

Answer each multiple choice by marking only one answer on your scantron unless the question states that there is more than one correct answer. Each multiple choice question is worth 2 pt.

CHP 4 (37 pt)

(6 pt) Calculate the number of food calories (Cal) in a cup of rice that has 2850 kJ of energy (4.184 J = 1 cal).

The Law of Conservation of Energy states that energy can be neither

1. _____ nor
2. _____, but it can be
3. _____ from one system to another and
4. _____ from one form to another.

Answers for Questions 1-4

- A) Changed
- B) Destroyed
- C) Transferred
- D) Collected
- E) Created

5. Which of the following statements about the colors emitted by elements put into a flame is/are **correct**?

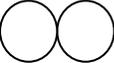
- i. The different colors are evidence that the protons in the atoms are changing energy states.
- ii. The different colors are evidence that electron energies ARE NOT restricted to certain values.
- iii. Light energy is emitted from atoms as electrons move from higher energy levels to lower energy levels.
- iv. Neutral atoms in the ground state emit light spontaneously.

A) i and ii B) i and iii C) ii & iii D) iii only E) iv only

6. Which of the following shell/subshell designations is not allowed?

- A) 4s B) 1s C) 1p D) 2s E) 2p

7. For the following orbitals, 1s, 2s, 2p, 3s and 3p, which of the following is most likely the 3s?

- A)  B)  C)  D)  E) 

8. Which of the following has the highest energy (*use your Aufbau diagram*)?

- A) 3s B) 3p C) 3d D) 4s

9. Indicate which of these electron configurations represent elements with similar chemical properties (**Mark two answers on your scantron**).

- A) $1s^2 2s^1$ B) $1s^2 2s^2$ C) $1s^2 2s^2 2p^1$ D) $1s^2 2s^2 2p^6 3s^1$ E) $1s^2 2s^2 2p^2$

10. Which group is the $ns^2 np^2$ group?

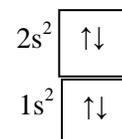
- A) 2A B) 3A C) 4A D) 5A E) 6A

11. Which of the following IS NOT correct?

- A) All the subshells (all the s, p, d's, etc) in a shell (principal energy level) have the same energy.
- B) A d subshell always contains five orbitals.
- C) An s orbital has a spherical shape.
- D) All orbitals can hold a maximum of 2 electrons.

(9 pt) Write the electron configuration for manganese _____

Draw the energy orbital diagram for manganese. For example Be is



CHP 5 (46 pt)

12. On the basis of formula which of these is an element? A) H₂ B) CO C) H₂O D) NH₃

13. Which of these elements has the the most valence electrons:

A) H B) C C) Na D) Al E) Ne

14. Which of the following elements will form an anion?

A) H B) K C) Na D) He E) Ar

15. Which of the following is isoelectronic (*same electron configuration*) with Ar?

(Mark your scantron for all that apply)

A) Na⁺ B) Cl⁻ C) O²⁻ D) Br⁻ E) P³⁻

16. How many bonding pairs/lone pairs are their in the following Lewis structure?

(A) 2/2 B) 2/4 C) 4/4 D) 4/8 E) 8/8 $\text{:}\ddot{\text{N}}=\text{O}=\ddot{\text{N}}\text{:}$

17. Which of the following bonds has the dipole shown correctly?

A) $\overset{+}{\text{N}}-\overset{-}{\text{C}}$ B) $\overset{+}{\text{O}}-\overset{-}{\text{H}}$ C) $\overset{+}{\text{H}}-\overset{-}{\text{Br}}$ D) $\overset{+}{\text{Cl}}-\overset{-}{\text{Cl}}$

18. The H-O bond is considered a

A) non-polar covalent bond B) polar covalent bond C) ionic bond

19. What is the normally expected bonding pattern for the element shown?

A) $\begin{array}{c} \text{..} \\ \text{---}\ddot{\text{O}}\text{---} \\ \text{..} \end{array}$ B) $\begin{array}{c} \text{..} \\ \text{---}\ddot{\text{N}}\text{---} \\ \text{..} \end{array}$ C) $\begin{array}{c} \text{..} \\ \text{---}\ddot{\text{C}}\text{---} \\ \text{..} \end{array}$ D) $\begin{array}{c} \text{..} \\ \text{---}\ddot{\text{Cl}}\text{---} \\ \text{..} \end{array}$

20. Which of the following statements is correct?

- A) Metal elements have greater electronegativity than non-metal elements.
- B) Electronegativity decreases from top to bottom in a group in the periodic table.
- C) Electronegativity increases from top to bottom in a group in the periodic table.
- D) Electronegativity decreases from left to right across a period in the periodic table.

21. All of these molecules have tetrahedral molecular geometry. Which one is a polar molecule?

- A) CH_3I B) CH_4 C) CH_3Cl D) CCl_4 E) more than one is polar.

(10 pt) Draw the Lewis structure for SO_2^{2-}

(16 pt) For each of the following molecules write the names of the shapes (geometries) and bond angles around the central atom.

STRUCTURE	ELECTRON GROUP GEOMETRY (<i>name</i>)	BOND ANGLE	MOLECULAR GEOMETRY (<i>name</i>)	POLAR (P) or NON-POLAR (NP)
$:\text{N}\equiv\text{N}-\ddot{\text{O}}:$				
$\begin{array}{c} \ddot{\text{F}}-\ddot{\text{N}}-\ddot{\text{F}}: \\ \\ \ddot{\text{F}}: \end{array}$				

CHP 6 (38 pt)

(10 pt) Draw a diagram using Lewis dot symbols showing the formation of the cation and anion and write the formula of the resulting ionic compound from the elements Ba and Cl.

LEWIS SYMBOLS

→

ION SYMBOLS

→

IONIC COMPOUND FORMULA

22. Which of the following formulas represents a covalent compound? (**Mark your scantron for all that apply**)

- A) NO B) No C) NH_4^+ D) ClO_2 E) $\text{Mg}(\text{OH})_2$

23. Which of the following are ionic compounds? (**Mark your scantron for all that apply**)

- A) H_2O B) Li_2O C) F_2O D) NH_3 E) MgS

24. A) TRUE B) FALSE ALL formulas that begin with "H" are acids.

25. Which of the following is a STRONG acid? A) HCl B) HNO_2 C) H_2CO_3 D) H_2SO_3

(10 pt) Complete the table with names

SO_3 (<i>a common air pollutant from oil refineries</i>)	
NH_3	
KCl (<i>in salt substitute</i>)	
SnF_2 (<i>the fluoride in toothpaste</i>)	
$\text{Mg}(\text{OH})_2$ (<i>in milk of magnesia</i>)	
NaHCO_3 (<i>in baking soda</i>)	
$\text{Zn}(\text{ClO}_3)_2$	
BaSO_4 (<i>used medically for GI X-rays</i>)	
HNO_3	
HCl (<i>swimming pool acid</i>)	

(10 pt) Complete the following table with formulas

phosphorus trichloride	
nitrogen monoxide	
silver sulfide (<i>the tarnish on silver</i>)	
iron(II) chloride	
potassium permanganate	
sodium hypochlorite (<i>in bleach</i>)	
calcium carbonate (<i>marble and chalk</i>)	
ammonium acetate	
phosphoric acid (<i>in navel jelly and Coke</i>)	
acetic acid (<i>in vinegar</i>)	

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
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† 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)
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Electronegativity Chart 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	‡	‡	‡	* Lanthanide Series † Actinide Series							

‡ IUPAC has not yet named these elements.

SCRATCH