Name: …… Register no: …….. Class: ……..

NGEE ANN SECONDARY SCHOOL NA

PRELIMINARY EXAMINATION

SCIENCE (CHEMISTRY) 5105/03

Paper 3 Multiple Choice

2 August 2024

Papers 3 and 4: 1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, register number and class on the Answer Sheet in the spaces provided.

There are **twenty** 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.

Answers to Paper 3 and Paper 4 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 3**.
You may proceed to answer Paper 4 as soon as you have completed Paper 3.
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.

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		**Key** proton (atomic) number atomic symbol name relative atomic mass									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	3	4	5	6	7	8	9	10	11	12	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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)
The Avogadro constant, L = 6.02 x10^{23} mol^{-1}.

Paper 3

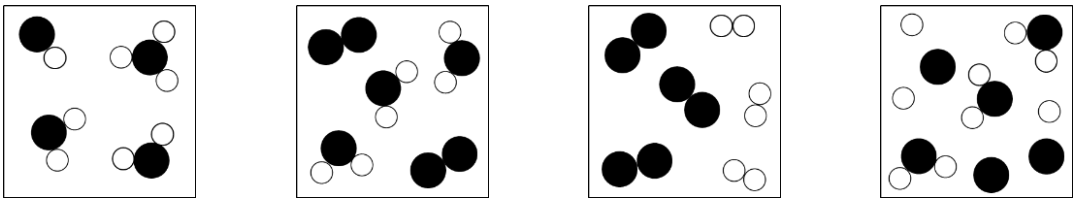
Multiple Choice Questions

Record your answers on the separate Multiple Choice Answer Sheet provided.

1. Hydrogen is burnt in excess oxygen to form water vapour in a reaction vessel.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Which diagram represents the particles that remain in the reaction vessel?



A **B** **C** **D**

2. The statements below contain descriptions of four different substances **P**, **Q**, **R** and **S**.

substance	description
P	A brick-red substance with a fixed composition and decomposes into two elements when heated.
Q	A greyish-green solid that is formed by heating a mixture of iron filings and sulfur powder.
R	A white solid that partially dissolves when placed in a beaker of excess water. It can be separated into a colourless solution and white residue by filtration.
S	A yellow liquid that boils at 69 ^oC and cannot be broken down into simpler substances.

What is the correct classification of the four substances?

	element	compound	mixture
A	**Q**	**P** and **R**	**S**
B	**S**	**P** and **R**	**Q**
C	**S**	**P** and **Q**	**R**
D	**R** and **Q**	**S**	**P**

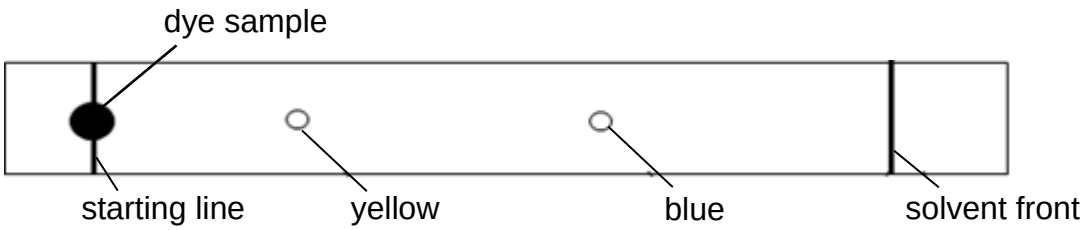
3. The table shows the number of protons, electrons and neutrons in a particle.

number of protons	number of electrons	number of neutrons
11	10	12

Which of the following about this particle is correct?

	type of particle	number of electron shells
A	atom	2
B	atom	3
C	ion	2
D	ion	3

4. The chromatogram of the dye used for the colouring of a sports drink is shown in the diagram below.



What can be deduced from the chromatogram?

A The blue dye is more soluble than the yellow dye in the solvent.

B The dye used for the colouring of the sports drink is a compound.

C The solvent used for the chromatogram is water.

D The volume of yellow dye is less than the volume of blue dye in the drink.

5. ^{10}B and ^{11}B are isotopes of boron.

Which statement about these isotopes is correct?

A Both isotopes have 6 neutrons.

B Both isotopes have different atomic number.

C Both isotopes have the same mass number.

D Both isotopes have the same chemical properties.

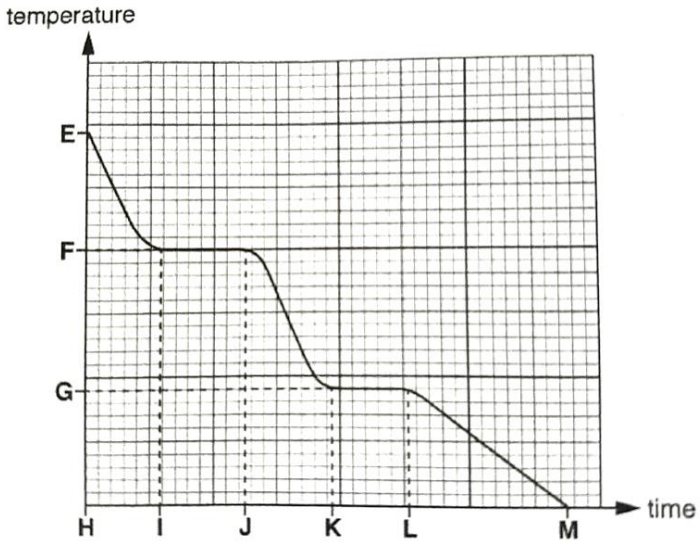
6. Element **X** has the electronic configuration 2,8,5.
Element **Y** has the electronic configuration 2,8,7.

What is the formula of the compound formed between **X** and **Y**?

A XY_3 **B** X_2Y_3 **C** X_3Y **D** X_3Y_2

Questions **7** and **8** are based on the information given in the graph below.

A gaseous substance is allowed to cool. The temperature of the substance is taken at regular intervals and a graph of the readings obtained is shown below.



7. Between which two letters on the time axis is there a mixture of solid and liquid present?

A **H** and **I**
B **I** and **J**
C **J** and **K**
D **K** and **L**

8. Name the process occurring at temperature **G**.

A boiling
B condensation
C freezing
D melting

9. The boiling point of methanol and water are 65 ^{o}C and 100 ^{o}C respectively.
Which method is used to separate a mixture of methanol and water?

A evaporation

B filtration

C fractional distillation

D paper chromatography

10. Turmeric is an example of a natural indicator.
It forms a yellow solution in water.
This solution turns red in an alkaline solution but remains yellow in an acidic solution.

Turmeric solution is added to a sample of liquid soap, pH 8 and to vinegar, pH 3.
Which colours are observed?

	liquid soap	vinegar
A	red	red
B	red	yellow
C	yellow	red
D	yellow	yellow

11. Which statements about oxides are correct?

1. Sulfur dioxide dissolves in water to produce a solution with a pH less than 7.
2. Potassium oxide dissolves in water to produce a solution that turns blue litmus paper red.
3. Carbon dioxide reacts with sulfuric acid to form a salt.
4. Potassium oxide reacts with hydrochloric acid to form a salt.

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

12. Which row correctly describes the properties of simple covalent molecules?

	boiling point	electrical conductivity
A	high	good
B	high	poor
C	low	good
D	low	poor

13. Flowers of a hydrangea bush are blue when grown in acidic soil and pink when the soil is alkaline.

Which substance when added to the soil of a hydrangea with blue flowers causes it to produce pink flowers?

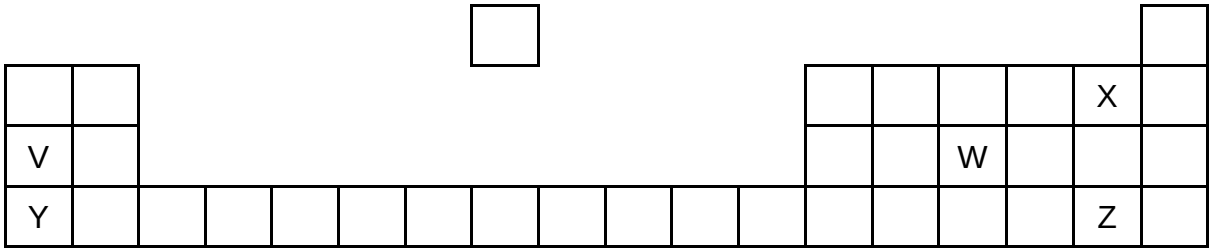
A calcium hydroxide

B citric acid

C copper(II) sulfate

D sodium chloride

14. The diagram below shows a part of the Periodic Table.



The letters are not symbols of the element.
Which of the following statements is **incorrect**?

A V has more metallic character than W.

B Y and Z has the same number of valence electrons.

C Y has lower melting point than V.

D Z is less reactive than X.

15. Which of the following statements about chlorine, bromine and iodine is correct?

A Bromine is a solid, chlorine is a liquid and iodine is a gas at room temperature.

B Chlorine, bromine and iodine exist as monatomic molecules.

C Chlorine displaces the iodide ions from a solution of sodium iodide.

D Iodine displaces the bromide ions from a solution of sodium bromide.

16. The table shows the results of metal displacement experiments.

Key: ✓ = reaction observed
× = no reaction observed

metal	**aqueous metal ion**		
	X^{2+}	Y^{2+}	Z^{2+}
X		✓	✓
Y	×		×
Z	×	✓	

What is the order of reactivity of the metals?

	most reactive →		least reactive
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

17. Which of the following gases will cause damage to marble buildings and steel structures?

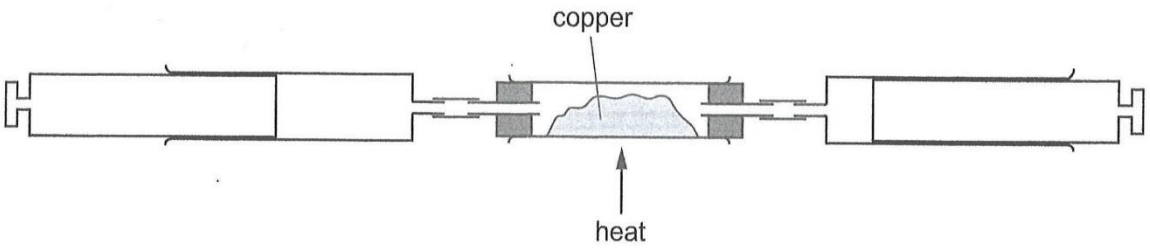
A argon

B carbon monoxide

C nitrogen

D sulfur dioxide

18. 80 cm^3 of dry air measured at room temperature is passed repeatedly over heated copper using the apparatus shown.



The heated copper reacts with oxygen to form copper(II) oxide. All the oxygen in the air reacted with copper.
After the reaction is complete, the air remaining is allowed to cool to room temperature.

What is the volume of air remaining?

A 1 cm^3 **B** 17 cm^3 **C** 63 cm^3 **D** 79 cm^3

19. Which of the following reactions is used to produce bioethanol?

A Combustion
B Decomposition
C Fermentation
D Oxidation

20. Two hydrocarbons, **P** and **Q**, have the following properties.

- Both are saturated hydrocarbons.
- Both undergo substitution with chlorine in the presence of UV light.
- **P** has a higher boiling point than **Q**.

What are **P** and **Q**?

	P	**Q**
A	butane	propane
B	ethane	butane
C	ethene	propene
D	propene	ethene

---End of Paper 3---

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2024 4NA Science Chemistry Prelim

Suggested Answers

Paper 3: MCQ [20 marks]

1	2	3	4	5	6	7	8	9	10
B	C	C	A	D	A	D	C	C	B
11	12	13	14	15	16	17	18	19	20
B	D	A	B	C	B	D	C	C	A