link full download: https://nursingtestbankdownload.com/product/test-bank-for-fundamentals-of-biochemistry-life-at-the-molecular-level-4th-edition-by-voet-and-voet-and-pratt/

Test Bank for Fundamentals of Biochemistry Life at the Molecular Level 4th Edition by Voet and Voet and Pratt

Chapter 15: Glycogen Metabolism and Gluconeogenesis

Matching

Choose the correct answer from the list. Not all the answers will be used.

A) phosphorylase *a*
B) gluconeogenesis
C) glucagon
D) glucose-6-phosphatase
E) cAMP
F) biotin
G) insulin
H) glycogenolysis
I) liver
J) glucose-1-phosphate
K) dolichol
L) muscle

1. The breakdown of glycogen is referred to as_____.

Ans: H
Section: 16.1
Level of Difficulty: Easy
Learning Objective: **Glycogen Breakdown**

2. Glucose can be synthesized from noncarbohydrate precursors by_____.

Ans: B
Section: Intro
Level of Difficulty: Easy
Learning Objective: **Gluconeogenesis**

3. Carboxylation of pyruvate in humans requires_____as an essential dietary nutrient.
Ans: F
Section: 16.4.A Level of
Difficulty: Easy
Learning Objective: **Gluconeogenesis**

4. _____activates glycogen breakdown. Ans: E

Section: 16.3.B
Level of Difficulty: Easy
Learning Objective: **Control of Glycogen Metabolism**

5. An enzyme present in the endoplasmic reticulum of liver cells is_____.
Ans: D
Section: 16.1.C
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown**

6. _____cells lack receptors for the hormone glucagon. Ans: L
Section: 16.3.C
Level of Difficulty: Easy
Learning Objective: **Control of Glycogen Metabolism**

7. Low blood glucose (< 5mM) levels result in the release of_____.
Ans: C
Section: 16.3.C
Level of Difficulty: Easy
Learning Objective: **Control of Glycogen Metabolism**

8. The first step in the breakdown of glycogen is catalyzed by_____. Ans: A
Section: 16.1.A Level of Difficulty: Easy
Learning Objective: **Glycogen Breakdown**

9. Both glycogen synthesis and glycogen breakdown share the metabolite _____. Ans: J
Section: 16.2.A
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown & Synthesis**

10. The membrane-bound polyisoprenol involved in the synthesis of *N*-linked glycoproteins is called_____.
Ans: K
Section: 16.5
Level of Difficulty: Easy
Learning Objective: **Other Carbohydrate Biosynthetic Pathways**

Multiple Choice

11. Which of the following enzymes catalyzes the conversion of glucose-1-phosphate to glucose-6-phosphate?

A) glucose-1-isomerase
B) glucokinase
C) glucose-1-phosphatase
D) phosphoglucomutase
E) glycogen phosphorylase

Ans: D Section:
16.1C
Level of Difficulty: E asy
Learning Objective: **Glycogen Breakdown**

12. Individuals with McArdle's disease lack the_____in the____,

A) debranching enzyme; liver
B) phosphoglucomutase; liver
C) glycogen phosphorylase; muscle
D) phosphoglucomutase; muscle
E) glycogen phosphorylase; liver

Ans: C
Section: 16.1.C, Box 16-2
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown, Box 16-2**

13. In glycogen synthesis, the intermediate between glucose-1-phosphate and glycogen is

A) UDP–glucose .
B) UDP-glycogen.
C) glucose-1,6-bisphosphate.
D) glucose-6-phosphate.
E) glucose.

Ans: A
Section: 16.2.A
Level of Difficulty: Easy
Learning Objective: **Glycogen Synthesis**

14. Which of the following aides in formation of a primer for glycogen synthesis ?

A) glycogen synthase
B) UDP-glucose pyrophosphatate
C) glycogenin
D) UDP–glycogen
E) amylo-(1,4 1,6)-transglycosylase

Ans: C
Section: 16.2.B

Level of Difficulty: Moderate
Learning Objective: **Glycogen Synthesis**

15. Which of the following enzymes directly converts phosphorylase *b* into the more active form, phosphorylase *a*?

A) cAMP-dependent protein kinase
B) phosphorylase kinase
C) protein kinase A
D) adenylate cyclase
E) phosphoprotein phosphatase-1

Ans: B
Section: 16.1.A, 16.3.B
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown, Control of Glycogen Metabolism**

16. The biotin prosthetic group of pyruvate carboxylase is covalently attached to a _____ residue of the enzyme?

A) valine
B) serine
C) lysine
D) arginine
E) the biotin is attached non-covalently

Ans: C
Section: 16.4.A Level of
Difficulty: Easy
Learning Objective: **Gluconeogenesis**

17. Which of the following serves as the free energy source for the metabolic conversion of oxaloacetate to phosphoenolpyruvate, which is catalyzed by PEP carboxykinase?

A) hydrolysis of PP_i

B) hydrolysis of ATP
C) hydrolysis of GTP
D) hydrolysis of an internal phosphoanhydride bond
E) hydrolysis of a thioester intermediate

Ans: C
Section: 16.4.A
Level of Difficulty: Easy
Learning Objective: **Gluconeogenesis**

18. What is the net energetic cost of converting two pyruvate to one glucose by gluconeogenesis in ATP equivalents?

A) 2
B) 3
C) 4
D) 6
E) 8

Ans: D
Section: 16.4.B
Level of Difficulty: Moderate
Learning Objective: **Gluconeogenesis**

19. Muscle cells are not able to supply glucose for other tissues because

A) they lack the GLUT2 transporter.
B) they lack pyruvate carboxylase.
C) they lack glucose-6-phosphatase.
D) they lack the malate-aspartate shuttle.
E) they lack glycogen phosphorylase.

Ans: C
Section: 16.1.C
Level of Difficulty: Difficult
Learning Objective: **Glycogen Breakdown**

20. Which of the following statements about glycogen is true?

I. Glycogen is a polymer of glucose in (1 6) linkages with (1 4) linked branches every 8–14 residues.
II. UDP–glucose is produced from glycogen by the action of the enzyme phosphorylase.

III. In glycogen breakdown, glucose residues are sequentially removed from the nonreducing ends.
IV. The breakdown of glycogen in skeletal muscle ultimately supplies glucose6-phosphate, which can enter glycolysis to generate ATP.

A) I, II, III, IV
B) I, II
C) II, III, IV
D) III, IV
E) III only

Ans: D
Section: 16.1
Level of Difficulty: Difficult
Learning Objective: **Glycogen Breakdown**

21. Which of the following metabolic conversions does not occur in gluconeogenesis?

A) oxaloacetatephosphoenolpyruvate
B) fructose-1,6-bisphosphatefructose-6-phosphate
C) GTPCO_2 + GDP
+ +
D) NADH + H N_{AD}
E) 1,3-bisphosphoglycerate3-phosphoglycerate

Ans: E
Section: 16.4
Level of Difficulty: Moderate
Learning Objective: **Gluconeogenesis**

22. Which of the following is correct concerning the metabolic reaction shown below?

Pyruvate + CO_2 + ATP oxaloacetate + ADP + P_i

I. This metabolic reaction is catalyzed by pyruvate carboxykinase.
II. The enzyme that catalyzes this reaction is activated by high concentrations of acetyl-CoA .
III. The enzyme that catalyzes this reaction is covalently bonded to the coenzyme pyridoxal-5'-phosphate.
IV. The enzyme that catalyzes this reaction is located in the endoplasmic reticulum of the cell .

A) I, II
B) I only
C) II only
D) II, III
E) II, III, IV

Ans: C
Section: 16.4.A
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

23. What molecules correspond to correspond to X and Y in the following gluconeogenic reaction?

Fructose-1,6-bisphosphotase + X → Fructose-6-phosphate + Y

A) X = NADH + H$^+$ Y = NAD$^+$
B) X = ATP Y = ADP + P_i
C) X = NAD$^+$ Y = NADH + H$^+$
D) X = GTP Y = GTP + P*i*
E) X = H_2O Y = P*i*

Ans: E
Section: 16.4.B

Level of Difficulty:
Learning Objective:

Moderate
Gluconeogenesis

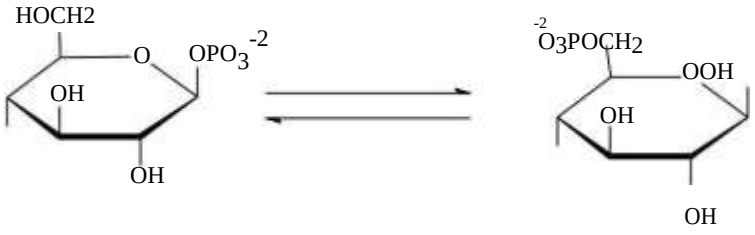
24. Which of the following metabolic conversions involved in glucose synthesis requires the direct expenditure of ATP?

I. 3-Phosphoglycerate1,3-bisphosphoglycerate
II. Glyceraldehyde-3-phosphate + dihydroxyacetone phosphate fructose-1,6-bisphosphate
III. Fructose-1,6-bisphosphate fructose-6-phosphate
IV. 1,3-Bisphosphoglycerate glyceraldehyde-3-phosphate

A) I only
B) II, III
C) III only
D) II, IV
E) I, IV

Ans: A
Section: 16.4.B
Level of Difficulty: Moderate
Learning Objective: **Gluconeogenesis**

25 . Which statement is TRUE concerning the metabolic reaction shown below?



A) The enzyme that catalyzes this reaction is called a mutase.
B) The enzyme that catalyzes this reaction is called a kinase.
C) This reaction requires the free energy of ATP hydrolysis.

Level of Difficulty:
Learning Objective:

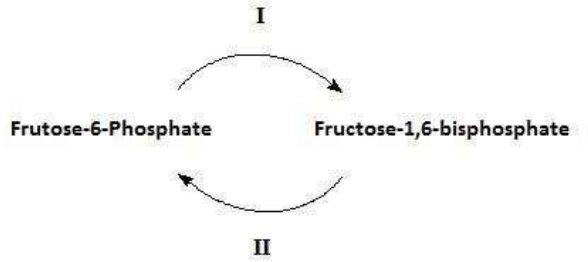
D) This reaction requires multiple steps catalyzed by a phosphorylase and a mutase.

E) The oxidation level of glucose-1-phosphate is higher than that of glucose6-phosphate.

Ans: A
Section: 16.1.C

Moderate
Glycogen Breakdown

26. The diagram represents a "substrate cycle" in glucose metabolism. Which of the following statements about the cycle is true?



A) Reactions I & II are catalyzed by the same enzyme and help establish equilibrium between the two metabolites.

B) Reaction II produces ATP by substrate-level phosphorylation.

C) Reaction II is catalyzed by an allosteric enzyme that is inhibited by fructose-2-6-bisphosphate.

D) Reaction I is involved in the biosynthesis of glucose.

E) Reaction II occurs under low-energy conditions when the cell needs ATP.

Ans: C
Section: 16.4.C
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

27. Increased levels of epinephrine in the blood will

I. activate adenylate cyclase in liver and muscle cells.
II. stimulate glycogen synthesis.
III. inhibit glycolysis in the muscle cell.
IV. stimulate gluconeogenesis in the muscle cell.

Level of Difficulty:
Learning Objective:

A) I only
B) I, II
C) I, II, III
D) II only
E) I, II, III, IV

Ans: A
Section: 16.3.C
Difficult
Control of Glycogen Metabolism

28. Avidin, a protein intact in raw egg whites, prevents the absorption of biotin in the intestine resulting in biotin deficiency. Which of the following is affected in individuals who consume large amounts of raw egg?

A) Oxaloacetatephosphoenolpyruvate
B) 1,3-Bisphosphoglycerateglyceraldehyde-3-phosphate
C) Fructose-1,6-bisphosphatefructose-6-phosphate
D) Pyruvateoxaloacetate
E) Phosphoenolpyruvate2-phosphoglycerate

Ans: D
Section: 16.4.A
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

29. Which enzyme has an intermediate of the form presented below?

Level of Difficulty:
Learning Objective:

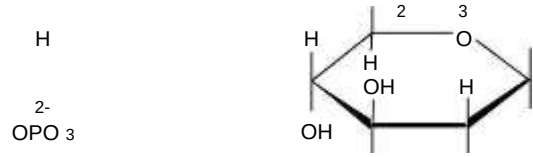
A) phosphofructokinase

B) glycogen phosphorylase

C) phosphohexose isomerase

D) phosphoglucomutase

E) none of the above



Ans: D
Section: 16.1.C
Level of Difficulty: Difficult
Learning Objective: **Glycogen Breakdown**

30. Which statement is true regarding the activation of pyruvate carboxylase by acetyl-CoA?

A) Feedback activation enhances flux through glycolysis.

B) Feedforward activation enhances the entry of pyruvate through the TCA cycle as Acetyl-CoA.

C) Ensures that gluconeogenesis occurs rather than pyruvate conversion to acetyl-CoA.

D) Ensures that ATP is not wasted in the production of oxaloacetate.

E) Feedback inhibition ensures that excess glucose-6-phosphate is not produced.

Ans: C
Section: 16.1.C
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

31. What is the net ATP yield for a muscle cell that stores one dietary glucose molecule as glycogen and then releases it and sends it through glycolysis?

A) 0
B) 1
C) 2
D) 3
E) 4

Ans: C
Section: 16.1
Level of Difficulty: Difficult
Learning Objective: **Glycogen Breakdown**

32. Which of the following best describes the function of the glycogen debranching enzyme in glycogenolysis?

A) It cleaves (1 6) branch points releasing glucose-6-phosphate.

B) It cleaves (1 6) branch points releasing glucose-1-phosphate.

C) It cleaves (1 6) branch points releasing glucose.

D) It transfers an (1 4) linked trisaccharide unit to the nonreducing end of an alternate branch, then cleaves the (1 6) branch point releasing glucose-1 phosphate.

E) It transfers an (1 4) linked trisaccharide to the nonreducing end of an alternate branch, then cleaves the (1 6) branch point releasing glucose.

Ans: E
Section: 16.1.B
Level of Difficulty: Easy
Learning Objective: **Glycogen Breakdown**

33. If cAMP levels are high

I. Glycogenolysis will occur in muscle cells but not liver cells.

III. Glucose released from liver glycogen will exit liver cells via the GLUT4 transporter.
IV. Glucose will enter liver cells resulting in glycogen synthesis.

A) I, II, IV
B) I, II
C) II, III, IV
D) II only
E) III only

Answer: D
Section: 16.3.C
Level of Difficulty: Very Difficult
Learning Objective: **Control of Glycogen Breakdown**

34 . Which of the following best explains the energetically favorable formation of UDP–glucose in the liver and muscle?

A) *G*° for the reaction glucose-1-phosphate + UTP UDP–glucose + PP_i is very negative.
B) *G*° for the reaction glucose-1-phosphate + UTP UDP–glucose + PP_i is very positive.
C) *G*° for the reaction $PP_i 2P_i$ is very negative.
D) *G*° for the reaction $PP_i 2P_i$ is very positive.
E) *G*° for the overall reaction is very positive.

Ans: C
Section: 16.2.A
Level of Difficulty: Moderate
Learning Objective: **Glycogen Synthesis**

35. Hexokinase does not catalyze the final step in gluconeogenesis **as written below** because

glucose-6-phosphate + ADP glucose + ATP

A) the phosphate bond in glucose-6-phosphate does not have a high enough free energy to form ATP.

B) ATP inhibits hexokinase and blocks the reaction from occurring as written.
C) hexokinase is only reversible when high levels of ATP are present.
D) hexokinase does not bind glucose-6-phosphate.
E) none of the above

Ans: A
Section: 16.4.B
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

36. Which of the following best describes the role of fructose-2,6-bisphosphate (FBP) in liver cells?

A) It is an intermediate in glycolysis.
B) It is an intermediate in gluconeogenesis.
C) It is an intermediate in both glycolysis and gluconeogenesis.
D) FBP is a potent allosteric activator of phosphofructokinase and an inhibitor of fructose bisphosphatase.
E) FBP is a potent allosteric activator of fructose bisphosphatase and an inhibitor of phosphofructokinase.

Ans: D
Section: 16.4.C
Level of Difficulty: Moderate
Learning Objective: **Gluconeogenesis**

37. Which of the following is true regarding the reaction shown below?

pyruvate + HCO_3^- + ATP oxaloacetate + ADP + P_i

I. It requires the direct transport of oxaloacetate across the membrane.
II. It utilizes the malate-aspartate shuttle in some species.
III. It is essential for gluconeogenesis.
IV. Its reactants require the function of enzymes which are only found in the cytosol.

A) I only
B) II, III
C) II, III, IV
D) III only
E) II, IV

Ans: B
Section: 16.4.B
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**

38. The synthesis of *N*-linked oligosaccharides occur in the_____ while *O*linked oligosaccharides are synthesized in the_____.

A) Golgi apparatus; endoplasmic reticulum
B) cytosol; Golgi apparatus
C) mitochondrial matrix; endoplasmic reticulum
D) endoplasmic reticulum; Golgi apparatus
E) Golgi apparatus; mitochondrial matrix

Ans: D
Section: 16.5
Level of Difficulty: Easy
Learning Objective: **Other Carbohydrate Biosynthetic Pathways**

39. Levels of glucose-6-phosphate (G6P) are affected by which of the following?

I. glycogen breakdown
II. activity of the pentose phosphate pathway
III. galactose preparation for entry into glycolysis

A) I, II
B) I, II, III
C) III
D) II,
E) I, III

Ans: B
Section: 15.5, 15.6, 16.1
Level of Difficulty: Difficult
Learning Objective: **Chapter 15 sections, Glygocen Breakdown**

40. The breakdown of glycogen produces G1P. Which of the following is FALSE regarding G1P?

A) It is involved in the utilization of fructose by glycolysis in the liver.
B) It is involved in the utilization of fructose by glycolysis in the muscle.
C) It is involved in utilization of galactose by glycolysis.
D) It is converted to G6P by phosphoglucoisomerase (PGI).
E) It is produced as an intermediate in the central glycolytic sequence.

Ans: D

Section: 15.1, 15.5, 16.1C, 16.2
Level of Difficulty: Difficult
Learning Objective: **Chapter 15 sections, Glycogen Breakdown, Glycogen Synthesis**

41. The glycogen debranching enzyme is required for

A) the transfer of 3-glucose units from one branch to another.

B) the transfer of phosphate from one position to another.

C) cleaving (1 → 6) sugar linkages

D) A and C

E) A, B and C

Ans: D
Section: 16.1.B
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown**

42. Which of the following describes a sequence which will ultimately activate glycogen breakdown in a muscle?

A) epinephrine binds β receptors. → → → cAMP → PKA → phosphorylase kinase → glycogen phosphorylase

B) epinephrine bind α receptors → Ca^{2+} increase → phosphorylase kinase → glycogen phosphorylase

C) glucagon → glucagon receptors → → → cAMP PKA phosphorylase kinase → glycogen phosphorylase

D) PP1 binding to unphosphorylated Gm → dephosphorylates glycogen phosphorylase and phosphorylase kinase

E) All of these will activate glycogen breakdown in a muscle.

Ans: A
Section: 16.3.C
Level of Difficulty: Difficult
Learning Objective: **Control of Glycogen Metabolism**

43. Phosphoprotein phosphatase -1 (PP1)

A) catalyzes the phosphorylation of phosphorylase kinase.
B) increases glycogen breakdown when active.
C) catalyzes the dephosphorylation of phosphorylase kinase.
D) catalyzes the dephosphorylation of glycogen phosphorylase.
E) Both C and Dare correct.

Ans: E
Section: 16.3.B
Level of Difficulty: Moderate
Learning Objective: **Control of Glycogen Metabolism**

44. Which of the following will NOT activate glycogen phosphorylase in the liver?

A) epinephrine
B) glucagon
C) eating a high carbohydrate meal
D) cAMP
E) All of the above will activate glycogen phosphorylase.

Ans: C
Section: 16.3.C
Level of Difficulty: Difficult
Learning Objective: **Control of Glycogen Metabolism**

45. Patient "G" has a glycogen storage disease which results in decreased muscle glycogen levels. Muscle biopsies indicate poor glycogen structure in the muscle. Which of the following enzymes might be related to the cause?

A) muscle debranching enzyme
B) muscle glycogen phosphorylase
C) liver debranching enzyme
D) muscle glycogen synthase
E) liver glycogen synthase

Ans: D
Section: 16.1
Level of Difficulty: Difficult
Learning Objective: **Glycogen Synthesis**

46. Which of the following overall sequences is correct with regard to gluconeogenesis?

A) Oxaloacetate → → PEP → G6P → Glucose

B) Pyruvate → FBP → PEP → Glucose C) Lactate → PEP → Pyruvate → G6P

D) Oxaloacetate → F6P → FBP → Glucose

E) F6P → FBP → Glucose → G6P

Ans: A
Section: 16.4

Level of Difficulty: Moderate
Learning Objective: **Gluconeogenesis**

47. Which enzyme below is NOT required for the synthesis of branched glycogen?

A) glycogen phosphorylase
B) glycogen synthase
C) branching enzyme
D) phosphoglucomutase
E) All are required for synthesis of glycogen.

Ans: A
Section: 16.1
Level of Difficulty: Easy
Learning Objective: **Glycogen Synthesis**

48. A deficiency in muscle glycogen phosphorylase would result in

A) normal muscle glycogen structure.
B) abnormal muscle glycogen structure.
C) elevated muscle glycogen levels
D) A and C
E) B and C

Ans: D
Section: 16.2.A, B, C
Level of Difficulty: Moderate
Learning Objective: **Glycogen Breakdown**

49. The Cori cycle is effective because

A) it allows the use of the lactate generated during anaerobic glycolysis to produce pyruvate.
B) it uses less ATP than gluconeogenesis.

C) it uses the compound DHAP and G3P generated during glycolysis to transport reducing equivalents.
D) A and B
E) A and C

Ans: A
Section: Box 16-1, 16.1
Level of Diffi culty: Moderate
Learning Objective: **Glycogen Breakdown, Box 16-1**

50. A deficiency in the enzyme PEPCK (PEP carboxykinase) would

A) block function of the malate/aspartate shuttle.
B) block transfer of reducing equivalents across the membrane in the heart and liver.
C) inhibit formation of ATP via oxidative phosphorylation.
D) inhibit formation of NADH.
E) decrease flux through gluconeogenesis.

Ans: E
Section: 16.4
Level of Difficulty: Difficult
Learning Objective: **Gluconeogenesis**