بسم الله الرحمـٰن الرحيم

(وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ)

Metabolism | Mid Material

Past Papers

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السلام عليكم ورحمة الله وبركاته

إذا لقيت أسئلة إول مرة تسمع فيها ومش عارف تحلها ولا عمرك سمعت عن شو بتحكي، عادي ☺ لأنه بكون أنا ما شلتهم (لأني مستعجل) وهما مش مطلوبين منا فاا متخافش.

If You find any weird question that you think it is not from our material, it’s no problem since I reviewed this file very quickly and some un required questions were not removed especially in the last 50 questions.

Lectures 1-3

Q1 : If a reaction has negative ΔG then it has to be:

A-Exergonic

B-Exothermic

C-Endothermic

D-Endergonic

E-non of the above

Answer : A

Q2 :Measure the change in the disorder of reactants and products is?

A-Delta G

B-Delta H

C-Delta S

D-Delta T

E-Delta G°

Answer : C

Q3 :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

Q 4:Delta G represents energy changes at constant temperature, pressure and proton concentration:

A-True

B-False

C-Can't be known

D-Depends on the conditions

Answer : B

Q 5: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

Q 6: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 equal

D-Delta G=don’t measure fast of reaction

E-exergonic reaction is favorable

Answer : C

Q7 :3-Assuming Q is the ratio of product to reactant concentrations; which of the following graph points represents accurately the equilibrium point?

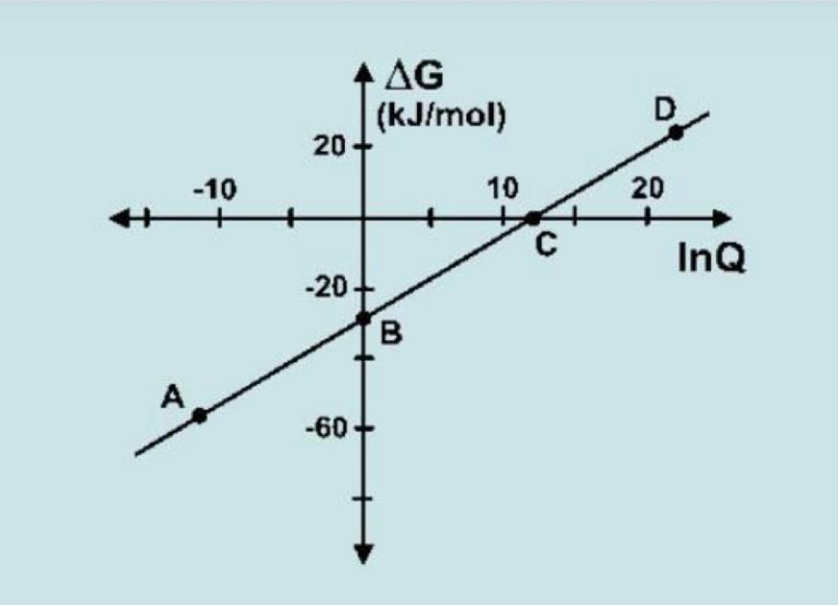
A. Point A

B. Point C

C. Point D

D. Point B

E. Cannot be known from the information given, so can be any of the above points



Answer : b

Q8 :Which one of the following reaction would you expect to be exergonic?

a. Decarboxylation

b. Condensation

c. Transamination

d. Carboxylation

e. Phosphorylation

Answer : a

Q9 :A reaction with(-632) delta g, is it endergonic or exergonic reaction? And how will the addition of an enzyme affect delta g?

A. Endergonic reaction, will not affect delta G

B. Exergonic, will reduce activation energy

C. exergonic reaction, will not affect delta g

D. Endergonic, will increase activation energy

E. Exergonic, will increase activation energy

Answer : C

Q 10:reaction has delt g°>0, what do you expect the value of Keq ?

A. Keq>1

B. keq=0

C. keq<1

D. keq>0

E. keq=1

Answer : C

Q11 :What is the standard free energy of the reaction if delta E°=-10 mvolt, 2 electron transported, Faraday constant=23 Kcal/volt?

A)0.46 kcal

B)-0.46 kcal

C)4.6 kcal

D)-4.6 kcal

E) 0.046 kcal

Answer : A

Q12 :ATP is the energy molecule of the cell because:

A) it is the only energy molecule in the body

B) it has 3 phosphate groups

C) it has an intermediate energy value

D) it isn’t present in all cells

E) C+D

Answer : C

Q 13:In experiment electrons transferred =4 and ΔE°=10 mv calculate ΔG°=?

a) 0.95
b) -0.92
c) 0.92
d) -.092
e) 0.092

Answer : b

Q 14: if you have the following rxns and their delta G values at standard conditions
A + B --> C + Pi.....Δ G0 = -43.0
ATP --> ADP + Pi..... Δ G0 = -30.5 The value of Δ G at standard conditions for the following RXN equals: A + B + ADP ---> C + ATP

a) -73.5

b) +73.5

c) -12.5

d) +12.5

e) we can't find it out unless we have Keq

Answer : c

Q15 :If enthalpy change(ΔH°) for a reaction is zero, then ΔG° equals to :

a) -TΔS°

b) TΔS°

c) -ΔH°

d) lnkeq

e)- lnkeq

Answer : a

Q 16:ΔG° 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[products]= [reactants] =1

e) Residual energy present in the products and reactants

Answer : d

Q 17:For a reaction if ΔG° 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

e) a+d

Answer : b

Q 18:If ΔG° of the reaction A → B is -40kJ/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

e) keq <1

Answer : d

Q 19:Which of the following statements is true ?

a) The reaction tends to go in the forward direction if ΔG is large and positive

b) The reaction tends to move in the backward direction if ΔG is large and negative

c) The system is at equilibrium if ΔG = 0

d) The reaction tends to move in the backward direction if ΔGo is large and positive

e)The reaction tends to go in the forward direction if ΔGo is large and negative

Answer : C

Q20 :The standard free energy change for a reaction in which A and B are converted to C and D is 0.4. The reaction was started by mixing 1 mmoles of each reactants and products. When the reaction reaches equilibrium, you expect that the molar concentration of:

a. A is greater than B.

b. A is larger than D.

c. A less or equal to C.

d. A and C are equal.

e. A is larger or equal to D.

Answer : b

Q21 :The hydrolysis reaction of Glucose 6-phosphate is produces 3.3 kcal per mole under standard conditions. Calculate the standard free energy reaction for the synthesis of glucose 6-phosphate from ATP and glucose:

a. -4.0

b. -3.3

c. -10.6

d. 10.6

e. +3.3

Answer : A

Q22 :if a non-spontaneous reaction accompanied by an increase in enthalpy , what do expect delta g:

a. this reaction must be endothermic

b. heat is liberated from reaction

c. the rate of reaction is high

d. I can’t determine delta G

e. this reaction must be exothermic

Answer : A

Q23 :A reaction has a positive delta G note, one statement is correct:

a. This reaction will not happen in a cell.

b. It could happen if coupled with an endergonic reaction.

c. It can happen when changing the concentration of the reactants and the product.

d. lnkeq<1

e. c+d

Answer : D

Q24 :If you know that, delta E for these reactions are NAD+\NADH = -0.32,pyruvate\lactate E= -0.19, choose the correct statement:

a) pyruvate\lactate is the stronger oxidizing agent.
b) NAD+\NADH is the stronger oxidizing agent.
c) Pyruvate\lactate is the stronger reducing agent.
d) NAD+ is higher tendency to gain electrons than pyruvate
e) C+B

Answer : a

Q25 :Which one of the following cannot be a mechanism used in the body to overcome an endergonic reaction?

a. Reaction coupling

b. Increased substrate concentration

c. Low intermediate concentration

d. Decreased product concentration

e. none of the above

Answer : C

Q 26:If you knew that the conversion of oxaloacetate to malate has delta G note of +32 KJ/mol, which of the following is true:

a. it will move slower.

b. it will not happen in the cell.

c. It may occur in the cell with specific concentrations for the reactant and products.

d. It could happen if coupled with an endergonic reaction.

e. None of the above.

Answer : C

Q 27:Which of the following concentrations of ATP and ADP are the most suitable for the human body?

	ATP	ADP	Pi
A	2	14.2	10
B	5	10	25
C	5	0.2	10

a) A

b) B

c) C

Answer : C

Q28 :All of the following regarding thermodynamics are INCORRECT, except:

a. If $\Delta G<0$, reaction is spontaneous and releases energy

b. If $\Delta G< 0$, reaction is spontaneous and consumes energy

c. If $\Delta G>0$, reaction is spontaneous and consumes energy

d. If $\Delta G>0$, reaction is non-spontaneous and releases energy

e. a+b

Answer : A

Q29 :The equilibrium constant (Keq) depends on which of the following?

a) Concentration of reactants

b) Concentration of products

c) Pressure

d) Temperature

e) Gibbs free energy

Answer : d

Test bank Qs

Test bank Q

Q30 : Which of the following statements regarding equilibrium is false?

A. Reactions with an equilibrium constant > 1 favor products

B. Concentrations of products and reactants is not necessarily equal

C. Ratio of products to reactants is constantly increasing

D. Rate of forward reaction is equal to rate of backward reaction

E.all of the above

Answer : C

Test bank Q

Q31：What happens to ΔG when reactant concentrations increase significantly at equilibrium?

A. It becomes more positive

B. It becomes more negative

C. Stays the same value

D. Nears zero

E. Note enough information provided

Answer : B

Test bank Q

Q32：In what cellular process is CTP primarily involved ?

A. Carbohydrate Synthesis

B. Combining Sugars

C. Protein Synthesis

D. Lipid Synthesis

E. Phosphorylation

Answer : D

Test bank Q

Q33 : What happens to the free energy released from ATP hydrolysis in an energy-coupled reaction?

A. Stored in the products of the reaction

B. Converted into entropy

C. Used to drive a spontaneous reaction

D. Drives an endergonic reaction

E. Used to increase cellular temperature

Answer : D

Test bank Q

Q34：Which molecule is most often used alongside ATP to couple energy in protein synthesis?

A.CTP

B.UTP

C.GTP

D.FADH2

E.UMP

Answer : C

Test bank Q

Q35 : How does ΔE∘ relate to the spontaneity of a redox reaction?

A. A positive ΔE∘ means the reaction is spontaneous
B. A negative ΔE∘ means the reaction is spontaneous
C. ΔE∘=0 means reaction is at equilibrium
D. ΔE∘ is not related to the spontaneity of the reaction
E. All are correct

Answer : A

Test bank Q

Q36 : Calculate the ΔG∘ for a reaction where 3 moles of electrons are transferred and the ΔE∘ is -0.2 V (Faraday constant F=23.06 kcal/volt).

A.13.84 kcal/mol

B.27.67 kcal/mol

C.-13.84 kcal/mole

D.-27.67 kcal/mol

E. Can't be determined from information

Answer : A

Test bank Q

Q37：What is a coenzyme A molecule primarily used for?

A. ATP synthesis

B. Acetyl group transfer

C. Protein Synthesis

D. Carbohydrate storage

E. Lipid Synthesis

Answer : B

Test bank Q

Q38：What is the Gibbs free energy change ΔG for ATP hydrolysis in standard conditions?

A.-7.5 kcal/mol

B.-3.4 kcal/mol

C.-7.3 kcal/mol

D.+3.4 kcal/mol

E. 14.6 kcal/mol

Answer : C

Test bank Q

Q39 : What does the term “thermogenesis” refer to?

A. Energy production for ATP synthesis

B. Energy expended for heat generation

C. Energy required for muscle contraction

D. Energy lost in metabolic pathways

E. Energy stored in fats

Answer : B

Test bank Q

Q40：When does a reaction reach equilibrium?

A. When reactants are completely consumed

B. When the rate of forward and reverse reactions are equal

C. When the concentration of reactants equals that of products

D. When the reaction is the irreversible

E. Delta G< 0

Answer : B

Test bank Q

Q41: Which of the following statements describes the relationship between ΔG and ΔGº in cellular conditions?

A) ΔG equals ΔGº under all conditions

B) ΔG represents the free energy change under standard conditions, while ΔGº accounts for physiological conditions

C) ΔG is constant regardless of product and reactant concentrations

D) ΔG is related to ΔGº through the equation: $\Delta G - \Delta G^\circ = RT \ln K_{eq}$

E) ΔG is always positive for anabolic reactions

Answer : D

Test bank Q

Q42: A reaction has a ΔGº of +3.4 kcal/mol. Which of the following changes could allow this reaction to proceed spontaneously in a cell?

A. Decreasing the concentration of reactants

B. Increasing the concentration of products

C. Coupling the reaction to ATP hydrolysis

D. Lowering the reaction temperature

E. Increasing the reaction activation energy

Answer : D

Test bank Q

Q43: All of the following are characteristics of exergonic reactions except:

A. They have a negative ΔG

B. They release free energy to the system

C. They are spontaneous under standard conditions

D. They require an input of energy to proceed

E. They are often coupled with endergonic reactions in metabolism

Answer : D

Test bank Q

Q44: All of the following are true about thermogenesis except:

A. Thermogenesis refers to the production of heat as a by-product of metabolic reactions.

B. Shivering thermogenesis involves muscle contractions that generate heat

C. Non-shivering thermogenesis is mainly associated with brown adipose tissue

D. Non-shivering thermogenesis is an ATP-consuming process that occurs in response to cold temperatures.

E. Thermogenesis helps maintain body temperature, particularly in cold environments

Answer : D

Test bank Q

Q45: A reaction has a ΔGº of –2.5 kcal/mol, and the ratio of reactants to products 10:1.What happens to the ΔG value of the reaction?

A. ΔG becomes more negative, reaction favors forward direction
B. ΔG becomes more positive, reaction becomes less spontaneous
C. ΔG stays the same as ΔGº
D. ΔG becomes zero , thus reaction reaches equilibrium
E. ΔG becomes more positive, reactions favors backward direction

Answer : A

Test bank Q

Q46: Which of the following statements is true about the relationship between ΔG, ΔGº, and Keq?

A. ΔG = ΔGº when Keq=0

B. When ΔG is negative, reaction is always spontaneous under standard conditions

C. When ΔGº is positive, reaction is always non-spontaneous under standard conditions

D. ΔG depends only on the concentration of reactants

E. ΔG = ΔGº only when the temperature is 25°C

Answer : C

Test bank Q

Q47: All of the following statements is true about **ΔG** except:

A. ΔG can determine whether reaction is spontaneous or not

B. ΔG is not affected by the reaction mechanism or pathway

C. ΔG can't be altered by enzymes catalyzing the reaction

D. ΔG only depends on the initial and final states of the reaction

E. A reaction with ΔG=1 is at equilibrium

Answer : E

Lectures 4-6

Q1: Which of the following is considered an inhibitor for both isocitrate dehydrogenase and α-ketoglutarate dehydrogenase?

A. ATP
B. NADH
C. ADP
D. Calcium
E. All are incorrect

Answer : B

Q2: Which of the following structures is activated by ADP?

a) Citrate synthase

b) Isocitrate dehydrogenase

c) α-ketoglutarate dehydrogenase

d) Succinate dehydrogenase

e) Both b and c

Answer : b

Q3: Which of the following enzymes in the citric acid cycle uses thiamine (vitamin B1) as a cofactor?

a) Citrate synthase

b) Isocitrate dehydrogenase

c) α-ketoglutarate dehydrogenase

d) Succinate dehydrogenase

e) none of the above

Answer : c

Q4: Which of the following enzymes catalyze decarboxylation reactions in the citric acid cycle?

a) Citrate synthase

b) Succinate dehydrogenase

c) Isocitrate dehydrogenase

d) α-ketoglutarate dehydrogenase

e) c + d

Answer : e

Q5: Which of the following enzymes in the citric acid cycle does not produce NADH?

a) Isocitrate dehydrogenase

b) α-ketoglutarate dehydrogenase

c) Malate dehydrogenase

d) Succinate dehydrogenase

e) Both a and c

Answer : d

Q6: What would be the ATP yield if fumarase was inhibited in the citric acid cycle?

a) 2.5 moles

b) 5 moles

c) 7.5 moles

d) 10 moles

e) 12.5 moles

Answer : d

Q7: What's unique about the conversion of succinate to fumarate in the TCA cycle?

a) Produces NADH

b) Utilizes an enzyme bound to the inner mitochondrial membrane

c) Occurs in the mitochondrial matrix

d) Produces ATP directly

e) produces Co2

Answer : b

Q8: What enzymes are responsible for the loss of CO_2 in the TCA cycle?

a) Citrate synthase

b) Isocitrate dehydrogenase

c) Alpha-ketoglutarate dehydrogenase

d) Succinate dehydrogenase

e) b+c

Answer : e

Q9: What is the total yield of NADH and $FADH_2$ in one turn of the TCA cycle?

a) 3 NADH and 1 $FADH_2$

b) 2 NADH and 1 $FADH_2$

c) 3 NADH and 2 $FADH_2$

d) 4 NADH and 1 $FADH_2$

e) 2 NADH and 2 $FADH_2$

Answer : a

Q10: which one of the following conditions decrease the oxidation of acetyl CoA by the Citric Acid Cycle:

a) a high availability of Calcium ions

b) a high acetyl CoA/CoA ratio

c) a low ATP/ADP ratio

d) a low NAD+/NADH ratio

e) 2 or more are correct

Answer : d

Q11: 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

e) isocitrate to alpha ketoglutarate

Answer : b

Q12: Which of the following intermediates in the TCA cycle contains 4 carbon atoms?

a) Isocitrate

b) Citrate

c) Fumarate

d) Alpha-ketoglutarate

e) pyruvate

Answer : c

Q13: one of these reaction needs H2O

a) fumarate to malate

b) malate to Oxaloacetate

c) Citrate to Isocitrate

d) Isocitrate to alpha-ketoglutarate

e) pyruvate to citrate

Answer : a

Q14: Oxidative decarboxylation:

a) do not occur in the TCA cycle.

b) involve loss of CO2 and the production of NAD.

c) involve loss of CO2 and the production of NADH.

d) involve gainof CO2 and the production of FADH2.

e) occur three times in the TCA cycle.

Answer : c

Q15: 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

e) none of the following

Answer : a

Q16: All of the following co-factors are required for the α-ketoglutarate dehydrogenase complex in the citric acid cycle, except:

a) Lipoic acid

b) NAD+

c) TPP

d) FAD

e) All are required

Answer : e

Q17: The cofactor required by the enzyme that produces oxaloacetate from pyruvate is.

a) Coenzyme A.

b) Pantothenic Acid

c) Lipoic Acid

d) NADH

e) Biotin

Answer : e

Q18: CoA is a substrate for:

a) Succinate dehydrogenase.

b) Pyruvate Dehydrogenase and alpha-ketoglutarate.

c) Malate dehydrogenase.

d) Isocitrate Dehydrogenase.

e) Fumarase.

Answer : b

Q19: The reactive group of coenzyme A is

a) Phosphate

b) Carboxyl

c) Amino

d) Sulfhydryl

e) Aldehyde

Answer : d

Q20: High NADH/NAD+ ratio inhibits:

a) Fumarate hydratase

b) Isocitrate dehydrogenase

C) Malate dehydrogenase

d) Succinate dehydrogenase

e) Citrate isomerase.

Answer : b

Q21: Release of CoA from specific compounds in the mitochondrial matrix aids directly in:

a) Substrate level phosphorylation

b) Oxaloacetate production

c) Formation of NADH

d) Formation of FADH2

e) Release of CO2

Answer : a

Q22: Which of the following is TRUE considering TCA cycle?

a) If citrate is very high in concentration, TCA cycle will run less effectively

b) When oxidation occurs, an accompanying decarboxylation takes place

c) The overall ΔG is considered zero at physiological conditions

d) ADP is an allosteric activator for 2 of the three dehydrogenases included

e) All enzymes are allocated within the mitochondrial matrix

Answer : a

Q23: The reactions in which succinate is converted to oxaloacetate are, in order:

a. three successive oxidation reactions

b. an oxidation, a hydration, and an oxidation

c. an oxidation, a dehydration, and an oxidation

d. an oxidative decarboxylation, a dehydration, and a condensation

e. a condensation, a dehydration, and an oxidative decarboxylation

Answer : b

Q24: Release of CoA from specific compounds in the mitochondrial matrix aids directly in:

a) Substrate level phosphorylation

b) Oxaloacetate production

c) Formation of NADH

d) Formation of FADH2

e) Release of CO2

Answer : a

Q25: Consider the TCA cycle reaction that produces oxaloacetate has a ΔGo = 0.1 kCal/mol. (0.001) M of each compound is mixed & the reaction is allowed to come to equilibrium. Accordingly, which statement is CORRECT about the resulting concentration of niacin at equilibrium?

a) [NAD+] ≥ [NADH]

b) [NAD+] > [NADH]

c) [NAD+] < [NADH]

d) [NAD+] = [NADH]

e) Cannot be determined from the information provided

Answer : b

Q26: Which one of the following reaction would you expect to be exergonic?

a) Decarboxylation

b) Condensation

c) Transamination

d) Carboxylation

e) Phosphorylation

Answer : a

Q27: During oxidative decarboxylation of a-ketogluterate, the following happens:

a) Oxidation of an acetate group

b) Addition of Coenzyme A to a 2-carbon fragment

c) Oxidation of NADH

d) Removal of 2 CO2 molecules

e) Oxidation of 2 thiol groups by FAD

Answer : e

Q28: what do you expect from this reaction: (acetyl CoA + OAA)

a) Consume energy

b) Done and completed via citrate synthase

c) Inhibited by high concentration of OAA

d) It’s an oxidation decarboxylation reaction

e) It’s an oxidation reaction

Answer : B

Q29: Release of CoA from specific compounds in the mitochondrial matrix aids directly in:

a) Substrate level phosphorylation

b) Oxaloacetate production

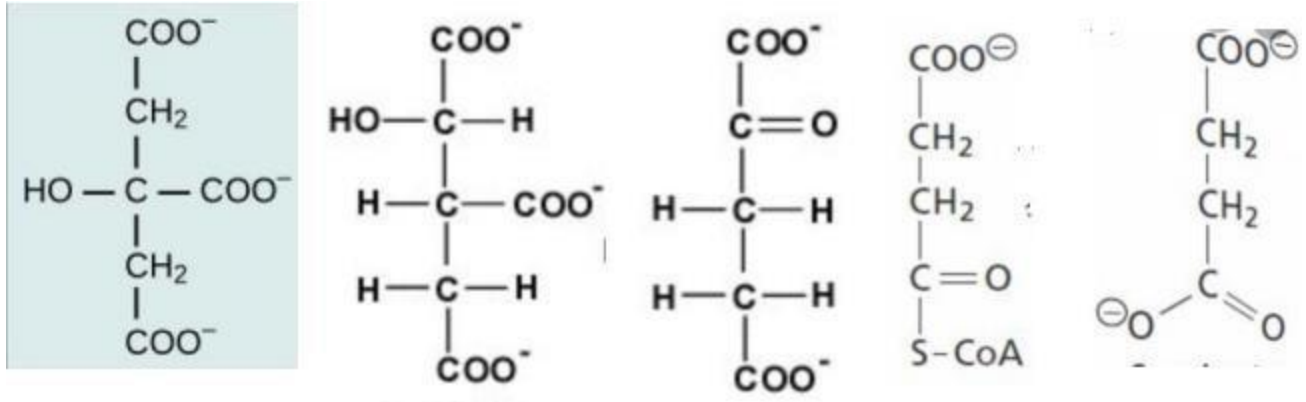
c) Formation of NADH

d) Formation of FADH2

e) Release of CO2

Answer : a

Q30: Regarding to these structures answer the three questions below



1.Which structure is regulated by ADP:

A-1 B-2 C-3 D-4 E-5

2.which converging between these structures gives produce substrate phosphorylation:

A)1-2 B) 2-3 C) 3-4 D) 4-5

3.Which structure gives FADH2 by enzyme dehydrogenase:

A-1 B-2 C-3 D-4 E-5

Answer : b, d, e

Q31: How many molecules of ATP produce in oxidation phosphorylation by using single Acetyl CoA?

a) 10

b) 36

c) 20

d) 5

e) 15

Answer : a

Q32: one of the following will activate pyruvate dehydrogenase (PDH) :

a) increase Ca+ concentration

b) Increase concentration of acetyl coA

c) Decrease concentration of pyruvate

d) Alanine

e) Citrate

Answer : a

Q33: In TCA cycle, oxidation decarboxylation reaction occurs in?

a) Succinate thiokinase

b) Malate dehydrogenase & alpha ketoglutarate dehydrogenase

c) isocitrate DH, alpha ketoglutarate dehydrogenase

d) Citrate synthase

e) Malate dehydrogenase & isocitrate DH

Answer : c

Q34: The conversion of pyruvate to Acetyl Co and CO2:

a) is a decarboxylation process

b) is activated when pyruvate dehydrogenase (PDH, El) of the pyruvate dehydrogenase complex is phosphorylated by PDH kinase in the presence of ATP

c) is reversible.

d) occurs in the cytosol

e) depends on the coenzyme biotin

Answer : a

Q35: The cofactor required by the enzyme that produces of oxaloacetate from pyruvate is:

a) Coenzyme A

b) Pantothenic Acid

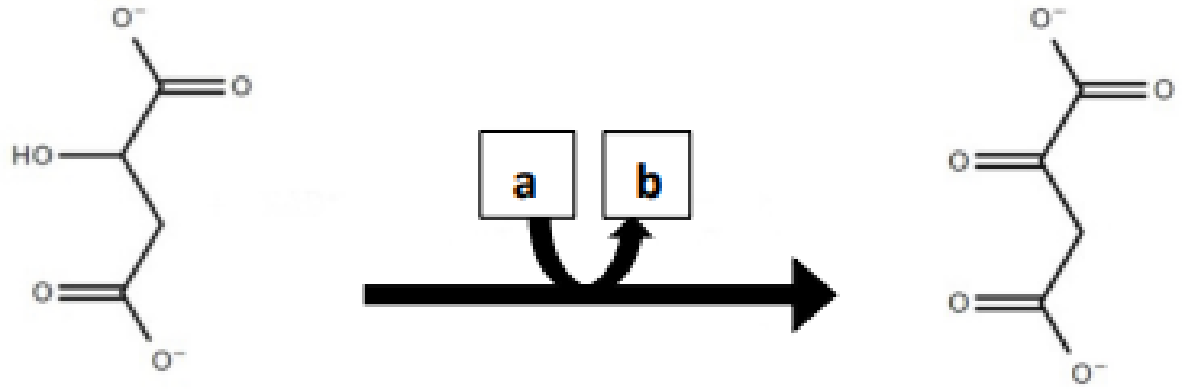
c) Biotin

d) NADH

e) Lipoic Acid

Answer : c

Q36: Based on your knowledge of the TCA cycle , which group of small molecules does best fit the boxes associated with the reaction shown?

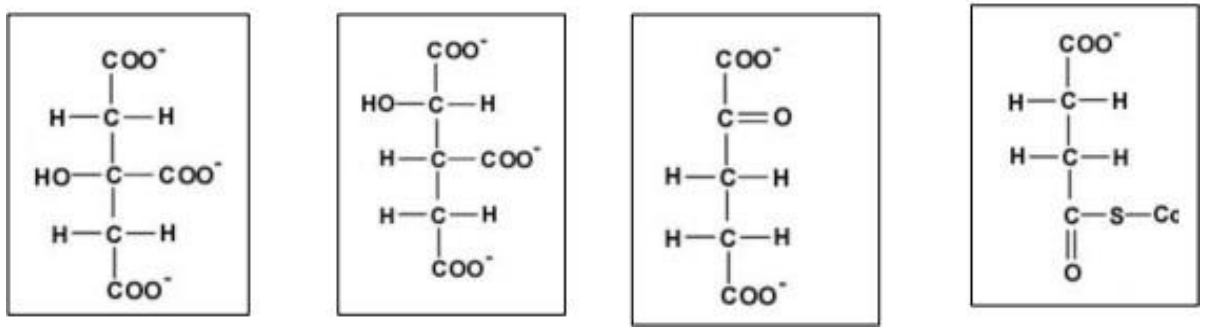


	a	b
A	ADP + $2P_i$	ATP
B	NAD^+	NADH
C	$NADP^+$	NADPH
D	FAD	$FADH_2$
E	All options are correct	☺

Answer : b

Q37: Choose the CORRECT statement based on the following structures of TCA cycle intermediates:

1 2 3 4



a) Conversion of compounds 1 to 2 is an oxidative decarboxylation reaction

b) Release f CoA from compound 4 accompanies the release of CO2

c) Compound 1 is oxidized but can't be reduced

d) Conversion of compounds 3 to 4 is the rate -limiting step of the cycle

e) The enzyme that catalyzes the conversion of compounds 2 to 3 is allosterically activated by ADP

Answer : e

Q38: If you knew that the conversion of oxaloacetate to malate has delta G note of +32 KJ/mol, which of the following is true:

a) it will move slower.

b) it will not happen in the cell.

c) It may occur in the cell with specific concentrations for the reactant and products.

d) It could happen if coupled with an endergonic reaction.

e) None of the above.

Answer : c

Q39: One of these is not an intermediate in Krebs cycle:

a) Citrate
b) Alpha ketoglutarate
c) Acetyl CoA
d) Fumarate
e) Oxaloacetate

Answer : c

Q40: Which of the following is the coenzyme for dihydrolipoyl transacetylase:

a) NAD + FAD

b) CoA + NAD

c) Lipoic acid

d) TPP

e) Lipoic acid + CoA

Answer : e

Q41: Which of the following is not a coenzyme of alpha ketoglutarate dehydrogenase?

a) NAD

b) FAD

c) Lipoic acid

d) ATP

e) TPP

Answer : d

Q42: one of the following will activate pyruvate dehydrogenase (PDH) :

a) increase Ca+ concentration

b) Increase concentration of acetyl coA

c) Decrease concentration of pyruvate

d) Alanine

e) Citrate

Answer : a

Q43: How many high-energy phosphate molecules are produced in the conversion of Citrate to Succinate?

a) 0

b) 3

c) 6

d) 7

e) 9

Answer : C

Q44: What is the maximal amount of ATP produced from the oxidation of isocitrate to alpha-ketoglutarate?

a) 0

b) 2

c) 3

d)4

e)8

Answer : c

Q45: What type of reaction is the conversion of alpha-ketoglutarate to succinyl-CoA in the Krebs cycle?

a) Exergonic

b) Endergonic

c) Isogenic

d) None of the above

e) 2 or more are correct

Answer : a

Q46: Which enzyme is located differently compared to the rest in the Krebs cycle enzymes?

a) Citrate synthase

b) Isocitrate dehydrogenase

c) α-Ketoglutarate dehydrogenase

d) Succinate dehydrogenase

e) fumarase

Answer : d

Q47: What can be concluded from studying the Krebs cycle?

a) Intermediates can be used solely for ATP production.

b) Fat cannot be synthesized from carbohydrates.

c) Intermediates can be used for multiple biosynthetic pathways.

d) The Krebs cycle only occurs in anaerobic conditions.

e) krebs cycle only is a process after glycogenesis

Answer : d

Q48: 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 : d

Q49: The following is the sum of three steps in the citric acid cycle. A + B + FAD + H2O → C + FADH2 + NADH 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+ Oxaloacetate

c) Fumarate NAD+ Oxaloacetate

d) Succinate NAD+ Malate

e) Fumarate GTP Malate

Answer : B

Test bank Qs

Test bank Q

Q50:Which of the following conditions is most unlikely to directly affect the activity of the α-ketoglutarate dehydrogenase complex?

A. Deficiency in thiamine (Vitamin B1)
B. Excessive accumulation of NADH
C. High levels of succinyl-CoA and ATP
D. Increased O2 in mitochondria
E. Increased availability of lipoic acid

Answer : D

Test bank Q

Q:51Which of the following is a critical step in the reaction mechanism of the α-ketoglutarate dehydrogenase complex?

A. Direct phosphorylation of succinate to produce ATP
B. Oxidation of $FADH_2$ to FAD to drive the reaction forward
C. Decarboxylation of α-ketoglutarate followed by transamination
D. Formation of a thioester bond in succinyl-CoA using Coenzyme A
E. Hydrolysis of NAD^+ to generate NADPH and CO_2

Answer : D

Test bank Q

Q:52Which of the following would most likely lead to a significant reduction in the activity of the α-ketoglutarate dehydrogenase complex in a cell?

A. a .Elevated levels of succinyl-CoA and ATP
B. Increased NADnotiartnecnoc noi muiclac hgih dna otiar HDAN/$^{+}$
C. Low levels of succinate and increased TPP
D. Decreased ADP levels and low lipoic acid availability
E. High oxaloacetate concentration and low FAD levels

Answer : A

Test bank Q

Q53:Which combination of cofactors is required for the full catalytic activity of the α-ketoglutarate dehydrogenase complex?

A. a) NAD(PPT) etahpsohporyp enimaihT ,A emyzneoC ,ntioiB ,DAF ,$^{+}$
B. b) NADH, FADHPPT ,A emyzneoC ,dica ciopiL ,$_{2}$
C. c) NADPPT ,A emyzneoC ,dica ciopiL ,DAF ,$^{+}$
D. d) FAD, Biotin, Lipoic acid, ATP, Coenzyme
E. e) NADPH, FAD, Lipoic acid, Coenzyme A, Pyridoxal phosphate

Answer : C

Test bank Q

Q54:What effects does prolonged fasting have on the concentration of oxaloacetate in the liver?

a) It increases due to enhanced glycolysis.
b) It decreases due to its diversion to gluconeogenesis.
C) It remains stable as it is replenished
d) It decreases due to increased fatty acid oxidation
e) It increases because of decreased energy demand.

Answer : B

Test bank Q

Q55:What happens to Acetyl-CoA during fasting when oxaloacetate levels are insufficient?

A. It is converted back to pyruvate.
B. It enters the Krebs Cycle directly.
C. It is diverted to ketogenesis.
D. It is stored as glycogen.
E. It is excreted by the kidneys.

Answer : C

Test bank Q

Q:56Pyruvate carboxylase requires which cofactor for its activity?

A. Thiamine
B. Biotin
C. Pyridoxine
D. Riboflavin
E. Cobalamin

Answer : B

Test bank Q

Q57:Which metabolic pathway is primarily associated with the activity of pyruvate carboxylase?

A. Glycolysis
B. TCA cycle
C. Gluconeogenesis
D. Fatty acid oxidation
E. Urea cycle

Answer : C

Test bank Q

Q:58A 58-year-old man with a history of coronary artery disease suffers a myocardial infarction. After treatment with malonate, the medical team observes improvements in cardiac function. What is the likely mechanism behind this improvement?

A. Increased heart rate and contractility
B. Decreased ischemic damage and preserved myocardial cells
C. Enhanced fat metabolism in cardiac tissue
D. Promotion of angiogenesis in ischemic areas
E. Reduction of arterial plaque formation

Answer : B

Lectures 7-9

Q1: If complex I of the electron transport chain is inefficient, which consequence is likely?

a) No production of ATP in cell
b) We can't use NADH as an electron carrier
c) We can't synthesize H_2O from O_2
d) ATP synthase turns off
e) Increase O_2 consumption

Answer: B

Q2: What inhibits Complex IV in the electron transport chain?

A) Oligomycin

B) Antimycin A

C) Cyanide

D) Rotenone

E) Dinitrophenol

Answer: C

Q3: Incorrect about ATP / ADP translocase:

A) Contains a single nucleotide binding site

B) Is an exergonic process

C) Its inhibition leads to inhibition of cellular respiration

D) Has similar affinity to both ADP and ATP

E) Allows ATP to flow with ADP exchange

Answer: B

Q4: The method discovered to reduce obesity:

A) Antimycin A

B) Supplementing with ATP

C) Uncoupling of oxidation and phosphorylation

D) Reducing electron flow

E) Increasing mitochondrial mass

Answer: C

Q5: Inhibit ATP synthase directly:

A) Oligomycin
B) Amygdalin
C) Antimycin
D) Cyanide
E) Rotenone

Answer: A

Q6: What is the effect of uncouplers on cellular respiration?

a) Increase ATP production
b) Inhibit electron transport chain
c) Decrease proton gradient across inner mitochondrial membrane
d) Decrease oxygen consumption
e) More than one answer

Answer: C

Q7: If mitochondria are placed in a low pH solution, what would happen?

a) Increased ATP production
b) Decreased ATP production
c) No change in ATP production
d) Decrease in oxygen consumption
e) B and D

Answer: A

Q8: True about uncoupling proteins:

a) Increases ATP production
b) Stops formation of H_2O
c) Stops ATP synthesis but not consumption of O_2
d) Stops O_2 consumption
e) Decreases cellular respiration

Answer: C

Q9: 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 FADH2 will reach oxygen

C) Cytochrome a3 will be in the reduced form

D) Oxidation of NADH will continue

E) Oxidation of FADH2 will continue

Answer : A

Q10: 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

Answer : B

Q11: An advantage of oxidative phosphorylation uncoupling in brown adipose tissue:

A) Improved ATP production
B) Increased fatty acid synthesis
C) Heat generation
D) Decreased oxygen usage
E) Reduced NADH production

Answer : C

Q12: Coenzyme Q (Ubiquinone) functions in the electron transport chain as:

A) A lipid-soluble electron carrier
B) A water-soluble electron donor
C) A covalently attached cytochrome cofactor
D) A lipid-soluble oxygen carrier
E) A water-soluble proton carrier

Answer : A

Q13: Cytochrome c oxidase complex in the electron transport chain:

A) Accepts electrons from cytochrome c

B) Pumps two protons out of the matrix space

C) Donates four electrons to O_2

D) Produces two H_2O per O_2 reduced

E) All of the above

Answer : E

Q14: Uncoupling oxidative phosphorylation results in:

A) Increased ATP production

B) Increased heat generation

C) Reduced respiration rate

D) Enhanced NADH production

E) Decreased O_2 consumption

Answer : B

Q15: Which of the following is true about NADH in the electron transport chain?

A) It donates electrons to Complex II

B) It pumps protons at Complex I

C) It donates electrons to oxygen

D) It donates electrons to $FADH_2$

E) It transports protons directly

Answer : B

Q16: 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

E) Cyanide

Answer : A

Q17: Which of the following is correct regarding Oligomycin:

A) It permits H+ 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.

E) None of the above.

Answer: D

Q18: Which of the following doesn´t contain iron sulfur center:

A) Complex I

B) Complex II

C) Complex III

D) Complex IV

E) All of the following complexes contain iron sulfur center

Answer: D

Q19: 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) It is not essential for ATP production

E) All of the above are false

Answer : B

Q20: What would happen if the NADH-CoQ oxidoreductase complex (Complex I) in the electron transport chain does not function?

a) Increased ATP production
b) Decreased OxPhos ATP production
c) Increased oxygen consumption
d) Decreased glycolysis rate
e) Production of H_2O stops

Answer : B

Q21: Is there any complex in the electron transport chain that does not require iron?

a) Complex I
b) Complex II
c) Complex III
d) Ubiquinone
e) None of the above

Answer: D

Q22: Cyanide inhibits which complex in ETC?

A) Complex I

B) Complex II

C) Complex III

D) Complex IV

E) Complex MIM

Answer: D

Q23: Which of the following molecules has the highest reduction potential in the electron transport chain?

A) Coenzyme Q

B) FADH2

C) Cytochrome c

D) NADH

E) Oxygen

Answer : E

Q24: The cytochrome c oxidase complex:

A) accepts electrons from cyt c

B) donates four electrons to O2

C) produces 2 H2O per O2 reduced

D) pumps 2 protons out of the matrix space

E) All of the above are correct

Answer : E

Q25: The main regulator of electron flow in the electron transport chain is:

a) The NADH level
b) FAD/FADH2 ratio
c) Calcium ions
d) Oxygen
e) ADP levels

Answer : E

Q26: A characteristic feature of glycerol phosphate shuttle is

a) It operates through two isozymes, cytosolic and another in the matrix.
b) Glycerol phosphate is oxidized to phosphoglycerate
c) Malate is a component of the shuttle.
d) It shuttles NADH across inner mitochondrial membrane by carrier molecule.
e) It shuttles electrons from NADH across the inner mitochondrial membrane to FAD.

Answer : E

Q27: Copper ion is a prosthetic group of:

a) NADH dehydrogenase
b) Cytochrome reductase
c) Succinate dehydrogenase
d) Cytochrome oxidase
e) ATP Synthase

Answer: D

Q28: Dinitrophenol inhibits:

a) NADH oxidation by Complex I
b) Electron flow in electron transport chain and ATP synthesis
c) ATP synthesis but not oxidation of NADH
d) Electron flow in Complex IV

Answer: D

Q29: The complex in electron transport chain that DOES NOT have a direct link to coenzyme Q in some form is:

a) Cytochrome c oxidase
b) Complex III
c) Complex II
d) Succinate dehydrogenase complex
e) Complex I

Answer: A

Q30: Which statement is CORRECT considering ATP generation in the electron transport chain?

a) Entry of protons occurs through the F0 piece into the mitochondrial matrix
b) The F_O piece of the ATP synthase is composed of one subunit
c) The F_I piece of the ATP synthase is composed of one subunit
d) The F_O piece of the ATP synthase binds ADP and P_i tightly before ATP synthesis occurs.
e) Conformational changes are minimal in the F_O piece compared to the F_I piece

Answer: A

Q31: Uncoupling in mitochondria refers to:

a) Stopping ATP synthesis but not stopping electron flow
b) Increasing the pH value inside the mitochondrial matrix
c) Blocking NADH electrons from entering the electron transport system
d) Interruption of electron flow
e) Stopping electron flow but not stopping ATP synthesis

Answer: A

Q32: If the inner mitochondrial membrane becomes more permeable to protons ,what happens?

a) ATP synthesis increases
b) No change
c) inorganic phosphate concentration increases in the mitochondrial matrix
d) ATP synthase become more active
e) Inhibition of ATP synthase

Answer: E

Q33: How many molecules of ATP are produced in oxidative phosphorylation by using a single Acetyl COA?

a) 10
b) 36
c) 20
d) 5
e) 15

Answer: A

Q34: How many O2molecules will be reduced by using 4 glucose molecules?

a) 32
b) 10
c) 12
d) 24
e) 16

Answer: D

Q35: ATP synthase can produce ATP using this mechanism as a direct source of energy:

a) The oxidation of pyruvate producing CO_2, and H_2O
b) The conversion of glucose to pyruvate
c) The breakdown of NADH and $FADH_2$
d) A proton gradient established in the mitochondria
e) The metabolism of amino acids

Answer: D

Q36: Ubiquinone is one of the following:

a) It is a small protein with an iron-sulfur center and can carry one or two electrons between complexes Il and Ill

b) It is a small organic molecule that can carry one electron between complexes I and Ill in the mitochondrial inner membrane

c) It is a large protein embedded in the inner membrane of the mitochondria and can transfer two electrons between complexes I and Ill

d) It is a small organic molecule that is free in the mitochondrial inter-membranous space

e) It is a small organic molecule in the mitochondrial inner membrane that can transfer 1 of 2 electrons to complex III

Answer: E

Q37: Most O_2 in your body consumed during breathing is converted into?

a) CO then CO_2
b) CO_2
c) H_2O
d) CO
e) Acetyl CoA

Answer: C

Q38: Which membrane characteristic is not correct about the inner mitochondrial membrane (IMM)?

a) Contains cholesterol
b) Impermeable to most ions and small molecules
c) Site of electron transport chain
d) Contains ATP synthase
e) Very high protein content

Answer: A

Q39: Which of the following is True about Ubiquinone –

Cytochrome C

a) Ubiquinone is a 2-electron donor – Cytochrome C is a 1 electron acceptor
b) Ubiquinone is a 1-electron donor – Cytochrome C is a 2-electron acceptor
c) Ubiquinone has a higher reducing potential than Cytochrome C
d) Both are mobile protein electron carriers
e) More than one correct answer

Answer: A

Q40: Which of the following is correct about oligomycin, cyanide, 2,4-Dinitrophenol:

a) DNP and oligomycin inhibits ATP synthesis, cyanide affects the respiratory chain.
b) DNP and cyanide inhibit ATP synthesis, oligomycin affects the respiratory chain.
c) DNP affects the respiratory chain, cyanide and oligomycin inhibit ATP synthesis
d) All of them inhibit ATP synthesis and the respiratory chain
e) All of them inhibit ATP synthesis but not the respiratory chain

Answer: A

Q41: A mutation in the coenzyme Q results in which of the following:

a) Increased body pH
b) Disturbance in the transport of electrons from malate to oxygen
c) Increased generation of body heat
d) Increased oxygen consumption
e) None of the above

Answer: B

Q42: In a patient with cyanide poisoning, The expected effect on cytochrome C oxidase:

a) More oxidized
b) No effect
c) More reduced
d) Increased activity
e) Not enough information, so can not determine

Answer: C

Q43: What subunit is the proton path in ATP synthase?

a) α subunit
b) β subunit
c) γ subunit
d) A subunit
e) C subunit

Answer: C

Q44: What is the role of the γ-subunit in ATP synthase?

a) Binding
b) Rotation
c) Structural
d) Catalysis
e) Point of entry and exit

Answer: B

Q45: How do uncoupling proteins influence ATP synthesis and oxygen consumption in mitochondria?

a) Increase respiration & decreases ATP formation
b) Decrease respiration & decrease ATP formation
c) Decrease respiration & increase ATP formation
d) Increase respiration & increase ATP formation
e) Depends on the uncoupling protein

Answer: A

Test Bank

Test Bank

Q1: Which has the strongest tendency to gain electrons?

a) O_2
b) Coenzyme-Q
c) Cytochrome-c
d) FAD
e) NAD^+

Answer: A

Test Bank

Q2: 2,4-DNP, an uncoupler of Ox-Phos, was used as a weight-loss agent in the 1930s. Reports of fatal overdoses led to its discontinuation in 1939. Which of the following would most likely be true concerning Individuals taking 2,4-DNP

a) Greater ATP level than normal
b) Body temperature is elevated as a result of hypermetabolism
c) Cyanide has no effect on electron flow
d) The proton gradient across the IMM is greater than normal
e) The rate of electron transport is abnormally low

Answer: B

Lectures 10-13

Q 1: When pyruvate is converted to lactate one statement is correct:

a) Nad+ is reduced to NADH
b) NADH is oxidized to NAD+
c) The reaction is irreversible
d) Pyruvate is reduced to form lactate
e) b+d

Answer : e

Q 2: How many CO2 molecules result from the oxidation of one mole of glucose?

a) 3
b) 2
c) 4
d) 6
e) 12

Answer : d

Q 3: True about isomaltase-sucrase enzyme:

a) It’s composed of 2 polypeptide chains.
b) It can metabolize lactose, sucrose and isomaltose.
c) It is a glycoprotein.
d) It’s cleaved pre-translationally.

Answer : d

Q4 : Which of these transporters is insulin dependent glucose transferase?

a) Glut 5
b) Sglt
c) Glut 4
d) Glut 3
e) Glut 7

Answer : d

Q 5: Acetaldehyde is reduced to ethanol by?

a) Alcohol dehydrogenase
b) Catalase
c) Cytochrome P450 2E1
d) All the above

Answer : a

Q6 : Net of ATP that results of glycolysis:

a) 4
b) 0
c) 1
d) 2
e) 5

Answer : d

Q 7: Rate limiting step for glycolysis is catalyzed by:

a) PFK-1
b) Aldolase
c) Pyruvate kinase
d) hexokinase

Answer : a

Q 8: Which of the following is the transporter of fructose in intestine:

a) GLUT 4
b) GLUT 7
c) GLUT 3
d) GLUT 5
e) GLUT 4

Answer :d

Q 9: Which of the following statements is correct regarding the enzyme that phosphorylates Fructose 6 phosphate to Fructose-1,6-bisphosphate:

a) It catalyzes the rate limiting step of glycolysis
b) Is called Phosphofructokinase II
c) Can catalyze the reversible reaction
d) A+b

Answer : a

Q 10: Which enzyme deficiency causes hemolytic anemia?

a) Pyruvate kinase
b) PFK-1
c) PFK-2
d) glucokinase

Answer : a

Q 11: All of the following cause lactic acidosis, except:

a) Deficiency of lactate dehydrogenase
b) Inhibition of electron transport chain
c) Inhibition of Phosphofructokinase-1
d) Low blood absorption of O2 in lungs

Answer : c

Q 12: All of the following can result in lactic acidosis EXCEPT:

a) Respiratory failure associated with COVID19.
b) Direct inhibition of oxidative phosphorylation
c) Uncontrolled haemorrhage
d) Reduced tricarboxylic acid cycle activity.
e) Activated gluconeogenesis.

Answer : e

Q 13: The reaction that is catalyzed by phosphofructokinase-1:

a) is activated by high concentrations of ATP and citrate.
b) uses fructose 1-phosphate as a substrate.
c) is inhibited by fructose 2,6-bisphosphate.
d) is near equilibrium in most tissues.
e) is the rate-limiting reaction of the glycolytic pathway.

Answer : e

Q 14: Isomaltase is a mucosal enzyme that is used in the digestion of ____bond:

a) alpha 1,2
b) alpha 1,1
c) beta 1,4
d) alpha 1,6
e) alpha 1,4

Answer : d

Q15 : The glucose transporter whose expression on cell membrane is increased due to insulin secretion is:

a) Glut 4
b) Glut1
c) Glut 5
d) Glut 7
e) Glut 2

Answer : a

Q 16: The Na+ monosaccharide cotransporter.

a) uses ATP to drive the transport of sodium with glucose.
b) is present in plasma membrane of hepatocytes.
c) is insulin dependent.
d) transfers glucose from high to low concentration by facilitated diffusion.
e) is involved in glucose reabsorption in proximal tubules.

Answer : e

Q17 :B glycosidic bond is found in

a) Isomaltose
b) Maltose
c) Lactose
d) Trehalose
e) starch

Answer : c

Q18 :The products of glycolysis under aerobic conditions in the muscle are

a) pyruvate, NADPH and ATP.
b) lactate, NADH and ATP.
c) lactate and ATP.
d) pyruvate, NADH and ATP.
e) lactate, NADPH and ATP.

Answer : c

Q 19:The glucose transporter GLUT4

a) is found in the pancreatic cells.
b) is found in liver cells.
c) can transport glucose against concentration gradient.
d) is actually fructose transporter.
e) is insulin sensitive.

Answer : e

Q 20: All of the following cause lactic acidosis, except:

a) Deficiency of lactate dehydrogenase
b) Inhibition of electron transport chain
c) Inhibition of Phosphofructokinase-1
d) Low blood absorption of O2 in lungs

Answer : c

Q21: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

Answer : C

Q22: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

Answer : A

Q23: activators of the enzyme pyruvate kinase include :

A) insulin

B) fructose 1,6-bisphosphate

C) fructose 2,6-bisphosphate

D) A+B

Answer : D

Q24: 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

Answer : D

Q25: 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

Answer : D

Q26: 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

Answer : E

Q27: Glycolysis will cease if:

A) Phosphofructokinase is activated

B) Mitochondria aren’t present in the cell

C) NADH is not oxidized

Answer : C

Q28: The rate of glycolysis is increased by :

A) Increased insulin/glucagon ratio

B) ATP

C) Citrate

Answer : A

Q29: under anaerobic conditions , a primary product of glycolysis is :

A) Pyruvate

B) Lactate

C) ethanol

Answer : B

Q30: Which of the following enzymes of glycolysis is/are regulated?

A) Glucokinase/hexokinase

B) Aldolase

C) Pyruvate kinase

D) A AND C

Answer : D

Q31: The rate-limiting enzyme in glycolysis is :

A) Hexokinase

B) Glucokinase

C) Phosphatase-1

D) Phosphofructokinase-1

E) Aldolase

Answer : D

Q32: the enzyme that has low km and low Vmax for glucose is :

A) Hexokinase

B) Glucokinase

C) Phosphofructokinase-1

D) Aldolase

Answer : A

Q33: pyruvate carboxylase :

A) Requires acetyl CoA for activity

B) Occurs in the cytosol

C) Catalyze an irreversible reaction in glycolysis

D) Produces carbon dioxide

Answer : A

Q34: 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

Answer : C

Q35: Citrate is used as :

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

Answer : A

Q36: glucokinase , the liver enzyme has which of the following properties:

A) A lower Km for glucose than hexokinase

B) Can be inhibited by glucose6-phosphate

C) A higher Km for glucose than hexokinase

Answer : C

Q37: 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

Answer : B

Q38: Cleavage of fructose 1-phosphate will form:

a-Glyceraldehyde and DHAP

b-G3P and DHAP

c-Dihydroxyacetone and G3P

d-Dihydroxyacetone and Glyceraldehyde

Answer : A

Q39: 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

Answer : C

Q40: Which of the following is true regarding isomaltase?

a. It is found in the saliva
b. It has an α (1-6) glycosidase activity
c. It is a soluble enzyme
d. It cleaves α (1-4) glycosidic bond in dextrins

Answer : B

Q41: all of the following are positive regulator to PFK-1 except:

A-ATP

B-F-2,6-BPase

C-AMP

Answer : A

Q42: all of the following about GLUT true except:

A-facilitated diffusion

B-sodium independent

C-ATP dependent

D-tissue specific pattern

Answer : C

Q43: products of aerobic glycolysis:

A-2 ATP

B-2 NADH

C-2 pyruvate

D- ALL

Answer : C

Q44: 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 : C

Q45: 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 : A

Q46: 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

Q47: Which of the following carbohydrates is a triose?

a. glucose

b. ribose

c. ribulose

d. glyceraldehyde

e. none of the above

Answer : D

Q48: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 : D

Q49: α(1-4) bond is found in:

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

Answer : B

Lectures 14-16

Q1 : 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

Answer : B

Q2: inhibited by glucose -6 phosphate:

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

Answer : B

Q3 : 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

Answer : C

Q4 : 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

Answer : C

Q5: During fight or flight (stressful situation), which of the following is observed?

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

Answer : A

Q6: A glucose molecule ends up as X acetyl CoA. They produce after entering TCA Y NADH, Z GTP and P FADH2. (only in TCA)

a) a-X = 2. Y= 3. Z= 1. P=1.
b) b-X = 3. Y= 6. Z= 3. P=3
c) c-X = 1. Y= 6. Z= 2. P=2
d) d-X = 2. Y= 6. Z= 2. P=2

Answer : D

Q7: 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

Answer : B

Q8:POMPE disease is caused by a deficiency in:

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

Answer : C

Q9: 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

Answer : C

Q10: Which of the following is a not a common intermediate between glycolysis and gluconeogenesis?

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

Answer : C

Q11: Glycolysis is inhibited by elevated concentrations of fructose 2,6-bisphosphate”

A. true
B. false
C. It depends

Answer : false

Q12: Source of glucose after 20 hours of fasting:

A. diet
B. Gluconeogenesis
C. Glucogenesis
D. glycolysis
E. All are correct

Answer : B

Q12:which one of the following conditions decrease the oxidation of acetyl

- A-a high availability of calcium
- B-a high acetyl coA/ coA ratio
- C-a low ATP/ADP ratio
- D-a low NAD+/NADH ratio

Answer : D

Q13: 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

Q14: glucose-6 phosphatase present in all tissue except the liver:

A-true

B-false

Answer : B

Q15: ATP needed in gluconeogenesis:

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

Answer : B

16: one of the functions of the fluoride in toothpaste :

A. inhibits the enzyme “enolase” of the bacteria
B. inhibits the enzyme “aldolase” of the bacteria
C. inhibits the enzyme “phosphofructokinase” of the bacteria
D. inhibits the enzyme “phosphoglucoisomerase” of the bacteria
E. 2 or more are correct

Answer : A

Q17: What is true about gluconeogenesis?

- A)enhanced by alcohol.
- B)activated in prolonged fasting in the kidneys.
- C)happens in mitochondria.
- D)happens only during exercise.

Answer : B

Q18: Excess glycogen in muscle with normal blood sugar and is a problem in muscle's:

A. transferase
B. Glucose phosphatase
C. glycogen phosphorylase
D. glycogen synthase
E. None of the above

Answer : C

Q19:rate limiting step of glycolysis:

- A-PFK-1
- B-PFK-2
- C-MUTASE
- D-ALDOLASE

Answer : A

Q20: 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?

- A)Phosphoglucomutase deficiency
- B)Glycogen phosphorylase deficiency
- C)Glucose-6-phosphatase deficiency

Answer : B

Q21: True or False:

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

A. Tue
B. false

Answer : B

Q22: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 : C

Q23:About Glycogen phosphorylase kinase what is true:

- A) found in well fed state
- B) found in liver only not muscle
- C) ATP activates it
- D) phosphatase inhibits it
- E) all of the above

Answer : C

Q24: A 40-years-old male with hypoglycemia and hyperlacticacidemia, What is the most likely deficient enzyme?

- a) Galactokinase.
- b) Glucose 6-phosphatase.
- c) Fructokinase.
- d) GALT.
- e) b+d.

Answer : E

Q25: 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+ and dihydroxyacetone phosphate as substrates
- d) It uses FADH2 and glyceraldehyde 3-phosphate as substrates

Answer : A

Q26: The correct statement about glycolysis?

- 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 3th one is NOT regulated.
- d) There are 4 kinases and the first one catalyzes the committed step.
- e) More then one of the above.

Answer : C

Q27: Which of the following statements about gluconeogenesis is correct?

- a) Pyruvate is first converted to phosphoenolpyruvate by Phosphoenolpyruvate carboxykinase
- b) Fructose 1, 6-biphosphatase 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

Q28: 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 : D

Q29: The precursor to glycogen in the glycogen synthase reaction is:

a) glucose-1-phospate
b) glucose-6-phosphate
c) UDP-glucose
d) UTP-glucose
e) none of the above

Answer : D

Q30: 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 : A

Q31: The key regulatory enzyme in glycogen breakdown is:

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

Answer : B

Q32: 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 : C

Q33: The active form of glycogen synthase is:

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

Answer : B

Q34: 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 : D

Q35: 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,fructose6,phosphate
- B. Fructose1,6biphosphate into fructose2,6,biphosphate
- C. Fructose1,6biphosphate into fructose 6,phosphate

Answer : A

Q36: 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

Q37:Fructose 2,6,biphosphate :

- A. is required for gluconeogenesis
- B. stimulates fructose 1,6,biphosphatases
- C. increased by cAMP
- D. inhibits PFK1

Answer : C

Q38: Rate of Glycolysis is increased by

- A. Increased Insulin/glucagon ratio
- B. ATP
- C. Citrate
- D. Increased glucagon/insulin ratio

Answer : A

Q39:rate limiting enzyme of glycolysis :

a) hexokinase
b) phosphatase1
c) Phosphofructokinase1
d) Aldolase
e) glucokinase

Answer : C

Q40: a substrate for glycogen synthase is：

- A. Glucose-6-phosphate
- B. glucose-1-phosphate
- C. UDP-glucose
- D. free glucose

Answer : C

Q41: 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 : B

Q42: Which enzyme activates glycogen phosphorylase?

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

Answer : D

Q43: Which of the following enzymes cleaves glucose residues from glycogen chains?

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

Answer : D

Q44: 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 : D

Q45: Which enzyme forms α(1-6) linkages?

- A. glycogen phosphorylase
- B. Protein Kinase A
- C. glycogen branching enzyme
- D. Phosphorylasekinase
- E. Phosphoprotein phosphatase

Answer : D

Q46: All of the following co-factors are required in the pyruvate dehydrogenase complex except :

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

Answer : E

Q47: Which one of the following reactions is unique to gluconeogenesis?

- a. Phosphoenolpyruvate → pyruvate
- b. 1,3-Bis-phosphoglycerate 3-phosphoglycerate
- c. Lactate→ pyruvate
- d. Glucose 6-phosphate → fructose 6-phosphate
- e. Oxaloacetate phosphoenolpyruvate

Answer : E

Q49: When glycogen phosphorylase is active, the following change occurs:

- a. Fructose-1,6-bisphosphatase is activated.
- b. Alcohol dehydrogenase is activated.
- c. Glycogen synthase is activated.
- d. Glycogen kinase phosphorylase is inactivated.
- e. Phosphoglucomutase is activated.

Answer : E

Q51:Which one of the following statements concerning glycolysis is CORRECT?

- a. The regulated reactions are also the reversible reactions.
- b. Hexokinase is important in hepatic glucose metabolism following consumption of a
- carbohydrate-containing meal.
- c. Glycolysis is activated by glucagon.
- d. The conversion of glucose to lactate requires the presence of oxygen.
- e. AMP is a potent activator of phosphofructokinase.

Answer : E

Q52: A newborn with organomegaly in several organs due to glycogen storage in lysosomes was diagnosed with Pompe's disease. The biochemical deficiency in this patient is:

- a. Glucose-6-phosphatase deficiency
- b. Lysosomal glucosidase deficiency
- c. Glycogenin deficiency.
- d. Glycogen phosphorylase deficiency

A. e. a-1,6 glycosidase deficiency

Answer : B

Q53: The cofactor required by the enzyme that produces oxaloacetate from pyruvate is.

- a. Coenzyme A.
- b. Pantothenic Acid
- c. Lipoic Acid
- d. NADH
- e. Biotin

Answer : E

Q54: The reaction that is catalyzed by phosphofructokinase-1:

- a. is activated by high concentrations of ATP and citrate.
- b. uses fructose 1-phosphate as a substrate.
- c. is inhibited by fructose 2,6-bisphosphate.
- d. is near equilibrium in most tissues.
- e. is the rate-limiting reaction of the glycolytic pathway.

Answer : E

Q55: The main role of the glucose produced by gluconeogenesis in the liver is:

- a. To be used for the synthesis of sugar moiety of glycoproteins, glycolipids and proteoglycans.
- b. To be used for lactose production.
- c. To maintain blood glucose levels.
- d. To supply muscles with glucose to be metabolized for energy production.
- e. To be used for glycogen synthesis and storage.

Answer : C

Q56: The active form of glucose required by glycogen synthase is

- a. UDP-Glucose.
- b. Glucose 6-Phosphate.
- c. Glucose l-Phosphate.
- d. UTP-Glucose.
- e. ADP-Glucose

Answer : A

Q57: Glycolysis is inhibited by

- a. Hydrogen ions.
- b. phosphorylation of glyceraldehyde 3- phosphate dehydrogenase.
- c. high ADP/ATP ratio.
- d. fructose 2,6 bisphosphate.
- e. dephosphorylation of pyruvate kinase.

Answer : A

2023 Exam

1: Choose the CORRECT statement about citrate:

a) it activates fatty acids synthesis

b) it activates PFK-1 in glycolysis

c) it becomes oxidized in ECT

2: which enzyme catalyze a reversible step in glycolysis:

a) enolase

b) Pyruvate kinase

c) glucokinase

3: staphylo bacteria is found in teeth plaque, if it treated with flour or which metabolite will accumulate?

a) 2-phosphoglycerate

4: alpha ketoglutrate and Pyruvate kinase utilize these coenzymes except:

a) FAD

b) CoA

c) lipoic acid

d) biotin

5: diabetes complications in many tissues due to:

a) sorbitol accumulate within the cell, trapping water inside.

b) sorbitol dehydrogenase deficiency.

c) increasing the osmotic pressure.

6: choose the correct statement about glucose absorption in the proximal tubules in the kidneys:

a) the absorption against the concentration gradient.

b) Na independent.

c) does not need energy.

7: all of the following diseases inherited only from mothers except:

-encephalopathy

-sporadic myophaty

-Leigh syndrome

-neuropathy ataxia

8: which is true about ubiquinone:

a) can accept either 1 electron or 2 electrons.

Q: G-what is true about NADH shuttling system:

a) electrons can be shuttled in malate.

Q: match the inhibitor with the target enzyme:

a) succinyl CoA, alpha keto glutarate.

9: match the inhibitor with the target enzyme:

a) succinyl CoA, alpha keto glutarate.

Q: which of the following is true regarding protons flow in ETC:

a) 2(complex III).
b) 0(complex II).
c) 4(complex IV).

Ans:B

10: what happens to the reducing potentials in ETC:

A- it decreases gradually.
B- it is the same until reaching complex III.
C- it increases gradually.

Ans:c

11: what stage of energy production stages produce the highest amount:

A- stage 1
B- stage 2
C- stage 3
D- stage 4
E- all stages produce the same amount of energy

Ans:d

12: choose the correct statement about the pathway that is responsible for the most alcohol metabolism:

a) it involves ADH enzyme.

Q: which of the following will be recognized in individuals under alcoholic effect:

a) high NADH/NAD ration.

13: a baby with megalopathy in the the liver, affected heart, can’t raise his head, blood tests Showa early liver failure, normal glycogen structure but trapped in vacuoles in the liver , what is the enzyme affected:

A-glycogen phosphorylase
B-alpha 1,4 glycosidase

Ans:B

14-a women during starvation will produce glucose from?

a) lactate, alanine,glycerol

19-which of the following could be activated from oxidation of the major source of energy in the body:

a) Pyruvate carboxylase.

15-which of the following does not get phosphorylated by protein kinase A:

A- Pyruvate kinase
B- PFK 1
C- PFK-2

Ans: B(not sure)

16-which of the following could be activated from oxidation of the major source of energy in the body:

a) Pyruvate carboxylase.

17- in the reaction :
glucose-6-phosphate—>fructose 6-phosphate
the reaction is in equilibrium, the concentration of fructose-6-phosphate is 0.22 mol/L glucose-6-phosphate is 0.44 mol/L, calculate the free energy change?

Ans:0

18- in the reaction :
glucose-6-phosphate->fructose 6-phosphate
if the reaction is in equilibrium, the concentration of fructose-6-phosphate is 0.11 mol/L, Glucose-6-phosphate is 0.22mol/L calculate keq?

Ans:0.5

19: which of the following enzyme catalyze anaplerotic reaction :

A-Pyruvate kinase.
B-Pyruvate carboxylase.

Ans:B

20: which of the following enzyme catalyze anaplerotic reaction:

A- Pyruvate kinase
B- Pyruvate carboxylase

Ans:B

27: what is true about F1 in atp synthase:

A- it contains gamma subunit, that performs rotation catalysis.
B- it can run backward
C- a subunit can enter H atoms

Ans:A

21: in which enzyme deficiency will lead to lactic acidosis in the liver?

Ans: cytosolic malate dehydrogenase

29: 2G-GDP is phosphorylation to GTP in krebs cycle using:

A-oxidative phosphorylation
B-substrate level phosphorylation

Ans:B

22-which is predicted in branching enzyme deficiency:

a) less layers of branches or absence

31-the most important regulatory factor in oxidative phosphorylation is:

a) ADP

23 -Which enzyme catalyse the transformation of glucose 1 to udp galactose :

Answer epimerase (not sure)

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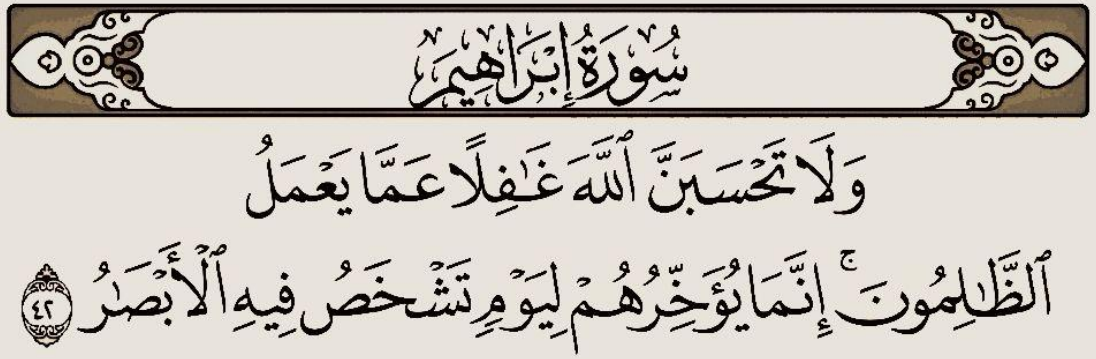

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Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			