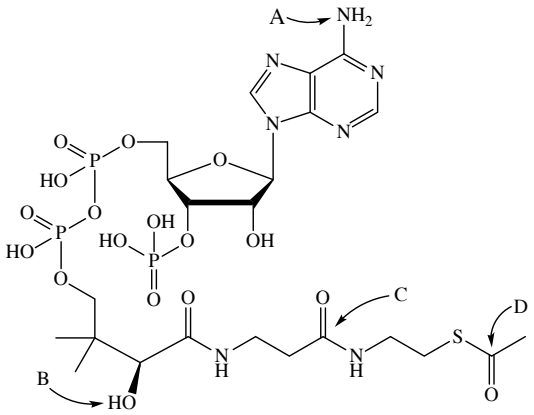
1																	18
1 H 1.008	2											13	14	15	16	17	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	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 65.38	31 Ga 69.72	32 Ge 72.64	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 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (267)	105 Db (268)	106 Sg (269)	107 Bh (270)	108 Hs (270)	109 Mt (278)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (290)	116 Lv (293)	117 Ts (294)	118 Og (294)

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	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 (266)

This exam should have exactly 20 questions. Each question is equally weighted at 5 points each. Bubble in your answer choices on the bubblehseet provided. Your score is based on what you bubble on the bubblesheet and not what is circled on the exam.

---

1. (Part 1 of 4) Acetyl coenzyme A is a chemical with a wide range of uses in metabolic process in the body. Consequently, it has a ton of functional groups. Use this molecule for the next four questions.



What is the functional group labeled A?

- ● a. amine
- b. amide
- c. alcohol
- d. ketone
- e. carboxylic acid
- f. aldehyde

Explanation: The -NH_2 group is an amine.

---

2. (Part 2 of 4) What is the functional group labeled B?

- a. amine
- b. amide
- ● c. alcohol
- d. ketone
- e. carboxylic acid
- f. aldehyde

Explanation: The -OH group is an alcohol.

---

3. (Part 3 of 4) What is the functional group labeled C? Note: C is pointing to the full group that contains the oxygen, carbon, and nitrogen.

- a. amine
- ● b. amide
- c. alcohol
- d. ketone
- e. carboxylic acid
- f. aldehyde

Explanation: The carbonyl carbon next to the -NH group is an amide.

---

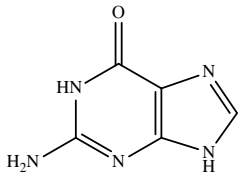
4. (Part 4 of 4) What is the functional group labeled D?

- a. amine
- b. amide
- c. alcohol
- ● d. ketone
- e. carboxylic acid
- f. aldehyde

Explanation: A carbonyl carbon within a carbon chain is a ketone.

---

5. What is the chemical formula for the following molecule?



- a. $C_5H_5N_5O$
- b. $C_4H_2N_5O$
- c. $C_5H_2N_3O$
- d. $C_7H_2N_4O$
- e. $C_7H_5N_5O$

Explanation: Count the carbons, nitrogen, oxygen and hydrogen. There is only one implied hydrogen. This gives: $C_5H_5N_5O$

---

6. Which of the following functional groups contain a carbonyl group?

I. ketone

II. aldehyde

III. alcohol

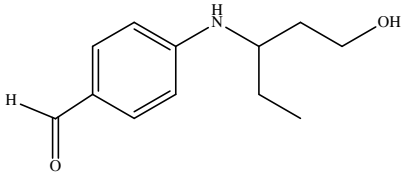
IV. carboxylic acid

- a. I, II, and IV
- b. I, III, and IV
- c. I and IV
- d. II and IV
- e. I, II, III, and IV

Explanation: A carbonyl group is a carbon with a double bond to oxygen. Ketones, carboxylic acids, and aldehydes all contain carbonyl groups.

---

7. What are three functional groups found in the molecule below?



- a. nitrile, primary alcohol, aldehyde
- b. secondary amine, primary alcohol, aldehyde
- c. primary amine, ester, primary alcohol
- d. primary amine, carboxylic acid, ether
- e. secondary amine, ketone, ether

Explanation: This structure has an aldehyde, secondary amine, and primary alcohol.

---

8. An elimination reaction beginning with chloroethane, CH_3CH_2Cl, produces HCl and...

- a. ethene, $H_2C{=}CH_2$
- b. ethyne, $HC{\equiv}CH$
- c. dichloroethene, CHCl=CHCl
- d. dichloroethane, CHCl-CHCl

Explanation: The elimination creates an alkene and removes the substituted halogen, producing $H_2C = CH_2$

---

9. $CH_3CH_2CH_2Br$ reacts with HCl to form $CH_3CH_2CH_2Cl$ and HBr. What type of organic reaction is this?

- a. substitution
- b. elimination
- c. condensation
- d. rearrangment
- e. addition

Explanation: Two reactants have each swapped a atom, in this case the Br and Cl switch places. This is a substitution reaction.

---

10. Bromine liquid is exposed to radiation and breaks into two identical bromine radicals. This is an example of...

- a. homolytic cleavage
- b. heterolytic cleavage
- c. homonuclear fusion
- d. condensation
- e. homoisomeric cleavage

Explanation: The cleavage of a molecule into two identical parts is known as homolytic cleavage.

---

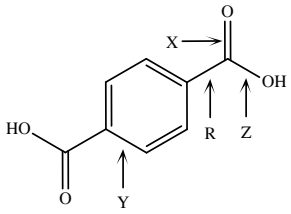
11. Which step of the addition mechanism will create a free radical on a growing polymer chain?

- a. initiation
- b. propagation
- c. termination
- d. elimination
- e. substitution

Explanation: The propagation step will grow the polymer chain by one monomer unit and create a radical on the opposite end.

---

12. The molecule shown below is terephthalic acid, which will create a polymer with ethylene glycol. In the condensation reaction, which bond will break when the mechanism produces water?



- a. X
- b. Y
- c. R
- d. Z

Explanation: The hydroxyl group connect to the rest of the molecule with the bond labeled Z will be protonated and break off as water.

---

13. Which of the following plastics is NOT formed by an addition mechanism?

- a. Low density polyethylene (LDPE)
- b. High density polyethylene (HDPE)
- c. Polyvinyl chloride (PVC)
- d. Polypropylene (PP)
- e. Polystyrene (PS)
- f. Polyethylene terephthalate (PET)

Explanation: PET is formed via condensation.

---

14. Polyethylene can be fashioned into strong milk containers and flimsy plastic bags. Which particular type of polyethylene is used to make a plastic bags and why?

- a. high density polyethylene because it is more branched
- b. low density polyethylene because it is more branched
- c. high density polyethylene because it a linear polymer
- d. low density polyethylene because it is a linear polymer

Explanation: LDPE can make plastic bags because it is more branched, creating a softer plastic.

---

15. Plumbing pipes are commonly made from...

- a. low density polyethylene (LDPE)
- b. high density polyethylene (HDPE)
- c. polyvinyl chloride (PVC)
- d. polypropylene (PP)
- e. polystyrene (PS)
- f. polyethylene terephthalate (PET)

Explanation: PVC is used to make plumbing pipes.

---

16. Five of the Big 6 plastics are all either composed or direct substitutions of which monomer?

- a. $H_2C{=}CH_2$
- b. HC≡CH
- c. CHCl=CHCl
- d. CHCl-CHCl
- e. $H_2C{=}CHCl$

Explanation: Five of the Big 6 plastics are composed of ethene (ethylene), $H_2C{=}CH_2$.

---

17. Which of the following is a set of two sugar-based polymers?

- a. cellulose and starch
- b. wool and silk
- c. cellulose and PET
- d. wool and rubber
- e. starch and PET

Explanation: Cellulose and starch are repeating glucose monomers.

---

18. Which of the following is a copolymer with a very high melting point that is used to produce both pistol frames and guitar strings?

- a. silk
- b. bakelite
- c. nylon
- d. polypropylene
- e. teflon

Explanation: Nylon is formed from condensation. The polymer is tough and ordered, causing it to be very strong and useful for things like plastic frames, machine parts, and guitar strings.

---

19. Which two functional groups are present on all monomers that make up proteins?

- a. amine and carboxylic acid
- b. nitrile and carboylic acid
- c. amine and ester
- d. nitrile and alcohol
- e. carboxylic acid and alcohol

Explanation: Proteins are made up of amino acids, which all have amine and carboxylic acid functional groups.

---

20. Which feature differentiates RNA nucleotides and allows them to code for the production of different proteins?

- a. the nitrogenous base
- b. the phosphate group
- c. the deoxyribose sugar
- d. the ribose sugar
- e. the R-group

Explanation: The nitrogenous base of an RNA nucleotide differentiates it. All RNA nucleotides consist of a ribose sugar and a phosphate group.

Remember to bubble in ALL your answers BEFORE time is called. Double check your name, uteid, and version number before you turn in your bubblesheet. You must keep your exam for future reference. Please do not lose it. We will not replace it.