CHEMISTRY 0620/12
Paper 1 Multiple Choice (Core) May/June 2018

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO NOT WRITE IN ANY BARCODES.

There are forty questions on 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 the instructions on the Answer Sheet very carefully.

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 16.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 15 printed pages and 1 blank page.
1. When iodine is heated it turns from a solid to a gas.
   When liquid ammonia is cooled it turns into a solid.
   When ice is heated it turns into water.
   Which terms describe these changes of state?

<table>
<thead>
<tr>
<th>when iodine is heated</th>
<th>when liquid ammonia is cooled</th>
<th>when ice is heated</th>
</tr>
</thead>
<tbody>
<tr>
<td>A boiling</td>
<td>freezing</td>
<td>melting</td>
</tr>
<tr>
<td>B freezing</td>
<td>sublimation</td>
<td>boiling</td>
</tr>
<tr>
<td>C sublimation</td>
<td>condensation</td>
<td>freezing</td>
</tr>
<tr>
<td>D sublimation</td>
<td>freezing</td>
<td>melting</td>
</tr>
</tbody>
</table>

2. Which piece of apparatus **cannot** be used to collect and measure the volume of gas produced in an experiment?
   A burette
   B gas syringe
   C measuring cylinder
   D pipette

3. Pure ethanol has a melting point of –114 °C and a boiling point of 78 °C.
   What are the melting and boiling points of a sample of ethanol with glucose dissolved in it?

<table>
<thead>
<tr>
<th>melting point / °C</th>
<th>boiling point / °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A –116</td>
<td>77</td>
</tr>
<tr>
<td>B –116</td>
<td>79</td>
</tr>
<tr>
<td>C –112</td>
<td>77</td>
</tr>
<tr>
<td>D –112</td>
<td>79</td>
</tr>
</tbody>
</table>

4. Which atom has an equal number of protons, neutrons and electrons?
   A $^{40}\text{Ar}$  B $^{1}\text{H}$  C $^{23}\text{Na}$  D $^{14}\text{N}$
5 Which description of brass is correct?
   A alloy
   B compound
   C element
   D non-metal

6 The bonding between elements X and Y in compound XY₂ is shown.

\[ Y \quad X \quad Y \]

Which row shows the type of bond in XY₂ and the type of element X?

<table>
<thead>
<tr>
<th></th>
<th>type of bond</th>
<th>type of element X</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>covalent</td>
<td>metal</td>
</tr>
<tr>
<td>B</td>
<td>covalent</td>
<td>non-metal</td>
</tr>
<tr>
<td>C</td>
<td>ionic</td>
<td>metal</td>
</tr>
<tr>
<td>D</td>
<td>ionic</td>
<td>non-metal</td>
</tr>
</tbody>
</table>

7 The ‘lead’ in a pencil is made of a mixture of graphite and clay.

When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

A Graphite has a high melting point.
B Graphite is a form of carbon.
C Graphite is a lubricant.
D Graphite is a non-metal.
8 The equation for the reaction between magnesium and dilute sulfuric acid is shown.

The $M_r$ of MgSO$_4$ is 120.

$$\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$$

Which mass of magnesium sulfate is formed when 12 g of magnesium completely reacts with dilute sulfuric acid?

A 5 g  B 10 g  C 60 g  D 120 g

9 The electrolysis of molten lead(II) bromide is shown.

Which statement describes what happens at the negative electrode?

A Bromide ions gain electrons to form bromine molecules.
B Bromine molecules gain electrons to form bromide ions.
C Lead atoms lose electrons to form lead ions.
D Lead ions gain electrons to form lead atoms.

10 Which statement about the combustion of fuels is correct?

A It always produces carbon dioxide.
B It always produces carbon monoxide.
C It is always endothermic.
D It is always exothermic.
11 Which statement about chemical reactions is correct?

A Endothermic reactions show a temperature decrease because energy is absorbed from the surroundings.

B Endothermic reactions show a temperature increase because energy is released into the surroundings.

C Exothermic reactions show a temperature increase because energy is absorbed from the surroundings.

D Exothermic reactions show a temperature decrease because energy is released into the surroundings.

12 The diagram shows a rate of reaction experiment.

Increasing the concentration of the acid and increasing the temperature both affect the rate of reaction.

Which row is correct?

<table>
<thead>
<tr>
<th></th>
<th>increase the concentration of acid</th>
<th>increase the temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>decrease rate of reaction</td>
<td>decrease rate of reaction</td>
</tr>
<tr>
<td>B</td>
<td>decrease rate of reaction</td>
<td>increase rate of reaction</td>
</tr>
<tr>
<td>C</td>
<td>increase rate of reaction</td>
<td>decrease rate of reaction</td>
</tr>
<tr>
<td>D</td>
<td>increase rate of reaction</td>
<td>increase rate of reaction</td>
</tr>
</tbody>
</table>
13 Reaction X shows a test for water. Reaction Y occurs in the blast furnace for extracting iron.

reaction X  CoCl$_2$ + 6H$_2$O ⇄ CoCl$_2$.6H$_2$O

reaction Y  C + CO$_2$ → 2CO

Reaction X is ......1...... . In reaction Y, the oxide CO$_2$ is ......2...... .

Which words correctly complete gaps 1 and 2?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>irreversible</td>
<td>oxidised</td>
</tr>
<tr>
<td>B</td>
<td>irreversible</td>
<td>reduced</td>
</tr>
<tr>
<td>C</td>
<td>reversible</td>
<td>oxidised</td>
</tr>
<tr>
<td>D</td>
<td>reversible</td>
<td>reduced</td>
</tr>
</tbody>
</table>

14 Which equation shows an oxidation reaction?

A  C + O$_2$ → CO$_2$
B  CaCO$_3$ → CaO + CO$_2$
C  CaO + 2HCl → CaCl$_2$ + H$_2$O
D  N$_2$O$_4$ → 2NO$_2$

15 Which two gases each give the same result for the test shown?

<table>
<thead>
<tr>
<th>test</th>
<th>gas 1</th>
<th>gas 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  damp blue litmus paper</td>
<td>ammonia</td>
<td>chlorine</td>
</tr>
<tr>
<td>B  damp blue litmus paper</td>
<td>ammonia</td>
<td>oxygen</td>
</tr>
<tr>
<td>C  lighted splint</td>
<td>hydrogen</td>
<td>chlorine</td>
</tr>
<tr>
<td>D  lighted splint</td>
<td>hydrogen</td>
<td>oxygen</td>
</tr>
</tbody>
</table>

16 Which statement about oxides is correct?

A  A solution of magnesium oxide has a pH less than pH 7.
B  A solution of sulfur dioxide has a pH greater than pH 7.
C  Magnesium oxide reacts with nitric acid to make a salt.
D  Sulfur dioxide reacts with hydrochloric acid to make a salt.
17 Which methods are suitable for preparing both zinc sulfate and copper(II) sulfate?

1 reacting the metal oxide with warm dilute aqueous sulfuric acid
2 reacting the metal with dilute aqueous sulfuric acid
3 reacting the metal carbonate with dilute aqueous sulfuric acid

A 1, 2 and 3    B 1 and 2 only    C 1 and 3 only    D 2 and 3 only

18 Two separate tests are done on separate solutions of compound X.

1 Addition of aqueous sodium hydroxide forms a green precipitate that dissolves in an excess of aqueous sodium hydroxide.

2 Addition of dilute nitric acid and aqueous silver nitrate forms a white precipitate.

What is compound X?

A chromium(III) carbonate
B chromium(III) chloride
C iron(II) carbonate
D iron(II) chloride

19 Which statement about the Periodic Table is correct?

A Elements in the same group have the same number of electron shells.
B It contains elements arranged in order of increasing proton number.
C Metals are on the right and non-metals are on the left.
D The most reactive elements are at the bottom of every group.

20 Chlorine, bromine and iodine are elements in Group VII of the Periodic Table.

Which statement about these elements is not correct?

A The colour gets darker down the group.
B The density increases down the group.
C They are all gases at room temperature and pressure.
D They are all non-metals.
21 Which row describes the properties of a transition element?

<table>
<thead>
<tr>
<th></th>
<th>property 1</th>
<th>property 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>forms colourless compounds</td>
<td>acts as a catalyst</td>
</tr>
<tr>
<td>B</td>
<td>forms colourless compounds</td>
<td>low electrical conductivity</td>
</tr>
<tr>
<td>C</td>
<td>high density</td>
<td>acts as a catalyst</td>
</tr>
<tr>
<td>D</td>
<td>high density</td>
<td>low electrical conductivity</td>
</tr>
</tbody>
</table>

22 Which statement about the elements in Group VIII is correct?

A They all form diatomic molecules.
B They all have eight electrons in their outer shells.
C They all react with oxygen to form oxides.
D They are all gases at room temperature.

23 Stainless steel is an alloy of iron, carbon and other metals.

Which row is correct?

<table>
<thead>
<tr>
<th></th>
<th>stainless steel is harder than pure iron</th>
<th>stainless steel resists corrosion better than pure iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>C</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>
24 A student is given metal Z and its oxide.

The student does some experiments to find out the position of metal Z in the reactivity series.

The results are shown.

- Metal Z reacted slowly with dilute hydrochloric acid.
- Metal Z reacted slowly with steam but not with water.
- The oxide of metal Z reacted when heated with carbon.

Which statement about the position of metal Z in the reactivity series is correct?

A It is between calcium and sodium.
B It is between copper and hydrogen.
C It is between hydrogen and iron.
D It is between magnesium and calcium.

25 Iron is produced from iron ore in a blast furnace.

Which equation represents the main reaction that happens in zone 1?

A \( \text{C(s)} + \text{CO}_2(\text{g}) \rightarrow 2\text{CO(g)} \)
B \( \text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) \)
C \( \text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO(g)} \rightarrow 2\text{Fe(l)} + 3\text{CO}_2(\text{g}) \)
D \( \text{Fe}_3\text{O}_4(\text{s}) + \text{CO(g)} \rightarrow 3\text{FeO(s)} + \text{CO}_2(\text{g}) \)
26 Which row describes the use of an alloy and the property upon which the use depends?

<table>
<thead>
<tr>
<th>alloy</th>
<th>use</th>
<th>property</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mild steel</td>
<td>cutlery</td>
<td>resistant to corrosion</td>
</tr>
<tr>
<td>B mild steel</td>
<td>machinery</td>
<td>strong</td>
</tr>
<tr>
<td>C stainless steel</td>
<td>cutlery</td>
<td>low density</td>
</tr>
<tr>
<td>D stainless steel</td>
<td>machinery</td>
<td>good conductor of electricity</td>
</tr>
</tbody>
</table>

27 Dry air is passed over hot copper until all the oxygen has reacted.

![Diagram of dry air passing over copper](image)

The volume of gas at the end of the reaction is 120 cm³.

What is the starting volume of dry air?

A 132 cm³  
B 152 cm³  
C 180 cm³  
D 570 cm³

28 A steel bicycle which had been left outdoors for several months was starting to rust.

What would **not** reduce the rate of corrosion?

A Remove the rust and paint the bicycle.
B Remove the rust and store the bicycle in a dry shed.
C Remove the rust and wipe the bicycle with a clean, damp cloth.
D Remove the rust and wipe the bicycle with an oily cloth.
29 Which statements about water are correct?

1. Household water contains dissolved salts.
2. Water for household use is filtered to remove soluble impurities.
3. Water is treated with chlorine to kill bacteria.
4. Water is used in industry for cooling.

A 1, 2, 3 and 4
B 1, 2 and 3 only
C 1, 3 and 4 only
D 2, 3 and 4 only

30 Ammonium nitrate is a common fertiliser used by farmers to increase the yield of their crops.

Which compound reacts with ammonium nitrate to form ammonia?

A calcium hydroxide
B potassium nitrate
C sodium chloride
D sodium phosphate

31 Which process does not release a greenhouse gas?

A digestion of food in cows
B reaction between zinc and hydrochloric acid
C respiration by animals
D thermal decomposition of calcium carbonate

32 Which row describes the uses of sulfur and sulfur dioxide?

<table>
<thead>
<tr>
<th></th>
<th>sulfur</th>
<th>sulfur dioxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>extraction of aluminium</td>
<td>food preservative</td>
</tr>
<tr>
<td>B</td>
<td>extraction of aluminium</td>
<td>water treatment</td>
</tr>
<tr>
<td>C</td>
<td>manufacture of sulfuric acid</td>
<td>food preservative</td>
</tr>
<tr>
<td>D</td>
<td>manufacture of sulfuric acid</td>
<td>water treatment</td>
</tr>
</tbody>
</table>
33 Limestone is used in many industrial processes.

In which process is it not used?

A manufacture of alkenes  
B manufacture of cement  
C manufacture of iron  
D manufacture of lime

34 Lime is used to treat an industrial waste.

Which change occurs in the treatment?

<table>
<thead>
<tr>
<th>untreated waste</th>
<th>treated waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>A acidic</td>
<td>neutral</td>
</tr>
<tr>
<td>B alkaline</td>
<td>acidic</td>
</tr>
<tr>
<td>C alkaline</td>
<td>neutral</td>
</tr>
<tr>
<td>D neutral</td>
<td>acidic</td>
</tr>
</tbody>
</table>

35 What is not the correct use of the fraction named?

<table>
<thead>
<tr>
<th>name of fraction</th>
<th>use</th>
</tr>
</thead>
<tbody>
<tr>
<td>A fuel oil</td>
<td>making waxes</td>
</tr>
<tr>
<td>B gas oil</td>
<td>fuel in diesel engines</td>
</tr>
<tr>
<td>C kerosene</td>
<td>jet fuel</td>
</tr>
<tr>
<td>D naphtha</td>
<td>making chemicals</td>
</tr>
</tbody>
</table>
36 Four organic compounds are listed.

- ethane
- ethanoic acid
- ethanol
- ethene

Which bond do all four compounds contain?

A  C–C  B  C–H  C  C–O  D  O–H

37 Which compounds belong to the same homologous series?

A  ethane and propane  
B  ethanoic acid and ethanol  
C  methane and ethene  
D  propene and ethanoic acid

38 Which substances can be obtained by cracking hydrocarbons?

A  ethanol and ethene  
B  ethanol and hydrogen  
C  ethene and hydrogen  
D  ethene and poly(ethene)

39 The equations for two important processes used to manufacture ethanol are shown.

\[
\text{process 1 } \quad \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 \\
\text{process 2 } \quad \text{C}_2\text{H}_4 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH}
\]

Which statement is not correct?

A  Both processes require a catalyst.  
B  Both processes use a starting material obtained from petroleum.  
C  Process 1 shows the production of a renewable fuel.  
D  Process 2 is an addition reaction.
Part of the label on the packet of a potato product is shown.

This potato product contains:
- starch
- ethanoic acid
- sodium chloride
- sugar

Which constituent is a natural polymer?

A. ethanoic acid
B. sodium chloride
C. starch
D. sugar
The Periodic Table of 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>VIII</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>He</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Li</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
<td>F</td>
<td>Ne</td>
</tr>
<tr>
<td>4</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>5</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>6</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>7</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>8</td>
<td>Fr</td>
<td>Ra</td>
<td>89–103 actinoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lanthanoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actinoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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