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BIOL 101 – Foundations of Biology
Questions from Exam 3 – Spring 2012-- Prof. Hardy

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1. Translation is the process whereby the message in a _____ is converted into that of a _____.

- A. polypeptide, RNA
- B. RNA, RNA
- C. DNA, RNA
- D. DNA, polypeptide
- E. RNA, polypeptide**

2. _____ carries the message of a protein-coding gene from the nucleus to the ribosome.

- A. rRNA
- B. tRNA
- C. DNA
- D. catalase
- E. mRNA**

3. Translation happens _____

- A. in the nucleus
- B. at the golgi
- C. in vesicles
- D. in the central vacuole
- E. at the ribosome**

4. Transcription happens _____

- A. in the nucleus**
- B. at the golgi
- C. in vesicles
- D. in the central vacuole
- E. at the ribosome

5. What is the amino sequence of the following mRNA? (Use the copy of the Genetic Code in Appendix 1 of this test to answer this). (2 PT)

5'-AAAUAUGCUCGCGAUGGGGAGGAGUUAGAUAG-3'

- A. GLY-ARG-SER
- B. MET-GLY-ARG-SER
- C. MET-GLY-GLY-ARG-SER
- D. ALA-MET-GLY-ARG-SER
- E. MET-ALA-ALA-MET-GLY-ARG-SER**

6. How long is the coding region of the transcript above?

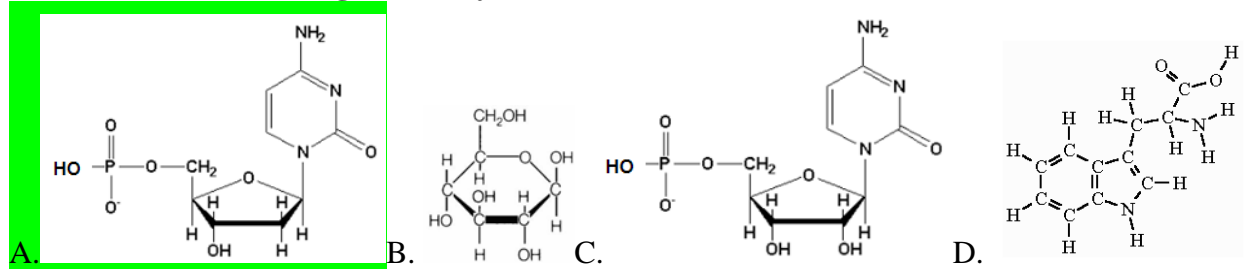
- A. 3 nucleotides long
- B. 32 nucleotides long
- C. 21 nucleotides long**
- D. 3⁷ nucleotides long
- E. 5 nucleotides long

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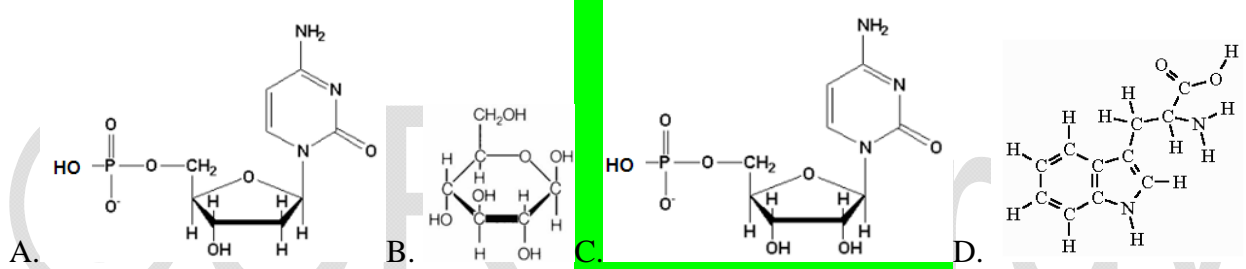
7. _____ carries the amino acid to the ribosome.

- A. rRNA
- B. tRNA**
- C. DNA
- D. catalase
- E. mRNA

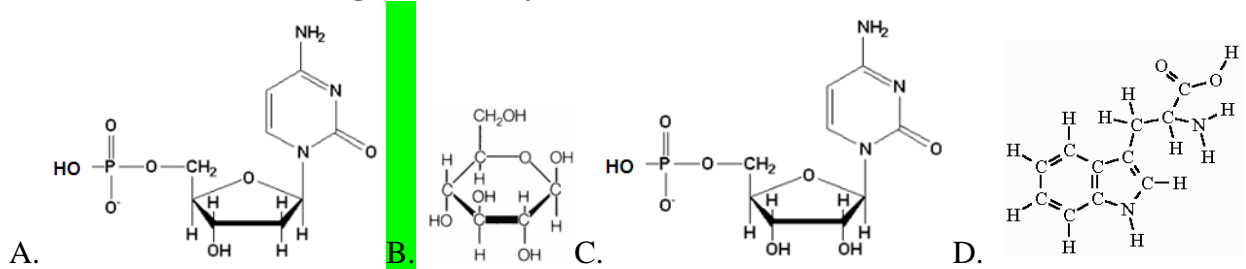
8. Which of the following is a deoxyribonucleotide?



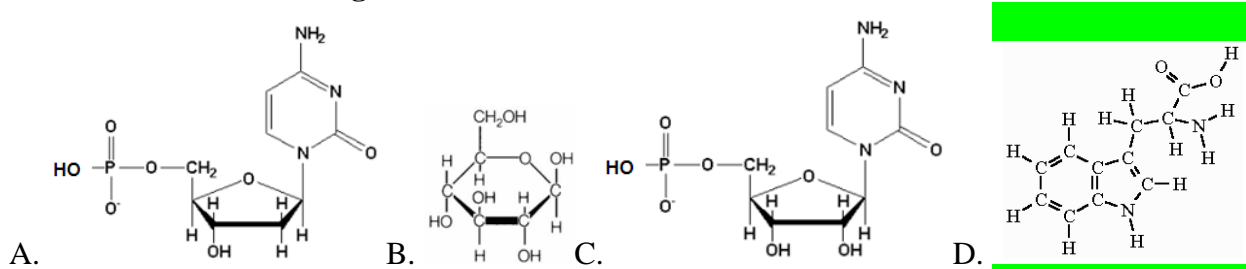
9. Which of the following is a ribonucleotide?



10. Which of the following is a carbohydrate?



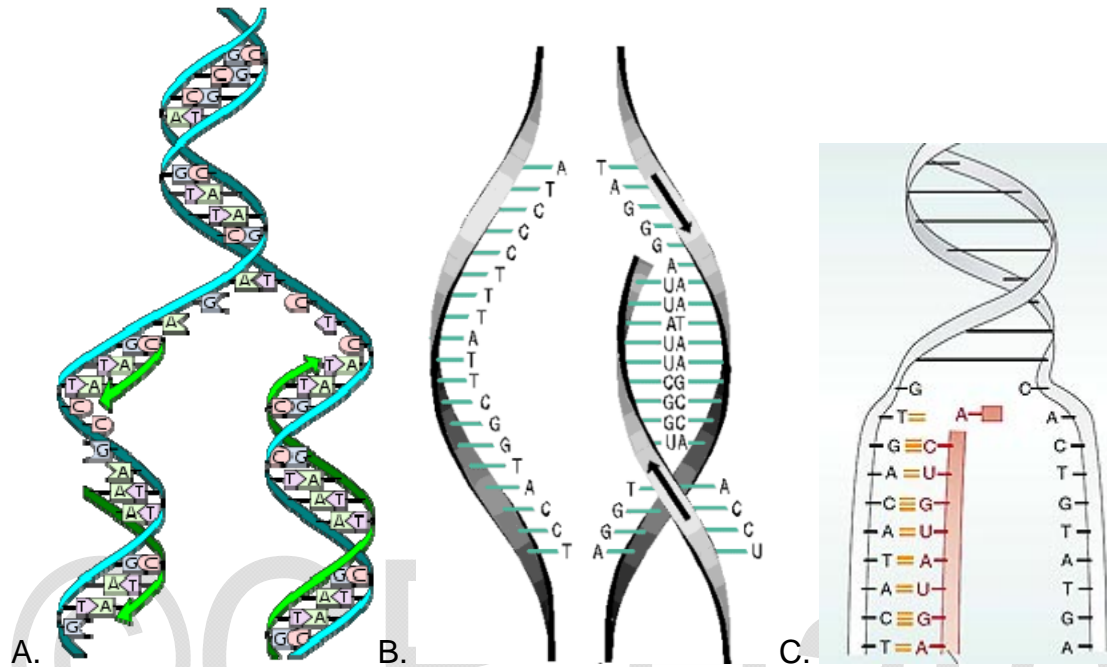
11. Which of the following is an amino acid?



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12. Which of the following depicts DNA replication?

- A. A only
- B. B only
- C. C only
- D. A and C
- E. B and C



13. The process depicted in 12A above should happen when?

- A. Only during mitotic cell division
- B. Only during meiotic cell division
- C. Only during either mitotic or meiotic cell division.
- D. Any time that gene expression is required.
- E. Only during fertilization.

14. The process depicted in 12C above should happen when?

- A. Only during mitotic cell division
- B. Only during meiotic cell division
- C. Only during either mitotic or meiotic cell division.
- D. Any time that gene expression is required.
- E. Only during fertilization.

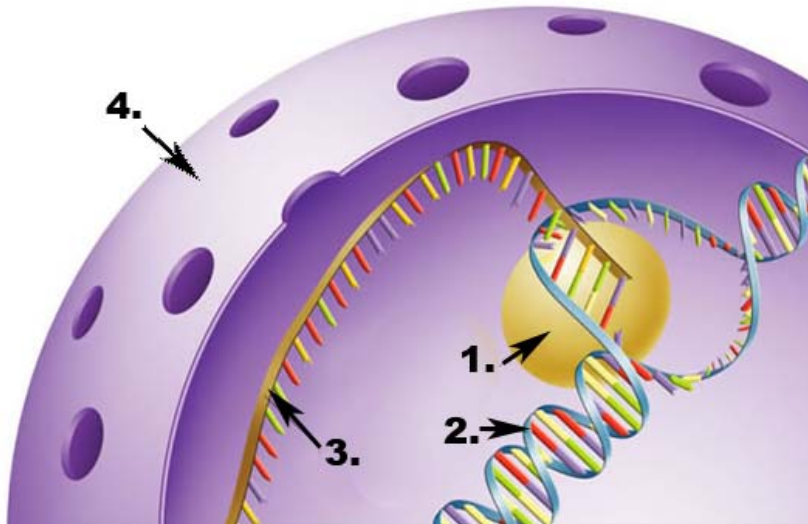
15. Given the following mRNA sequence, 5' -AAAUAUGGCUGCCUGA-3', which of the following is the sequence of the coding strand of the DNA double helix that the mRNA came from?

- A. 3' -AAAUAUGGCUGCCUGA-5'
- B. 3' -AAATATGGCUGCCTGA-5'
- C. 3' -TTTATAACCGACGGACT-5'
- D. 3' -AGTCCGTCGGTATAAAA-5'
- E. 3' -AGUCCGUCGGUAUAAA-5'

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16. The number 4 below represents....

- A. the ribosome
- B. the plasma membrane
- C. a replication bubble
- D. RNA polymerase
- E. the nuclear envelope**



17. The number 3 in the picture for question 16 above is intended to represent....

- A. DNA
- B. RNA**
- C. a replication bubble
- D. RNA polymerase
- E. the nuclear envelope

18. The globular (round) structure labeled number 1 in the picture for question 16 above is intended to represent...

- A. primase
- B. helicase
- C. a replication bubble
- D. RNA polymerase**
- E. the nuclear envelope

19. Are there any artistic errors in the picture for question 16 above?

- A. No.
- B. Yes. The plasma membrane should not have holes in it.
- C. Yes. The RNA should be single stranded.
- D. Yes. The DNA should be a right-handed helix.**
- E. Yes. The DNA should be a left-handed helix.

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20. How large will be the Punnett Square used to predict the outcome of a cross between two individuals each with the following genotype: PpJj?

- A. One cell
- B. Two cells
- C. Four cells
- D. 16 cells**
- E. 64 cells

21. How large will be the Punnett Square used to predict the outcome of a cross between two individuals each with the following genotype: PpJJ?

- A. One cell
- B. Two cells
- C. Four cells**
- D. 16 cells
- E. 64 cells

22. How large will be the Punnett Square used to predict the outcome of a cross between two individuals each with the following genotype: PpJjSs?

- A. One cell
- B. Two cells
- C. Four cells
- D. 16 cells
- E. 64 cells**

23. Dimples. The presence or absence of dimples is controlled by two alleles in a dominant/recessive manner. Having dimples is the dominant phenotype.

If **51 out of 100 people** have dimples and 49 do not, assume that this population is at Hardy-Weinberg Equilibrium and estimate the frequency of heterozygotes in the current generation.

- A. 0.70
- B. 0.30
- C. 0.21
- D. 0.42**
- E. 0.49

24. Assuming that the population above is at Hardy-Weinberg Equilibrium, what is the estimated frequency of the dominant allele 5 generations in the future?

- A. 0.70
- B. 0.42
- C. 0.21
- D. 0.30**
- E. 0.49

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25. Which is not a force of evolutionary change?

- A. Random mating
- B. Drift
- C. Mutation
- D. Natural Selection
- E. Migration

26. Charles Darwin's *Origin of Species* was published in....

- A. 1659
- B. 1759
- C. 1859
- D. 1959
- E. 1932

27. Populations are expected to evolve more rapidly....

- A. when they are large
- B. when there is no genetic evaluation
- C. when they are small
- D. when there is no natural selection
- E. when there is no sexual selection

28. Which is a diagram depicting the (hypothesized) evolutionary history of a group of species?

- A. Radiogram
- B. Cladogram
- C. Phylogeny
- D. Tokogeny
- E. Dendrogram

29. The selection for higher frequencies of darker pepper moths in Britain during the early Industrial Age is an example of

- A. Directional selection
- B. Stabilizing selection
- C. Disruptive selection

30. The increase in antibiotic resistance in *Staphylococcus aureus* caused by the use of that antibiotic against that bacterium is an example of

- A. Directional selection
- B. Stabilizing selection
- C. Disruptive selection

31. The selection for organisms of intermediate heights in a species is an example of ...

- A. Directional selection
- B. Stabilizing selection
- C. Disruptive selection

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32. The large and blue tail feathers in male peacocks evolved from small, grey feathers in their ancestors through...

- A. Directional selection
- B. Stabilizing selection
- C. Sexual selection
- D. both A and C**
- E. both B and C

33. A change in the relative frequencies of alleles in the gene pool of a population is an example of...

- A. genetic drift.
- B. evolution or microevolution.**
- C. mutation.
- D. natural selection

34. The reproductive success of one organism relative to another is known as....

- A. Sexual reproduction
- B. Darwinian fitness**
- C. Sexual selection
- D. Disruptive selection

35. A population of 1,000 birds exists on a small Pacific island. Some of the birds are yellow, a characteristic that is recessive. The others are green, a characteristic determined by a dominant allele. A hurricane on the island kills most of the birds from this population. Only ten remain, and all of those birds have green feathers. Which of the following statements is accurate? Assume that no new birds come to the island and no mutations have or will occur.

- A) future generations of this population may possibly contain both green and yellow birds.
- B) future generations of this population may possibly contain only green birds.
- C) future generations of this population may possibly contain only yellow birds.
- D) Both A and B are possible.
- E) All are possible.**

36. A population of 1,000 birds exists on a small Pacific island. Some of the birds are yellow, a recessive characteristic. The others are green, a characteristic determined by a dominant allele. A hurricane on the island kills most of the birds from this population. Only ten remain, and those birds all have yellow feathers. Which of the following statements is *true*? Assume that no new birds come to the island and no mutations occur.

- A) future generations of this population may possibly contain both green and yellow birds.
- B) future generations of this population may possibly contain only green birds.
- C) future generations of this population may possibly contain only yellow birds.**
- D) Both A and C are possible.
- E) All are possible.

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37. Apply your understanding of evolution: True or False: An individual who takes the recommended daily dose of antibiotics for a total of 8 days of a 10 day prescription of antibiotics is more likely to encourage the evolution of antibiotic resistance in the pathogenic bacterium than a similarly infected individual who completes 9 days of the 10 day prescription.

A) True

B) False

38. All else being equal, an oak tree with fewer successful matings than another will

A) produce more offspring

B) produce fewer offspring

C) will be more successful at passing copies of its genes to the next generation.

D) both A and C.

E) both B and C.

41. What is the expected frequency of the red-flowered phenotype in the immediate offspring generation following a cross between two parents that are heterozygous for red and white alleles where the white allele is recessive?

A. 0.00

B. 0.25

C. 0.50

D. 0.75

E. 1.00

42. The manatee is an example of a ...

A. Cetacean

B. Pinniped

C. Sirenian

D. Otter

E. Hominid

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43. The sea lion is an example of a....

- A. Cetacean
- B. Pinniped**
- C. Sirenian
- D. Otter
- E. Hominid

44. Which of these has extant species with claws/nails on their hind feet?

- A. Cetacean
- B. Pinniped**
- C. Sirenian
- D. Otter**
- E. Toothed whales.

45. An example of a toothed whale is...

- A. A dugong
- B. A manatee
- C. A bull seal
- D. A dolphin**
- E. A blue whale

46. An example of a baleen whale is...

- A. A dugong
- B. A manatee
- C. A bull seal
- D. A dolphin
- E. A blue whale**

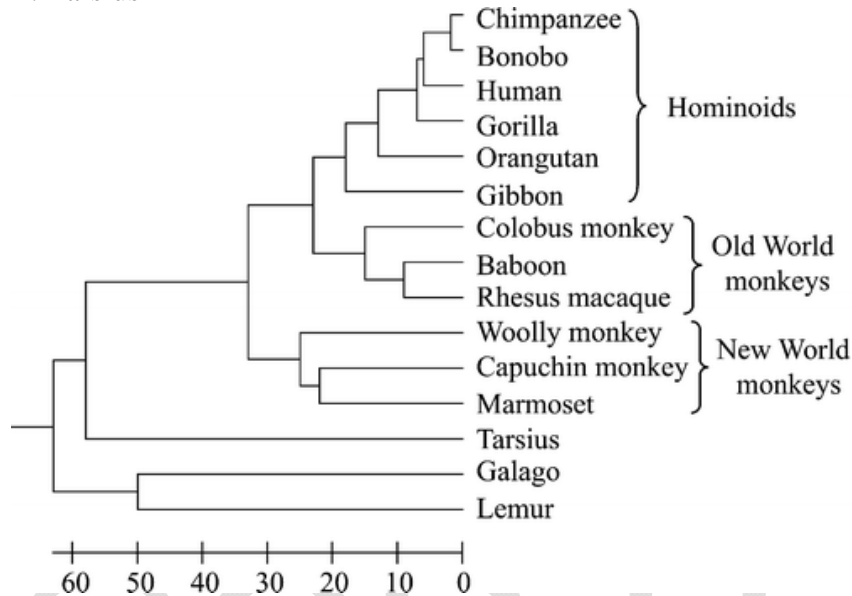
47. A dolphin's closest non-Cetacean relative is a

- A. rabbit
- B. dog
- C. sperm whale
- D. orca
- E. hippo**

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51. Using the cladogram below, who is more closely related to the baboon?

- A. Human
- B. Woolly monkey
- C. Marmoset
- D. Galago
- E. Tarsius



52. Using the cladogram above, who is more closely related to the gibbon?

- A. Human
- B. Woolly monkey
- C. Marmoset
- D. Galago
- E. Tarsius

56. Your somatic cells are...

- A. haploid
- B. pentaploid
- C. tetraploid
- D. diploid
- E. triploid

57. Which of the following decreases the risk of having a Down Syndrome baby more?

- A. An error during meiotic chromosomal segregation in your ovary or testis.
- B. An error during mitotic chromosomal segregation in a mother's uterus cells.

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58. A(n) _____ forms when two atoms share electrons.

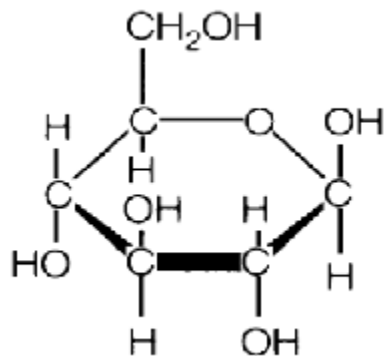
- A) ion
- B) element
- C) covalent bond
- D) ionic bond
- E) hydrogen bond

59. Small insects are able to walk on water because of the cohesion of neighboring water molecules. This cohesion is caused by

- A) Hydrogen bonding.
- B) Ionic bonding.
- C) Covalent bonding.

60. Which type of polymer did the following monomer come from?

- A. DNA
- B. RNA
- C. a polypeptide or protein
- D. starch (a polysaccharide)
- E. a fat (a triglyceride)



61. Cells typically make all of their macromolecules from a set of 40-50 common monomers and a few other rare ingredients via dehydration (or condensation) reactions. Which of the following statements is/are *true* about dehydration reactions?

- A) One monomer loses a hydrogen atom, and the other loses a hydroxyl (-OH) group.
- B) Electrons are shared between atoms of the joined monomers.
- C) H₂O is formed as the monomers are joined.
- D) Covalent bonds are formed between the monomers.
- E) All of the choices are correct.

62. Which type of cell(s) do not have a nucleus?

- A) a eukaryotic cell
- B) a bacterial cell
- C) a prokaryotic cell
- D) both A and B
- E) both B and C

63. Organisms belonging to the plant kingdom

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- A) have cells containing plastids.
- B) have cells with cell walls.
- C) have cells with both plastids and cell walls.
- D) contain chloroplasts and are all unicellular.
- E) lack a nucleus.

64. Osmosis is

- A) The net flow of water across a semi-permeable membrane from low to high water concentration.
- B) The diffusion of any substance across a semi-permeable membrane membrane.
- C) The diffusion of osmium-tetroxide across a membrane.
- D) The diffusion of water across a semi-permeable membrane.
- E) The flow of protons through ATP synthase

65. Most of a cell's enzymes are

- A) RNA molecules.
- B) proteins.
- C) amino acids.
- D) nucleic acids.
- E) carbohydrates.

66. Which pigment makes photosynthesis possible?

- A) Eumelanin
- B) Pheomelanin
- C) Chlorophyll

67. Photosynthesis is a process that naturally takes which of the following greenhouse gasses out of our atmosphere?

- A) O₂
- B) CO₂
- C) CO
- D) CH₄
- E) CO₃

68. Chemiosmosis is

- A. The net flow of water across a membrane from low to high water concentration.
- B. The diffusion of any substance across a membrane.
- C. The diffusion of osmium-tetroxide across a membrane.
- D. The diffusion of water across a membrane.
- E. The flow of protons through ATP synthase

69. Which of the following does not involve H-bonding?

- A. The joining of two amino acids
- B. Secondary structure of proteins
- C. Holding your DNA double helix together
- D. The folding of tRNA
- E. DNA replication

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70. Which of the following does not involve H-bonding?

- A. Transcription
- B. Translation
- C. DNA replication
- D. Water freezing
- E. The formation of H₂ from two separate H atoms.

71. Order the three main sets of reactions in cellular respiration in the order in which energy from glucose is harnessed.

- A) Electron Transport, Glycolysis, Krebs Cycle
- B) Glycolysis, Electron Transport, Krebs Cycle
- C) Citric Acid Cycle, Electron Transport, Glycolysis
- D) Glycolysis, Electron Transport, Citric Acid Cycle
- E) Glycolysis, Krebs Cycle, Electron Transport

72. What is ATP?

- A) Active Transport Protein.
- B) The energy “currency” of the cell.
- C) Adenosine Tri-Phosphate
- D) Both A and B.
- E) Both B and C.

73. Which of the reactions below best depicts aerobic cellular respiration?

- A) $6\text{CO}_2 + 6\text{H}_2\text{O} \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- B) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \Rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
- C) $\text{C}_6\text{H}_{12}\text{O}_6 \Rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
- D) $6\text{CO}_2 + 6\text{O}_2 \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O}$

74. Which atom is the final electron acceptor in the electron transport chain of respiration?

- A) carbon
- B) nitrogen
- C) phosphorus
- D) hydrogen
- E) oxygen

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Appendix 1. The Genetic Code in RNA.

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe	UCU } Ser	UAU } Tyr	UGU } Cys	U C A G
		UUC } Phe	UCC } Ser	UAC } Tyr	UGC } Cys	
		UUA } Leu	UCA } Ser	UAA Stop	UGA Stop	
		UUG } Leu	UCG } Ser	UAG Stop	UGG Trp	
	C	CUU } Leu	CCU } Pro	CAU } His	CGU } Arg	U C A G
		CUC } Leu	CCC } Pro	CAC } His	CGC } Arg	
		CUA } Leu	CCA } Pro	CAA } Gln	CGA } Arg	
		CUG } Leu	CCG } Pro	CAG } Gln	CGG } Arg	
	A	AUU } Ile	ACU } Thr	AAU } Asn	AGU } Ser	U C A G
		AUC } Ile	ACC } Thr	AAC } Asn	AGC } Ser	
		AUA } Ile	ACA } Thr	AAA } Lys	AGA } Arg	
		AUG Met	ACG } Thr	AAG } Lys	AGG } Arg	
	G	GUU } Val	GCU } Ala	GAU } Asp	GGU } Gly	U C A G
		GUC } Val	GCC } Ala	GAC } Asp	GGC } Gly	
		GUA } Val	GCA } Ala	GAA } Glu	GGA } Gly	
		GUG } Val	GCG } Ala	GAG } Glu	GGG } Gly	

Third letter