1) When muscle contract aerobically less lactic acid is formed than when it contract anaerobically because under aerobic conditions:

a. Muscles cannot convert glucose 6-phosphatase to pyruvate
b. Most of the pyruvate generated is oxidized
c. The lactic acid generated is rapidly converted back to glucose
d. The major source of energy is the pentose pathway
e. The major source of energy is creatine phosphate

2) The conversion of 1 mol of glucose 1-phosphate to 2 mol of pyruvate by the glycolytic pathway results in a net formation of

a. 1 mol of NAD+ and 2 mol of ATP
b. 1 mol of NADH and 2 mol of ATP
c. 2 mol of NADH and 2 mol of ATP
d. 2 mol of NADH and 3 mol of ATP
e. Biotin, NADH+ and FAD

3) The rate limiting step of glycolysis is

a. The breakdown of glycogen
b. The phosphorylation of glucose
c. Isomerization of glucose 6-phosphate to fructose 6-phosphate
d. The phosphorylation of fructose 6-phosphate
e. Formation of ATP from phosphoenolpyruvate

4) The steps of glycolysis between glyceraldehyde 3 phosphate and 3 phosphoglycerate involve all the following except

a. ATP synthesis
b. Utilization of Pi
c. Oxidation of NADH to NAD+
d. Reduction of NAD+ to NADH
e. Formation of 1.3 bisphosphoglycerate

5) During anaerobic glycolysis there is net production in the cytosol of lactate and

a. NAD+
b. NADH
c. CO_2
d. ATP
e. $FADH_2$

6) The committed step of the glycolytic pathway is catalyzed by:

a. Hexokinase / glucokinase
b. Phosphofructokinas1
c. Aldolase
d. Glycerol 6-phosphate dehydrogenase
e. Pyruvate kinase

7) The first high energy intermediate produced in the conversion of glucose to pyruvate

a. Glyceraidenyde 3-phosphate
b. Dihydroxyacetone phosphate
c. 1.3 diphosphoglycerate
d. Phosphoenolpyruvate

8) Lactic acid taken from the blood is significant fuel for the heart, if 30 ATP: are produced (not yield) by the complete oxidation of glucose, approximately how many ATP can be produced by the heart by the complete oxidation of 1 lactate molecule?

a. 12
b. 15
c. 18
d. 10
e. 14

9) An enzyme in glycolysis that catalyzes reversible reaction and generates high energy bond

a. Hexokinase
b. Pyruvate kinase
c. Phosphofructokinase - 1
d. Glyceraldehyde - 3 phosphate dehydrogenase
e. Phosphoglucoisomerase

10) Key activates of glycolysis in liver

a. a- ATP
b. Glucos6-phosphate
c. Ca+2
d. Acetyl COA
e. Fructose 2.6 bisphosphate

11) The most important allosteric inhibitor of phosphofructokinase - 1 resting muscle is

a. ATP
b. ADP
c. AMP
d. Glucose -6.phosphate
e. e Fructos6 phosphate

12) In aerobic muscle glycolysis pyruvate does not accumulate because its converted to

a. Lactate
b. Acetyl-COA
c. Oxalacetate
d. Phosphoenolpyruvate date
e. Alanine

13) Which enzyme is activated by fructose 2.6 biphosphate in liver

a. Acetyl -CoA carboxylase
b. Phosphofructokinase -1
c. Pyruvate carboxylase
d. Glycogen phosphorylase kinase
e. Fatty acid synthase

14) During aerobic glycolysis which of the following builds up in the blood stream

a. Pyruvate
b. Lactate
c. Ethanol
d. None of the above
e. All of the above

15) Which of the following has the highest free energy of hydrolysis

a. PEP
b. G6P
c. ATP
d. FDP

16) Glyceraldehydes 3-phosphate dehydrogenase enzyme needs

a. Coenzyme
b. FAD
c. Thiamine phosphate
d. Inorganic phosphate

17) Aerobic glycolysis produce net energy

a. 2
b. 4
c. 6
d. 8

18) Regarding phosphofructokinase 1

a. Rate limiting enzyme of glycolysis
b. Activated by elevated level of ATP
c. Inhibited bi fructose 2.6 bisphosphate
d. Low insulin/glucagon level activate the enzyme

19) Glucos6-phosphatase is not present in

a. Liver and kidneys
b. Kidney and muscle
c. Kidneys and adipose tissue
d. Muscles and adipose tissue

20) Fructose 2.6-biphosphate is formed by the action of

a. Phosphofructokinase -1
b. Phosphofructokinas2
c. Fructose biphosphate isomerase
d. Fructose 1.6-biphosphatase

21) Glucose uptake by liver cells is

a. Energy consuming
b. Saturable process
c. Insulin dependent
d. Insulin independent

22) Hexokinase has high affinity for glucose than

a. Fructokinase
b. Galactokinase
c. Glucokinase
d. d All of the above

23) Dihydro acetone phosphate glyceraldehyd3-phosphate are interconverted by

a. Triose isomerase
b. Phosphotriose isomerase
c. Diphosphoribose isomerase
d. Dihydroxyacetone phosphorylase

24) Under anaerobic condition glycolysis one mole of glucose yields - moles of ATP

a. One
b. Two
c. Eight
d. Thirty

25) The following is an enzyme required for glycolysis

a. Pyruvate kinase
b. Pyruvate carboxylase
c. Glucose - 6 - phosphatase
d. Glycero kinase

26) During glycolysis fructose, 1.6 diphosphate is decomposed by the enzymes

a. Enolase A
b. Fructokinase
c. Aldolase
d. phosphofructo phosphatase

27) Which of the following is not an enzyme involved in glycolysis

a. Enolase
b. Aldolase
c. Hexokinase
d. Glucose oxidase

28) Two examples of substrate level phosphorylation in EM pathway of glucose metabolism are in the reactions of

a. 1.3 bisphosphoglycerate and phosphoenolpyruvate
b. Glucos6- phosphate and fructos6-phosphate
c. 3 phosphoglyceraldehyde and phosphoenolpyruvate
d. 1.3 diphosphoglycerate and 2-phosphoglycerate

29) Pyruvate kinase requires ..... ions for maximum activity

a. Na+
b. K+
c. Ca2+
d. Mg2+

30) The enzyme in phosphorylation of glucose to glucose 6-phosphate are

a. Hexokinase
b. Glucokinase
c. Phosphofructokinase
d. Both A and B

31) In conversion of lactic acid to glucose three reactions of the glycolytic pathway are circumvented which of the following enzymes do not participate

a. Pyruvate carboxylase
b. Phosphoenol pyruvate carboxy kina
c. Pyruvate kinase
d. Glucos6-phosphatase

32) The normal resting state of human most of the blood glucose burnt as "fuel" is consumed by

e. Liver
a. Brain
b. Kidneysa
c. Adipose tissue

33) The glycolysis is regulated by

a. Hexokinase
b. Phosphofructokinase
c. Pyruvate kinase
d. All of these

34) How many ATP molecule will be required for conversion of 2-molecules of lactic acid to glucose

a. 2
b. 4
c. 8
d. 6

35) Glucokinase

a. Is widely distributed and occurs in most mammalian tissues
b. Has high km for glucose and hence is important in the phosphorylation of glucose primarily after ingestion of carbohydrate rich meal
c. Is widely distributed in prokaryotes
d. None of these

36) The reaction catalyzed by phosphofructokinase

a. Is activated by high concentrations of ATP and citrate
b. Use fructos1-phosphate as substrate
c. Is the rate limiting reaction of the glycolytic pathway
d. Is inhibited by fructose 2.6-bisphsphate

37) In which of the cell does glycolysis occur

a. Mitochondrion
b. Nucleus
c. Soluble cytoplasm (cytosol)
d. Rough endoplasmic reticulum
e. Smooth endoplasmic reticulum

38) How many net molecules of ATP are generated in the conversion of glucose to pyruvate

a. 0
b. 1
c. 2
d. 3
e. 4

39) Which of the following statements about glycolysis true

a. Glucokinase catalyzes the conversion of glucose to glucose 6-phosphate in the liver
b. Phosphofructokinase 1 catalyzes the conversion of fructose 1.6-bisphosphate to dihydro acetone phosphate
c. When one molecule of glucose is converted pyruvate via glycolysis one molecule of NAD N+ os reduced
d. When one molecule of glucose is converted to pyruvate via glycolysis one carbon is lost as CO2
e. Hexokinase catalyzes the conversion of fructose 6-phosphate to fructose 1.6 bisphosphate

40) Which of the following is NOT regulatory mechanism of glycolysis

a. Activation of phosphofructokinase by AMP
b. inhibition of hexokinase by its products
c. Inactivation of pyruvate kinase when glucagon levels are elevated
d. Inhibition of aldolase by fructose 1.6 bis-phosphate

41) Which of the following glycolytic enzymes is used in gluconeogenesis

a. Glucokinase
b. Phosphofructokinase 1
c. Pyruvate kinase
d. Aldolase

42) Which of the following is coenzyme the reaction catalyzed by glyceraldehyde - 3-phosphate dehydrogenase?

a. ATP
b. Cu2+
c. Heme
d. NAD+

43) The reaction catalyzed by phosphofructokinase is

a. Inhibited by fructose 2.6 bisphosphate
b. Activated by high concentration of ATP
c. Regulatory step of glycolysis
d. All of the above

44) Hexokinase has considerably lower km for

a. Glucose
b. Fructose
c. Galactose
d. Mannose

45) All are intermediates of glycolysis except

a. Glucos6-phosphate
b. Fructose 1.6 bisphosphate
c. Fructos6-phosphate
d. d. Glycerol-3-phosphate

46) The end product of glycolysis

a. is pyruvate in aerobic respiration
b. Can form alcohol and or lactate if fermentation occurs
c. Nets the cell 2 ATP
d. Nets the cell 2NADH
e. All of the choices are correct

47) Phosphofructokinase key enzyme in glycolysis is inhibited by

a. Citrate and ATP
b. AMP
c. ADP
d. TMP

48) Hexokinase is inhibited in allosteric manner by

a. Glucos6-phosphate
b. Glucose 1-phosphate
c. Fructos6-phosphate
d. Fructos1,6- bisphosphate

49) The two major factors determining whether cell oxidizes glucose by aerobic glycolysis or by anaerobic glycolysis are

a. FADH2- and the number of mitochondria
b. NADH and the ATP/ADP ratio
c. Ca++ and AMP
d. Oxygen pressure and the number of mitochondria
e. Presence of low glucose and High AMP

50) The ATP/AMP ratio has major effect upon the rate of ATP production by glycolysis ATP and AMP bind to allosteric sties on

a. Hexokinase
b. Glucokinase
c. Phosphofructokinase -1
d. Phosphofructokinase -2
e. Phosphoglycerate kinase.

51) Which of the following statements about pyruvate kinase is false :

a. can convert phosphoenol pyruvate to pyruvate
b. Is regulated by feed forward regulation
c. Is active in the dephosphorylated form
d. Is also involved in gluconeogenesis
e. Deficiency causes hemolytic anemia

52) Which of these enzymes reactions is not irreversible in glycolysis

a. Hexokinase
b. Glucokinase
c. 3-phosphoglycerate kinase
d. Phosphofructokinas1
e. Pyruvate kinase

53) The steps of Glycolysis between glyceraldehyde 3-phosphate and 3-phosphoglycerate involve all of the following except

a. ATP synthesis
b. Catalysis by phosphoglycerate kinase
c. Oxidation of NADH to NAD+
d. The formation 1.3 bis phosphoglycerate

Answers

(1)	b
(2)	c
(3)	d
(4)	c
(5)	d
(6)	b
(7)	c
(8)	e
(9)	d
(10)	e
(11)	a
(12)	b
(13)	b
(14)	b
(15)	a
(16)	d
(17)	d
(18)	a
(19)	d
(20)	b
(21)	d
(22)	c
(23)	b
(24)	b
(25)	a
(26)	c
(27)	d
(28)	a
(29)	d
(30)	d
(31)	c
(32)	b
(33)	d
(34)	d
(35)	b
(36)	c
(37)	c
(38)	e
(39)	a
(40)	d
(41)	d
(42)	d
(43)	c
(44)	a
(45)	d
(46)	e
(47)	a
(48)	a
(49)	d
(50)	c
(51)	d
(52)	c
(53)	c