

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. Enter all answers on your Akindi sheet.

- 1) You examine a water sample from a warm spring and find a single-celled organism that contains ribosomes and DNA. How would you classify this organism?

- A) It could be Archaea, Bacteria, or Eukarya.
- B) It could be either Archaea or Bacteria.
- C) It could be either Archaea or Eukarya.
- D) Archaea
- E) Eukarya

All organisms

contain ribosomes + DNA
along with that any of
these categories can have
single-celled organisms

- 2) A cell with an extensive area of smooth endoplasmic reticulum is specialized to _____.

- A) synthesize large quantities of lipids
- B) import and export protein molecules
- C) actively export protein molecules
- D) play a role in storage
- E) break down protein molecules

The Smooth ER synthesizes
lipids

- 3) What is the function of the nuclear pore complex found in eukaryotes?

- A) It synthesizes the proteins required to copy DNA and make mRNA.
- B) It assembles ribosomes from raw materials that are synthesized in the nucleus.
- C) It regulates the movement of proteins and RNAs into and out of the nucleus.
- D) It selectively transports molecules out of the nucleus, but prevents all inbound molecules from entering the nucleus.

The nuclear
pore complex has
to regulate
what goes
in + out
of the nucleus

- 4) Where in a human cell would you expect to find ribosomes?

- A) in the cytosol
- B) on the cytosolic face of the ER
- C) in the mitochondria
- D) A and B
- E) all of the above

Ribosomes can be free-floating
or be on the Rough ER

- 5) Glyceraldehyde-3-phosphate dehydrogenase catalyzes the conversion of glyceraldehyde-3-phosphate to 1,3-bisphosphoglycerate in glycolysis. Where would you expect that glyceraldehyde-3-phosphate dehydrogenase is synthesized in eukaryotes?

- A) on the ER
- B) in the cytosol
- C) in mitochondria
- D) B or C
- E) all of the above

Glycolysis occurs in the cytosol

Pyruvate Processing
+
The Citric Acid Cycle occur in the
mitochondrial matrix

6) During protein synthesis, what cellular component catalyzes the formation of peptide bonds?

- A) endoplasmic reticulum and ribosomes
- B) Golgi apparatus
- C) endoplasmic reticulum
- D) ribosomes
- E) endoplasmic reticulum and Golgi apparatus

Ribosomes catalyze protein synthesis

7) Where are most nuclear proteins synthesized?

- A) cytosol
- B) nucleus
- C) lysosome
- D) surface of the ER
- E) Golgi

Any protein that is reused in the cell is synthesized in the cytosol.

The Rough ER only synthesizes proteins that are meant to exit the cell

8) The proteins that make up collagen are synthesized with an ER signal sequence and no other sorting signal or tag. Where would you expect to find these proteins?

- A) ER
- B) extracellular matrix
- C) lysosomes
- D) Golgi
- E) cytosol

Proteins synthesized in the ER are always headed to the outside of a cell, hence the ECM

9) In the synthesis of a secreted protein, which of the following would occur first?

- A) A newly synthesized protein enters the ER
- B) mRNA binds to a ribosome attached to the surface of the rough ER
- C) A free ribosome synthesizes a signal sequence
- D) A ribosome binds to an SRP receptor on the ER membrane
- E) A signaling molecule binds to the SRP

The path to synthesis goes from free ribosomes

10) There are five classes of CFTR mutants, as described in the table below.

Class I	Gene contains a stop signal that prevents CFTR from being made.
Class II	CFTR is made, but does not reach the cell membrane.
Class III	CFTR is made and reaches the cell membrane, but its gates do not open normally.
Class IV	CFTR is made and reaches the cell membrane, but chloride does not move through the channel normally.
Class V	CFTR is made in smaller than normal quantities.

What class(es) would yield protein that passes through the lysosome on the way to the cell membrane?

- A) None of the classes would pass through the lysosome on the way to the cell membrane.
- B) Class V
- C) Class II
- D) Class III, Class IV, & Class V
- E) All classes would pass through the lysosome on the way to the cell membrane.
- lysosome digest + break down things, so nothing would be able to pass through them*

11) Amoebae move by crawling over a surface (cell crawling), which involves _____.

- A) setting up microtubule extensions that vesicles can follow in the movement of cytoplasm
- B) cytoplasmic streaming
- C) reinforcing the pseudopod with intermediate filaments
- D) growth of actin filaments to form bulges in the plasma membrane
- Actin's main goal is to keep cells attached to their surface + help them move*

12) What is a major difference between the extracellular matrix (ECM) of a plant cell and the ECM of an animal cell?

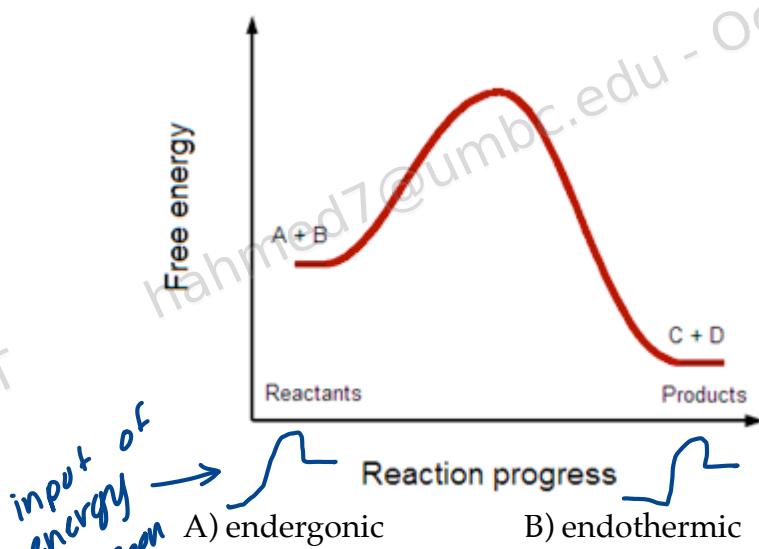
- A) Plant and animal ECMs are quite similar in structure and function.
- B) Plant ECM is composed primarily of proteins, whereas animal ECM is mainly carbohydrates.
- C) Plant ECM is primarily carbohydrate in nature, whereas animal ECM is mainly proteins.
- D) ECM components in plant cells are released extracellularly by the Golgi stacks, whereas lysosomes do this in animal cells.
- Plant ECM is meant to help with shock absorption = Carbs*

13) Which statement correctly describes all exothermic reactions?

- A) They are not spontaneous.
- B) The products have lower potential energy than the reactants.
- C) They are spontaneous.
- D) The products have higher entropy than the reactants.

Exothermic reactions have a release of heat energy ΔH (enthalpy) which would lower their potential energy

- 14) Given only the information in the graph below, you can conclude that the reaction $A + B \rightarrow C + D$ is



- C) exergonic D) exothermic

- 15) Consider the conversion of liquid water to water vapor. Which statement correctly describes ΔS for this process?

- A) $\Delta S = 0$
- B) $\Delta S > 0$ only at high temperatures
- C) $\Delta S > 0$**
- D) $\Delta S < 0$
- E) $\Delta S > 0$ only at low temperatures

entropy of a System
increases when liquid \rightarrow gas

- 16) Which of the following statements is TRUE about enzyme-catalyzed reactions?

- A) The reaction is faster than the same reaction in the absence of the enzyme.**
 - B) An enzyme catalyzes a reaction by raising the activation energy.
 - C) Enzyme-catalyzed reactions require energy to activate the enzyme.
 - D) Enzyme-catalyzed reactions release more free energy than noncatalyzed reactions.
 - E) The free-energy change of the reaction is opposite from the reaction that occurs in the absence of the enzyme.
- enzyme's speed up all reactions

- 17) Some of the drugs used to treat HIV patients are competitive inhibitors of the HIV reverse transcriptase enzyme. Unfortunately, the high mutation rate of HIV means that the virus rapidly acquires mutations with amino acid changes that make them resistant to these competitive inhibitors. Where in the reverse transcriptase enzyme would such amino acid changes most likely occur in drug-resistant viruses?

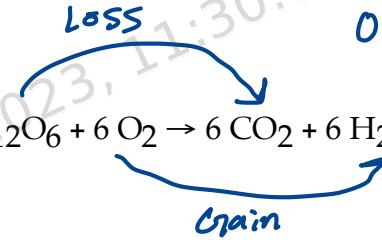
- X) A) At a cofactor binding site**
- B) In or near the active site**
- C) In regions of the protein that determine packaging into the virus capsid
- D) At an allosteric site
- E) Such mutations could occur anywhere with equal probability.

Competitive inhibitors bind to the active site so the change would have to occur in or near the active site

Cellular Respiration

18) Which statement is true of the following reaction? $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O$

- A) Glucose carbons are reduced to carbon dioxide
- B) Glucose oxygens are oxidized to carbon dioxide
- C) Glucose oxygens are oxidized to water
- D) Glucose carbons are oxidized to carbon dioxide**



glucose lost electrons
to form CO_2

19) What is the function of NADH in metabolism?

- A) NADH is an input in the synthesis of sugars.
- B) NADH is an electron carrier.**
- C) NADH transfers a phosphate group to substrates, increasing their potential energy.
- D) NADH is a proton pump.
- E) NADH is a proton carrier.

NADH donates electrons to the ETC, that is its main purpose in this instance

20) The oxygen consumed during cellular respiration is involved directly in which process or event?

- A) pyruvate processing (the oxidation of pyruvate to acetyl CoA)
- B) glycolysis
- C) accepting electrons at the end of the electron transport chain**
- D) the citric acid cycle
- E) fermentation

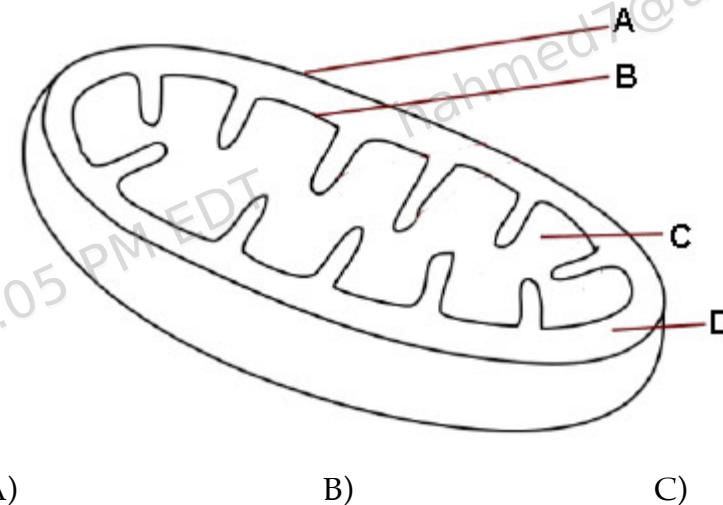
The oxygen accepts electrons at the end of the ETC to form H_2O

21) In glycolysis, for each molecule of glucose oxidized to pyruvate ____.

- A) two molecules of ATP are used and two molecules of ATP are produced.**
- B) four molecules of ATP are used and two molecules of ATP are produced.
- C) two molecules of ATP are used and four molecules of ATP are produced.**
- D) two molecules of ATP are used and six molecules of ATP are produced.

They make 4 ATP but use 2 of those 4 so there is only a net gain of 2

22) The figure below shows a mitochondrion. Where would you expect to find a high concentration of protons?



A)

B)

C)

D)

The ETC is located in the inter-membrane space and the ETC contains a high concentration of protons

23) In chemiosmosis, useful energy is harnessed by the cell from the movement of _____ across the inner mitochondrial membrane into the matrix _____ a concentration gradient.

- A) ATP, against
- B) protons, against
- C) electrons, down
- D) electrons, against
- E) protons, down

the inner mitochondrial membrane has protons that go down the concentration gradient

24) A mutation in yeast makes it unable to convert pyruvate to ethanol. How will this mutation affect these yeast cells if they are grown under anaerobic conditions? The mutant yeast cells will

- A) die because they cannot regenerate NAD⁺ from NADH
- B) grow only when given excess glucose
- C) be unable to metabolize glucose
- D) metabolize only proteins
- E) metabolize only fatty acids

25) Where in a eukaryotic cell would you find ATP synthase?

- A) cytosol
- B) thylakoid membrane
- C) inner mitochondrial membrane
- D) B and C
- E) all of the above

Eukaryotic cells can be animal or plant cells and the ATP synthase is located in the ETC which is always in a membrane

26) Where does the energy that excites electrons in photosystem II come from?

- A) water
- B) light
- C) oxygen
- D) carbon dioxide
- E) plastocyanin

In both photosystem II + I, the energy for exciting electrons comes from light

27) Where would you find the enzymes of the Calvin Cycle?

- A) chloroplast stroma
- B) thylakoid membrane
- C) inner mitochondrial membrane
- D) mitochondrial matrix
- E) thylakoid lumen

light-capturing reactions take place in thylakoid lumen and the Calvin Cycle takes place in the stroma

28) If the light-capturing reactions of photosynthesis stopped because of a mutation in one of the necessary enzymes, the Calvin Cycle would

- A) run in reverse to make up for the lack of the light-capturing reactions
- B) continue to function, but at a slower rate
- C) also stop
- D) proceed normally because they are light-independent
- E) continue to function, but at a faster rate

The Calvin
Cycle needs the products
of the light-capturing
reactions to proceed
so it would stop

29) What is the cellular function of phosphatases?

- A) Phosphatases serve as receptors for various signal molecules
- B) Phosphatases produce second messenger molecules
- C) Phosphatases activate or inactivate other proteins by removing a phosphate group from them
- D) Phosphatases function as second messenger molecules
- E) Phosphatases activate or inactivate other proteins by adding a phosphate group to them

30) What does it mean to say that a signal is transduced?

- A) The signal enters the cell directly and binds to a receptor inside.
- B) The signal is amplified, such that even a single molecule evokes a large response.
- C) The physical form of the signal changes from one form to another.
- D) The signal triggers a sequence of phosphorylation events inside the cell.

31) Different body cells can respond differently to the same peptide hormones because ____.

- A) a target cell's response is determined by the components of its signal transduction pathways
- B) the circulatory system regulates responses to hormones by routing the hormones to specific targets
- C) the hormone is chemically altered in different ways as it travels through the circulatory system
- D) each cell converts that hormone to a different metabolite
- E) different target cells have different sets of genes

32) The receptors for steroid hormones are located inside the cell instead of on the membrane surface like most other signal receptors. This is NOT a problem for steroids because ____.

- A) steroid hormones are lipid soluble, so they can readily diffuse through the lipid bilayer of the cell membrane
- B) the receptors can be readily stimulated to exit and relocate on the membrane surface
- C) steroids do not directly affect cells but instead alter the chemistry of blood plasma
- D) steroids must first bond to a steroid activator, forming a complex that then binds to the cell surface

The only
function of
phosphatases
is to remove
a phosphate
group



33) The activation of receptor tyrosine kinases is characterized by _____.
A) a phosphorylation cascade
B) dimerization and phosphorylation
C) GTP hydrolysis
D) dimerization and IP₃ binding
E) channel protein shape change

34) Did you bubble in your campus ID and version on the Akindi sheet?

A) Yes

B)

you're going to do great ♥

Answer Key

Testname: EXAM2 2022FA

- 1) No Correct Answer Was Provided.
- 2) A
- 3) C
- 4) E
- 5) B
- 6) D
- 7) A
- 8) B
- 9) C
- 10) A
- 11) D
- 12) C
- 13) B
- 14) C
- 15) C
- 16) A
- 17) B
- 18) D
- 19) B
- 20) C
- 21) C
- 22) D
- 23) E
- 24) A
- 25) D
- 26) B
- 27) A
- 28) C
- 29) C
- 30) C
- 31) A
- 32) A
- 33) B
- 34) A