Sample questions from old exam I
BCHS 3304 – Dr. Yeo

I. True or False (#1 to 5)?

1.	T	F	In the tripeptide Arg-Pro-Tyr, the C-terminal residue is Arg.
2	T	F	Open systems, such as living creatures, are not at equilibrium.
3	T	F	Hydrophilic substances such as ions and polar molecules dissolve readily in water.
4	T	F	Buffered solutions resist changes in pH within about one pH unit of the pK of the buffering species.
5	T	F	Amino acids may be covalently modified after they have been incorporated into a polypeptide.

II. Calculations

[A: #6 -8]. The molecular weight of the antibiotic ampicillin is 349 g/mole. Calculate how much ampicillin you would need to make **10 ml of a 1000x solution (1000-fold concentrated)** for each of the following:

6. 50 μg/ml ampicillin.

A. 100 mg ampicillin
B. 10 g ampicillin
C. 500 mg ampicillin
D. 50 g ampicillin
E. 5 g ampicillin

7. 1 mM ampicillin.

A. 34.9 mg ampicillin
B. 3.49 g ampicillin
C. 34.9 g ampicillin
D. 17.5 g ampicillin
E. 1.75 g ampicillin

8. Calculate how much of the solid reagents (chemical) you would add to make **500 ml of 10x TBE** buffer solution.

10x TBE (0.9 M Tris, 0.9 M Boric acid, 20 mM EDTA)

Tris (MW = 121 g/mole)
Boric acid (MW = 61.8 g/mole)
EDTA (MW = 292 g/mole)

A. 108 g Tris, 55.6 g Boric acid, 5.84 g EDTA
B. 54.4 g Tris, 27.8 g Boric acid, 2.92 g EDTA
C. 108 g Tris, 27.8 g Boric acid, 2.92 g EDTA
D. 54.4 g Tris, 55.6 g Boric acid, 5.84 g EDTA
E. 121 g Tris, 61.8 g Boric acid, 292 g EDTA

III. Other multiple-choice questions

9. The theory of evolution includes the following principles:

A. evolution is not directed toward a specific goal.
B. evolution is ongoing, and is constrained by its past.
C. evolution requires some "sloppiness" for adaptation to changes.
D. A and B
E. A, B, and C

10. Calculate $\Delta G^{\circ\prime}$ for the reaction A + B ↔ C + D at 25°C when the equilibrium conditions are [A] = 10 mM, [B] = 15 mM, [C] = 10 mM, [D] = 10 mM (Gas constant: 8.31 $J \cdot K^{-1} \cdot mol^{-1}$).

A. 1004 J/mol
B. 10 kJ/mol
C. 5 kJ/mol
D. 1 J/mol
E. insufficient data to determine answer

11. A reaction with ΔH = 23 kJ/mol and ΔS =22 J/K·mol, at 2°C, is:

A. spontaneous
B. nonspontaneous
C. at equilibrium
D. impossible to determine reactivity
E. none of the above

12. If gas molecules in an enclosed space are allowed to enter a second chamber, the resulting distribution of gas molecules represents and increase in

A. enthalpy
B. entropy
C. force
D. A and C
E. A, B, and C

13. Amphiphilic molecules:

A. have both oxidizing and reducing groups.
B. are micelles.
C. have chromophores in two different wavelength regions.
D. have both acidic and basic groups.
E. have both hydrophilic and hydrophobic groups.

14. Which of the following amino acids has a sulfur atom in its side chain?

A. Asn
B. Ser
C. Phe
D. Cys
E. Thr

15. At pH 7, arginine (p*K*s are α-carboxylate 1.82, α-amino 8.99, guanidino 12.48) would be charged as follows:

A. 0 α-carboxylate, 0 α-amino, +1 guanidino, +1 net charge
B. +1 α-carboxylate, 0 α-amino, –1 guanidino, 0 net charge
C. +1 α-carboxylate, –1 α-amino, –1 guanidino, –1 net charge
D. –1 α-carboxylate, +1 α-amino, +1 guanidino, +1 net charge
E. –1 α-carboxylate, 0 α-amino, +1 guanidino, 0 net charge

16. Which of the following amino acids would you expect to find in the interior of a protein's tertiary structure?

A. Phe
B. Thr
C. Asn
D. Lys
E. All of the above

17. What is the pH of 0.001 M solution of NaOH?

A. 2
B. 10
C. 11
D. 12
E. 13

18. In two homologous proteins, which residue is most likely to replace a Asp residue as a conservative substitution?

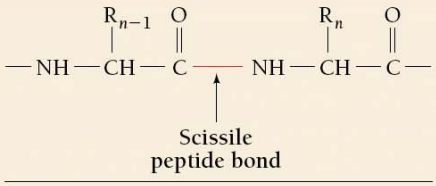
A. Ala
B. Gln
C. Asn
D. Arg
E. Glu

19. You must cleave the following peptide into smaller fragments. Which of the proteases would be likely to yield the most fragments? (Refer to the table below)

NLTQGRCKPENTFVHSPEVPVQPVC

A. Trypsin
B. Chymotrypsin
C. Elastase
D. Endopeptidase V8
E. Pepsin

Table 5-3 Specificities of Various Endopeptidases



Enzyme	Source	Specificity	Comments
Trypsin	Bovine pancreas	R_{n-1} = positively charged residues: Arg, Lys; $R_n \neq$ Pro	Highly specific
Chymotrypsin	Bovine pancreas	R_{n-1} = bulky hydrophobic residues: Phe, Trp, Tyr; $R_n \neq$ Pro	Cleaves more slowly for R_{n-1} = Asn, His, Met, Leu
Elastase	Bovine pancreas	R_{n-1} = small neutral residues: Ala, Gly, Ser, Val; $R_n \neq$ Pro	
Thermolysin	*Bacillus thermoproteolyticus*	R_n = Ile, Met, Phe, Trp, Tyr, Val; $R_{n-1} \neq$ Pro	Occasionally cleaves at R_n = Ala, Asp, His, Thr; heat stable
Pepsin	Bovine gastric mucosa	R_n = Leu, Phe, Trp, Tyr; $R_{n-1} \neq$ Pro	Also others; quite nonspecific; pH optimum = 2
Endopeptidase V8	*Staphylococcus aureus*	R_{n-1} = Glu	

Table 5-3 Fundamentals of Biochemistry, 2/e