

# BS20001: Spring2022 MCQ test

1

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2

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3

Carbonic anhydrase exhibits typical enzyme kinetics expected of similar enzymes. Which of the following is the quantity described by the value  $K_M$ ?  
(1 Point)

- ☐ The time it takes to reach half maximum reaction rate under standard conditions.
- ☒ The substrate concentration necessary to achieve half maximum reaction rate.
- ☐ The enzyme concentration necessary to achieve half maximum reaction rate.
- ☐ The half maximum reaction rate with enzyme catalysis.

4

5' GCTGTGAATTCAGT 3'  
3' CGACACTTAAGTCA 5'

If the recognition sequence of a restriction enzyme is GAATTC, then how many covalent bonds will be broken by the enzyme in the following DNA molecule?  
(1 Point)

- ☐ 2
- ☒ 4
- ☐ 1
- ☐ 0

5

Which of the following statement is TRUE for prokaryotes?  
(1 Point)

- ☐ Transcription produces only monocistronic mRNA
- ☒ Transcription and translation are coupled process
- ☐ Transcription and translation are not coupled process
- ☐ Transcription and translation occur in separate compartments

6

In alpha helix and beta sheets, the hydrogen bonds are  
(1 Point)

- ☐ perpendicular to the helical axis and parallel to the beta strands.
- ☐ parallel to the helical axis and parallel to the beta strands.
- ☐ perpendicular to the helical axis and perpendicular to the beta strands.
- ☒ parallel to the helical axis and perpendicular to the beta strands.

7

Which of the following is correct for a competitive inhibitor?  
(1 Point)

- ☐ The  $V_{max}$  remains unchanged.
- ☐ The  $K_m$  equals the substrate concentration at  $V_{max}/2$ .
- ☒ All of the above.
- ☐ The substrate and the inhibitor bind at the same site.

8

The function of the sigma factor of RNA polymerase is to  
(1 Point)

- ☐ assure that translation ends at the proper point
- ☒ assure that transcription begins at the proper point
- ☐ assure that translation begins at the proper point
- ☐ assure that transcription ends at the proper point

9

A BTech student has discovered a new restriction enzyme during her final year project. Which of the following sequences can be a probable cut site of the enzyme?

(1 Point)

- ☐ ATGATG
- ☒ ATGCAT
- ☐ AAAAAA
- ☐ ATGGTA

10

Which of the following is TRUE for a competitive inhibitor?

(1 Point)

- ☐  $V_{max}$  remains same,  $K_M$  decreases
- ☒  $V_{max}$  remains same,  $K_M$  increases
- ☐  $V_{max}$  decreases,  $K_M$  remains same
- ☐  $V_{max}$  decreases,  $K_M$  decreases

11

To overcome an energy barrier between reactants and products, energy must be provided to get the reaction started. This energy is called:

(1 Point)

- ☐ Kinetic energy
- ☐ Potential energy

☒ Activation energy

☐ Reaction energy

12

Which of the following can act as enzymes?  
(1 Point)

☒ proteins and RNA

☐ proteins, RNA and DNA

☐ proteins and DNA

☐ RNA and DNA

13

Enzymes catalyze reactions by  
(1 Point)

☐ lowering the energy of the reaction intermediate

☐ lowering the energy of the product

☒ lowering the energy of the transition state

☐ lowering the energy of the substrate

14

Identical twins are  
(1 Point)

☐ the result of embryo splitting at the early stage of pregnancy.

- ☐ the result of fertilization of single egg that splits in two.
- ☐ always of same sex.
- ☒ all of these.

15

Which of the following polymerases DOES NOT require a template sequence?  
(1 Point)

- ☐ Taq polymerase
- ☐ RNA polymerase
- ☒ Poly-A polymerase
- ☐ DNA polymerase

16

[S] mM	$V_o$ ( $\mu\text{mol} \cdot \text{min}^{-1}$ )
$8 \times 10^{-6}$	80
$2 \times 10^{-5}$	140
$8 \times 10^{-5}$	224
$4 \times 10^{-3}$	277
$2 \times 10^{-2}$	280
$1 \times 10^{-1}$	279

The data in the table below were collected for an enzyme catalyzed reaction.  
The  $K_m$  for this enzyme is approximately  
(1 Point)

- ☐  $8 \times 10^{-5} \text{ mM}$

- ☒  $0.8 \times 10^{-5} \text{ mM}$
- ☐  $2 \times 10^{-5} \text{ mM}$
- ☐  $2 \times 10^{-2} \text{ mM}$

17

Which of the following order is correct for the folding of haemoglobin in the red blood cells?

(1 Point)

- ☐ domain then quaternary structure then alpha helix
- ☐ domain then alpha helix then quaternary structure
- ☒ alpha helix then domain then quaternary structure
- ☐ alpha helix then quaternary structure then domain

18

Which of the following CAN NOT be close (adjacent) in primary structure

(1 Point)

- ☐ parallel  $\beta$ -strands
- ☒ an  $\alpha$ -helix and a  $\beta$ -strand
- ☐ two  $\alpha$ -helices
- ☐ anti-parallel  $\beta$ -strands

19

An enzyme enhances the rate of a reaction by  $10^{12}$  fold at 25 degree C. What is the energetic stabilization of the transition state by this enzyme?  $R = 8.314 \text{ J/mol}\cdot\text{K}$   
(1 Point)

- ☒ 68 kJ/mol
- ☐ 5.7 kJ/mol
- ☐ 30 kJ/mol
- ☐ 2.5 kJ/mol

20

Which of the following illustrates the difference between DNA and RNA?  
(1 Point)

- ☐ DNA can store genetic information but RNA cannot.
- ☒ DNA and RNA differ in one pyrimidine base.
- ☐ DNA and RNA differ in the phosphodiester linkage.
- ☐ All of the above.

21

The overall conclusion of the Griffith's experiment was that  
(1 Point)

- ☐ proteins and DNA both are genetic material
- ☐ the ratio of Adenine to thymine was always the same



- ☐ Phage DNA was similar to bacterial DNA
- ☒ DNA is the genetic material

22

Which of the following is TRUE for a competitive inhibitor?  
(1 Point)

- ☐ Competitive inhibitor and the substrate bind to active site of the enzyme together
- ☐ All of these statements are FALSE
- ☐ Substrate binds to active site whereas competitive inhibitor binds to a different site
- ☒ Competitive inhibitor and substrate can bind to active site but not together

23

In an enzyme catalyzed reaction, if the transition state has lower free energy than that of the products, what will be the outcome of the reaction?  
(1 Point)

- ☒ Enzyme catalyzed reaction will be faster than uncatalyzed reaction.
- ☐ Enzyme will catalyze product formation but they will remain bound to the enzyme.
- ☐ Reaction will not proceed beyond enzyme-substrate complex formation.
- ☐ Enzyme will not bind to substrate.

24

Why is it important to understand how proteins fold?  
(1 Point)

☐

- ☐ Function of a protein depends on its three-dimensional fold.
- ☒ All of these.
- ☐ Understanding protein folding will enable us to design new proteins with desired functions.
- ☐ Protein misfolding leads to several diseases.

25

What are the assumptions in Michaelis-Menten kinetics?  
(1 Point)

- ☒ All of the above
- ☐ The concentration of the substrate is much greater than the concentration of the product.
- ☐ The enzyme-substrate complex forms and breaks at the same rate.
- ☐ The initial velocity is independent of the enzyme concentration.

26

For an efficient enzyme, what relative values of  $K_M$  and  $k_{cat}$  are correct?  
(1 Point)

- ☒ Low  $K_M$  and high  $k_{cat}$
- ☐ High  $K_M$  and low  $k_{cat}$
- ☐ High  $K_M$  and high  $k_{cat}$
- ☐ Low  $K_M$  and low  $k_{cat}$

Why is BT Cotton called so?  
(1 Point)

- ☐ It is a product of British Bio-Tech corporation
- ☐ It is Bio-Technologically produced
- ☒ It carries a gene from a Bacillus sp of Bacteria
- ☐ It carries a gene from a Boletus sp of Fungus

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