

**METABOLISM**  
DOCTOR 2019 | MEDICINE | JU

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**-FROM 2018-**

Q 1: What is the net yield of NADH when 1 mole of glucose 6-phosphate is oxidized by aerobic glycolysis to yield pyruvate ?

- A) 0 mole of NADH
- B) 1 mole of NADH
- C) 2 mole of NADH
- D) 3 mole of NADH

Q2: The most important controlled step in the glycolytic pathway is:

- A) the formation of fructose 1,6-bisphosphate by PFK1
- B) the formation of glucose 6-phosphate
- C) the formation of glyceraldehyde 3 phosphate
- D) the formation of phosphoenolpyruvate .

Q3 : activators of the enzyme pyruvate kinase include :

- A) insulin
- B) fructose 1,6-bisphosphate
- C) fructose 2,6-bisphosphate
- D) A+B

Q4: Glucagon controls the entry of glucose into glycolysis by altering the enzymatic function of PFK-2 .

This inhibition results in the conversion of :

- A) fructose,6-phosphate into fructose 2,6-bisphosphate
- B) fructose 1,6-bisphosphate into fructose 2,6-bisphosphate
- C) fructose 2,6-bisphosphate into fructose,6-phosphate

Q5 : which of the following enzyme of glycolysis catalyze the reaction of phosphoenolpyruvate (PEP) to pyruvate while making one molecule of ATP in the process ?

- A) enolase
- B) phosphoglycerate kinase
- C) pyruvate kinase
- D) aldolase

Q6 : An enzyme in liver which is part of both the glycolytic and gluconeogenic pathway is :

- A) glucose 6-phosphatase
- B) PEP carboxykinase
- C) ) fructose 1,6-bisphosphatase
- D) glucokinase
- E) glyceraldehyde 3-phosphate dehydrogenase

Q7 : fructose 2,6-bisphosphate :

- A) Is required for gluconeogenesis
- B) Synthesis is stimulated by insulin
- C) Is increased by cyclic AMP
- D) Inhibits phosphofructokinase (PFK\_!)
- E) Stimulates fructose 1,6-bisphosphatase

Q8: glycolysis will cease if :

- A) Phosphofructokinase is activated
- B) Mitochondria aren't present in the cell
- C) NADH is not oxidized

Q9 : The rate of glycolysis is increased by :

- A) Increased insulin/glucagon ratio
- B) ATP
- C) Citrate

Q10: under anaerobic conditions , a primary product of glycolysis is :

- A) Pyruvate
- B) Lactate
- C) ethanol

Q11: most of the ATP made during catabolism is generated during :

- A) 1st stage of catabolism
- B) 2nd stage of catabolism
- C) 3rd stage of catabolism

Q12 : Which of the following enzymes of glycolysis is/are regulated?

- A) Glucokinase/hexokinase
- B) Aldolase
- C) Pyruvate kinase
- D) A AND C

Q13 : The rate-limiting enzyme in glycolysis is :

- A) Hexokinase

- B) Glucokinase
- C) Phosphatase-1
- D) Phosphofructokinase-1
- E) Aldolase

Q14: the enzyme that has low  $K_m$  and low  $V_{max}$  for glucose is :

- A) Hexokinase
- B) Glucokinase
- C) Phosphofructokinase-1
- D) Aldolase

Q15 : pyruvate carboxylase :

- A) Requires acetyl CoA for activity
- B) Occurs in the cytosol
- C) Catalyze an irreversible reaction in glycolysis
- D) Produces carbon dioxide

Q16: inhibited by glucose -6 phosphate:

- A) Glucokinase
- B) Hexokinase
- C) Both A and B
- D) None of the above

Q17: under anaerobic conditions , skeletal muscle tissue may continue to generate ATP from glucose metabolism (via glycolysis) , resulting in the conversion of glucose to :

- A) Acetyl-CoA
- B) Succinate
- C) Lactate
- D) Citrate
- E) Malonate

Q18: glucokinase , the liver enzyme has which of the following properties :

- A) A lower  $K_m$  for glucose than hexokinase
- B) Can be inhibited by glucose6-phosphate
- C) A higher  $K_m$  for glucose than hexokinase

Q19 : which of the following enzymes is absent in muscle but present in liver ?

- A) Hexokinase
- B) Lactate dehydrogenase
- C) Glucose 6-phosphatase
- D) Glycogen phosphorylase

Q20 : which enzyme would be impaired in case of Biotin deficiency ?

- A) Fructose 1,6-phosphatase
- B) Pyruvate kinase
- C) PEP carboxykinase
- D) Pyruvate carboxylase
- E) Malate dehydrogenase

Q21 : which of the following is (are) unique reaction(s) for Gluconeogenesis :

- A) Pyruvate to oxaloacetate
- B) Glucose 6-phosphate to glucose
- C) Fructose 1,6 bisphosphate to fructose 6-phosphate
- D) All of the above
- E) Non of the above

Q22: In the Cori cycle , carbons in the form of lactate are carried by the blood to the liver and then returned to muscle tissue by the blood in the form of :

- A) Glucose
- B) Pyruvate
- C) Glutamine

Q23-One of the protein complexes of electron transport chain does not span the inner mitochondrial membrane:

- a- NADH dehydrogenase
- b- Cytochrome C reductase
- c- Coq-Cytochrome C dehydrogenase
- d- Succinate dehydrogenase

24- Dinitrophenol was a drug used for weight loss, which of the following molecules does it resemble the most?

- a-Thermogenin
- b-Rotenone
- c-Antimycin
- d-CO

25) 3- Calculate standard  $\Delta G$  for phosphoglucomutase reaction that is involved in glycogen synthesis .

Reaction	$\Delta G^\circ$ (kcal)
Glucose $\rightarrow$ Glucose-6-p	3.3
Glucose $\rightarrow$ Glucose-1-p	5

- a-8.3 kcal
- b-1.7 kcal
- c-(-2.3) kcal
- d-2.3 kcal

26) 4- Calculate standard  $\Delta G$  for the ethanol metabolism reaction that is catalysed by alcohol Dehydrogenase: ( $F = 23$  kcal/volt)

Reaction	$\Delta E^\circ$
acetaldehyde $\rightarrow$ Ethanol	-0.2
$\text{NAD}^+ \rightarrow \text{NADH}$	-0.32

- a-(-5.5 kcal)
- b-11 kcal
- c-(-2.25) kcal
- d-2.25 kcal

27) Citrate is used as :

- a-PFK inhibitor
- b-PFK activator
- c-Hexokinase inhibitor
- d-Glucokinase inhibitor

28) Diabetic patient lost consciousness after she injected herself with insulin, we gave her glucagon and she recovered very fast. What metabolic pathway was activated?

a-Glycogenesis

b-Glycogen phosphorylase kinase activates glycogen phosphorylase

c-PFK2 is activated forming more Fructose 2,6-BP

d-Pyruvate kinase is allosterically activated

29) One of the following is not a substrate for gluconeogenesis:

a-Succinate

b-Acetate

c-Glycerol

d-Glutamate

e-Malate

30) A scientist made an experiment on mitochondria, he added antimycin, and then added an acid that lowered the PH. What is expected to happen?

a-ATP synthesis will be observed

b-Electrons from FADH<sub>2</sub> will reach oxygen

c-Cytochrome a<sub>3</sub> will be in the reduced form

d-Oxidation of NADH will continue

31) - Cleavage of fructose 1-phosphate will form:

a-Glyceraldehyde and DHAP

b-G3P and DHAP

c-Dihydroxyacetone and G3P

d-Dihydroxyacetone and Glyceraldehyde

32) Which of the following can be used to reduce the loss of hemoglobin in degradation of RBCs?

a-Complexing it with  $\alpha_2$ -macroglobulin

b-Binding to Albumin

c-Complexing it with Haptoglobin

d-Removing copper from diet

33) Which of the following is correct regarding Oligomycin:

- a-It permits H<sup>+</sup> transport through mitochondrial membrane
- b-It binds to complex 2 of the electron transport chain
- c-It binds to the catalytic subunit of ATP synthase without inhibiting the transfer of electrons
- d-It inhibits ATP synthesis and the oxidation of NADH

34) Which of the following is true about CoQ:

- a-It is highly hydrophilic
- b-It can accept one or two electrons
- c-It can move freely in the cytosol
- d-All statements are true

35) During fight or flight (stressful situation), which of the following is observed?

- a-cAMP synthesis is activated, and downstream phosphorylation takes place
- b-Glycogen synthase is activated
- c-Inhibitor Protein becomes inactive
- d-Decreased rate of glycogenolysis

37) Decrease in Which of the following may cause lung disease?

- a-Albumin
- b- $\alpha$ 1 fetoprotein
- c-Haptoglobin
- d- $\alpha$ 1 antitrypsin

38) A patient has low levels of plasma proteins. Tests showed that his liver isn't damaged, and his parathyroid gland is working well. Which of the following regarding the patient's condition could be true?

- a-The total plasma calcium level is normal
- b-There is a prolonged period of blood clotting
- c-Albumin is found in the urine
- d-Skin is abnormally red and hot

40) A glucose molecule ends up as X acetyl CoA. They produce after entering TCA Y NADH, Z GTP and P FADH<sub>2</sub>.

a-X = 2. Y= 3. Z= 1. P=1.

b-X = 3. Y= 6. Z= 3. P=3

c-X = 1. Y= 6. Z= 2. P=2

d-X = 2. Y= 6. Z= 2. P=2

41) -GTP in citric acid cycle is produced by :

a-Oxidative phosphorylation

b-Substrate level phosphorylation

c-Active phosphorylation

d-Transfer of phosphate from ATP

42) -What determines the rate of oxidative phosphorylation?

a-Availability of NADH

b-The type of tissue

c-Availability of ADP

d-None of the above

43) Classic galactosemia happens because of deficiency in the enzyme that catalyses:

a-Exchange between galactose 1-phosphate and UDP glucose

b-Phosphorylation of galactose into galactose 1-phosphate

c-Isomerization of glucose 1-phosphate to galactose 1-phosphate

d-Epimerization of UDP-glucose and UDP-galactose

45) - The enzyme which is involved in glycogen metabolism and does not exist in muscles is:

a-Glycogen synthase

b-Glucose 6 phosphatase

c-Glucose 1 phosphatase

d-Glycogen phosphorylase

47)- Which of the following is considered an inhibitor for both isocitrate dehydrogenase and  $\alpha$ -ketoglutarate dehydrogenase?

a-ATP

b-NADH

c-ADP

d-A+B

48) POMPE disease is caused by a deficiency in:

- a-Glucose 6 phosphatase
- b-Glycogen phosphorylase
- c-Lysosomal glucosidase
- d-Phosphoglucomutase

49) Which of the following is true about albumin?

- a-Its concentration in the blood is 25
- b-It is made of 3 subunits
- c-It has oligosaccharide chains
- d-Low albumin/globulin indicates chronic liver disease

50) Which of the following is found mainly during inflammation?

- a-Albumin
- b-C-reactive protein
- c-Prealbumin
- d-Transferrin

51) - Which of the following events take place in Cori cycle?

- a-Lactate is converted to glucose in the liver
- b-Glucose is broken down into pyruvate in the liver
- c-Lactate is converted to pyruvate and sent to the blood

52) -Glucose is broken down into pyruvate and then lactate in the liver

31-An athlete's diet consists of 75g protein, 150g carbohydrates, 50g fats and 20g indigestible fibers (cellulose). Given that each gram of protein gives 4kcal, calculate total Calories in this diet.

- a-1350
- b-1400
- c-1450
- d-1500

53) - Which of the following is true about pyruvate dehydrogenase?

- a-It catalyses a reversible reaction
- b-It contains four coenzymes

- c-Its deficiency causes lactic acidosis
- d-It is inhibited by the presence of ADP

54) Which of the following is true regarding isomaltase?

- a-It is found in the saliva
- b-It has an  $\alpha$  (1-6) glycosidase activity
- c-It is a soluble enzyme
- d-It cleaves  $\alpha$  (1-4) glycosidic bond in dextrans

56) - If a reaction has negative  $\Delta G$  then it has to be:

- a-Exergonic
- b-Exothermic
- c-Endothermic
- d-Endergonic

57) Which of the following is a not a common intermediate between glycolysis and gluconeogenesis?

- a-Glucose 6-phosphate
- b-Phosphoenolpyruvate
- c-Oxaloacetate
- d-Fructose 1,6-bisphosphate

### Answers :

- 1) C
- 2) A
- 3) D
- 4) C
- 5) C
- 6) E
- 7) B
- 8) C
- 9) A
- 10) B
- 11) C
- 12) D
- 13) D
- 14) A

- 15) A
- 16) B
- 17) C
- 18) C
- 19) C
- 20) D
- 21) D
- 22) A
- 23) D
- 24) A
- 25) B
- 26) A
- 27) A
- 28) B
- 29) B
- 30) A
- 31) A
- 32) C
- 33) D
- 34) B
- 35) A
- 36) C
- 37) D
- 38) C
- 40) D
- 41) B
- 42) C
- 43) A
- 45) B
- 47) D
- 48) C
- 49) D
- 50) B
- 51) A
- 52) A
- 53) C
- 54) B

56) A

57) C

### -FROM (2011-2017):

1-What is the standard free energy of the reaction if  $\Delta E^\circ = -10$  mV, 2 electron transported, Faraday constant = 23 Kcal/volt??

**Answer:**

$$\Delta G^\circ = -nF E^\circ$$

$$-2 \times 23 \times -10 / 1000$$

$$= 0.46 \text{ Kcal}$$

2-ATP is the energy molecule of the cell because:

**Answer:** it has an intermediate energy value.

~ من أسئلة د. نافذ السؤال اللي معطيك إن ه في تفاعل صار بين مواد متفاعلة و ناتجة بالأول تركيز ه كان متساوي وعند الاتزان كان تركيز وحدة 6 مرات قد الثانية وسألك كم دلتا G عند ن ه اية التفاعل من دون حساب لأن ه ن ه اية التفاعل بكون متزن بتطلع صفر

3-Measure the change in the disorder of reactants and products is?

A-Delta G

B-Delta H

C-Delta S

D-Delta T

**Answer:**C

4-Which of the following that predict whether reactions is spontaneous or not:

- A-Delta G•
- B-Delta G
- C-Delta H
- D-Delta E
- E-Delta E•

**Answer:**B

5-Delta G represents energy changes at constant temperature ,pressure and proton concentration:

- A-True
- B-False

**Answer:** B

6-Delta G=DeltaG• ,when:

- A-R=0
- B-[reactant]=0
- C-[B]/[A]=0
- D-In [B]/[A]=1
- E-[B]/[A]=1

**Answer:**E

7-Which of the following pair is NOT true:

- A-positive delta G—>endergonic
- B-negative delta G—>exergonic
- C-Delta G=Zero—>equilibrium and concentration ([A]=[B]) are equals
- D-Delta G=don't measure fast of reaction

**Answer:**C

8-In experiment electrons transferred =4 and  $\Delta E^\circ=10$  mv calculate  $\Delta G^\circ=?$

**Answer:**0.92

**Important note:**

General rule: phosphorylation of an enzyme that increases the level of glucose will convert it into an active enzyme, while the phosphorylation of an enzyme which utilizes glucose will inhibit it.

(اي انزيم بيصنع غلوكوز اعمله phosphorylation بصير active والعكس صحيح)

9-True about ATP synthase :

- 1)Fo domain composed of 1 subunit.
- 2)F1 domain composed of 1 subunit.
- 3)H<sup>+</sup> passes through fo to the mitochondrial matrix.

**Answer:** H<sup>+</sup> passes through Fo to the mitochondrial matrix.

10-What inhibits complex IV in electron transport chain?

- 1)Oligomycin.
- 2) Antimycin A
- 3) Cyanide
- 4) Rotenone

**Answer:** Cyanide

11-Wrong about ATP / ADP translocase:

- A- contain single nucleotide binding site
- B- exergonic process
- C- inhibition of it lead to inhibition of cellular respiration
- D- similar affinity to ADP and ATP

**Answer:** exergonic process

12-Which of these structures is oxidized by FAD?

- 1)succinate
- 2)succinyl coA
- 3)malate
- 4)alpha-ketoglutarate

**Answer:** succinate

13-Which of the following structures is activated by ADP?

- 1)phosphofructokinase
- 2)isocitrate dehydrogenase
- 3)pyruvate dehydrogenase

**Answer:** isocitrate dehydrogenase

14-What inhibits complex IV in electron transport chain?

**Answer:** CO,CN,N<sub>3</sub>-

15-What is the true if glutamate undergo transamination then by the enzyme glutamatendehydrogenase?

- A-This require ATP
- B- require NADH
- C- net product is alpha ketoglutarate
- D- Net product is ammonia
- E- all of the above

**Answer:** C

16-What is the method that is discovered to decrease the obesity?

**Answer:** uncoupling of oxidation and phosphorylation in oxidative phosphorylation.

17-Which of these structures uses thiamine as a cofactor

**Answer:** alpha ketoglutarate dehydrogenase

18-What enzymes do decarboxylic reaction in TCA?

**Answer:** Alpha keto dehydrogenase and Iso-cetrate dehydrogenase

19-The converting sequence from succinate to oxaloacetate is?

**Answer:** Oxidation, hydration, oxidation

20-NADH energy is always?

**Answer:** 53 kJ/mol

21-True about lactic acid fermentation?

**Answer:** it oxidizes NADH to NAD<sup>+</sup>

22-this statement is right or wrong?

“Glycolysis is inhibited by elevated concentrations of fructose 2,6-bisphosphate”

**Answer:** wrong

phosphofructokinase (a committed step in glycolysis) is activated by Fructose 2,6- bisphosphate and by AMP ( it sends a message that we don't have enough ATP so increase glycolysis).

23-Delta G can be calculated for glycolysis by:

A) difference in potential energy between Glucose and pyruvate.

C) sum of Delta G for all reactions.

**Answer:** A+C are true

24- Cyanide inhibits which complex in TCA?

**Answer:** complex IV

25- Uncoupling in electron transport chain increases the following:

**Answer:** body thermogenesis.

26-Doesn't produce NADH?

**Answer:** Succinate dehydrogenase.

27-Main purpose of TCA cycle?

**Answer:** Extraction of electrons

28-Source of glucose after 20 hours of fasting:

**Answer:** gluconeogenesis

29-Wrong about H<sub>2</sub>O<sub>2</sub>?

**Answer:** produced by catalase

30-The enzyme that does not produce reactive oxygen species?

**Answer:** Catalase.

31-Krebs cycle graph and asks about rate limiting step:

**Answer:** Step 3

32-Inhibit ATP synthase directly:

**Answer:** Oligo Mycin

33-Determines Respiratory rate:

**Answer:** level of ADP

34-An enzyme that doesn't produce NADH:

**Answer:** Succinate dehydrogenase

35-ATP yield if fumarase was inhibited:

**Answer:** 7.5 moles

36-During oxidative phosphorylation ATP is synthesized by ADP and organic phosphate

A-true

B-false

**Answer:** B

37-Which of the following doesn't contain iron sulfur center:

A-complex 1

B-complex 2

C-complex 3

D-complex 4

**Answer:** D

38-Which of the following will cause the highest loss of energy at ATP production.

- A-CN-
- B-CO
- C-N3-
- D-Amytal
- E-Antimycin A

**Answer:**D

هاي معلومات الي تحت رح يجي عليها اسئلة فرکزوا عليها



The inhibitors:

1. Amytal and Retonone: inhibit complex I and therefore inhibiting CoQ but they don't affect complex II. (الأكثر تأثيراً)



2. Antimycin A : inhibits complex III

3. CN<sup>-</sup> , CO ,H<sub>2</sub>S , NaN<sub>3</sub>: inhibits electron transportation from complex 4 to the formation of oxygen , these inhibitors have less effect than the others .

39-Efficiency of krebs cycle :

**Answer:**90%

40-.A question about converting succinate to fumarate :

**Answer:**Utilize enzyme bounded to inner MM

41-if we broke fatty acid contain 12 carbons the outputs:

**Answer:** 6 acetyl coA, 5FADH<sub>2</sub>, 5NADH

**-(ATPase synthase works due to conformational change of beta.)**

42-Loss of co<sub>2</sub> in TCA cycle >>

**Answer:**Isocitrate dehydrogenase + alpha-ketoglutarate

43-TCA cycle >>

**Answer:**3 NADH , 1 FADH<sub>2</sub>

44-Something about substrate-level phosphorylation:

**Answer:**1,3 bisphosphoglycerate (I'm not sure if the question was about the substrate or the enzyme! if it was about the substrate so this is the answer .. but if it was about the enzyme so the answer is ANOLASE

45-which one of the following conditions decrease the oxidation of acetyl coA by the citric acid cycle:

A-a high availability of calcium

B-a high acetyl coA/ coA ratio

C-a low ATP/ADP ratio

D-a low NAD<sup>+</sup>/NADH ratio

**Answer :D**

46-Which of the following reaction is irreversible:

A-PEP to pyruvate

B-fructose-6-phosphate to fructose-1,6-bisphosphate

C-glucose to glucose-6-phosphate

D- all of the above

**Answer:D**

47-glucose-6 phosphatase present in all tissue except the liver:

A-true

B-false

**Answer:B**

48-which of the following does not included in TCA cycle:

A-alpha ketoglutarate to succinyl coA

B-pyruvate to acetyl coA

C-succinate to fumarate

D-malate to oxaloacetate

**Answer:B**

49-intermediate at TCA contain 4 carbon:

A-isocitrate

B-citrate  
C-fumarate  
D-alpha ketoglutarate

**Answer:**C

50-one of these reaction needs H<sub>2</sub>O:

A-fumarate to malate  
B-malate to OAA  
C-citrate to isocitrate

**Answer:**A

51-ATP needed in gluconeogenesis:

A-5  
B-6  
C-4  
D-2

**Answer:**B

52-How many ATP is produced by TCA:

**Answer:** 2

53-the amount of ATP that needed to transfer single pyruvate to glucose:

**Answer:** 3

54-one of the functions of the fluoride in toothpaste :

**Answer:** inhibits the enzyme "enolase" of the bacteria which prevents dental caries.

55-Wrong about alcohol fermentation from glucose: A)use pyruvate decarboxylase.

B) release CO<sub>2</sub>.

C)produce 1ATP per glucose.

D)produce NAD<sup>+</sup> from NADH.

**Answer:** produce 1ATP per glucose

56-The products of anaerobic glycolysis?

1)2 ATP, 2 acetyl coA, 2 CO<sub>2</sub>

2)2 ATP, 2 pyruvate, 2 NADH

3)2 ATP, 2 ethanol, 2 CO<sub>2</sub>

4)2 ATP, 2 lactate

**Answer:** 2 ATP, 2 lactate.

57-What is true about gluconeogenesis?

1)enhanced by alcohol.

2)activated in prolonged fasting in the kidneys.

3)happens in mitochondria.

4)happens only during exercise.

**Answer:** activated in prolonged fasting in the kidneys.

58-Triose phosphate isomerase converts?

**Answer:** interconverts DHAP and GAP.

59.A pregnant woman suffering from galactosemia, it wouldn't be a problem if she had:

**Answer:** Udp-glucose epimerase

60-Excess glycogen in muscle with normal blood sugar and is a problem in muscle's:

**Answer:** glycogen phosphorylase

61-.Iso citrate and alpha keto glutarate and citrate and succinyl coA structures and asks which statement is right:

**Answer:** Reaction making alpha ketoglutarate "٢ كان رقمه" from isocitrate "٣ رقمه" is rate limiting

62-a reaction with ATP yield in mitochondria = ATP yield in cytosol:

**Answer:**Oxaloacetate to malate

63-.Severe hypoglycemia:

**Answer:**G-6-Phosphatase

64-One of these is not involved in the activity of PKA:

**Answer:**Activation of Phosphodiesterase

65-Right statement about Aldose reductase:

**Answer:**All of the above **كان خيارين في** produces sorbitol from glucose  
Produces galactitol from galactose

66-An enzyme which its product is involved in a reaction which produces ATP by substrate level phosphorylation:

**Answer:** Enolase

67-Involved in both glycogen lysis and glycogen synthesis:

**Answer:**Production of Glucose 1 p

68-Uncoupling oxidative phosphorylation:

**Answer:**Decrease body mass

69-NADH:

**Answer:**Source of electrons

70-Well fed state:

**Answer:**Glycogen synthesis and glycolysis

71-Wrong about NO:

**Answer:**Synthesized from Asparagine

72-Right about fructose 2,6-bisphosphate:

**Answer:**High insulin/glucagon ratio

73-Mismatch between enzyme and its allosteric effector:

**Answer:**PFK-->Glucose-2,6 bisphosphate

74-Not important in gluconeogenesis:

**Answer:**Acetyl coa

75-Phosphorylase b activated in the muscles by :

**Answer:**AMP

76-.Wrong about G6PD:

**Answer:**Reduced ATP

77-Red blood cells glycolysis produce :

**Answer:**2lactate +2ATP

78-Why muscle glycogen cannot rise blood glucose ?

**Answer**-no glucose-6-phosphatase

79-Phosphorylation inhibit what enzyme in liver ?

**Answer**-pyruvate kinase

80-Common between glycogen synthesis and degradation:

**Answer:**Phosphoglucomutase

81-A person has exercise intolerant when he did exercise no Lactate is profuse , which enzyme defected ?

**Answer:**Phosphofructokinase

82-Gluconeogenesis increase with:

**Answer:**activated by acetyl coA \

83- glucose and galactose are:

**Answer:**C4 epimers

84-most common type of glucose is D-form:

**Answer:**true

85-the enzyme that convert cAMP to AMP:

A-adenylyl cyclase

B-phosphodiesterase

C-G-protein

D-protein kinase

**Answer:**B

86-all of the following are positive regulator to PFK-1 except:

A-ATP

B-F-2,6-BPase

C-AMP

**Answer:A**

87-caffeine increased:

A-5'-AMP

B-ATP

C-cAMP

D-PKA

**Answer:C**

88-liver:

A-GLUT 3

B-GLUT 2

C-GLUT 4

D-GLUT 5

**Answer:B**

89-all of the following about GLUT true except:

A-facilitated diffusion

B-sodium independent

C-ATP dependent

D-tissue specific pattern

**Answer:C**

90-products of aerobic glycolysis:

A-2 ATP

B-2 NADH

C-2 pyruvate

D- ALL

**Answer : D**

91-rate limiting step of glycolysis:

A-PFK-1

B-PFK-2

C-MUTASE

D-ALDOLASE

**Answer:A**

92-enzyme that make dehydration at glycolysis:

**Answer:** enolase

93-After carbohydrate-rich meal, glucose absorption depends on:

**Answer:** Na-K antiport.

94-someone suffering from hypoglycemia between meals, he has high levels of free fat in blood (sth like that), high glycogen levels but normal structure & enlarged liver. What is the problem?

- 1) Phosphoglucomutase deficiency
- 2) Glycogen phosphorylase deficiency
- 3) Glucose-6-phosphatase deficiency

**Answer:** Glycogen phosphorylase deficiency

95-Cataract formation and problems in lens in uncontrolled diabetes is due to :

**Answer:** sorbitol accumulation.

96- True or False:

glycogen synthase is responsible for making alpha (1 4) and alpha (1 6) linkages in glycogen.

**Answer:** false

97-Well fed state and we have High insulin to glucagon ratio which of the following enzymes will be activated?

- A) glycogen phosphorylase kinase
- B) adenylate kinase
- C) pyruvate kinase
- D) fructose 2,6 bisphosphatase
- E) all of the above

**Answer:** pyruvate kinase

98-**\*IMPORTANT\***About Glycogen phosphorylase kinase what is true

- A) found in well fed state

- B ) found in liver only not muscle
- C) calcium activates it
- D) phosphatase inhibits it
- E) all of the above

**Answer:** D

**REMEMBER** the **General rule:**

phosphorylation of an enzyme that increases the level of glucose will convert it into an active enzyme, while the phosphorylation of an enzyme which utilizes glucose will inhibit it.

99. A child that vomits and is weak when he takes sucrose containing food, and the symptoms fade when he is fed from his mom's milk, the child has deficiency in:

**Answer:** Aldolase B

100-it is an acute phase protein:

- A) fibrinogen
- B) transferrin
- C) albumin
- D) transthyretin

**Answer:** fibrinogen

101-NFKB functions:

- A) while being in the cytosol
- B) after translocated to the cytosol
- C) stimulates Interleukin 1
- D) activates gene transcription

**Answer:** activates gene transcription

102-Concentration of albumin =

**Answer:** 3.4-5 g/100 ml

103-doesn't cause emphysema:

- A) SZ
- B) MZ
- C) FS

- D) smoking
- E) presence of methionine-sulfoxide at residue no. 358

**Answer:**MZ

104-prevents loss of hemoglobin in urine:

- A) ceruloplasmin
- B) haptoglobin
- C) alpha1- antitrypsin
- D) alpha1- fetoprotein

**Answer:**haptoglobin

105-Which of the following plasma protein has the higher molecular weight ?

- a) Haptoglobin.
- b)  $\alpha$ 1-antitrypsin.
- c)  $\alpha$ 2-macroglobulin.
- d) Albumin.

**Answer:** $\alpha$ 2-macroglobulin.

106- The correct order of the amount (abundance) of the globulin plasma proteins is :

- a) Albumin >  $\alpha$ 1 >  $\alpha$ 2 >  $\beta$  >  $\gamma$
- b)  $\gamma$  >  $\beta$  >  $\alpha$ 2 >  $\alpha$ 1 > albumin
- c) Albumin >  $\gamma$  >  $\beta$  >  $\alpha$ 2 >  $\alpha$ 1
- d)  $\gamma$  >  $\beta$  >  $\alpha$ 2 >  $\alpha$ 1
- e)  $\alpha$ 1 >  $\alpha$ 2 >  $\beta$  >  $\gamma$

**Answer:** $\gamma$  >  $\beta$  >  $\alpha$ 2 >  $\alpha$ 1

107-if you have the following rxns and their delta G values at standard conditions



The value of  $\Delta G$  at standard conditions for the following RXN equals:



- A) -73.5
- B) +73.5
- C) -12.5

D) +12.5

E) we can't find it out unless we have  $K_{eq}$

**Answer:** -12.5

108-If enthalpy change for a reaction is zero, then  $\Delta G^\circ$  equals to

a)  $-T\Delta S^\circ$

b)  $T\Delta S^\circ$

c)  $-\Delta H^\circ$

d)  $\ln K_{eq}$

**Answer:**  $-T\Delta S^\circ$

109- $\Delta G^\circ$  is defined as the :

a) Residual energy present in the reactants at equilibrium

b) Residual energy present in the products at equilibrium

c) Difference in the residual energy of reactants and products at equilibrium

d) Energy required or released to reach equilibrium when  $\frac{[products]}{[reactants]} = 1$

**Answer:** D

110-For a reaction if  $\Delta G^\circ$  is positive, then

a) The products will be favored

b) The reactants will be favored

c) The concentration of the reactants and products will be equal

d) All of the reactant will be converted to products

**Answer:** The reactants will be favored

111-If  $\Delta G^\circ$  of the reaction  $A \rightarrow B$  is  $-40\text{kJ/mol}$  under standard conditions then the reaction

a) Will never reach equilibrium

b) Will not occur spontaneously

c) Will proceed at a rapid rate

d) Will proceed from left to right spontaneously

**Answer:** Will proceed from left to right spontaneously

112-Which of the following statements is true ?

- a) The reaction tends to go in the forward direction if  $\Delta G$  is large and positive
- b) The reaction tends to move in the backward direction if  $\Delta G$  is large and negative
- c) The system is at equilibrium if  $\Delta G = 0$
- d) The reaction tends to move in the backward direction if  $\Delta G$  is large and positive

**Answer:** The system is at equilibrium if  $\Delta G = 0$

113-Putting an inhibitor of succinate dehydrogenase will cause a decrease in the concentration of:

- A) citrate
- B) pyruvate
- C) isocitrate
- D) fumarate
- E) acetyl Co-A

**Answer:** acetyl Co-A

114-The  $FADH_2$  and  $NADH$  produced when we start from pyruvate and proceed to the end of the TCA result in the synthesis of about \_\_\_ ATPs.

- a) 7
- b) 11
- c) 14
- d) 9
- e) 0

**Answer:** 14

115-During electron transport, protons are pumped out of the mitochondrion at each of the major sites except for:

- a) Complex I.
- b) Complex II.
- c) Complex III.
- d) Complex IV.
- e) Complex MIM (a.k.a. MCMXCIX).

**Answer:** Complex II.

116-Coenzyme Q is involved in electron transport

- a) as a lipid-soluble electron carrier.
- b) as a water-soluble electron donor.
- c) as a covalently attached cytochrome cofactor.
- d) as a water-soluble electron acceptor.
- e) directly to O<sub>2</sub>.

**Answer:**as a lipid-soluble electron carrier.

117-The cytochrome c oxidase complex

- a) accepts electrons from cyt c.
- b) donates four electrons to O<sub>2</sub>.
- c) produces 2 H<sub>2</sub>O per O<sub>2</sub> reduced.
- d) pumps 2 protons out of the matrix space.
- e) All of the above are correct.

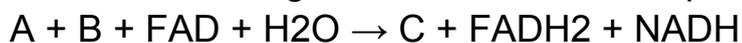
**Answer:**All of the above are correct.

118-Oxidative decarboxylations

- a) do not occur in the TCA cycle.
- b) involve loss of CO<sub>2</sub> and the production of NAD.
- c) involve loss of CO<sub>2</sub> and the production of NADH.
- d) involve loss of CO<sub>2</sub> and the production of FADH<sub>2</sub>.
- e) occur three times in the TCA cycle.

**Answer:**involve loss of CO<sub>2</sub> and the production of NADH

119-The following is the sum of three steps in the citric acid cycle.



Choose the lettered answer that corresponds to the missing "A", "B", and "C" in the equation.

Reactant A   Reactant B   Reactant C

---

- A. Succinyl CoA   GDP   Succinate
- B. Succinate   NAD<sup>+</sup>   Oxaloacetate
- C. Fumarate   NAD<sup>+</sup>   Oxaloacetate
- D. Succinate   NAD<sup>+</sup>   Malate
- E. Fumarate   GTP   Malate

**Answer:**Succinate   NAD<sup>+</sup>   Oxaloacetate

120-What are the effects of increased concentration of citrate?

- a) Increases the inhibitory effect of ATP
- b) Decreases the inhibitory effect of ATP
- c) Increases the activity of ATP
- d) Increases the activity of AMP

**Answer:**Increases the inhibitory effect of ATP

121- A 40-years-old male with hypoglycemia and hyperlacticacidemia ,  
What is the most

(انتبهوا على الأسئلة اللي زي هيك) ( ? enzyme deficient likely)

- a) Galactokinase.
- b) Glucose 6-phosphatase.
- c) Fructokinase.
- d) GALT.
- e) b+d.
- f) All of the above.

**Answer:**b+d.

122 -A common intermediate in the conversion of glycerol and lactate to glucose is which of the following?

- a) Pyruvate
- b) Oxaloacetate
- c) Malate
- d) Glucose 6-phosphate
- e) Phosphoenolpyruvate

**Answer:**Glucose 6-phosphate

123-The first step in glycolysis that uses lyase generates .....

- a) Two aldoses
- b) Two ketoses
- c) An aldose and a ketose
- d) Only a ketose

**Answer:**An aldose and a ketose

124-Which of the following is true about the enzyme producing NADH in the glycolytic

pathway?

- a) It produces 1, 3-biphosphoglycerate and NADH
- b) It catalyzes irreversible reaction
- c) It uses NAD<sup>+</sup> and dihydroxyacetone phosphate as substrates
- d) It uses FADH<sub>2</sub> and glyceraldehyde 3-phosphate as substrates

**Answer:** It produces 1, 3-biphosphoglycerate and NADH

125-When one molecule of glucose is oxidized to two molecules of lactate during anaerobic

glycolysis, which of the following statements is false?

- a) Glyceraldehyde 3-P dehydrogenase reaction produces 2 ATP molecules
- b) Lactate dehydrogenase reaction produces no ATP
- c) Pyruvate kinase reaction produces 2 ATP molecules
- d) Phosphofructokinase-1 reaction uses 1 ATP molecule

**Answer:** Glyceraldehyde 3-P dehydrogenase reaction produces 2 ATP molecules

126-Which of the following is false regarding ONE turn of Q cycle ?

- a) Two QH<sub>2</sub> are oxidized.
- b) One Q is reduced into QH<sub>2</sub>.
- c) Two Cyt c molecules are reduced.
- d) 4 H<sup>+</sup> are released.
- e) Non of the following.

**Answer:** e

127-The correct statement about glycolysis? (مرتب)

- a) There are 3 kinases and all are regulated.
- b) There are 3 kinases and the second one catalyzes the committed step.
- c) There are 4 kinases and the 3<sup>rd</sup> one is NOT regulated.
- d) There are 4 kinases and the first one catalyzes the committed step.
- e) More than one of the above.

**Answer:** There are 4 kinases and the 3<sup>rd</sup>

128- How many ATP molecules does the glycolysis contribute in the whole cellular respiration ?

- a) 2
- b) 4
- c) 8
- d) 36

**Answer:**8

129-Which of the following statements about gluconeogenesis is correct?

- a) Pyruvate is first converted to phosphoenolpyruvate by phosphoenolpyruvate carboxykinase
- b) Fructose 1, 6-bisphosphatase converts fructose 1, 6-bisphosphate into fructose 1-phosphate
- c) Glucose 6-phosphatase hydrolyzes glucose 6-phosphate to release glucose into the blood
- d) Glucose 6-phosphatase hydrolyzes glucose 6-phosphate and is found in liver and muscle

**Answer:** C

130-The active form of glycogen \_\_\_\_\_ is phosphorylated; the active

form of glycogen \_\_\_\_\_ is dephosphorylated.

- a. hydrolase; dehydrogenase
- b. dehydrogenase; hydrolase
- c. hydrolase; synthase
- d. phosphorylase; synthase
- e. synthase; phosphorylase

**Answer:**phosphorylase; synthase

131-The precursor to glycogen in the glycogen synthase reaction is:

- a. glucose-1-phosphate

- b. glucose-6-phosphate
- c. UDP-glucose
- d. UTP-glucose
- e. none of the above

**Answer:**UTP-glucose

132-In glycogen, the chains are formed by \_\_\_\_\_ glycosidic linkages while the branches are \_\_\_\_\_ glycosidic linkages.

- a. alpha-1,4; alpha-1,6
- b. alpha-1,6; alpha-1,4
- c. beta-1,4; alpha-1,6
- d. beta-1,6; alpha-1,4
- e. none of the above

**Answer:**alpha-1,4; alpha-1,6

133-The key regulatory enzyme in glycogen breakdown is:

- a. synthase
- b. phosphorylase
- c. phosphatase
- d. isomerase
- e. kinase

**Answer:**phosphorylase

134-The key regulatory enzyme in glycogen synthesis is:

- a. synthase
- b. phosphorylase
- c. phosphatase
- d. isomerase
- e. kinase

**Answer:**synthase

135-The formation of primers to initiate glycogen synthesis is carried out by:

- a. glycogenin
- b. oxidase
- c. reductase
- d. kinase

e. synthase

**Answer:**glycogenin

136-Phosphorylase b is converted to phosphorylase a by:

- a. protein kinase a
- b. protein kinase b
- c. phosphorylase kinase
- d. adenylyl cyclase
- e. none of the above

**Answer:**phosphorylase kinase

137-The active form of glycogen synthase is:

- a. phosphorylated
- b. dephosphorylated
- c. oxidized
- d. reduced
- e. isomerized

**Answer:** dephosphorylated

138-The active form of glucose used in glycogen synthesis is:

- a. glucose 6-phosphate
- b. glucose 1-phosphate
- c. UTP-glucose
- d. UDP-glucose
- e. a + d

**Answer:** UDP-glucose

139-The enzyme which removes the glucose residue at branch points of glycogen during glycogen breakdown is:

- a. glycogen synthase
- b. debranching enzyme
- c. phosphoglucose mutase
- d. none of the above

**Answer:**debranching enzyme

140-The two hormones that signal for glycogen breakdown are:

- a. norepinephrine and glucagon

- b. calcitonin and glucagon
- c. glucagon and epinephrine
- d. insulin and epinephrine
- e. calcitonin and epinephrine

**Answer:** glucagon and epinephrine

141- Why is glycogen branching important?

- a. slower breakdown/synthesis
- b. faster breakdown/synthesis
- c. decreases solubility
- d. increases solubility
- e. b + d

**Answer:** b + d

142-A 15-year old type 1 diabetic faints after injecting himself with insulin. He is administered glucagon and rapidly recovers consciousness. Glucagon induces activity of:

- a. glycogen synthase
- b. glycogen phosphorylase
- c. glucokinase
- d. hexokinase
- e. UDP glucose pyrophosphorylase

**Answer:** glycogen phosphorylase

143- A 30-year old presents with intractable vomiting and inability to eat or drink for the past 3 days. His blood glucose level is normal. Which of the following is most important for maintenance of blood glucose?

- a. spleen
- b. heart
- c. skeletal muscle
- d. lysosome
- e. liver

**Answer:** liver

144-Which enzyme is not present in muscle?

- a. phosphorylase b
- b. hexokinase

- c. glucose-6-phosphatase
- d. glycogen synthase
- e. lactate dehydrogenase

**Answer:**glucose-6-phosphatase

145-During the breakdown of glycogen, free glucose is formed from which of the following?

- a. glucose residues in an alpha 1,4 glycosidic linkages
- b. the reducing end
- c. the nonreducing end
- d. glucose residues in alpha 1,6 glycosidic linkages
- e. hydrolysis of glucose 1-phosphate

**Answer:**glucose residues in alpha 1,6 glycosidic linkages

146-Enzyme that converts glucose 1-phosphate to glucose 6-phosphate:

- a. glycogen phosphorylase
- b. phosphoglucomutase
- c. glycogen debranching enzyme
- d. glucose 6-phosphatase
- e. glycogen synthase

**Answer:**phosphoglucomutase

147-TRUE/FALSE: Glycogen synthesis and breakdown are reversible reactions of each other

**Answer:**False

148-Which glycogen storage disease is related to severe hypoglycemia and hepatomegaly fatty liver?

- a. von gierk's disease
- b. McArdle syndrome
- c. pomp disease
- d. glucose 6-phosphatase disease
- e. a + d

**Answer:**von gierk's disease

149-which of the following diseases is contributed to massive

cardiomegaly?

- a. von gierk's disease
- b. McArdle syndrome
- c. pomp disease
- d. glucose 6-phosphatase disease
- e. a + d

**Answer:**pomp disease

150-Which one of following statements about glycogen metabolism is correct?

- a) Glycogen is synthesized in the liver in the fed state, then exported to other tissues in low density lipoproteins.
- b) Glycogen reserves in liver and muscle will meet energy requirements for several days in prolonged fasting.
- c) Liver synthesizes more glycogen when the hepatic portal blood concentration of glucose is high because of the activity of glucokinase in the liver.
- d) Muscle synthesizes glycogen in the fed state because glycogen phosphorylase is activated in response to insulin.
- e) The plasma concentration of glycogen increases in the fed state.

**Answer:**C

151-Which of the following is the major energy source for sperm cells?

- a. glucose
- b. lactose
- c. galactose
- d. sucrose
- e. fructose

**Answer:** fructose

152-Glucose transporter that is insulin independent:

- a. GLUT 1
- b. GLUT 2
- c. GLUT 3
- d. GLUT 4
- e. a + c

**Answer:** a + c

153- Which of the following are an example of epimers?

- a. glucose and galactose
- b. glucose and ribose
- c. mannose and glucose
- d. glucose and sucrose
- e. a + c

**Answer:** e

154-Which of the following carbohydrates is a triose?

- a. glucose
- b. ribose
- c. ribulose
- d. glyceraldehyde
- e. none of the above

**Answer:** glyceraldehyde

155-Phosphorylation of fructose at carbon #1 to produce fructose 1-phosphate is mediated by:

- a. fructokinase
- b. aldolase B
- c. aldolase A
- d. aldolase C
- e. a + b

**Answer:** fructokinase

156-Fructose 1-phosphate is cleaved by:

- a. aldolase A
- b. aldolase B
- c. aldolase C
- d. fructokinase
- e. aldose reductase

**Answer:** aldolase B

157-Fructosuria is caused by:

- a. fructokinase deficiency

- b. aldolase B deficiency
- c. aldolase C deficiency
- d. phosphofructose kinase deficiency
- e. a + d

**Answer:** fructokinase deficiency

158-aldolase B deficiency results in:

- a. no phosphorylation of fructose
- b. fructose poisoning
- c. accumulation of fructose 1-phosphate
- d. fructosuria
- e. b + c

**Answer:** b + c

159-TRUE/FALSE: Lactic acidosis is a result of aldolase B deficiency.

**Answer:** TRUE

160-Glucose is \_\_\_\_\_ to sorbitol, then sorbitol is \_\_\_\_\_ to fructose

- a. oxidized/reduced
- b. oxidized/interconverted
- c. reduced/oxidized
- d. reduced/reduced
- e. none of the above

**Answer:**reduced/oxidized

161-Glucose reduction to sorbitol is mediated by which enzyme?

- a. aldolase
- b. aldose reductase
- c. sorbitol dehydrogenase
- d. aldose dehydrogenase
- e. sorbitol reductase

**Answer:**aldose reductase

162-Sorbitol oxidation to fructose is mediated by which enzyme?

- a. aldolase
- b. aldose reductase

- c. sorbitol dehydrogenase
- d. aldose dehydrogenase
- e. sorbitol reductase

**Answer:**sorbitol dehydrogenase

163-All of the following are sources of galactose EXCEPT:

- a. lactose
- b. glycolipids
- c. glycoproteins
- d. mannose
- e. a + b

**Answer:**mannose

164-The exchange reaction involves which enzyme:

- a. GALT
- b. GLUT
- c. galactokinase
- d. epimerase enzyme
- e. none of the above

**Answer:**GALT

165- Isomerization between UDP-glucose and UDP- galactose is mediated by:

- a. GALT
- b. epimerase
- c. galactokinase
- d. galactosyl transferase
- e. alpha-lactalbumin

**Answer:**epimerase

166-Accumulation of galactical (resulting in cataract) is related to which enzyme deficiency?

- a. GALT deficiency
- b. galactokinase deficiency
- c. fructokinase deficiency
- d. aldolase B deficiency
- e. none of the above

**Answer:**galactokinase deficiency

167-The structure of lactose synthase includes:

- a. galactosyl transferase
- b. alpha-lactalbumin
- c. protein A
- d. protein B
- e. all of the above

**Answer:** all of the above

168-\_\_\_\_\_ phosphorylates mannose, producing mannose 6-phosphate, which in turn, is isomerized to fructose 6-phosphate by \_\_\_\_\_.

- a. glucokinase/phosphomannose isomerase
- b. glucokinase/hexokinase
- c. hexokinase/phosphomannose isomerase
- d. hexokinase/epimerase
- e. none of the above

**Answer:**hexokinase/phosphomannose isomerase

169- synthetase is:

- a. ATP independent
- b. ATP dependent
- c. AMP independent
- d. AMP dependent
- e. a + d

**Answer:**ATP dependent

170-TRUE/FALSE : transport of galactose into cells is insulin dependent

**Answer:** false

171- What is the net yield of NADH when 1 mole of glucose 6-phosphate is

oxidized by aerobic glycolysis to yield pyruvate?

- A. 0 mole NADH
- B. 1 mole NADH

C. 2 Mole NADH

D. 3 mole NADH

**Answer:** 2 Mole NADH

172-The most important controlled step in the glycolytic pathway is:

A. the formation of fructose 1,6biphosphate

B. formation of glucose-6-phosphate

C. Formation of glyceraldehyde-3-

phosphate D. formation of fructose-6-phosphate

E. formation of PEP

**Answer:** the formation of fructose 1,6biphosphate

173-activators of the enzyme pyruvate kinase include:

A. Insulin

B. Fructose1,6,biphosphate

C. Fructose 2,6biphosphate

D. A + B

E. None of the above

**Answer:**A + B

174-Glucagon controls the entry of glycolysis by altering the enzymatic action

of PFK2, this results in the inhibition of :

A. Fructose,6,phosphate into fructose,1,6biphosphate

B. Glucose6phosphate into fructose6,phosphate

C. Fructose1,6biphosphate into fructose2,6,biphosphate

D. Fructose1,6biphosphate into fructose 6,phosphate

**Answer:**A

175-which enzyme participates in both glycolytic and gluconeogenic pathways?

A. Glucose-6-phosphate

B. PEP carboxylase

C. Fructose-1,6,phosphatase

D. Glucokinase

E. Glyceraldehyde 3-phosphate dehydrogenase

**Answer:**E

176-Fructose 2,6,biphosphate :

A. is required for gluconeogenesis

B. stimulates fructose 1,6,biphosphatases

C. increased by cAMP

D. inhibits PFK1

**Answer:**A

177-Rate of Glycolysis is increased by

A. Increased Insulin/glucagon ratio

B. ATP

C. Citrate

D. Increased glucagon/insulin ratio

**Answer:**A

178-rate limiting enzyme of glycolysis :

A. hexokinase

B. phosphatase1

C. Phosphofructokinase1

D. Aldolase

E. glucokinase

**Answer:**Phosphofructokinase1

179-Which is inhibited by glucose-6-phosphate :

A. hexokinase

B. glucokinase

C. A + B

D. none

**Answer:**hexokinase

180-Which of the following enzymes is found in the liver but not in the muscle?

A. Hexokinase

B. Glucose-6-phosphatase

C. Glycogen phosphorylase

D. Lactate dehydrogenase

**Answer:**Glucose-6-phosphatase

181-which of the following when found in less than normal amount results in glycogen storage disease V?

A. Hexokinase

B. Glucose-6-phosphatase

C. Glycogen phosphorylase

D. Lactate dehydrogenase

**Answer:**Glycogen phosphorylase

182- a substrate for glycogen synthase is :

A. Glucose-6-phosphate

B. glucose-1-phosphate

C. UDP-glucose

D. free glucose

**Answer:**UDP-glucose

183-Both glucagon and epinephrine stimulate \_\_\_\_\_ and inhibit \_\_\_\_\_

A. glycogen synthesis / breakdown

B. glycogen breakdown / synthesis

C. glycolysis / gluconeogenesis

D. cAMP breakdown / cAMP formation

E. Glucose uptake / release

**Answer:**glycogen breakdown / synthesis

184-Which enzyme activates glycogen phosphorylase? A. glycogen phosphorylase

B. Protein Kinase A

C. Debranchingenzyme

D.Phosphorylase kinase

E. Phosphoprotein phosphatase

**Answer:**Phosphorylase kinase

185- Which enzyme inactivatesphosphorlyase kinase?

A. glycogen phosphorylase

- B. Protein Kinase A
- C. Debranching enzyme
- D. Phosphorylase kinase
- E. Phosphoprotein phosphatase

**Answer:** Phosphoprotein phosphatase

186-Which of the following enzymes cleaves glucose residues from glycogen chains?

- A. glycogen phosphorylase
- B. Protein Kinase A
- C. Debranching enzyme
- D. Phosphorylase kinase
- E. Phosphoprotein phosphatase

**Answer:** Debranching enzyme

187-Insulin promotes glycogen synthesis in the liver by

- A. inhibiting glycogen synthase
- B. binding to phosphorylase
- C. causing the dephosphorylation of both phosphorylase and glycogen synthase
- D. activating phosphorylase
- E. facilitating the entry of glucose to the cell

**Answer:** C

188-Glycogen phosphorylase is :

- A. catalyses the rate limiting step of glycogenolysis
- B. releases glucose 6-phosphate
- C. acts on branched chain of glycogen
- D. A + B
- E. A + B + C

**Answer:** A

189-Which enzyme forms  $\alpha(1-6)$  linkages?

- A. glycogen phosphorylase
- B. Protein Kinase A
- C. glycogen branching enzyme

- D. Phosphorylasekinase
- E. Phosphoprotein phosphatase

**Answer:**glycogen branching enzyme

190-  $\alpha(1-4)$  bond is found in:

- A. sucrose
- B. Maltose
- C. Lactose
- D. Galactose

**Answer:**Maltose

191-All of the following co-factors are required in the pyruvate dehydrogenase complex except :

- A. lipoic acid
- B. NAD<sup>+</sup>
- C. TPP
- D. FAD
- E. All are required

**Answer:**All are required

192- Substrate level phosphorylation occurs from which of the following enzymes?

- A. lactate dehydrogenase
- B. Succinate dehydrogenase
- C. succinate thiokinase
- D. fumarase
- E. hexokinase

**Answer:**succinate thiokinase

193-Which of the following results in hepatomegaly?

- A. Glycogen storage disease type I
- B. Glycogen storage disease type II
- C. Glycogen storage disease type III
- D. Glycogen storage disease type V
- E. Glycogen storage disease type VII

**Answer:**A

