

**Test 1 2015**

**Classification of matter, Atomic structure**

**Question/Answer Booklet**

**CHEMISTRY**

**Stage 2**

|  |  |
| --- | --- |
| **Student Name/Number:** |  |

|  |  |
| --- | --- |
| **Section** | **Mark** |
| One | /30 |
| Two | /35 |
| Total | /65 |
| % | |

**Time allowed for this paper**

Working time for paper:

**PTE mark /4**

**Material required/recommended for this paper**

***To be provided by the supervisor***

This Question/Answer booklet

Multiple-choice Answer sheet

Chemistry Data sheet

***To be provided by the candidate***

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the WACE examinations

**Important note to candidates**

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Section One: Multiple-choice (30 marks)**

This section has **15** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided.

Suggested working time:

1. Which one of the following ions is colourless in aqueous solution?
   1. Co2+
   2. Cr3+
   3. Mg2+
   4. Fe2+
2. Which statement does not describe a physical property?
   1. Its crystals are a metallic gray.
   2. It dissolves in alcohol.
   3. It forms a violet-colored gas.
   4. It reacts with hydrogen to form a gas.
3. When a solution of lead nitrate is added to a solution of sodium iodide, an insoluble yellow precipitate of lead iodide is formed. Of the following the BEST way of separating the lead iodide from the solution would be
   1. evaporation.
   2. distillation.
   3. filtration.
   4. crystallization.
4. Which of the following contains only pure substances?
   1. molten iron, oxygen gas, water
   2. molten iron, an aqueous solution of copper(11) chloride
   3. Salt, nitrogen gas, copper(11) nitrate solution
   4. Carbon dioxide gas, nitrogen gas, air
5. Which of the following statements is NOT consistent with the kinetic theory of gases?
   1. Any two gases at the same temperature will have the same average kinetic energy
   2. The molecules of a gas move in random, straight line motion, colliding with the walls of their container and each other
   3. The average distance between gas molecules is large compared to the relatively small size of the molecules themselves.
   4. There is some loss of energy as gas molecules collide because these collisions are not perfectly elastic.
6. The following diagram represents the apparatus used for filtration.

The correct names for labels A and B respectively are

* 1. filtrate and distillate
  2. crystals and residue
  3. filtrate and residue
  4. residue and filtrate

1. What is the product of (52.6 cm).(1.214 cm) expressed to the correct number of significant figures?
   1. 64 cm2
   2. 63.9 cm2
   3. 63.86 cm2
   4. 63.90 cm2
2. Accuracy relates to
   1. the spread of results measured for a particular data point.
   2. the difference between the measured value and the true value.
   3. random errors.
   4. systematic errors
3. Which of the following statements regarding atomic particles is false?
   1. Protons are found in the nucleus and are positively charged particles.
   2. Electrons move around the nucleus and contribute little to the mass of the atom.
   3. Neutrons are found in the nucleus and they have no charge.
   4. The numbers of neutrons, protons and electrons are always equal in a neutral atom.
4. The formula of the dihydrogen phosphate ion is
   1. SO42-
   2. HSO4-
   3. HPO42-
   4. H2PO4-
5. The name of the ionic compound, SnCl4 is
   1. Tin tetrachloride.
   2. Tin (I) chloride.
   3. Tin (II) chloride.
   4. Tin (IV) chloride.
6. Which one of the following is the most important factor that determines the chemical properties of an element?
   1. The number of protons in the nucleus of the atom.
   2. The total number of electrons in the atom.
   3. The number of valence electrons in the atom.
   4. The number of neutrons in the nucleus of the atom.
7. The electron configuration: 2, 8, 4 is that of:
   1. Carbon
   2. Nitrogen
   3. Neon
   4. Silicon
8. The ion  contains:
   1. 71 protons, 33 neutrons and 68 electrons.
   2. 33 protons, 38 neutrons and 30 electrons.
   3. 33 protons, 38 neutrons and 33 electrons.
   4. 33 protons, 71 neutrons and 30 electrons.
9. The element boron has two stable isotopes, 10B and 11B and an atomic weight of 10.811. From this it can be concluded that:
   1. the % natural abundance of 10B is larger than the % natural abundance of 11B.
   2. the mass number of both isotopes is the same.
   3. the atomic number of 10B is larger than the atomic number of 11B.
   4. the % natural abundance of 10B is smaller than the % natural abundance of 11B.

**END OF PART A – PLEASE TURN OVER**

**PART B: EXTENDED ANSWER AND CALCULATIONS ( 30 MARKS)**

1. Complete the following table: [3]

|  |  |  |
| --- | --- | --- |
| **Sub atomic particle** | **Relative Charge** | **Relative Mass** |
| Proton | +1 | **1** |
| **Electron** | **-1** | 1/1850 |
| **Neutron** | 0 | **1** |

**1 mark each for an entirely correct row**

**Charges had to be given as +1, not just (0.5 mark off for each)**

1. The next two questions relate to the term ‘isotope’.
2. Using an example, explain what is meant by the term ‘isotope’. [2]

**Atoms with the same number of protons as one another but different numbers of neutrons.**

**Any valid example: e.g C-14 has 6 protons, 8 neutrons, wheras C-12 had 6 protons, and 6 neutrons;**

**(Not sufficient to just give the examples, e.g. C-14, but not refer to the number of neutrons)**

1. Would you expect two isotopes of the same element to have similar or

different chemical properties? Explain your answer. [2]

**Similar chemical properties as it is the number of valence electrons which determines the chemical properties of an element**

Copper has two isotopes; 69.17% copper -63 and 30.83% copper - 65. Calculate the average atomic weight of copper based on this data to 3 significant figures. (Show your workings). [3]

**(63 \* 69.17 + 65 \* 30.83)/100 = 63.62 %**

**1 mark for calculating correct average**

**1 mark for showing working out**

**1 mark for 4SF**

1. Write the chemical formula for each of the following: [3]

(a) rubidium carbonate **Rb2CO3**

(b) potassium dichromate **K2Cr2O7**

(c) ammonium sulfide (**NH4)2S**

1. Name each of the following compounds [3]

(a) Fe(MnO4)3 **Iron (III) permanganate**

(b) AlPO4 **Aluminium phosphate**

(c) Ni(HSO4)2 **Nickel hydrogensulfate**

1. Provide the formula for ionic compounds formed from the following pairs of ions: [6]
2. K+ and CH3COO- **KCH3COO**
3. Mg2+ and OH- **Mg(OH)2**
4. Na+ and SO42-  **Na2SO4**
5. Mn2+ and CO32- **MnCO3**
6. Complete the table below: [6]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Name of isotope | Atomic symbol | Number of Protons | Number of Neutrons | Number of Electrons | Nuclide symbol | Ion Symbol |
| Sulfur 34 | S | 16 | 18 | 18 |  | **S2-** |
| Cobalt-60 | Co | 27 | 33 | 24 |  | Co3+ |
| Nitrogen-15 | N | 7 | 8 | 10 | 15  **N**  7 | N3- |

**1/2 mark for each correct answer**

1. Write a definition and give an example for:
2. a homogeneous mixture. [2]

**a mixture that has a uniform distribution throughout (1)**

**(e.g. a solution) (1)**

1. a pure substance [2]

**a substance with a constant composition (definition given here for**

**constant composition (i.e. fixed ratio), (1)**

**(e.g. water H2O) (1)**

**END OF PART B – PLEASE TURN OVERPART C: VALIDATION QUESTIONS FROM PERIODIC TABLE RESEARCH ASSIGNMENT (4 MARKS)**

How does position of an element on the modern Periodic table relate to electrons and chemical properties? Give an example of each.

The properties of an atom relate directly to the number of electrons in various orbitals (1)

The valence electrons are related to the chemical properties of the element (1)

All the elements in a particular group are chemically similar in nature./Elements within a group show regular gradation in their physical properties and chemical reactivities.(1)

Relevant example(1)

**END OF TEST –**