_____ 1. What volume of a 0.153 *M* KCl solution is needed to provide 2.14 g of KCl?

(a) 11.4 mL
(b) 1.04 L
(c) 188 mL
(d) 24.4 mL
(e) 4.39 mL

_____ 2. A bottle of wine contains 12.5% of ethanol (CH_3CH_2OH) ***by volume***. The density of ethanol is 0.789 g/mL. The concentration of ethanol in the wine is:

(a) 2.45 M
(b) 12.5 % by mass
(c) 12.5 m
(d) 2.14 m
(e) 2.14 M

_____ 3. A solution is prepared by dissolving 18 g of sucrose [$C_{12}H_{22}O_{11}$; MW = 342.30 g/mol] in 175 g of water. The boiling point of this solution is:

(a) 0.15°C
(b) 100.15°C
(c) 100°C
(d) 99.85°C
(e) -0.15°C

_____ 4. All of the following are found in DNA except:

(a) the double helix.
(b) a nucleotide.
(c) a peptide bond.
(d) a phosphate group.
(e) a sugar.

_____ 5. You made a condensation polymer in lab during the preparation of:

(a) luminol.
(b) NaOH.
(c) aspirin.
(d) nylon.
(e) none of these

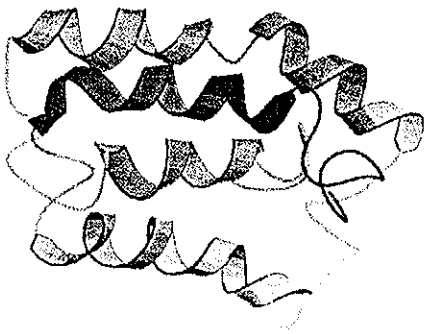
_____ 6. The 'primary structure' of a protein refers to:

(a) the sequence of amino acids.
(b) interactions among the side chains or R-groups of the amino acids.
(c) coiling due to hydrogen bonding between amino acids.
(d) the alpha-helix, or pleated sheets.
(e) the weak interaction of two or more polypeptides.

_____ 7. The functional group(s) associated with all individual amino acids is/are:

(a) hydroxyl
(b) carbonyl
(c) amino
(d) carboxyl
(e) both amino and carboxyl

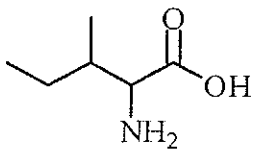
_____ 8. The structure below represents the Mistic membrane protein:



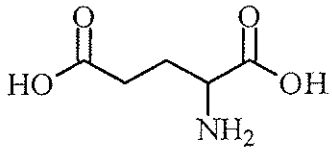
What is the best description of the secondary structure of this protein?

(a) It contains predominately alpha helices.
(b) It contains predominately beta sheets.
(c) It is an equal mix of alpha helix and beta sheets.
(d) It is a pentameric structure.
(e) The secondary structure cannot be determined from this representation.

_____ 9. The Mistic membrane protein shown in question 8 contains residues of both leucine (leu) and glutamic acid (glu).



leucine
leu



glutamic acid
glu

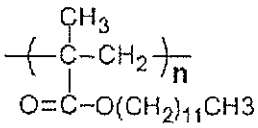
Considering the structures of leu and glu, which of the following statements is most likely to be correct?

(a) The leu and the glu are both in the membrane.
(b) The leu and the glu are both inside the cell.
(c) The glu is inside the membrane and the leu is outside the cell.
(d) The leu is inside the membrane and the glu is outside the cell.
(e) The leu is inside the cell and the glu is outside the cell.

_____ 10. The DNA from sea urchins contains about 32% A and about 18% G. What percentages of T and C will be found in sea urchin DNA?

(a) Both T and C will constitute 18%.
(b) Both T and C will constitute 32%.
(c) Both T and C will constitute 50%.
(d) C will constitute 18% and T will constitute 32%.
(e) C will constitute 32% and T will constitute 18%.

_____ 11. Poly(lauryl methacrylate) is used as an additive in motor oils to counter the loss of viscosity at high temperatures.



Poly(lauryl methacrylate) is soluble in oil because of:

(a) H-bonding.
(b) dipole-dipole interactions.
(c) ionic bonding.
(d) dispersion forces.
(e) covalent bonding with the oil.

_____ 12. At low temperature poly(lauryl methacrylate), the polymer shown in question 11, is coiled into balls. At higher temperature the ball uncoils and the polymer exists as long chains. Which is correct?

(a) The radius of gyration (R_g) does not change.
(b) The radius of gyration (R_g) increased with increased temperature.
(c) The radius of gyration (R_g) decreased with increased temperature.
(d) At high temperature there is crosslinking of the polymer with the oil.
(e) At high temperature the polymer breaks down into the monomers.

_____ 13. Which of the polymers you prepared in lab is cross-linked?

(a) luminol
(b) NaOH
(c) aspirin
(d) nylon
(e) slime

_____ 14. A co-polymer is created by free radical polymerization of a mixture of 10.0 g of styrene (C_8H_8) with 20.0 g of propene (C_3H_6). Assuming that all of the starting materials are consumed, what is the mole fraction of styrene in the final polymer?

(a) 0.500
(b) 0.476
(c) 0.333
(d) 0.168
(e) 0.096

_____ 15. A short polymer chain has a mass of 158.24 g. This is a polymer of:

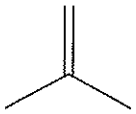
(a) C_2H_4

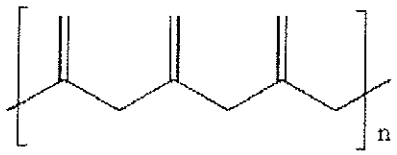
(b) CH_2CHCH_3

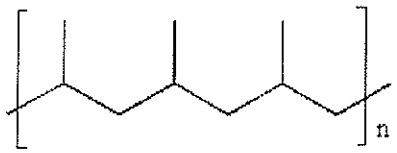
(c) CH_2CHCN

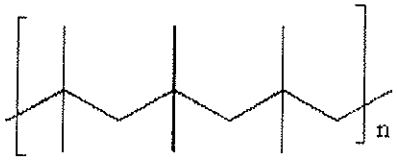
(d) CH_2CHCl

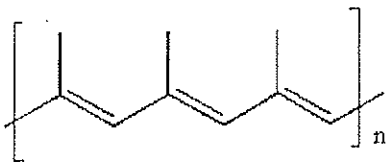
(e) C_2F_4

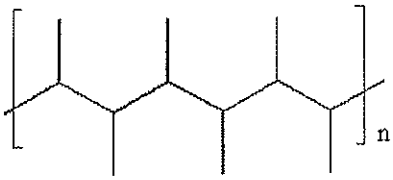
_____ 16. Isobutylene  can undergo polymerization through an addition reaction. The structure for polyisobutylene would be:

(a) 

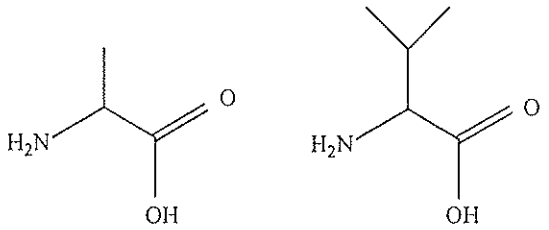
(b) 

(c) 

(d) 

(e) 

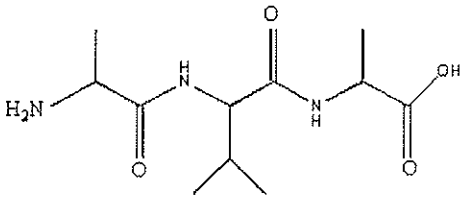
_____ 17. Which tripeptide can be formed from the following amino acids?



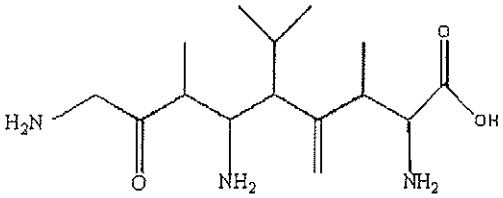
Alanine

Valine

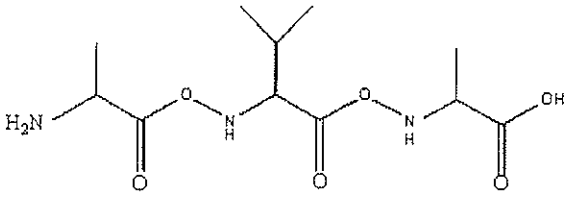
(a)



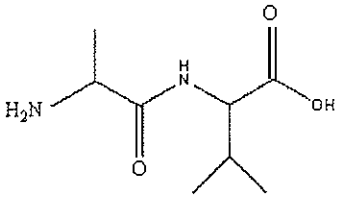
(b)



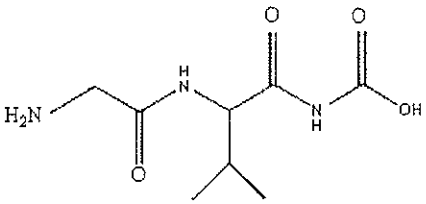
(c)



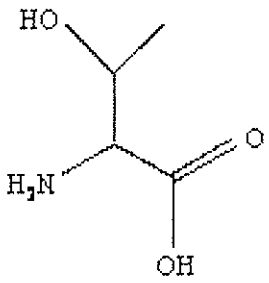
(d)



(e)

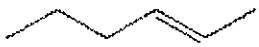


_____ 18. A folded protein has the following amino acid on the outside:

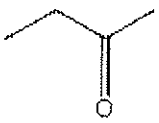


A researcher is trying to design a small drug molecule to bind that protein. Which molecule would be a promising candidate?

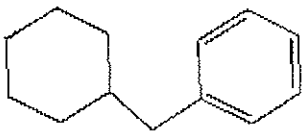
(a)



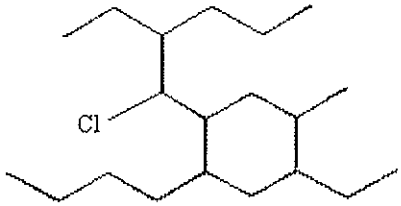
(b)



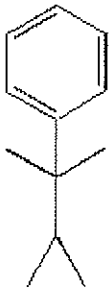
(c)



(d)



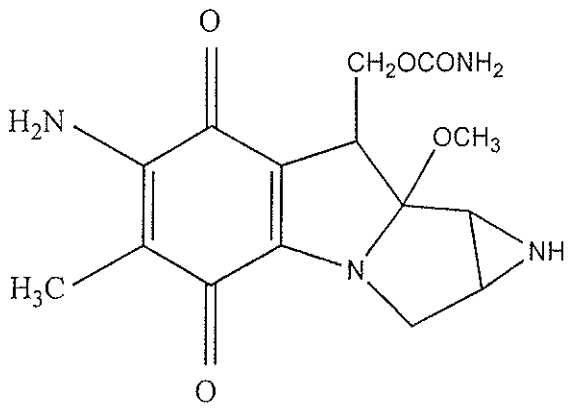
(e)



_____ 19. Gleevec is:

(a) an agonist that triggers transfer of a phosphate group to a protein.
(b) an antagonist that inhibits transfer of a phosphate group to a protein.
(c) an antagonist that shuts down an opioid receptor.
(d) an agonist that activates an opioid receptor.
(e) an opiate produced from the breakdown of endorphins produced by stress.

_____ 20. Use Lipinski's rules of 5 to determine whether Mytomicin C is acceptable as a drug.



Mitomycin C
MW = 334.13
LogP = 0.44

(a) No, its MW is too low.
(b) No, it has too many nitrogen and oxygen atoms.
(c) No, its log P value is too low.
(d) No, it has too many NH and OH bonds.
(e) Yes, because it meets all the Lipinski criteria.

USEFUL INFORMATION

O K = −273.15°C

$\Delta T = k\,m$

K_b for H_2O = 0.512°C/m

K_f for H_2O = 1.86°C/m

$\pi = MRT$

$$R = 0.0821\ \frac{L \cdot atm}{K \cdot mol}$$

$R_g = (n_{avg}\,\ell_o^2/6)^{1/2}$

$$\%\ \text{by volume} = \frac{\text{volume of solute}}{\text{volume of solution}} \times 100$$

Periodic Table of the Elements

1A (1)												3A (13)	4A (14)	5A (15)	6A (16)	7A (17)	8A (18)
1 H 1.008	2A (2)																2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	(8)	- 8B - (9)	(10)	1B (11)	2B (12)	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)		114 (285)				

Silberberg, 3rd Ed.

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)