1. **Substrate level phosphorylation**  
   A) is part of the glycolytic phosphoglycerate kinase reaction  
   B) pertains to the action of ATP synthase  
   C) is how an H+ gradient is made across membranes  
   D) is part of the reaction of Fr 1,6 bisphosphatase

2. **Thermogenin**  
   A) transports protons across the mitochondrial inner membrane  
   B) binds ATP keeping it from halting H2O production  
   C) is found in the outer membrane of mitochondria  
   D) is reduced by electrons in complex IV

3. **Which metabolic reaction does not occur in the cytosol**  
   A) production of succinyl-Coa from α-ketoglutarate  
   B) phosphorylation of fructose 6-P  
   C) oxidation of glucose6-P by NADP+  
   D) ATP-dependent cleavage of citrate to generate Ac-CoA

4. **You enter a tiny submarine located in the mitochondrial matrix. You fire up the engines and pilot the vessel to the cytosol. What is the most likely order of things to see passing by the porthole during your voyage from the matrix outward.**  
   A) outer membrane, intermembrane space, inner membrane, cytosol.  
   B) inner membrane, matrix, outer membrane, cytosol.  
   C) outer membrane, inner membrane, matrix, cytosol.  
   D) inner membrane, intermembrane space, outer membrane, cytosol.

5. **Which of the metabolic reactions below is involved in moving electrons across a membrane:**  
   A) re-oxidation of cytochrome c by complex IV  
   B) transamination of alpha ketoglutarate into glutamate  
   C) transfer of an H+ ion from NADH to Complex I  
   D) oxidation of succinate to fumarate

6. **CDP-diacylglycerol**  
   A) is an intermediate in phospholipids synthesis  
   B) is formed during triglyceride catabolism  
   C) shuttles diacylglycerol across a membrane  
   D) is an intermediate in ketone body formation

7. **Gluconeogenesis**  
   A) allows conversion of fat into glucose in mammalian cells  
   B) occurs in the mitochondrion  
   C) allows conversion of fat into glucose in plants  
   D) is upregulated by insulin
8. The “Cori cycle”, that describes the flow of molecules to and from muscle during intense activity:
   A) is a way the body moves nitrogen from muscle to liver
   B) involves the cyclic degradation of amino acids to urea and carbon skeletons
   C) includes an alternative to the Krebs cycle that allows acetate to be synthesized into glucose with no loss of carbons
   D) is a way the body moves carbon from muscle to liver

9. Glycogen's branches
   A) are made by glycogen synthase
   B) are made by branching enzyme from UDP-glucose subunits
   C) are made by branching enzyme from linear chains made during glycogen synthesis
   D) consist of individual glucose linked together by alpha(1-6) linkages

10. Rubisco
    A) converts a 5 carbon molecule into a 6 carbon molecule
    B) uses biotin to add CO\textsubscript{2} to its substrate
    C) converts a 5 carbon molecule into two distinct 3 carbon molecules
    D) converts a 5 carbon molecule into two identical 3 carbon molecules

11. Debranching enzyme
    A) rearranges branched glucose chains on glycogen and generates free glucose
    B) is used to synthesize glycogen that is not branched
    C) completely hydrolyzes glycogen branches into glucose-1P
    D) rearranges branched glucose chains on glycogen

12. Citrate lyase inhibitors
    A) inhibit a reaction of the Krebs cycle
    B) inhibit the synthesis of only cholesterol
    C) inhibit the synthesis of cholesterol and fatty acids
    D) inhibit the synthesis of only fatty acids

13. The enzyme nitrogenase
    A) converts NOx into usable nitrogen for plants
    B) is produced by plants to fix elemental N\textsubscript{2} into ammonia
    C) produces NH\textsubscript{3} from N\textsubscript{2}
    D) functions both in mammals and plants to convert nitrogen into a useable form

14. Chylomicrons
    A) are lipoproteins produced by the liver
    B) deliver dietary fats to the circulation from the gut
    C) are part of the mitochondrial structure
    D) are a unit of measurement used in microscopy of organelles
15. **In C. elegans, lowering mitochondrial activity**  
   A) causes decreases in fat stores  
   B) causes them to eat less food, which makes them live longer  
   C) causes an increase in lifespan  
   D) causes a decrease in lifespan

16. **De novo synthesis of the pyrimidine ring**  
   A) occurs on a ribose-derived carrier  
   B) occurs on a glucose-derived carrier  
   C) occurs on a nucleotide carrier  
   D) does not occur on a carrier

17. **De novo synthesis of the purine ring**  
   A) occurs on a ribose-derived carrier  
   B) occurs on a glucose-derived carrier  
   C) occurs on a nucleotide carrier  
   D) does not occur on a carrier

18. **The urea cycle**  
   A) produces no amino acids that are found in proteins  
   B) removes urea from the amino acid R  
   C) removes urea from the amino acid ornithine  
   D) uses succinate as a source of atoms

19. **Phosphoenoylpyruvate carboxykinase**  
   A) is an ATP-requiring step in gluconeogenesis  
   B) is an enzyme of glycolysis  
   C) catalyzes the production of PEP  
   D) adds CO$_2$ to OAA using biotin

20. **Synthesis of glucose from pyruvate**  
   A) requires both GTP and ATP to run spontaneously  
   B) requires energy rich molecules, and is thus not spontaneous  
   C) uses all of the enzymes of glycolysis  
   D) uses requires two enzymes from the Krebs cycle

21. **A sixteen carbon fatty acid (palmitic acid) is being synthesized. An acetyl group with the methyl carbon labeled with $^{14}$C is used in the last 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 2  
   B) carbon number 1  
   C) carbon number 15  
   D) carbon number 16
22. When a palmitae is synthesized by the FAS, as in the question above, de novo from acetyl Co A, how many reaction cycles take place to produce the final fatty acid?
   A) Damned if I know!
   B) 16
   C) 8
   D) 7

23. The first reaction of the glyoxylate cycle that distinguishes it from the Krebs cycle is
   A) cleavage of isocitrate into glyoxylate and succinate
   B) rearrangement of isocitrate by isocitrate isomerase
   C) condensation of acetyl-CoA with glyoxylate
   D) generation of glyoxylate by removal of CO$_2$ from a precursor

24. One of the observations from the tissue-specific insulin receptor removal studies mentioned in class is
   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

25. 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

26. In photosynthesis, electrons from water first enter
   A) photosystem II reaction center
   B) cytochrome b6f
   C) photosystem I reaction center
   D) LHCII

27. What is the correct order of intermediates that appear along the cholesterol synthetic pathway
   A) acetyl-CoA, mevalonic acid, cholesterol
   B) acetoacetyl-CoA, methylmalonyl-CoA, squalene, cholesterol
   C) acetyl-CoA, mevalonyl-CoA, squalene, cholesterol
   D) malonyl-CoA, mevalonic acid, cholesterol
28. The regulation process known as “acceptor control” predicts that in normal mitochondria
   A) elevated NAD\(^+\) increases ATP production
   B) increased ADP decreases NADH oxidation rate
   C) decreased ADP slows the respiratory chain
   D) increased proton gradient increases ATP synthesis

29. What is the structure shown in the picture
   A) propionate
   B) malonate
   C) glycerol
   D) acetone

30. 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

31-40 It's Krebulation time! The following questions are all about the Krebs cycle and a couple 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. Free of charge info: Z is lactate; B is acetyl-CoA; C is citrate; J is oxaloacetate. Get it? For each question, choose the BEST answer.

31. The reaction in which the same choice of two indistinguishable prochiral groups is always selected for formation of a new bond?
   A) 1
   B) 8
   C) 4
   D) 10

32. Production of CO\(_2\) occurs in
   A) 4 and 5
   B) 5, 6
   C) 5, 6, and 2
   D) 5, 6, and 10

33. A dicarboxylic acid with a carbon-carbon double bond
   A) A
   B) G
   C) G and H
   D) H
34. Also complex III of the respiratory chain  
   A) 2  
   B) none  
   C) 4  
   D) 8  

35. Molecule that is at the branch point between Krebs and glyoxylate cycle  
   A) D  
   B) C  
   C) A  
   D) L  

36. Has Co-A as part of its structure  
   A) B  
   B) F  
   C) B and F  
   D) Z  

37. Shuttled out of the mitochondrion to provide both acetyl groups and reducing equivalents for fatty acid synthesis  
   A) C  
   B) I  
   C) Z  
   D) J  

38. Reactions that add electrons to NAD⁺  
   A) 5, 8  
   B) 5, 6, 10, 8  
   C) 5, 6, 9  
   D) 5, 6, 10, 2  

39. Generated in first step of pyruvate conversion to glucose (gluconeogenesis)  
   A) H  
   B) I  
   C) J  
   D) B  

40. Enzyme uses TPP, lipoic acid, FAD as cofactors  
   A) 1  
   B) 4  
   C) 6  
   D) 1 and 6  

(End of Krebulation period....)
41. The metal ion that is part of the cytochrome c molecule is 
   A) Mn$^{+2}$  
   B) Al$^{+3}$  
   C) Fe$^{+3}$  
   D) Mg$^{+2}$

42. What is this molecule?  
   A) creatine  
   B) carnitine  
   C) cytosine  
   D) chylotine

43. The picture shown is a Lineweaver-Burke plot for enzymes A and B. Which statement is the most accurate?  
   A) B has a higher Vmax, A has a higher Km 
   B) B has a lower Vmax, but a higher Km 
   C) B has a lower Vmax and a lower Km 
   D) A has a lower Vmax, B has a lower Km

44. In photosynthesis, NADP$^+$ is reduced 
   A) with electrons from reduced cytb6f  
   B) with electrons donated by ferredoxin  
   C) with electrons that come directly from water  
   D) by electrons from the respiratory chain

45. The activation energy of a reaction is lowered by 10 kJ/mole. What is the effect on the rate constant k?  
   A) it is increased to k x $e^{10/RT}$  
   B) it is increased to (k + $e^{10/RT}$)  
   C) it is increased to k x $e^{-10/RT}$  
   D) it is unaffected; activation energy does not determine the rate constant

46. Phosphocreatine is used in metabolism 
   A) to replenish ATP in strenuous exercise  
   B) in the synthesis of fatty acids  
   C) as a cofactor in glycolysis.  
   D) to transport fatty acids across a membrane

47. Brown adipose tissue:  
   A) has mitochondria that are more uncoupled than normal mitochondria  
   B) builds up during endurance exercise training  
   C) uses its ATP to produce heat to keep newborns and bears warm  
   D) has peroxisomes instead of mitochondria
48. Resveratrol (which is found in red wine) is
   A) an inhibitor of the cannabinoid receptor CB1
   B) an activator of the insulin receptor
   C) an activator of the SIR2 protein
   D) an inhibitor of HMG-CoA reductase

49. Which nucleotide is most directly involved in carbohydrate metabolism
   A) UTP
   B) GTP
   C) CTP
   D) TTP

50. 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

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

52. Co^{2+} ion is most directly involved in
   A) reactions in which phosphate is transferred
   B) removal of electrons from water
   C) oxidation of odd-numbered fatty acids
   D) function of the molecule chlorophyll

53. The F1 subunit of ATP synthase
   A) transports protons across a membrane
   B) binds both ADP and ATP
   C) accepts electrons from the last complex in the respiratory chain
   D) is produced in response to low oxygen

54. The thylakoid membrane vesicles within the chloroplast
   A) have a higher pH inside when ready to make ATP
   B) have a higher pH outside when ready to make ATP
   C) have a permeable membrane like the mitochondrial outer membrane
   D) produce ATP in the inside compartment, like in the matrix of the mitochondrion
55. **Glucose is made during photosynthesis**
   A) by gluconeogenesis starting with pyruvate
   B) by gluconeogenesis using 3-carbon molecules from the Calvin cycle
   C) by gluconeogenesis using a 4 carbon molecules from the Calvin cycle
   D) by gluconeogenesis from products of the Krebs cycle

56. **DAF2 is a gene involved in ageing in C. elegans, and is considered the worm version of which protein?**
   A) insulin
   B) SIR2
   C) the insulin receptor
   D) cytochrome c

57. **Mitochondrial component that involves a “Q cycle” in its chemistry**
   A) Complex I        C) Complex III
   B) Complex II       D) Complex IV

58. **When fructose 2,6 bisphosphate is lowered**
   A) both gluconeogenesis and glycolysis are slowed
   B) both gluconeogenesis and glycolysis are hastened
   C) glycolysis is slowed and gluconeogenesis is hastened
   D) glycolysis is hastened and gluconeogenesis is slowed

59. **Statins are**
   A) inhibitors of the cannabinoid receptor CB1
   B) inhibitors of citrate synthase
   C) activators of the SIR2 protein
   D) inhibitors of HMG-CoA reductase

60. **The Ahlborg et al. study presented in our exercise lecture examined the metabolism of people doing low-intensity exercise over 4 hours. Which of the following was observed in that experiment.**
   A) Insulin levels went up as exercise progressed
   B) By four hours, fatty acids provided the majority of the energy used
   C) The muscles continuously increased glucose consumption during the experiment
   D) Glucose blood levels fell by 40 minutes of exercise

61. **Insulin-caused increase in glycogen synthesis and decrease in glycogen degradation is an example of**
   A) allosteric regulation of metabolism
   B) regulation of enzyme activity by altering enzyme phosphorylation
   C) the question is irrelevant because insulin only decreases glycogen synthesis
   D) the question is irrelevant because insulin decreases glycogen synthesis and increase glycogen breakdown
62. **Addition of acyl groups to carnitine**
   A) is the rate-limiting step in fatty acid oxidation
   B) is required to transfer fatty acids out of adipocytes
   C) is the first step in fatty acid elongation
   D) is the rate-limiting step in phospholipid synthesis

63. **Type II diabetes**
   A) is due to beta cell dysfunction as the primary cause
   B) is caused by over production of insulin
   C) is caused by environments, and not genetic, factors
   D) is a deficiency of insulin responsiveness.

64. **Type I diabetes**
   A) is due to lack of insulin as the primary cause
   B) is caused by over production of insulin
   C) is caused by environments, and not genetic, factors
   D) is a deficiency of insulin responsiveness.

65. **What is the molecule shown to the right?**
   A) malonyl CoA, formed during beta oxidation of fatty acids
   B) methylmalonyl CoA, formed during odd-number fatty acid oxidation
   C) malonyl CoA, formed during fatty acid synthesis
   D) An intermediate of the glyoxalate cycle

66. **Rimonabant is**
   A) an inhibitor of the cannabinoid receptor CB1
   B) an activator of the cannabinoid receptor CB1
   C) an activator of the SIR2 protein
   D) an inhibitor of HMG-CoA reductase

67. **The Pima indigenous North Americans**
   A) settled long ago in an environment where lipids were an abundant part of diet
   B) have a genetic predisposition for type I diabetes and obesity
   C) have had high incidence of obesity in their population prior to the arrival of Europeans
   D) have a genetic predisposition for type II diabetes and obesity

68. **Ketosis occurs**
   A) when respiration depletes acetyl-CoA faster then it can be replenished
   B) when production of AcCoA exceeds the rate of its entry into the Krebs cycle
   C) Most often in a well-fed animal
   D) as a result of over-active fatty acid synthesis
69. Genetic and physiological studies of ageing indicate that
   A) diminished SIR2 activity is correlated with longevity
   B) diminished SIR2 activity is a result of the ageing process
   C) increased SIR2 activity is a result of the ageing process
   D) increased SIR2 activity is correlated with longevity

70. Aspirin and ibuprofen
   A) block a pathway involving a 20-carbon unsaturated fatty acid
   B) block the production of numerous unsaturated fatty acids
   C) block the production of ROS
   D) selectively inhibit COX2

71. Triglycerides consumed when eating a Starbucks' muffin (500 calories):
   A) are broken down and then used for biosynthesis while in the gut
   B) undergo catabolism after leaving the gut intact and arriving at other tissues
   C) hydrolyzed to smaller molecules by the gut for catabolism in that tissue
   D) are directly transferred to the blood as part of lipid-rich particles

72. Peroxisomes
   A) produce H$_2$O$_2$ (peroxide) when they are oxidizing fatty acids
   B) produce H$_2$O$_2$ (peroxide) but do not oxidize fatty acids
   C) destroy the peroxide formed during mitochondrial respiration
   D) house the enzymes of the glyoxylate cycle

73. Which nucleotide is most directly involved in lipid synthesis
   A) UTP
   B) GTP
   C) CTP
   D) TTP

74. Complex IV
   A) uses a “Q cycle” for electron transfer
   B) uses O$_2$ as a substrate
   C) accepts electrons from succinate, via FADH$_2$
   D) uses oxidized cytochrome c as a substrate

75. 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
76. **An enzyme**
   A) causes identical enhancement of the forward and reverse reaction rate
   B) raises the forward and reverse reaction activation energies to the same extent
   C) alters the actual $\Delta G$ for the reaction
   D) increases the forward and reverse reaction rates to different extents

77. **glutamate + ATP + NH$_3$ $\rightarrow$ glutammine + ADP + Pi**
   **This reaction is catalyzed by**
   A) glutamine synthetase
   B) glutamine transaminase
   C) glutamine amidotransferase
   D) transglutaminase

78. **Which nucleotide is involved in covalent regulation of glutamine synthesis**
   A) UTP  B) GTP  C) CTP  D) TTP

79. **A cofactor used extensively in carboxylation reactions is**
   A) pyridoxal phosphate (PLP)
   B) coenzyme A
   C) thiamine pyrophosphate (TPP)
   D) biotin

80. **During starvation, alanine from muscles**
   A) is deaminated in the liver, and used in gluconeogenesis
   B) is used as a substrate in the urea cycle
   C) is produced during initial high-intensity exercise
   D) is produced by transamination of lactic acid

81. **A non-essential amino acid**
   A) is any of the amino acids that are not in proteins, such as ornithine
   B) is an amino acid that can be synthesized by humans and is needed for life
   C) is an amino acid that required for the structure, but not the active site, of an enzyme
   D) is synthesized by organisms but is not used by mammalian cells

82. **Phenylketourics are warned against using aspartame because**
   A) aspartame has aspartic acid, that can not be metabolized by these individuals
   B) aspartame has phenylalanine, that is metabolized to a toxic molecule by these individuals
   C) aspartame has aspartic acid, that inhibits an enzyme in these individuals
   D) aspartame has phenylalanine that can not be catabolized by these individuals
83. The two N atoms in urea (the molecule, not the word) come from:
   A) aspartate and ammonia
   B) aspartate and ornithine
   C) ornithine and glutamate
   D) both come from ammonia

84. N-acetylglutamate and fructose 2,6 bisphosphate
   A) are both synthesized in the mitochondrion
   B) are both involved in regulating nitrogen metabolism
   C) are both involved in regulating glycolysis
   D) are both natural molecules that function as allosteric regulators

85. The main function of fermentation is
   A) to produce ethanol for metabolism
   B) to regenerate NAD⁺ for glycolysis
   C) to produce NADPH for anabolism
   D) to produce lactic acid for storage of carbon

86. When a proton gradient is established across a membrane, the available free energy is due to
   A) the concentration gradient across the membrane
   B) the electrical potential across the membrane
   C) both the electrical potential and the concentration gradient
   D) the ability of the protons to react with ATP

87. Ribonucleotide reductase
   A) methylates UDP to form TDP
   B) removes the 3 OH from a ribose ring to make deoxyribose
   C) removes the 2 OH from the ribose ring to make deoxyribose
   D) is blocked by methotrexate, as a treatment for cancer

88. A simple description of what a reaction center does is
   A) changes an electron carrier to one with a more positive reduction potential
   B) captures initial light energy from photons
   C) changes an electron carrier to one with a more negative reduction potential
   D) uses light energy to remove electrons from water

89. Allosteric activation of liver-specific hexokinase (as in the work of Joe Grippo)
   A) decreases appetite
   B) promotes release of glucose into the bloodstream
   C) traps free glucose in cells
   D) increases tissue consumption of glucose
90-95 Pensive about sugars… The picture to the right is a schematic of one of the pathways that we have studied in class. It is not glycolysis, but something else that happens to glucose, and is represented by letters. Let’s think about that pathway.

90. What is the name of this metabolic pathway?
   A) The ribose shunt  
   B) The pentose phosphate pathway  
   C) The Calvin pathway  
   D) The phosphogluconate pathway

91. What is the name of the final product
   A) ribulose-5-phosphate  
   B) ribose-5-phosphate  
   C) deoxyribose-5-phosphate  
   D) ribose-1-phosphate

92. Which molecule is a lactone?
   A) A  
   B) B  
   C) C  
   D) no lactone in this pathway

93. What product is produced twice in the pathway with letters?
   A) NADPH  
   B) CO₂  
   C) NADH  
   D) ATP

94. What product is produced once in the pathway with letters?
   A) NADPH  
   B) CO₂  
   C) NADH  
   D) ATP

95. Which molecule is directly involved (in plants) in carbon fixation
   A) A  
   B) B  
   C) C  
   D) final product

End of pensive questions…
96. Ammonia nitrogen ingested by mammals is frequently incorporated into a carrier molecule that is then used in many anabolic reactions. In one letter code, it would be
A) G
B) D
C) N
D) Q

97. PRPP is involved in
A) purine and pyrimidine catabolism
B) purine synthesis
C) pyrimidine synthesis
D) purine and pyrimidine synthesis

98. For a 20 carbon omega-3 fatty acid, "omega 3" in this case means
A) the fatty acid has a double bond at carbon 3
B) the fatty acid has the same modification 3 times on the molecule
C) the fatty acid has three cis double bonds
D) the fatty acid has a double bond at carbon 18

99. The glyoxylate cycle does not
A) have two separate steps involving AcCoA
B) occur in the mitochondrion
C) allow production of succinate from citrate without CO₂ production
D) provide a way for bacteria to make all needed carbon compounds from acetate

100 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

101. In the urea cycle, the urea is produced
A) in the ureosome
B) in the mitochondrion
C) in the cytosol
D) in the bloodstream

102. Legumes such as pea plants
A) fix nitrogen in their roots with plant nitrogenase enzyme
B) fix nitrogen by the action of symbiotic bacteria
C) produce ammonia for anabolism from light reactions
D) must take up nitrates provided in the soil from natural sources of fertilizer
103. Elevated HIF1a causes
   A) increased glycolysis
   B) increased endurance in mice
   C) increase the levels of proteins involved in the respiratory chain
   D) show diminished production of lactic acid

104. The pictured molecule
   A) is formed during deamination of alanine
   B) is a source of electrons for shuttling into the mitochondrion
   C) is a pentose phosphate pathway intermediate
   D) is produced during substrate-level phosphorylation

105. Gout is a disease
   A) that afflicts the wealthy, through poor dietary choices
   B) in which purine salvage is under active
   C) in which purine catabolism is over active
   D) in which pyrimidine synthesis is unbalanced with purine synthesis

106-125. True-False questions. A = T , B= F

106. _____ The Krebs cycles is amphibolic

107. _____ Germinating seeds make glucose from stored triglycerides

108. _____ A low carbohydrate diet causes ketosis by increasing Krebs cycle activity

109. _____ Kaveh Ashrafi's studies on C. elegans were based on visual detection of fat stores

110. _____ Recent studies on C. elegans lend support to the idea that CR (caloric restriction) increases longevity through altering mitochondrial activity.

111. _____ all reactions are far from equilibrium in the living cell

112. _____ Fatty acid synthesis is non-spontaneous

113. _____ Methotrexate is a drug that blocks synthesis of a DNA precursor
114. ______Hibernating bears make glucose from stored triglycerides

115. ______Ketone bodies provide an alternate fuel source for numerous tissues

116. ______Muscle glycogen stores can be used to maintain blood glucose levels

117. ______Type I muscle fibers are better able to use fatty acids as a fuel

118. ______Synthesis of glucose from lactate requires both mitochondrial and cytoplasmic enzymes

119. ______No animals can survive by only using glycolysis to get energy from glucose

120. ______Reduction of DHAP to glycerol-3-P can provide a route for NAD+ regeneration during glycolysis

121. ______The first CO₂ lost in the Krebs cycle comes from the most recently added acetate group

122. ______Anaerobic energy metabolism accounts for 90% of the energy needed for sprinters and other high intensity exercises

123. ______Lipoic acid serves as both a carrier of both electrons and functional groups

124. ______Endurance training typically causes changes in mitochondrial enzyme levels that are around 2-fold (a doubling), but not 10-fold

125. ______Sony 40" LCD TVs omit a new kind of obesity ray, previously undetected by science.

Happy Holidays

Spread your wisdom....