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ANDERSON SECONDARY SCHOOL
Preliminary Examination 2019
Secondary Four Express

CANDIDATE NAME:

CLASS: /

INDEX NUMBER:

CHEMISTRY

6092/01

Paper 1 Multiple Choice

3 September 2019

1 hour

1000 – 1100h

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

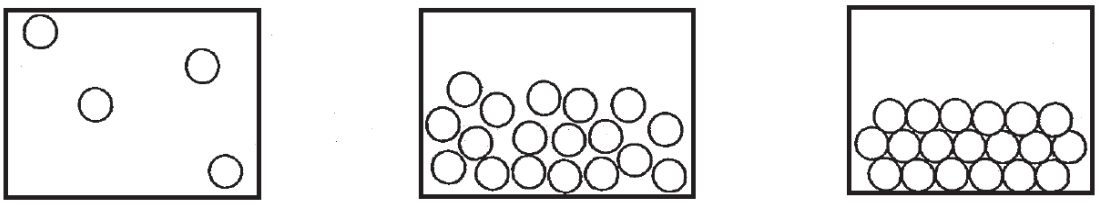
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C**, **D**.
Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for the wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page **21**.

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

1 Diagrams I, II and III show the particles of three substances at room temperature and pressure.

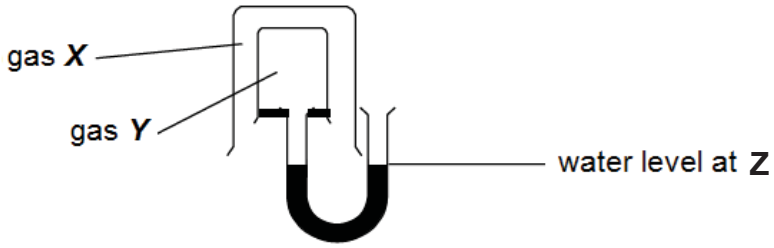


I II III

Which of these substances are correctly represented by the corresponding diagram?

	I	II	III
A	ethanol	hydrogen chloride	dry ice
B	helium	mercury	zinc
C	methane	sodium chloride	copper
D	water	argon	mercury

2 The set–up below shows how the relative rate of diffusion of gas **X** and **Y** can be determined.



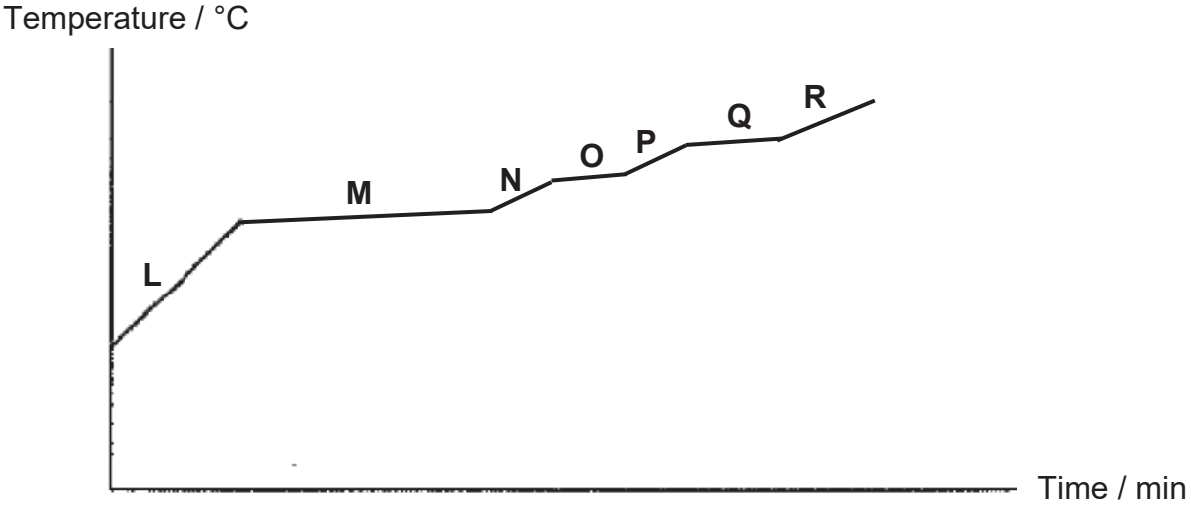
Which pair of substances could **X** and **Y** be if the water level at **Z** decreases?

	X	**Y**
A	ethane	argon
B	carbon monoxide	neon
C	methane	oxygen
D	nitrogen	carbon dioxide

3 The three main components of liquid air are nitrogen, oxygen and argon. Their respective boiling points are:

Nitrogen: –196°C
Oxygen: –183°C
Argon: –186°C

Liquid air can be separated into its three main components by fractional distillation. The graph shows the temperature of a liquid air mixture as it is heated.



In section **N** of the graph, the mixture remaining consists of

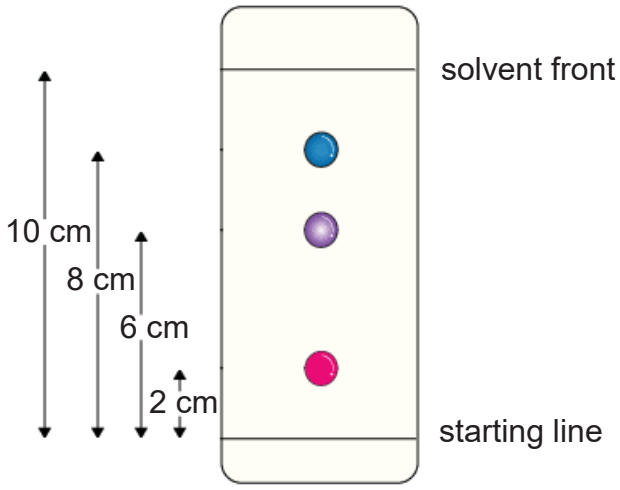
A liquid nitrogen and argon only.

B liquid nitrogen only.

C liquid oxygen and argon only.

D liquid oxygen only.

4 The diagram shows the chromatogram obtained by analysis of a dye mixture. Three measurements are shown in the diagram below.



What is the R_f value of the most soluble dye?

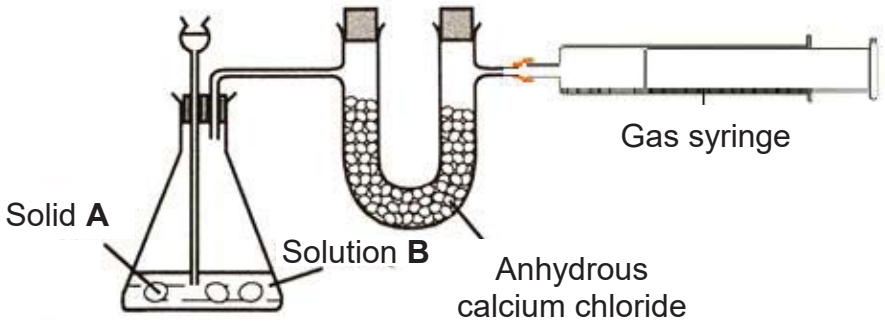
A 0.20

B 0.80

C 1.25

D 5.00

5 The diagram shows a simple laboratory set-up used to prepare and collect a dry gas.



Which pair of reagents would be most suitable to prepare the gas produced using this set-up?

	solid **A**	solution **B**
A	ammonium chloride	sodium hydroxide
B	calcium carbonate	aqueous ammonia
C	potassium hydroxide	sulfuric acid
D	zinc	hydrochloric acid

6 The solubilities of three solids in water and tetrachloromethane are given in the table below.

solid	solubility in water	solubility in tetrachloromethane
sand	not soluble	not soluble
sodium chloride	good	not soluble
sulfur	not soluble	good

Which of the experimental procedures would be suitable for obtaining pure sand from a mixture of sand, sodium chloride and sulfur?

A Add tetrachloromethane and stir, then filter to collect residue.

B Add tetrachloromethane and stir, then filter. Add the residue to water and stir, then filter to collect residue.

C Add water and stir, then filter. Evaporate the filtrate to dryness.

D Add water and stir, then filter. Add tetrachloromethane to filtrate and stir, then evaporate to dryness.

7 Brass is an alloy of copper and zinc. Copper has a melting point of 1085°C and zinc 419.5°C. Which of the following is a possible melting point of brass?

A Above 419.5°C

B Above 1085°C

C Below 1085°C

D Between 419.5°C and 1085°C

8 An ion of formula $\mathbf{X}^{2-}$ contains 18 electrons. If the relative atomic mass of **X** is 32, what is present in the nucleus of the ion?

A 16 protons and 16 neutrons

B 16 protons and 18 electrons

C 18 protons and 14 neutrons

D 18 protons and 18 electrons

9 Which statement correctly describes the properties of the compound copper(II) sulfide, CuS and mixture of copper and sulfur?

	copper(II) sulfide	**mixture of copper and sulfur**
1	copper and sulfur react when heated to form copper(II) sulfide	copper and sulfur mix together with no energy change
2	the ratio of copper to sulfur is always 1 : 1	the ratio of copper to sulfur can vary
3	copper(II) sulfide has the same properties as copper and sulfur	the mixtures do not have the same properties as copper and sulfur

A 1 only

B 1 and 2

C 2 and 3

D All the above

10 Which compound contains both ionic and covalent bonds?

A ammonia

B beryllium chloride

C ethyl ethanoate

D potassium nitrate

11 An investigation of the properties of the chlorides of Period 3 elements shows that the boiling points of sodium chloride and silicon tetrachloride are 1465°C and 57°C respectively. This difference in boiling points is a result of

A covalent bonds being weaker than ionic bonds.

B metallic character decreasing across the period.

C silicon forming weaker bonds with chlorine as compared to sodium.

D silicon tetrachloride having weak intermolecular forces of attraction.

12 Two comments about hydrogen chloride are made below.

Comment 1: Hydrogen chloride has strong covalent bonds in its simple molecular structure.
Comment 2: Hydrogen chloride is soluble in water.

Which statement is correct?

A Both comments are correct and comment 1 explains comment 2.

B Both comments are correct but comment 1 does not explain comment 2.

C Both comments are incorrect.

D Comment 2 is correct but comment 1 is incorrect.

13 The reaction of nitrogen dioxide with water is as shown.

$$\mathbf{w}\ NO_2 + \mathbf{x}\ H_2O \rightarrow \mathbf{y}\ HNO_3 + \mathbf{z}\ HNO_2$$

Which of the following values will give a balanced equation for the reaction above?

	w	**x**	**y**	**z**
A	1	1	1	1
B	2	1	1	1
C	2	2	1	1
D	4	2	2	2

14 Antimony is in the same group as nitrogen in the Periodic Table. What is the chemical formula of lithium antimonide?

A Li_3An

B $LiAnO_3$

C Li_3Sb

D $LiSbO_3$

15 Which statements about molecular mass is **incorrect**?

A It is the mass obtained on an electronic balance by 1g of the molecules.

B It is the ratio of the average mass of a molecule to the mass of a ^{12}C atom.

C It is the ratio of the mass of 1 mole of molecules to the mass of 1 mole of ^{12}C atom.

D It is the sum of the relative atomic masses of all the atoms within the molecules.

16 Which substance contains the greatest number of atoms in 1g?

A CO_2

B NO_2

C O_2

D SO_2

17 100 cm^3 of ammonia burns in 50 cm^3 of oxygen according to the following equation:

$$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

What volume of gas will be collected at the end of the reaction when cooled to room temperature?

A 33.3 cm^3 **B** 50.0 cm^3

C 66.7 cm^3 **D** 166.7 cm^3

18 The fertilisers ammonium nitrate (NH_4NO_3, M_r = 80) is manufactured from ammonia (NH_3, M_r = 17) by a two-stage process.

Stage 1: $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$
Stage 2: $HNO_3 + NH_3 \rightarrow NH_4NO_3$

What is the maximum mass of fertilizer that can be made if only 17 tonnes of ammonia is available?

A 34 tonnes **B** 40 tonnes

C 80 tonnes **D** 97 tonnes

19 Magnesium oxide is produced by heating magnesium carbonate.

$$MgCO_3 \rightarrow MgO + CO_2$$

When 84 g of magnesium carbonate is heated, 34 g of magnesium oxide is produced.
What is the percentage yield of magnesium oxide?
[M_r: $MgCO_3$, 84; MgO, 40]

A $\frac{34}{40} \times 100$

B $\frac{34}{84} \times 100$

C $\frac{40}{34} \times 100$

D $84 \times \frac{34}{40} \times 100$

20 35.0 cm^3 of 0.500 mol/dm^3 hydrochloric acid were added to 1.41 g of a sample of sodium carbonate containing some sodium chloride as impurity. The excess acid was neutralised by 15.0 cm^3 of 0.400 mol/dm^3 of sodium hydroxide solution.

What is the percentage purity of the sodium carbonate in the sample?
[M_r: HC*l*, 36.5; Na_2CO_3, 106; NaOH, 40]

A 43.2%
B 45.1%
C 86.5%
D 90.2%

21 Which method(s) is/are suitable to test the strengths of acids and alkalis?

1 titration
2 measuring their electrical conductivity
3 using a pH meter

A 1 only
B 1 and 3
C 2 and 3
D All of the above

22 Arsine (AsH_3) is a gas that behaves like ammonia. Which of the following particles are found in the solution when Arsine dissolves in water?

A As^+ and OH^-

B AsH_3, As^+ and OH^-

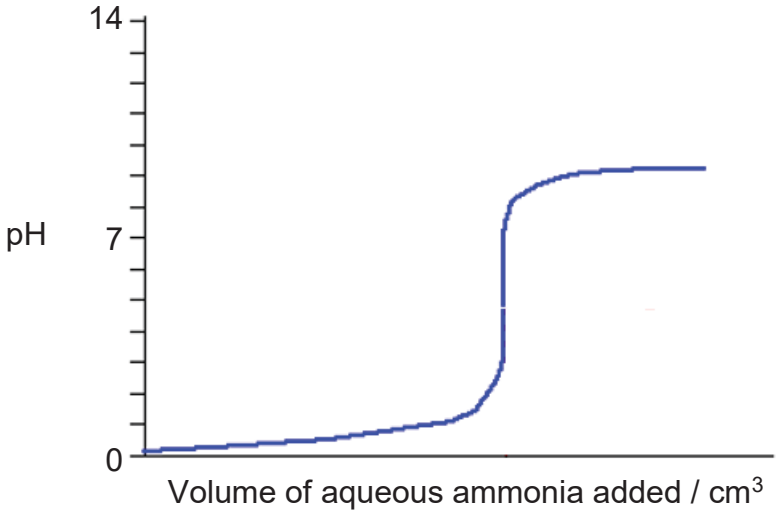
C AsH_4^+ and OH^-

D AsH_3, AsH_4^+ and OH^-

23 Different indicators change colour over different pH ranges and it is important to choose the correct indicator to obtain an accurate result in a titration.

indicator	pH range for the colour change	colour	
		lower pH	higher pH
indigo carmine	11.6 – 14.0	blue	yellow
methyl red	4.2 – 6.3	red	yellow
methyl violet	0.3 – 3.0	yellow	violet
phenolphthalein	8.2 – 10.0	colourless	pink

The graph below shows the change of pH when aqueous ammonia is added to a fixed volume of dilute hydrochloric acid in a titration.



Which indicator would be the best choice to use in this titration?

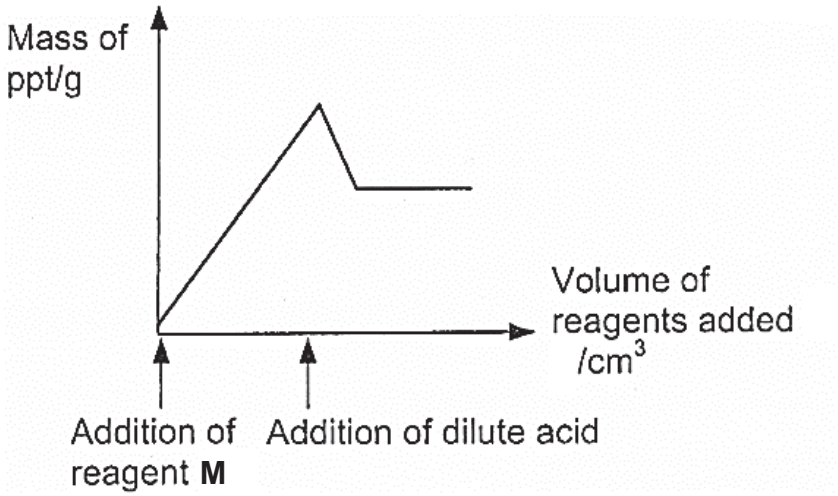
A indigo carmine **B** methyl red

C methyl violet **D** phenolphthalein

24 Which substance has metallic bonding?

substance	electrical conductivity		property of product formed from the reaction between substance and oxygen
	in solid state	in molten state	
A	X	X	reacts with alkali
B	X	✓	no reaction with acid or alkali
C	✓	✓	reacts with alkali
D	✓	✓	reacts with both acid and alkali

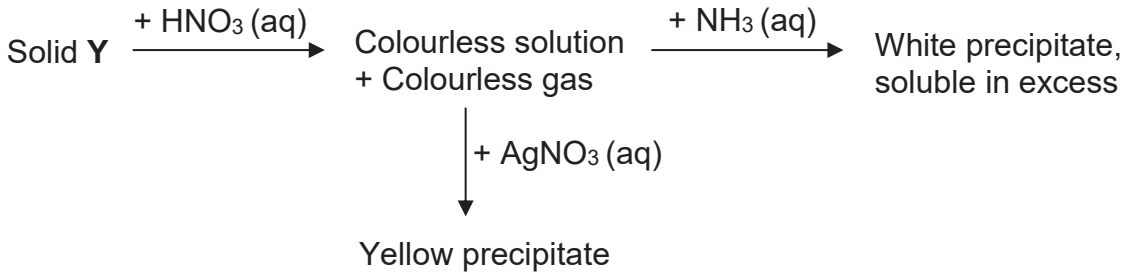
25 In a quantitative analysis, reagent **M** is gradually added to a salt solution **N** (that contains either 1 or 2 different anions), followed by the addition of a dilute acid. The graph below shows how the mass of precipitate formed changes with the reagents added.



Which of the following combinations would produce the graph above?

	anions in **N**	reagents (**M** and acid) added
A	CO_3^{2-}	$AgNO_3$ and HNO_3
B	CO_3^{2-}, Cl^-	$BaCl_2$ and HNO_3
C	CO_3^{2-}, SO_4^{2-}	$AgNO_3$ and HCl
D	CO_3^{2-}, SO_4^{2-}	$BaCl_2$ and HCl

26 Solid **Y** contains a mixture of two salts. The scheme below shows some reactions of solid **Y**.



Which of the following could be the two salts present in solid **Y**?

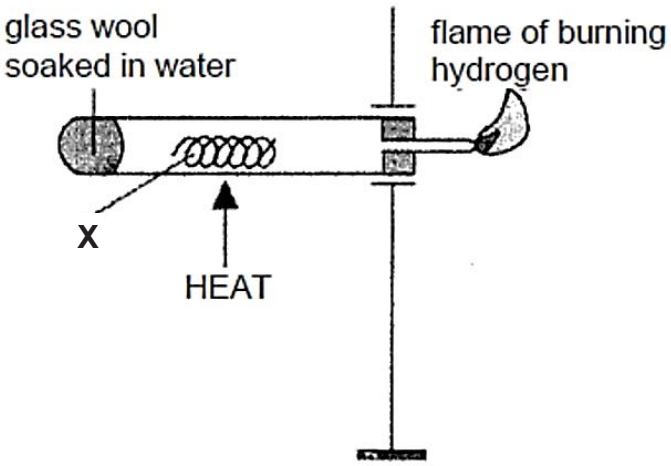
A aluminium carbonate and ammonium chloride

B calcium chloride and zinc carbonate

C lead(II) carbonate and sodium iodide

D zinc iodide and calcium carbonate

27 The set-up below shows the reaction of substance **X**.



What is the possible identity of **X**?

A **X** is a metal above hydrogen in the reactivity series.

B **X** is a metal below hydrogen in the reactivity series.

C **X** is an oxide of a metal that is above hydrogen in the reactivity series.

D **X** is an oxide of a metal that is below hydrogen in the reactivity series.

28 The following observations were made when nickel and iron were placed separately into solutions of metals **S**, **T** and **U**.

	salt solution of **S**	salt solution of **T**	salt solution of **U**
nickel	displaced	not displaced	not displaced
iron	displaced	displaced	not displaced

What is the correct order in increasing reactivity of the five metals?

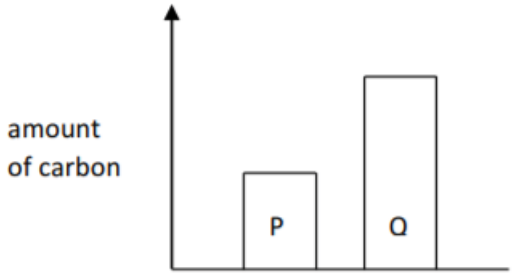
A **S** < Ni < Fe < **T** < **U**

B **S** < Ni < **T** < Fe < **U**

C **U** < Fe < **T** < Ni < **S**

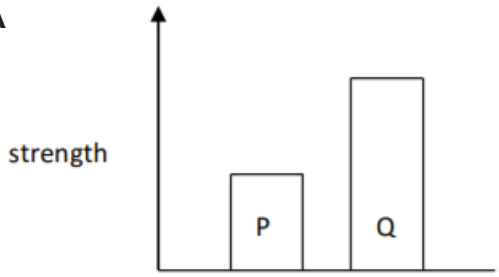
D **U** < **T** < Fe < Ni < **S**

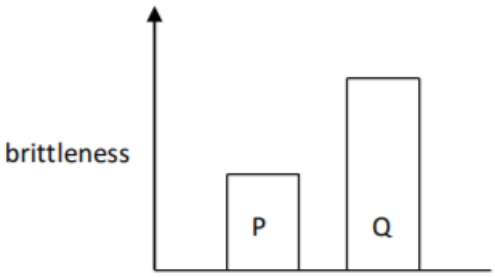
29 The diagram compares the amount of carbon in two steels, **P** and **Q**?



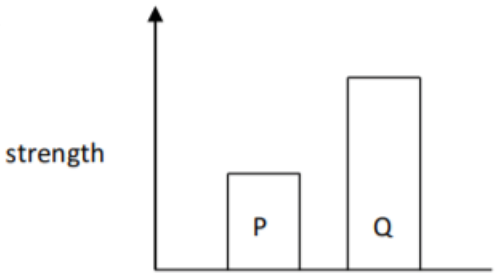
Which two diagrams correctly compare the strength and brittleness of **P** and **Q**?

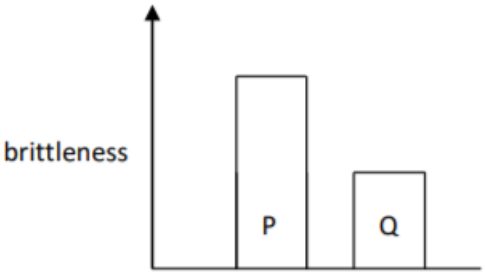
A



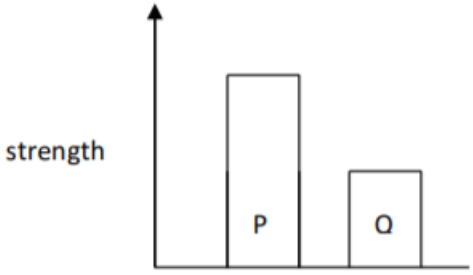


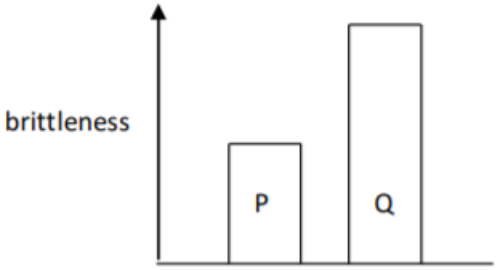
B



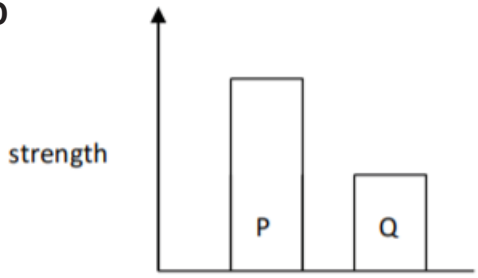


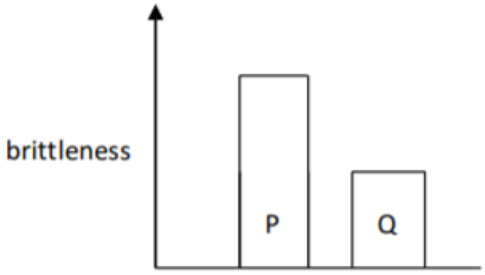
C



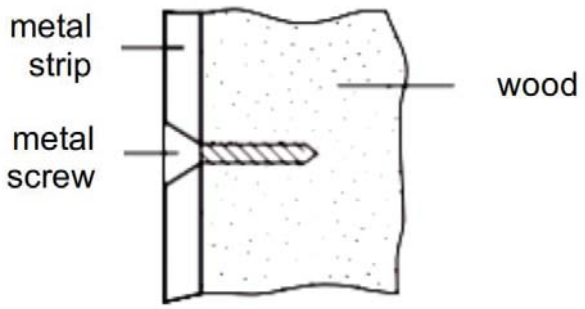


D





30 An old railway carriage is being restored by having metal strips secured to the outside of the wooden carriage by means of screws.



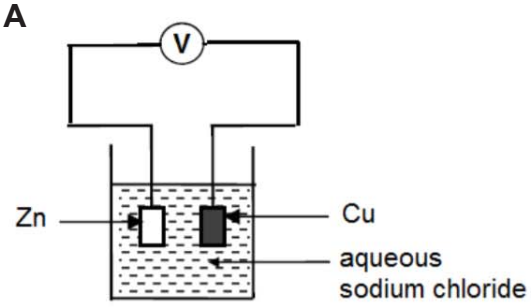
After a few weeks of being exposed to wind and rain, the screws are heavily corroded but the metal strips are not.

Which two metals would give this result?

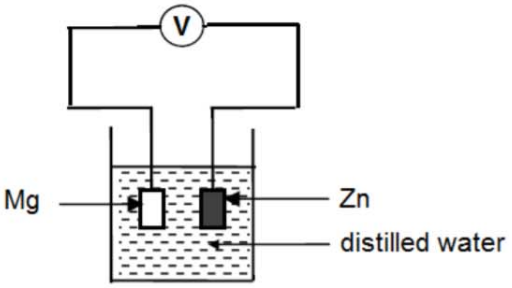
	screw	strip
A	copper	steel
B	copper	zinc
C	steel	copper
D	steel	magnesium

31 Which set–up would produce the greatest reading on the voltmeter?

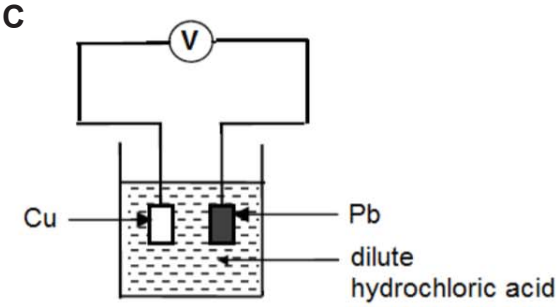
A



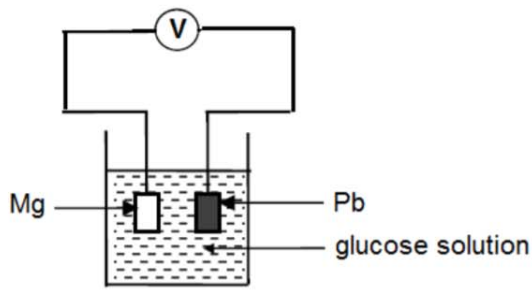
B



C



D



32 For which process is the enthalpy change always positive?

A combustion

B dissolving of acids in water

C evaporation

D respiration

33 Which of the following reactions takes place in a hydrogen fuel cell?

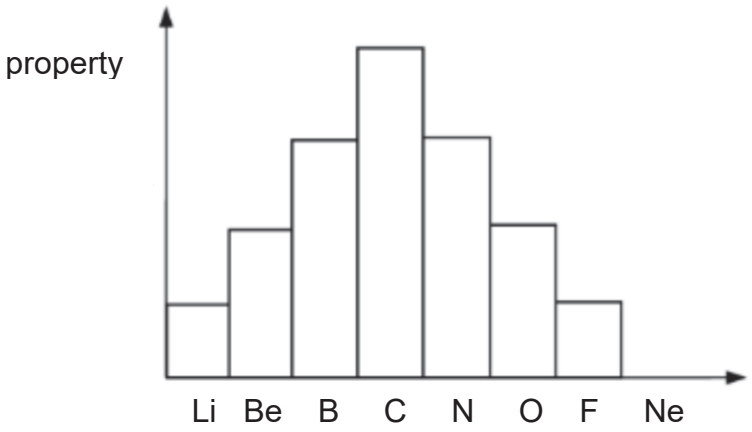
A Hydrogen ions are oxidised at the anode.

B Hydrogen ions are reduced at the cathode.

C Hydrogen loses electrons to form H^+ ions at the anode.

D Oxygen gains electrons to form O^{2-} at the cathode.

34 The bar chart shows the variation of a specific property of elements in Period 2 from lithium to neon. Which property of these elements is shown in the chart?



A The atomic radius.

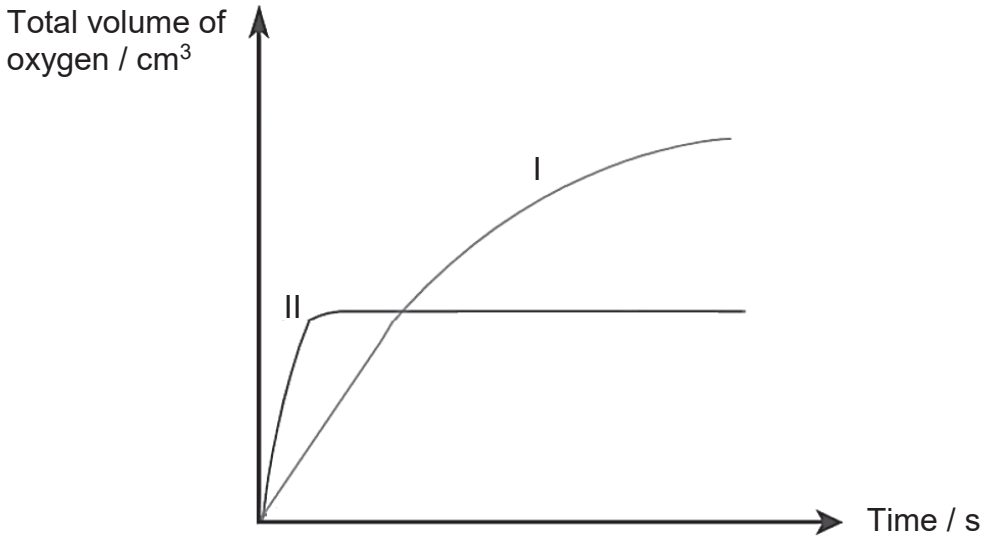
B The melting point.

C The number of electrons used in bonding.

D The number of shells holding electrons.

35 Manganese(IV) oxide catalyses the decomposition of aqueous hydrogen peroxide into water and oxygen.

In order to follow the rates of this reaction for two different solutions of hydrogen peroxide, the total volumes of oxygen evolved were recorded at regular time intervals and the results were plotted. In each experiment, the same mass of catalysts were used and the temperature kept constant.



If curve I corresponds to 20.0 cm^3 of 4.0 mol/dm^3 of solution, curve II would correspond to

A 5.0 cm^3 of 8.0 mol/dm^3 solution.

B 10.0 cm^3 of 4.0 mol/dm^3 solution.

C 20.0 cm^3 of 2.0 mol/dm^3 solution.

D 20.0 cm^3 of 8.0 mol/dm^3 solution.

36 Which statement about the fractional distillation of crude oil is correct?

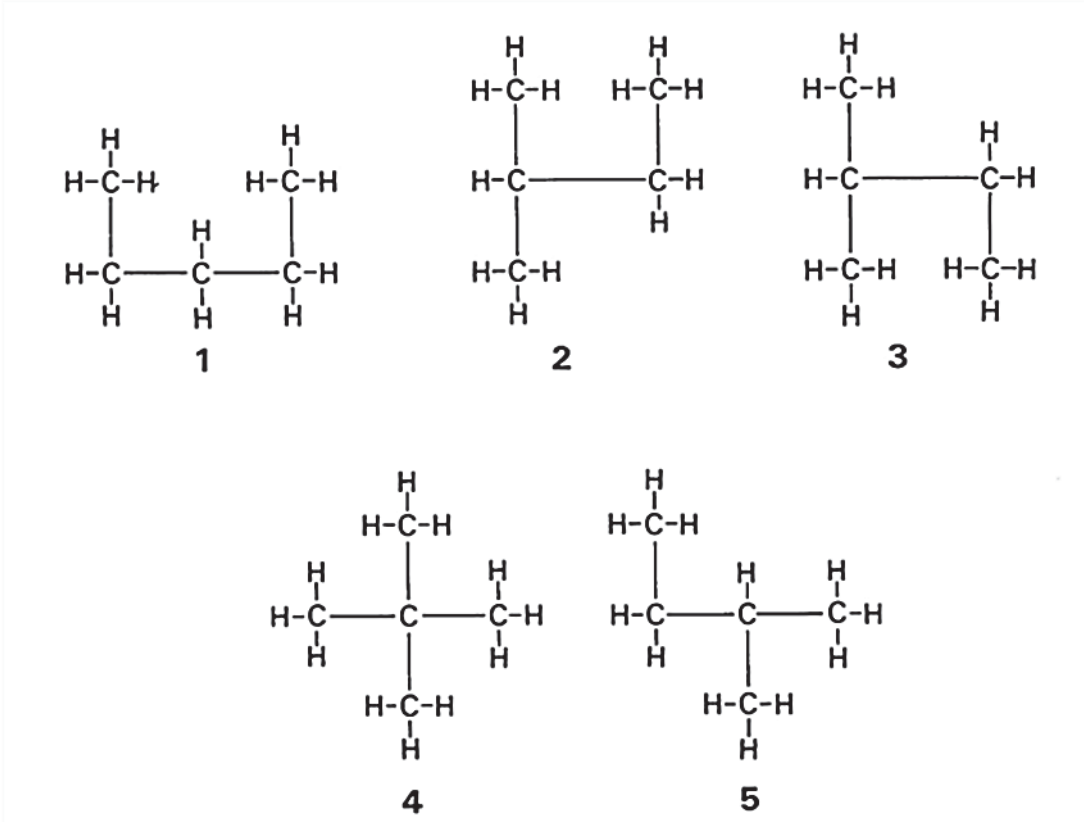
A At each level of the fractionating column, only one compound is collected.

B The higher up the fractionating column, the higher the temperature.

C The fraction at the top of the column are the least flammable.

D The fraction collected at the bottom of the column have the highest viscosity.

37 Five structural formulae are shown below.



How many of the structures represent isomers of one another?

A 2 **B** 3

C 4 **D** 5

38 A student investigated the reaction of different vegetable oils and margarines with hydrogen.

100 cm^3 of hydrogen was passed through 1g samples containing a catalyst. The volume of hydrogen gas remaining in each reaction was recorded in the table below.

sample	volume of hydrogen remaining (cm^3)
P	0
Q	87
R	100

Which sample(s) is/are margarine?

A **P** only

B **P**, **Q** and **R**

C **P** and **Q**

D **R** only

39 In which reaction is water **not** a product?

A combustion of fossil fuels

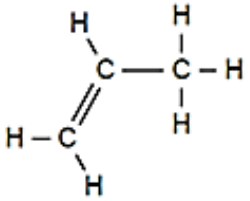
B esterification between ethanoic acid and ethanol

C fermentation of glucose

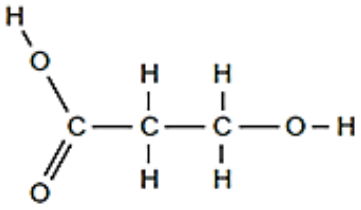
D neutralization between dilute hydrochloric acid and aqueous ammonia

40 Which of the following monomer(s) would undergo polymerisation on their own?

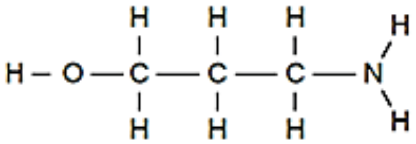
I



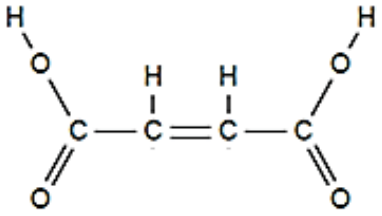
II



III



IV



A I, II and III

B I, II and IV

C II and III

D All of the above

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										2 He helium 4
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 –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

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.).

O

ANDERSON SECONDARY SCHOOL
Preliminary Examination 2019
Secondary Four Express

CANDIDATE NAME:

CLASS: /

INDEX NUMBER:

CHEMISTRY

6092/01

Paper 1 Multiple Choice

3 September 2019

1 hour

1000 – 1100h

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

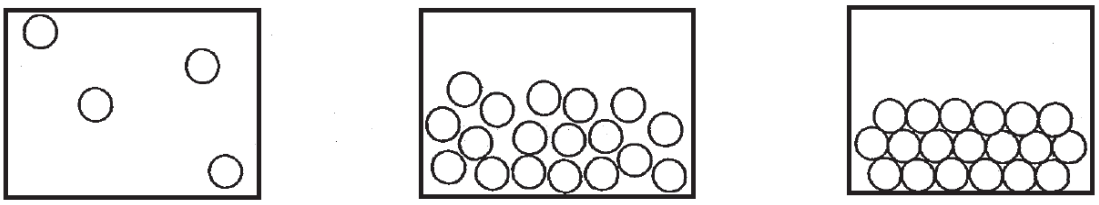
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C**, **D**.
Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for the wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page **21**.

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

1 Diagrams I, II and III show the particles of three substances at room temperature and pressure.

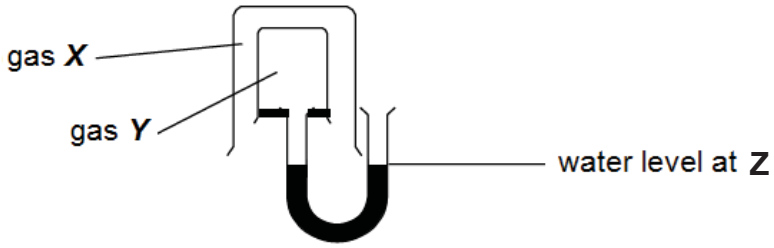


I II III

Which of these substances are correctly represented by the corresponding diagram?

	I	II	III
A	ethanol	hydrogen chloride	dry ice
B	helium	mercury	zinc
C	methane	sodium chloride	copper
D	water	argon	mercury

2 The set–up below shows how the relative rate of diffusion of gas **X** and **Y** can be determined.



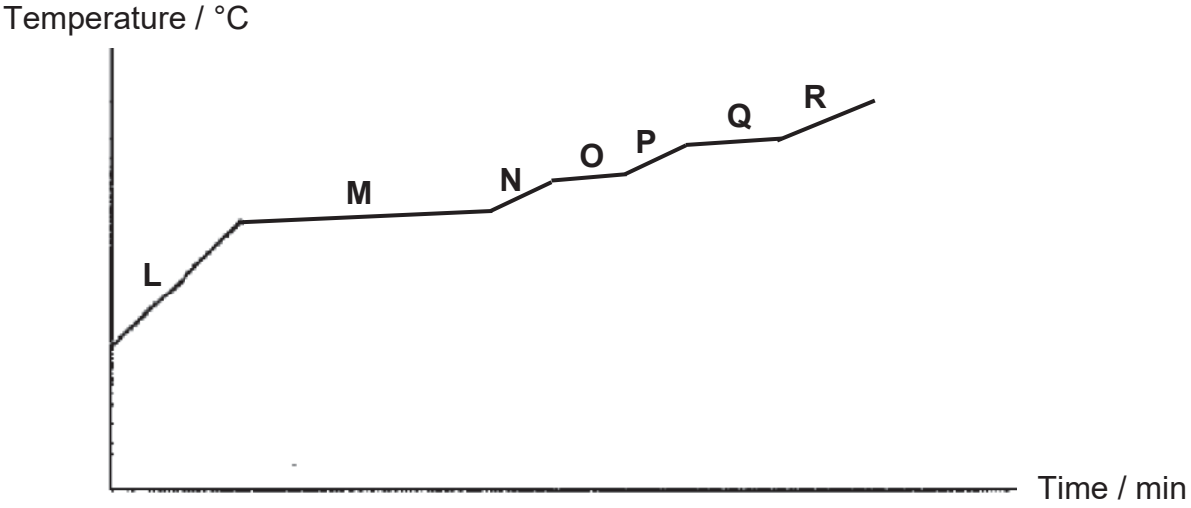
Which pair of substances could **X** and **Y** be if the water level at **Z** decreases?

	X	**Y**
A	ethane	argon
B	carbon monoxide	neon
C	methane	oxygen
D	nitrogen	carbon dioxide

3 The three main components of liquid air are nitrogen, oxygen and argon. Their respective boiling points are:

Nitrogen: –196°C
Oxygen: –183°C
Argon: –186°C

Liquid air can be separated into its three main components by fractional distillation. The graph shows the temperature of a liquid air mixture as it is heated.



In section **N** of the graph, the mixture remaining consists of

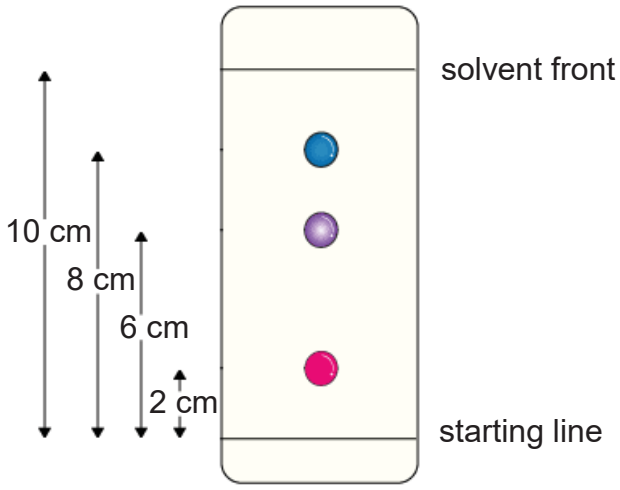
A liquid nitrogen and argon only.

B liquid nitrogen only.

C liquid oxygen and argon only.

D liquid oxygen only.

4 The diagram shows the chromatogram obtained by analysis of a dye mixture. Three measurements are shown in the diagram below.



What is the R_f value of the most soluble dye?

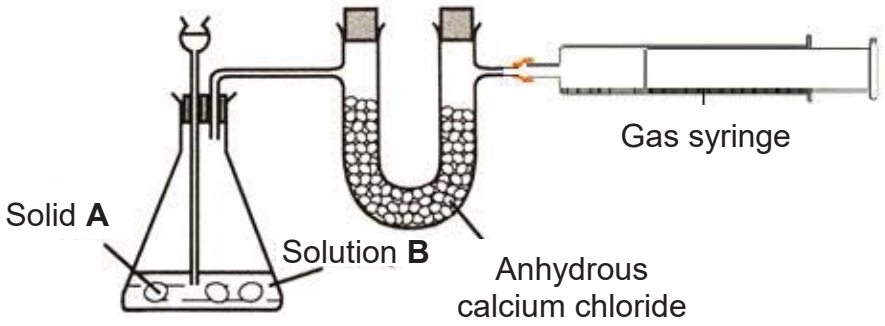
A 0.20

B 0.80

C 1.25

D 5.00

5 The diagram shows a simple laboratory set-up used to prepare and collect a dry gas.



Which pair of reagents would be most suitable to prepare the gas produced using this set-up?

	solid **A**	solution **B**
A	ammonium chloride	sodium hydroxide
B	calcium carbonate	aqueous ammonia
C	potassium hydroxide	sulfuric acid
D	zinc	hydrochloric acid

6 The solubilities of three solids in water and tetrachloromethane are given in the table below.

solid	solubility in water	solubility in tetrachloromethane
sand	not soluble	not soluble
sodium chloride	good	not soluble
sulfur	not soluble	good

Which of the experimental procedures would be suitable for obtaining pure sand from a mixture of sand, sodium chloride and sulfur?

A Add tetrachloromethane and stir, then filter to collect residue.

B Add tetrachloromethane and stir, then filter. Add the residue to water and stir, then filter to collect residue.

C Add water and stir, then filter. Evaporate the filtrate to dryness.

D Add water and stir, then filter. Add tetrachloromethane to filtrate and stir, then evaporate to dryness.

7 Brass is an alloy of copper and zinc. Copper has a melting point of 1085°C and zinc 419.5°C. Which of the following is a possible melting point of brass?

A Above 419.5°C

B Above 1085°C

C Below 1085°C

D Between 419.5°C and 1085°C

8 An ion of formula $\mathbf{X}^{2-}$ contains 18 electrons. If the relative atomic mass of **X** is 32, what is present in the nucleus of the ion?

A 16 protons and 16 neutrons

B 16 protons and 18 electrons

C 18 protons and 14 neutrons

D 18 protons and 18 electrons

9 Which statement correctly describes the properties of the compound copper(II) sulfide, CuS and mixture of copper and sulfur?

	copper(II) sulfide	**mixture of copper and sulfur**
1	copper and sulfur react when heated to form copper(II) sulfide	copper and sulfur mix together with no energy change
2	the ratio of copper to sulfur is always 1 : 1	the ratio of copper to sulfur can vary
3	copper(II) sulfide has the same properties as copper and sulfur	the mixtures do not have the same properties as copper and sulfur

A 1 only

B 1 and 2

C 2 and 3

D All the above

10 Which compound contains both ionic and covalent bonds?

A ammonia

B beryllium chloride

C ethyl ethanoate

D potassium nitrate

11 An investigation of the properties of the chlorides of Period 3 elements shows that the boiling points of sodium chloride and silicon tetrachloride are 1465°C and 57°C respectively. This difference in boiling points is a result of

A covalent bonds being weaker than ionic bonds.

B metallic character decreasing across the period.

C silicon forming weaker bonds with chlorine as compared to sodium.

D silicon tetrachloride having weak intermolecular forces of attraction.

12 Two comments about hydrogen chloride are made below.

Comment 1: Hydrogen chloride has strong covalent bonds in its simple molecular structure.
Comment 2: Hydrogen chloride is soluble in water.

Which statement is correct?

A Both comments are correct and comment 1 explains comment 2.

B Both comments are correct but comment 1 does not explain comment 2.

C Both comments are incorrect.

D Comment 2 is correct but comment 1 is incorrect.

13 The reaction of nitrogen dioxide with water is as shown.

$$\mathbf{w}\ NO_2 + \mathbf{x}\ H_2O \rightarrow \mathbf{y}\ HNO_3 + \mathbf{z}\ HNO_2$$

Which of the following values will give a balanced equation for the reaction above?

	w	**x**	**y**	**z**
A	1	1	1	1
B	2	1	1	1
C	2	2	1	1
D	4	2	2	2

14 Antimony is in the same group as nitrogen in the Periodic Table. What is the chemical formula of lithium antimonide?

A Li_3An

B $LiAnO_3$

C Li_3Sb

D $LiSbO_3$

15 Which statements about molecular mass is **incorrect**?

A It is the mass obtained on an electronic balance by 1g of the molecules.

B It is the ratio of the average mass of a molecule to the mass of a ^{12}C atom.

C It is the ratio of the mass of 1 mole of molecules to the mass of 1 mole of ^{12}C atom.

D It is the sum of the relative atomic masses of all the atoms within the molecules.

16 Which substance contains the greatest number of atoms in 1g?

A CO_2

B NO_2

C O_2

D SO_2

17 100 cm^3 of ammonia burns in 50 cm^3 of oxygen according to the following equation:

$$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

What volume of gas will be collected at the end of the reaction when cooled to room temperature?

A 33.3 cm^3 **B** 50.0 cm^3

C 66.7 cm^3 **D** 166.7 cm^3

18 The fertilisers ammonium nitrate (NH_4NO_3, M_r = 80) is manufactured from ammonia (NH_3, M_r = 17) by a two-stage process.

Stage 1: $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$
Stage 2: $HNO_3 + NH_3 \rightarrow NH_4NO_3$

What is the maximum mass of fertilizer that can be made if only 17 tonnes of ammonia is available?

A 34 tonnes **B** 40 tonnes

C 80 tonnes **D** 97 tonnes

19 Magnesium oxide is produced by heating magnesium carbonate.

$$MgCO_3 \rightarrow MgO + CO_2$$

When 84 g of magnesium carbonate is heated, 34 g of magnesium oxide is produced.
What is the percentage yield of magnesium oxide?
[M_r: $MgCO_3$, 84; MgO, 40]

A $\frac{34}{40} \times 100$

B $\frac{34}{84} \times 100$

C $\frac{40}{34} \times 100$

D $84 \times \frac{34}{40} \times 100$

20 35.0 cm^3 of 0.500 mol/dm^3 hydrochloric acid were added to 1.41 g of a sample of sodium carbonate containing some sodium chloride as impurity. The excess acid was neutralised by 15.0 cm^3 of 0.400 mol/dm^3 of sodium hydroxide solution.

What is the percentage purity of the sodium carbonate in the sample?
[M_r: HC*l*, 36.5; Na_2CO_3, 106; NaOH, 40]

A 43.2%
B 45.1%
C 86.5%
D 90.2%

21 Which method(s) is/are suitable to test the strengths of acids and alkalis?

1 titration
2 measuring their electrical conductivity
3 using a pH meter

A 1 only
B 1 and 3
C 2 and 3
D All of the above

22 Arsine (AsH_3) is a gas that behaves like ammonia. Which of the following particles are found in the solution when Arsine dissolves in water?

A As^+ and OH^-

B AsH_3, As^+ and OH^-

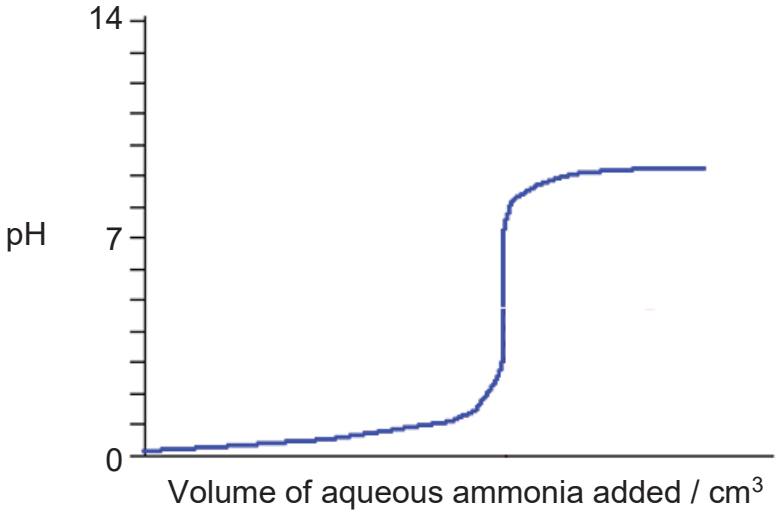
C AsH_4^+ and OH^-

D AsH_3, AsH_4^+ and OH^-

23 Different indicators change colour over different pH ranges and it is important to choose the correct indicator to obtain an accurate result in a titration.

indicator	pH range for the colour change	colour	
		lower pH	higher pH
indigo carmine	11.6 – 14.0	blue	yellow
methyl red	4.2 – 6.3	red	yellow
methyl violet	0.3 – 3.0	yellow	violet
phenolphthalein	8.2 – 10.0	colourless	pink

The graph below shows the change of pH when aqueous ammonia is added to a fixed volume of dilute hydrochloric acid in a titration.



Which indicator would be the best choice to use in this titration?

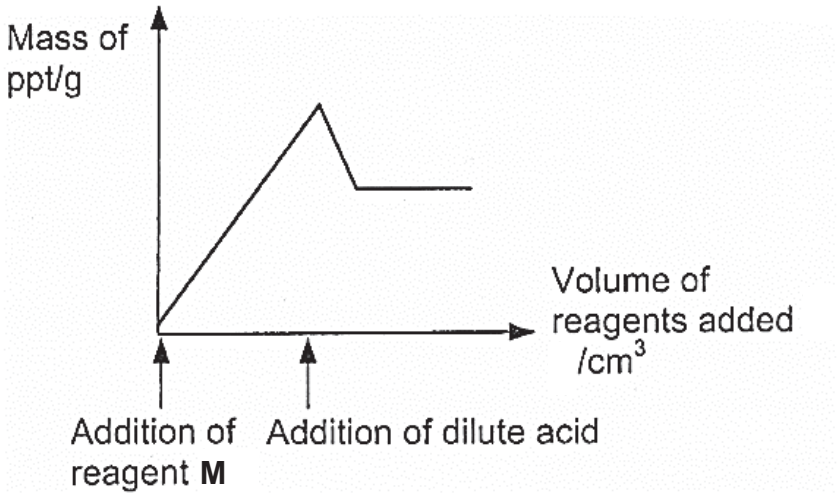
A indigo carmine **B** methyl red

C methyl violet **D** phenolphthalein

24 Which substance has metallic bonding?

substance	electrical conductivity		property of product formed from the reaction between substance and oxygen
	in solid state	in molten state	
A	X	X	reacts with alkali
B	X	✓	no reaction with acid or alkali
C	✓	✓	reacts with alkali
D	✓	✓	reacts with both acid and alkali

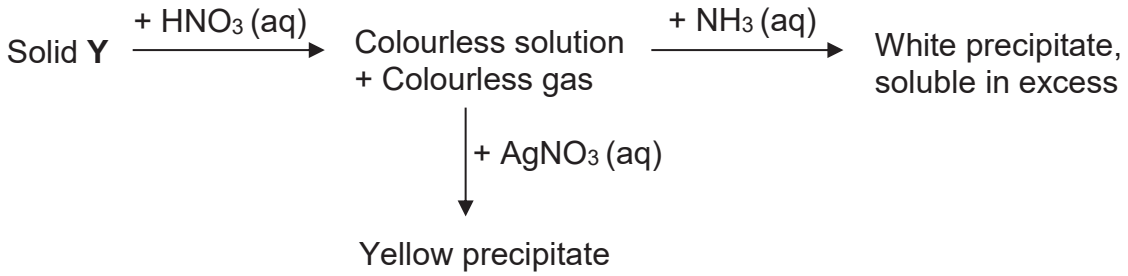
25 In a quantitative analysis, reagent **M** is gradually added to a salt solution **N** (that contains either 1 or 2 different anions), followed by the addition of a dilute acid. The graph below shows how the mass of precipitate formed changes with the reagents added.



Which of the following combinations would produce the graph above?

	anions in **N**	reagents (**M** and acid) added
A	CO_3^{2-}	$AgNO_3$ and HNO_3
B	CO_3^{2-}, Cl^-	$BaCl_2$ and HNO_3
C	CO_3^{2-}, SO_4^{2-}	$AgNO_3$ and HCl
D	CO_3^{2-}, SO_4^{2-}	$BaCl_2$ and HCl

26 Solid **Y** contains a mixture of two salts. The scheme below shows some reactions of solid **Y**.



Which of the following could be the two salts present in solid **Y**?

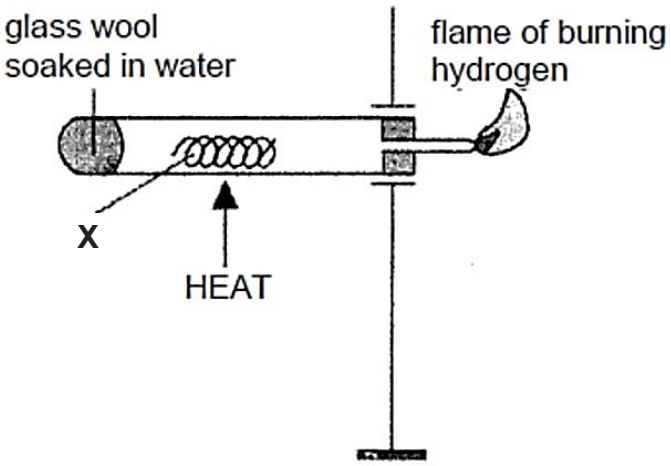
A aluminium carbonate and ammonium chloride

B calcium chloride and zinc carbonate

C lead(II) carbonate and sodium iodide

D zinc iodide and calcium carbonate

27 The set-up below shows the reaction of substance **X**.



What is the possible identity of **X**?

A **X** is a metal above hydrogen in the reactivity series.

B **X** is a metal below hydrogen in the reactivity series.

C **X** is an oxide of a metal that is above hydrogen in the reactivity series.

D **X** is an oxide of a metal that is below hydrogen in the reactivity series.

28 The following observations were made when nickel and iron were placed separately into solutions of metals **S**, **T** and **U**.

	salt solution of **S**	salt solution of **T**	salt solution of **U**
nickel	displaced	not displaced	not displaced
iron	displaced	displaced	not displaced

What is the correct order in increasing reactivity of the five metals?

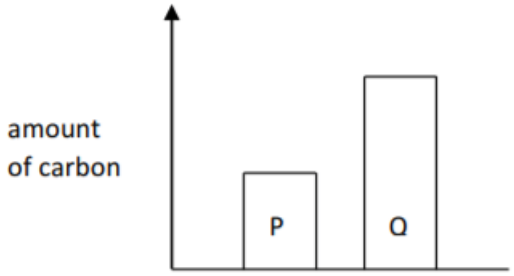
A **S** < Ni < Fe < **T** < **U**

B **S** < Ni < **T** < Fe < **U**

C **U** < Fe < **T** < Ni < **S**

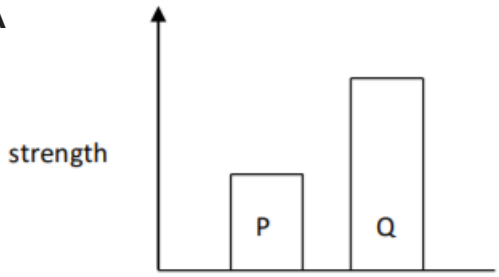
D **U** < **T** < Fe < Ni < **S**

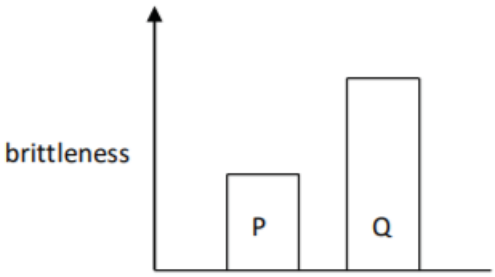
29 The diagram compares the amount of carbon in two steels, **P** and **Q**?



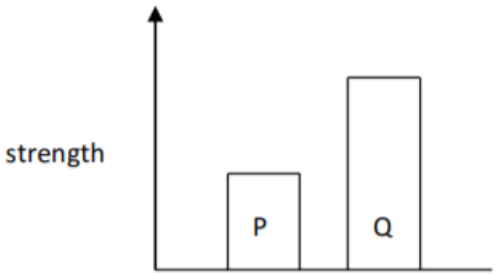
Which two diagrams correctly compare the strength and brittleness of **P** and **Q**?

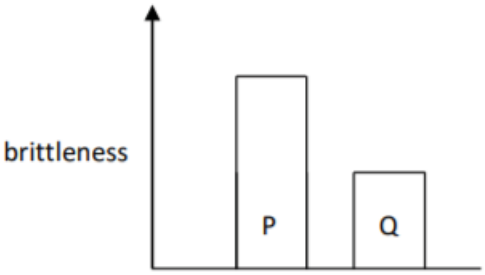
A



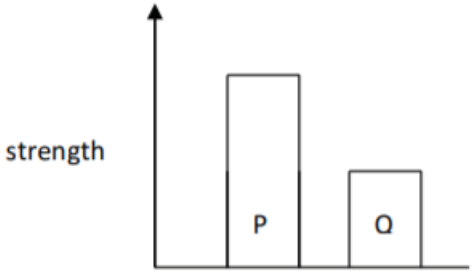


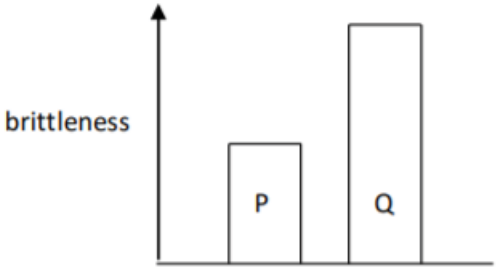
B



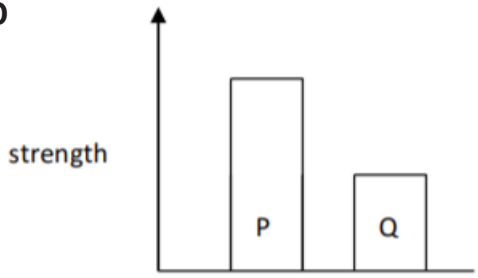


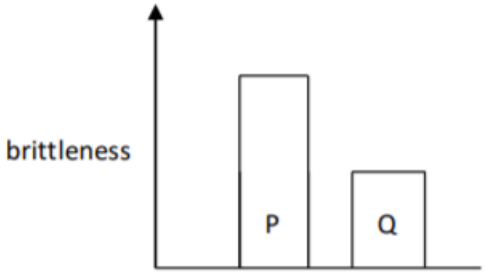
C



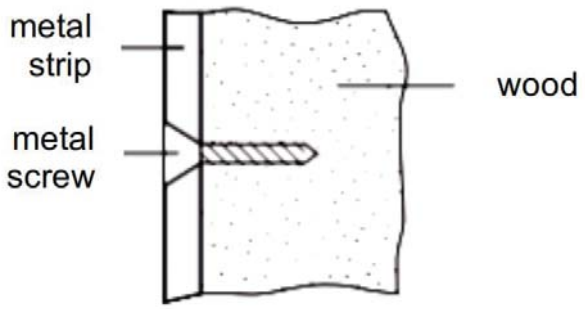


D





30 An old railway carriage is being restored by having metal strips secured to the outside of the wooden carriage by means of screws.



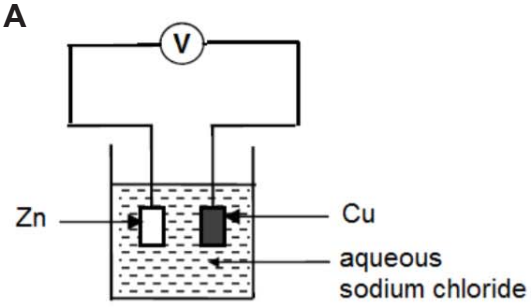
After a few weeks of being exposed to wind and rain, the screws are heavily corroded but the metal strips are not.

Which two metals would give this result?

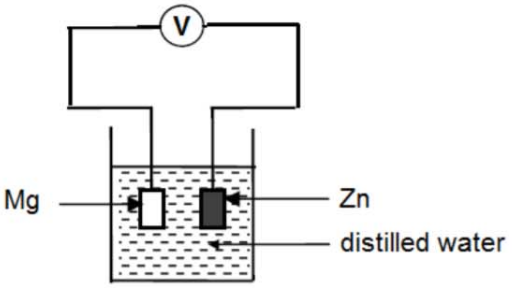
	screw	strip
A	copper	steel
B	copper	zinc
C	steel	copper
D	steel	magnesium

31 Which set–up would produce the greatest reading on the voltmeter?

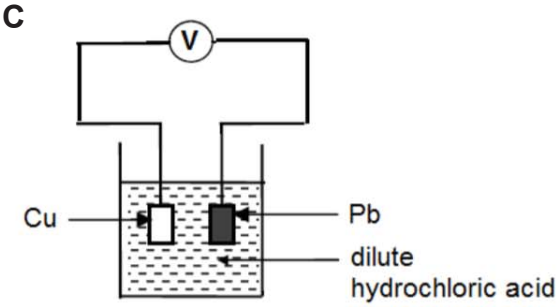
A



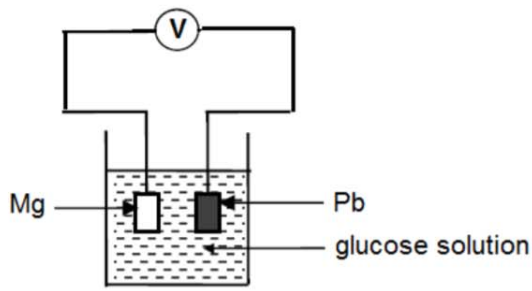
B



C



D



32 For which process is the enthalpy change always positive?

A combustion

B dissolving of acids in water

C evaporation

D respiration

33 Which of the following reactions takes place in a hydrogen fuel cell?

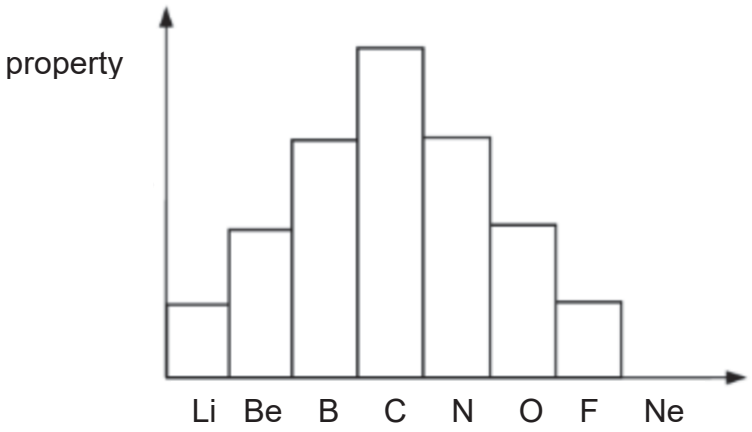
A Hydrogen ions are oxidised at the anode.

B Hydrogen ions are reduced at the cathode.

C Hydrogen loses electrons to form H^+ ions at the anode.

D Oxygen gains electrons to form O^{2-} at the cathode.

34 The bar chart shows the variation of a specific property of elements in Period 2 from lithium to neon. Which property of these elements is shown in the chart?



A The atomic radius.

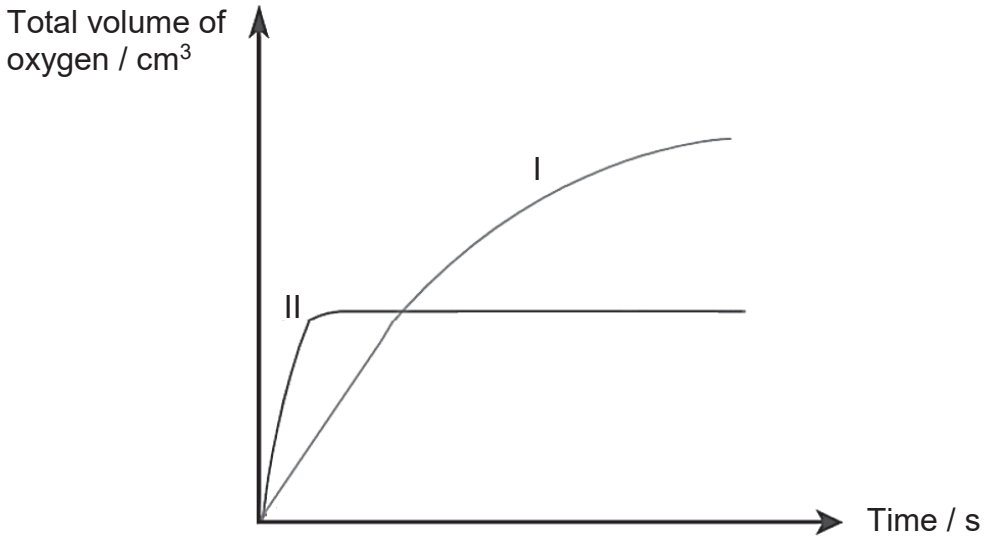
B The melting point.

C The number of electrons used in bonding.

D The number of shells holding electrons.

35 Manganese(IV) oxide catalyses the decomposition of aqueous hydrogen peroxide into water and oxygen.

In order to follow the rates of this reaction for two different solutions of hydrogen peroxide, the total volumes of oxygen evolved were recorded at regular time intervals and the results were plotted. In each experiment, the same mass of catalysts were used and the temperature kept constant.



If curve I corresponds to 20.0 cm^3 of 4.0 mol/dm^3 of solution, curve II would correspond to

A 5.0 cm^3 of 8.0 mol/dm^3 solution.

B 10.0 cm^3 of 4.0 mol/dm^3 solution.

C 20.0 cm^3 of 2.0 mol/dm^3 solution.

D 20.0 cm^3 of 8.0 mol/dm^3 solution.

36 Which statement about the fractional distillation of crude oil is correct?

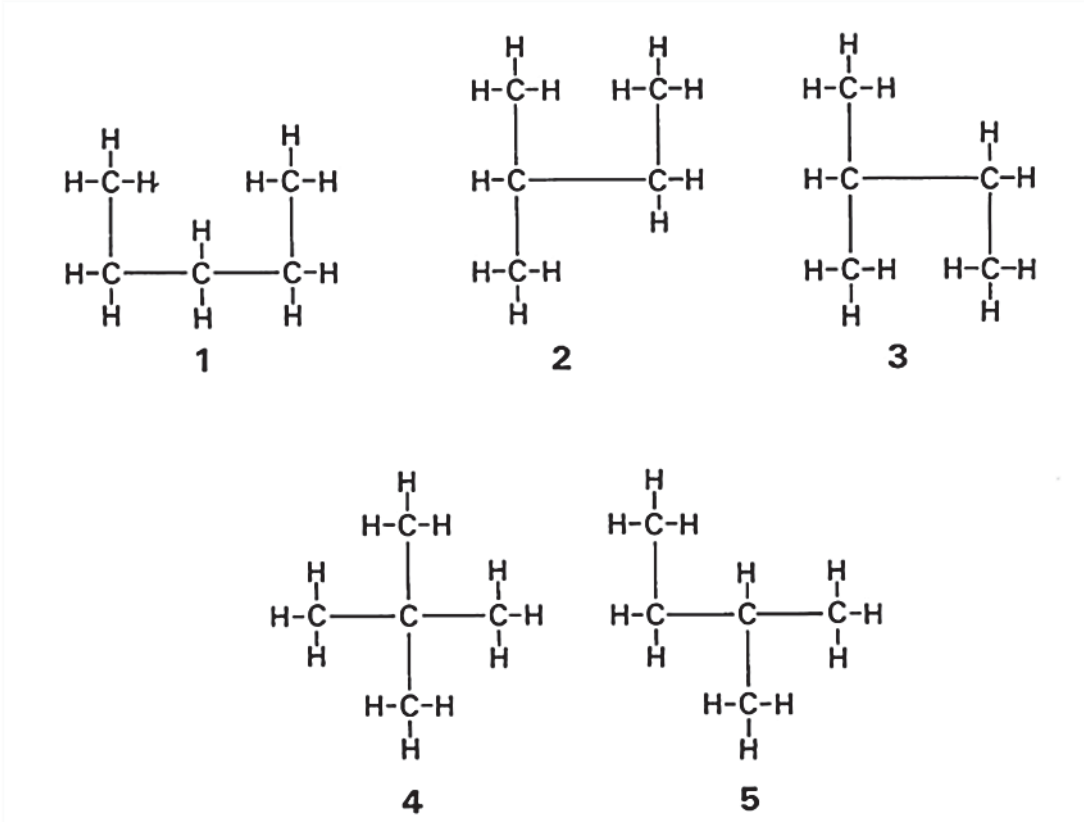
A At each level of the fractionating column, only one compound is collected.

B The higher up the fractionating column, the higher the temperature.

C The fraction at the top of the column are the least flammable.

D The fraction collected at the bottom of the column have the highest viscosity.

37 Five structural formulae are shown below.



How many of the structures represent isomers of one another?

A 2 **B** 3

C 4 **D** 5

38 A student investigated the reaction of different vegetable oils and margarines with hydrogen.

100 cm^3 of hydrogen was passed through 1g samples containing a catalyst. The volume of hydrogen gas remaining in each reaction was recorded in the table below.

sample	volume of hydrogen remaining (cm^3)
P	0
Q	87
R	100

Which sample(s) is/are margarine?

A **P** only

B **P**, **Q** and **R**

C **P** and **Q**

D **R** only

39 In which reaction is water **not** a product?

A combustion of fossil fuels

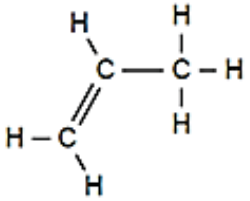
B esterification between ethanoic acid and ethanol

C fermentation of glucose

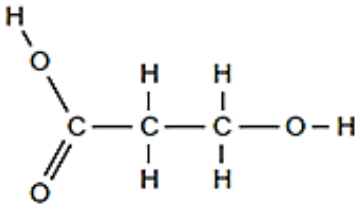
D neutralization between dilute hydrochloric acid and aqueous ammonia

40 Which of the following monomer(s) would undergo polymerisation on their own?

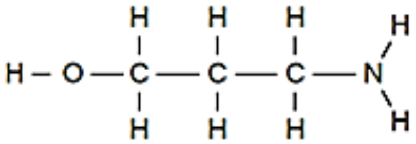
I



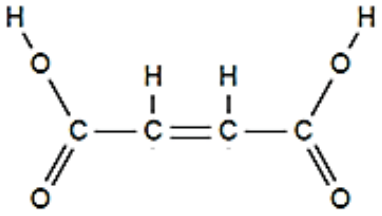
II



III



IV



A I, II and III

B I, II and IV

C II and III

D All of the above

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										2 He helium 4
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 –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

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.).

O

ANDERSON SECONDARY SCHOOL
Preliminary Examination 2019
Secondary Four Express

CANDIDATE NAME:

CLASS: / INDEX NUMBER:

CHEMISTRY 6092/01

Paper 1 Multiple Choice

3 September 2019

1 hour

1000 – 1100h

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C**, **D**.
Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

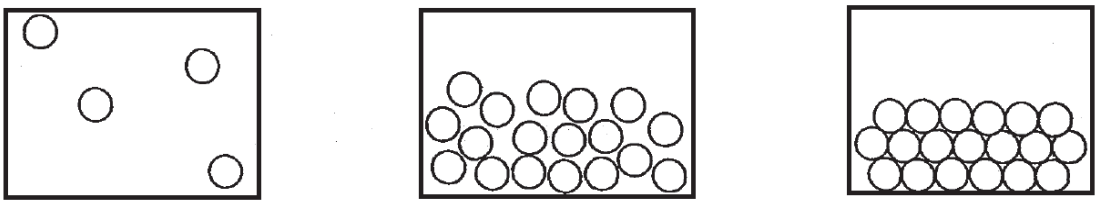
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for the wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page **21**.

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

Setter: Mrs Goh Li Eng

1 Diagrams I, II and III show the particles of three substances at room temperature and pressure.

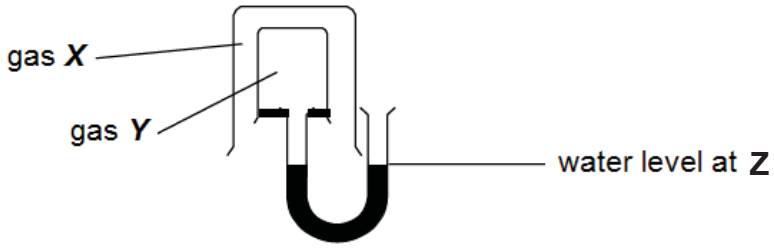


I II III

Which of these substances are correctly represented by the corresponding diagram?

	I	II	III
A	ethanol	hydrogen chloride	dry ice
B	helium	mercury	zinc
C	methane	sodium chloride	copper
D	water	argon	mercury

2 The set–up below shows how the relative rate of diffusion of gas **X** and **Y** can be determined.



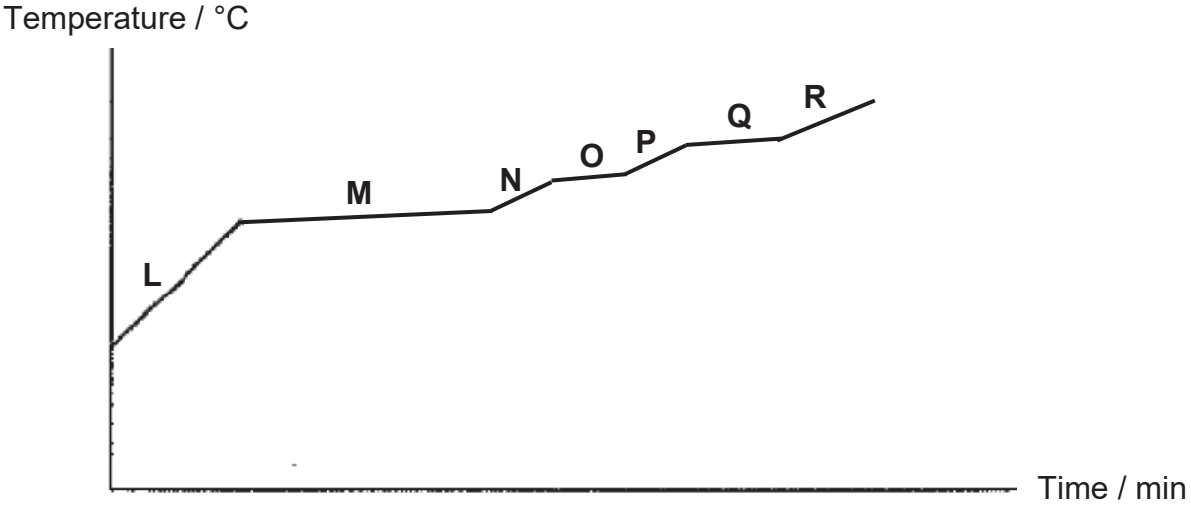
Which pair of substances could **X** and **Y** be if the water level at **Z** decreases?

	X	**Y**
A	ethane	argon
B	carbon monoxide	neon
C	methane	oxygen
D	nitrogen	carbon dioxide

3 The three main components of liquid air are nitrogen, oxygen and argon. Their respective boiling points are:

Nitrogen: –196°C
Oxygen: –183°C
Argon: –186°C

Liquid air can be separated into its three main components by fractional distillation. The graph shows the temperature of a liquid air mixture as it is heated.



In section **N** of the graph, the mixture remaining consists of

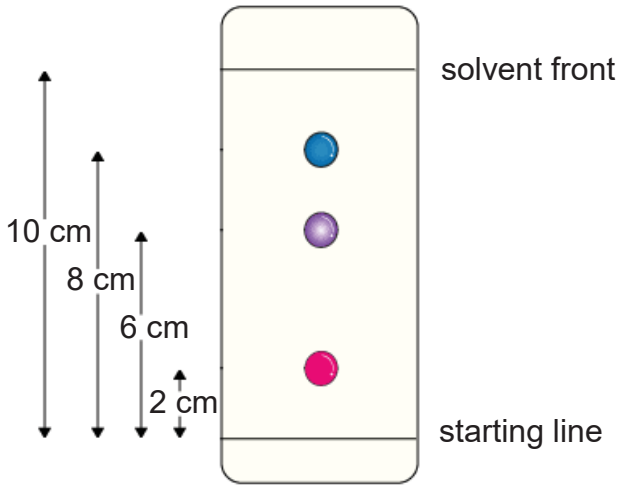
A liquid nitrogen and argon only.

B liquid nitrogen only.

C liquid oxygen and argon only.

D liquid oxygen only.

4 The diagram shows the chromatogram obtained by analysis of a dye mixture. Three measurements are shown in the diagram below.



What is the R_f value of the most soluble dye?

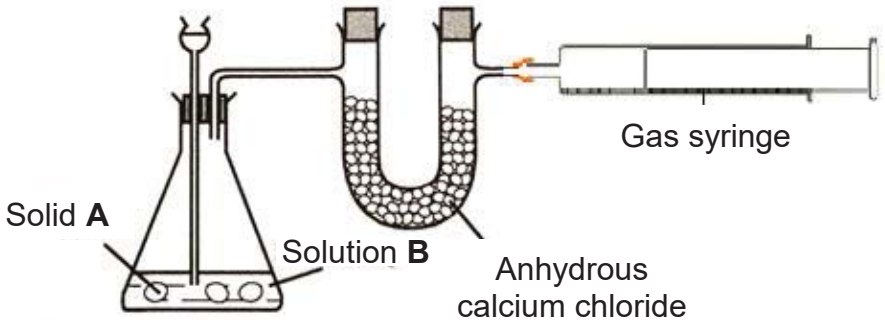
A 0.20

B 0.80

C 1.25

D 5.00

5 The diagram shows a simple laboratory set-up used to prepare and collect a dry gas.



Which pair of reagents would be most suitable to prepare the gas produced using this set-up?

	solid **A**	solution **B**
A	ammonium chloride	sodium hydroxide
B	calcium carbonate	aqueous ammonia
C	potassium hydroxide	sulfuric acid
D	zinc	hydrochloric acid

6 The solubilities of three solids in water and tetrachloromethane are given in the table below.

solid	solubility in water	solubility in tetrachloromethane
sand	not soluble	not soluble
sodium chloride	good	not soluble
sulfur	not soluble	good

Which of the experimental procedures would be suitable for obtaining pure sand from a mixture of sand, sodium chloride and sulfur?

A Add tetrachloromethane and stir, then filter to collect residue.

B Add tetrachloromethane and stir, then filter. Add the residue to water and stir, then filter to collect residue.

C Add water and stir, then filter. Evaporate the filtrate to dryness.

D Add water and stir, then filter. Add tetrachloromethane to filtrate and stir, then evaporate to dryness.

7 Brass is an alloy of copper and zinc. Copper has a melting point of 1085°C and zinc 419.5°C. Which of the following is a possible melting point of brass?

A Above 419.5°C

B Above 1085°C

C Below 1085°C

D Between 419.5°C and 1085°C

8 An ion of formula $\mathbf{X}^{2-}$ contains 18 electrons. If the relative atomic mass of **X** is 32, what is present in the nucleus of the ion?

A 16 protons and 16 neutrons

B 16 protons and 18 electrons

C 18 protons and 14 neutrons

D 18 protons and 18 electrons

9 Which statement correctly describes the properties of the compound copper(II) sulfide, CuS and mixture of copper and sulfur?

	copper(II) sulfide	**mixture of copper and sulfur**
1	copper and sulfur react when heated to form copper(II) sulfide	copper and sulfur mix together with no energy change
2	the ratio of copper to sulfur is always 1 : 1	the ratio of copper to sulfur can vary
3	copper(II) sulfide has the same properties as copper and sulfur	the mixtures do not have the same properties as copper and sulfur

A 1 only

B 1 and 2

C 2 and 3

D All the above

10 Which compound contains both ionic and covalent bonds?

A ammonia

B beryllium chloride

C ethyl ethanoate

D potassium nitrate

11 An investigation of the properties of the chlorides of Period 3 elements shows that the boiling points of sodium chloride and silicon tetrachloride are 1465°C and 57°C respectively. This difference in boiling points is a result of

A covalent bonds being weaker than ionic bonds.

B metallic character decreasing across the period.

C silicon forming weaker bonds with chlorine as compared to sodium.

D silicon tetrachloride having weak intermolecular forces of attraction.

12 Two comments about hydrogen chloride are made below.

Comment 1: Hydrogen chloride has strong covalent bonds in its simple molecular structure.
Comment 2: Hydrogen chloride is soluble in water.

Which statement is correct?

A Both comments are correct and comment 1 explains comment 2.

B Both comments are correct but comment 1 does not explain comment 2.

C Both comments are incorrect.

D Comment 2 is correct but comment 1 is incorrect.

13 The reaction of nitrogen dioxide with water is as shown.

$$\mathbf{w}\ NO_2 + \mathbf{x}\ H_2O \rightarrow \mathbf{y}\ HNO_3 + \mathbf{z}\ HNO_2$$

Which of the following values will give a balanced equation for the reaction above?

	w	**x**	**y**	**z**
A	1	1	1	1
B	2	1	1	1
C	2	2	1	1
D	4	2	2	2

14 Antimony is in the same group as nitrogen in the Periodic Table. What is the chemical formula of lithium antimonide?

A Li_3An

B $LiAnO_3$

C Li_3Sb

D $LiSbO_3$

15 Which statements about molecular mass is **incorrect**?

A It is the mass obtained on an electronic balance by 1g of the molecules.

B It is the ratio of the average mass of a molecule to the mass of a ^{12}C atom.

C It is the ratio of the mass of 1 mole of molecules to the mass of 1 mole of ^{12}C atom.

D It is the sum of the relative atomic masses of all the atoms within the molecules.

16 Which substance contains the greatest number of atoms in 1g?

A CO_2

B NO_2

C O_2

D SO_2

17 100 cm^3 of ammonia burns in 50 cm^3 of oxygen according to the following equation:

$$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

What volume of gas will be collected at the end of the reaction when cooled to room temperature?

A 33.3 cm^3 **B** 50.0 cm^3

C 66.7 cm^3 **D** 166.7 cm^3

18 The fertilisers ammonium nitrate (NH_4NO_3, M_r = 80) is manufactured from ammonia (NH_3, M_r = 17) by a two-stage process.

Stage 1: $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$
Stage 2: $HNO_3 + NH_3 \rightarrow NH_4NO_3$

What is the maximum mass of fertilizer that can be made if only 17 tonnes of ammonia is available?

A 34 tonnes **B** 40 tonnes

C 80 tonnes **D** 97 tonnes

19 Magnesium oxide is produced by heating magnesium carbonate.

$$MgCO_3 \rightarrow MgO + CO_2$$

When 84 g of magnesium carbonate is heated, 34 g of magnesium oxide is produced.
What is the percentage yield of magnesium oxide?
[M_r: $MgCO_3$, 84; MgO, 40]

A $\frac{34}{40} \times 100$

B $\frac{34}{84} \times 100$

C $\frac{40}{34} \times 100$

D $84 \times \frac{34}{40} \times 100$

20 35.0 cm^3 of 0.500 mol/dm^3 hydrochloric acid were added to 1.41 g of a sample of sodium carbonate containing some sodium chloride as impurity. The excess acid was neutralised by 15.0 cm^3 of 0.400 mol/dm^3 of sodium hydroxide solution.

What is the percentage purity of the sodium carbonate in the sample?
[M_r: HC*l*, 36.5; Na_2CO_3, 106; NaOH, 40]

A 43.2%
B 45.1%
C 86.5%
D 90.2%

21 Which method(s) is/are suitable to test the strengths of acids and alkalis?

1 titration
2 measuring their electrical conductivity
3 using a pH meter

A 1 only
B 1 and 3
C 2 and 3
D All of the above

22 Arsine (AsH_3) is a gas that behaves like ammonia. Which of the following particles are found in the solution when Arsine dissolves in water?

A As^+ and OH^-

B AsH_3, As^+ and OH^-

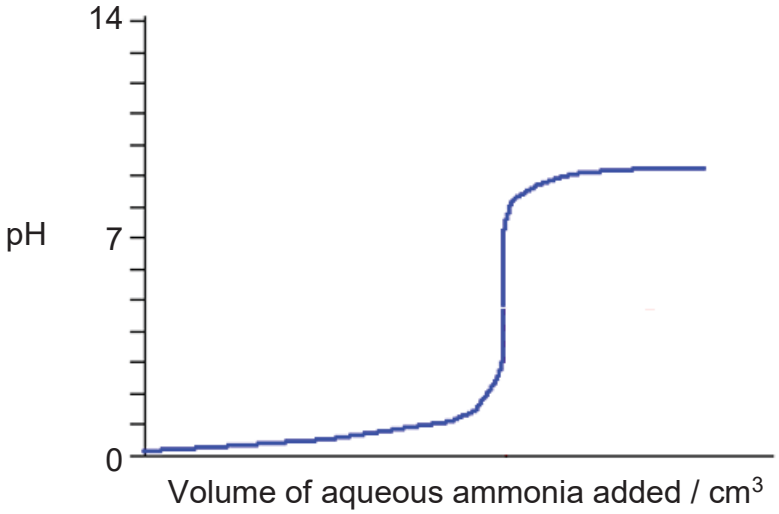
C AsH_4^+ and OH^-

D AsH_3, AsH_4^+ and OH^-

23 Different indicators change colour over different pH ranges and it is important to choose the correct indicator to obtain an accurate result in a titration.

indicator	pH range for the colour change	colour	
		lower pH	higher pH
indigo carmine	11.6 – 14.0	blue	yellow
methyl red	4.2 – 6.3	red	yellow
methyl violet	0.3 – 3.0	yellow	violet
phenolphthalein	8.2 – 10.0	colourless	pink

The graph below shows the change of pH when aqueous ammonia is added to a fixed volume of dilute hydrochloric acid in a titration.



Which indicator would be the best choice to use in this titration?

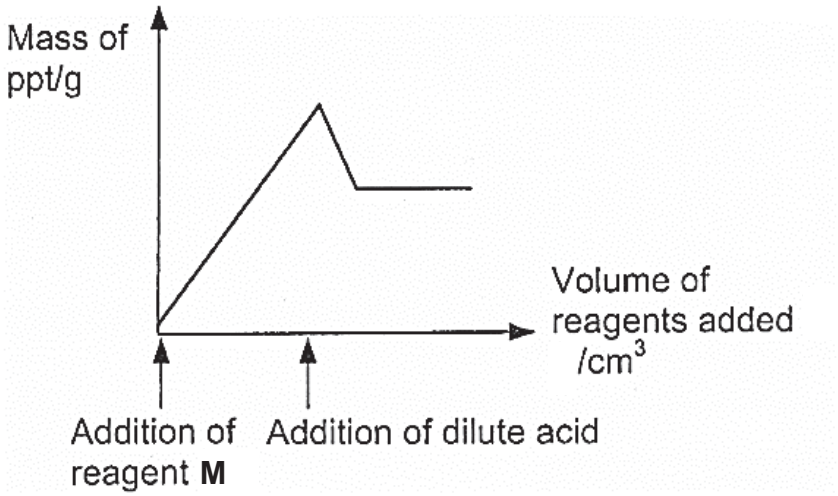
A indigo carmine **B** methyl red

C methyl violet **D** phenolphthalein

24 Which substance has metallic bonding?

substance	electrical conductivity		property of product formed from the reaction between substance and oxygen
	in solid state	in molten state	
A	X	X	reacts with alkali
B	X	✓	no reaction with acid or alkali
C	✓	✓	reacts with alkali
D	✓	✓	reacts with both acid and alkali

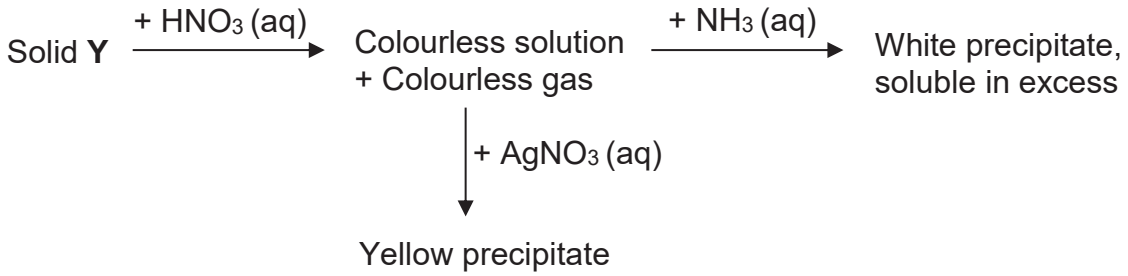
25 In a quantitative analysis, reagent **M** is gradually added to a salt solution **N** (that contains either 1 or 2 different anions), followed by the addition of a dilute acid. The graph below shows how the mass of precipitate formed changes with the reagents added.



Which of the following combinations would produce the graph above?

	anions in **N**	reagents (**M** and acid) added
A	CO_3^{2-}	$AgNO_3$ and HNO_3
B	CO_3^{2-}, Cl^-	$BaCl_2$ and HNO_3
C	CO_3^{2-}, SO_4^{2-}	$AgNO_3$ and HCl
D	CO_3^{2-}, SO_4^{2-}	$BaCl_2$ and HCl

26 Solid **Y** contains a mixture of two salts. The scheme below shows some reactions of solid **Y**.



Which of the following could be the two salts present in solid **Y**?

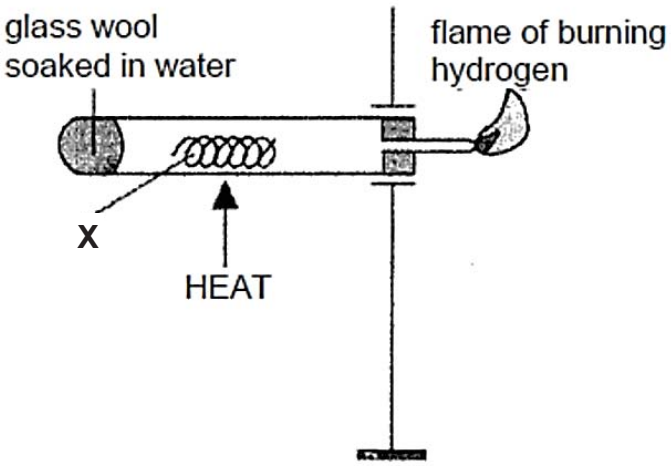
A aluminium carbonate and ammonium chloride

B calcium chloride and zinc carbonate

C lead(II) carbonate and sodium iodide

D zinc iodide and calcium carbonate

27 The set-up below shows the reaction of substance **X**.



What is the possible identity of **X**?

A **X** is a metal above hydrogen in the reactivity series.

B **X** is a metal below hydrogen in the reactivity series.

C **X** is an oxide of a metal that is above hydrogen in the reactivity series.

D **X** is an oxide of a metal that is below hydrogen in the reactivity series.

28 The following observations were made when nickel and iron were placed separately into solutions of metals **S**, **T** and **U**.

	salt solution of **S**	salt solution of **T**	salt solution of **U**
nickel	displaced	not displaced	not displaced
iron	displaced	displaced	not displaced

What is the correct order in increasing reactivity of the five metals?

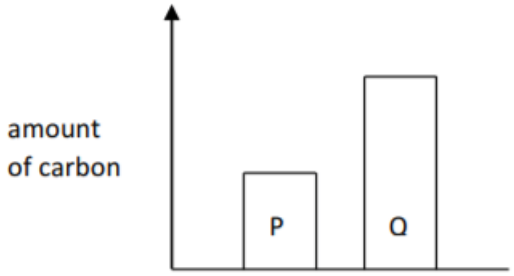
A **S** < Ni < Fe < **T** < **U**

B **S** < Ni < **T** < Fe < **U**

C **U** < Fe < **T** < Ni < **S**

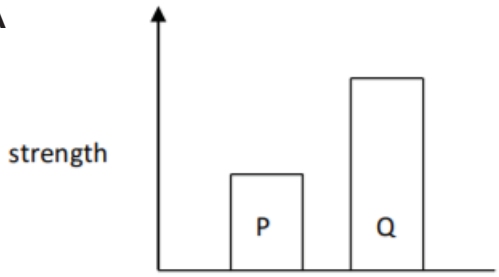
D **U** < **T** < Fe < Ni < **S**

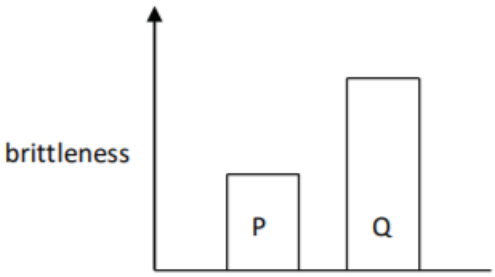
29 The diagram compares the amount of carbon in two steels, **P** and **Q**?



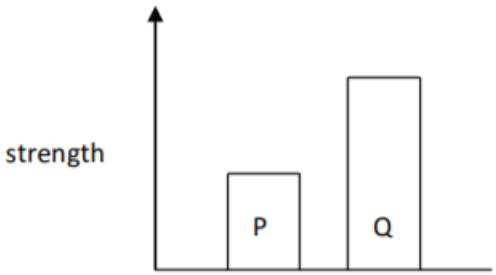
Which two diagrams correctly compare the strength and brittleness of **P** and **Q**?

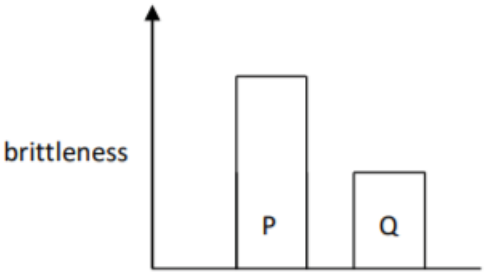
A



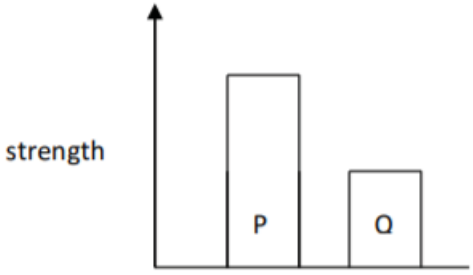


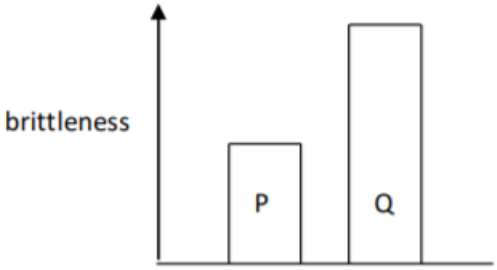
B



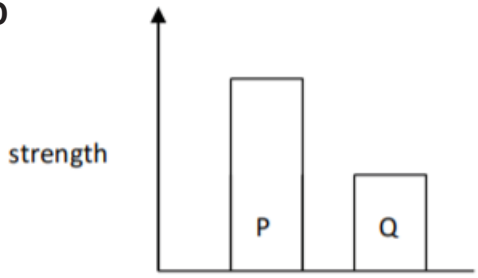


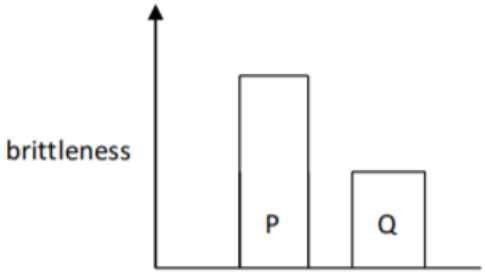
C



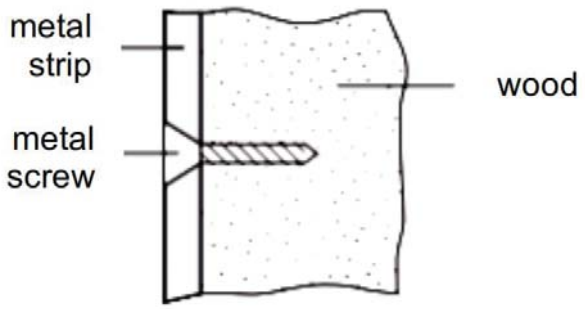


D





30 An old railway carriage is being restored by having metal strips secured to the outside of the wooden carriage by means of screws.



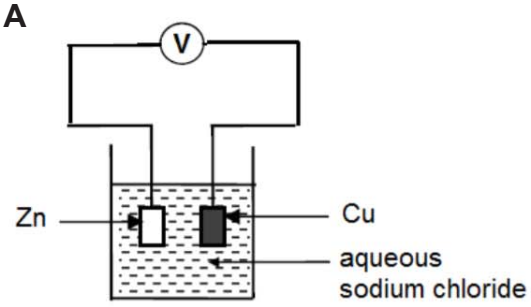
After a few weeks of being exposed to wind and rain, the screws are heavily corroded but the metal strips are not.

Which two metals would give this result?

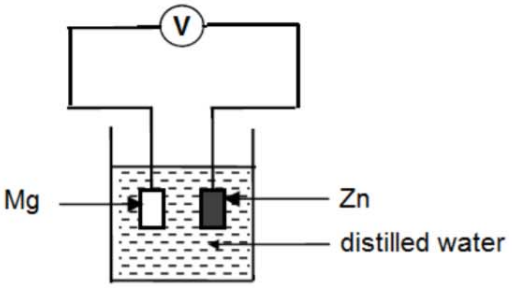
	screw	strip
A	copper	steel
B	copper	zinc
C	steel	copper
D	steel	magnesium

31 Which set–up would produce the greatest reading on the voltmeter?

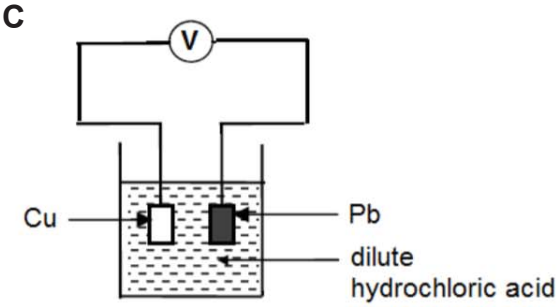
A



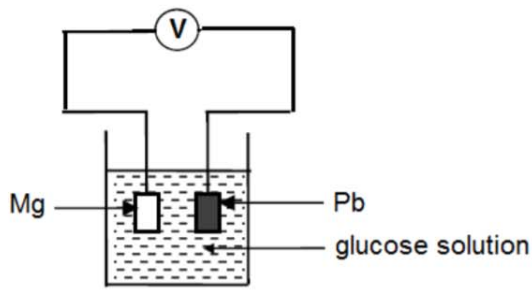
B



C



D



32 For which process is the enthalpy change always positive?

A combustion

B dissolving of acids in water

C evaporation

D respiration

33 Which of the following reactions takes place in a hydrogen fuel cell?

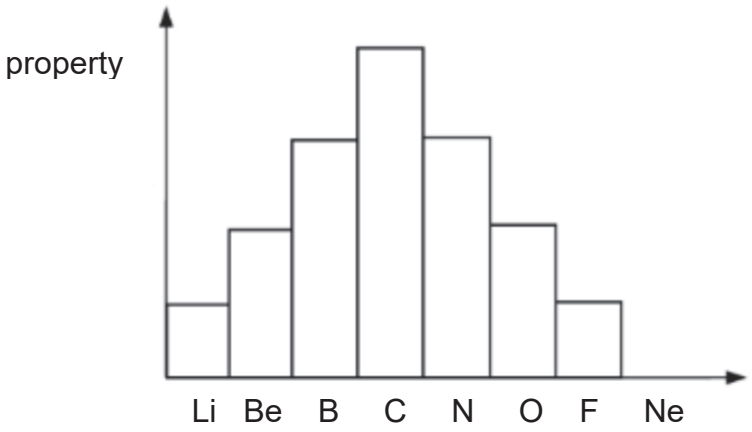
A Hydrogen ions are oxidised at the anode.

B Hydrogen ions are reduced at the cathode.

C Hydrogen loses electrons to form H^+ ions at the anode.

D Oxygen gains electrons to form O^{2-} at the cathode.

34 The bar chart shows the variation of a specific property of elements in Period 2 from lithium to neon. Which property of these elements is shown in the chart?



A The atomic radius.

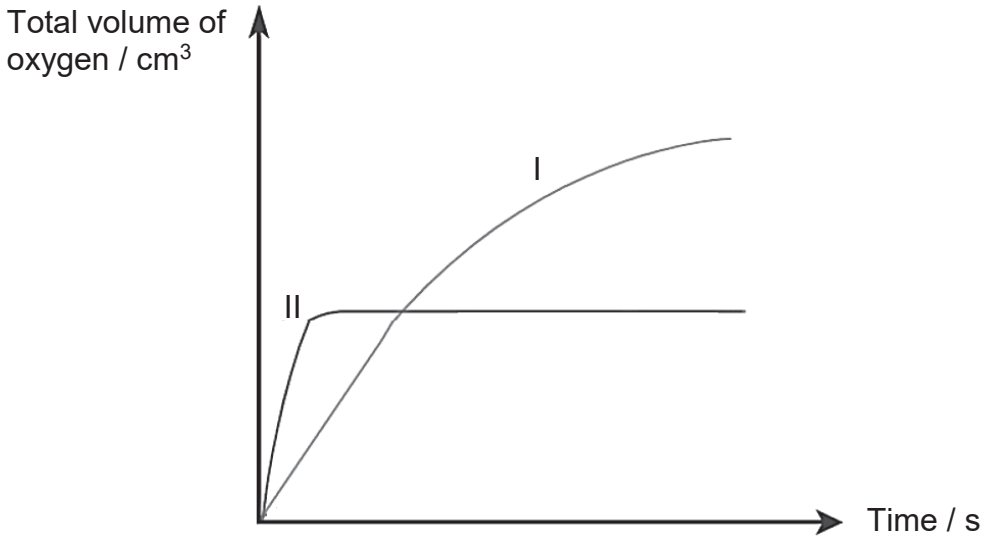
B The melting point.

C The number of electrons used in bonding.

D The number of shells holding electrons.

35 Manganese(IV) oxide catalyses the decomposition of aqueous hydrogen peroxide into water and oxygen.

In order to follow the rates of this reaction for two different solutions of hydrogen peroxide, the total volumes of oxygen evolved were recorded at regular time intervals and the results were plotted. In each experiment, the same mass of catalysts were used and the temperature kept constant.



If curve I corresponds to 20.0 cm^3 of 4.0 mol/dm^3 of solution, curve II would correspond to

A 5.0 cm^3 of 8.0 mol/dm^3 solution.

B 10.0 cm^3 of 4.0 mol/dm^3 solution.

C 20.0 cm^3 of 2.0 mol/dm^3 solution.

D 20.0 cm^3 of 8.0 mol/dm^3 solution.

36 Which statement about the fractional distillation of crude oil is correct?

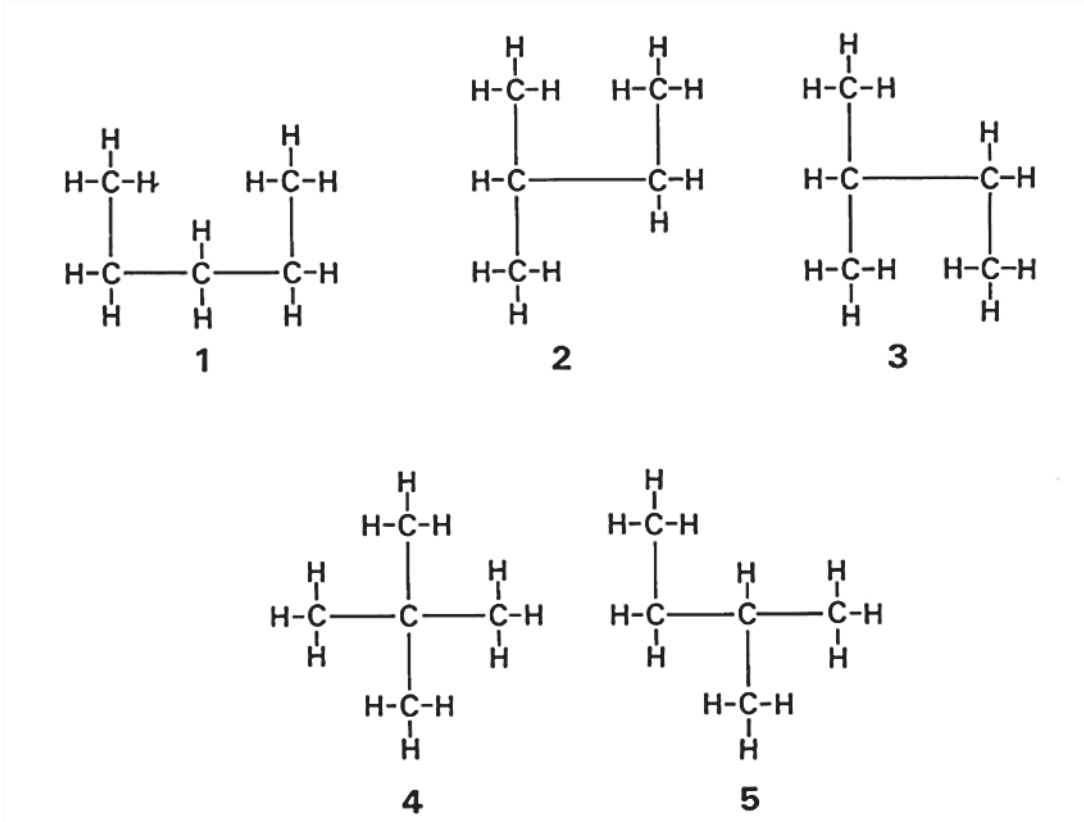
A At each level of the fractionating column, only one compound is collected.

B The higher up the fractionating column, the higher the temperature.

C The fraction at the top of the column are the least flammable.

D The fraction collected at the bottom of the column have the highest viscosity.

37 Five structural formulae are shown below.



How many of the structures represent isomers of one another?

A 2 **B** 3

C 4 **D** 5

38 A student investigated the reaction of different vegetable oils and margarines with hydrogen.

100 cm^3 of hydrogen was passed through 1g samples containing a catalyst. The volume of hydrogen gas remaining in each reaction was recorded in the table below.

sample	volume of hydrogen remaining (cm^3)
P	0
Q	87
R	100

Which sample(s) is/are margarine?

A **P** only

B **P**, **Q** and **R**

C **P** and **Q**

D **R** only

39 In which reaction is water **not** a product?

A combustion of fossil fuels

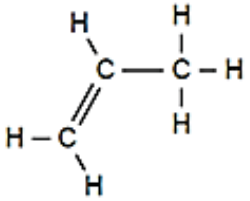
B esterification between ethanoic acid and ethanol

C fermentation of glucose

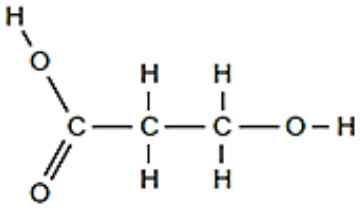
D neutralization between dilute hydrochloric acid and aqueous ammonia

40 Which of the following monomer(s) would undergo polymerisation on their own?

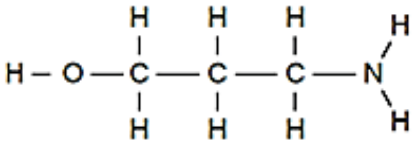
I



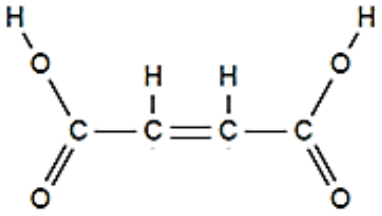
II



III



IV



A I, II and III

B I, II and IV

C II and III

D All of the above

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										2 He helium 4
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 –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

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.).