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**BCH2333**

**Final Exam-AID  
Review Package**

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# REVIEW FOR FINAL EXAM

1) The length of the bonds from shortest to longest

- a) C-C, C-H, C-I, hydrogen bond
- b) C-H, C-C, C-I, hydrogen bond -> correct
- c) C-H, C-C, hydrogen bond, C-I
- d) C-C, hydrogen bond, C-H, C-I

2) The force between two molecules is

- a) Related to radius
- b) Related to dielectric constant
- c) Inversely related to radius
- d) Inversely related to dielectric constant -> correct

$$\text{Note: } F = \frac{kq_1q_2}{r^2}$$

3) How does the osmotic pressure across a cell vary from 10°C to 20°C?

- a) Increases by 2x
- b) Decreases by 2x
- c) Increases by less than 2x -> correct
- d) More information is needed

$$\text{Note: } \pi = CRT$$

where T is in KELVIN

4) What is the ratio of OH<sup>-</sup> to H<sup>+</sup> at pH 5?

- a) 1/10,000 -> correct
- b) 1/100,000
- c) 1/1,000,000
- d) 1/10,000,000

$$\begin{aligned} \text{pH} &= -\log [\text{H}^+] \\ 5 &= -\log [\text{H}^+] \\ [\text{H}^+] &= 10^{-5} \end{aligned}$$

$$\begin{aligned} \text{pOH} &= 14 - \text{pH} \\ \text{pOH} &= 9 \\ \text{pOH} &= -\log [\text{OH}^-] \\ 9 &= -\log [\text{OH}^-] \\ [\text{OH}^-] &= 10^{-9} \end{aligned}$$

$$\begin{aligned} \frac{[\text{OH}^-]}{[\text{H}^+]} &= \frac{10^{-9}}{10^{-5}} \\ &= \frac{1}{10,000} \end{aligned}$$

5) You have 1L of water to which you add 60mM of weak acid which has a pK of 7. To this solution 10mM of H<sup>+</sup> is added. What is the new pH?

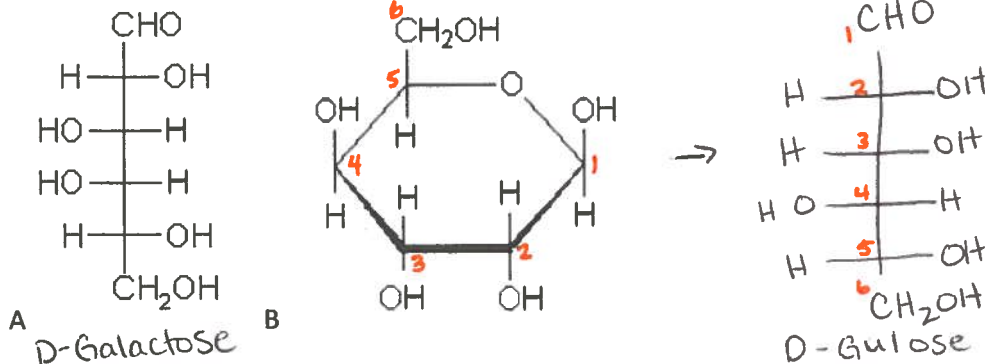
- a) 6.7 -> correct
- b) 5.5
- c) 3
- d) 2

$$\text{pH} = \text{pK} + \log \frac{[\text{Z}^-]}{[\text{HZ}]}$$

	$[\text{HZ}]$	$[\text{Z}^-]$
initial	30mM	30mM
change	30mM + 10mM	30mM - 10mM
final	40mM	20mM

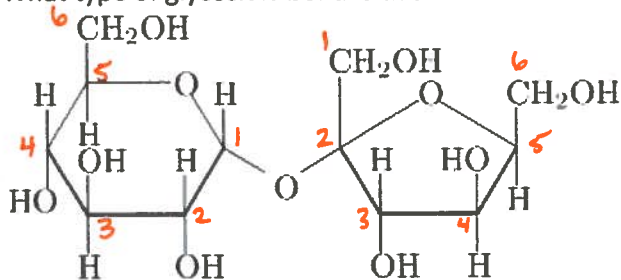
$$\begin{aligned} \text{pH} &= 7 + \log \left( \frac{20\text{mM}}{40\text{mM}} \right) \\ &= 6.7. \end{aligned}$$

6) Use these sugars to answer the following True or False questions



- A and B are diastereoisomers (T)
- A and B are epimers (T) at Carbon 3
- A and B are enantiomers (F)
- A and B are geometric isomers (F)
- Carbon 6 on sugar A is prochiral (T)
- A and B make a racemic mixture (F)
- Carbon 3 on sugar B is L configuration (F)
- Sugar A is glucose (F)
- Sugar B is galactose (F)
- Sugar A is an L-sugar (F)
- Sugar A is a hemi-ketal (F)
- Sugar B is an alpha (F)
- Sugar B is a furanose (F)
- Sugar B is a hemi-acetal (T)
- Sugar B is a pentose (F)
- Both A and B will react positively with Fehling's test (T)

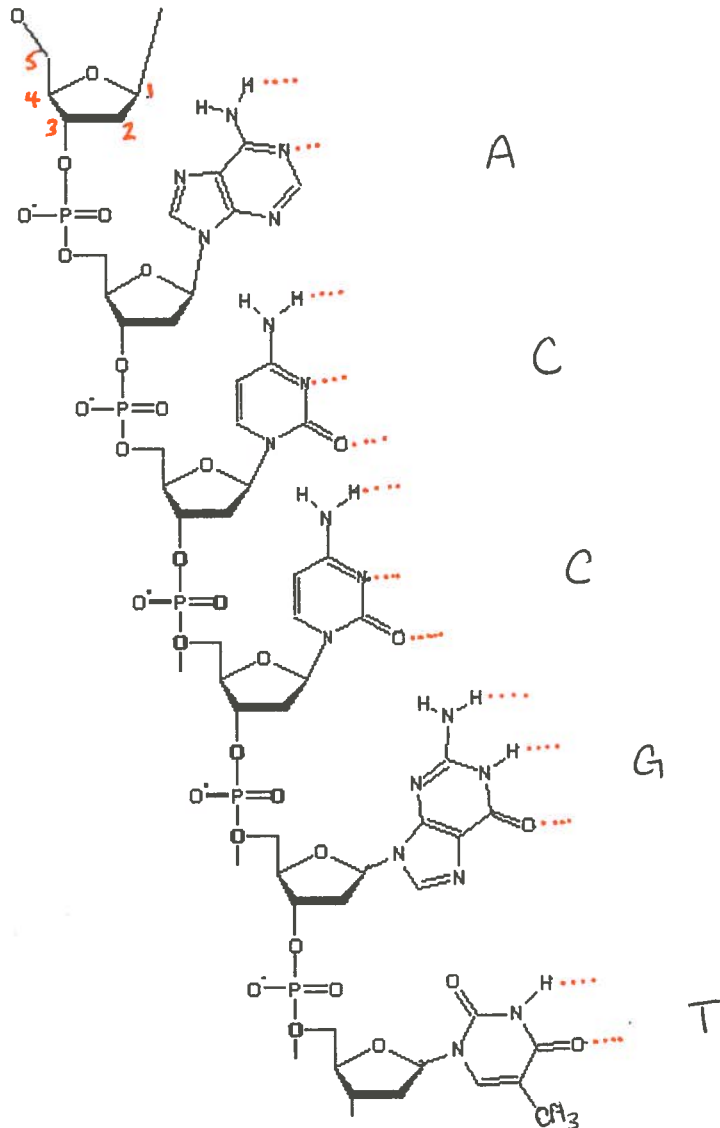
7) What type of glycosidic bond is this?



- Alpha 1-4
- Alpha 1-2
- Beta 1-2
- Alpha-1, beta-2-> correct
- Beta-1, alpha-4

d

8) Answer True or False for this strand of nucleic acids



- This is a strand of RNA (F)
- The top end is the 5' end (T)
- The third residue is a cytosine (T)
- The fifth residue is a uracil (F)
- The first residue is a thymine (F)
- The second residue makes 3 hydrogen bonds with its paired nucleic acid (T)
- The forth residue is a pyrimidine (F)
- The sugar is an L sugar (F)
- The sugar is deoxyribose (T)
- The sugar is an alpha (F)
- This structure contains a 3'-1' phosphodiester bond (F)

9) The Z DNA has

- a) ☒ Right handed helix -> correct
- b) One groove
- c) 11 base pairs per turn
- d) Larger diameter than Watson Crick
- e) Smaller length per base pair than Watson Crick

10) Chromatin are composed of all except

- a) DNA
- b) Histones
- c) ☒ tRNA -> correct
- d) RNAi
- e) Regulatory proteins

11) Histones are composed of very high amounts of

- a) Histamine
- b) ☒ Lysine -> correct
- c) Aspartic acid
- d) Proline
- e) Glycine

12) mRNA modifications can include

- a) splice out exons from mRNA
- b) stabilized by phosphorylation of bases
- c) ☒ 5' cap of 7 methylguanosine -> correct
- d) Poly (A) tail at 5' end

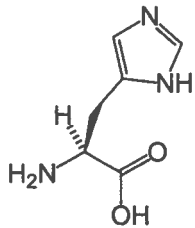
13) Common to all tRNA molecules is all of the following EXCEPT

- a) 80 nucleotides long
- b) 3' CCA tail
- c) Identical L-shaped structure
- d) ☒ Identical anticodon region -> correct

14) What would not help you find the size of a DNA fragment?

- a) Southern blot
- b) Electrophoresis
- c) ☒ Northern blot -> correct
- d) Restriction enzymes

15) What is this amino acid?



d

- a) Tryptophan
- b) Proline
- c) Glutamine
- ☒ d) Histidine -> correct

16) Which amino acid contains a charge?

a

- ☒ a) Asparagine -> correct
- b) Threonine
- c) Glutamine
- d) Serine

17) Which amino acid is the most hydrophobic?

b

- a) Cysteine
- ☒ b) Methionine -> correct
- c) Isoleucine
- d) Tryptophan

18) Which amino acid is essential?

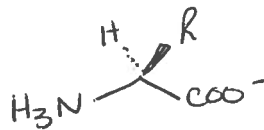
c

- a) Alanine
- b) Glutamic acid
- ☒ c) Lysine -> correct
- d) Serine

19) A zwitterion is

d

- a) Charged
- b) Net neutral
- c) A state of all amino acids
- ☒ d) All of the above -> correct



20) The isoelectric point of alanine is

d

- a) Approximately pH of 6
- b) The point where there is a net charge of 0
- c) The point where the amino acid is a zwitterion
- ☒ d) All of the above -> correct

21) All of the following are true regarding the isoelectric point of lysine EXCEPT

- a
- ☒ a) Approximately pH of 8 -> Correct
  - b) Between pK2 and pK3
  - c) Occurs after 2 equivalents of base have been added
  - d) Amino acid carries net neutral charge

22) A beta pleated sheet

- b
- a) Has torsion angles of  $\Phi = -57, \Psi = -47$
  - ☒ b) Has torsion angles of  $\Phi = -119$  and  $\Psi = 113$  -> correct
  - c) Has torsion angles of  $\Phi = 57, \Psi = 47$
  - d) Is found in the upper right quadrant of the Ramachandran diagram

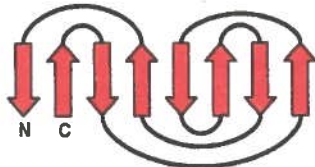
23) An alpha helix is described as:

- b
- a) 3.6<sub>13</sub> : 3.6 amino acids per turn, 13 atoms per turn
  - ☒ b) 3.6<sub>13</sub> : 3.6nm pitch, 13 hydrogen bonds per turn -> correct
  - c) 3.3<sub>10</sub> : 3.3 amino acids per turn, 10 atoms per turn
  - d) 3.3<sub>10</sub> : 3.3nm pitch, 10 hydrogen bonds per turn

24) All statements are true regarding a hairpin turn EXCEPT

- d
- a) It is 4 amino acids long
  - b) There is an H-bond between 1<sup>st</sup> and 4<sup>th</sup> amino acid
  - c) The 2<sup>nd</sup> amino acid is proline
  - ☒ d) The 4<sup>th</sup> amino acid is glycine -> correct

25) This is a



- c
- a) Immunoglobulin fold
  - b) Up and down barrel
  - ☒ c) Swiss roll barrel -> correct
  - d) Greek key

26) The following are properties of alpha-keratin

- I. Right-handed helix
- II. Rich in Cys, Glu, Gln, Ser
- III. Is a 3.3<sub>10</sub> helix
- IV. Found in teeth and skin

- a) I only
- b) I and II -> correct**
- c) I, II and IV
- d) III and IV
- e) I, II, III, and IV

27) Stabilization forces of proteins, from strongest to weakest, are

- a) Hydrogen bonds, hydrophobic forces, electrostatic forces, disulfide bonds
- b) Disulfide bonds, electrostatic forces, hydrogen bonds, hydrophobic forces
- c) Hydrophobic forces, disulfide bonds, hydrogen bonds, electrostatic forces
- d) Hydrophobic forces, hydrogen bonds, electrostatic forces, disulfide bonds -> correct**

28) If you wanted to find the concentration of a protein, you would NOT use

- a) Bradford assay
- b) Ninhydrin assay
- c) Gel electrophoresis -> correct**
- d) Ultraviolet spectroscopy

29) Match the test with the property it would determine:

Test	Choices	Answer
2D NMR	Concentration	Tertiary and quaternary structure
Bradford assay	Concentration	Concentration
Circular dichroism spectroscopy	concentration	Secondary structure determination
Edman degradation	Molecular mass	Protein sequencing
Gel electrophoresis	Molecular mass	Molecular mass
In silico analysis	Molecular mass	Repeats, motifs, domains
Infrared spectroscopy	Protein sequencing	Secondary structure determination
Ion exchange chromatography	Protein sequencing	Purification
Mass spectrometry	Purification	Protein sequencing
Ninhydrin assay	Repeats, motifs, domains	Concentration
Size exclusion chromatography	Secondary structure determination	Molecular mass
Ultracentrifugation	Secondary structure determination	Molecular mass
Ultraviolet spectroscopy	Tertiary and quaternary structure	concentration
X-ray diffraction	Tertiary and quaternary structure	Tertiary and quaternary structure



30) In haemoglobin, the Fe atom binds to all of the following except

- b
- a) 4 pyrrole groups
  - b) 8 helices -> correct**
  - c) Atom of oxygen
  - d) Histidine

31) An enzyme lacking a covalently bonded cofactor is called a

- b
- a) Prosthetic
  - b) Apoenzyme -> correct**
  - c) Haloenzyme
  - d) Isoenzyme

Question 33.

time	$[N_2O_5]$	$\ln [N_2O_5]$
0	1.3	0.26
25	0.52	-0.65

32) These are properties of first order reactions?

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-0.65 - 0.26}{25 - 0} = -0.037.$$

Note:  $m = -K$   
 $K = 0.037.$

$$t_{1/2} = \frac{\ln 2}{K} = \frac{\ln 2}{0.037}$$

$$t_{1/2} = 19.0 \text{ seconds}$$

33) Calculate the 1<sup>st</sup> order rate and half life of this enzyme

Time (min)	0.00	5.00	10.00	15.00	20.00	25.00
$[N_2O_5]$ (M)	1.30	1.08	0.90	0.75	0.62	0.52

$K=0.037$ , half life= 19.0 sec

34) On a Lineweaver-Burk plot,

- a
- a)  $K_m = -1/x\text{-int}$ ,  $V_{max} = 1/y\text{-int}$  -> correct**
  - b)  $K_m = 1/x\text{-int}$ ,  $V_{max} = -1/y\text{-int}$
  - c)  $V_{max} = -1/x\text{-int}$ ,  $K_m = 1/y\text{-int}$
  - d)  $V_{max} = 1/x\text{-int}$ ,  $K_m = -1/y\text{-int}$

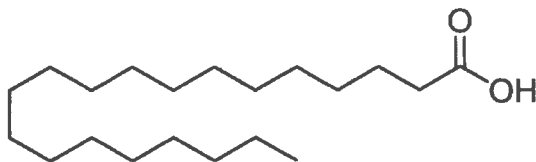
35) Uncompetitive inhibition occurs when

- a) Inhibitor competes directly with substrate
- b) Inhibition can be overcome by using high [S]
- c) Lowers  $V_{max}$ , lowers  $K_m$  -> correct
- d) Inhibitor binds to either E or ES but not active site

36) Match the property with the inhibition

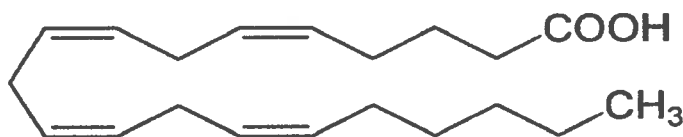
Property	Choices	Answer
Binds to either E or ES, not at active site	Competitive	Mixed
Competes directly with substrate at active site	Competitive	Competitive
Effects cannot be overcome by increasing [S]	Competitive	Uncompetitive
Inhibition overcome by using high [S]	Mixed	Competitive
Inhibitor binds to ES but not E, not at active site	Mixed	Uncompetitive
Inhibitor has equal affinity for E and ES	noncompetitive	noncompetitive
Lowers $V_{max}$ , $K_m$ unchanged	Noncompetitive	Noncompetitive
Lowers $V_{max}$ , lowers $K_m$	Uncompetitive	Uncompetitive
Lowers $V_{max}$ , lowers $K_m$	Uncompetitive	Mixed
$V_{max}$ unchanged, $K_m$ increases	Uncompetitive	Competitive

37) This amino acid is



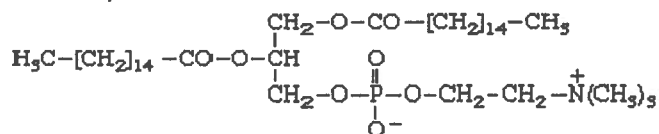
- a) Arachidonic acid
- b) Eicosanoic acid
- c) 20:0
- d) Fully saturated
- e) All of the above -> correct

38) Which is incorrect about this fatty acid



- a) It is an omega-6 amino acid
- b) It is essential for humans -> correct
- c) It is essential for cats
- d) It is 5,8,11,14-Eicosatetraenoic acid

39) This fatty acid is



- d
- a) Glycerophosphocholine
  - b) An ester linked glycerophospholipid
  - c) Fully Saturated
  - ☒ d) All of the above -> correct

40) Which of the following is true regarding platelet activating factors?

- b
- a) They are sphingolipids
  - ☒ b) They are ether-linked glycerophospholipids -> correct
  - c) They have two fatty acids attached to their glycerol backbone
  - d) They are found in the neurons and the brain

41) What is true of spingolipid classes?

- d
- a) Sphingomyelins have a sugar X group
  - b) Gangliosides have and X group which is phosphocholine
  - c) Glycosphingolipids make up myelin sheaths
  - ☒ d) Gangliosides have complex alogosaccharide with sialic acid -> correct

42) The first step of lipid digestion is

- c
- a) To package lipids into water-soluble transport structures, chylomicrons
  - b) To absorb free fatty acids across the intestinal mucosa
  - ☒ c) To dissolve fat globules into micelles -> correct
  - d) To convert triacylglycerols into fatty acids

43) Which enzyme is responsible for conversion of triacylglycerides in chylomicrons to fatty acids?

- c
- a) Pancreatic lipase
  - b) Glycerol-3-phosphate acyltransferase
  - ☒ c) Lipoprotein lipase -> correct
  - d) Phosphatidic acid phosphatase

44) Chylomicrons contain all except

- d
- a) Triacylglycerols
  - b) Cholesterol
  - c) Apolipoproteins
  - ☒ d) Perilipin -> correct

45) Describe the sequence of events of hormone signalling for lipid mobilization

- i) Adenyl cyclase increases cAMP concentration
- ii) epinephrine and glucagon secreted and bind to GPCR
- iii) Perilipins and hormone sensitive lipases are activated via phosphorylation
- iv) PKA is activated

a

- a) II, I, IV, III -> correct
- b) I, II, III, IV
- c) II, I, III, IV
- d) IV, II, I, III

46) In the carnitine shuttle

- a) Fatty acids are transported from the blood stream to the cytosol
- b) There is cytoplasmic and mitochondrial pools of carnitine
- c) Fatty acids are transported through the membrane while unattached to acetyl CoA -> correct
- d) Acetyl CoA pools are located between the inner and outer membrane of mitochondria

c

47)  $\text{FADH}_2$  is generated in

- a) Hydration
- b) Dehydrogenation -> correct
- c) Hydrogenation
- d) Thiolyis

b

48) Beta oxidation involves

- a) Dehydrogenation via enoyl-CoA hydratase
- b) Hydration via flavoenzyme acyl-CoA dehydrogenase
- c) Dehydrogenation which generates NADH -> correct
- d) Thiolyis via 3-L-hydroxylacyl-CoA dehydrogenase

c

49) The total ATP yield from Lauric acid is

- a) 95 -> correct
- b) 97
- c) 100
- d) 102

a

50) Which statement is false?

- a) Beta oxidation burns the equivalent of two ATP per fatty acid
- b) Citric acid cycle occurs in the cytosol and converts Acetyl CoA into  $\text{CO}_2$
- c) Electron transport chain occurs in the mitochondrial matrix and oxidizes NADH and  $\text{FADH}_2$
- d) Beta oxidation occurs in the mitochondria and breaks apart fatty acids into 2C units -> correct

d

Question 49

Lauric acid = 12 carbons long.

$\beta$ -oxidation:

6 acetyl-CoA

5 NADH

5  $\text{FADH}_2$

- 2 eq. ATP

Citric Acid:

18 NADH

6  $\text{FADH}_2$

6 GTP (ATP)

ETC

23 NADH  $\Rightarrow$  69 ATP

11  $\text{FADH}_2 \Rightarrow$  22 ATP

6 ATP

- 2 ATP

TOTAL 95 ATP