**ATAR CHEMISTRY**

**Formative Assessment:**

**UNIT 1 Part A**

**2020**



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

**To be provided by the supervisor:**

This Question/Answer Booklet

Multiple-choice Answer Sheet

Chemistry Data Book

**To be provided by the candidate:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

eraser, correction tape/fluid, ruler, highlighters

Special items: up to three 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.

**Structure of this paper**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time  (minutes) | Marks available | Percentage of examination |
| Section One  Multiple-choice | 25 | 25 | 50 | / 25 | / 25 |
|  | | | | | / 100 |

**Instructions to candidates**

1. Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens.

2. Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.



Multiple-choice Answer Sheet

|  |
| --- |
| Name: |

**INSTRUCTIONS**

|  |
| --- |
| For each question shade the box to indicate your answer.  Use **only** a blue or black **pen** to shade the boxes.  For example, if b is your answer: a □ b ■ c □ d □  If you make a mistake, place a cross through that square and shade your new answer. **Do not** erase or use correction fluid/tape.  For example, if b is a mistake and d is your answer: a □ b ■ c □ d ■  If you then want to use your first answer b, cross out d and then circle b.  a □ b ■ c □ d ■  Marks will **not** be deducted for incorrect answers.  **No marks** will be given if more than one answer is completed for any question. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | a □ b □ c □ d □ |  | 6 | a □ b □ c □ d □ |  | 11 | a □ b □ c □ d □ |
| 2 | a □ b □ c □ d □ |  | 7 | a □ b □ c □ d □ |  | 12 | a □ b □ c □ d □ |
| 3 | a □ b □ c □ d □ |  | 8 | a □ b □ c □ d □ |  | 13 | a □ b □ c □ d □ |
| 4 | a □ b □ c □ d □ |  | 9 | a □ b □ c □ d □ |  | 14 | a □ b □ c □ d □ |
| 5 | a □ b □ c □ d □ |  | 10 | a □ b □ c □ d □ |  | 15 | a □ b □ c □ d □ |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 16 | a □ b □ c □ d □ |  | 21 | a □ b □ c □ d □ |  |  |  |
| 17 | a □ b □ c □ d □ |  | 22 | a □ b □ c □ d □ |  |  |  |
| 18 | a □ b □ c □ d □ |  | 23 | a □ b □ c □ d □ |  |  |  |
| 19 | a □ b □ c □ d □ |  | 24 | a □ b □ c □ d □ |  |  |  |
| 20 | a □ b □ c □ d □ |  | 25 | a □ b □ c □ d □ |  |  |  |

**Section One: Multiple-choice 25% (25 marks)**

This section has **25** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 50 minutes.

1. Which of the following statements regarding subatomic particles is **not** correct?

1. The mass of a proton and neutron are equal.
2. The mass of a proton is greater than that of an electron.
3. The charge of a proton and electron are equal in magnitude.
4. The charge of a neutron is greater than that of a proton.

2. Which of the following species has the most stable electron configuration?

1. Na2+
2. P2-
3. Al+
4. N3-

3. Which of the following is **not** a mixture?

(a) Brass

(b) Ammonia

(c) Air

(d) Vinegar

4. Cobalt metal is placed into a solution of sulfuric acid, producing cobalt sulfate solution, sulfur dioxide gas and water.

The correctly balanced chemical equation representing this reaction is

1. Co(s) + H2SO4(aq) → CoSO4(aq) + SO2(g) + H2O(l)
2. Co(s) + 2 H2SO4(aq) → Co(SO4)2(aq) + SO2(g) + 2 H2O(l)
3. Co(s) + 2 H2SO4(aq) → CoSO4(aq) + SO2(g) + 2 H2O(l)
4. Co(s) + H2SO3(aq) → CoSO3(aq) + SO2(g) + H2O(l)

5. Which of the following statements does **not** contribute to an explanation of why sodium (Na) and magnesium (Mg) display different emission and absorption spectra?

1. The number of electron shells present in each element differs.
2. The number of electrons in each element differs.
3. The energy of the electron shells in each element differs.
4. The distance between the electron shells of each element differs.

**Questions 6, 7 and 8 refer to the procedure illustrated below.**

The following flow chart shows the procedure carried out by several groups of students, in order to separate a mixture of powdered barium sulfate (BaSO4) and powdered sodium nitrate (NaNO3). There was 3.0 grams of each powder present in the initial mixture.

NaNO3(aq)

mixture containing 3.0 g BaSO4(s) and 3.0 g NaNO3(s)

add distilled water and stir

BaSO4(s)

NaNO3(aq)

pour

BaSO4(s)

wash and dry residue

NaNO3(s)

Y

heat to remove distilled water

X

6. Name the separation techniques being used at X and Y.

**X Y**

1. decantation filtration
2. filtration evaporation
3. sieving evaporation
4. filtration decantation

7. Which of the following errors, when introduced into this procedure, would result in a **decreased** mass of BaSO4(s) being recorded?

1. Not washing the BaSO4 residue with distilled water before weighing.
2. Not subtracting the mass of the filter paper when determining the mass of BaSO4.
3. Not transferring all of the BaSO4(s) and NaNO3(aq) mixture into the funnel.
4. Not allowing the BaSO4 residue to dry before weighing.

8. The table below shows the results of four different student groups (A to D). Each group carried out this separation procedure four (4) times and recorded the final masses of BaSO4(s) and NaNO3(s) obtained in each trial. This table shows only the mass, in grams, of NaNO3(s) obtained by each group, across each of their four trials.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| **Group A** | 3.1 | 3.2 | 3.1 | 3.2 |
| **Group B** | 2.9 | 3.0 | 2.9 | 3.2 |
| **Group C** | 2.3 | 2.4 | 2.5 | 2.4 |
| **Group D** | 3.3 | 3.3 | 3.3 | 3.3 |

Which of the following statements is **correct**?

1. Group A was the most accurate.
2. Group B was the most precise.
3. Group C suggests only sources of random error were present.
4. Group D suggests a source of systematic error.

9. Chromium has four (4) naturally occurring isotopes;

(i) chromium-50

(ii) chromium-52

(iii) chromium-53

(iv) chromium-54.

Which of these isotopes would have the same electron configuration, at room temperature?

1. (i) and (ii) only.
2. (ii) and (iii) only.
3. (i) and (iv) only.
4. All of (i), (ii), (iii) and (iv).

**Questions 10, 11 and 12 refer to the four organic compounds in the table below, shown as condensed formulas.**

|  |  |
| --- | --- |
| **A**  (CH3)3CCH2CH2CH3 | **B**  CH3CH(CH3)CHCHCH3 |
| **C**  CH3CH2CH(C2H5)CH(CH3)CH3 | **D**  CH3(CH2)5CH3 |

10. Which compound is unsaturated?

1. A
2. B
3. C
4. D

11. Which compound has the IUPAC name 2,2-dimethylpentane?

(a) A

(b) B

(c) C

(d) D

12. The full structural formula of which compound is shown below?



1. A
2. B
3. C
4. D

13. Choose the reaction below that represents an endothermic process.

1. K(g) → K+(g) + e-
2. 2 H2(g) + O2(g) → 2 H2O(g)
3. Ag+(aq) + Cl-(aq) → AgCl(s)
4. 2 N(g) → N2(g)

14. Silicon (Si) is placed to the immediate right of aluminium (Al) on the periodic table because

1. it is a semi-metal.
2. it is a less reactive element.
3. it contains one more proton.
4. it is slightly larger in diameter.

15. An ion will always have

(a) a different number of protons and neutrons.

(b) a different number of protons and electrons.

(c) a different number of neutrons and electrons.

(d) the electron configuration of a Noble Gas.

**Questions 16 and 17 relate to the compound shown below.**



16. Which of the following statements is **not** correct regarding this compound?

1. The compound is called benzene.
2. The compound has the molecular formula C6H6.
3. The compound contains delocalised electrons.
4. The compound conducts electricity.

17. This compound was mixed with chlorine gas in the presence of an appropriate catalyst. Choose the species below that **cannot** be present in the final reaction mixture.













1. HCl

**Questions 18 and 19 refer to the diagram below regarding changes of state / phase.**

A B

Solid Liquid Gas

C D

18. Give the names for the processes occurring at B and C.

**B C**

1. boiling melting
2. vaporisation solidification
3. condensation freezing
4. solidification boiling

19. Which two processes are exothermic?

1. A and B
2. A and C
3. B and D
4. C and D

20. Which of the following statements is **not generally** correct?

1. Elements in group 15 have the capacity to form single covalent bonds with three other atoms.
2. Elements in group 16 have the capacity to form triple covalent bonds.
3. Elements in group 17 do not have the capacity to form double covalent bonds.
4. Elements in group 18 do not tend to form covalent bonds.

21. A separating funnel can be used to separate oil and water, as shown in the diagram below.

oil

water

Which of the following statements is **least** relevant in justifying the use of this separating technique in this situation?

1. The oil and water have different boiling points.
2. The oil and water are both liquid.
3. The oil and water have different densities.
4. The oil is not soluble in the water.

**Questions 22 and 23 refer to the production of ethanol and bioethanol.**

Ethanol and bioethanol are both very useful fuels and chemical reagents. The chemical equations for the manufacture of ethanol and bioethanol are given below.

Ethanol: C2H4(g) + H2O(g) → C2H5OH(g) + 45 kJ

Bioethanol: C6H12O6(s) → 2 C2H5OH(l) + 2 CO2(g) + 68 kJ

22. What is a key difference between the ethanol and bioethanol?

1. Bioethanol is structurally different to ethanol.
2. Bioethanol has a different molecular formula to ethanol.
3. Bioethanol contains a lower percent composition of carbon than ethanol.
4. Bioethanol is produced from a renewable resource.

23. Consider the enthalpy change diagrams below, which all have the same scale on their vertical axis.

**A B**

Reactants

Products

H

Progress of reaction

Reactants

Products

H

Progress of reaction

Reactants

Products

H

Progress of reaction

Reactants

Products

H

Progress of reaction

**C D**

Which diagrams are most representative of the chemical reactions used to produce ethanol and bioethanol?

**Ethanol Bioethanol**

(a) A C

(b) C A

(c) B D

(d) D B

24. Which of the following lists contains ions that all have the same valency charge?

1. fluoride, hydrogencarbonate, phosphide
2. carbonate, nitrate, sulfate
3. sulfite, dichromate, hydrogenphosphate
4. hydrogensulfate, phosphate, bromide

25. A sample of pure water boils at 100 °C. Under the same conditions of pressure, a sample of pure water containing dissolved sodium chloride would

1. have a boiling point of 102 °C.
2. have a boiling point of 98 °C.
3. have a boiling point above 100 °C.
4. have a boiling point below 100 °C.

End of Section One