



Note: This document is not a complete practice exam. Rather, it is a compilation of questions from the 2012 AP Biology International Exam that support the learning objectives of the redesigned AP course. *Questions that do not support this course have been removed.* This publication may be used to help students prepare for the 2013 AP Biology exam and future exams. Following the last page of the exam, there is an answer key as well as the learning objectives which are supported by each of the questions herein.

AP[®] Biology Practice Exam

From the 2012 Administration

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AP[®] Biology Exam

Monday morning, May 14, 2012

SECTION I: Multiple Choice

2012

I affirm that:

- This exam is being administered on **Monday morning, May 14, 2012**, and will begin between the hours of 8 a.m. and 9 a.m.* If this exam is being offered to me at any other time or any other date, I will refuse to take the exam and will contact the Office of Testing Integrity.
- I will not take this exam booklet from the room or disclose any of the multiple-choice questions to anyone, including my AP teacher.

I understand and accept that my exam score may be canceled if I do not meet these conditions and sign below.

* The administration of this exam in Alaska must begin between 7 a.m. and 8 a.m.

Signature _____ Date _____

Print your full legal name here:

(First) (M.I.) (Last)

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DO NOT seal answer sheet inside

Form I
Form Code 4IBP4-S

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Exam begins on page 4.

BIOLOGY
SECTION I
Time—1 hour and 20 minutes

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then fill in the corresponding circle on the answer sheet.

3. DNA replication occurs
- (A) during the S phase of the cell cycle
 - (B) as the nuclear envelope breaks down in early mitosis
 - (C) during mitosis but not during meiosis
 - (D) in animal cells but not in plant cells
 - (E) only in cells destined to become gametes
8. An allele on the X chromosome is responsible for the recessive trait of red-green color blindness in humans. The daughter of a woman who is color-blind has normal vision and marries a man who is color-blind. This couple has a son, what is the probability that the son will be color-blind?
- (A) 0
 - (B) $1/4$
 - (C) $1/2$
 - (D) $3/4$
 - (E) 1

10. Which of the following depicts the most probable pathway of processing and packaging a secretory protein within a eukaryotic cell?
- (A) Secretory vesicles → rough endoplasmic reticulum → Golgi body → cell membrane
 - (B) Rough endoplasmic reticulum → Golgi body → secretory vesicles → cell membrane
 - (C) Golgi body → secretory vesicles → rough endoplasmic reticulum → cell membrane
 - (D) Secretory vesicles → Golgi body → rough endoplasmic reticulum → cell membrane
 - (E) Golgi body → rough endoplasmic reticulum → secretory vesicles → cell membrane

15. Which of the following best describes the function of the coenzymes NAD^+ and FAD in eukaryotic cellular respiration?
- (A) They participate in hydrolysis reactions by accepting protons from water molecules.
 - (B) They participate directly in the phosphorylation of ADP to ATP.
 - (C) They serve as final electron acceptors in the electron transport chain.
 - (D) They aid vitamins such as niacin in the breakdown of glucose.
 - (E) They accept electrons during oxidation-reduction reactions.
16. A group of people whose ancestors immigrated to North America 200 years ago have certain allele frequencies that differ significantly from those in surrounding populations in the United States. Which of the following is the most likely explanation for the difference in allele frequencies?
- (A) Mutation
 - (B) Independent assortment
 - (C) Reproductive isolation
 - (D) Sex linkage
 - (E) Gametic isolation

38. There is strong evidence that two species of cliff-dwelling birds have nested in the same environment and fed in the same water for thousands of years, with each having stable population sizes. Based on this information, which of the following statements is the best conclusion?
- (A) One species is a better diver than the other species is.
 - (B) The two birds compete for food.
 - (C) One species will displace the other.
 - (D) The two birds have different ecological niches that allow coexistence.
 - (E) One species eats a more diverse diet than the other does.

43. When the dorsal lip of the blastopore is removed from one developing embryo and successfully implanted into a different location in a second embryo of the same species at the same developmental stage, which of the following is the most likely result?
- (A) Two neural tubes form in the second embryo.
 - (B) Both embryos continue to develop normally.
 - (C) The second embryo fails to develop a head.
 - (D) The second embryo splits into two almost immediately.
 - (E) The tissues derived from mesoderm fail to develop in the second embryo.

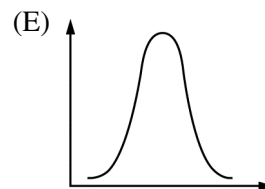
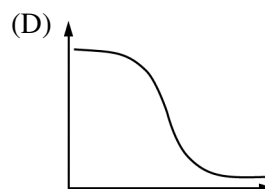
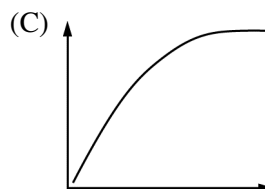
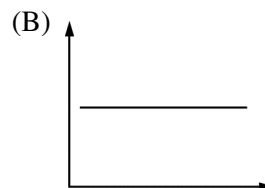
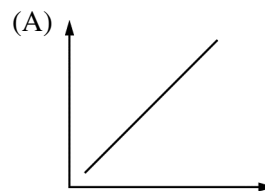
Directions: Each group of questions below consists of five lettered headings followed by a list of numbered phrases or sentences. For each numbered phrase or sentence, select the one heading to which it is most closely related and fill in the corresponding circle on the answer sheet. Each heading may be used once, more than once, or not at all in each group.

Questions 53-56 refer to the following genetic crosses, in which *R* and *T* represent dominant alleles and *r* and *t* represent recessive alleles for two genes that are located on different chromosomes.

- (A) $ttrr \times ttrr$
- (B) $TtRr \times TtRr$
- (C) $TTRr \times TiRR$
- (D) $TtRr \times ttrr$
- (E) $TtRr \times ttRr$

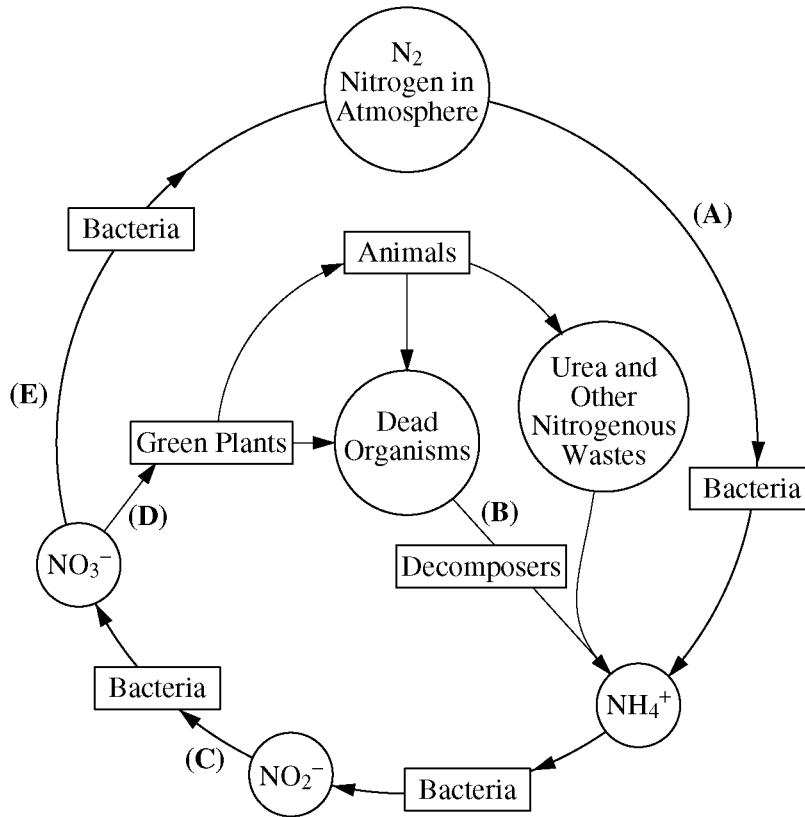
53. Offspring from this cross are expected to exhibit a 1 : 1 : 1 : 1 phenotypic ratio.
54. Offspring from this cross are expected to exhibit a 3 : 3 : 1 : 1 phenotypic ratio.
55. All offspring from this cross are expected to exhibit both dominant traits.
56. This cross is an example of a dihybrid cross in which both parents are heterozygous.

Question 63 refers to the following graphs.



63. Depicts the rate of an enzyme-catalyzed reaction from low substrate concentrations to saturating substrate concentrations

Questions 69-71 refer to the diagram of the nitrogen cycle shown below.



69. Assimilation of nitrate by photosynthetic eukaryotes

70. Nitrogen fixation by prokaryotes

71. Denitrification by anaerobic prokaryotes

Directions: Each group of questions below concerns an experimental or laboratory situation or data. In each case, first study the description of the situation or data. Then choose the one best answer to each question following it and fill in the corresponding circle on the answer sheet.

Questions 72-74

Dialysis tubing is permeable to water molecules but not to sucrose. Four dialysis tubes are half filled with 5 percent, 10 percent, 20 percent, and 40 percent sucrose solutions, respectively, and two dialysis tubes are half filled with distilled water. The dialysis tubes are all sealed at both ends, and the initial masses are determined. Five dialysis tubes are placed into beakers containing distilled water, and the sixth dialysis tube, containing distilled water, is placed into a 40 percent sucrose solution. The masses of the dialysis tubes are recorded at 30-minute intervals for 90 minutes, as shown in the table below.

Dialysis Tube Number	Dialysis Tube Contents	Beaker Contents	Initial Mass	Mass (grams)		
				30 Min	60 Min	90 Min
1	5% Sucrose	Distilled water	12.8	13.3	13.4	13.8
2	10% Sucrose	Distilled water	15.6	16.7	17.0	17.3
3	20% Sucrose	Distilled water	13.7	15.4	16.2	16.5
4	40% Sucrose	Distilled water	13.4	16.3	18.1	19.6
5	Distilled water	Distilled water	11.2	11.2	11.2	11.2
6	Distilled water	40% Sucrose	13.8	10.1	8.3	6.3

72. The contents of which dialysis tube are initially isotonic to the distilled water in the beaker?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

73. A net movement of water into the beaker occurs in which of the following dialysis tubes?

- (A) 2
- (B) 3
- (C) 4
- (D) 5
- (E) 6

74. To model a plant cell, a permeable, nonflexible case is placed around each piece of dialysis tubing. The greatest pressure potential will develop within dialysis tube number

- (A) 2
- (B) 3
- (C) 4
- (D) 5
- (E) 6

Questions 75-77 refer to the following DNA strand and table of codons.

3' TAG TTC AAA CCG CGT AAC ATT 5'

Triplet
Number 1 2 3 4 5 6 7

		Second Letter				
		U	C	A	G	
First Letter (5' End)	U	UUU } phe	UCU } ser	UAU } tyr	UGU } cys	U
		UUC } phe	UCC } ser	UAC } tyr	UGC } cys	C
		UUA } leu	UCA } ser	UAA stop	UGA stop	A
		UUG } leu	UCG } ser	UAG stop	UGG trp	G
	C	CUU } leu	CCU } pro	CAU } his	CGU } arg	U
		CUC } leu	CCC } pro	CAC } his	CGC } arg	C
		CUA } leu	CCA } pro	CAA } gln	CGA } arg	A
		CUG } leu	CCG } pro	CAG } gln	CGG } arg	G
	A	AUU } ile	ACU } thr	AAU } asn	AGU } ser	U
		AUC } ile	ACC } thr	AAC } asn	AGC } ser	C
		AUA } ile	ACA } thr	AAA } lys	AGA } arg	A
		AUG met	ACG } thr	AAG } lys	AGG } arg	G
	G	GUU } val	GCU } ala	GAU } asp	GGU } gly	U
		GUC } val	GCC } ala	GAC } asp	GGC } gly	C
		GUA } val	GCA } ala	GAA } glu	GGA } gly	A
		GUG } val	GCG } ala	GAG } glu	GGG } gly	G
		Third Letter (3' End)				

75. The mRNA transcribed from the DNA would read

- (A) 5' TAG TTC AAA CCG CGT AAC AAT 3'
- (B) 5' ATC AAG TTT GGC GCA TTG TAA 3'
- (C) 5' AUC AAG UUU GGC GCA UUG UAA 3'
- (D) 5' AAU CAA UGC GCC AAA CUU GAU 3'
- (E) 5' AUU GUU ACG CGG UUU GAA CUA 3'

76. Which of the following modifications of the DNA would produce the greatest change in the primary structure of the polypeptide chain?

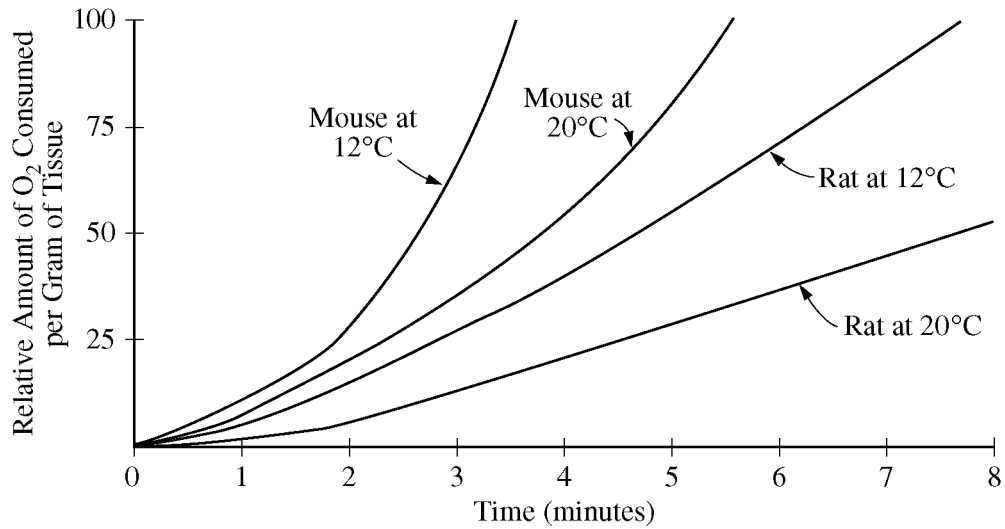
- (A) Deleting the first T in the second triplet
- (B) Changing the second triplet to read 3' CTC 5'
- (C) Changing the third triplet to read 3' AAC 5'
- (D) Changing the fourth triplet to read 3' CCA 5'
- (E) Deleting the sixth triplet

77. In which of the following would there NOT be a change in the amino acid sequence of the peptide coded for by this DNA?

- (A) Changing 3' AAA 5' to read 3' AAG 5'
- (B) Changing 3' TTC 5' to read 3' ATC 5'
- (C) Changing 3' CCG 5' to read 3' GGC 5'
- (D) Deleting the first A from 3' AAA 5'
- (E) Deleting the last triplet

Questions 81-82

A respirometer is a container used to measure the amount of oxygen consumed by an organism. A respirometer was used to determine how environmental temperature affects the uptake of oxygen in one 300-gram rat and one 50-gram mouse. The results of this experiment are shown on the graph below.



81. Which of the following statements best explains why oxygen is taken up more rapidly at 12°C than at 20°C?

- (A) Oxygen is more soluble in blood at lower temperatures.
- (B) At 12°C a higher rate of oxygen consumption is required to maintain a high body temperature.
- (C) In colder temperatures, more heat is lost at the surface of the skin and the heat is replaced by deeper breathing.
- (D) Oxygen is taken up more rapidly because of the greater expansion of the lungs caused by the loss of heat.
- (E) The loss of body heat causes muscles to relax and require more oxygen.

82. Which of the following hypotheses is best supported by the results of this experiment?

- (A) Metabolic rate per gram of tissue is higher in smaller mammals.
- (B) Metabolic rate per gram of tissue is not related to body mass.
- (C) Mice produce less CO_2 per gram of tissue than do rats.
- (D) Rats consume more food per gram of tissue than do mice.
- (E) Rats lose more heat per gram of tissue than do mice.

Questions 84-85

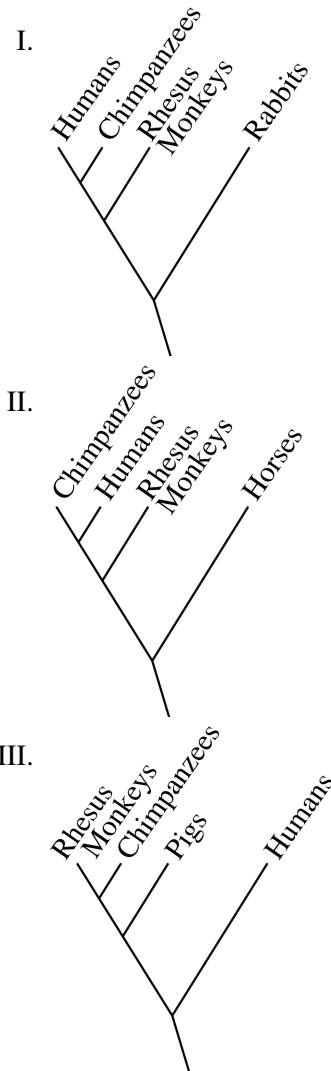
A scientist used the amino acid sequence of cytochrome *c* in different species to consider evolutionary relationships.

The data below summarize the number of differences in the amino acid sequences of cytochrome *c* found in selected species.

Species Compared	Number of Differences
Humans–Chimpanzees	0
Humans–Rhesus monkeys	1
Humans–Horses or donkeys	7
Humans–Cows or pigs or sheep	7
Humans–Rabbits	7
Mammals–Birds and reptiles	10–15
Mammals–Fish	18–20
Animals–Plants	45–48

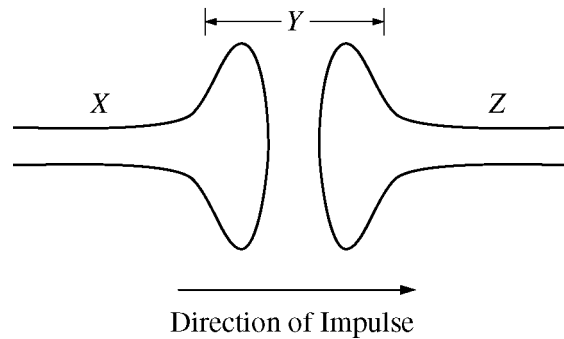
84. Interpretation of the data supports which of the following statements?
- (A) Rhesus monkeys are more closely related to rabbits than they are to horses.
 - (B) Horses and cows have identical amino acid sequences in their cytochrome *c*.
 - (C) Humans are more closely related to rabbits than they are to rhesus monkeys.
 - (D) Plants and animals have no similarities at all.
 - (E) Mammals are more closely related to reptiles than they are to fish.

85. Which of the following phylogenetic trees can be supported by the data?



- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III

Questions 86-87 refer to the diagram below of nerve-impulse transmission.



86. Observation of the direction of the nerve impulse supports the conclusion that fiber *X* is

- (A) an axon
- (B) a dendrite
- (C) an effector
- (D) a ganglion
- (E) a synapse

87. Which of the following statements is true about the neurotransmitter used to transmit the impulse at the synapse?

- (A) It is constantly released by fiber *X*.
- (B) It is constantly released by fiber *Z*.
- (C) It is released by fiber *X* when an impulse travels the length of fiber *X*.
- (D) It is released by fiber *Z* after an impulse travels across *Y*.
- (E) It is passed from fiber *Z* to fiber *X* by way of *Y*.

Questions 91-93

In a study on seed germination of radish seeds, five beakers were set up containing equal numbers of seeds. The beakers were subjected to the conditions indicated in the table below.

	Beaker 1	Beaker 2	Beaker 3	Beaker 4	Beaker 5
Incubation temperature	22°C	22°C	22°C	22°C	5°C
Treatment of radish seeds	None	Boiled	None	None	None
Addition of deoxygenated water	Yes	Yes	No	Yes	Yes
Addition of mineral oil to block oxygen diffusion	No	No	Yes	Yes	No

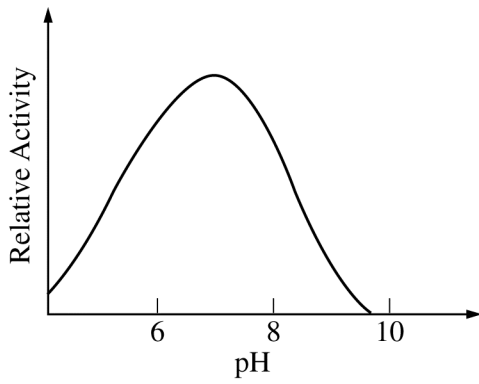
91. The experimental design allows testing of which of the following?
- (A) Only the effect of temperature on germination
 - (B) Only the need for oxygen for germination
 - (C) Only the effect of light on germination
 - (D) The effects of both temperature and oxygen on germination
 - (E) The effects of both temperature and light on germination

92. Germination would be expected to occur first in which beaker?
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
 - (E) 5

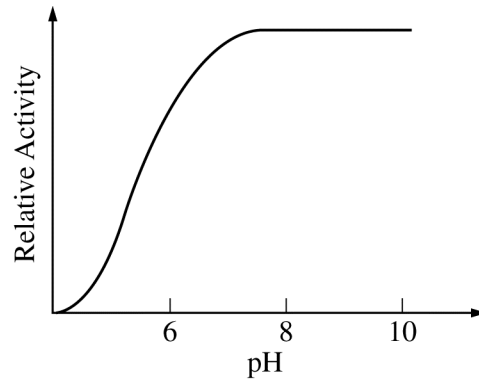
93. Comparing results from which of the following pairs of beakers would help determine if enzymes are necessary for germination?
- (A) 1 and 2
 - (B) 1 and 3
 - (C) 1 and 4
 - (D) 2 and 4
 - (E) 3 and 4

Questions 97, 98 & 100

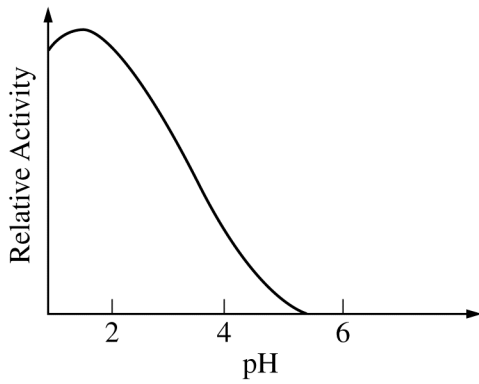
Graphs I-IV depict the effect of pH on the activity of four different hydrolytic enzymes.



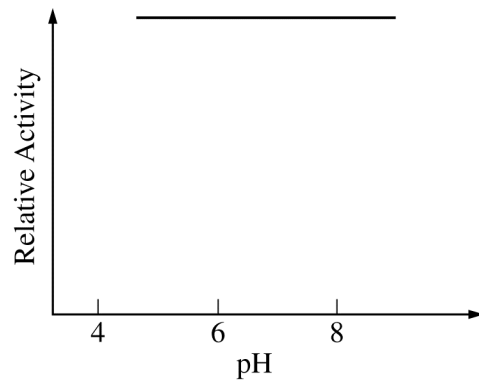
Graph I



Graph II



Graph III



Graph IV

97. Enzymes with their highest activity at an alkaline (basic) pH are represented by which of the following graphs?
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I and III only
 - (E) I and IV only
98. Graphs representing enzymes sensitive to changes in pH include which of the following?
- (A) I only
 - (B) IV only
 - (C) II and III only
 - (D) III and IV only
 - (E) I, II, and III only
100. The most likely explanation for the results shown in Graph I is that
- (A) pH affects the shape of the active site of the enzyme
 - (B) pH affects the temperature of the reaction
 - (C) the enzyme has a quaternary structure
 - (D) the enzyme has disulfide bonds
 - (E) pH affects the primary structure of the enzyme

END OF SECTION I

**IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY
CHECK YOUR WORK ON THIS SECTION.**

DO NOT GO ON TO SECTION II UNTIL YOU ARE TOLD TO DO SO.

MAKE SURE YOU HAVE DONE THE FOLLOWING.

- **PLACED YOUR AP NUMBER LABEL ON YOUR ANSWER SHEET**
- **WRITTEN AND GRIDDED YOUR AP NUMBER CORRECTLY ON YOUR ANSWER SHEET**
- **TAKEN THE AP EXAM LABEL FROM THE FRONT OF THIS BOOKLET AND PLACED IT ON YOUR ANSWER SHEET**

Question No.	Answer	Learning Objective (LO)
3	A	LO 3.8: The student can describe the events that occur in the cell cycle.
8	C	
10	B	LO 4.4: The student is able to make a prediction about the interactions of subcellular organelles.
15	E	
16	C	
38	D	LO 4.19: The student is able to use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and abundance.
43	A	LO 2.31: The student can connect concepts in and across domains to show that timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms.
51	D	LO 3.12: The student is able to construct a representation that connects the process of meiosis to the passage of traits from parent to offspring.
52	B	LO 3.4: The student is able to describe representations and models illustrating how genetic information is translated into polypeptides.
53	D	<p>LO 3.9: The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.</p> <p>LO 3.14: The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets.</p>
54	E	<p>LO 3.9: The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.</p> <p>LO 3.14: The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets.</p>
55	C	<p>LO 3.9: The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.</p> <p>LO 3.14: The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets.</p>

56	B	<p>LO 3.9: The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.</p> <p>LO 3.14: The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets.</p>
63	C	<p>LO 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function.</p>
69	D	<p>LO 2.9: The student is able to represent graphically or model quantitatively the exchange of molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction.</p>
70	A	<p>LO 2.9: The student is able to represent graphically or model quantitatively the exchange of molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction.</p>
71	E	<p>LO 2.9: The student is able to represent graphically or model quantitatively the exchange of molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction.</p>
72	E	
73	E	
74	C	
75	C	<p>LO 3.4: The student is able to describe representations and models illustrating how genetic information is translated into polypeptides.</p>
76	A	<p>LO 3.4: The student is able to describe representations and models illustrating how genetic information is translated into polypeptides.</p>
77	A	<p>LO 3.4: The student is able to describe representations and models illustrating how genetic information is translated into polypeptides.</p>
81	B	
82	A	<p>LO 2.2: The student is able to justify a scientific claim that free energy is required for living systems to maintain organization, to grow or to reproduce, but that multiple strategies exist in different living systems.</p>
84	E	<p>LO 1.9: The student is able to evaluate evidence provided by data from many scientific disciplines that support biological evolution.</p>

85	D	LO 1.18: The student is able to evaluate evidence provided by a data set in conjunction with a phylogenetic tree or a simple cladogram to determine evolutionary history and speciation.
86	A	LO 3.45: The student is able to describe how nervous systems transmit information.
87	C	LO 3.45: The student is able to describe how nervous systems transmit information.
91	D	LO 2.31: The student can connect concepts in and across domains to show that timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms.
92	A	LO 2.32: The student is able to use a graph or diagram to analyze situations or solve problems (quantitatively or qualitatively) that involve timing and coordination of events necessary for normal development in an organism.
93	A	LO 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function.
97	B	LO 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function.
98	E	LO 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function.
100	A	LO 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function.