

- Print your name and student number on your test booklet. UNDERLINE YOUR LAST NAME
- SPACE OUT YOUR ANSWERS – we will mark answers on the lined side of the page only – you can use the other side for rough work if you wish
- **KEEP YOUR TEST PAPER - HAND IN ONLY THE BOOKLET**
- **TURN OFF YOUR CELL PHONES AND ANY ALARMS YOU MAY HAVE**

25% 1. Electromagnetic radiation of wavelength 121 nm is just energetic enough to ionize sulfur.

- Determine the ionization energy of a sulfur atom
- Determine the ionization energy of sulfur in kJ/mol
- If you want the electrons that are emitted to have a kinetic energy of 900. kJ/mol, what wavelength of electromagnetic radiation will you need to use, **in nanometers?**

20% 2. For molybdenum $_{42}\text{Mo}$:

- Give the electron configuration
- Identify the valence subshell(s). Give the orbital diagram and the quantum numbers for all electrons in the valence subshell(s)
- Identify the highest energy subshell. Give the orbital diagram and the quantum numbers for all electrons in the highest energy subshell (if different from b).
- Give the electron configuration for the molybdenum(II) ion.

15% 3. Predict the most likely ion or ions for:

- a) $_{56}\text{Ba}$ b) $_{13}\text{Al}$ c) $_{49}\text{In}$ d) $_{52}\text{Te}$ e) $_{53}\text{I}$

15% 4. Give the IUPAC (systematic) name for the following:

- a) P_2O_3 b) CaO c) CoO d) In_2O_3

Give the chemical formula for the following:

- e) gallium nitride f) gallium nitrate g) antimony(III) sulfide

Turn over for question 5 and equations/P.T.

5. for TeCl_4^{2-} :

25% (tellurium tetrachloride anion)

- Show the Lewis diagram
- Give the bond order for each bond
- Draw and name the VSEPR geometry
- Show the bond and net dipoles

Data and Equations

$$E = hc/\lambda ; \quad E = hv$$

$$E = R_H \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right)$$

$$\text{K.E.} = \frac{1}{2} m v^2$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$R_H = 2.18 \times 10^{-18} \text{ J}$$

$$m_e = 9.109 \times 10^{-31} \text{ kg}$$

$$1 \text{ mol: } 6.02 \times 10^{23}$$

The periodic table
www.webelements.com

Key:		Element Name	Atomic number	Symbol	Atomic weight (mean relative mass)
1	H	Hydrogen	1	H	1.008
2	He	Helium	2	He	4.0026
3	Li	Lithium	3	Li	6.941
4	Be	Beryllium	4	Be	9.0122
5	B	Boron	5	B	10.81
6	C	Carbon	6	C	12.011
7	N	Nitrogen	7	N	14.007
8	O	Oxygen	8	O	15.999
9	F	Fluorine	9	F	18.998
10	Ne	Neon	10	Ne	20.180
11	Na	Sodium	11	Na	22.990
12	Mg	Magnesium	12	Mg	24.305
13	Al	Aluminum	13	Al	26.982
14	Si	Silicon	14	Si	28.086
15	P	Phosphorus	15	P	30.974
16	S	Sulfur	16	S	32.06
17	Cl	Chlorine	17	Cl	35.45
18	Ar	Argon	18	Ar	39.948
19	K	Potassium	19	K	39.098
20	Ca	Calcium	20	Ca	40.078(4)
21	Sc	Scandium	21	Sc	44.956
22	Ti	Titanium	22	Ti	47.887
23	V	Vanadium	23	V	50.942
24	Cr	Chromium	24	Cr	51.996
25	Mn	Manganese	25	Mn	54.938
26	Fe	Iron	26	Fe	55.845(2)
27	Co	Cobalt	27	Co	58.933
28	Ni	Nickel	28	Ni	58.693
29	Cu	Copper	29	Cu	63.546(3)
30	Zn	Zinc	30	Zn	65.38(2)
31	Ga	Gallium	31	Ga	69.723
32	Ge	Germanium	32	Ge	72.63
33	As	Arsenic	33	As	74.922
34	Se	Selenium	34	Se	78.96(3)
35	Br	Bromine	35	Br	79.904
36	Kr	Krypton	36	Kr	83.798(2)
37	Rb	Rubidium	37	Rb	85.468
38	Sr	Strontium	38	Sr	87.62
39	Y	Yttrium	39	Y	88.906
40	Zr	Zirconium	40	Zr	91.224(2)
41	Nb	Niobium	41	Nb	92.906(2)
42	Mo	Molybdenum	42	Mo	95.96(2)
43	Tc	Technetium	43	Tc	97.91
44	Ru	Ruthenium	44	Ru	101.07(2)
45	Rh	Rhodium	45	Rh	102.91
46	Pd	Palladium	46	Pd	106.42
47	Ag	Silver	47	Ag	107.87
48	Cd	Cadmium	48	Cd	112.41
49	In	Indium	49	In	114.82
50	Sn	Tin	50	Sn	118.71
51	Sb	Antimony	51	Sb	121.76
52	Te	Tellurium	52	Te	127.6(3)
53	I	Iodine	53	I	126.90
54	Xe	Xenon	54	Xe	131.29
55	Cs	Cesium	55	Cs	132.91
56	Ba	Barium	56	Ba	137.33
57-70	*	*	*	*	*
71	Lu	Lutetium	71	Lu	174.97
72	Hf	Hafnium	72	Hf	178.49(2)
73	Ta	Tantalum	73	Ta	180.95
74	W	Tungsten	74	W	183.84
75	Re	Rhenium	75	Re	186.21
76	Os	Osmium	76	Os	190.23(2)
77	Ir	Iridium	77	Ir	192.22
78	Pt	Platinum	78	Pt	195.08
79	Au	Gold	79	Au	196.97
80	Hg	Mercury	80	Hg	200.59
81	Tl	Thallium	81	Tl	204.38
82	Pb	Lead	82	Pb	207.2
83	Bi	Bismuth	83	Bi	208.98
84	Po	Polonium	84	Po	209
85	At	Astatine	85	At	210
86	Rn	Radon	86	Rn	222
87	Fr	Francium	87	Fr	223
88	Ra	Radium	88	Ra	226
89-102	**	**	**	**	**
103	Lr	Lawrencium	103	Lr	260
104	Rf	Rutherfordium	104	Rf	261
105	Db	Dubnium	105	Db	262
106	Sg	Seaborgium	106	Sg	263
107	Bh	Berkelium	107	Bh	264
108	Hs	Hassium	108	Hs	265
109	Mt	Moscovium	109	Mt	266
110	Ds	Darmstadtium	110	Ds	267
111	Rg	Roentgenium	111	Rg	268
112	Cn	Copernicium	112	Cn	269
113	Uut	Ununtrium	113	Uut	270
114	Ff	Flerovium	114	Ff	271
115	Uup	Ununpentium	115	Uup	272
116	Lv	Livermorium	116	Lv	273
117	Uuq	Ununseptium	117	Uuq	274
118	Uuo	Ununoctium	118	Uuo	276

***lanthanoids**

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
57	58	59	60	61	62	63	64	65	66	67	68	69	70
138.91	140.12	140.91	144.24	144.91	150.36(2)	151.96	157.25(3)	158.93	162.50	164.93	167.26	168.93	173.05
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No
89	90	91	92	93	94	95	96	97	98	99	100	101	102
227.03	232.04	231.04	238.03	237.05	244.06	243.06	247.07	247.07	251.08	252.08	257.10	258.10	259.10

****actinoids**

Symbols and names: the symbols and names of the elements, and their groupings are those recommended by the International Union of Pure and Applied Chemistry (IUPAC - <http://www.iupac.org/>). Names have yet to be proposed for elements 113, 115, 117, and 118 and so those used here are IUPAC's temporary system (1-10) used here is the current IUPAC convention. Atomic weights (mean relative masses): these are the IUPAC 2009 values and given to 5 significant figures. The last significant figure of each value is considered reliable to ±1 except where a larger uncertainty is given in parentheses. Representative values for those elements having an atomic weight interval are given (H, Li, B, C, N, O, Si, Cl, Ti). Elements for which the atomic weight is given within brackets have no stable nuclides and are represented by the element's longest-lived nuclide. Values in parentheses are ¹ June 2013. ©2012 Dr. Mark A. Winter (Webelements Ltd and University of Sheffield). All rights reserved. For updates to this table see http://www.webelements.com/history/updates_1306_2012/.