SBI4U Grade 12 Biology: Final Exam
(100 Marks Total)

Name:_____

Signature:_____

Marks obtained:

Category	Total Marks	Possible Marks
Knowledge/Understanding (K/U)		**20**
Thinking/Investigation (T/I)		**30**
Application (A)		**20**
Communication (C)		**30**
Total		**100**
Percentage		

SECTION 1: Knowledge/Understanding - Multiple Choice (Questions 1-10)

[K/U, 10: 1 each]

Write your section 1 answers here:

Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Answer										
Question	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Answer										

K/U	T/I	A	C
/20			

****NOTE: FOR SECTIONS 1 WRITE YOUR ANSWERS IN THE TABLES ON THE FIRST PAGE OF THIS TEST****

SECTION 1: Knowledge/Understanding - Multiple Choice (Questions 1-10)

[K/U, 10: 1 each]

1. Which three of the following are characteristics of hydrogen bonds?

I. They are responsible for the surface tension properties of water.
II. They are responsible for the relatively high boiling point of water.
III. They are stronger than ionic bonds.
IV. They are present in all substances.
V. They are weaker than covalent bonds.

a) III, IV and V
b) II, III and IV
c) I, II and V
d) I, III, and IV
e) I, III and IV

2. Of the following, which is not considered to by a polymer?

a) cellulose
b) protein
c) RNA
d) fat
e) starch

3. The shape of an enzyme's active site is complimentary to that of:

a) its substrate
b) the product formed in the reaction
c) the enzyme's primary structure
d) a quaternary protein structure
e) the substrate's primary structure

4. Aerobic respiration involves which one of the following?

a) the input of energy into cells without sufficient oxygen
b) the release of energy in cells without sufficient oxygen
c) the sequence of events in fermentation
d) breathing very rapidly, getting too much oxygen into the blood
e) the release of energy in cells with an adequate supply of oxygen

5. What are the products of one molecule of glucose that has undergone **glycolysis**?

a) Two molecules of pyruvate in the cytoplasm
b) Two molecules of pyruvate, two molecules of NADH and two molecules of ATP in the cytoplasm.
c) Two molecules of pyruvate in the mitochondrion and two molecules of water in the cytoplasm.
d) One molecule of pyruvate in the mitochondrion and one molecule of water in the cytoplasm.
e) None of the above

6. Where in the electron transport chain does the energy come from for the synthesis of ATP?

a) the combination of hydrogen ions, electrons, and oxygen to form water
b) the breakdown of water
c) the cytochromes
d) an electrochemical gradient across the inner mitochondrial membrane
e) none of the above

7. The percentage composition of a nucleic acid molecule found in bacterial cells is 32.3% adenine 30.7% thymine 19.1% cytosine 17.9% guanine The molecule is most likely to be

a) double-stranded DNA.
b) double-stranded RNA.
c) mitochondrial DNA.
d) single-stranded DNA.
e) messenger RNA.

8. The enzyme which unwinds the double helix by disrupting hydrogen bonds is:

a) gyrase
b) ligase
c) helicase
d) exonuclease
e) none of the above

9. What happens during capping and tailing?

a) a methyl 5' tail and a 3' poly A cap are added
b) a methyl 3' tail and a 5' poly A cap are added
c) a methyl 5' cap and a 3' poly A tail are added
d) a methyl 3' cap and a 5' poly A tail are added
e) none of the above

10. DNA acts as a template for transcription. Which of the following statements regarding the DNA of a gene being expressed is true?

a) After unwinding, both of the DNA strands act as templates.
b) After unwinding, only one of the DNA strands acts as a template.
c) The two strands only act as a template when paired.
d) In prokaryotes, the binding of RNA polymerase to unwound DNA occurs randomly on either of the two strands.
e) The strand with the higher cytosine-guanine content acts as the template.

11. Gel electrophoresis separates fragments of DNA using

a) a sieving medium through which DNA fragments are moved by gravitational forces
b) repulsion of charged DNA molecules by the electrically charged gel beads
c) a sieving medium through which DNA molecules are moved by electrical forces
d) movement through a sieving medium by positively charged DNA molecules attracted by a negative pole
e) movement of DNA fragments of different sizes at different speeds as a result of ultracentrifugation

12. What is the best order of the following steps in translation?

i) tRNA delivers an amino acid to the A site
ii) the mRNA joins the ribosome
iii) a peptide bond is formed
iv) the tRNA that was in the A site moves to the P site

a) iii, iv, ii, i
b) i, iii, iv, ii
c) ii, iii, iv, i
d) ii, iv, i, iii
e) none of the above

13. The coordination of motor activities in mammals is carried out by which of the following?

a) pons
b) medulla
c) cerebellum
d) hypothalamus
e) cerebrum

14. All of the following statements about hormones are correct **EXCEPT**:
- a) They are produced by endocrine glands
- b) They travel to different areas of the body
- c) They are carried by the circulatory system
- d) They are used to communicate between different organisms
- e) None of the above

15. Part that carry nerve impulses away from the cell body are called
- a) cell bodies
- b) axon
- c) dendrites
- d) Schwann Cells
- e) pyramid cells

16. The portion of the nervous system that is considered involuntary is the _____ system.
- a) somatic
- b) sensory
- c) autonomic
- d) peripheral
- e) default

17. In the sequence of changes that depolarizes and then repolarizes the membrane of a neuron during an action potential, which of the following changes occurs first?
- a) Sodium channels open
- b) The Na^+ - K^+ pump shuts down
- c) Potassium gates close
- d) Potassium gates open
- e) None of the above

18. Which of the population dispersion patterns is most often found in natural populations?
- a) uniform dispersion
- b) clumped dispersion
- c) random dispersion
- d) all of these patterns are equally common
- e) none of the above

19. The number of organisms of the same species living within the total area of their entire habitat is best known as which of the following?

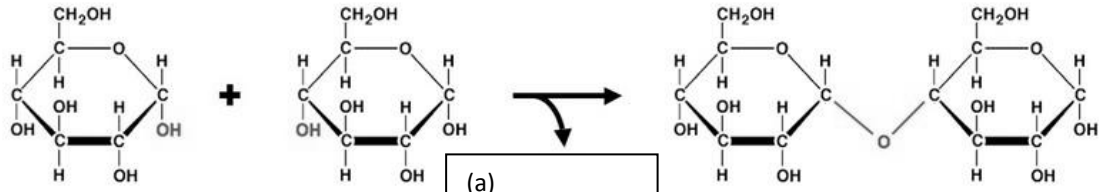
a) population size
b) population dynamics
c) ecological density
d) crude density
e) none of the above

20. The population dispersion pattern in which organisms are spread throughout their habitat in an unpredictable manner is known as which of the following?

a) clumped
b) patterned
c) uniform
d) ecological
e) random

SECTION 2: Application - Labeling (Questions 21-22) *[Total: A, 10]*

21. Label the reaction below by writing the name of the reaction on the line and the missing product in the box. *[A, 2]*



Type of Reaction:

(b)

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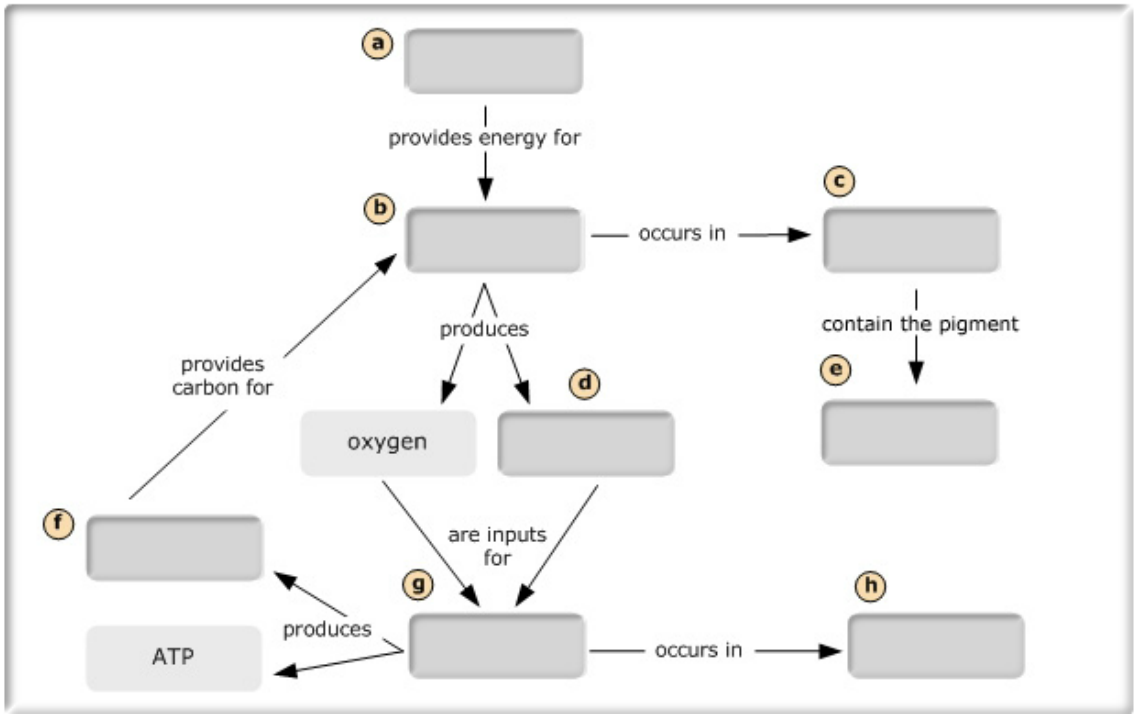
22. Label the following diagram with the words provided: *[A, 8]*

carbon dioxide
mitochondria
photosynthesis
chlorophyll
chloroplasts
sunlight
ribosomes
cellular respiration
central vacuole
sugar



Label (letter)	Word	Label (letter)	Word
(a)		**(e)**	
(b)		**(f)**	
(c)		**(g)**	
(d)		**(h)**	

K/U	T/I	A	C
		/10	

SECTION 3: Thinking/Inquiry & Application – Short Answer (Questions 23-)

[T/I, 20; A, 10]

23. Contrast how hydrogen bonds and covalent bonds contribute to the function of molecules in different cellular processes (i.e. transcription/translation, cellular respiration, photosynthesis, etc.) *[A, 5]*

24. Compare the electron transport chain in cell respiration to the light reactions of photosynthesis. *[A, 5]*

K/U	T/I	A	C
		/10	

25. Local anesthetics used by dentists to deaden pain block work on Na+ channels. How does this work and why is this effective? *[T/I, 5]*

26. One of the themes in this course has been that events in organisms are highly regulated. One regulatory mechanism that you have learned about is negative feedback.

a) Describe how a typical negative feedback mechanism works and describe a specific feedback loop of your choice.

b) In your examples be sure to describe how the feedback work loops and what is being controlled. Conclude by discussing the advantages of feedback loops. *[T/I, 5]*

K/U	T/I	A	C
	/10		

27. In a river in Ontario, 270 Atlantic salmon were captured and fin-marked with a numbered anchor tag. Two weeks later, a total of 112 Atlantic salmon were recaptured, and 11 carried the T-bar anchor tags. Estimate the Atlantic salmon population in this river during this study. (Show all your work) *[T/I, 5]*

28. A paramecium is a single celled organism that lives in freshwater. If the cytoplasm of the paramecium is composed mainly of saltwater, what challenges does the paramecium face in this environment? Use terms appropriate to cell transport to get full marks. *[T/I, 5]*

K/U	T/I	A	C
	/10		

SECTION 4: Communication – Short Answer (Question 29) *[C, 20]*

29. Using the unaltered strand of DNA below, show how a frameshift mutation could cause a change in the structure of a protein by taking a mutated strand of DNA through protein synthesis *(5 points)*. Use a diagram in your explanation *(5 points)* *[C, 10]*

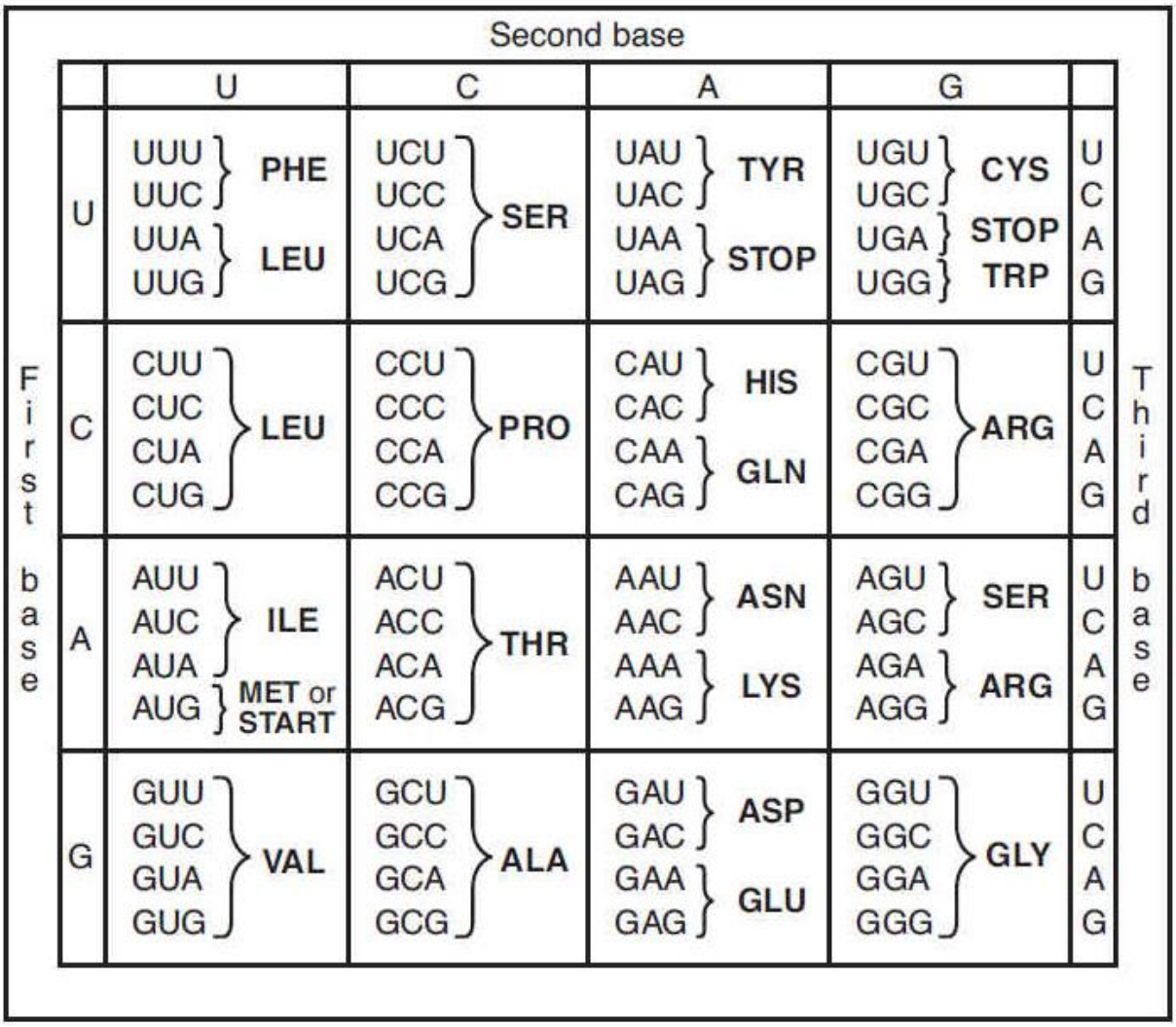
3' TACGAACTTCGGTCCATT 5'

30. Choose any organ system in the body and describe a disorder or illness that could affect its function and describe the kind of drug you would design to combat the illness. *[Total: C, 10]*

a) Clearly identify the organs within the organ system with a diagram. *[C, 3]*
b) State the cause and symptoms of the disorder or illness. *[C, 3]*
c) Describe how a drug could combat the illness. *[C, 4]*

K/U	T/I	A	C
			/20

Reference Resources:



First base	Second base: U	Second base: C	Second base: A	Second base: G	Third base
U	UUU, UUC: PHE UUA, UUG: LEU	UCU, UCC, UCA, UCG: SER	UAU, UAC: TYR UAA, UAG: STOP	UGU, UGC: CYS UGA: STOP UGG: TRP	U C A G
C	CUU, CUC, CUA, CUG: LEU	CCU, CCC, CCA, CCG: PRO	CAU, CAC: HIS CAA, CAG: GLN	CGU, CGC, CGA, CGG: ARG	U C A G
A	AUU, AUC, AUA: ILE AUG: MET or START	ACU, ACC, ACA, ACG: THR	AAU, AAC: ASN AAA, AAG: LYS	AGU, AGC: SER AGA, AGG: ARG	U C A G
G	GUU, GUC, GUA, GUG: VAL	GCU, GCC, GCA, GCG: ALA	GAU, GAC: ASP GAA, GAG: GLU	GGU, GGC, GGA, GGG: GLY	U C A G