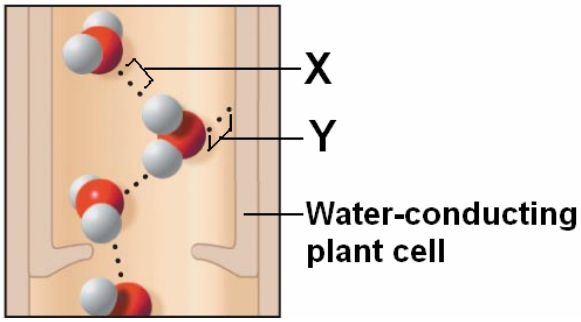
KEY

Department of Biological Sciences
General Biology (304101)
Final Exam

Name:.....
Registration Number.:.....

Multiple Choice Questions: Choose the most appropriate answer and shade the letter corresponding to the correct answer on the computerized answer sheet. Be sure to code in your Registration Number correctly. (0.5 pt each)

Refer to the following figure to answer questions 1-3:



1. Both "X" and "Y" are called……. …bonds.
A. hydrogen B. ionic C. covalent
D. peptide E. ester

2. Bond "X" is involved in ……..……..of water molecules.
A. polarity B. adhesion **C. cohesion**
D. electronegativity E. hydrophobic clinging

3. Bond "Y" is involved in ……..……..of water molecules to the water-conducting plant cell wall.
A. polarity **B. adhesion** C. cohesion D. electronegativity E. hydrophobic clinging

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4. The functional group(s) of glucose is (are)
A. ketone B. aldehyde C. hydroxyl D. both A and B **E. both B and C**

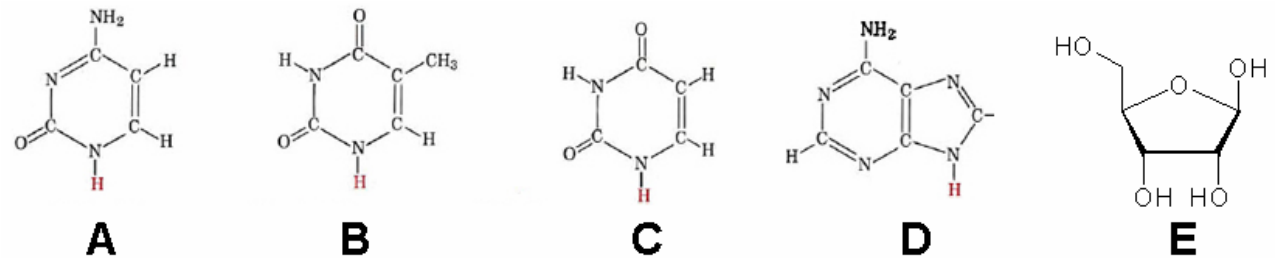
5. Cellulose is
A. storage polysaccharide **B. structural polysaccharide** C. helical polymer
D. soluble in water E. hydrolyzed by human enzymes

6. Lipids share one important trait that they are
A. polymers B. hydrophilic **C. hydrophobic** D. triglycerol
E. formed by condensation (dehydration) reaction

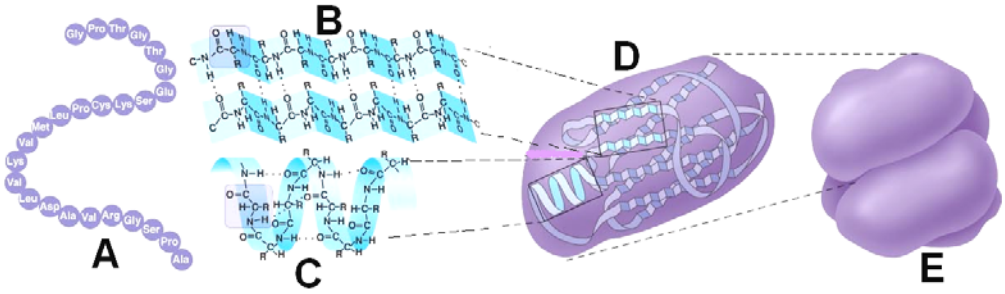
7. All of the following are true about fat EXCEPT
A. energy storage **B. it contains saturated fatty acids only** C. cushions of vital organs
D. it is formed by dehydration reaction E. it insulates the body of marine animals from cold water

8. Which of the following is NOT found in RNA?
A. Uracil B. Guanine **C. Deoxyribose** D. Ribose E. Phosphodiester bonds

9. Which of the following is a purine?



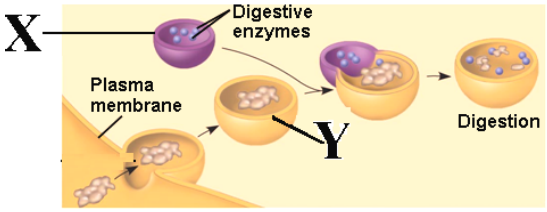
Refer to the following figure to answer questions 10-11:



10. The quaternary structure is represented by letter
A. B. C. D. **E.**

11. The β-pleated sheet is represented by letter
A. **B.** C. D. E.

Refer to the following figure to answer questions 12-14:



12. Organelle "X" is called
A. central vacuole B. food vacuole C. contractile vacuole
D. lysosome E. transport vesicle

13. Organelle "Y" is called
A. central vacuole **B. food vacuole** C. contractile vacuole D. lysosome E. transport vesicle

14. Organelle "Y" is formed by
A. phagocytosis B. pinocytosis C. receptor mediated endocytosis D. exocytosis
E. none of the above

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15. Which cellular organelle functions in detoxification of drugs and poisons?
A. Rough endoplasmic reticulum **B. Smooth endoplasmic reticulum** C. Golgi apparatus
D. Chloroplast E. Mitochondrion

16. Which of the following does NOT leave the nucleus to the cytosol through the nuclear pores?
A. pre-mRNA B. mRNA C. tRNA D. ribosomal subunits E. All of the above

17. Which is FALSE about the plant cell wall? It
A. protects the cell B. maintains cell shape C. **is composed of phospholipid bilayer**
D. prevents excessive uptake of water E. contains cellulose

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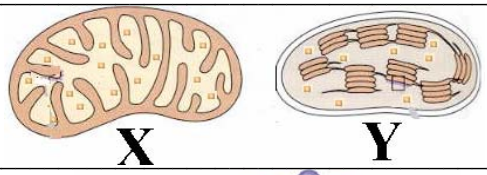
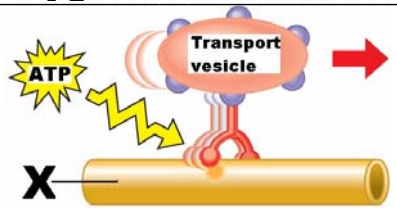
18. Which is common for both "X" and "Y" organelles? Both
A. are bounded by a double membrane B. contain DNA
C. contain ribosomes D. are energy transformers
E. All of the above



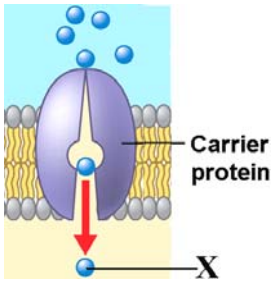
Refer to the following figure to answer questions 19-20:



19. Structure "X" is
A. cellulose fiber B. collagen fiber C. **microtubule**
D. intermediate filament E. any of the above

20. Structure "X" is formed of .....subunits.
A. myosin **B. tubulin** C. keratin D. collagen E. all of the above

Refer to the following figure to answer questions 21-22:



21. Molecule "X" is transported across the membrane
A. down the concentration gradient B. by facilitated diffusion
C. against the concentration gradient D. by active transport
E. both A and B

22. Which is FALSE about the carrier protein for molecule "X"?
A. is synthesized by a bound ribosome B. has hydrophilic and hydrophobic regions
C. is a peripheral protein C. is integral protein E. has a specific binding site for molecule "X"

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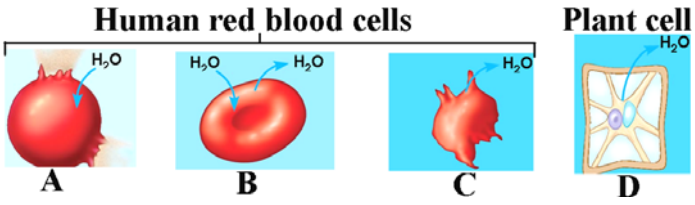
23. In this figure, which cell was placed in a hypertonic solution?
A. B. C. D.
E. both C and D



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24. The Na^+/ K^+ pump requires
A. a gradient of H^+ across the cell membrane B. a peripheral protein C. transport protein D. ATP
E. Both C and D

25. A chemical reaction that has a positive ΔG is described as
A. endergonic B. spontaneous C. enthalpic D. exergonic E. exothermic

26. A substance that is NOT a coenzyme is
A. NADPH B. NAD^+ C. **ATP** D. FAD E. $FADH_2$

27. The active site of an enzyme
A. is the same in all enzymes B. **is the part of the enzyme where the substrate binds**.
C. can be used by an allosteric inhibitor D. is not affected by environmental factors like pH and temperature.
E. Both B and C

28. How can one increase the rate of a chemical reaction?
A. Add a catalyst (enzyme) B. Decrease the concentration of reactants C. Cool the reactants
D. Increase the activation energy needed E. Add a competitive inhibitor

29. Which statement is FALSE about enzyme inhibition?
A. In competitive inhibition, the inhibitor binds to the active site of the enzyme.
B. In noncompetitive inhibition, the inhibitor binds to the allosteric site of the substrate.
C. In irreversible inhibition, a poison binds to the enzyme so that it can never work again.
D. Most inhibitors act in a reversible fashion.
E. both A and C

30. Dehydrogenase transfers .....to NAD^+, forming NADH.
A. 1 electron and 1 H^+ **B. 2 electrons and 1 H^+** C. 1 electron and 2 H^+ D. 2 electrons and 2 H^+
E. any of the above

31. Which of the following molecule(s) is/are used in the energy investment phase of glycolysis?
A. NAD^+ B. ATP C. ADP D. Glucose **E. both B and D**

32. Which of the following is NOT a product of citric acid (Krebs) cycle?
A. CO_2 B. $FADH_2$ **C. NADPH** D.NADH E. ATP

33. Which of the following molecule(s) is/are oxidized during oxidative phosphorylation of cellular respiration?
A. NAD^+ B. NADH C. FAD D. $FADH_2$ **E. both B and D**

34. Glycerol produced from digested fats can enter glycolysis as
A. **glyceraldehyde-3-phosphate** B. phosphoglycerate C. phosphoenolpyruvate
D. pyruvate E. none of the above

35. In lactic acid fermentation, reduction of one pyruvate molecule yields
A. 1 NADH + 1 CO_2 B. 2 ATP + 1 CO_2 C. 1 NADPH + 1 CO_2
D. 1 NAD^+ E. 1 NAD^+ + 1 CO_2

36. The number of ATP and NADPH molecules used to fix three carbon atoms in Calvin cycle is
A. 1 ATP +1 NADPH **B. 9 ATP +6 NADPH** C. 9 ATP + 3 NADPH
D. 3 ATP +2 NADPH E. 18 ATP +12NADPH

37. Which of the following is produced in Calvin cycle
A. pyruvate **B. glyceraldehyde-3-p (G-3-p)** C. ribose D. deoxyribose E. glucose

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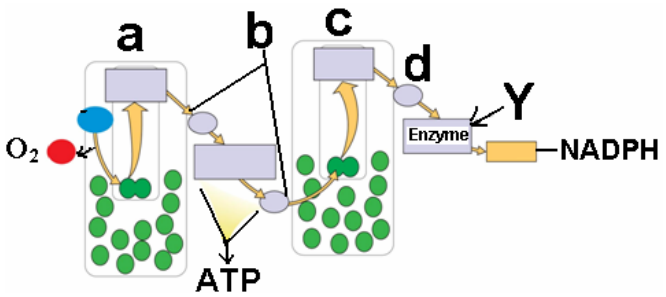
Refer to the following figure to answer questions 38-40:

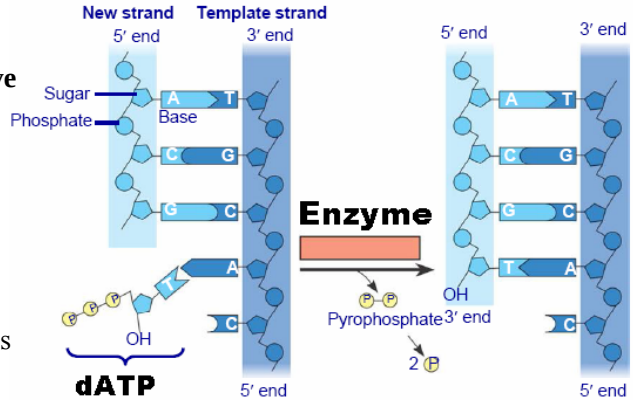


38. Which is FALSE about molecule "Y"?
A. It is $NADP^+$ B. It is a dinucleotide
C. It is reduced by $NADP^+$ reductase
D. It is substrate for RuBP carboxylase (rubisco)
E. It is the final electron acceptor in the light reaction

39. The source of oxygen in this figure is
A. H_2O B. H_2O_2 C. CO_2 D. $C_6H_{12}O_6$ E. NADPH

40. The letter which represents photosystem I (PSI) is
A. a B. b **C. c** D. d E. both a and b

Refer to the following figure to answer questions 41-43:



41. The type of DNA replication shown in this figure is
A. conservative B. nonconservative **C. semiconservative**
D. dispersive E. any of the above

42. The enzyme catalyzing this reaction is called
A. DNA polymerase B. reverse transcriptase
C. RNA polymerase D. helicase E. topoisomerase

43. The structure of deoxy adenosine triphosphate (dATP) used by this enzyme is different from that of ATP produced from glycolysis in the
A. base component B. **sugar component** C. phosphate group
D. both B and C E. all of the above

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44. Who demonstrated that DNA is the genetic material of the T2 phage?
A. Franklin B. Watson and Crick C. Meselson and Stahl D. **Hershey and Chase** E. Chargaff

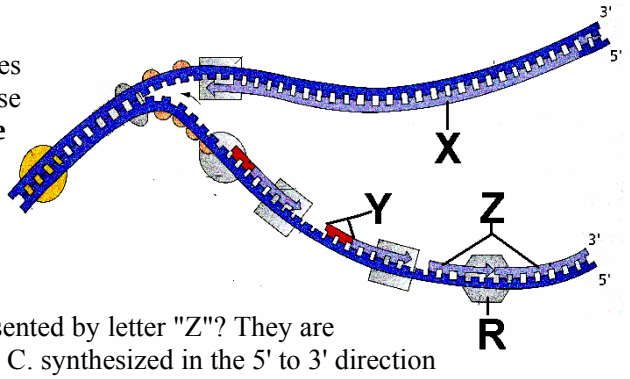
45. All of the following are functions of DNA polymerases **EXCEPT**
A. DNA synthesis **B. primer synthesis** C. DNA proofreading D. DNA repair
E. replacement of RNA primers by DNA

46. Which of the following enzymes is **NOT** involved in nucleotide excision repair?
A. Nuclease B. Ligase **C. Primase** D. DNA polymerase E. Both A and B

Match the terms in Column I with those in Column II to answer questions 47-49:

Column I	**Column II**
.....47. DNA unwinding	A. Origin of replication
.....48. A start point of DNA replication	B. Telomere
.....49. Sequences at the ends of an eukaryotic chromosome	C. Telomerase
	D. Primase
	E. Helicase

Refer to the following figure which represents the DNA replication fork to answer questions 50-52:

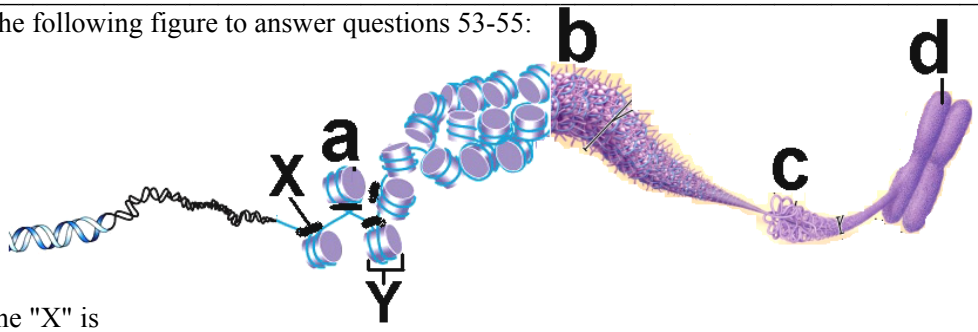


50. Synthesis of the DNA strand represented by letter "X" requires
A. primer B. primase C. DNA polymerase
D. single–strand DNA binding proteins **E. all of the above**

51. The sequence represented by letter "Y" is
A. RNA B. DNA C. snRNA D. telomere
E. Okazaki fragment

52. Which of the following is FALSE about the sequences represented by letter "Z"? They are
A. DNA sequences **B. synthesized by primase** C. synthesized in the 5' to 3' direction
D. joined by ligase (R) E. called Okazaki fragments

Refer to the following figure to answer questions 53-55:



53. Histone "X" is
A. H1 B. H2A C. H2B D. H3 E. H4

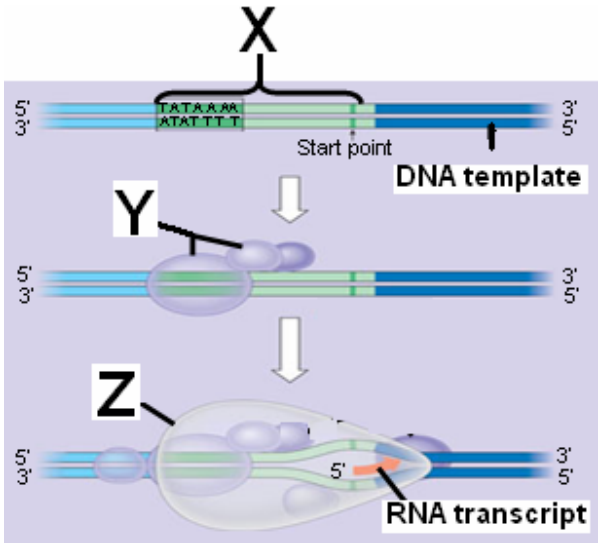
54. Structure "Y"
A. is called nucleosome B. consists of DNA wrapped around histones
C. is maintained by Histone "X" D. diameter is 10 nm **E. all of the above**

55. Which structure contains the most highly packed DNA?
A. a B. b C. c **D. d** E. both b and c

Match items in column I with the most correct ones in column II:

Column I	**Column II**
……56. Beadle and Tatum	A. Discharges empty tRNA
……57. Codons	B. Amino acid attachment site
……58. 3' end of tRNA	C. One gene-one enzyme hypothesis
……59. E site	D. Abnormal protein
……60. Frameshift mutation	E. Triplets of bases

Refer to the following figure to answer questions 61-63:

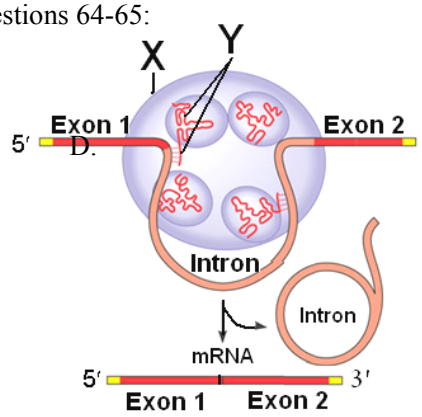


61. Sequence "X" is called
A. promoter B. operator C. operon
D. TATA box E. none of the above

62. Proteins "Y"
A. are transcription factors B. bind the TATA box
C. are required to initiate transcription of eukaryotic genes
D. all of the above E. none of the above

63. Which is FALSE about molecule "Z"?
A. It is called RNA polymerase.
B. It transcribes the DNA template to RNA transcript.
C. It requires a primer for transcription.
D. It synthesizes the RNA transcript from the 5' end to the 3' end.
E. It uses the RNA nucleotides (nucleosides triphosphate) as substrate.

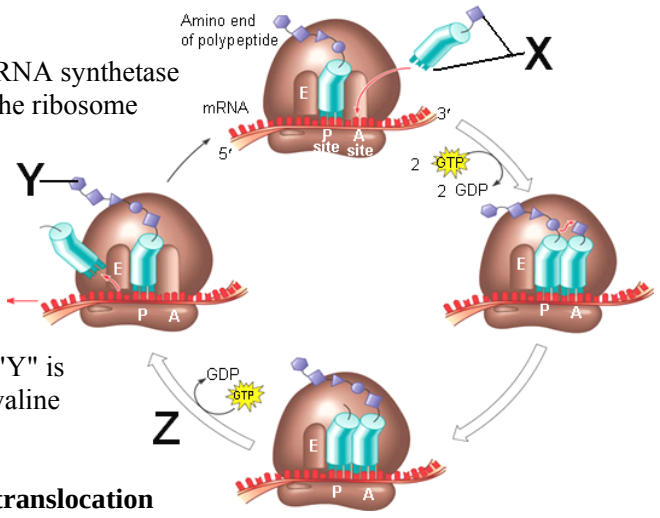
Refer to the following figure which shows the pre-mRNA splicing to answer questions 64-65:



64. What is FALSE about this process? It
A. occurs in the nucleus **B. occurs in the cytosol**
C. is carried out by particle "X" D. involves removing of intron
E. involves joining of exons 1 and 2

65. Molecule "Y"
A. is snRNA B. functions as ribozyme
C. is part of the small nuclear ribonucleoprotein particle (snRNPs).
D. both A and C **E. all of the above**

Refer to the following figure which shows the elongation stage of translation to answer questions 66-70:



66. Molecule "X"
A. is called aminoacyl-tRNA B. is synthesized by aminoacyl-tRNA synthetase
C. anticodon is complementary to the mRNA codon in the "A" site of the ribosome
D. only A and B **E. all of the above**

67. The amino acid sequence of the growing polypeptide "Y" is determined by the sequence of codons on:
A. mRNA B. pre-mRNA C. rRNA D. tRNA
E. any of the above

68. The first amino acid at the N-terminus of the growing polypeptide "Y" is
A. alanine **B. methionine** C. glycine D. cysteine E. valine

69. Stage "Z" represents
A. codon recognition B. peptide bond formation **C. translocation**
D. translation termination E. any of the above

70. Synthesis of the growing polypeptide "Y" is terminated when the
A. ribosome reaches the stop codon on the mRNA. B. release factor sits in the A site of the ribosome
C. initiator tRNA base pair with the complementary codon on the mRNA
D. empty tRNA leaves the ribosome through E site E. **both A and B**

71. The product of gene transcription is
A. mRNA B. tRNA C. rRNA D. snRNA **E. any of the above**

72. The 5' end of the pre-mRNA is modified by the addition of
A. a cap B. 5' UTR C. 3' poly-A tail D. 3' UTR E. a phosphate group

73. What is FALSE about a secretory protein? It
A. synthesis begins on free ribosomes B. is targeted to ER membrane through the signal peptide
C. is processed in the rough ER lumen D. **functions in cytosol** E. is secreted by exocytosis

74. A nonsense mutation results in formation of …….in mRNA and termination of translation.
A- AUG B- CCC **C- UGA** D- CGA E- GAU

75. In sickle-cell disease, the tertiary structure of the β-chain of hemoglobin is abnormal due to……of this subunit.
A. insertion of a base pair in the gene B. insertion of a codon in the mRNA
C. deletion of a base pair in the gene D. deletion of a codon from the mRNA
E. replacement of glutamic acid by valine at position 6

76. Metabolic control could be at the level of
A. enzyme activity B. gene transcription C. cell division **D. both A and B** E. all of the above

77. Which of the following is NOT part of an operon?
A. structural gene B. operator **C. origin of replication** D. promoter E. none of the above

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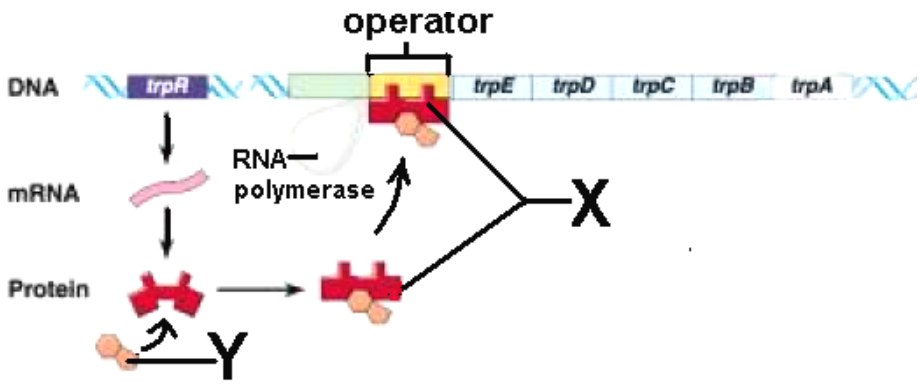
Refer to the following figure to answer questions 78-81:



78. *trpE* gene in this operon is a/an
A. regulatory gene B. **structural gene** C. inducer D. repressor E. corepressor

79. What is FALSE about the genes of this operon?
A. They are split genes B. Controlled by one promoter C. Transcribed by RNA polymerase
D. Transcribed into one mRNA E. Code for functionally related enzymes

80. This operon is switched off because
A. tryptophan is present B. molecule "X" is activated by molecule "Y"
C. molecule "X" binds the operator D. there is no access for RNA polymerase to genes (A-E)
E. all of the above

81. Which of the following is NOT part of this operon?
A. *trpR* gene B. *trpE* gene C. *trpD* gene D. promoter E. operator

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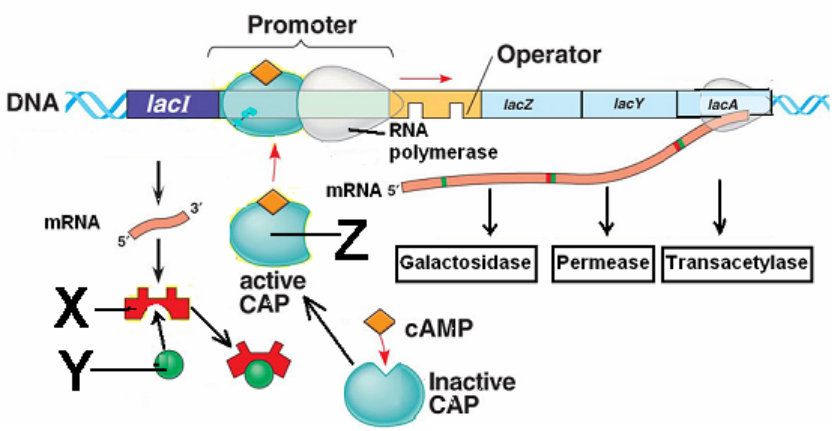
Refer to the following figure to answer questions 82-85:



82. Molecule "X" is a/an
A. operon **B. repressor** C. corepressor D. activator E. inducer

83. Molecule "Y" is
A. repressor B. corepressor **C. allolactose** D. tryptophan E. ATP

84. Which is FALSE about molecule "Z"? It
A. is a regulatory protein B. is activated by cAMP **C. binds the operator to switch the operon off**
D. stimulates binding of RNA polymerase to the promoter E. is involved in positive regulation of this operon

85. The genes of this operon are expressed at high rate in the presence of
A. lactose B. low level of glucose C. high level of cAMP **D. all of the above** E. none of the above

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86. Which is NOT a component of any virus?
A. **cell wall** B. double-stranded (ds) DNA C. single-stranded (ss) DNA
D. double-stranded (ds) RNA E. protein

87. The host range of a virus is determined by the
A. viral and host surface proteins B. type of the nucleic acid (DNA or RNA) of the virus.
C. nutrient components of the host medium. D. enzymes carried by the virus.
E. enzymes in the host cell.

88. The genetic material of HIV is
A. single-stranded DNA **B. single-stranded RNA** C. double-stranded DNA
D. double-stranded RNA E. none of the above

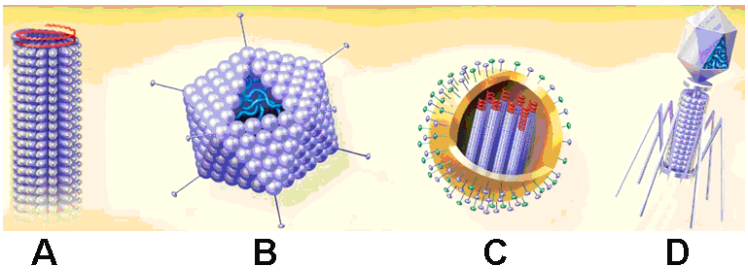
89. What is the source of a viral envelope?
A. host cell DNA B. prophages C. provirus
D. **host cell membrane** E. viral glycoprotein

90. Naked, circular RNA infectious agent is termed a
A. **viroid** B. bacteriophage C. retrovirus D. provirus E. none of the above

91. Prions are
A. misfolded versions of normal brain protein B. defective phages C. bacteriophages
D. tiny molecules of RNA that infect plants E. any of the above

92. Which of the following is a vertical transmission route of plant viruses?
A. Insects B. Pruning shears **C. Infected seeds** D. Wind E. Farmer's tools

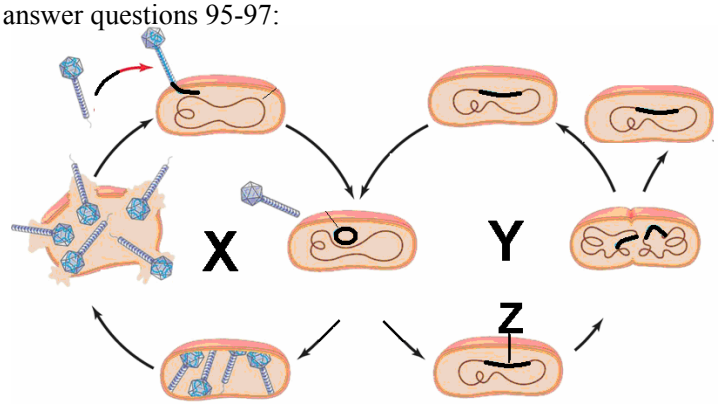
Refer to the following figure to answer questions 93-94:



93. Which of these viruses is enveloped?
A. B. **C.** D. E. both C and D

94. Which of these viruses has/have an icosahedral capsid?
A. B. C. D. **E. both B and C**

Refer to the following figure to answer questions 95-97:

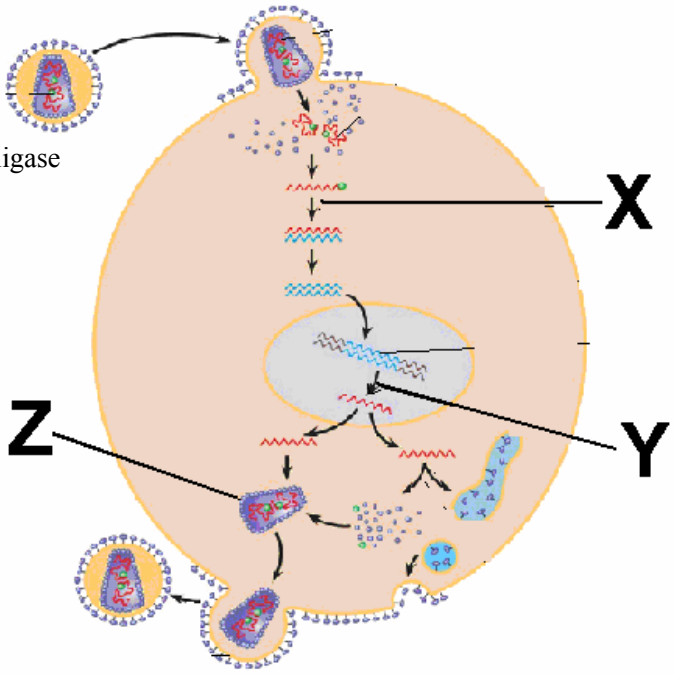


95. Cycle "Y" is the _____ cycle and cycle "X" is the _____ cycle.
A. lytic ..... lysogenic B. lytic ..... phage C. **lysogenic**..... **lytic**
D. lysogenic..... phage E. phage..... lysogenic

96. Letter "Z" represents the
A. host cell DNA B. a capsid C. **a prophage** D. viral fiber E. defective phage

97. As a result of cycle "X",
A. the host cell is not destroyed **B. the host cell's DNA is degraded** C. the viral ribosomes are produced
D. a prophage is synthesized E. viral DNA is inserted in the host cell DNA

Refer to the following figure to answer questions 98-100:



98. Stage "X" in the reproductive cycle of this virus is performed by
A. RNA polymerase B. primase
C. reverse transcriptase D. nuclease E. DNA ligase

99. Stage "Y" in the reproductive cycle of this virus is
A. replication B. **transcription**
C. translation D. lysis E. infection

100. Letter "Z" represents the.....the virus.
A. **capsid** B. envelope C. glycoprotein
D. genome E. reverse transcriptase