

The Periodic Table

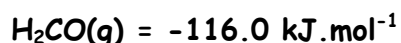
IA H 1 1.01	The Periodic Table																VIII A He 2 4.00																												
II A Li 3 6.94	II A Be 4 9.01											III A B 5 10.81	IV A C 6 12.01	V A N 7 14.01	VI A O 8 16.00	VII A F 9 19.00	VIII A Ne 10 20.18																												
Na 11 22.99	Mg 12 24.31											Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95																												
K 19 39.10	Ca 20 40.08	III B Sc 21 44.96	IV B Ti 22 47.88	V B V 23 50.94	VI B Cr 24 52.00	VII B Mn 25 54.94	VIII B Fe 26 55.85	VIII B Co 27 58.93	VIII B Ni 28 58.69	IB Cu 29 63.55	IIB Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80																												
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.91	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29																												
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)																												
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 263	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)	Ds 110 (271)	Rg 111 (272)	Uub 112 (285)	Uut 113 (284)	Uuq 114 (289)	Uup 115 (288)																															
<table border="1"> <tbody> <tr> <td style="text-align: center;">Ce 58 140.12</td> <td style="text-align: center;">Pr 59 140.91</td> <td style="text-align: center;">Nd 60 144.24</td> <td style="text-align: center;">Pm 61 (145)</td> <td style="text-align: center;">Sm 62 150.36</td> <td style="text-align: center;">Eu 63 152.97</td> <td style="text-align: center;">Gd 64 157.25</td> <td style="text-align: center;">Tb 65 158.93</td> <td style="text-align: center;">Dy 66 162.50</td> <td style="text-align: center;">Ho 67 164.93</td> <td style="text-align: center;">Er 68 167.26</td> <td style="text-align: center;">Tm 69 168.93</td> <td style="text-align: center;">Yb 70 173.04</td> <td style="text-align: center;">Lu 71 174.97</td> </tr> <tr> <td style="text-align: center;">Th 90 232.04</td> <td style="text-align: center;">Pa 91 231.04</td> <td style="text-align: center;">U 92 238.03</td> <td style="text-align: center;">Np 93 237.05</td> <td style="text-align: center;">Pu 94 (240)</td> <td style="text-align: center;">Am 95 243.06</td> <td style="text-align: center;">Cm 96 (247)</td> <td style="text-align: center;">Bk 97 (248)</td> <td style="text-align: center;">Cf 98 (251)</td> <td style="text-align: center;">Es 99 252.08</td> <td style="text-align: center;">Fm 100 257.10</td> <td style="text-align: center;">Md 101 (257)</td> <td style="text-align: center;">No 102 259.10</td> <td style="text-align: center;">Lr 103 262.11</td> </tr> </tbody> </table>																		Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97	Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11
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Solubility Guidelines

Soluble Ionic Compounds	Exceptions
Sodium (Na ⁺), potassium (K ⁺), and ammonium (NH ₄ ⁺) salts	
Nitrate (NO ₃ ⁻), acetate (CH ₃ CO ₂ ⁻), chlorate (ClO ₃ ⁻), and perchlorate (ClO ₄ ⁻) salts	
Chloride (Cl ⁻), bromide (Br ⁻), and iodide (I ⁻) salts	Pb ²⁺ , Ag ⁺ , Hg ₂ ²⁺
Fluoride (F ⁻) salts	Ca ²⁺ , Sr ²⁺ , Ba ²⁺ , Pb ²⁺
Sulfate (SO ₄ ²⁻) salts	Ca ²⁺ , Hg ₂ ²⁺ , Sr ²⁺ , Ba ²⁺ , Pb ²⁺

Insoluble Ionic Compounds	Exceptions
Hydroxide (OH ⁻) and oxide (O ²⁻) compounds	Na ⁺ , K ⁺ , Ba ²⁺
Sulfide (S ²⁻) salts	Na ⁺ , K ⁺ , NH ₄ ⁺ , Ba ²⁺
Carbonate (CO ₃ ²⁻) and phosphate (PO ₄ ³⁻) salts	Na ⁺ , K ⁺ , NH ₄ ⁺

Heats of Formation:



SID

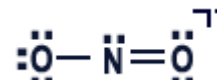
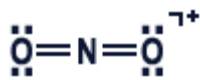
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Last _____

First _____

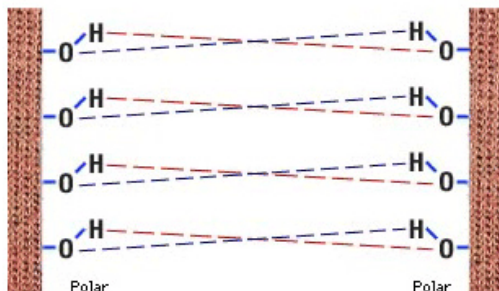
Question 1
8 Points

Classify each of the following molecules as **polar** or **nonpolar**?



Question 2
4 Points

In our discussion on the **consequences of molecular polarity**, the diagram depicted below was used to discuss:



- Membranes
- Micelle action
- Fabric softeners
- Like dissolves like
- Detergents

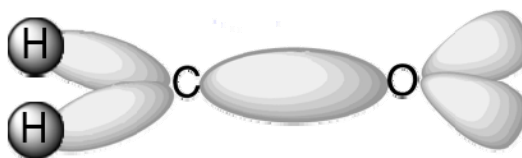
Question 3
9 Points

A molecule has sp^3d^2 hybridization with 2 lone pairs.

- The **electron pair geometry** of this molecule is: _____
- The **molecular geometry** of this molecule is: _____
- Molecule will have an **approximate bond angle(s)** of: _____

Question 4
8 Points

Depicted below are the sigma bonds in **formaldehyde (H_2CO)**.



- The **sigma** bond formed between the **carbon and oxygen atoms** is best described as being between the overlap of a(n) _____ hybrid orbital on C with a(n) _____ hybrid orbital on O.
- The **sigma** bonds formed between the **hydrogen and carbon** is best described as being the overlap of an _____ hybrid orbital on each carbon with the _____ orbital on the hydrogen atoms.
- The **pi** bond formed between carbon and oxygen is the result of the overlap by of a _____ orbital on carbon and oxygen.
- The **lone pairs** on the **oxygen atom** are found on _____ hybrid orbitals

<p>Question 5 6 Points</p>	<p>Classify each of the compounds as soluble (s) or not soluble (ns):</p> <p>a) Calcium iodide: _____</p> <p>b) Magnesium hydroxide: _____</p> <p>c) Barium fluoride: _____</p>
<p>Question 6 4 Points</p>	<p>Write a balanced chemical equation for the reaction that occurs when aqueous solutions of lead(II) iodide and iron(III) bromide are combined:</p> <p>_____ = _____</p>
<p>Question 7 4 Points</p>	<p>Write a net ionic equation for the reaction that occurs when aqueous solutions of potassium hydroxide and nitrous acid (HNO₂) are combined.</p> <p>_____ = _____</p>
<p>Question 8 4 Points</p>	<p>Write a net ionic equation for the reaction that occurs when an aqueous solution of hydriodic acid is added to solid barium sulfite.</p> <p>_____ = _____</p>
<p>Question 9 7 Points</p>	<p>A 41.2g sample of copper at 99.8°C is dropped into a beaker containing 153g of water at 18.5°C. What is the final temperature when thermal equilibrium is reached? <i>Assume the beaker neither absorbs nor loses heat.</i></p> <p>Heat Capacities : $\text{H}_2\text{O} = 4.184 \text{ J/g}^\circ\text{C}$ $\text{Cu} = 0.385 \text{ J/g}^\circ\text{C}$</p> <p style="text-align: right;"><u>For full credit you must show work.</u></p> <p style="text-align: right;">_____ °C</p>

Question 10

8 Points

In an experiment, a **1.452g** sample of **L-ascorbic acid** ($C_6H_8O_6$) is burned completely in a bomb calorimeter. The calorimeter is surrounded by **1319g** of water. During the combustion the temperature **increases** from **24.21** to **27.15 °C**.

Assuming that no energy is lost to the surroundings, **calculate the molar heat of combustion** of L-ascorbic acid based on these data.

Heat Capacities: $H_2O = 4.184 \text{ J/g}^\circ\text{C}$ Calorimeter = **784.2 J/°C**

Molar Mass: $C_6H_8O_6 = 176.13 \text{ g.mol}^{-1}$

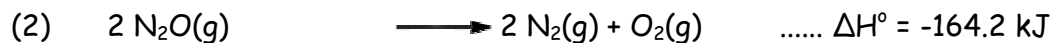
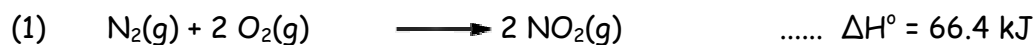
For full credit you must show work.

J.mol⁻¹

Question 11

6 Points

Given the standard enthalpy changes for the following two reactions:



what is the standard enthalpy change for the reaction:



For full credit you must show work.

kJ

Question 12
6 Points

Using standard heats of formation, *given on the first page of this exam*, calculate the standard enthalpy change for the following reaction.



kJ

Question 13
6 Points

How many milliliters of an aqueous solution of **0.204M magnesium iodide** is needed to obtain **13.7 grams** of the salt?

For full credit you must show work.

mL

Question 14
6 Points

For the following reaction, **0.126 moles** of propane (C_3H_8) are mixed with **0.222 moles** of oxygen gas.



What is the **maximum amount** of **carbon dioxide** that can be produced?

For full credit you must show work and give balanced chemical equation(s).

mol

Question 15

7 Points

For the following reaction, **3.43 grams of oxygen gas** are mixed with **excess butane** (C_4H_{10}). The reaction yields **1.97 grams of carbon dioxide**.



What is the **percent yield of carbon dioxide** ?

For full credit you must show work and give balanced chemical equation(s).

 %

Question 16

7 Points

What **volume in mL** of a **0.178M hydrochloric acid** solution is required to neutralize **24.7 mL** of a **0.158M calcium hydroxide** solution?

For full credit you must show work and give balanced chemical equation(s).

 mL

Do Not Write Below This

Exam III Score