EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Chemistry 5070/1
Paper 1 Multiple Choice

Tuesday 12 JULY 2016

Additional materials:
- Electronic calculator (non programmable) and / or Mathematical tables
- Multiple Choice Answer Sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)

Time 1 hour

Instructions to Candidates

Do not open this question paper until you are told to do so.

Look at the left hand side of your answer sheet. Ensure that your name, the school/centre name and subject paper are printed. Also ensure that the subject code, paper number, centre code, your examination number and the year are printed and shaded. Do not change the already printed information.

There are forty questions in this paper. Answer all questions. For each question there are four possible answers, A, B, C and D. Choose the one you consider correct and record your choice in soft pencil on the separate answer sheet provided.

Read very carefully the instructions on the Answer Sheet.

Information for Candidates

Each correct answer will score one mark.

Any rough working should be done in this question paper.

The Periodic Table is printed on page 14.

Cell phones are not allowed in the examination room.

This question paper consists of 14 printed pages.
1. Four identical gas jars are filled with different gases. The lids are taken off the gas jars and left open in a room for 10 minutes.

Which gas jar A, B, C or D will then have the most gas left in it?

2. The diagrams show spacing of molecules in a substance at a pressure of 2 atmosphere but at two different temperatures.

Which substance could the diagram represent?

<table>
<thead>
<tr>
<th>Substance</th>
<th>Melting point/°C</th>
<th>Boiling point/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>−114</td>
<td>−85</td>
</tr>
<tr>
<td>B</td>
<td>−169</td>
<td>−104</td>
</tr>
<tr>
<td>C</td>
<td>−182</td>
<td>−162</td>
</tr>
<tr>
<td>D</td>
<td>−183</td>
<td>−89</td>
</tr>
</tbody>
</table>

3. The equation for the reaction between aqueous barium nitrate and aqueous sodium sulphate is shown.

\[ \text{Ba(NO}_3\text{)}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaNO}_3(\text{aq}) \]

Colourless Colourless White Colourless

Which method could be used to separate the products?
A. Chromatography
B. Crystallisation
C. Distillation
D. Filtration
4 The diagram below shows the paper chromatogram of four substances, W, X, Y and Z.

Which two substances are impure?

A  W and Z
B  W and Y
C  X and Z
D  X and Y

5 Which of the following is a pure compound?

A  Ethanol
B  Petrol
C  Steel
D  Tap water

6 The phosphate of praseodymium has the chemical formula Pr₃(PO₄)₄. The formula of its oxide is

A  Pr₂O₄
B  Pr₃O₄
C  PrO₂
D  PrO₃

7 How many protons, neutrons and electrons does a sodium ion (Na⁺) contain?

<table>
<thead>
<tr>
<th>Protons</th>
<th>Neutrons</th>
<th>Electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  12</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>B  11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>C  10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>D  10</td>
<td>12</td>
<td>11</td>
</tr>
</tbody>
</table>

8 Aluminium Sulphate can be obtained from the reaction

\[ 2\text{Al(OH)}_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O} \]

How many moles of sulphuric acid are needed to produce 0.5 mol of aluminium sulphate?

A  0.5
B  1.0
C  1.5
D  3.0

[Turn over]
9. What mass of dinitrogen oxide, N₂O occupies a volume of 18.0 dm³ measured at r.t.p?
   A  44g
   B  33g
   C  24g
   D  22g

10. What is the concentration in mol/dm³ when 2.8g of potassium hydroxide is dissolved in water to make 250 cm³ of solution?
    A  0.02
    B  0.05
    C  0.2
    D  0.5

11. What is the percentage yield when 6.4g of copper are heated in air and 7.6g of copper (II) oxide is obtained?
    A  20%
    B  80%
    C  95%
    D  98%

12. Sodium reacts with water according to the equation below:
    \[ 2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \]
    Which volume of hydrogen is produced at r.t.p when 0.2 mol of sodium reacts?
    A  1.2 dm³
    B  2.4 dm³
    C  4.8 dm³
    D  9.6 dm³
13 Lead (II) bromide was electrolysed using inert electrodes as shown in the circuit diagram.

Why does the lamp in the circuit light up only when the lead (II) bromide is melted?

A  There are no ions in solid lead (II) bromide
B  Electrons flow through the lead (II) bromide when melted.
C  The ions in Lead (II) bromide are free to move only when the solid is melted.
D  Bromide atoms in the Lead (II) bromide are converted to ions when melted.

14 If a copper ring has to be silver plated, the best arrangement is ...

A  

B  

C  

D  

[Turn over]
15 Which element needs the smallest number of electrons for one mole of atoms to be liberated during electrolysis?
   A  Aluminium
   B  Calcium
   C  Copper
   D  Sodium

16 A sample of copper contained an impurity which was a metal below it in the reactivity series. The diagram below shows the apparatus used for refining the sample.

![Diagram of refining copper](image)

The loss in mass of the anode was 40g and gain in mass of the cathode was 30g. Calculate the percentage purity of the sample.
   A  20%
   B  25%
   C  70%
   D  75%

17 The energy level diagram for the reaction of X and Y to form XY is shown:

![Energy level diagram](image)

Which statement is true about the reaction?
   A  The reaction is exothermic and $\Delta H$ is negative
   B  The reaction is exothermic and $\Delta H$ is positive
   C  The reaction is endothermic and $\Delta H$ is positive
   D  The reaction results in the decrease in temperature.
18 The table below shows the energy released by the complete combustion of some compounds used as fuels.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Formula</th>
<th>Mr</th>
<th>ΔH in Kj/mol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>16</td>
<td>-880</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>46</td>
<td>-1380</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>44</td>
<td>-2200</td>
</tr>
<tr>
<td>Heptane</td>
<td>C₇H₁₆</td>
<td>100</td>
<td>-4800</td>
</tr>
</tbody>
</table>

Which fuel produces the most energy when 1g of the compound is completely burnt?

A Ethanol
B Heptane
C Methane
D Propane

19 Which of the following is an endothermic reaction?

A The combustion of carbon
B The combustion of ethanol
C Photosynthesis
D Respiration

20 Which equation does not represent a redox reaction

A \( \text{Cu}^{2+}(aq) + \text{Zn}(s) \rightarrow \text{Zn}^{2+}(aq) + \text{Cu}(s) \)
B \( \text{Cl}_2(g) + \text{S}^2-(aq) \rightarrow \text{S}(s) + 2\text{Cl}^-(aq) \)
C \( \text{Br}_2(g) + 2\text{I}^-(aq) \rightarrow 2\text{Br}^-(aq) + \text{I}_2(s) \)
D \( \text{Ba}^{2+}(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{BaSO}_4(s) \)

21 Magnesium reacts with an excess of dilute hydrochloric acid. The graph shows how the volume of hydrogen gas given off changes with time.

![Graph showing volume of hydrogen vs time]

Why is the graph horizontal at Y?

A All the magnesium reacted.
B The reaction is beginning to slow down.
C All the hydrochloric acid has reacted.
D Hydrogen is being produced at a constant rate.
22 Consider the reaction equation below:

\[ 2Na(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2(g) \]

The reaction can be classified as …

A decomposition only.
B neutralisation only.
C both redox and displacement.
D both redox and precipitation.

23 Silver chloride when precipitated by mixing aqueous solutions of silver nitrate and hydrochloric acid, is initially a white precipitate but turns grey on standing. The reason for this change is that the precipitate …

A is decomposed by light.
B reacts with oxygen in the air.
C reacts with dilute hydrochloric acid.
D reacts with excess silver nitrate solution.

24 Which of the following best defines an acid?

A It is a compound which has a sour taste.
B A compound produced from an oxide of a metal once dissolved in water.
C A substance that produces negatively charged ions only when dissolved in water.
D A substance which produces hydrogen ions as the only positively charged ions in aqueous solutions.

25 The table gives information about the solubilities of the hydroxides, carbonates and sulphates of calcium, sodium and zinc.

<table>
<thead>
<tr>
<th></th>
<th>Hydroxide</th>
<th>Carbonate</th>
<th>Sulphate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Slightly soluble</td>
<td>Insoluble</td>
<td>Slightly soluble</td>
</tr>
<tr>
<td>Sodium</td>
<td>Soluble</td>
<td>Soluble</td>
<td>Soluble</td>
</tr>
<tr>
<td>Zinc</td>
<td>Insoluble</td>
<td>Insoluble</td>
<td>Soluble</td>
</tr>
</tbody>
</table>

What is the best way of making zinc carbonate?

A Shake solid zinc sulphate and solid calcium carbonate with water.
B Shake solid zinc sulphate with water and aqueous sodium carbonate.
C Shake solid zinc hydroxide with aqueous sodium hydroxide and bubble carbon dioxide through it.
D Shake aqueous zinc sulphate with solid calcium hydroxide and bubble carbon dioxide through it.

26 Which of the following salts can be prepared by precipitation method?

A Ammonium sulphate
B Barium sulphate
C Lead (II) nitrate
D Silver nitrate
27 A common property of a transition metal that some industrial processes make use of is that it ...
   A reverses the reaction.
   B increases the yield.
   C acts as a catalyst.
   D stops the reaction.

28 Selenium, Se, is in the same Group of the Periodic Table as sulphur. What is the formula of sodium selenide?
   A Na₂Se₃
   B NaSe
   C NaSe₂
   D Na₂Se

29 A metallic element has a low melting point, a density of 0.9g/cm³ and reacts violently with water.
   In which of the following Groups of the Periodic Table is the element likely to be found?
   A V
   B IV
   C III
   D I

30 Three experiments to investigate the reactivity of three metals are shown below:

   chromium ——-> manganese ——> chromium
          aqueous nickel sulphate    aqueous manganese (II) sulphate

Result: Nickel displaced    Nickel displaced    Manganese not displaced

What is the correct order of reactivity for these three metals?

<table>
<thead>
<tr>
<th>Most reactive</th>
<th></th>
<th>least reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Chromium</td>
<td>Manganese</td>
<td>Nickel</td>
</tr>
<tr>
<td>B  Manganese</td>
<td>Chromium</td>
<td>Nickel</td>
</tr>
<tr>
<td>C  Manganese</td>
<td>Nickel</td>
<td>Chromium</td>
</tr>
<tr>
<td>D  Nickel</td>
<td>Chromium</td>
<td>Manganese</td>
</tr>
</tbody>
</table>
31. The diagram shows the industrial manufacture of a metal.

![Diagram](image)

What is the name of the ore used in the manufacture and extraction of the metal?

A. Bauxite  
B. Calamine  
C. Fluorspar  
D. Magnetite

32. The table gives the formulae of the catalysts used in some industrial processes.

<table>
<thead>
<tr>
<th>Process</th>
<th>Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haber process</td>
<td>Fe + Mo</td>
</tr>
<tr>
<td>Contact process</td>
<td>V₂O₅</td>
</tr>
<tr>
<td>Cracking of alkanes</td>
<td>Al₂O₃ + SiO₂</td>
</tr>
<tr>
<td>Polymerisation of ethene</td>
<td>Al(C₂H₅)₃ + TiCl₂</td>
</tr>
<tr>
<td>Manufacture of silicones</td>
<td>CuCl₂</td>
</tr>
</tbody>
</table>

How many different transition metals are included (as elements or as compounds) in the list of catalysts?

A. 3  
B. 5  
C. 6  
D. 7

33. The flow diagram below represents stages in the manufacture of ammonia by the Haber process.

![Diagram](image)
Identify the correct conditions in the table below for obtaining a maximum yield of ammonia.

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>Pressure</th>
<th>Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>450°C</td>
<td>50 atm</td>
<td>Silicon</td>
</tr>
<tr>
<td>B</td>
<td>450°C</td>
<td>200 atm</td>
<td>Iron</td>
</tr>
<tr>
<td>C</td>
<td>800°C</td>
<td>50 atm</td>
<td>Copper</td>
</tr>
<tr>
<td>D</td>
<td>800°C</td>
<td>200 atm</td>
<td>Iron</td>
</tr>
</tbody>
</table>

34 The diagram shows the laboratory preparation and collection of a gas.

![Diagram of a gas preparation and collection setup]

Which one of the following statements below is true? The gas ...

A  formed bleaches damp litmus paper.
B  decolourises potassium permanganate.
C  forms dense white fumes with ammonia.
D  formed turns lime water milky.

35 Which of the following is the reason carbon monoxide is said to pollute the environment?

A  It burns readily
B  It's a neutral oxide
C  It does not occur in nature
D  It causes suffocation in animals
36 The diagram below shows the structure of a polymer.

\[ \begin{aligned} \text{H} & \text{C} \equiv \text{CH}_2 \\ \text{CH}_3 & \text{CH}_3 \end{aligned} \]

Which structure shows the correct monomer unit for the polymer?

A
\[ \begin{aligned} \text{H} & \text{C} \equiv \text{CH}_2 \\ \text{CH}_3 & \text{CH}_3 \end{aligned} \]

B
\[ \begin{aligned} \text{H} & \text{C} \equiv \text{CH} \equiv \text{CH}_2 \\ \text{CH}_3 & \text{CH}_3 \end{aligned} \]

C
\[ \begin{aligned} \text{CH}_3 & \text{C} \equiv \text{C} \\ \text{CH}_3 & \text{CH} \end{aligned} \]

D
\[ \begin{aligned} \text{H} & \text{C} \equiv \text{CH}_2 \\ \text{H} & \text{H} \end{aligned} \]

37 Ethanol, an ingredient in alcoholic beverage is made from ethene and steam as shown below:

\[ \begin{aligned} \text{H} & \text{C} \equiv \text{C} \\ \text{H} & \text{H} \text{H}_2 \text{O}_g \text{Catalyst} \rightarrow \begin{aligned} \text{H} & \text{C} \equiv \text{C} \\ \text{H} & \text{H} \end{aligned} \]

The above reaction is called ...

A addition.
B fermentation.
C hydrolysis.
D polymerisation.

38 Which compound has the empirical formula \( \text{CH}_2\text{O} \) and reacts with calcium hydroxide?

A Ethanol
B Ethylethanoate
C Methanoic acid
D Ethanoic acid

39 Which one is the balanced equation for the complete combustion of propane?

A \[ \text{C}_3\text{H}_8 + 2\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} \]
B \[ \text{C}_3\text{H}_8 + 3\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} \]
C \[ \text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} \]
D \[ \text{C}_3\text{H}_8 + 4\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} \]
40 Terylene is a synthetic polymer, which of the following is the structure of Terylene?

A  
\[
\begin{array}{cccccc}
\text{O} & - & \text{C} & - & \square & - \\
& & \text{C} & - & \text{N} & - \\
& & & & \square & - \\
& & & & \text{N} & - \\
& & & & \text{C} & - \\
& & & & \square & - \\
& & & & \text{N} & - \\
& & & & \text{H} & - \\
\end{array}
\]

B  
\[
\begin{array}{cccccc}
\text{O} & - & \square & - & \text{C} & - \\
& & & & \text{O} & - \\
& & & & \square & - \\
& & & & \text{C} & - \\
& & & & \text{O} & - \\
& & & & \square & - \\
& & & & \text{O} & - \\
\end{array}
\]

C  
\[
\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2
\]

D  
\[
\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2
\]

Tf  
Tf
The Periodic Table of the Elements

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>H</td>
<td>Li</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
<td>F</td>
<td>He</td>
</tr>
<tr>
<td></td>
<td>Na</td>
<td>Mg</td>
<td>Al</td>
<td>Si</td>
<td>P</td>
<td>S</td>
<td>Cl</td>
<td>Ar</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>Ca</td>
<td>Sc</td>
<td>Ti</td>
<td>V</td>
<td>Cr</td>
<td>Mn</td>
<td>Fe</td>
</tr>
<tr>
<td></td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Mo</td>
<td>Tc</td>
<td>Ru</td>
</tr>
<tr>
<td></td>
<td>Cs</td>
<td>Ba</td>
<td>La</td>
<td>Hf</td>
<td>Ta</td>
<td>W</td>
<td>Re</td>
<td>Os</td>
</tr>
<tr>
<td></td>
<td>Fr</td>
<td>Ra</td>
<td>Ac</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key:
- a = relative atomic mass
- X = atomic symbol
- b = proton (atomic) number

*58-71 Lanthanoid series
+90-103 Actinoid series

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

\[ N_A = 6.0 \times 10^{23}/\text{mol}; \ 1\text{F} = 96500\text{C}. \]

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