## CHEMISTRY

0620/13
Paper 1 Multiple Choice

## 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, highlighters, 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.

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.
You may use a calculator.

This document consists of 16 printed pages.

1 In which changes do the particles move further apart?

$$
\text { gas } \underset{\mathrm{Y}}{\stackrel{\mathrm{~W}}{\rightleftharpoons}} \text { liquid } \underset{\mathrm{Z}}{\stackrel{\mathrm{X}}{\rightleftharpoons}} \text { solid }
$$

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

2 The table shows the structure of different atoms and ions.

| particle | proton <br> number | nucleon <br> number | number of <br> protons | number of <br> neutrons | number of <br> electrons |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Mg | 12 | 24 | 12 | W | 12 |
| $\mathrm{Mg}^{2+}$ | X | 24 | 12 | 12 | 10 |
| F | 9 | 19 | 9 | Y | 9 |
| $\mathrm{~F}^{-}$ | 9 | 19 | 9 | 10 | Z |

What are the values of $\mathrm{W}, \mathrm{X}, \mathrm{Y}$ and Z ?

|  | W | X | Y | Z |
| :---: | :---: | :---: | :---: | :---: |
| A | 10 | 10 | 9 | 9 |
| B | 10 | 12 | 10 | 9 |
| C | 12 | 10 | 9 | 10 |
| D | 12 | 12 | 10 | 10 |

3 Element X has a nucleon (mass) number of 19 and a proton (atomic) number of 9.
To which group in the Periodic Table does it belong?
A 1
B III
C VII
D 0

4 A mixture of ethanol and methanol are separated by fractional distillation.
This method of separation depends on a difference in property $X$ of these two alcohols.
What is property X ?
A boiling point
B colour
C melting point
D solubility

5 Chromatography is used to find out if a banned dye, $P$, is present in foodstuffs.
The results are shown in the diagram.
Which foodstuff contains P ?


6 Which diagram does not show the outer shell electrons in the molecule correctly?
A

B

C



7 Two isotopes of hydrogen are ${ }_{1}^{1} \mathrm{H}$ and ${ }_{1}^{2} \mathrm{H}$.
Which diagram shows the arrangement of particles in the two isotopes?

|  | ${ }_{1}^{1} \mathrm{H}$ | ${ }_{1}^{2} \mathrm{H}$ |
| :---: | :---: | :---: |
| A |  |  |
| B |  |  |
| C |  |  |
| D |  |  |

key
(e) = an electron
(D) $=$ a proton
(n) = a neutron


8 The chemical compositions of two substances, W and X , are given.
W $\mathrm{Na}\left(\mathrm{AlSi}_{3}\right) \mathrm{O}_{8}$
X $\mathrm{Ca}\left(\mathrm{Al}_{2} \mathrm{Si}_{2}\right) \mathrm{O}_{8}$
Which statements are correct?
1 W and X contain the same amount of oxygen.
2 W contains three times as much silicon as X .
3 X contains twice as much aluminium as W .
A 1 and 2
B 1 and 3
C 2 and 3
D 1, 2 and 3

9 The electronic structures of atoms X and Y are shown.

$X$ and $Y$ form a covalent compound.
What is its formula?
A $X Y_{5}$
B $\mathrm{XY}_{3}$
C XY
D $X_{3} Y$

10 Element X is shiny and can be formed into a sheet by hammering.
Which row correctly describes the properties of element $X$ ?

|  | conducts electricity | melts below $25^{\circ} \mathrm{C}$ |
| :---: | :---: | :---: |
| A | $\checkmark$ | $\checkmark$ |
| B | $\checkmark$ | $x$ |
| C | $x$ | $\checkmark$ |
| D | $x$ | $x$ |

11 Substance $X$ was electrolysed in an electrolytic cell.
A coloured gas was formed at the anode and a metal was formed at the cathode.


What is substance X ?
A aqueous sodium chloride
B molten lead bromide
C molten zinc oxide
D solid sodium chloride

12 The diagram shows apparatus used in an attempt to electroplate a metal ring with copper.


The experiment did not work.
What change is needed in the experiment to make it work?
A Add solid copper(II) sulfate to the electrolyte.
B Increase the temperature of the electrolyte.
C Replace the copper electrode by a carbon electrode.
D Reverse the connections to the battery.

13 When concentrated sodium chloride solution is electrolysed, elements $X$ and $Y$ are formed.


What are $X$ and $Y$ ?

|  | X | Y |
| :---: | :---: | :---: |
| A | chlorine | hydrogen |
| B | hydrogen | chlorine |
| C | hydrogen | oxygen |
| D | oxygen | hydrogen |

14 Calcium carbonate was reacted with hydrochloric acid in a conical flask. The flask was placed on a balance and the mass of the flask and contents was recorded as the reaction proceeded.

During the reaction, carbon dioxide gas was given off.
The reaction was carried out at two different temperatures.
Which row is correct?

|  | change in mass | temperature at which mass <br> changed more quickly |
| :---: | :---: | :---: |
| A | decrease | higher temperature |
| B | decrease | lower temperature |
| C | increase | higher temperature |
| D | increase | lower temperature |

15 Which is an endothermic process?
A burning hydrogen
B distilling petroleum
C reacting potassium with water
D using petrol in a motor car engine

16 The diagrams show some pieces of laboratory equipment.
1
balance

2
stop-clock


3 thermometer


Which equipment is needed to find out whether dissolving salt in water is an endothermic process?
A 1 only
B 1 and 3
C 2 and 3
D 3 only

17 Which reaction will result in a decrease in pH ?
A adding calcium hydroxide to acid soil
B adding citric acid to sodium hydrogen carbonate solution
C adding sodium chloride to silver nitrate solution
D adding sodium hydroxide to hydrochloric acid

18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.

$$
\mathrm{CoCl}_{2} \cdot 6 \mathrm{H}_{2} \mathrm{O} \rightleftharpoons \mathrm{CoCl}_{2}+6 \mathrm{H}_{2} \mathrm{O}
$$

What happens when water is added to the blue solid?

|  | colour | temperature |
| :---: | :---: | :---: |
| A | changes to pink | decreases |
| B | changes to pink | increases |
| C | remains blue | decreases |
| D | remains blue | increases |

19 The red colour in some pottery glazes may be formed as a result of the reactions shown.

$$
\begin{aligned}
\mathrm{CuCO}_{3} & \xrightarrow{\text { heat }} \mathrm{CuO}+\mathrm{CO}_{2} \\
\mathrm{CuO}+\mathrm{SnO} & \longrightarrow \mathrm{Cu}+\mathrm{SnO}_{2}
\end{aligned}
$$

These equations show that $\qquad$ 1. is oxidised and $\qquad$
$\qquad$ is reduced.

Which substances correctly complete gaps 1 and 2 in the above sentence?

|  | 1 | 2 |
| :---: | :---: | :---: |
| A | $\mathrm{CO}_{2}$ | $\mathrm{SnO}_{2}$ |
| B | $\mathrm{CuCO}_{3}$ | CuO |
| C | CuO | SnO |
| D | SnO | CuO |

20 Some barium iodide is dissolved in water.
Aqueous lead(II) nitrate is added to the solution until no more precipitate forms.
This precipitate, X , is filtered off.
Dilute sulfuric acid is added to the filtrate and another precipitate, Y , forms.
What are the colours of precipitates X and Y ?

|  | X | Y |
| :---: | :---: | :---: |
| A | white | white |
| B | white | yellow |
| C | yellow | white |
| D | yellow | yellow |

21 The table shows some reactions of the halogens.
Which reaction is the most likely to be explosive?

| reaction | chlorine gas | bromine gas | iodine gas |
| :--- | :---: | :---: | :---: |
| reaction with hydrogen | A | B | C |
| reaction with iron | very vigorous | less vigorous | D |

22 Which compound is likely to be coloured?
A $\mathrm{KMnO}_{4}$
B $\mathrm{KNO}_{3}$
C $\mathrm{K}_{2} \mathrm{CO}_{3}$
D $\mathrm{K}_{2} \mathrm{SO}_{4}$

23 A salt is made by adding an excess of an insoluble metal oxide to an acid.
How can the excess metal oxide be removed?
A chromatography
B crystallisation
C distillation
D filtration

24 The oxide of element $X$ was added to an acid. It reacted to form a salt and water.


What is the pH of the acid before the reaction and what type of element is X ?

|  | pH | type of element X |
| :---: | :---: | :---: |
| A | greater than 7 | metal |
| B | greater than 7 | non-metal |
| C | less than 7 | metal |
| D | less than 7 | non-metal |

25 The diagram shows the positions of elements $\mathrm{P}, \mathrm{Q}, \mathrm{R}, \mathrm{S}$ and T in the Periodic Table.
These letters are not the chemical symbols for the elements.


Which statement about the properties of these elements is correct?
A P reacts more vigorously with water than does Q .
B $P, Q$ and $R$ are all metals.
C T exists as diatomic molecules.
D T is more reactive than S .

26 The table compares the properties of Group I elements with those of transition elements.
Which entry in the table is correct?

|  | property | Group I elements | transition elements |
| :---: | :---: | :---: | :---: |
| A | catalytic activity | low | high |
| B | density | high | low |
| C | electrical conductivity | low | high |
| D | melting point | high | low |

27 Which pollutant, found in car exhaust fumes, does not come from the fuel?
A carbon monoxide
B hydrocarbons
C lead compounds
D nitrogen oxides

28 The diagram shows the materials used in the production of steel from impure iron.

| impure <br> iron | oxygen |
| :---: | :---: |
|  | an oxide of element $X$ | steel

What could element X be?
A calcium
B carbon
C nitrogen
D sulfur

29 Which property do all metals have?
A Their boiling points are low.
B Their densities are low.
C They conduct electricity.
D They react with water.

30 Which diagram could represent the structure of an alloy?



C

D



31 Some metals react readily with dilute hydrochloric acid.
Some metals can be extracted by heating their oxides with carbon.
For which metal are both statements correct?
A calcium
B copper
C iron
D magnesium

32 Which diagram shows a common use of stainless steel?
A

B

C

D


33 Why is chlorination used in water treatment?
A to kill bacteria in the water
B to make the water neutral
C to make the water taste better
D to remove any salt in the water

34 A test-tube containing damp iron wool is inverted in water.
After three days, the water level inside the test-tube has risen.


Which statement explains this rise?
A Iron oxide has been formed.
B Iron wool has been reduced.
C Oxygen has been formed.
D The temperature of the water has risen.

35 A bag of fertiliser 'Watch it grow' contains ammonium sulfate and potassium sulfate.
Which of the three elements $\mathrm{N}, \mathrm{P}$ and K does 'Watch it grow' contain?

|  | N | P | K |
| :---: | :---: | :---: | :---: |
| A | $\checkmark$ | $\checkmark$ | $x$ |
| B | $\checkmark$ | $x$ | $\checkmark$ |
| C | $x$ | $\checkmark$ | $x$ |
| D | $x$ | $x$ | $\checkmark$ |

36 Which information about carbon dioxide and methane is correct?

|  |  | carbon dioxide | methane |
| :---: | :--- | :---: | :---: |
| A | formed when vegetation decomposes | $\checkmark$ | $x$ |
| B | greenhouse gas | $\checkmark$ | $\checkmark$ |
| C | present in unpolluted air | $x$ | $x$ |
| D | produced during respiration | $x$ | $\checkmark$ |

37 Ethene reacts with $Y$ to produce ethanol.

$$
\text { ethene }+\mathrm{Y} \rightarrow \text { ethanol }
$$

What is $Y$ ?
A hydrogen
B oxygen
C steam
D yeast

38 In an oil refinery, crude oil is separated into useful fractions.
The diagram shows some of these fractions.


What are fractions $\mathrm{X}, \mathrm{Y}$ and Z ?

|  | X | Y | Z |
| :---: | :---: | :---: | :---: |
| A | fuel oil | bitumen | paraffin (kerosene) |
| B | fuel oil | paraffin (kerosene) | bitumen |
| C | paraffin (kerosene) | bitumen | fuel oil |
| D | paraffin (kerosene) | fuel oil | bitumen |

39 The diagram shows the structure of a compound.


To which classes of compound does this molecule belong?

|  | alkane | alkene | alcohol |
| :---: | :---: | :---: | :---: |
| A | no | no | no |
| B | no | yes | yes |
| C | yes | no | yes |
| D | yes | yes | yes |

40 Which structures show compounds that are members of the same homologous series?



3


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

The volume of one mole of any gas is $24 \mathrm{dm}^{3}$ at room temperature and pressure (r.t.p.).

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