NAME	CLASS	INDEX NO.

ST. PATRICK'S SCHOOL

PRELIMINARY EXAMINATIONS 2021

SUBJECT	:	CHEMISTRY 6092 / 01	DATE	:	18 Aug 2021
LEVEL	:	SECONDARY 4 EXPRESS	DURATION	:	1 HOUR

INSTRUCTIONS TO CANDIDATES:

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

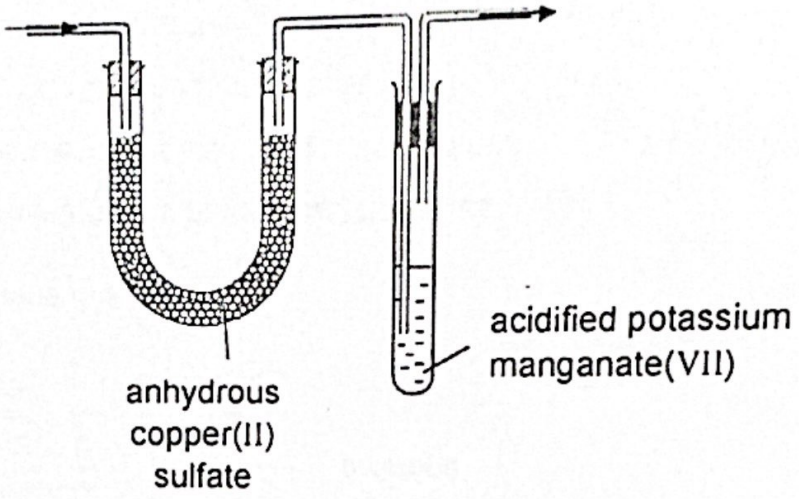
1 There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate **OPTICAL ANSWER SHEET.**

INFORMATION FOR CANDIDATES:

Each correct answer will score one mark. Marks will not be deducted for wrong answers.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.
Your total score for Paper 1 will be the number of correct answers given.

This paper consists of 17 printed pages, including this cover page and a copy of the Periodic Table

1 A student used the apparatus shown in the diagram to examine the gas sample collected during an experiment.



The student observed that the white anhydrous copper(II) sulfate turned blue and the purple acidified potassium manganate(VII) turned colourless.
Which gases were present in the gas sample?

A chlorine and carbon dioxide
B chlorine and water vapour
C sulfur dioxide and carbon dioxide
D sulfur dioxide and water vapour

2 In a volumetric experiment involving the addition of aqueous hydrochloric acid to 25.0 cm^3 of aqueous sodium hydroxide, it is necessary to determine when the reaction has just completed.

Which apparatus can be used to determine the end-point of the reaction?

A electronic balance
B gas syringe
C stopwatch
D thermometer

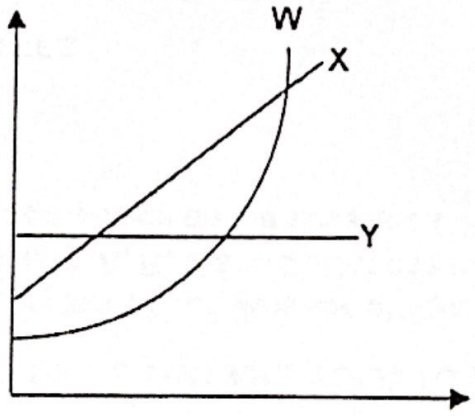
3 Which physical processes could be best used to separate kerosene and water?

1. distillation
2. filtration
3. sublimation
4. use of separating funnel

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

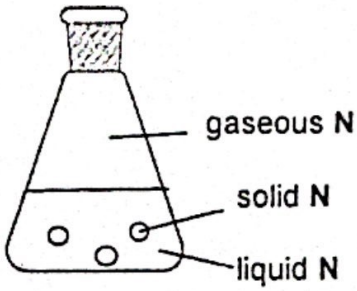
4 The solubility curves of salts W, X and Y are shown.

Which salt(s) can be prepared by crystallisation?



A W only
B X only
C X and Y only
D W and X only

5 The conical flask contains compound **N** which is present in the solid, liquid and gaseous states.



Which statement is correct?

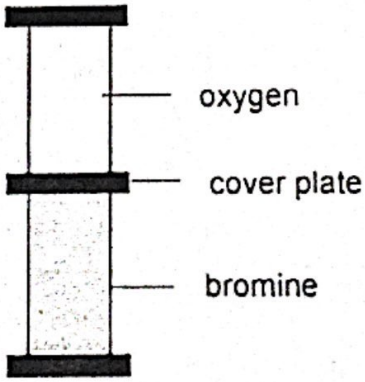
A A gaseous **N** molecule has a lower mass than a liquid **N** molecule.

B Energy is released when **N** changes from liquid to solid.

C Liquid **N** is at a higher temperature than solid **N**.

D Liquid **N** molecules vibrate about fixed positions.

6 The cover plate was removed from the gas jars shown in the diagram. After several days, the colour of the gas was the same in both jars.



Which statement explains this change?

A Oxygen and bromine gases have equal densities.

B Oxygen and bromine molecules are in random motion.

C Oxygen and bromine diffuse at the same rate.

D Equal volumes of oxygen and bromine contain equal number of molecules.

7 The following shows the properties of some substances (underlined).

Which substance has been wrongly classified as an element or mixture?

	property	classification
A	Black powder burns in air forming a colourless gas.	element
B	Colourless solution produces two colourless gases when an electric current is passed through it.	mixture
C	Green powder on heating leave black residue and a colourless gas is evolved.	element
D	White solid melts over the range of 56 °C to 58 °C.	mixture

8 Hydrogen can form both H^+ ions and H^- ions.

Which statement about these two ions is correct?

A A H^+ ion has no electron in its first shell.

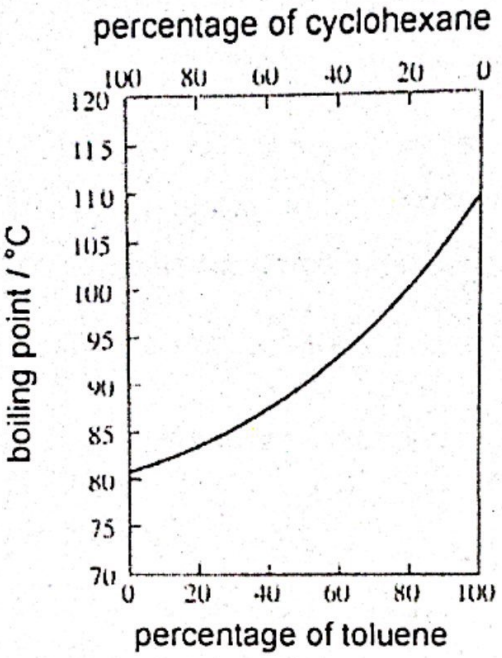
B A H^+ ion has more protons than an H^- ion.

C A H^- ion has one more electron than an H^+ ion.

D A H^- ion is formed when a hydrogen atom loses an electron.

9 Toluene and cyclohexane are two common organic solvents and they form a homogenous mixture when mixed together.

The following graph shows the boiling points of mixtures containing different percentages of toluene and cyclohexane.



Which of the following best describes the boiling point of any mixture of toluene and cyclohexane as shown by the graph?

A The boiling point is below that of cyclohexane.

B The boiling point is higher than that of toluene.

C The boiling point is below that of both toluene and cyclohexane.

D The boiling point is between that of toluene and cyclohexane.

10 The table shows the information about particles P, Q, R and T.

particle	proton number	nucleon number	number of electrons
P	11	23	10
Q	11	23	11
R	17	35	17
T	17	37	17

Which of the following are true about P, Q, R and T?

1. P and Q are particles of the same element.
2. P is a positive ion of atom Q.
3. Q reacts with R to form an ionic compound.
4. R and T are isotopes.

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

11 Ethylamine is a covalent molecule with the formula $CH_3CH_2NH_2$.

How many electrons are not involved in bonding of ethylamine?

A 0
B 2
C 6
D 8

12 Which statements are correct for both metals and ionic compounds ?

1. They contain positive ion.
2. They conduct electricity because electrons flow through the solid material.
3. They conduct electricity when molten and aqueous
4. Most have high melting points.

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

13 Silicon carbide, SiC, has a structure similar to diamond.

Boron nitride, BN, has a structure similar to graphite.

Bronze is an alloy of copper and tin.

Which statements about SiC, BN and bronze are correct?

1. All are bonded covalently.
2. All except silicon carbide conduct electricity when solid.
3. All have high melting points.

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

14 Acid E is mixed with solid F in a conical flask. After mixing and standing for 5 min, the final mass of the mixture in the conical flask is less than that of the initial mass.
What could acid E and solid F be?

	acid E	solid F
A	nitric acid	magnesium carbonate
B	sulfuric acid	calcium hydroxide
C	hydrochloric acid	zinc nitrate
D	hydrochloric acid	ammonium sulfate

15 Which of the following properties does not show that a solution is alkaline?

A It decolourises acidified aqueous potassium manganate(VII).
B It forms a reddish-brown precipitate when reacted with iron(III) chloride solution.
C It reacts with ammonium sulfate to form ammonia gas.
D It reacts with dilute hydrochloric acid to produce a soluble salt.

16 Methylamine dissolves in water to give an alkaline solution.

A few drops of Universal Indicator are added to an aqueous solution of methylamine.

Which row shows the pH of the solution and the colour of the solution after the indicator has been added?

	pH	colour of solution
A	greater than 7	blue
B	greater than 7	orange
C	less than 7	blue
D	less than 7	orange

17 Which pair of substances would not be suitable for producing a large quantity of carbon dioxide?

A iron(II) carbonate and hydrochloric acid

B lead(II) carbonate and hydrochloric acid

C sodium carbonate and sulfuric acid

D calcium carbonate and nitric acid

18 Which of the following shows the salts that can be prepared by titration and adding excess metal, base or carbonate to an acid?

	titration	adding excess metal, base or carbonate to an acid
A	ammonium nitrate	sodium chloride
B	copper(II) sulfate	zinc nitrate
C	magnesium nitrate	silver chloride
D	potassium chloride	magnesium sulfate

19 The gaseous hydride of element **X** has a chemical formula XH_4.

At room temperature, 3600 cm^3 of the hydride weighs 4.8 g.

What is element **X**?

A nitrogen

B silicon

C sulfur

D tin

20 Coke is made from coal and is an almost pure form of carbon.
What is the minimum volume of air required for complete combustion of 24.0 g of coke?

A $24.0\ dm^3$
B $48.0\ dm^3$
C $114\ dm^3$
D $229\ dm^3$

21 Which of the following is the molecular formula for a hydrocarbon with 84.2% by mass of carbon?

A CH_4
B C_6H_6
C C_7H_{14}
D C_8H_{18}

22 A mixture of 24 dm^3 of hydrogen and 100 dm^3 of oxygen was ignited and the reaction mixture cooled to room temperature and pressure.
What would be the total volume of gases remaining at the end of the reaction?

A $24\ dm^3$
B $76\ dm^3$
C $88\ dm^3$
D $112\ dm^3$

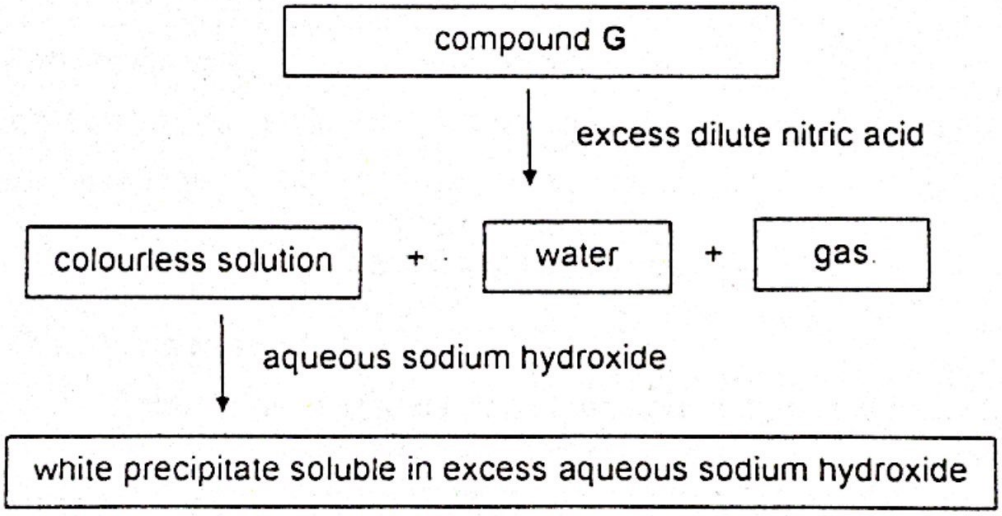
23 Which statement about the manufacture of ammonia through the Haber process is correct?

A The reaction is reversible.
B Low pressure will result in an increase in yield of ammonia.
C Hydrogen is obtained from fractional distillation of air.
D The reaction is endothermic.

24 Which change in conditions in the Haber process results in a decrease in activation energy?

A increasing the concentration of the reactants
B increasing the pressure
C increasing the temperature
D using a catalyst

25 The scheme below shows some reactions of compound G.



What is compound G likely to be?

A zinc carbonate

B ammonium carbonate

C zinc

D calcium carbonate

26 Which substance will react with dilute sulfuric acid to give a colourless solution only?

A copper(II) oxide
B zinc carbonate
C potassium hydroxide
D barium chloride

27 Which pair of elements cannot be used to form an alloy?

A aluminium and magnesium
B copper and zinc
C chlorine and sodium
D lead and tin

28 Which iron sheet will least likely to rust in the conditions stated below?

A An iron sheet attached with blocks of magnesium on one side.
B An iron sheet coated with lubricating oil on one side.
C An iron sheet coated overall with paint but has scratches exposing the iron below.
D An iron sheet electroplated with copper but has scratches exposing the iron below.

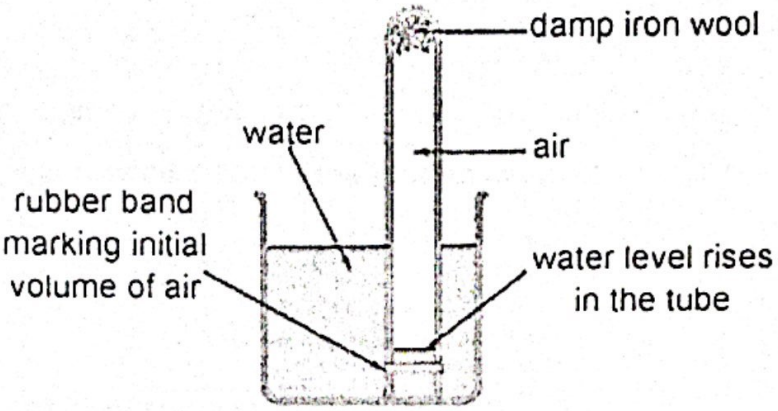
29 The following observations were made with the nitrate of metal **Z**.

- A brown gas was given off when solid **Z** nitrate is heated strongly.
- A deposit of metal **Z** form when an iron nail is placed in a solution of **Z** nitrate.
- No pink deposit forms when a copper plate is placed in a solution of **Z** nitrate.

What is the position of **Z** in the reactivity series?

A below iron but above copper
B above iron
C below copper
D same as iron

30 A test-tube containing damp iron wool is inverted in a beaker of water. After a week, the water level inside the test-tube has risen.



Which statement explains the rise of water level in the test-tube?

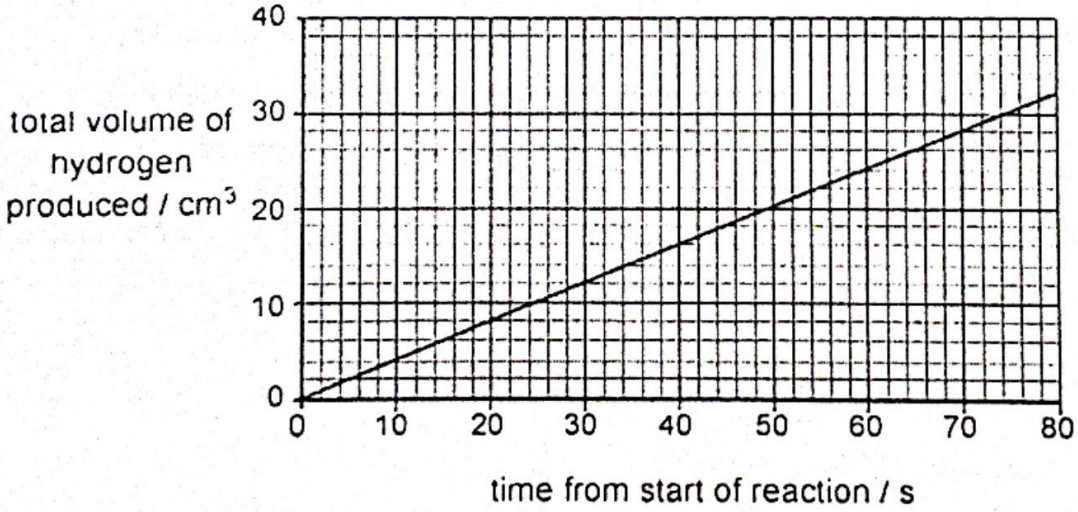
A Iron has been reduced.

B The mass of the iron wool has increased.

C Carbon dioxide in the test-tube has dissolved into the water.

D Water is a product when iron reacts with air.

31 Dilute hydrochloric acid was reacted with magnesium ribbon and the volume of hydrogen gas evolved was measured for the first 80 seconds.



What was the average rate of production of hydrogen?

A 0.4 cm^3/s

B 2.5 cm^3/s

C 4 cm^3/s

D 40 cm^3/s

32 The oxide of titanium, TiO_2, is used as a 'whitener' in toothpaste. It is obtained from the ore iron(II) titanate, $FeTiO_3$. What is the change, if any, in the oxidation number of titanium in the reaction $FeTiO_3 \longrightarrow TiO_2$?

A It is oxidised from +3 to +4.

B It is reduced from +3 to +2.

C It is reduced from +6 to +4.

D There is no change in the oxidation number.

33 Hydrogen peroxide undergoes a chemical reaction with $NaJO_4$.

$$2NaJO_4 + 3H_2O_2 \longrightarrow 2JO_2 + 2NaOH + 2H_2O + 3O_2$$

What is the role of hydrogen peroxide on $NaJO_4$?

A catalyst

B reducing agent

C oxidising agent

D dehydrating agent

34 In the electrolysis of molten lead(II) bromide, 3 moles of lead(II) ions were discharged at the cathode. Which of the following would be discharged by the same amount of electricity?

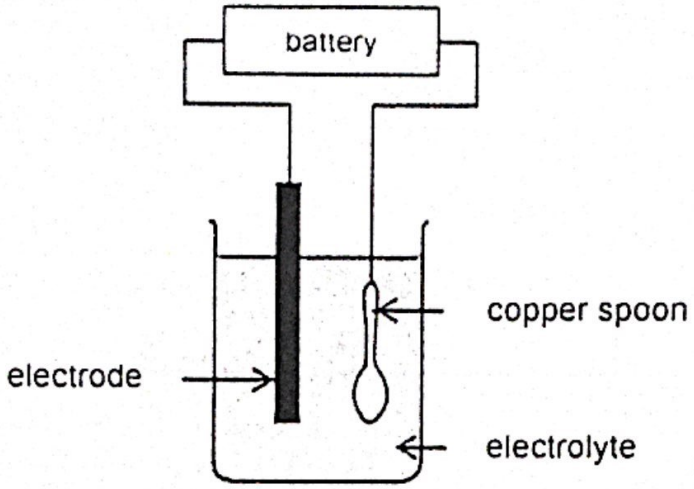
A 3 moles of iron(II) ions in the electrolysis of aqueous iron(II) chloride

B 3 moles of hydrogen ions in the electrolysis of aqueous zinc sulfate

C 6 moles of copper(II) ions in the electrolysis of aqueous copper(II) nitrate

D 6 moles of silver ions in the electrolysis of aqueous silver nitrate

35 The diagram shows the set-up for the electroplating of a copper spoon with silver.



Which statement is not correct?

A The electrode would be made of pure silver metal.
B The electrolyte would be a soluble silver salt.
C The spoon would be connected to the positive terminal of the battery.
D The mass of the electrode decreases with time.

36 Which two compounds are commonly used as fuels in engines?

A diesel and paraffin
B methane and naphtha
C naphtha and bitumen
D paraffin and bitumen

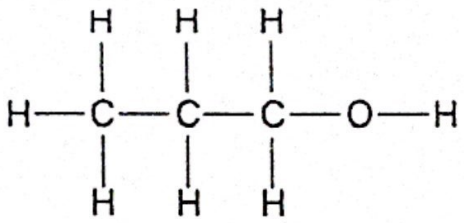
37 The general formula of the alkanes is C_nH_{2n+2}.
Which physical property decreases as n increases?

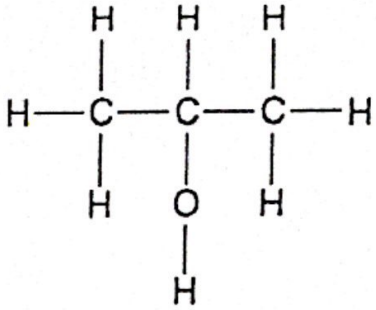
A boiling point
B flammability
C melting point
D viscocity

38 How many moles of hydrogen chloride are formed when one mole of methane is added to a large excess of chlorine in the dark?

A 0
B 1
C 2
D 4

39 The diagram shows the structures of two compounds.





Why did the two compounds exhibit similar chemical properties?

A The molecules have the same functional group.

B The molecules have the same number of carbon atoms.

C The molecules have the same number of oxygen atoms.

D The molecules have the same relative molecular mass.

40 Which bond in a molecule of ethanoic acid is broken when it reacts with magnesium?

A the C–H bond

B the C–C bond

C the O–H bond

D the C=O bond

END OF PAPER