

## Lecture 6 Questions

- 1. A breast-fed infant began to vomit frequently and lose weight, several days later she developed jaundice, hepatomegaly and cataract, what is the possible cause of these symptoms?**
  - A. Galactosemia
  - B. Von-gierke disease
  - C. Mcardel disease
  - D. Pomp disease
- 2. Familial Fructokinase deficiency is Asymptomatic because**
  - A. Hexokinase can phosphorylate fructose
  - B. Liver aldose B can metabolize fructose
  - C. Excess fructose dose escape into the urine
  - D. Excess fructose is excreted through feces
  - E. Excess fructose is converted to glucose
- 3. The products of Aldolase B upon acting on Fructose-1-P are:**
  - A. 2 molecules of Dihydroxyacetone-P
  - B. Dihydroxyacetone-P and Glyceraldehyde
  - C. Dihydroxyacetone and Glyceraldehyde-3-P
  - D. Dihydroxyacetone-P and Glyceraldehyde-3-P
- 4. A female with classic galactosemia due to GALT deficiency is able to produce lactose in breast milk because:**
  - A. free (nonphosphorylated) galactose is the acceptor of glucose transferred by lactose synthase in the synthesis of lactose.
  - B. galactose can be produced from a glucose metabolite by epimerization.
  - C. hexokinase can efficiently phosphorylate dietary galactose to galactose 1-phosphate.
  - D. the enzyme deficient in galactosemia is activated by a hormone produced in the mammary gland.
  - E. galactose can be produced from fructose by isomerization.
- 5. A 5-month-old boy is brought to his physician because of vomiting, night sweats, and tremors (رجفة، ارتعاش). History revealed that these symptoms began after fruit juices were introduced to his diet as he was being weaned off (مفطوم) breast milk. The physical examination was remarkable for hepatomegaly. Tests on the baby's urine were positive for reducing sugar but negative for glucose. The infant most likely suffers from:**
  - A. aldolase B deficiency.
  - B. fructokinase deficiency.
  - C. galactokinase deficiency.
  - D.  $\beta$ -galactosidase deficiency.
  - E. glucose 6-phosphatase deficiency.

## Lecture 7 Questions

6. In preparation for a trip to an area of India where malaria is endemic (مرض مستوطن), a young man is given primaquine prophylactically للوقاية. Soon thereafter, he develops a hemolytic condition. The most likely cause of the hemolysis is a less-than-normal level of which of the following?
- Glucose 6-phosphate
  - Oxidized form of NAD
  - Reduced form of glutathione
  - Ribose 5-phosphate
  - Ribulose 5-phosphate
7. Erythrocytes (RBC) are affected in G6PD deficiency more than other cells, such as in the liver. Which one of the following provides the most reasonable explanation for this different response by these individual tissue types?
- Excess glucose 6-phosphate in the liver, but not in RBCs, can be channeled to glycogen, thus averting cellular damage.
  - Liver cells, in contrast to RBCs, have alternative mechanisms for supplying the NADPH required for keeping metabolic and cellular integrity.
  - Glucose 6-phosphatase activity in RBCs decreases the level of glucose 6-phosphate, thus resulting in cell damage. This does not happen in the hepatocyte.
  - Because RBCs do not have mitochondria, production of ATP required to keep cell integrity depends exclusively on the routing of glucose 6-phosphate to the pentose phosphate pathway.
  - The catalytic properties of the liver enzyme are significantly different than those of the RBC enzyme.
8. All of the following sugar arrangement are part of pentose phosphate pathway except:-
- $C5 + C5 \rightarrow C7 + C3$
  - $C5 + C5 \rightarrow C6 + C4$
  - $C7 + C3 \rightarrow C6 + C4$
  - $C5 + C4 \rightarrow C6 + C3$
  - all of these arrangements occurs in pentose phosphate pathway
9. One of the principal sources of NADPH in erythrocytes is:
- Conversion of glucose-6-P to lactate.
  - The conversion of glucose-6-P into pentose-5-P
  - Oxidative phosphorylation
  - The citric acid cycle
10. The oxidative reactions in pentose phosphate pathway:
- Produce NADPH rather than NADH
  - Require biotin
  - Require Coenzyme A
  - Require thiamine pyrophosphate

11. which of the following statements is NOT correct regarding pentose phosphate pathway?

- A. An alternative pathway to glycolysis
- B. Produce NADPH
- C. Produce pentose sugars.
- D. Generate 2ATP molecules per glucose molecule

12. during the pentose phosphate pathway (Glucose-6-P → ribose 5-P) is there a net oxidation of the substrate carbon atoms?

- A. yes
- B. no
- C. it depends on whether the process is under aerobic or anaerobic
- D. it depends whether the glucose goes through the oxidative part of the pathway or not

13. the activity of the following enzyme can be used to diagnose thiamine deficiency?

- A. Phosphopentose Epimerase
- B. Glucose-6-P dehydrogenase
- C. Transketolase
- D. Transaldolase

14. the enzyme phosphopentose isomerase is characterized by all of the following except:-

- A. it catalyzes the interconversion of ribose-5-P and ribulose-5-P
- B. there is no requirement of ATP
- C. it converts a ketose to aldose
- D. it catalyzes an inversion of configuration on Carbon-3

15. in addition to pentoses, the pentose phosphate pathway involves sugars of these sizes except :-

- A. 3 carbons
- B. 4 carbons
- C. 6 carbons
- D. 7 carbons
- E. all of these sizes are used in this pathway

16. What kind of enzymes catalyzes the reaction: ribulose-5-P → Xylulose-5-P

- A. Transketolase
- B. Epimerase
- C. Transaldolase
- D. isomerase

17. Transketolase catalyzes the transfer of a:

- A. 2C group to a ketose
- B. 2C group to an aldose
- C. 3C group to a ketose
- D. 3C group to an aldose

18. Which of the following antioxidant enzymes contain Selenocysteine?

- A. Glutathione peroxidase
- B. Glutathione reductase
- C. Superoxide dismutase
- D. Catalase

19. Which of the enzymes of PPP will be affected by thiamine deficiency?

- A. Glucose-6-phosphate dehydrogenase
- B. 6-phosphogluconate dehydrogenase
- C. Transketolase
- D. Transaldolase

20. NADPH requiring reaction to regenerate the active form of Glutathione is catalyzed by?

- A. Glutathione peroxidase
- B. Glutathione reductase
- C. Superoxide dismutase
- D. Catalase

21. Which of the following enzymes in PPP catalyze an oxidative decarboxylation reaction?

- A. Glucose-6-phosphate dehydrogenase
- B. 6-phosphogluconate dehydrogenase
- C. Transketolase
- D. Transaldolase

22. Which of the following is correct regarding the non-oxidative part of PPP?

- A. Irreversible
- B. transketolase transfer 3C
- C. transaldolase require TPP
- D. pentoses converted to glycolytic intermediate
- E. Produce NADPH

23. 19- years old African-American male military recruit, is about to be sent to Iraq, he is given primaquine to prevent malaria , several days he develops fatigue and hemolytic anemia , which of the following Enzyme is most likely to be deficient ?
- Fructokinase
  - Aldolase B
  - G6PD
  - Muscle glycogen phosphorylase
24. During PPP Glucose 6-p is oxidized to 6-Phosphogluconate which further metabolized by:
- Aldolase
  - Converted to 1,6 Bisphosphogluconate
  - Decarboxylation to produce pentose
  - Oxidation using  $\text{NAD}^+$  as oxidizing
25. 3 moles of glucose is metabolized in the oxidative part of PPP generate:
- 2 mole pentoses , 4 mol of NADPH and 8  $\text{CO}_2$
  - 3 mole pentoses , 4 mol of NADPH and 3 CO
  - 3 mole pentoses , 6 mol of NADPH and 3  $\text{CO}_2$
  - 4 mole pentoses , 3 mol of NADPH and 3  $\text{CO}_2$
26. Which of the following about PPP is correct?
- It generate 38 ATP per glucose consumed
  - It generate 6  $\text{CO}_2$  per glucose
  - It's a reductive pathway requiring NADH
  - It provides precursor for nucleotide synthesis
27. Glucose-6-P  $\rightarrow$  Ribulose-5-P, this reaction is important for all of the following activities EXCEPT:
- Fatty acid and cholesterol synthesis
  - Respiratory burst and formation of reactive oxygen species in phagocytic cells
  - Regeneration of reduced Glutathione in RBCs
  - Production of ATP
28. Which of the following is correct about the oxidative part of PPP?
- Generate NADH
  - Oxidize NADPH to  $\text{NADP}^+$
  - Rate limiting step catalyzed by 6PGD
  - Highly active in fasting state
  - Supply NADPH in quantities the cell requires

## Lecture 8 Questions

29. How many hydroxyl groups does a molecule of glycerol have?

- A. none
- B. 1
- C. 2
- D. 3
- E. 4

30. What kinds of bonds do lipase break in order to release fatty acids from triacylglycerols?

- A. esters
- B. carbon-carbon single bonds
- C. carbon-carbon double bonds
- D. There are no fatty acids in triacylglycerols to release.

31. Which of the following groups is not present in a phosphatidic acid?

- A. Choline
- B. Fatty acids
- C. Glycerol
- D. Phosphate
- E. All of these are components of phosphatidic acid.

32. Which of the following groups is not present in a sphingomyelin?

- A. Sphingosine
- B. Fatty acid
- C. Phosphate
- D. Choline
- E. All of these can be components of sphingomyelin.

33. Which of the following groups is not present in Glycerophospholipids?

- A. Choline
- B. Fatty acids
- C. Glycerol
- D. Phosphate
- E. All of these are components of Glycerophospholipids.

34. With what compound are fatty acids reacted to make a fat or oil?

- A. cholesterol
- B. glycerol
- C. sphinganine
- D. ceramide

35. The myelin sheaths of neurons typically contain large amounts of

- A. waxes
- B. triacylglycerols
- C. cholesterol
- D. sphingolipids

**36. How does the presence of cis double bonds in fatty acids affect membrane fluidity?**

- A. They tend to increase the fluidity.
- B. They tend to decrease the fluidity.
- C. They don't have any specific effect on fluidity.

## Lecture 9 Questions

**37. which of the following enzymes catalyze the rate limiting step of cholesterol synthesis?**

- A. Thiolase
- B. HMG-CoA reductase
- C. HMG-CoA synthase
- D. HMG-CoA Lyase

**38. The product of the rate limiting step of cholesterol synthesis is:**

- A. HMG-CoA
- B. Mevalonate
- C. Squalene
- D. Isopentenyl-pyrophosphate

**39. The 10C intermediate of cholesterol de novo synthesis is formed by condensing?**

- A. 2 mevalonate molecules
- B. 2 molecules of isopentenyl-pyrophosphate
- C. One isopentenyl-pyrophosphate and one dimethylallyl-pyrophosphate
- D. 2 molecules of Farnesyl-pyrophosphate

**40. How many ATP equivalents are required to synthesize a triglyceride molecule starting from glycerol and 3 fatty acids?**

- A. 3
- B. 6
- C. 7
- D. 12

**41. Which of the following is not true regarding catabolism of triacylglycerols?**

- A. Control of release of fatty acids from triacylglycerols in adipocytes involves cyclic AMP as a second messenger.
- B. When cAMP is a second messenger in the catabolism of triacylglycerols, it activates a protein kinase
- C. The protein kinase, once activated, cleaves fatty acids from the triacylglycerol
- D. The phosphorylated form of hormone sensitive lipase is the active form
- E. All of these are true

**42. Which of the following is false about TAG digestion in the intestine?**

- A. catalyzed by pancreatic Lipase
- B. produce MAG and 2 Fatty acid
- C. phosphotidic acid is formed as intermediate
- D. require emulsification by bile salts

43. Which of the following enzymes will be activate when insulin/glucagon ratio is high?

- A. Triacylglycerol lipase
- B. Phosphatidate phosphatase
- C. Glycogen phosphorylase
- D. Fructose-1,6 bisphosphatase

44. Synthesis of Cardiolipin requires?

- A. Phosphatidyl-glycerol + Diacylglycerol
- B. CDP-phosphatidyl-glycerol + phosphatidic acid
- C. Phosphatidyl-glycerol + CDP-Diacylglycerol
- D. CDP-phosphatidyl-glycerol + CDP-Diacylglycerol

45. The amino nitrogen of ceramide is derived from?

- A. Serine
- B. Glycine
- C. Choline
- D. Ethanolamine

46. Which of the following is not true about HMG-CoA reductase

- A. it catalyzes the rate limiting step in cholesterol synthesis
- B. low cholesterol level activate transcription of it's gene
- C. the phosphorylated form is more active
- D. Inhibited by high level of AMP

47. Dietary cholesterol is transported to the liver via:

- A. HDL
- B. LDL
- C. Chylomicron remnant
- D. IDL

48. Familial hypercholesterolemia is caused by deficiency of:

- A. A lipid molecule
- B. Lipoprotein molecule
- C. Protein molecule
- D. Glycolipid molecule

49. Which of the following is false about TAG synthesis in adipose tissue?

- A. it requires 3 Acyl-CoA
- B. phosphatidate phosphatase is activated after heavy balanced meal
- C. activated by high cAMP level
- D. phosphotidic acid is an intermediate



## Lecture 10 and 11 Questions

50. Which of the following vitamins and cofactors is not used in  $\beta$ -oxidation?

- A. Biotin
- B. Niacin
- C. Pantothenic acid
- D. Riboflavin
- E. All of these are important in the  $\beta$ -oxidation of fatty acids.

51. How many  $\text{NAD}^+$  are reduced in the degradation of palmitoyl - CoA to form eight molecules of acetyl-CoA?

- A. 1
- B. 7
- C. 8
- D. 14
- E. 16

52. The number of  $\text{FADH}_2$  produced from beta-oxidation of Oleic acid 18:1(9) are?

- A. 9
- B. 8
- C. 7
- D. 17

53. A key intermediate in the catabolism of fatty acids with uneven numbers of carbon atoms is

- A. malonyl-CoA
- B. propionyl-CoA
- C. Oxaloacetate
- D. Phosphoenolpyruvate

54. which of the following fatty acids require  $\text{NADPH}$  for its oxidation?

- A. 15:0
- B. 16:0
- C. 16:1(9)
- D. 18:2(9,12)

55. The cis double bonds of naturally - occurring fatty acids react well with the hydratase enzyme.

- A. True
- B. False.

**56. The unsaturated fatty acids that are intermediates in the  $\beta$ -oxidation cycle have what orientation around the double bond?**

- A. the cis orientation
- B. the trans orientation
- C. can have either orientation
- D. the orientation is not known

**57. Which of the following statements below about the activation of fatty acids is false?**

- A. Activation involves the formation of a high energy thioester bond.
- B. Activation is accompanied by hydrolysis of ATP to ADP and P.
- C. Activation of short and medium chain fatty acids occurs in the mitochondrial matrix
- D. Activation includes hydrolysis of ATP to produce AMP and PP, with the further hydrolysis of PP to drive the reaction to completion.

**58. The reactions involved in  $\beta$ - oxidation of fatty acids include the following:**

1. Cleavage of acetyl-CoA from the fatty acid.
2. Hydration of a double bond.
3. Formation of a CC double bond.
4. Oxidation of an alcohol

**The correct order of these reactions is:**

- A.  $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
- B.  $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$
- C.  $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$
- D.  $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$
- E.  $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

**59. 30 years old man has been fasting for religious reasons for several days, his brain reduced its need for glucose by using the following substance as an alternate source of energy?**

- A. Fatty acids
- B.  $\beta$ -hydroxybutyrate
- C. Glycerol
- D. Alanine
- E.  $\beta$ -caroten

**60. Which of the following is true about conversion of 3- hydroxyl acyl-CoA to 3-Keto-Acyl-CoA**

- A. catalyzed by hydrates
- B. require FAD as oxidizing agent
- C. occurs in the mitochondria
- D. occurs in the cytoplasm

61. which of the following favor ketone body synthesis?

- A. increased lipolysis in adipose tissue.
- B. decreased gluconeogenesis in liver.
- C. increased glycogenolysis in skeletal muscle.
- D. increased fatty acid synthesis in liver.

62. Liver cannot use ketone bodies as source of energy because it lacks.....

- A.  $\alpha$ -ketobutyrate dehydrogenase
- B. thiolase
- C. 3-ketoacyl-CoA transferase
- D. Acetoacetate lyase

63. Which of the following is true about Acetyl-CoA Carboxylase?

- A. it needs Thiamine (TPP) as cofactor
- B. it does not require energy to catalyze the reaction
- C. it's product inhibit the entry of Acyl-CoA to mitochondria
- D. it's a key enzyme for cholesterol synthesis

64. Which of the following is true about regulation Acetyl-CoA Carboxylase?

- A. Its active in octameric form
- B. The phosphorylated form is more active
- C. Its activated after high carbohydrate meal
- D. Palmitoyl-CoA inhibit this enzyme by inducing its phosphorylation

65. Fat free diet, reduce the Endogenous synthesis of:

- A. palmitic acid
- B. palmitoleic acid
- C. stearic acid
- D. oleic acid
- E. Arachidonic acid

66. during fatty acid synthesis, Acetyl-CoA is transported from mitochondrial matrix to the cytosol in the form of:

- A. Acetyl-CoA
- B. Malonyl-CoA
- C. Oxaloacetate
- D. Citrate

67. Which of the following is/are products of conversion of malate to pyruvate in the cytosol?

- A. CO<sub>2</sub>
- B. NADPH
- C. NADH
- D. a + b
- E. a + c

68. The synthesis of 10 carbon chain fatty acid requires

- A. Total of 4 Acetyl-CoA
- B. 5 ATP
- C. 8 NADPH
- D. 5 Malonyl-CoA

69. Which of the following molecules inhibit carnitine Shuttle?

- A. Acetyl-CoA
- B. Long chain F.A
- C. malonyl-CoA
- D. HMG-CoA

70. Oleic acid 18:1(9) is desaturated at carbon 6 and then elongated, what is the correct representation of the product?

- A. 19:2 (7,9)
- B. 20:2 ( $\omega$ -6)
- C. 20:2 (6,9)
- D. 20:2 (8,11)

71. A double bond can be introduced to 14:0 within delta carbons:

- A. 1-6
- B. 1-7
- C. 1-8
- D. 1-9

72. Which of the following is the main precursor of Eicosanoids?

- A. Arachidic acid
- B. 20:4(5,8,11,14)
- C.  $\omega$ -9 fatty acids
- D. A + B

73. Which of the following cannot be a product of cyclooxygenase?

- A. PGG<sub>2</sub>
- B. TxA<sub>2</sub>
- C. LTA<sub>4</sub>
- D. Prostacyclin

74. Aspirin Inhibit the synthesis of all of the following except:

- A. PGE<sub>2</sub>
- B. TxA<sub>2</sub>
- C. LTA<sub>4</sub>
- D. PGI<sub>2</sub>

## Lecture 12 Question

75. The direct source(s) of Nitrogen in urea is:

- A. Glycine
- B. Aspartate
- C. Ammonia
- D. b + c

76. The product of ALT during amino acids disposal is

- A. Aspartate
- B. pyruvate
- C. Glutamate
- D. oxaloacelate
- E. b + c

77. Which of the following is not part of urea cycle?

- A. Carbamoyl-phosphate Synthetase I
- B. Ornithine transcarbamoylase
- C. urea synthetase
- D. Arginase

78. Which of the following amino acids is non-essential exclusively glucogenic amino acid?

- A. Methionine
- B. Valine
- C. Tyrosine
- D. Asparagine

79. The carbon skeleton of proline feed the TCA cycle via:

- A.  $\alpha$ -ketoglutarate
- B. succinyl-CoA
- C. malate
- D. oxaloacetate

80. the carbon skeleton of Methionine feed the TCA-cycle via:

- A.  $\alpha$ -ketoglutarate
- B. succinyl-CoA
- C. malate
- D. oxaloacetate

81. which of the following amino acids cannot be precursor for gluconeogenesis?

- A. Arginine
- B. Histidine
- C. Isoleucine
- D. Leucine

82. Which of the following statement is not true regarding nitrogen balance?

- A. Deficiency of essential amino acids lead to negative nitrogen balance
- B. Positive nitrogen balance is a characteristic of healthy adult
- C. Nitrogen equilibrium achieved when nitrogen input equals the nitrogen excretion
- D. Pregnancy cause positive nitrogen balance

83. In urea cycle..... is translocated from mitochondria to the cytosol and ..... Move in the opposite direction by the same antiporter translocase system

- A. Citrulline/Arginine
- B. Citrulline/Ornithine
- C. Ornithine/Citrulline
- D. Arginine/Citrulline

84. Inborn hyperammonemia characterized accumulation of Argininosuccinate and low Arginine level is most probably caused by a deficiency of?

- A. Argininosuccinate synthetase
- B. Ornithine transcarbamoylase
- C. Argininosuccinate lyase
- D. Arginase

85. Which of the following forms of folate is required when converting Glycine to Serine?

- A. Tetrahydrofolate
- B.  $N^5, N^{10}$ -methenyl tetrahydrofolate
- C.  $N^5, N^{10}$ -methylene tetrahydrofolate
- D.  $N^5$ -methyl tetrahydrofolate

86. Melatonin is a derivative of:

- A. Tyr
- B. Phe
- C. Trp
- D. Ser

87. Regarding amino acids biosynthesis; All of the following amino acids belong to pyruvate family EXCEPT:

- A. Ala
- B. Ile
- C. Gly
- D. Val

88. Which of the following enzymes can fix a free ammonia to an organic molecule?

- A. Glutamine synthetase
- B. Alanine amino transferase
- C. Glutamate dehydrogenase
- D. Glutaminase
- E. More than one answer

89. Ribose-5-P in addition to nucleotide synthesis it can be precursor for:

- A. Ser
- B. His
- C. Arg
- D. Lys

Question	Answer	Question	Answer	Question	Answer
1	A	41	C	81	D
2	C	42	C	82	B
3	B	43	B	83	B
4	B	44	C	84	C
5	A	45	A	85	C
6	C	46	C	86	C
7	B	47	C	87	C
8	B	48	C	88	E
9	B	49	C	89	B
10	A	50	A		
11	D	51	B		
12	D	52	C		
13	C	53	B		
14	D	54	D		
15	E	55	B		
16	B	56	B		
17	A	57	B		
18	A	58	C		
19	C	59	B		
20	B	60	C		
21	B	61	A		
22	D	62	C		
23	C	63	C		
24	C	64	C		
25	C	65	E		
26	D	66	D		
27	D	67	D		
28	E	68	C		
29	D	69	C		
30	A	70	D		
31	A	71	A		
32	E	72	B		
33	E	73	C		
34	B	74	C		
35	D	75	D		
36	A	76	E		
37	B	77	C		
38	B	78	D		
39	C	79	A		
40	C	80	B		