Name: ..... ( ) Class: .....

WOODLANDS SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022

EXPRESS

Level:	Secondary Four Express	Marks:	40
Subject:	Chemistry	Day:	Wednesday
Paper:	6092/01	Date:	24th August 2022
Duration:	1 hour	Time:	1235 – 1335

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.
Read the instructions on the Answer Sheet very carefully.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

At the end of the examination, submit the OTAS separately from the question paper.
A copy of the Periodic Table is printed on page 18.
The use of an approved scientific calculator is expected, where appropriate.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.
This document consists of **17** printed pages and 1 blank page.

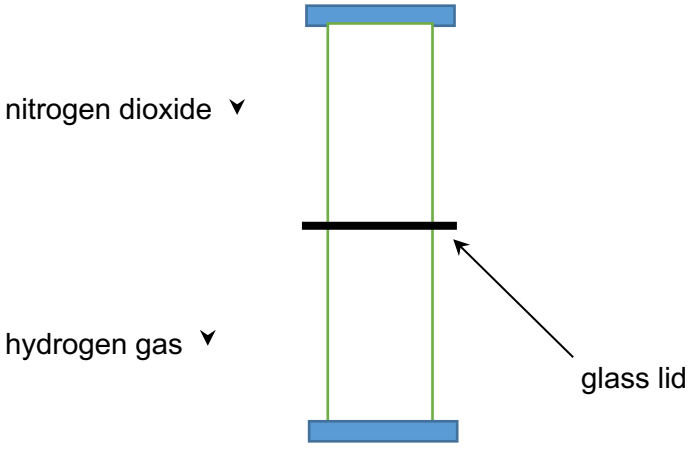
1 Which one of the following apparatus is suitable for measuring 11.60 cm^3 of acid?

A burette
B conical flask
C measuring cylinder
D pipette

2 Which one of the following correctly describes the particles in a dilute sugar solution at room temperature?

	sugar molecules	water molecules
A	close together, moving at random	widely separated, vibrating slightly
B	widely separated, moving at random	close together, moving at random
C	widely separated, moving at random	close together, not moving
D	widely separated, not moving	widely separated, moving at random

3 The diagram below shows two gas jars separated by a glass lid. The upper gas jar contains brown nitrogen dioxide while the lower gas jar contains colourless hydrogen gas.



When the glass lid is removed, both gas jars are coloured brown in a short time.

What is the reason for this observation?

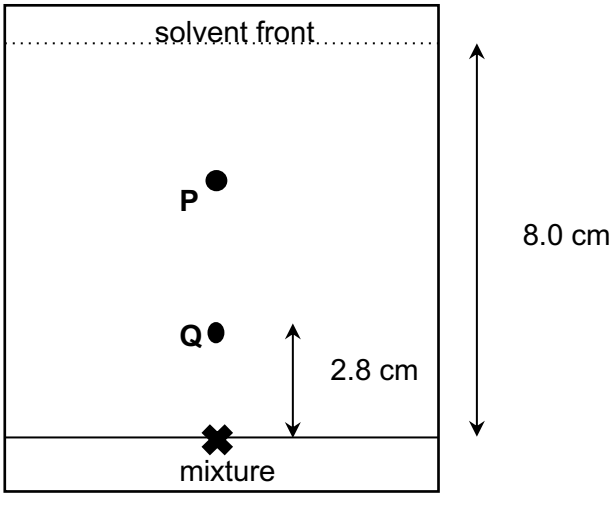
A All molecules are in constant, random motion.
B Nitrogen dioxide diffused faster than hydrogen gas.
C Nitrogen dioxide is heavier than hydrogen gas.
D Nitrogen dioxide reacted with hydrogen gas.

4 Which of the following tests is/are best to show that a solution is hydrochloric acid?

test	action
I	Add acidified barium nitrate to the solution
II	Add acidified silver nitrate to the solution
III	Add sodium carbonate to the solution

A I, II and III
B II only
C II and III only
D III only

5 A colourless mixture is separated into its two constituents, **P** and **Q**, by paper chromatography as shown below. **P** and **Q** are acidic and alkaline in nature respectively.



What locating agent should be used, and what is the R_f value of **Q**?

	locating agent	R_f value of **Q**
A	barium nitrate	0.40
B	litmus solution	0.35
C	methyl orange	0.70
D	sodium hydroxide	1.43

6 The diagram below shows the experimental set up for a simple distillation. It is commonly used to separate liquids in a mixture.

Which of the following substances may be condensed using a water condenser?

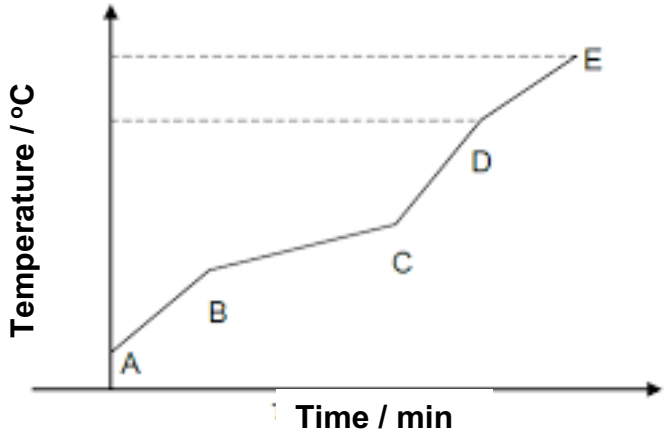
	substance	melting point/ ^{o}C	boiling point/ ^{o}C
A	ammonia	-79	-33
B	hydrogen chloride	-115	-85
C	nitrogen dioxide	-73	-10
D	pentane	-130	36

7 50 cm^3 of aqueous bromine was added to 50 cm^3 of cyclohexene in a beaker. Two layers of colourless solutions are observed.

Which one of the following methods can be used to obtain the organic layer?

	method	organic layer obtained
A	evaporation	bottom layer
B	evaporation	top layer
C	separating funnel	bottom layer
D	separating funnel	top layer

8 The graph below shows the temperature changes of a substance as it is heated from room temperature to boiling point. It is a solid at room temperature.



Which one of the following conclusion can be made about the substance?

A It is a mixture.
B It is a liquid between B and C.
C Its melting point is 100 °C.
D Its boiling point is 110 °C.

9 Which of the following has the same electronic configuration as a calcium ion?

A aluminium atom
B barium atom
C chloride ion
D oxide ion

10 Which one of the following correctly gives the numbers of the different sub-atomic particles to be found in a hydroxide ion?

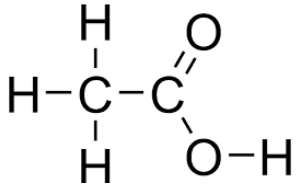
	protons	neutrons	electrons
A	8	8	8
B	8	8	9
C	9	8	10
D	9	9	10

11 X, Y and Z are three elements with consecutive proton (atomic) numbers. X has the lowest proton (atomic) number and Y is a halogen.

How can a stable compound be formed?

A Each atom of X gives an electron to an atom of Y, to form X^+Y^-.
B Each atom of Y receives an electron from an atom of Z, to form Y^-Z^+.
C Each atom of X shares a pair of electrons with two atoms of Y.
D Each atom of X shares an electron with an atom of Y.

12 How many unshared electrons are there in a molecule of ethanoic acid?



A 4
B 8
C 12
D 16

13 In which of the following compound(s) is/are covalent bonds found?

I aqueous ammonia
II graphite
III nitric acid

A I and II only
B I, II and III
C II only
D II and III only

14 Propane burns completely in oxygen according to the equation shown.

$$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$$

If 100 cm^3 of propane is burnt in 200 cm^3 of oxygen at 200 ^oC, what is the total volume of the gases left at the end of the reaction?

A 60 cm^3
B 180 cm^3
C 340 cm^3
D 380 cm^3

15 What is the concentration of hydrogen ions in 0.5 mol/dm^3 sulfuric acid?

A 1 g/dm^3
B 2 g/dm^3
C 49 g/dm^3
D 98 g/dm^3

16 An aqueous solution has a pH value of 1.

What information does this fact give about the ions present in the solution?

	concentration of H^+ ions	concentration of OH^- ions
A	high	low
B	high	none
C	low	low
D	low	high

17 Which one of the following does **not** show the correct reaction of nitric acid?

	reactant	product
A	aqueous ammonia	ammonia
B	barium	hydrogen
C	sodium oxide	water
D	zinc carbonate	carbon dioxide

18 Oxides of elements may be classified as acidic, basic or amphoteric.

Which set of properties is correctly classified?

	acidic	basic	amphoteric
A	dissolves in water to form acidic solution	reacts with acids only	reacts with alkalis only
B	dissolves in water to form acidic solution	reacts with acids only	reacts with both acids and alkalis
C	reacts with alkalis only	dissolves in water to form alkaline solution	reacts with acids only
D	reacts with alkalis only	reacts with both acids and alkalis	dissolves in water to form neutral solution

19 Which of the following salts is correctly prepared?

	salt	reactants	method
A	barium chloride	barium hydroxide + hydrochloric acid	reaction of acid with excess solid
B	copper(II) carbonate	copper(II) nitrate + sodium carbonate	precipitation
C	magnesium sulfate	sulfuric acid + magnesium chloride	titration
D	silver chloride	silver carbonate + sodium chloride	precipitation

20 Which one of the following processes is endothermic?

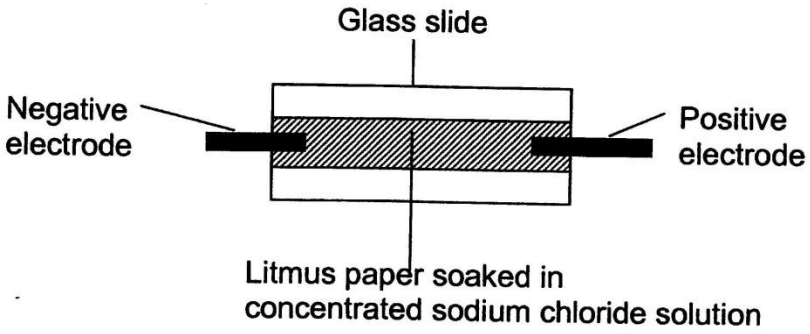
A sodium hydroxide + hydrochloric acid $\rightarrow$ sodium chloride + water
B N_2 (l) $\rightarrow$ N_2 (g)
C N_2 (g) + $3H_2$ (g) $\rightarrow$ $2NH_3$ (g)
D ammonia + water $\rightarrow$ aqueous ammonia

21 Hydrogen reacts with oxygen in a fuel cell to generate electricity directly.

Which one of the following statements is correct?

A Bond breaking energy in this reaction is lower than bond forming energy.
B Each O-H bond is stronger than each H-H bond and each O=O bond.
C More bonds are formed than broken in this reaction.
D This reaction has a positive enthalpy change.

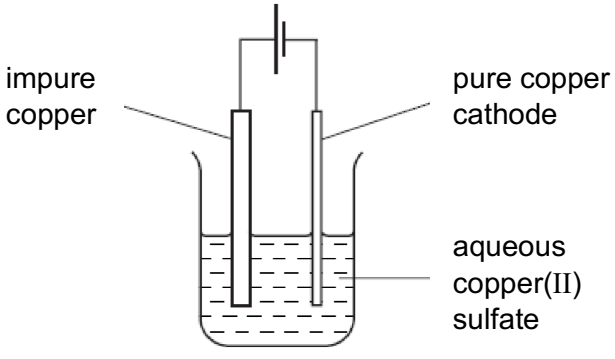
22 An electrolytic cell was set up as shown below.



After electricity is passed for a few minutes, what colour would you expect to observe in the litmus paper near the negative and positive electrode?

	near the negative electrode	near the positive electrode
A	blue	white
B	no change	blue
C	red	white
D	white	blue

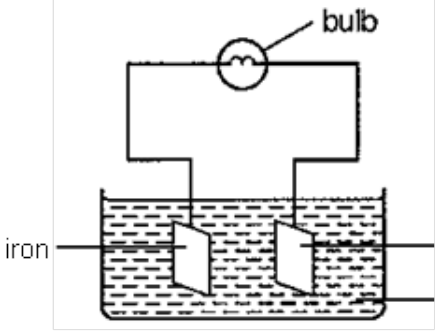
23 To purify an impure copper rod, the following electrolytic cell was set up.



Which one of the following correctly shows the half equations for the reactions occurring at the anode and cathode?

	at the anode	at the cathode
A	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$2H^+ + 2e^- \rightarrow H_2$
B	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$
C	$Cu \rightarrow Cu^{2+} + 2e^-$	$2H^+ + 2e^- \rightarrow H_2$
D	$Cu \rightarrow Cu^{2+} + 2e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$

24 The diagram below shows an electric cell. When the circuit was closed, the bulb lighted up.

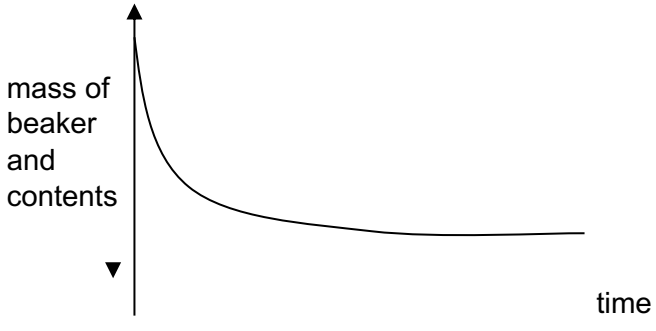


What changes will be observed at the electrodes and in the electrolyte?

	at the iron electrode	at the copper electrode	in the electrolyte
A	It becomes thicker	effervescence	no change
B	It becomes thicker	it becomes thinner	turns pale green
C	it becomes thinner	effervescence	turns pale green
D	it becomes thinner	it becomes thicker	no change

25 Two solutions were mixed in a beaker and the mass of the beaker and contents was then recorded at various times. The graph shows the results.

What could the two solutions have been?

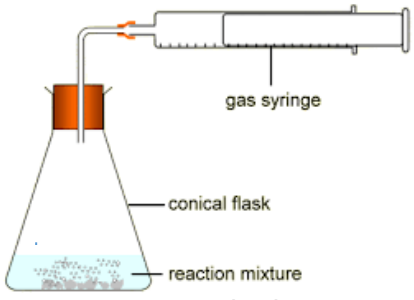


A aqueous copper (II) sulfate and aqueous ammonia
B aqueous sodium carbonate and dilute nitric acid
C aqueous sodium hydroxide and aqueous zinc sulfate
D dilute hydrochloric acid and aqueous sodium oxide

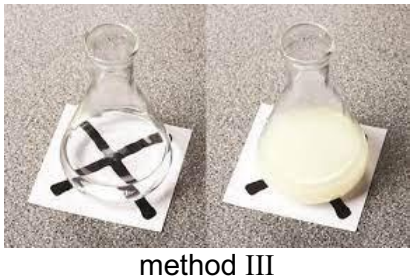
26 Which of the following methods can be used to determine the rate of the reaction below?

$$Pb(NO_3)_2\ (aq) + 2KI\ (aq) \rightarrow PbI_2\ (s) + 2KNO_3\ (aq)$$

method I



method II



method III

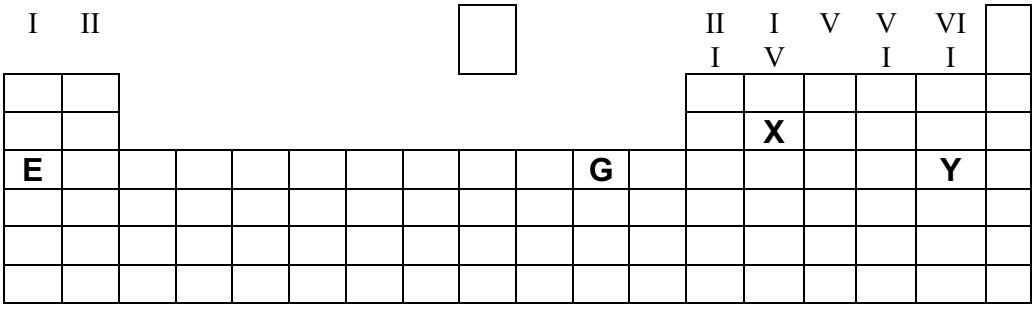
A I and II only
B I and III only
C II and III only
D III only

27 In which reaction is the underlined substance oxidised?

A $\underline{Br_2} + 2I^- \rightarrow 2Br^- + I_2$
B $\underline{Cl_2} + 2Fe^{2+} \rightarrow 2Fe^{2+} + 2Cl^-$
C $\underline{CO_3^{2-}} + 2H^+ \rightarrow CO_2 + H_2O$
D $\underline{Mg} + 2H^+ \rightarrow Mg^{2+} + H_2$

Four elements are shown in the Periodic Table below. Use the Periodic Table to answer questions **28** and **29**.

28 Four elements are shown in the Periodic Table below.



Which one of the following statement(s) is/are correct?

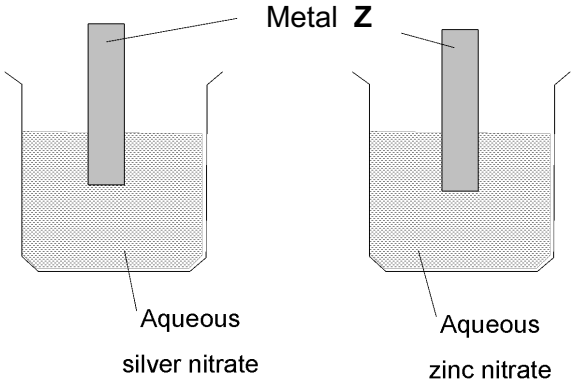
I **E** forms E^{2-} ion.
II **E**, **X** and **Y** have non-metallic character.
III **X** forms giant molecular structure with oxygen.
IV **X** has the smallest atomic number.

A I, II and III only
B II and III only
C II, III and IV only
D III and IV only

29 Which one of the following correctly describes element G?

	density	melting point	oxidation state(s)
A	0.0045	-130	+2, +4, +6
B	0.97	92	+1
C	8.96	1085	+1, +2
D	9.9	1923	+4

30 The following experiment was set up to test the reactivity of metal **Z**. It was observed that in the beaker containing silver nitrate, the colourless solution turns blue. In the beaker containing zinc nitrate, no visible change was observed.



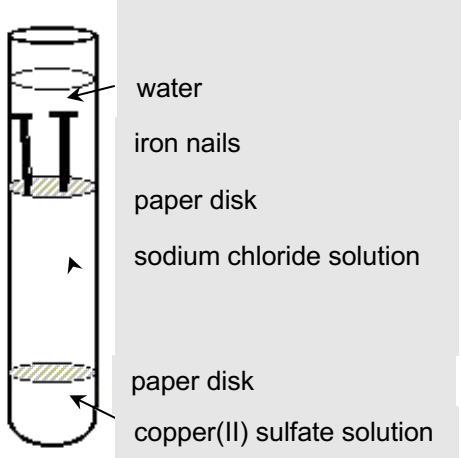
What could metal **Z** be?

A calcium
B copper
C gold
D iron

31 Which one of the following sets of information is correct?

	type of steel	additive	property	use
A	high carbon steel	carbon	strong and malleable	machinery
B	low carbon steel	chromium	brittle	drill bits
C	mild steel	carbon	softer and more easily shaped	car bodies
D	stainless steel	cobalt	corrosion-resistant	cutlery

32 The following experiment was set up for 2 days. At the end of 2 days, the iron nails rusted and reddish-brown powder was observed at the bottom of the test tube.



Which of the following equations represents the overall reaction in the test tube?

A $2\ Fe\ (s) + 3\ Cu^{2+}\ (aq) \rightarrow 2\ Fe^{3+}\ (s) + 3\ Cu\ (s)$
B $Fe\ (s) + Cl^{-}\ (aq) \rightarrow FeCl_3\ (aq)$
C $Fe\ (s) + n\ H_2O\ (l) + O_2\ (g) \rightarrow Fe_2O_3.nH_2O\ (s)$
D $Fe^{3+}\ (s) + Cu\ (aq) \rightarrow Fe^{2+}\ (aq) + Cu^{+}\ (s)$

33 Which one of the following substances can be an alternative substitute for limestone in the Blast Furnace?

A ammonium chloride
B calcium oxide
C phosphorus (V) oxide
D zinc sulfate

34 Methods used to stop iron from rusting include; coating with tin; coating with zinc; and connection to magnesium rods.
Which metal is most often used to protect iron in food containers, in oil pipelines and in roofing sheets?

	food containers	oil pipelines	roofing sheets
A	magnesium	tin	zinc
B	tin	zinc	magnesium
C	tin	magnesium	zinc
D	zinc	magnesium	tin

35 The air in 4 cities, **A**, **B**, **C** and **D** were analyzed, and the concentration of three air pollutants in parts per million (ppm) were tabulated below.

In which city will the air pollution problem be most reduced if car owners are made to install catalytic converters by law?

	concentration of carbon dioxide / ppm	concentration of carbon monoxide / ppm	concentration of nitrogen dioxide / ppm
A	27	23	36
B	34	35	48
C	68	50	12
D	70	24	39

36 Which of the following statements describe the differences between saturated and unsaturated hydrocarbons?

I Saturated hydrocarbons have C=C bond(s), but not unsaturated hydrocarbons.
II Saturated hydrocarbons undergo substitution reaction while unsaturated hydrocarbons do not.
III Unsaturated hydrocarbons have a general formula of C_nH_{2n}, while saturated hydrocarbons have a general formula of C_nH_{2n+1}.
IV Unsaturated hydrocarbons will decolourise aqueous bromine at room temperature, but not saturated hydrocarbons.

A I, II only
B I, II, IV only
C II, IV only
D III, IV only

37 Which one of the following is the correct set of conditions for manufacturing margarine from unsaturated vegetable oils?

A concentrated sulfuric acid and heating
B high pressure, temperature and catalyst
C nickel catalyst and heating
D phosphoric (V) acid catalyst and heating

38 Which one of the following shows the correct order of reactions that produce ethanoic acid from ethane?

A dehydrogenation → hydration → oxidation
B dehydrogenation → fermentation → esterification
C substitution → addition → reduction
D substitution → dehydration → oxidation

39 In the polymerisation of ethene to form poly(ethene), there is no change in

A boiling point.
B density.
C empirical formula.
D mass.

40 In many vineyards, wine are made from grape juice.

Which of the following statements about the reaction involved is/are true?

I The conditions needed are 40 °C and yeast as catalyst.
II The equation for this reaction is: $C_6H_{12}O_3 \rightarrow 3C_2H_5OH$
III This reaction is called fermentation.
IV The reaction needs to be carried out in the absence of oxygen.

A I, II only
B II, III only
C II, III, IV only
D III, IV only