EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

CHEMISTRY

PAPER 1 Multiple Choice

Friday 6 NOVEMBER 2009 1 hour

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 booklet until you are told to do so.
Write your name, centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

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.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet

A copy of the Periodic Table is printed on page 13.

Cell phones are not allowed in the examination room.

This question paper consists of 13 printed pages.
1 Which property of a gas affects the rate at which it spreads throughout a laboratory?
   A position in the reactivity series
   B molecular mass
   C atomic mass
   D solubility in water

2 Boiling and melting points are shown in the table. Which substance could be volatile at room temperature and pressure?

<table>
<thead>
<tr>
<th>Substance</th>
<th>Melting point/°C</th>
<th>Boiling point/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-6</td>
<td>220</td>
</tr>
<tr>
<td>B</td>
<td>175</td>
<td>600</td>
</tr>
<tr>
<td>C</td>
<td>44</td>
<td>270</td>
</tr>
<tr>
<td>D</td>
<td>-100</td>
<td>-10</td>
</tr>
</tbody>
</table>

3 The apparatus in Figure 3.1 consists of a porous pot containing a gas X which is then surrounded by a gas Y in a beaker.

![Diagram of apparatus](image)

**Figure 3.1**

Which pair of gases would cause an upward movement of the liquid in the right hand of the u-tube?

<table>
<thead>
<tr>
<th>Gas X</th>
<th>Gas Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O₂</td>
</tr>
<tr>
<td>B</td>
<td>SO₂</td>
</tr>
<tr>
<td>C</td>
<td>N₂</td>
</tr>
<tr>
<td>D</td>
<td>NH₃</td>
</tr>
<tr>
<td></td>
<td>CO₂</td>
</tr>
<tr>
<td></td>
<td>H₂</td>
</tr>
<tr>
<td></td>
<td>O₂</td>
</tr>
<tr>
<td></td>
<td>CO₂</td>
</tr>
</tbody>
</table>
4 **Figure 4.0** below was set up to study Brownian motion in air.

![Diagram](image)

**Figure 4.0**

What causes Brownian motion?
A random collisions between air molecules and smoke particles.
B random collisions between air molecules and the walls of the smoke cell.
C Heat from the light source.
D Convection currents in the smoke cell.

5 **Figure 5.0** shows distillation of potassium manganate VII solution. Choose the statement which matches the correct letter.

![Diagram](image)

**Figure 5.0**

A The water eventually boils to form water vapour
B The water enters the condenser.
C Condensed water vapour drips into the flask.
D The condenser cools the vapour to form liquid.
6 Figure 6.0 shows the chromatogram for a dye.

[Diagram showing solvent front, final position of dye, and starting point of dye]

What is the Rf value for the dye?
A 0.7
B 1.5
C 10
D 20

7 An element has two isotopes $^{226}\text{Th}$ and $^{230}\text{Th}$. How does $^{226}\text{Th}$ differ from $^{232}\text{Th}$? This because $^{226}\text{Th}$ has ........
A 3 more protons and 3 more electrons.
B 3 less protons but more electrons.
C 3 more neutrons and protons.
D 3 less neutrons but same protons.

8 Which atom has the same electronic configuration as the iodide ion?
A Te
B Cs
C Xe
D Rb

9 What property is used to place elements in order in the Periodic Table?
A Their relative atomic mass.
B The number of electrons in their outer shell.
C The number of neutrons in the nucleus.
D The number of protons in their nucleus.

10 A metal X forms oxides with the formulae XO and $X_2O_3$. Where is it found in the Periodic Table?
A Group I
B Group II
C Transition metals
D Group III
11 An oxide of hydrogen has a percentage composition by mass H=5.9% and O=94.1%. Its relative molecular mass is 34. Calculate the molecular formula of the oxide.

A  \text{HO}  \\
B  \text{H}_2\text{O}  \\
C  \text{H}_2\text{O}_2  \\
D  \text{H}_2\text{O}_3

12 By titration 22.5cm\(^3\) of a solution of sulphuric acid neutralises 25cm\(^3\) of a 0.1mol/dm\(^3\) solution of sodium hydroxide. Calculate the concentration of the acid.

A  0.045mol/dm\(^3\)  \\
B  0.056mol/dm\(^3\)  \\
C  0.1mol/dm\(^3\)  \\
D  0.2mol/dm\(^3\)

13 What is the concentration in mol/dm\(^3\) of a solution containing 12g of lithium hydroxide dissolved in 200cm\(^3\) of water.

A  0.0025mol/dm\(^3\)  \\
B  0.06mol/dm\(^3\)  \\
C  0.5mol/dm\(^3\)  \\
D  2.5mol/dm\(^3\)

14 **Figure 14** shows the apparatus used in purification of copper by electrolysis in industry.

![Diagram of electrolysis apparatus](image)

**Figure 14**

Which equation represents the electrode reaction on plate A?

A  \text{2H}^+\text{ (aq)} + 2e \rightarrow \text{H}_2\text{(g)}  \\
B  40\text{H}^+\text{ (aq)} - 4e \rightarrow 2\text{H}_2\text{O} + \text{O}_2  \\
C  \text{Cu}^{2+}\text{ (aq)} + 2e \rightarrow \text{Cu}\text{(s)}  \\
D  \text{Cu}\text{(s)} - 2e \rightarrow \text{Cu}^{2+}\text{ (aq)}
15 When a solution of nickel salt was electrolysed by a current of 0.4A flowing for 965 seconds, 0.118g of nickel is formed. Find the charge on the nickel ion.  
1 mole of electrons = 96500c.  
A 1+  
B 1-  
C 2-  
D 2+

16 The industrial production of sodium uses a current of 20Amps. Calculate the time taken to produce 4.6g of sodium from molten sodium chloride.  
A 9.65 seconds  
B 96.5 seconds  
C 965 seconds  
D 9650 seconds

17 The energy level diagram shows the reaction between hydrogen and chlorine.  
\[ \text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl} \]  
Bond enthalpies  
H-H = 436 KJ/mol  
Cl-Cl = 242 KJ/mol  
H-Cl = 431 KJ/mol  

Progress of reaction  
A -115 KJ/mol  
B -230 KJ/mol  
C -184KJ/mol  
D +184KJ/mol

18 What is the oxidation number of sulphur in potassium sulphate?  
A +2  
B +4  
C +6  
D +8
19 Some of the hydrocarbon fractions that can be obtained from crude oil (petroleum) are shown below

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Boiling range</th>
<th>Number of carbon atoms per molecule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid petroleum gas</td>
<td>Below 20°C</td>
<td>1 to 4</td>
</tr>
<tr>
<td>Petrol</td>
<td>20°C to 230°C</td>
<td>6 to 12</td>
</tr>
<tr>
<td>Paraffin</td>
<td>200°C to 300°C</td>
<td>11 to 16</td>
</tr>
<tr>
<td>Diesel</td>
<td>280°C to 360°C</td>
<td>13 to 20</td>
</tr>
<tr>
<td>Lubricating oil</td>
<td>350°C to 430°C</td>
<td>Above 20</td>
</tr>
</tbody>
</table>

How many carbon atoms are likely to be in a hydrocarbon which boils at 330°C?
A 9
B 10
C 11
D 15

20 Which of the following compounds can behave as an oxidizing or reducing agent?
A \( \text{SO}_2 \)
B \( \text{K}_2\text{Cr}_2\text{O}_7 \)
C \( \text{MnO}_2 \)
D \( \text{CO} \)

21 Curve I was obtained by observing the decomposition of 100cm\(^3\) of 1 mol/dm\(^3\) aqueous hydrogen peroxide catalysed by manganese (iv) oxide.

\[
2\text{H}_2\text{O}_2(\ell) \rightarrow 2\text{H}_2(\ell) + \text{O}_2(\ell)
\]

Which alteration to the condition would produce curve II?
A Adding some 0.1 mol/dm\(^3\) aqueous hydrogen peroxide.
B Using less manganese (iv) oxide.
C Lowering the temperature.
D Using a catalyst.
22 From the list choose a drying agent for ammonia
A $\text{H}_2\text{SO}_4$
B $\text{CaO}$
C $\text{CaCl}_2$
D $\text{NaCl}$

23 Which tests would correctly identify the presence of a zinc chloride salt.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Result of adding aqueous sodium hydroxide</th>
<th>Result of adding aqueous ammonia</th>
<th>Result of adding aqueous silver nitrate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A white precipitate insoluble in excess</td>
<td>White precipitate insoluble in excess</td>
<td>White precipitate</td>
</tr>
<tr>
<td>B</td>
<td>Green precipitate insoluble excess</td>
<td>Green precipitate insoluble in excess</td>
<td>Yellow precipitate</td>
</tr>
<tr>
<td>C</td>
<td>White precipitate soluble in excess</td>
<td>White precipitate soluble in excess</td>
<td>White precipitate</td>
</tr>
<tr>
<td>D</td>
<td>Ammonia gas produced</td>
<td>White precipitate soluble in excess</td>
<td>No apparent change</td>
</tr>
</tbody>
</table>

24 From the list choose the least soluble in cold water.
A Calcium chloride
B Copper(II) chloride
C Zinc chloride
D Lead(II) chloride.

25 Which one of the following is efflorescent under normal laboratory conditions?
A $\text{Na}_2\text{CO}_3\cdot 10\text{H}_2\text{O}$
B $\text{CuSO}_4\cdot 5\text{H}_2\text{O}$
C $\text{MgSO}_4\cdot 7\text{H}_2\text{O}$
D $\text{H}_2\text{SO}_4$

26 Which substance contains a triple bond?
A $\text{HCl}$
B $\text{O}_2$
C $\text{N}_2$
D $\text{CO}_2$
27 Use the information from mass spect-ra below to calculate the relative atomic mass of
rubidium.

![](image)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>33.33</td>
</tr>
<tr>
<td>B</td>
<td>66.67</td>
</tr>
<tr>
<td>C</td>
<td>85.01</td>
</tr>
<tr>
<td>D</td>
<td>85.67</td>
</tr>
</tbody>
</table>

28 What prevents atmospheric oxidation of iron in the blast furnace?

A Iron forms an oxide layer which makes it unreactive.
B Its low in the reactivity series of metals.
C Slag which collects on top of iron.
D Iron is tapped rapidly by an opening at the bottom.

29 **Figure 29** shows a metal X being heated in a hard glass tube producing a gas which
burns with a blue flame at the end.

![](image)

What could metal X be.

A Fe
B Cu
C Au
D Ag
30. Which of the following does not produce nitrogen dioxide when heated strongly?
   A. Pb(NO₃)₂
   B. Hg(NO₃)₂
   C. NaNO₃
   D. AgNO₃

31. Choose a compound which produces three moles of carbon dioxide and three moles of water when burnt completely in air.
   A. CH₃CO₂CH₃
   B. C₃H₈
   C. C₃H₇OH
   D. C₃H₇CO₂H

32. The processes in water purification are shown in stages.

   Why is sodium hydroxide added at point 4?
   A. To kill bacteria.
   B. Increase the pH of water to 7.
   C. Neutralise industrial acidic waste.
   D. Give water a mineral taste.

33. Figure 33.0 shows the industrial manufacture of nitric acid.

   K and excess air
   What do the letters K, L, M, N represent?

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>nitrogen</td>
<td>500°C</td>
<td>Iron catalyst</td>
<td>ammonia</td>
</tr>
<tr>
<td>B</td>
<td>ammonia</td>
<td>700°C</td>
<td>platinum</td>
<td>nitrogen dioxide</td>
</tr>
<tr>
<td>C</td>
<td>nitrogen dioxide</td>
<td>500°C</td>
<td>vanadium(V) oxide</td>
<td>nitrogen monoxide</td>
</tr>
<tr>
<td>D</td>
<td>ammonia</td>
<td>450°C</td>
<td>aluminium oxide</td>
<td>nitrogen dioxide</td>
</tr>
</tbody>
</table>
34 61g of barium chloride crystals were heated and formed 52g of the anhydrous salt. What is the percentage by mass of the water of crystallization?

A 15%
B 17%
C 46%
D 85%

35 The test for chlorine is it ........

A turns blue litmus paper red.
B forms white fumes when in contact with hydrogen chloride gas
C decolourises acidified potassium dichromate.
D turns damp blue litmus red then bleaches it.

36 Which one of the following is used in the manufacture of explosives?

A Sulphuric acid.
B Hydrochloric acid.
C Methyl benzene.
D Sodium hydrogen sulphate.

37 70cm$^3$ of air was passed over heated perforated copper until there was no further change in the appearance of copper.

![Diagram of syringe with 70cm$^3$ of air and perforated copper]

When cooled to its original temperature what volume of gas remains?

A 14cm$^3$
B 20cm$^3$
C 56 cm$^3$
D 64 cm$^3$

38 The structural formula of butemidic acid is

\[
\begin{align*}
\text{O} & \quad \text{H} & \quad \text{H} & \quad \text{O} \\
\text{C} & \quad \text{H} & \quad \text{C} & \quad \text{C} & \quad \text{O} \\
\text{H} & \quad \text{O} & \quad \text{C} & \quad \text{C} & \quad \text{C} & \quad \text{O} & \quad \text{H}
\end{align*}
\]

Which statement about butemidic acid is not correct?

A Its empirical formula mass is 116.
B Its empirical formula is the same as its molecular formula.
C Its aqueous solution reacts in calcium carbonate.
D It turns lime water milky.
39 **Figure 39.0** diagram shows the structure of a macromolecule.

![Diagram of a macromolecule]

**Figure 49.0**

What could it be?
A. fats
B. proteins
C. carbohydrate
D. cellulose

40 Which is the structure of methylpropenoate?

A. 
```
  H   O   H   H
  |   |   |   |
  H--C--O--C--C--H
  |   |   |   |
  H   H   H   H
```

B. 
```
  H   O   H   H
  |   |   |   |
  H--C--C--O--C--C--H
  |   |   |   |
  H   H   H   H
```

C. 
```
  H   O   H   H
  |   |   |   |
  H--C--C--C--O--C--C--H
  |   |   |   |
  H   H   H   H
```

D. 
```
  H   O   H
  |   |   |
  H--C--C--O--C--H
  |   |   |
  H   H   H
```
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

\[ NA = 6.0 \times 10^{23}/mol, \quad 1F = 96500C. \]

*Chemistry/5070/1/2016 a*
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