle has no oxygen-dependent steps

109. Both insulin and glucagon alter fructose 2,6 bisphosphate to regulate glucose metabolism

110. Muscles express the enzyme glucose-6-phosphatase

111. The glucose molecules at the branch points in glycogen are released as neutral, unphosphorylated molecules

112. Type IIb muscle fibers are more dependent on anaerobic metabolism than Type IIa fibers

113. Ribonucleotide reductase is a simple Michaelis-Menten enzyme

114. The Levine study described in the last class indicates that obesity causes lower levels of NEAT in humans.

115. In normal, respiring cells, an inhibitor of ATP synthase would slow glycolysis

116. Seeds make glucose molecules from stored fatty acids upon germination

117. The inner mitochondrial membrane is impermeable to aspartate (amino acid D)

118. The conversion of glucose into fatty acids requires citrate synthase

119. In amino acid catabolism, the nitrogen is directly removed from each amino acid by an enzyme to produce free ammonium ion

120. Depleting calories by exercise has the same effects on longevity as decreasing intake by calorie restriction

Have a great Summer!!!

As of tomorrow, you are all a leaving group...

RH