

Name: _____ () Class: _____

YEAR THREE INTEGRATED PROGRAMME
END-OF-YEAR ASSESSMENT

Chemistry
Paper 1

30 September 2022

45 mins

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on the Answer Sheet using a soft pencil.

There are **30** 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.

Amendments may be done using a soft eraser.

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 2.

The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Total (30)	

This document consists of **13** printed pages and **1** blank page



圣尼各拉女校
CHIJ ST NICHOLAS GIRLS' SCHOOL

Girls of Grace • Women of Strength • Leaders with Heart

[Turn over

The Periodic Table of Elements

Group																			
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0		
		Key																	
		proton (atomic) number atomic symbol name relative atomic mass																	
3 Li lithium 7	4 Be beryllium 9													5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24													13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84		
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131		
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium	85 At astatine	86 Rn radon		
87 Fr francium	88 Ra radium	89 – 103 actinoids	104 Rf Rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium		114 Fl flerovium		116 Lv livermorium	–			

Topics Tested: Atomic Structure, Compounds, Elements and Mixtures, Bonding and Structure, Kinetic Particle Theory, Redox, Periodic Table, Mole Concept, Acids and Bases, Preparation of Salts, Qualitative Analysis.

- 1 Which statement is true?
- A Ne has more electrons than F^- .
 - B F^- has more electrons than Na^+ .
 - C Cu^{2+} has more electrons than Cu^+ .
 - D O^{2-} has more electrons than O.
- 2 The rate of diffusion of gas P ($Mr = 32$) and gas Q ($Mr = 64$) was compared at $30\text{ }^{\circ}\text{C}$ and $60\text{ }^{\circ}\text{C}$. Which would have the slowest rate of diffusion?
- A gas P at $30\text{ }^{\circ}\text{C}$
 - B gas P at $60\text{ }^{\circ}\text{C}$
 - C gas Q at $30\text{ }^{\circ}\text{C}$
 - D gas Q at $60\text{ }^{\circ}\text{C}$
- 3 In which species are the numbers of electrons and neutrons equal?
- A ${}^9_4\text{Be}$
 - B ${}^{19}_9\text{F}$
 - C ${}^{23}_{11}\text{Na}^+$
 - D ${}^{18}_8\text{O}^{2-}$

- 4 The isotope cobalt-60 ($^{60}_{27}\text{Co}$) is used to destroy cancer cells in the human body. Which statements about an atom of cobalt-60 is/are correct?

- 1 It contains 33 neutrons.
- 2 Its nucleus has a relative charge of 27+.
- 3 It has different number of neutrons from the other isotopes of cobalt.

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

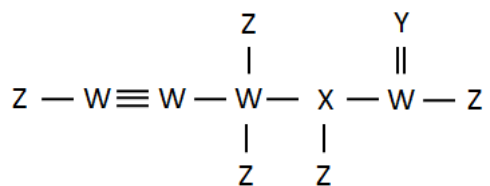
- 5 Which of the following pairs consists of two pure substances?

- A** diamond and aqueous iodine
B hydrogen and bronze
C hydrogen chloride and water
D lithium and air

- 6 Which of the following best describes the arrangement of particles present in dilute aqueous ammonia?

	NH ₃ molecules	OH ⁻ ions
A	Not present	Close together
B	Not present	Far apart
C	Close together	Close together
D	Far apart	Far apart

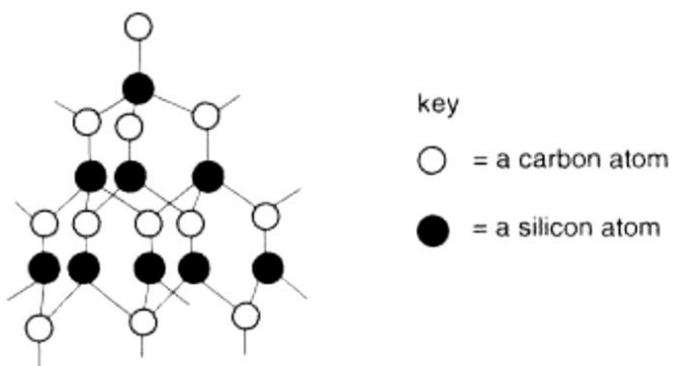
7 Study the molecule below:



In which group of the Periodic Table are elements W, X, Y and Z likely to be found?

	W	X	Y	Z
A	Group III	Group V	Group VI	Group I
B	Group IV	Group III	Group VI	Group VII
C	Group III	Group V	Group II	Group I
D	Group IV	Group V	Group VI	Group VII

8 The compound silicon carbide has the structure as shown:



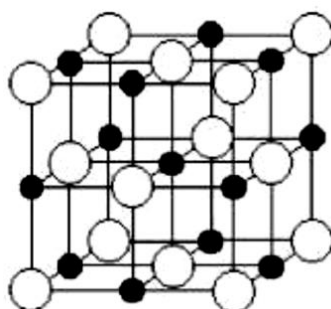
Which property is not correct for this compound?

- A** It is hard.
- B** It is soluble in water.
- C** It has high melting point.
- D** It has poor electrical conductivity.



- 9 Coloured glass, such as those used in church windows, requires three oxides – one macromolecular, one ionic and one of a transition metal.
Which combination is likely to produce a coloured glass?

- A Al_2O_3 , MgO , SnO
- B P_4O_{10} , CaO , CuO
- C SiO_2 , CaO , PbO
- D SiO_2 , PbO , CoO

- 10 The diagram below shows the structure of sodium chloride.



key

-  = chloride ion
-  = sodium ion

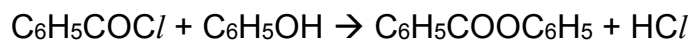
Which of the following statements is false?

- A The structure is not able to conduct electricity in any physical states.
 - B Each sodium ion is surrounded by 6 chloride ions.
 - C The ratio of the ions is 1:1.
 - D The structure is held together by strong electrostatic forces of attraction.
- 11 In which of the following does sulfur exhibit the highest oxidation state?

- A S_8
- B SO_2
- C $\text{Na}_2\text{S}_2\text{O}_3$
- D H_2SO_4

- 12 Which of the following reactions does hydrogen gas behave as an oxidising agent?
- A** $2\text{Na} + \text{H}_2 \rightarrow \text{NaH}$
B $\text{C}_2\text{H}_4 + \text{H}_2 \rightarrow \text{C}_2\text{H}_6$
C $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
D $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- 13 How many moles of carbon are present in 18 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$?
- A** 0.1 mole
B 0.6 mole
C 1.0 mole
D 6.0 mole
- 14 'Iron tablets' can be consumed as a supplement to one's diet. They contain iron(II) sulfate. The percentage of iron in the tablets can be determined through a titration, where iron(II) is converted to iron(III). Which of the following aqueous reagents could be best used under suitable conditions to carry out the titration?
- A** nitric acid
B potassium iodide
C potassium manganate(VII)
D sodium sulfite
- 15 Silver nitrate and barium chloride react according to the equation below.
- $$2\text{AgNO}_3 (\text{aq}) + \text{BaCl}_2 (\text{aq}) \rightarrow 2\text{AgCl} (\text{s}) + \text{Ba}(\text{NO}_3)_2 (\text{aq})$$
- What is the volume of 0.10 mol/dm^3 aqueous silver nitrate that reacts completely with 20 cm^3 of 0.20 mol/dm^3 of barium chloride?
- A** 10 cm^3
B 20 cm^3
C 40 cm^3
D 80 cm^3

- 16** An acyl chloride, $\text{C}_6\text{H}_5\text{COCl}$ reacts with an alcohol, $\text{C}_6\text{H}_5\text{OH}$ according to the equation below.



What is the percentage yield if 0.8 g of $\text{C}_6\text{H}_5\text{COOC}_6\text{H}_5$ was obtained from 1.2 g of the acyl chloride?

[Mr of $\text{C}_6\text{H}_5\text{COCl}$ is 140.5; Mr of $\text{C}_6\text{H}_5\text{COOC}_6\text{H}_5$ is 198]

- A** 47.3%
 - B** 66.7%
 - C** 71.0%
 - D** 94.0%
- 17** Aqueous lead(II) nitrate cannot be used to differentiate
- A** dilute sulfuric acid from dilute hydrochloric acid.
 - B** aqueous potassium iodide from aqueous potassium chloride.
 - C** aqueous sodium hydroxide from aqueous ammonia.
 - D** aqueous sodium carbonate from aqueous sodium nitrate.
- 18** Which of the following is suitable for the preparation of potassium chloride?
- A** potassium with dilute hydrochloric acid
 - B** potassium hydroxide with dilute hydrochloric acid
 - C** potassium chloride with dilute sulfuric acid
 - D** potassium carbonate with sodium chloride solution
- 19** A blue solution contains two sulfate salts. When aqueous ammonia is added to the solution, a blue precipitate is formed, which dissolves in excess aqueous ammonia to form a deep blue solution. Which are the two cations in the solution?
- A** Cu^{2+} and Zn^{2+}
 - B** Cu^{2+} and Ca^{2+}
 - C** Cu^{2+} and Pb^{2+}
 - D** Cu^{2+} and Al^{3+}

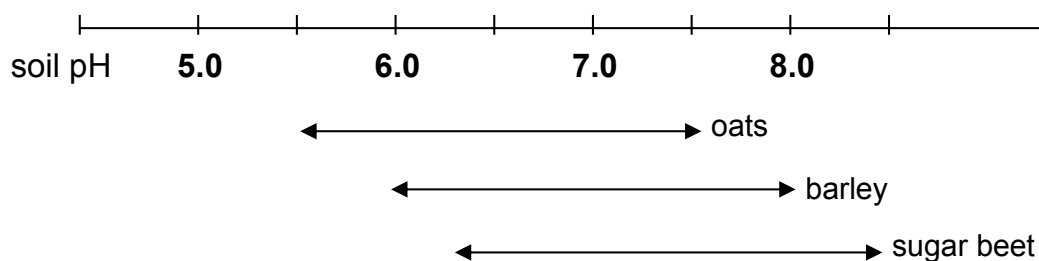
- 20** The reaction between CuCO_3 and HNO_3 is as shown in the equation.



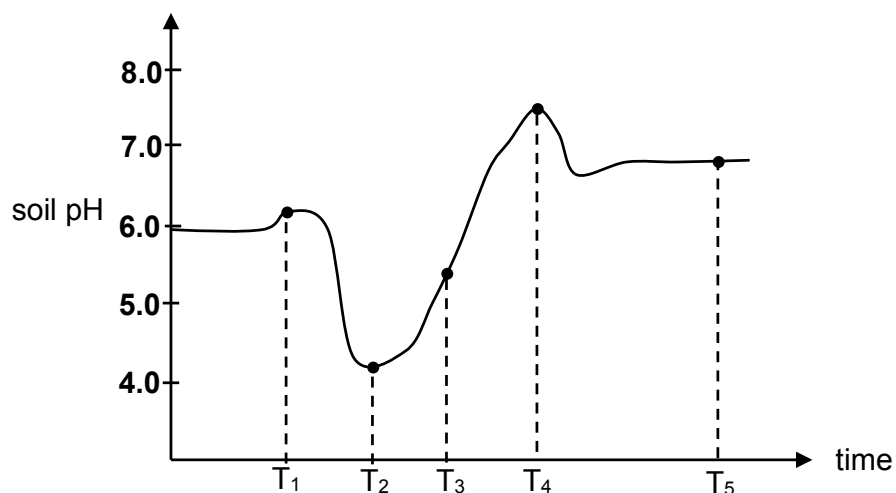
What would be observed if 18.6 g of CuCO_3 is reacted with 0.4 dm³ of 0.5 mol/dm³ HNO_3 ?

- A** Blue solution only.
 - B** Colourless solution only.
 - C** Blue solution with green solid.
 - D** Colourless solution with green solid.
- 21** Which of the following statements is correct about the elements going from left to right in Period 2 of the Periodic Table?
- A** The metallic properties of the elements increases.
 - B** The oxidising ability of the elements increases.
 - C** The tendency of the elements to gain electron decreases.
 - D** The number of valence electrons decreases.
- 22** An element Y reacts with oxygen to form two gases with the formulae YO and YO₂. YO is neutral to litmus while YO₂ reacts with alkalis to form salt and water only. What does this suggest about Element Y?
- A** It is an alkali metal.
 - B** It is a non-metal in Group IV.
 - C** It is a metal in Group II.
 - D** It is a halogen.

- 23** The table shows the pH ranges required by different crops for growth.



The graph shows how the pH value of the soil in a farmer's field changes over time.



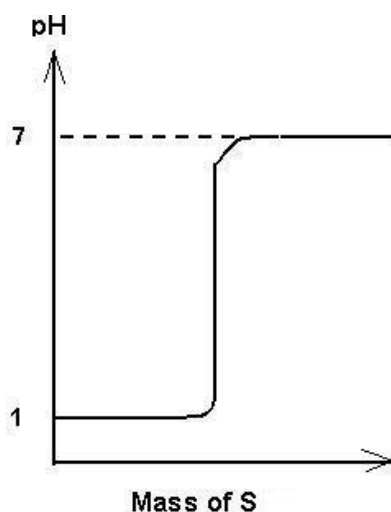
The farmer wants to grow oats, barley and sugar beet. In which period of time would **all** three crops grow well?

- A** between T₁ and T₂
 - B** between T₂ and T₃
 - C** between T₃ and T₄
 - D** between T₄ and T₅
- 24** Both chlorine and iodine belong to Group VII of the Periodic Table. Which statement about these elements is correct?

- A** Both are diatomic gases at room temperature and pressure.
- B** Iodine is a stronger oxidising agent than chlorine.
- C** Iodine has a higher melting point than chlorine.
- D** Iodine will react with a solution of sodium chloride.

- 25** Which of the following properties of argon is applied when used for filling light bulbs?
- A** It is inert.
 - B** It is colourless.
 - C** It is monatomic.
 - D** It is less dense than air.
- 26** Which of the following statements regarding the reaction between excess sulfuric acid and barium hydroxide is/are true?
1. The ion of the highest concentration in the resulting mixture is SO_4^{2-} .
 2. The ionic equation of the reaction is $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$.
 3. The pH of the resulting mixture is 7.
- A** 1 only
 - B** 1 and 2 only
 - C** 2 and 3 only
 - D** none of the above
- 27** Which characteristic of Group I metals is correct as their number of electron shells increases?
- A** Their atomic size decreases.
 - B** They form ions with higher charge.
 - C** Their melting and boiling point increases.
 - D** The tendency to lose electrons increases.

- 28** A solid S was gradually added till excess to a fixed volume of dilute hydrochloric acid. The pH changes in solution were recorded by a datalogger as shown.



What could solid S be?

- A** copper
 - B** copper(II) oxide
 - C** sodium
 - D** sodium hydroxide
- 29** Which of the following bases produces the highest concentration of hydroxide ions when 1 mole of the compound is added to the same volume of water?
- A** ammonia
 - B** barium hydroxide
 - C** sodium hydroxide
 - D** iron(II) hydroxide

- 30** The results of some tests on a solution of compound X are shown in the table.

test	result
aqueous ammonia	white precipitate formed, insoluble in excess
aqueous sodium hydroxide, aluminium foil, warm	colourless pungent gas produced which turns moist red litmus paper blue
aqueous potassium iodide	yellow precipitate formed

What could compound X be?

- A** aluminium iodide
- B** aluminium nitrate
- C** lead(II) iodide
- D** lead(II) nitrate

- End of Paper -

BLANK PAGE

2022 S3 EOY MCQ Answers

1	D	2	C	3	D	4	D
5	C	6	D	7	D	8	B
9	D	10*	A	11	D	12*	A
13	B	14*	C	15	D	16	A
17*	A	18	B	19	A	20	C
21	B	22	B	23	D	24	C
25	A	26	D	27	D	28	B
29	B	30	D				