BRADFORD COLLEGE

**CHEMISTRY TEST ATOMIC STRUCTURE 2014**

STUDENT NAME :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Marks: /40

1. What are the states of the following substances at 250 Celsius? [4]

Nitrogen\_\_\_\_\_\_\_\_\_\_\_\_

Copper\_\_\_\_\_\_\_\_\_\_\_\_\_

Mercury \_\_\_\_\_\_\_\_\_\_\_\_

Table salt\_\_\_\_\_\_\_\_\_\_\_

1. Name the changes of states. [4]

Example: Water turns to ice: *solidification*

Boil liquid water and water steam forms\_\_\_\_\_\_\_\_\_\_\_

Dry ice turns to carbon dioxide gas \_\_\_\_\_\_\_\_\_\_\_\_\_

Ice-cream left outside \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Early in the morning, water droplets form on a window \_\_\_\_\_\_\_\_\_

1. Solid and liquid density comparison
   1. Draw a diagram of the arrangement of the particles in solid. [1]
   2. Draw a diagram of the arrangement of the particles in liquid. [1]
   3. Use your diagrams above to explain why substances in the solid state are usually heavier than the same substance in the liquid state. [1]
2. Classify each of the following as an element, compound or mixture. [3]

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| --- | --- |
| blood | ethanol |
| sulphur | a cup of tea |
| ammonia | zirconium |

1. List one similarity and one difference between a compound and a mixture. [2]

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1. The combustion of propane in air produces carbon dioxide and water.
   1. Balance the combustion equation. [2]



* 1. State which law is used to balance the equation above. [1]

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1. Complete the following table. [7]

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| --- | --- | --- | --- | --- | --- |
| **SYMBOL** | **ATOMIC NUMBER** | **MASS NUMBER** | **PROTONS** | **NEUTRONS** | **ELECTRONS** |
|  | 14 | 28 |  |  | 14 |
| Cs+ |  | 133 |  |  |  |
| Po |  | 209 |  |  |  |
|  |  |  | 53 | 74 | 54 |

1. Bromine has two stable isotopes with mass numbers of 79 and 81.
   1. Write down the symbols for the two isotopes including the proper subscripts and superscripts. [1]

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* 1. List one similarity and one difference between the two.( hint: properties, subatomic numbers) [2]

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1. For Molybdenum, a student proposed that the electronic figuration is:

1s22s22p63s23p64s23d104p65S14d5

1. Draw the spin diagram for molybdenum.[1]
2. This electronic configuration does not make sense according to a principle. State the name of that principle. [1]

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1. Give one reason why Molybdenum adopts 5S14d5 instead of 5S24d4. [1]

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1. Write down the electronic configuration and draw spin diagrams for the following atoms and ions. [8]
   1. Ca2+
   2. Aluminium
   3. Bromide ion
   4. Mercury

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|  |

PERIODIC TABLE OF ELEMENTS

↓PERIOD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 |  |  |  |  |  |  |  |  |  |  | 13 | 14 | 15 | 16 | 17 | 18 |
| 1 | 1  H  Hydrogen  1.008 |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | 2  He  Helium  4.003 |
| 2 | 3  Li  Lithium  6.941 | 4  Be  Beryllium  9.012 |  |  |  | ← GROUP → | |  |  |  |  |  | 5  B  Boron  10.811 | 6  C  Carbon  12.011 | 7  N  Nitrogen  14.007 | 8  O  Oxygen  15.999 | 9  F  Fluorine  18.998 | 10  Ne  Neon  20.180 |
| 3 | 11  Na  Sodium  22.990 | 12  Mg  Magnesium  24.305 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13  Al  Aluminium  26.982 | 14  Si  Silicon  28.086 | 15  P  Phosphorus  30.974 | 16  S  Sulphur  32.065 | 17  Cl  Chlorine  35.453 | 18  Ar  Argon  39.948 |
| 4 | 19  K  Potassium  39.098 | 20  Ca  Calcium  40.078 | 21  Sc  Scandium  44.956 | 22  Ti  Titanium  47.867 | 23  V  Vanadium  50.942 | 24  Cr  Chromium  51.996 | 25  Mn  Manganese  54.938 | 26  Fe  Iron  55.845 | 27  Co  Cobalt  58.933 | 28  Ni  Nickel  58.693 | 29  Cu  Copper  63.546 | 30  Zn  Zinc  65.380 | 31  Ga  Gallium  69.723 | 32  Ge  Germanium  72.640 | 33  As  Arsenic  74.922 | 34  Se  Selenium  78.960 | 35  Br  Bromine  79.904 | 36  Kr  Krypton  83.798 |
| 5 | 37  Rb  Rubidium  85.468 | 38  Sr  Strontium  87.620 | 39  Y  Ytrium  88.906 | 40  Zr  Zirconium  91.224 | 41  Nb  Niobium  92.906 | 42  Mo  Molybdenum  95.940 | 43  Tc  Technetium  98.91 | 44  Ru  Ruthenium  101.070 | 45  Rh  Rhodium  102.906 | 46  Pd  Palladium  106.42 | 47  Ag  Silver  107.870 | 48  Cd  Cadmium  112.411 | 49  In  Indium  114.428 | 50  Sn  Tin  118.710 | 51  Sb  Antimony  121.760 | 52  Te  Tellurium  127.600 | 53  I  Iodine  126.904 | 54  Xe  Xenon  131.293 |
| 6 | 55  Cs  Caesium  132.905 | 56  Ba  Barium  137.327 | 71  Lu  Lutetium  174.967 | 72  Hf  Hafnium  178.490 | 73  Ta  Tantalum  180.948 | 74  W  Tungsten  183.840 | 75  Re  Rhenium  186.207 | 76  Os  Osmium  190.230 | 77  Ir  Iridium  192.217 | 78  Pt  Platinum  195.064 | 79  Au  Gold  196.967 | 80  Hg  Mercury  200.590 | 81  Tl  Thallium  204.383 | 82  Pb  Lead  207.200 | 83  Bi  Bismuth  208.980 | 84  Po  Polonium  (209) | 85  At  Astatine  (210) | 86  Rn  Radon  (222) |
| 7 | 87  Fr  Francium  (223) | 88  Ra  Radium  226.030 | 103  Lr  Lawrencium  262.100 | 104  Rf  Rutherfordium  (267) | 105  Db  Dubnium  (268) | 106  Sg  Seaborgium  (271) | 107  Bh  Bohrium  (272) | 108  Hs  Hassium  (269) | 109  Mt  Meitnerium  (268) | 110  Ds  Darmstadium  (271) | 111  Rg  Roentgenium  (280) | 112  Uub  Ununbium  (285) | 113  Uut  Ununtrium  (284) | 114  Uuq  Ununquadium  (289) | 115  Uup  Ununpentium  (288) | 116  Uuh  Ununhexium  (293) | 117  Uus  Ununseptium | 118  Uuo  Ununoctium  (294) |
|  | KEY |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **57**  **La**  **Lanthanum**  **133.905** | **Atomic**  **Number**  **Symbol**  **Name**  **Relative**  **atomic mass** | 57  La  Lanthanum  138.905 | 58  Ce  Cerium  140.116 | 59  Pr  Praseodymium  140.908 | 60  Nd  Neodymium  144.242 | 61  Pm  Promethium  (145) | 62  Sm  Samarium  150.360 | 63  Eu  Europium  151.964 | 64  Gd  Gadolinium  157.250 | 65  Tb  Terbium  158.925 | 66  Dy  Dysprosium  162.500 | 67  Ho  Holmium  164.930 | 68  Er  Erbium  167.259 | 69  Tm  Thulium  168.934 | 70  Yb  Ytterbium  173.054 |  |  |
|  | **metalloids** |  | 89  Ac  Actinium  (227) | 90  Th  Thorium  232.038 | 91  Pa  Protactinium  231.036 | 92  U  Uranium  238.029 | 93  Np  Neptunium  (237) | 94  Pu  Plutonium  (244) | 95  Am  Americium  (2443) | 96  Cm  Curium  (247) | 97  Bk  Berkelium  (247) | 98  Cf  Californium  (251) | 99  Es  Einsteinium  (252) | 100  Fm  Fermium  (257) | 101  Md  Mendelevium  (258) | 102  No  Nobelium  (259) |  |  |