

Biology 202 2002 Mid-Term Exam

Correct answers in **bold**.

(1) If the concentration of salt is 0.3 M in a solution surrounding live, well-functioning cells, and the intracellular concentration of the salt is 3 M, which of the following will happen?

- A) water will move from the cell to the solution
- B) water will move into the cell**
- C) salt will move into the cell
- D) salt will move out of the cell

(2) Which has the highest free energy?

- A) NAD
- B) NADP
- C) AMP
- D) ATP**

(3) For every molecule of acetate that enters into the Krebs's cycle,

- A) three cycles will be completed
- B) six cycles will be completed
- C) 6 molecules of AMP will be produced
- D) 2 molecules of NAD will be produced
- E) 2 molecules of CO₂ will be produced**

(4) Which molecule does not participate in the citric acid cycle?

- A) acetyl-CoA
- B) oxaloacetate
- C) fumarate
- D) NADPH**
- E) succinate

(5) Which is produced during fermentation?

- A) acetaldehyde
- B) lactate**
- C) NAD
- D) all of the above
- E) A and B

(6) Which process does not require ATP?

- A) protein synthesis
- B) Na⁺,K⁺-ATPase
- C) glycolysis
- D) active transport
- E) osmosis**

(7) If the mitochondrial membrane is disrupted so that hydrogen ions can cross the membrane through pores (holes), the amount of ATP produced/ citric acid cycle will be

- A) increased
 - B) decreased**
 - C) remain the same
 - D) dependent on the amount of oxygen consumed
 - E) none of the above
- (8) Which subcellular compartment(s) has a pH<7
- A) Golgi
 - B) endoplasmic reticulum
 - C) lysosomes**
 - D) nucleus
 - E) cytosol
- (9) Which characteristic is shared by both chloroplasts and mitochondria?
- A) They are both organelles found in eukaryotes, but not prokaryotes
 - B) They are surrounded by unit membranes
 - C) They both contain folded or convoluted internal membranes
 - D) They both produce energy via a mechanism involving H⁺ gradients
 - E) All of the above are found in both chloroplasts and mitochondria**
- (10) How can the amount of product formed from an enzymatic reaction be doubled without changing the amount of substrates or enzyme?
- A) allosteric activation of the enzyme
 - B) optimizing the environment of the reaction (heat, pH, etc)
 - C) removing a competitive inhibitor
 - D) all of the above**
 - E) A and B
- (11) Where are proteins synthesized?
- A) rough endoplasmic reticulum
 - B) Golgi
 - C) lysosomes
 - D) mitochondria
 - E) A and D only**
- (12) Which compound is the most oxidized?
- A) methane
 - B) methanol
 - C) formaldehyde
 - D) carbon dioxide**
 - E) ethanol
- (13) Which subcellular compartment(s) has a pH<7
- A) Golgi
 - B) endoplasmic reticulum
 - C) the inner membrane space of the mitochondria**
 - D) nucleus
 - E) cytosol

- (14) A protein X normally has a domain which is basic and this domain is responsible for binding to an acidic domain on receptor Y. Which mutation in the receptor binding region of protein X is most likely to inhibit its binding to receptor Y?
- A) a cysteine to arginine
 - B) a lysine to arginine
 - C) a lysine to aspartic acid**
 - D) an aspartic acid to arginine
 - E) an arginine to lysine
- (15) Which is an example of a protein that is synthesized on endoplasmic reticulum membrane bound ribosomes?
- A) thrombin, a secreted protein
 - B) CYP3E, an integral membrane protein in the endoplasmic reticulum
 - C) the LDL receptor, an integral membrane protein in the plasma membrane
 - D) all of the above**
 - E) A and C only
- (16) Which of the following secondary structures can exist in proteins?
- A) hydrophilic beta-sheets
 - B) amphipathic alpha-helices
 - C) random coils
 - D) hydrophobic beta-sheets
 - E) all of the above**
- (17) Which amino acid(s) ha(ve)s a free hydroxyl (-OH) group?
- A) tyrosine
 - B) serine
 - C) lysine
 - D) alanine
 - E) A and B**
- (18) Which amino acid(s) ha(ve)s a free SH group?
- A) methionine
 - B) serine
 - C) cysteine**
 - D) valine
 - E) A and B
- (19) Under normal circumstances the amount of potassium in a viable, well-functioning cell will
- A) be less than the amount of Na⁺
 - B) be equal to the amount of Na⁺
 - C) be greater than the amount of Na⁺
 - D) be pumped **into** cells by Na,K- ATPase
 - E) C and D**
- (20) The ATP requiring proton pump is an example of
- A) active diffusion
 - B) passive diffusion
 - C) active transport**
 - D) facilitated transport
 - E) none of the above

(21) Which of the following carbohydrates are made by plants?

- A) sucrose
- B) fructose
- C) cellulose
- D) ribose
- E) **all of the above**

(22) Which enzymatic reaction control glycolysis via and allosteric activation by AMP/NAD levels?

- A) phosphohexose isomerase
- B) **phosphofructokinase**
- C) enolase
- D) isomerase
- E) all of the above

(23) According to the following equation $\Delta G = \Delta H - T \Delta S$, as ΔS decreases toward a more negative difference (i.e. the product causes lower entropy), ΔG becomes less negative and the equilibrium constant K ($\Delta G = -RT \ln K$) will be

- A) **decreased**
- B) stay the same
- C) increased
- D) not affected
- E) zero

(24) If the molar ratio of cholesterol:phospholipid decreases, membrane viscosity will

- A) **decrease**
- B) stay the same
- C) increase
- D) not be affected
- E) none of the above

(25) Which sugar is found DNA?

- A) fructose
- B) sucrose
- C) **deoxyribose**
- D) ribulose
- E) ribose

(26) A lower energy state has

- A) **higher entropy**
- B) lower entropy
- C) higher free energy
- D) A and C
- F) B and C

(27) If the activation energy of the transition state is decreased, which of the following will occur?

- A) **the rate of the forward reaction will be increased**
- B) the equilibrium constant K will be decreased
- C) the equilibrium constant K will be increased
- D) the rate of the forward reaction will be decreased
- G) A and C

(28) In DNA which nucleotide(s) hydrogen bonds most efficiently with adenine?

- A) **thymidine**
- B) uracil
- C) guanine
- D) cytosine
- E) A and B

(29) Which molecule is formed as a result of a **reduction** reaction that is later coupled to the production of ATP by oxidative phosphorylation?

- A) NAD
- B) GDP
- C) NADP
- D) **NADH**
- E) A and C

(30) Which membrane contains the highest molar ratio of cholesterol/phospholipid?

- A) endoplasmic reticulum
- B) **the plasma membrane**
- C) Golgi
- D) mitochondria
- E) nucleus

(31) Which compound(s) is(are) insoluble in water?

- A) Cholesterol
- B) Phospholipid
- C) Triglycerides
- D) **all of the above**
- E) sodium chloride

(32) Which compound is transcribed into mRNA?

- A) **DNA**
- B) tRNA
- C) ribulose
- D) cDNA
- E) rRNA

(33) An enzyme tends to facilitate the formation of a product mainly by

- A) increasing enthalpy
- B) **decreasing the free energy of the transition state**
- C) decreasing the entropy of the transition state
- D) B and C

- (34) When the intramembrane space in the mitochondria becomes less acidic, what happens to ATP synthesis?
- A) it's increased
 - B) it's decreased**
 - C) it's unchanged
- (35) Where is glucose metabolized to pyruvate?
- A) mitochondria
 - B) cytosol**
 - C) endoplasmic reticulum
 - D) nucleus
 - E) plasma membrane
- (36) What is the maximum (net) amount of ATP that can be formed from a single molecule of glucose during anaerobic metabolism (fermentation)?
- A) 23
 - B) 32
 - C) 2
 - D) 36**
- (37) Which complex carbohydrate is linked together by α -1,4 glycosidic linkages?
- A) starch
 - B) glycogen
 - C) maltose
 - D) cellulose
 - E) sucrose
- (38) DNA is made in which cell compartment?
- A) Golgi
 - B) mitochondria
 - C) nuclei
 - D) A and B
 - E) B and C**
- (39) Which cellular compartment contains Na⁺,K⁺-ATPase
- A) plasma membrane**
 - B) mitochondria
 - C) lysosomes
 - D) peroxisomes
- (40) What happens if mitochondria are suddenly placed in a solution having a pH of 11?
- A) NADP is formed
 - B) ATP is formed
 - C) NAD is formed
 - D) B and C
 - E) none of the above**
- (41) The major immediate source of acetyl-CoA for the citric acid cycle is:
- A) fructose 1,6 biphosphate
 - B) citric acid
 - C) oxaloacetate
 - D) pyruvic acid**
 - E) oleic acid

- (42) Which amino acid(s) is(are) hydrophobic?
A) isoleucine
B) leucine
C) tryptophan
D) all of the above
E) A and B
- (43) Which has the higher pH: a solution containing 10^{-4} Molar H^+ or a solution containing 10^{-6} Molar H^+
D) 10^{-4} Molar H^+
B) 10^{-6} Molar H^+
- (44) On the planet Xenon, which has an atmosphere containing almost no O_2 , which catabolic energy producing process will still take place in cells?
A) oxidative phosphorylation
B) citric acid cycle
C) photosynthesis
D) none of the above
- (45) Which compound is the acceptor of CO_2 during photosynthesis?
A) ribose-1,6-biphosphate
B) ribulose-1,5-bisphosphate
C) 3-phosphoglycerate
D) glyceraldehyde-3-phosphate
E) oxalacetate
- (46) Which sugar is found in NADP?
A) fructose
B) sucrose
C) maltose
D) ribose-1phosphate
E) ribulose
- (47) How many sodium ions are transported out of a cell during one cycle Na^+K^+ -ATPase?
A) 1
B) 2
C) 3
D) 4
E) 5
- (48) Which of the following hydrocarbons/sugars is(are) digested by termites, humans and yeast?
A) glucose
B) fructose
C) ribose
E) pyruvate
F) all of the above

(49) Which amino acid(s) is(are) basic?

- A) lysine
- B) arginine
- C) alanine
- D) A and B**
- E) A and C

(50) Where in a cell is protein broken down into free amino acids?

- A) Golgi
- B) mitochondria
- C) lysosomes**
- D) endoplasmic reticulum
- E) nucleus