

*Use your scantron to answer questions 1-22. Some Question have more than one answer. Write answers to the questions without numbers directly on the exam.*

**CHP 5.1**

- For a reaction to be exothermic or endothermic it is determined by:
  - the activation energy
  - the states of the reactants
  - the overall loss or gain of energy when the bonds break and reform
  - collision orientation of molecules
- What type of nutrient has the highest energy content per gram?
  - carbohydrate
  - fat
  - protein
  - They all have the same energy content.
- Calculate the energy content (Cal) of a snack bar that contains 25 g carbohydrate, 8 g fat and 5 g protein.
  - 200 Cal
  - 200 cal
  - 38 Cal
  - 100 Cal
  - 50 Cal

(18 pt) Calculate the Calories in the nut from the following data obtained from the calorimetry experiment done in lab.

Mass of empty soft drink can (g)	23.435 g	
Mass of can + water (g)	125.929 g	
(2 pt) Mass of water (g) <i>Show calculation.</i>		
Initial temperature water (°C)	23.2 °C	
Final temperature water (°C)	99.9 °C	
(2 pt) Temperature change of water (°C) <i>Show calculation.</i>		
Mass of the nut (g)	2.481 g	
Mass of the residue after nut is burned (g)	0.234 g	
Mass of nut consumed by combustion (g) <i>Show calculation</i>		
Specific heat of water	1.00 calorie/g °C	
(6 pt) Energy absorbed by water (cal) <i>Show calculation.</i>		
(2 pt) Energy released by the nut (cal)		
(2 pt) Energy released by the nut (Cal) <i>Show calculation.</i>		
(4 pt) Cal/g of nut consumed <i>Show calculation</i>		

Chp 5.2

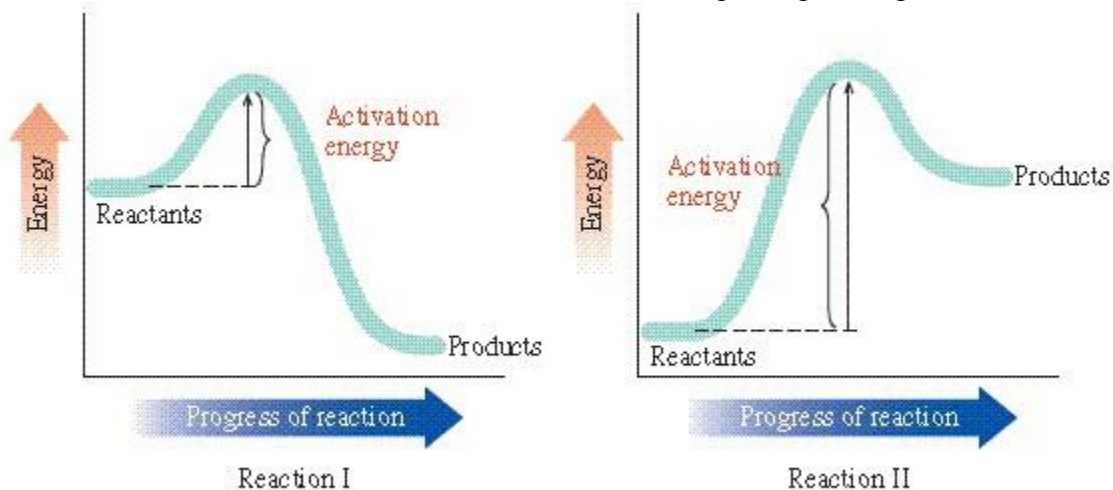
4. Which of the following factors influence the rate of a reaction?

- A) temperature      B) reactant concentration      C) a catalyst      D) all of the above

5. A fast reaction rate for a chemical reaction is dependent on:

- A) having a large activation energy  
 B) having a small activation energy  
 C) being exothermic  
 D) being endothermic

6. Determine which of the statements is INCORRECT regarding this figure:



- A) Reaction I is exergonic.  
 B) Reaction II occurs faster than reaction I.  
 C) Reaction II is endergonic.  
 D) The activation energy for reaction I is smaller than that of reaction II.

7. An enzyme increases the rate of a biological process in what way?

- A) Increases the concentration of reactants  
 B) Increases the temperature of the reactants  
 C) Lowers the activation energy of the process  
 D) Makes the reaction more exergonic

CHP 5.3

8. In what type of reaction are there more reactant substances than product substances?

- A) combination      B) decomposition      C) single displacement      D) double displacement

9. A solution of potassium ( $K_2CrO_4$ ) when added to a solution of lead(II) acetate ( $Pb(CH_3COO)_2$ ) produces a yellow precipitate of lead(II) chromate. What type of reaction is it?

- A) combination      B) decomposition      C) single displacement      D) double displacement

10. Which of these reactions is a double displacement reaction?

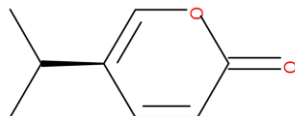
- A)  $K(s) + H_2O(l) \rightarrow H_2(g) + KOH(aq)$   
 B)  $Mg(s) + HClO_4(aq) \rightarrow Mg(ClO_4)_2(aq) + H_2(g)$   
 C)  $BaO(s) + H_2O(l) \rightarrow Ba(OH)_2(aq)$   
 D)  $CH_3COOH(aq) + K_2CO_3(aq) \rightarrow H_2O(l) + CO_2(g) + KCH_3COO(aq)$

11. What statement is correct about this oxidation-reduction reaction?  $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{SO}_3(\text{g})$
- A)  $\text{O}_2$  is the oxidizing agent.  
 B)  $\text{SO}_2$  is the reducing agent.  
 C)  $\text{O}_2$  is reduced.  
 D)  $\text{SO}_2$  losses electrons.  
 E) All are correct.
12. What is the correctly balanced reaction for the combustion of  $\text{C}_6\text{H}_{14}\text{O}$ ?
- A)  $\text{C}_6\text{H}_{14}\text{O} + 18\text{O} \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$   
 B)  $\text{C}_6\text{H}_{14}\text{O} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$   
 C)  $2\text{C}_6\text{H}_{14}\text{O} + 19\text{O}_2 \rightarrow 12\text{CO}_2 + 14\text{H}_2\text{O}$   
 D)  $\text{C}_6\text{H}_{14}\text{O} \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$
13. When an organic molecule loses hydrogens it is said to be:  
 A) reduced    B) oxidized    C) both oxidized and reduced    D) neither oxidized or reduced
14. If this is the reduced form of NADH which of the following is the oxidized form of this important biomolecule?  
 A)  $\text{NADH}_2$     B)  $\text{NAD}^+$     C)  $\text{NAD}$     D)  $\text{NAD}^{+2}$

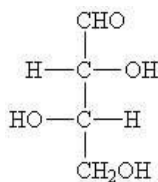
CHP 5.4

15. The structural part of an organic compound that determines its family and chemical reactivity is called a(n)  
 A) functional group.    B) organic compound.    C) identifying group.    D) ionic bond.    E) covalent bond.

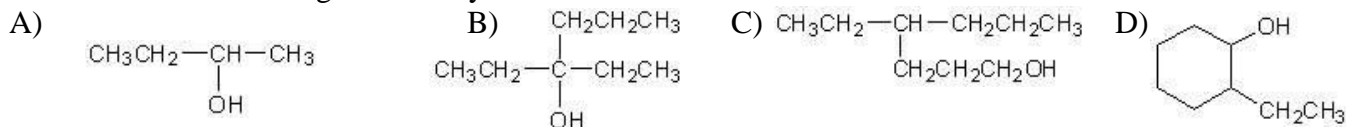
(4 pt) Identify the functional groups in the following structures by circling and naming them.



16. What functional groups are in  
**Mark all that apply**

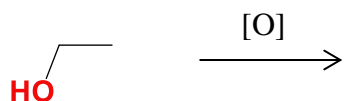
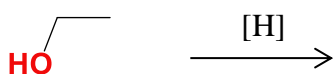


- A) ketone    B) aldehyde    C) carboxylic acid    D) primary alcohol    E) secondary alcohol
17. Which of the following is a tertiary alcohol?



18. Identify the correct sequence of substances in degree of oxidation.
- A) alcohol  $\rightarrow$  aldehyde  $\rightarrow$  carboxylic acid  
 B) carboxylic acid  $\rightarrow$  aldehyde  $\rightarrow$  alcohol  
 C) alcohol  $\rightarrow$  carboxylic acid  $\rightarrow$  aldehyde  
 D) carboxylic acid  $\rightarrow$  alcohol  $\rightarrow$  aldehyde

(12 pt) Complete each of the following oxidation/reduction reactions. Write NR if there is no reaction.

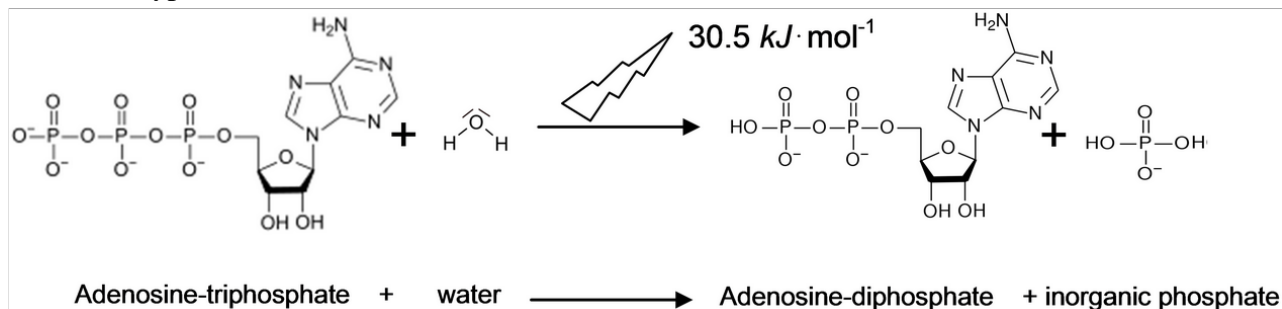


CHP 5.5 & 5.6

19. Hydrogenation of an alkene is an example of what kind of reaction?

- A) addition    B) oxidation    C) hydrolysis    D) condensation

20. What type of reaction is shown below where ATP becomes ADP?

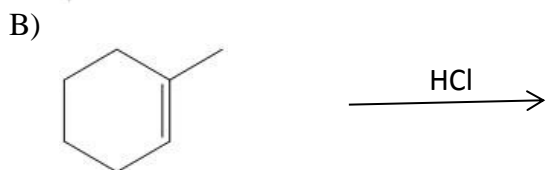


- A) addition    B) oxidation    C) hydrolysis    D) condensation

21. What is the most likely product of hydration of  $\text{CH}_3\text{CH}=\text{CH}_2$ ?

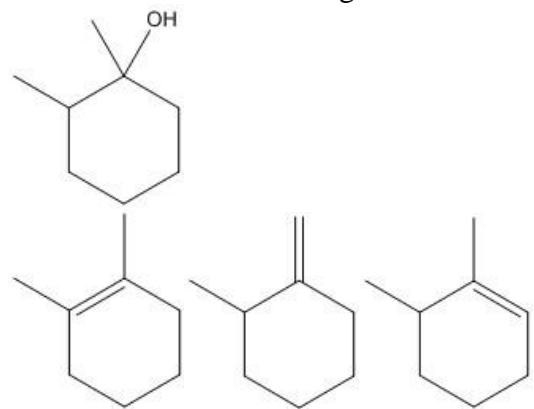
- A)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$     B)  $\text{CH}_3\text{CH}_2\text{CH}_3$     C)  $\text{CH}_3\text{CHOHCH}_3$     D)  $\text{CH}_3\text{CHOHCH}_2\text{OH}$

(8 pt) Draw the products of the following addition reactions.



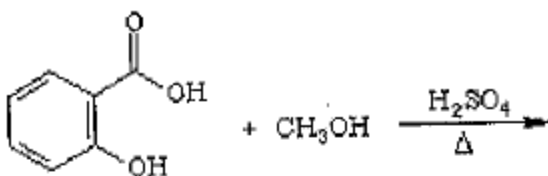
26 pt

22. Which of the following molecules would yield this product when hydrated?

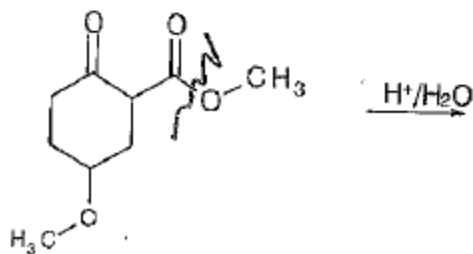
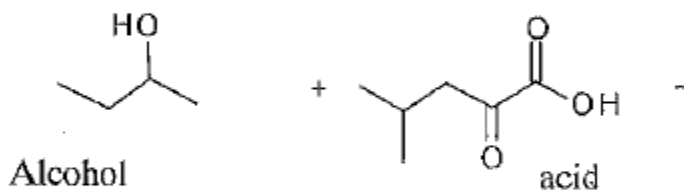


A) B) C) D) All of the above could yield this product.

(12 pt) Complete the following reactions by drawing the structure(s) of the products.



Oil of wintergreen (methyl salicylate)



## PERIODIC CHART OF THE ELEMENTS

1 H 1.00797																	1 H 1.00797	2 He 4.0026			
3 Li 6.939	4 Be 9.0122															5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312															13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80				
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30				
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	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 ? (271)	111 ? (272)	112 ? (277)										

\* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
--------------------	---------------------	--------------------	-------------------	--------------------	--------------------	--------------------	---------------------	--------------------	---------------------	--------------------	---------------------	--------------------	--------------------

† Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)
---------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	--------------------	--------------------	--------------------	--------------------

## ELECTRONEGATIVITIES OF THE ELEMENTS

H 2.1																	H 2.1	He --			
Li 1.0	Be 1.5															B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne --
Na 0.9	Mg 1.2															Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar --
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr --				
Rb 0.8	Sr 1.0	Y 1.3	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe --				
Cs 0.7	Ba 0.9	La 1.1	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.8	Bi 1.9	Po 2.0	At 2.2	Rn --				
Fr 0.7	Ra 0.9	Ac 1.1	Rf	Db	Sg	Bh	Hs	Mt	‡	‡	‡										