MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which coenzyme is the electron acceptor in the following reaction?

\[
\begin{array}{c}
\text{H} & \text{H} \\
\text{C} & \text{C} \\
\text{C} & \text{C} \\
\end{array}
\]

A) FMN  
B) NADH  
C) FADH₂  
D) FAD  
E) NAD⁺

2) Which of the following metabolic pathways can occur in the absence of oxygen?
   A) electron transport  
   B) β-oxidation  
   C) citric acid cycle  
   D) oxidative phosphorylation  
   E) glycolysis

3) The compounds formed when fructose 1, 6-diphosphate is split are
   A) ethanol and acetyl CoA.  
   B) dihydroxyacetone phosphate and pyruvic acid.  
   C) pyruvic acid and lactic acid.  
   D) glyceraldehyde 3-phosphate and pyruvic acid.  
   E) dihydroxyacetone phosphate and glyceraldehyde 3-phosphate.

4) When one glucose molecule undergoes glycolysis it generates
   A) 12 ATP.  
   B) 6 ATP and 2 NADH.  
   C) 2 ATP and 2 NADH.  
   D) 6 ATP.  
   E) 2 ATP and 4 NADH.

5) The process by which complex molecules are broken down into simpler ones for the body's use is called
   A) gluconeogenesis.  
   B) metabolism.  
   C) anabolism.  
   D) catabolism.  
   E) glucogenesis.
6) Anabolic reactions are reactions that
   A) use oxidation but not reduction.
   B) give off energy.
   C) break down large molecules into smaller ones.
   D) use energy.
   E) take place in the mitochondria.

7) How many main stages of catabolism are there?
   A) one  B) two  C) three  D) four  E) five

8) Protein synthesis takes place
   A) on the endoplasmic reticulum.
   B) in the cytosol.
   C) on the ribosomes.
   D) in the mitochondria.
   E) in the nucleus.

9) The hydrolysis of ATP to ADP is

10) The reaction of glucose with ATP to produce ADP and glucose-6-phosphate is an example of a(n)
    A) coupled reaction.
    B) endothermic reaction.
    C) oxidation reaction.
    D) decomposition reaction.
    E) reduction reaction.

11) In biochemical systems, the term reduction often refers to
    A) a gain in oxygen.
    B) a loss of electrons.
    C) a gain of hydrogen or electrons by a compound.
    D) a loss of hydrogen or electrons by a compound.
    E) an energy-releasing reaction.

12) NAD⁺ participates in reactions that produce
    A) ADP from ATP.
    B) a CH₂ group.
    C) a C-C bond.
    D) a C=O bond.
    E) phosphorylation.
13) The portion of Coenzyme A that reacts with potential substrates is
   A) an amino group.
   B) a C=O group.
   C) an acid group.
   D) an alcohol group.
   E) a thiol group.

14) Digestion of carbohydrates begins in the
   A) small intestine.
   B) mouth.
   C) stomach.
   D) pancreas.
   E) large intestine.

15) In the process of glycolysis, glucose is converted to

16) Under aerobic conditions, pyruvate produced in glycolysis can be converted to
   A) acetyl CoA.
   B) glucose-6-phosphate.
   C) fructose-6-phosphate.
   D) lactic acid.
   E) glyceraldehyde-3-phosphate.

17) Under anaerobic conditions, lactate is produced from
   A) ATP.
   B) NAD⁺.
   C) pyruvate.
   D) acetyl CoA.
   E) carbon dioxide.

18) When as much glycogen is stored as possible in the body, excess glucose is converted to
   A) Coenzyme A.
   B) ATP.
   C) triacylglycerols.
   D) fructose.
   E) sucrose.

19) Most of the energy in our bodies is stored in the form of ________.
   A) glucose       B) proteins       C) cholesterol   D) triglycerides   E) glycogen
20) Most of the energy in the typical animal cell is produced in the _____.
   A) nucleus
   B) endoplasmic reticulum
   C) cytosol
   D) mitochondria
   E) lysosomes

21) When combined with the electron transport chain, one turn of the citric acid cycle produces ____ ATP.
   A) 12    B) 11    C) 2    D) 14    E) 24

22) What electron acceptor(s) is(are) used in the citric acid cycle?
   A) FAD only
   B) FMN
   C) NADH + FADH₂ + CoASH
   D) NAD⁺ only
   E) NAD⁺ + FAD

23) The components of the electron transport chain do NOT include
   A) cytochromes.    B) acetyl CoA.    C) CoQ.    D) FMN.    E) oxygen (O₂).

24) In the electron transport chain, the three protein complexes (I, III, and IV)
   A) act as proton pumps, which generate a proton gradient.
   B) transfer electrons from FAD to O₂.
   C) act as Ca²⁺ pumps, which generate a Ca²⁺ gradient.
   D) transfer electrons from NAD⁺ to O₂.
   E) act as electron pumps, which generate an electron gradient.

25) The electron carrier ____ provides two ATP via the electron transport chain.
   A) CoASH    B) FADH₂    C) FMNH₂    D) NADH    E) NADPH

26) The citric acid cycle takes place in the
   A) Golgi apparatus.
   B) endoplasmic reticulum.
   C) cytosol.
   D) mitochondria.
   E) cytoplasm.

27) The energy released during the electron transport chain is used to produce
   A) glucose.
   B) NADH.
   C) ATP.
   D) citric acid.
   E) carbon dioxide.
28) Another name for the citric acid cycle is
   A) oxidative phosphorylation.
   B) the Krebs cycle.
   C) the chemiosmotic pump.
   D) gluconeogenesis.
   E) glucose hydrolysis.

29) In the first reaction of the citric acid cycle
   A) ATP is produced.
   B) acetyl CoA reacts with oxaloacetate to give citrate.
   C) glucose becomes pyruvate.
   D) pyruvate becomes CO₂ and H₂O.
   E) NADH is produced.

30) In the hydrolysis of succinyl CoA in step 5 of the citric acid cycle, CoA is released as

31) The GTP formed in step 5 of the citric acid cycle is used to make
   A) oxygen.
   B) water.
   C) CoA.
   D) carbon dioxide.
   E) ATP.

32) In the dehydration of succinate to fumarate in the citric acid cycle, the coenzyme used is
   A) FAD.  B) NAD⁺.  C) acetyl CoA.  D) NADH.  E) CoA.

33) In step 7 of the citric acid cycle, fumarate is converted to malate by a _____ reaction.
   A) dehydrogenation
   B) hydrolysis
   C) hydrogenation
   D) dehydration
   E) hydration

34) The last step in the citric acid cycle converts malate to

35) Overall, one turn of the citric acid cycle produces
   A) 6 ATP.
   B) 2 GTP.
   C) three CO₂ molecules.
   D) two FADH₂ molecules.
   E) three NADH molecules.
36) In the electron transport chain, in the iron–sulfur proteins,
   A) iron alternates between the +2 and +3 state.
   B) FAD is carried to coenzyme Q.
   C) oxygen is carried to water.
   D) the protein complex is either oxidized or reduced.
   E) the sulfur is the element that carries the electrons.

37) The complete oxidation of glucose produces _____ ATP molecules.
   A) 2   B) 36   C) 24   D) 8   E) 12

38) In the activation of a fatty acid, energy from the hydrolysis of ATP is used to
   A) form a double bond in an oxidation reaction.
   B) join the fatty acid to CoA.
   C) oxidize the hydroxyl group on the β-carbon.
   D) cause a unit of acetyl CoA to separate from the fatty acid chain.
   E) add a molecule of water across a double bond to give a hydroxyl group on the β-carbon.

39) The coenzyme(s) used in fatty acid synthesis is (are) _____.
   A) FADH₂
   B) NADPH
   C) NADH and NADPH
   D) FADH₂ and NADH
   E) NADH

40) Fat cells are known as
   A) monoacylglycerols.
   B) adipocytes.
   C) islet cells.
   D) lysosomes.
   E) glycerides.

41) The action of pancreatic lipase on triacylglycerols produces
   A) high-density lipoproteins.
   B) emulsions.
   C) low-density lipoproteins.
   D) micelles.
   E) monoacylglycerols and free fatty acids.

42) A chylomicron is a
   A) triacylglycerol.
   B) lipase.
   C) storage protein.
   D) digestive enzyme.
   E) transport lipoprotein.
43) Fatty acids are not a source of energy for the brain because
   A) they are metabolized before they get as far as the brain.
   B) they cannot diffuse across the blood-brain barrier.
   C) there is no lipase in the brain.
   D) the citric acid cycle does not operate in the brain.
   E) chylomicrons are too large for absorption by brain cells.

44) The 2-carbon segments removed from a fatty acid during metabolism are used to form

45) Beta-oxidation takes place in the
   A) cytoplasm.
   B) Golgi body.
   C) cytosol.
   D) mitochondrial matrix.
   E) nucleus.

46) Myristic acid, a C₁₄ fatty acid, produces ____ acetyl CoA when completely metabolized.
   A) 5       B) 2       C) 7       D) 12       E) 14

47) Myristic acid, a C₁₄ fatty acid, undergoes the β-oxidation cycle ______ times.
   A) 4       B) 2       C) 14      D) 7       E) 6

48) Fats are higher in caloric value than carbohydrates because
   A) 1 gram of fat produces significantly more ATP than 1 gram of glucose.
   B) fats make use of β-oxidation.
   C) fats can make use of the citric acid cycle.
   D) 1 gram of glucose contains more moles than 1 gram of fat.
   E) 1 gram of glucose weighs more than 1 gram of fat.

49) Ketosis can lower the blood pH below 7.4, producing the condition

50) Acyl carrier protein is used in
   A) fatty acid degradation.
   B) lipogenesis.
   C) β-oxidation.
   D) gluconeogenesis.
   E) acetyl CoA production.
Answer Key
Testname: FALL 2002 EXAM 3.TST

1) Answer: D
2) Answer: E
3) Answer: E
4) Answer: C
5) Answer: D
6) Answer: D
7) Answer: C
8) Answer: C
9) Answer: C
10) Answer: A
11) Answer: C
12) Answer: D
13) Answer: E
14) Answer: B
15) Answer: E
16) Answer: A
17) Answer: C
18) Answer: C
19) Answer: D
20) Answer: D
21) Answer: A
22) Answer: E
23) Answer: B
24) Answer: A
25) Answer: B
26) Answer: D
27) Answer: C
28) Answer: B
29) Answer: B
30) Answer: A
31) Answer: E
32) Answer: A
33) Answer: E
34) Answer: B
35) Answer: E
36) Answer: A
37) Answer: B
38) Answer: B
39) Answer: B
40) Answer: B
Answer Key
Testname: FALL 2002 EXAM 3.TST

41) Answer: E
42) Answer: E
43) Answer: B
44) Answer: C
45) Answer: D
46) Answer: C
47) Answer: E
48) Answer: A
49) Answer: B
50) Answer: B