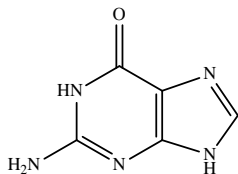


1										18								
1 H 1.008																		2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 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)

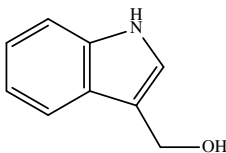
This exam should have exactly 20 questions. Each question is equally weighted at 5 points each. Bubble in your answer choices on the bubble sheet provided. Your score is based on what you bubble on the bubble sheet and not what is circled on the exam.

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



- a. $C_5H_5N_5O$
- b. $C_4H_2N_4O$
- c. $C_5H_2N_3O$
- d. $C_7H_2N_4O$
- e. $C_7H_6N_4O$

2. (Part 1 of 2) Consider the structure of indole-3-carbinol, an ingredient in broccoli that contributes to its nutritional value, for the next two questions.



What is the chemical formula for indole-3-carbinol?

- a. $C_{10}H_9NO$
- b. C_9H_9NO
- c. C_9H_7NO
- d. $C_{10}H_7NO$
- e. C_9H_2NO

3. (Part 2 of 2) Refer again to the previous structure of indole-3-carbinol. How many total lone pairs exist on this structure? (even though they aren't shown)

- a. 0
- b. 1
- c. 3
- d. 2
- e. 6

4. Which substance contains polar covalent bonds?

- a. CH_2F_2
- b. NaF
- c. CsCl
- d. Cl_2
- e. Br_2

5. Select the series of possible bond orders that reflects increasing bond strengths.

- a. 1, 3, 2
- b. 1, 2, 1.5, 3
- c. 1, 1.5, 1.33, 2
- d. 1, 1.33, 1.5, 2
- e. 3, 2, 1
- f. 2, 1.5, 1

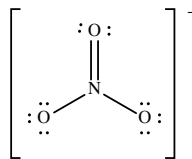
6. How many lone pairs are in the molecule with the formula $HOCH_2NH_2$?

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4

7. Carbon dioxide has a carbon-oxygen double bond. Carbon monoxide has a carbon-oxygen triple bond. Which of the following statements is true?

- a. the bonds in carbon monoxide are weaker and shorter than the bonds in carbon dioxide
- b. the bonds in carbon monoxide are stronger and shorter than the bonds in carbon dioxide
- c. the bonds in carbon monoxide are weaker and longer than the bonds in carbon dioxide
- d. the bonds in carbon monoxide are stronger and longer than the bonds in carbon dioxide

8. What is the formal charge on nitrogen for the nitrate resonance structure shown below?



- a. +1
- b. 0
- c. -1
- d. +3
- e. +5
- f. -3

9. Which of the following best describes the bonds in the hybrid resonance structure for nitrite, NO_2^- ?

- a. a single N-O bond and a double N-O bond resonating back and forth
- b. two N-O single bonds
- c. two N-O 1.5 bonds
- d. a single N-O bond and a double O-O bond resonating back and forth

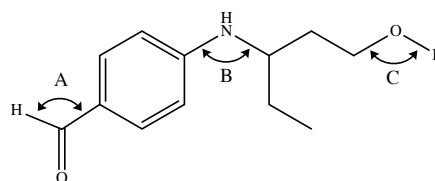
10. What is the molecular geometry for NCl_3 ?

- a. T-shape
- b. trigonal pyramid
- c. tetrahedral
- d. trigonal planar
- e. octahedral

11. Draw ozone and then determine which of the following statements is/are true.

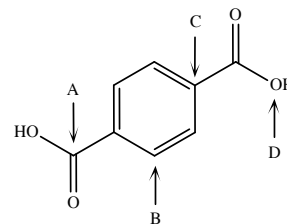
- I. ozone has a trigonal planar electronic geometry
 - II. the bond angles in ozone are approximately 109.5°
 - III. the bonds in ozone are weaker than the bond angles in diatomic oxygen
 - IV. ozone has a bent molecular geometry
- a. I, II, III, and IV
 - b. I and IV
 - c. I, II, and IV
 - d. I and III
 - e. I, III, and IV

12. What are the bond angles at positions labeled A, B, and C (in that order)?



- a. 120° , 107° , 104.5°
- b. 120° , 109.5° , 109.5°
- c. 107° , 109.5° , 90°
- d. 120° , 120° , 120°
- e. 109.5° , 120° , 178°

13. Which arrow(s) is/are pointing to a central atom with a trigonal planar molecular geometry?



- a. A, B, and C only
- b. A and C only
- c. A and B only
- d. A, B, C, and D
- e. B and C only

14. A molecule has three bonds and three lone pairs. What is the molecular geometry?

- a. see-saw
 - b. trigonal pyramid
 - c. T-shape
 - d. trigonal planar
 - e. octahedral
-

15. A molecule has four bonds and one lone pair. What are the electronic and molecular geometries, respectively?

- a. trigonal bipyramidal, seesaw
 - b. square pyramidal, seesaw
 - c. seesaw, trigonal bipyramidal
 - d. seesaw, square pyramidal
 - e. trigonal planar, tetrahedral
-

16. What is the product of the ozone-depleting mechanism that allows one chlorine atom to destroy around 100,000 ozone molecules in the stratosphere?

- a. a chlorine radical
 - b. oxygen gas
 - c. ozone
 - d. chlorine gas
-

17. Why are HFCs, the newest refrigerants in use, considered unsustainable?

- a. HFCs are cooling down the ozone layer.
 - b. HFCs are rapidly depleting the ozone layer.
 - c. HFCs are potent greenhouse gases.
 - d. HFCs emit UV radiation.
-

18. Which of the following is a reason why greenhouse gases are important to our ecosystems?

- a. Without greenhouse gases, global temperatures would average around -15°C .
 - b. The planet would be much warmer without greenhouse gases.
 - c. Greenhouse gases account for the majority of our atmosphere.
 - d. Greenhouse gases absorb about 99% of the total radiation from the sun.
-

19. Chlorofluorocarbon (CFC) use as refrigerants has impacted the environment because they...

- a. rapidly cooled down the air due to their thermal properties.
 - b. inadvertently caused an increase in carbon monoxide which is a toxic pollutant.
 - c. were toxic when inhaled in small quantities.
 - d. provided the source of the catalyst that causes ozone depletion.
 - e. depleted ozone at ground level via direct reaction.
-

20. Which of the following molecules can readily absorb IR radiation?

- I. Ar
 - II. O_2
 - III. CO_2
 - IV. CH_2F_2
- a. I, II, III, and IV
 - b. I and IV
 - c. I, II, and IV
 - d. I and III
 - e. III and IV
-

Remember to bubble in ALL your answers BEFORE time is called. Double check your name, utetid, 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.