可以使用計算機

1. Perform each calculation to the correct number of significant figures.

(a) 1.10 X 0.5120 X 4.0015 ÷ 3.4555　　　　(5 pts)

(b) (14.84 X 0.55) - 8.02　　　　　　(5pts)

2.

(a) Copper has two naturally occurring isotopes: Cu-63 with mass 62.9396 amu and a natural abundance of 69.17%, and Cu-65 with mass 64.9278 amu and a natural abundance of 30.83%. Calculate the atomic mass of copper.　　(5 pts)

(b) Calculate the amount of carbon (in moles) contained in a 0.0265-g pencil "lead." (Assume that the pencil "lead" is made of pure graphite, a form of carbon.)　　(5 pts)

[1 mole = 6.022 X 10^{23}]

3.

(a) What are the quantum numbers and names (for example, 2s, 2p) of the orbitals in the n = 4 principal level?　How many n = 4 orbitals exist?　　　　(5 pts)

(b) Which figure represents a *d* orbital?　　　　(5 pts)

a)
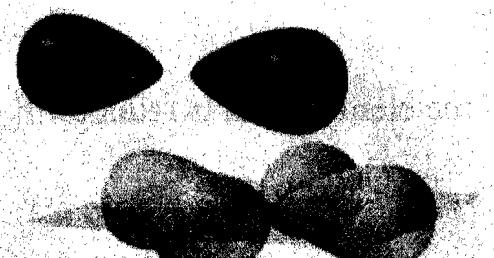
b)

c)

d) none of the above

4.

(a) Write the orbital diagram for sulfur and determine its number of unpaired electrons.　　(5 pts)
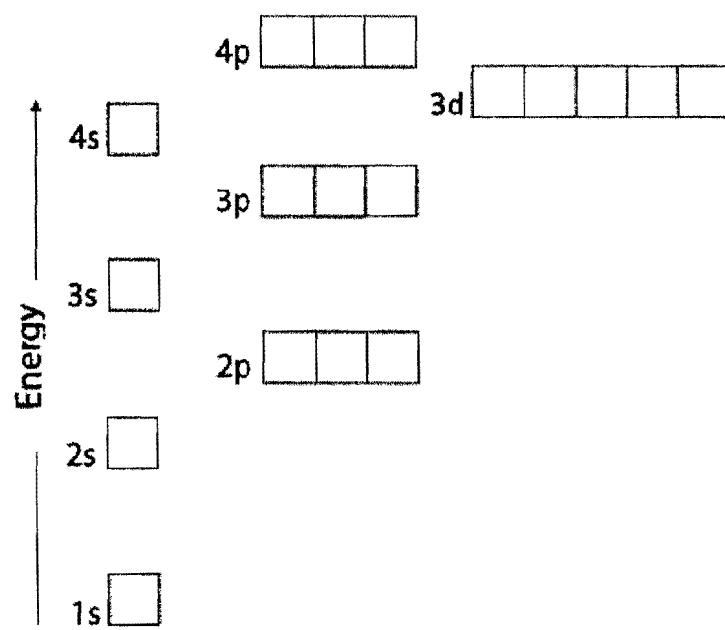
(b) On the basis of periodic trends, choose the larger atom in N or Al (if possible). Explain your choices.　　(5 pts)

5.

(a) On the basis of periodic trends, determine which element in N or Si has the higher first ionization energy.　　(5 pts)

(b) On the basis of periodic trends, choose the more metallic element from Ge or In.　　(5 pts)

6.

(a) Write the Lewis structure for XeF_2.　　(5 pts)

(b) Assign formal charges to each atom in the resonance forms of the cyanate ion (OCN^-). Which resonance form is likely to contribute most to the correct structure of OCN^-?　　(5 pts)
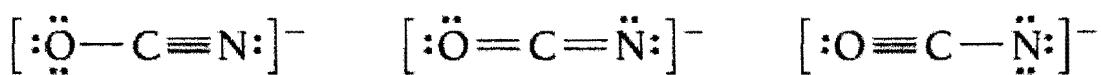

7.

(a) Predict the geometry and bond angles of PCl_3.　　(5 pts)

(b) Predict the geometry and bond angles of ICl_4^-.　　(5 pts)

8

(a) Use oxidation states to identify the element that is oxidized and the element that is reduced in the redox reaction.　　(5 pts)

$$Mg(s) + 2 H_2O(l) \longrightarrow Mg(OH)_2(aq) + H_2(g)$$
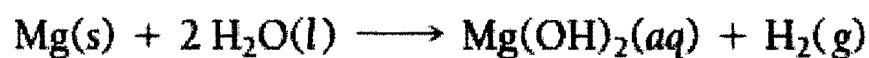
(b) Write a molecular and net ionic equation for the reaction between aqueous HI and aqueous $Ba(OH)_2$.　　(5 pts)

9.

(a) Arrange these ionic compounds in order of increasing magnitude of lattice energy:

　CaO, KBr, KCl, SrO.　　(5 pts)
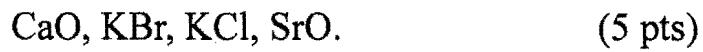
(b) Find ΔH_{rxn} for the reaction:

$$3 C(s) + 4 H_2(g) \longrightarrow C_3H_8(g)$$

Use these reactions with known ΔH values:
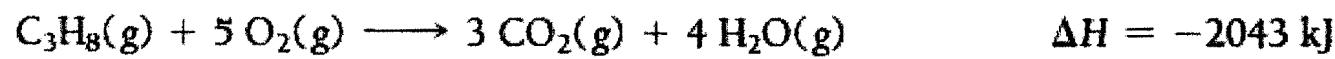
$C_3H_8(g) + 5 O_2(g) \longrightarrow 3 CO_2(g) + 4 H_2O(g)$　　　　$\Delta H = -2043 \text{ kJ}$

$C(s) + O_2(g) \longrightarrow CO_2(g)$　　　　$\Delta H = -393.5 \text{ kJ}$

$2 H_2(g) + O_2(g) \longrightarrow 2 H_2O(g)$　　　　$\Delta H = -483.6 \text{ kJ}$

(5 pts)

10.

(a) An unknown gas effuses at a rate that is 0.462 times that of nitrogen gas (at the same temperature). Calculate the molar mass of the unknown gas in g/mol.　　(5 pts)

(b) Calculate the vapor pressure at 25°C of a solution containing 99.5 g sucrose ($C_{12}H_{22}O_{11}$) and 300.0 mL water. The vapor pressure of pure water at 25°C is 23.8 torr. Assume the density of water to be 1.00 g/mL.　　(5 pts)

[附件]

Periodic Table

Hydrogen H 1.008																	Helium 2 He 4.0026
Lithium 3 Li 6.94	Beryllium 4 Be 9.0122											Boron 5 B 10.81	Carbon 6 C 12.011	Nitrogen 7 N 14.007	Oxygen 8 O 15.999	Fluorine 9 F 18.998	Neon 10 Ne 20.180
Sodium 11 Na 22.990	Magnesium 12 Mg 24.305											Aluminium 13 Al 26.982	Silicon 14 Si 28.085	Phosphorus 15 P 30.974	Sulfur 16 S 32.06	Chlorine 17 Cl 35.45	Argon 18 Ar 39.948
Potassium 19 K 39.098	Calcium 20 Ca 40.078	Scandium 21 Sc 44.956	Titanium 22 Ti 47.867	Vanadium 23 V 50.942	Chromium 24 Cr 51.996	Manganese 25 Mn 54.938	Iron 26 Fe 55.845	Cobalt 27 Co 58.933	Nickel 28 Ni 58.693	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.630	Arsenic 33 As 74.922	Selenium 34 Se 78.971	Bromine 35 Br 79.904	Krypton 36 Kr 83.798
Rubidium 37 Rb 97.468	Strontium 38 Sr 87.62	Yttrium 39 Y 88.906	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.906	Molybdenum 42 Mo 95.95	Technetium 43 Tc [98]	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 102.91	Palladium 46 Pd 106.42	Silver 47 Ag 107.87	Cadmium 48 Cd 112.41	Indium 49 In 114.82	Tin 50 Sn 118.71	Antimony 51 Sb 121.76	Tellurium 52 Te 127.60	Iodine 53 I 126.90	Xenon 54 Xe 131.29
Caesium 55 Cs 132.91	Barium 56 Ba 137.33	Lanthanum 57 La 138.91	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.95	Tungsten 74 W 183.84	Rhenium 75 Re 186.21	Osmium 76 Os 190.23	Iridium 77 Ir 192.22	Platinum 78 Pt 195.08	Gold 79 Au 196.97	Mercury 80 Hg 200.59	Thallium 81 Tl 204.38	Lead 82 Pb 207.2	Bismuth 83 Bi 208.98	Polonium 84 Po [209]	Astatine 85 At [210]	Radon 86 Rn [222]
Francium 87 Fr [223]	Radium 88 Ra [226]	Actinium 89 Ac [227]	Rutherfordium 104 Rf [267]	Dubnium 105 Db [268]	Seaborgium 106 Sg [269]	Bohrium 107 Bh [270]	Hassium 108 Hs [270]	Meitnerium 109 Mt [278]	Darmstadtium 110 Ds [281]	Roentgenium 111 Rg [282]	Copernicium 112 Cn [285]	Nihonium 113 Nh [286]	Flerovium 114 Fl [289]	Moscovium 115 Mc [290]	Livermorium 116 Lv [293]	Tennessine 117 Ts [294]	Oganesson 118 Og [294]

Cerium 58 Ce 140.12	Praseodymium 59 Pr 140.91	Neodymium 60 Nd 144.24	Promethium 61 Pm [145]	Samarium 62 Sm 150.36	Europium 63 Eu 151.96	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.93	Dysprosium 66 Dy 162.50	Holmium 67 Ho 164.93	Erbium 68 Er 167.26	Thulium 69 Tm 168.93	Ytterbium 70 Yb 173.05	Lutetium 71 Lu 174.97
Thorium 90 Th 232.04	Protactinium 91 Pa 231.04	Uranium 92 U 238.03	Neptunium 93 Np [237]	Plutonium 94 Pu [244]	Americium 95 Am [243]	Curium 96 Cm [247]	Berkelium 97 Bk [247]	Californium 98 Cf [251]	Einsteinium 99 Es [252]	Fermium 100 Fm [257]	Mendelevium 101 Md [258]	Nobelium 102 No [259]	Lawrencium 103 Lr [266]