METABOLISM

1. Calculate standard ΔG for phosphoglucomutase reaction that is involved in glycogen synthesis

Reaction	ΔG° (kcal)
Glucose → Glucose-6-p	3.3
Glucose → Glucose-1-p	5

a-8.3 kcal

b-1.7 kcal

c-(-2.3) kcal

d-2.3 kcal

ANSWER: B

2. Calculate standard ΔG for the ethanol metabolism reaction that is catalysed by alcohol Dehydrogenase: (F = 23 kcal/volt)

Reaction	ΔE°
acetaldehyde→ Ethanol	-0.2
$NAD^+ \rightarrow NADH$	-0.32

a-(-5.5 kcal)

b-11 kcal

c-(-2.25) kcal

d-2.25 kcal

ANSWER: A

3. A glucose molecule ends up as X acetyl CoA. They produce after entering TCA Y NADH, Z GTP and P FADH2.

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

ANSWER: D

4. -GTP in citric acid cycle is produced by :

a-Oxidative phosphorylation

b-Substrate level phosphorylation

c-Active phosphorylation

d-Transfer of phosphate from ATP

ANSWER: B

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

a-ATP

b-NADH

c-ADP

d-A+B

ANSWER: D

6. If a reaction has negative ΔG then it has to be:

a-Exergonic

b-Exothermic

c-Endothermic

d-Endergonic

ANSWER: A

7. What is the standard free energy of the reaction if

delta E°=-10 mvolt, 2 electron transported, Faraday

constant=23 Kcal/volt??

Answer:

delta G°= -nf E°

-2*23*-10/1000

=0.46Kcal

8. 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

9. 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

10. 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

11.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

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. Given the following reaction: A + B C + D ΔGo ′ = +15.5 kcal/mol And [A] = 5 mM, [B] = 4 mM, [C] = 0.5 mM, and [D] = 2.5 mM under cellular

conditions, what is the overall Gibbs free energy change for the reaction at 25o C (R = 1.98 × 10–3 kcal/mol/o K) (in kcal/mol)?

(A) +13.86

(B) –13.86

(C) +15.50

(D) –15.50

(E) +17.13

ANSWER: A

15. A + 2e– + 2H+ → AH2 +0.55 V

B + 2e– + 2H+ → BH2 +0.12 V

C + 2e– + 2H+ → CH2 +0.03 V

D + 2e– + 2H+ → DH2 –0.22 V

E + 2e– + 2H+ → EH2 –0.47 V

The order of electron flow in this bacterium is which of the following?
(A) A transfers to B, which transfers to C, which transfers to D, which transfers to E

(B) E transfers to D, which transfers to C, which transfers to B, which transfers to A

(C) C transfers to D, which transfers to E, which transfers to B, which transfers to A

(D) A transfers to E, which transfers to B, which transfers to D, which transfers to C

(E) E transfers to C, which transfers to A, which transfers to D, which transfers to B

ANSWER: B

16. For the bacterial strain referenced in the previous question, the amount of energy available from transporting a pair of electrons across

this chain is which of the following? (R = 1.98 × 10–3 kcal/mol/K and F = 23 kcal/mol-V)

(A) 2.3 kcal/mol

(B) 23 kcal/mol

(C) 47 kcal/mol

(D) 70 kcal/mol

(E) 100 kcal/mol

ANSWER: C

16. Consider the reaction shown below. If [A] = 5.00 mM, [B] = 2.50 mM, and [C] = 1.25 mM, what would the concentration of D have to be to allow this to be a favorable reaction under these conditions? A + B C + D ΔGo ′ = +8.65 kcal/mol

(A) <0.125 μM

(B) <0.43 μM

(C) <4.3 nM

(D) <43 nM

(E) <5.0 μM

ANSWER: C

17. ***16. Consider the reaction shown below. If [A] = 5.00 mM, [B] = 2.50 mM, and [C] = 1.25 mM, what would the concentration of D have to be to allow this to be a favorable reaction under these conditions? A + B C + D ΔGo ′ = +8.65 kcal/mol***

(A) <0.125 μM

(B) <0.43 μM

(C) <4.3 nM

(D) <43 nM

(E) <5.0 μM

ANSWER: C

17. **The conversion of pyruvate to acetyl coenzyme A and carbon dioxide:**

A. involves the participation of lipoic acid.

B. is activated when pyruvate decarboxylase of the pyruvate dehydrogenase complex (PDHC) is phosphorylated by PDH kinase in the presence of ATP.

C. is reversible.

D. occurs in the cytosol.

E. requires the coenzyme biotin

ANSWER: A

18. **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	Product C
A. Succinyl CoA	GDP	Succinate
B. Succinate	NAD^+	Oxaloacetate
C. Fumarate	NAD^+	Oxaloacetate
D. Succinate	NAD^+	Malate
E. Fumarate	GTP	Malate

ANSWER: B

19. The TCA cycle is unique because:

A. It produces ATP molecules through substrate-level phosphorylation

B. It has a very high efficiency

C. It produces electron carrying molecules

D. It is a cyclic pathway

E. It is an exergonic pathway

Answer: B

20. The following are direct or indirect derivatives of the TCA cycle intermediate a-ketoglutarate EXCEPT:

A. Isocitrate

B. Glutamine

C. Succinyl-CoA

D. GABA

E. Glutamate

Answer: A

21. The conversion of pyruvate to Acetyl Co and CO2:

A. involves the participation of lipoic acid

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

22. 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

23. The rate limiting step of glycolysis is catalyzed by:

A. Phosphofructokinase-1

B. Phosphofructokinase-2

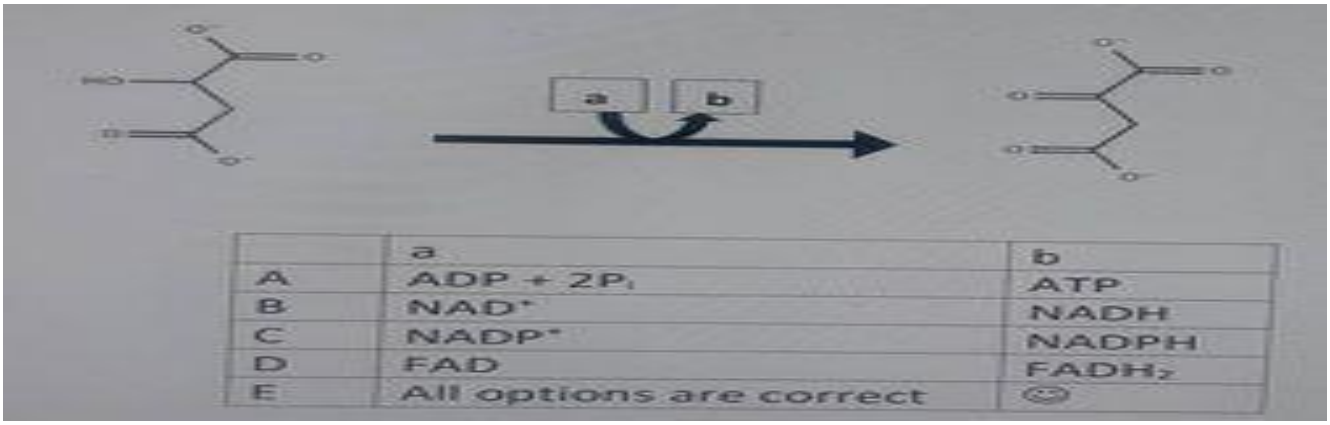
C. Pyruvate kinase

D. Hexokinase

E. Aldolase

Answer: A

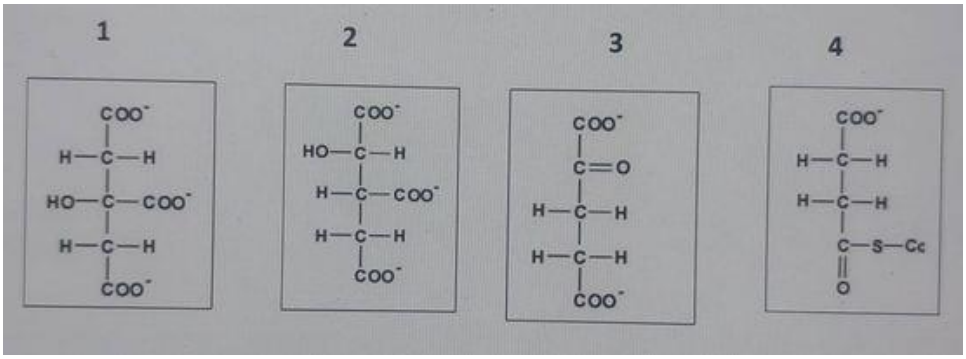
24. Based on your knowledge of the TCA cycle , which group of small molecules does best fit the boxes associated with the reaction shown?



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

ANSWER: B

25. **Choose the CORRECT statement based on the following structures of TCA cycle intermediates**:



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