1996

CHEMISTRY

UNIT 2

TRIAL EXAM

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STUDENT NUMBER

Letter

Figures
Words

NAME _____

SECTION A.

MULTIPLE CHOICE ANSWER SHEET

Instructions

Complete **ALL** the questions.

Marks will **NOT** be deducted for incorrect answers.

NO mark will be given if more than **ONE** answer is completed for any question.

USE HB PENCIL ONLY.

All answers must be completed like **THIS** example.

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

One answer per line ***One answer per line*** ***One answer per line***

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

Please DO NOT fold, bend or staple this form

DETACH THIS ANSWER SHEET AT THE START OF THE EXAMINATION

CHEMISTRY UNIT 2 (YEAR 11)

Chemistry In Everyday Life

1996 TRIAL EXAMINATION

(not to be used before Monday November 4, 1996)

Reading time: 15 minutes
Total writing time: 1 hour 30 minutes

STUDENT NAME _____

Structure of examination paper: Number of booklets = 1
Number of Sections = 2

Directions to students

Materials
Question and answer booklet of 17 pages.
A data sheet which should be removed at the beginning of the examination
Multiple choice answer sheet.
An approved calculator may be used.

The task
Answer all items from Section A.
Section A items should be answered on the multiple-choice answer sheet provided.
Answer all questions from Section B.
Section B questions should be answered in this booklet in the spaces provided following each question.
All written responses should be in English.

At the end of the task
Please ensure that you write your **name** in the space provided on this booklet and your **name and student number (if one is provided)** in the space provided on the multiple-choice answer sheet.
Place the multiple-choice answer sheet inside the back cover of this booklet and hand them in.

SPECIFIC INSTRUCTIONS FOR SECTION A

(1) Section A, Question 1, consists of 30 multiple choice items and is worth 30 marks and therefore 30% of the total marks available for this examination. You should therefore spend about 27 minutes on Section A.

(2) Choose the response you consider is correct or best, and mark your choice on the Multiple Choice Answer Sheet according to the instructions on that sheet.

(3) A correctly answered item scores 1, an incorrect item scores 0. No credit will be given for an item if two or more letters are marked for that item. Marks will NOT be deducted for incorrect answers and you are urged to attempt every item.

DATA

TABLE 1: RELATIVE ATOMIC MASS

Element	*Symbol*	*Relative Atomic Mass*
Barium	Ba	137.3
Calcium	Ca	40.1
Carbon	C	12.0
Chlorine	Cl	35.5
Hydrogen	H	1.0
Oxygen	O	16.0
Phosphorus	P	31.0
Sodium	Na	23.0

TABLE 2: PHYSICAL CONSTANTS

Avogadro constant (N_A)	6.023×10^{23} mol^{-1}
Ideal gas molar volume at STP	(0^oC and 1 atmosphere pressure)
	(273K and 101325 Nm^{-2} (Pa)) = 22.4 L
Universal gas constant (R)	8.31 J K^{-1} mol^{-1}

Section A Question 1

For each of the following , put a line through the correct response on the answer sheet provided.

Item 1
Which one of the following contains a base and an acid **in that order**?

A. lemon juice, vinegar

B. potassium bicarbonate, lemon juice

C. vinegar, potassium carbonate

D. potassium carbonate, potassium bicarbonate

Item 2
Hydrochloric acid (HCl) is known as an acid because it

A. produces OH^- ions in aqueous solution.

B. produces H_3O^+ ions in aqueous solution.

C. reacts with potassium chloride to produce H_2 gas.

D. neutralises sulfuric acid.

Item 3
The conjugate base of the ion, HPO_4^{2-} is

A. $H_2PO_4^-$

B. H_2O

C. OH^-

D. PO_4^{3-}

Section A Question 1

Item 4
Which one of the following contains bases listed in order from **weakest** to **strongest**?

A. $NaOH$, CO_3^{2-} , HCO_3^- , H_2O

B. $NaOH$, HCO_3^- , CO_3^{2-} , H_2O

C. H_2O , CO_3^{2-} , HCO_3^- , $NaOH$

D. H_2O , HCO_3^- , CO_3^{2-} , $NaOH$

Item 5
Of the following solutions, which one contains the **largest** concentration of $OH^-(aq)$ ions?

A. Solution with pH = 0

B. Solution with pH = 7

C. Solution with pH = 10

D. Solution with pH = 14

Item 6
Paracetamol is a pain-killer with the molecular formula $C_6H_4(OH)(NHCOCH_3)$.
One mole of paracetamol contains

A. 10 mole of atoms.

B. 15 mole of atoms.

C. 20 mole of atoms.

D. 30 mole of atoms.

Section A Question 1

Item 7
In exactly 32.0 g of ozone gas, O_3, the number of ozone molecules is approximately

A. 4.02×10^{23}.

B. 6.02×10^{23}.

C. 1.2×10^{24}.

D. 2.4×10^{24}.

Item 8
The pH of 2000 mL of a 0.1 mol dm^{-3} solution of KOH is

A. 10

B. 11

C. 12

D. 13

Item 9
The relative formula mass of sodium orthophosphate, Na_3PO_4 is closest to

A. 70.0

B. 116.0

C. 148.0

D. 257.0

Item 10
Which one of the following is the empirical formula of benzene?
The molecular formula of benzene is C_6H_6.

A. CH

B. C_2H_2

C. C_3H_3

D. C_6H_6

Section A Question 1

SECTION A QUESTION 1

Item 11
Which one of the following chemical equations best summarises the production of glucose in green plants by photosynthesis?

A. $6CO_2(g) + 6H_2O(l) \rightarrow C_6H_{12}O_6(aq) + 6O_2(g)$

B. $C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

C. $C_6H_{12}O_6(aq) \rightarrow 2C_2H_5OH(aq) + 2CO_2(g)$

D. $2C_6H_{12}O_6(aq) \rightarrow C_{12}H_{22}O_{11}(aq) + H_2O(l)$

Item 12
The reaction $N_2(g)$ $NO_3^-(aq) + NO_2^-(aq)$ is known as

A. nitrogen reduction.

B. nitrogen fixation.

C. nitrogen conversion.

D. nitrogen release

Item 13
Which one of the following chemical equations best describes the **complete** combustion of methane gas.

A. $CH_4(g) + O_2(g) \rightarrow CO(g) + 2H_2O(g)$

B. $CH_4(g) + 2O_2(g) \rightarrow CO(g) + 2H_2O(g)$

C. $CH_4(g) + O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

D. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

Section A Question 1

Item 14
Carbon dioxide can be regarded as an atmospheric pollutant because it

A. is used in the process of photosynthesis.

B. is produced in the internal combustion engine of cars.

C. contributes to the warming of the Earth's atmosphere.

D. can react to produce the poisonous gas carbon monoxide.

Item 15
Hospital patients suffering from breathing difficulties can be given pure oxygen gas. This oxygen gas is obtained by

A. fractional distillation of liquid air.

B. heating of oxygen-containing compounds.

C. filtration from the air.

D. electrolysis of water

Item 16
Of the following gases, which one has the **highest** boiling temperature?

A. $H_2O(g)$

B. $O_2(g)$

C. $H_2(g)$

D. $CO_2(g)$

Item 17
The atoms of the noble gases Ne and Ar have

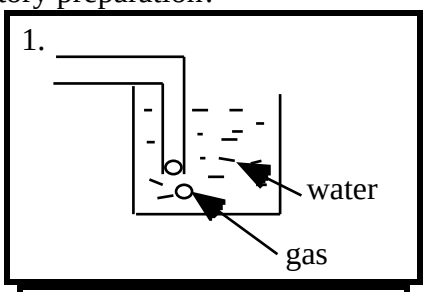
A. full outer electron shells

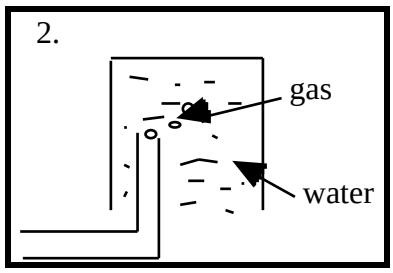
B. 2 electrons in their outershells.

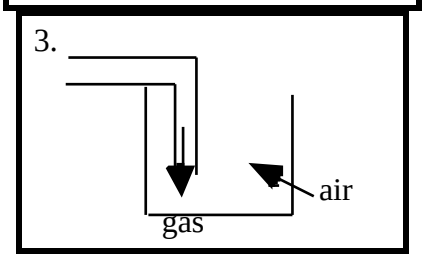
C. 7 electrons in their outershells.

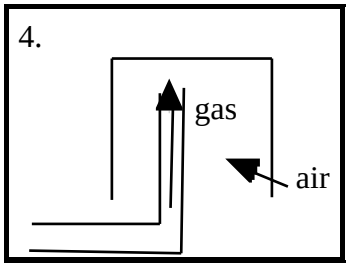
D. 8 electrons in their outershells.

Item 18
Which **two** of the following methods could be used for collecting a sample of **hydrogen gas** in a laboratory preparation?









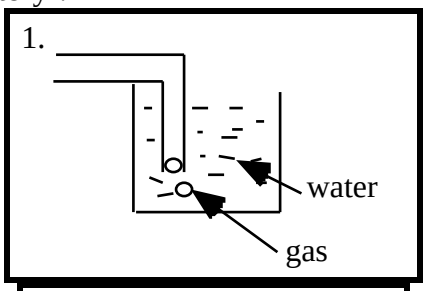
A. 1 and 3

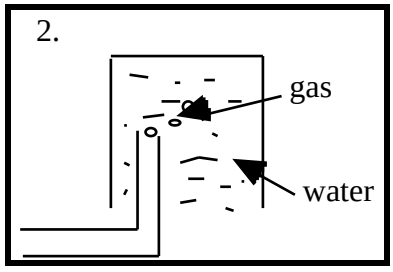
B. 1 and 4

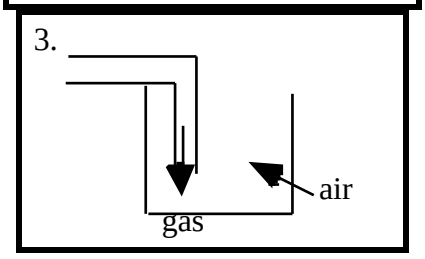
C. 2 and 3

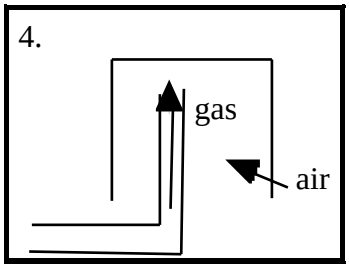
D. 2 and 4

Item 19
Which **two** of the following methods could be used for collecting a sample of **argon gas** in the laboratory ?









A. 1 and 3

B. 1 and 4

C. 2 and 3

D. 2 and 4

Section A Question 1

Item 20
The boiling temperature of argon is -186°C. This is equivalent to a Kelvin temperature of approximately

A. -87 K

B. +87 K

C. -459 K

D. +459 K

Item 21
When iron corrodes, it is

A. always oxidised.

B. always reduced.

C. sometimes oxidised and sometimes reduced.

D. neither oxidised nor reduced.

Item 22
A zinc coating is often added to metallic iron. This prevents the corrosion of the iron by

A. forming a physical barrier between the iron and the oxygen in the air.

B. reacting more readily than the iron with the oxygen in the air.

C. forming a reflective surface on the iron.

D. both A and B.

Item 23
Which one of the following chemical equations best illustrates the oxidation of iron metal to its **highest** oxidation state?

A. $Fe(s) + O_2(g) \rightarrow FeO_2(s)$

B. $2Fe(s) + O_2(g) \rightarrow 2FeO(s)$

C. $3Fe(s) + O_2(g) \rightarrow Fe_3O_2(s)$

D. $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$

Section A Question 1

Item 24

In the reaction, $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$, the reductant is

A. $H_2(g)$

B. Cu in CuO(s)

C. O in CuO(s)

D. H in $H_2O(g)$

Item 25

When an iron nail is placed in an aqueous solution of silver nitrate ($AgNO_3$), a silver coating appears on the surface of the nail. The balanced chemical equation that best summarises this reaction is

A. $2Ag^+(aq) + Fe^{2+}(aq) \rightarrow 2Ag(s) + Fe(s)$

B. $2Ag^+(aq) + Fe(s) \rightarrow 2Ag(s) + Fe^{2+}(aq)$

C. $2Ag(s) + Fe(s) \rightarrow 2Ag^+(aq) + Fe^{2+}(aq)$

D. $2Ag(s) + Fe^{2+}(aq) \rightarrow 2Ag^+(aq) + Fe(s)$

Items 26, 27, 28, 29 and 30 refer to the following information.

A galvanic cell is set up using Ag(s), $AgNO_3(aq)$, Fe(s) and $Fe(NO_3)_2(aq)$.

Item 26

In this galvanic cell, the silver electrode is

A. negative and is called the cathode.

B. positive and is called the anode.

C. negative and is called the anode.

D. positive and is called the cathode.

Section A Question 1

Item 27
In this galvanic cell, the electrons flow

A. through the external circuit from the cathode to the anode.

B. through the salt bridge towards the anode.

C. through the salt bridge towards the cathode.

D. through the external circuit from the anode to the cathode.

Item 28
In this galvanic cell, the nitrate ions ($NO_3^-(aq)$) flow through

A. the wire in the external circuit from the iron electrode to the silver electrode.

B. the wire in the external circuit from the silver electrode to the iron electrode.

C. the salt bridge towards the silver electrode.

D. the salt bridge towards the iron electrode.

Item 29
The balanced half-equation for the reaction occurring at the cathode is

A. $Ag^+(aq) + e^- \rightarrow Ag(s)$

B. $Fe^{2+}(aq) + 2e^- \rightarrow 2Fe(s)$

C. $Ag(s) \rightarrow Ag^+(aq) + e^-$

D. $2Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$

Item 30
The balanced half-equation for the reaction occurring at the anode is

A. $Ag^+(aq) + e^- \rightarrow Ag(s)$

B. $Fe^{2+}(aq) + 2e^- \rightarrow 2Fe(s)$

C. $Ag(s) \rightarrow Ag^+(aq) + e^-$

D. $2Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$

END OF SECTION A

Section B

SPECIFIC INSTRUCTIONS FOR SECTION B

(1) Section B consists of 7 questions (numbered 2 to 8) and is worth 70 marks and therefore 70% of the total marks available for the examination.

You should therefore spend about 63 minutes on Section B.
The marks allotted to each question are indicated.

(2) Answers must be written in the spaces following each question in this booklet.

(3) When chemical symbols are used in equations they must be accompanied by correct symbols of state. For example, $H_2(g)$ for hydrogen gas.

Question 2 (9 minutes, 2+2+2+2+2 = 10 marks)

Write a balanced chemical equation for each of the following:

(a) aqueous hydrochloric acid reacts with solid magnesium.

_____

(b) aqueous hydrochloric acid reacts with solid magnesium oxide.

_____

(c) aqueous hydrochloric acid reacts with solid magnesium carbonate.

_____

(d) aqueous sulfuric acid is neutralised by aqueous magnesium hydroxide.

_____

(e) aqueous sulfuric acid reacts with aqueous sodium sulfite.

_____

Section B

Question 3 (9 minutes, 5+5 = 10 marks)

(a) In the data table, the relative atomic mass of chlorine is given as 35.5. Explain how it is possible to have the relative atomic mass of an element halfway between two whole numbers.

(b) Calculate the percentage composition of chlorine in trichloromethane, $CHCl_3$.

Section B

Question 4 (9 minutes, 2+8 = 10 marks)

(a) When dilute sulfuric acid is added to an aqueous solution of barium hydroxide, a white precipitate is formed

Write a balanced equation for this reaction.

_____

_____

(b) Calculate the **maximum** mass of precipitate that could be produced from the reaction between 1000 mL of 0.2 mol dm^{-3} H_2SO_4 and 1000 mL of 0.05 mol dm^{-3} $Ba(OH)_2$.

_____

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_____

Section B

Question 5 (9 minutes, 2+2+2+4 = 10 marks)

(a) (i) Write a balanced chemical equation for the preparation of carbon dioxide gas from limestone.

_____

(ii) Describe a test that would show the presence of carbon dioxide gas in your collected sample.

_____

_____

_____

_____

_____

(b) (i) Write a balanced chemical equation for the preparation of hydrogen gas using magnesium metal.

_____

(ii) Describe a test that would show the presence of hydrogen gas in your collected sample and indicate **two** safety measures you would adopt during your preparation of and testing for hydrogen gas

_____

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Section B

Question 6 (9 minutes, 2+4+4 = 10 marks)

Neon gas is the second member of the noble gas group.

(a) Explain why neon gas is unreactive and give one use for this gas.

(b) 0.5 L of pure neon is collected at $25^{o}C$ and a pressure of 10^{5} Nm^{-2} (Pa).
How many mole of neon is present in the sample?

(c) Calculate the volume of neon if the temperature is increased to $50^{o}C$ while the pressure remains constant.

Section B

Question 7 (9 minutes, 2+4+4 = 10 marks)

Hydrogen gas will react with oxygen gas to produce water vapour.
In a particular experiment 50 g of hydrogen gas reacts with 50 g oxygen gas to produce water vapour.

(a) Write a balanced equation for this reaction.

_____

(b) Calculate the mass of hydrogen used in the reaction.

_____

_____

_____

_____

_____

(c) Calculate the volume of water vapour produced at STP.

_____

_____

_____

_____

_____

Section B

Question 8 (9 minutes, 1+1+1+1+1+2+2+1= 10 marks)

(a) Magnesium metal, aqueous magnesium ions, copper metal and aqueous copper ions can be used to construct a galvanic cell. Use these chemicals and anything else you require to draw a fully labelled galvanic cell, showing clearly the

(i) anode and cathode
(ii) positive electrode and negative electrode
(iii) direction of electron flow
(iv) direction of ion flow
(v) contents of the salt bridge

Section B

Question 8 (continued)

(b) Write the equation for the reaction occurring at the anode.

_____

(c) Write the equation for the reaction occurring at the cathode.

_____

(d) Write the equation for the overall reaction.

_____

END OF QUESTIONS 1996 CHEMISTRY UNIT 2

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Suggested Solutions

Section A
Question 1

ITEM 1 ANS B
Lemon juice and vinegar are acids while potassium bicarbonate and potassium carbonate are bases.

ITEM 2 ANS B

Hydrochloric acid produces $H_3O^+(aq)$ ions in aqueous solution according to the equation:

$HCl(aq) + H_2O(l) \rightarrow H_3O^+(aq) + Cl^-(aq)$

ITEM 3 ANS D

To obtain the conjugate base of an acid, take H^+ out of the formula.
Hence, PO_4^{3-} is the conjugate base of HPO_4^{2-}.

ITEM 4 ANS D
A strong base is completely ionised in solution. A weak base is only partially ionised in solution.
The order from weakest base to strongest base is H_2O , HCO_3^-, CO_3^{2-}, NaOH.

ITEM 5 ANS D

Since $pH = -\log_{10}[H_3O^+]$, the higher the pH, the smaller the hydrogen ion concentration and the larger the hydroxide ion concentration.
At pH = 14, $[H_3O^+] = 10^{-14}$ mol dm^{-3} and $[OH^-] = 10^0 = 1$ mol dm^{-3}.

ITEM 6 ANS C
The total number of mole of atoms = 8C + 2O + 9H + 1N = 20 mole of atoms.

ITEM 7 ANS A

$n(O_3) = \frac{32.0}{3x16.0} = \frac{32.0}{48.0} = 0.67.$

Hence, approximate number of ozone molecules = $0.67 \times 6.023 \times 10^{23} = 4.02 \times 10^{23}$.

ITEM 8 ANS D
$[OH^-] = [KOH] = 0.1\ M = 10^{-1}\ M.$

Hence, $[H_3O^+] = 10^{-13}$ M. Hence, pH = 13. The volume is not relevant to the problem.
It is the concentration that must be used in the calculation.

ITEM 9 ANS C
Relative formula mass = (23.0 x 3) + 31.0 +(3 x 16.0) = 69.0 + 31.0 + 48.0 = 148.0

ITEM 10 ANS A
An empirical formula is the simplest whole number ratio of atoms in a formula.
For benzene, the simplest whole number ratio is 1 : 1. Hence, the empirical formula is CH.

ITEM 11 ANS A
Photosynthesis is the reaction of carbon dioxide and water in the presence of chlorophyll and sunlight to produce glucose, $C_6H_{12}O_6$, and oxygen.

Suggested Solutions

ITEM 12 ANS B
Nitrogen fixation involves the conversion of atmospheric nitrogen (N_2) into useable soluble forms such as nitrites (NO_2^-) and nitrates (NO_3^-)

ITEM 13 ANS D
The **complete** combustion of methane produces carbon dioxide and water.
$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$ is the balanced equation.

ITEM 14 ANS C
CO_2 contributes to global warming. In this regard it is a pollutant. It should be carefully noted that chemicals can be both useful in some ways and harmful in other ways.

ITEM 15 ANS A
Air is a mixture of gases (mainly N_2 and O_2). Air is turned into a liquid and then heated slowly. O_2 is collected at its boiling temperature of -183^oC. This is known as fractional distillation.

ITEM 16 ANS A
Water boils at 100^o C at atmospheric pressure. All of the other gases boil at temperatures well below O^oC.

ITEM 17 ANS D
Neon and argon have eight electrons in their outershells.

ITEM 18 ANS D
Hydrogen gas is not soluble in water and is less dense than air. Hence, it could be collected by downward displacement of water or air in a gas jar

ITEM 19 ANS C
Argon gas is not soluble in water and is denser than air. Hence, it could be collected by downward displacement of water or upward displacement of air in a gas jar.

ITEM 20 ANS B
Kelvin temperature = $^oC + 273 = -186 + 273 = 87$ K

ITEM 21 ANS A
The corrosion of iron involves the loss of electrons. When iron loses electrons it is always oxidised.

ITEM 22 ANS C
The corrosion of the iron is prevented by both the physical barrier of the zinc coating and the sacrificial oxidation of the zinc.

ITEM 23 ANS D
When iron metal is oxidised to its highest oxidation state, it forms iron in the +3 oxidation state, as in the formula Fe_2O_3

Suggested Solutions

ITEM 24 **ANS A**
The reductant is the element has an increase in oxidation number. In this case, the oxidation number of hydrogen changes from 0 in $H_2(g)$ to +1 in $H_2O(g)$.

ITEM 25 **ANS B**
The correct equation is $2Ag^+(aq) + Fe(s) \rightarrow 2Ag(s) + Fe^{2+}(aq)$

ITEM 26 **ANS D**
Reduction of $Ag^+(aq)$ to Ag(s) occurs at this electrode. Hence, this is the cathode.
Electrons flow to this electrode. Hence, this electrode is positive.

ITEM 27 **ANS D**
Because oxidation occurs at the anode, the anode is negative and electrons will flow from the anode to the cathode through the external circuit. Electrons do not move through the salt bridge.

ITEM 28 **ANS C**
The negatively charged nitrate ions will flow in the same direction in the circuit as the negatively charged electrons. Hence, they will flow through the salt bridge towards the iron electrode.

ITEM 29 **ANS A**
At the cathode, reduction of silver ions to metallic silver takes place.
$Ag^+(aq) + e^- \rightarrow Ag(s)$

ITEM 30 **ANS D**
At the anode, oxidation of metallic iron to iron ions takes place.
$2Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$

Section B

Question 2

(a) $2HCl(aq) + Mg(s) \rightarrow MgCl_2(aq) + H_2(g)$

(b) $2HCl(aq) + MgO(s) \rightarrow MgCl_2(aq) + H_2O(l)$

(c) $2HCl(aq) + MgCO_3(s) \rightarrow MgCl_2(aq) + H_2O(l) + CO_2(g)$

(d) $H_2SO_4(aq) + Mg(OH)_2(aq) \rightarrow MgSO_4(aq) + 2H_2O(l)$

(e) $H_2SO_4(aq) + Na_2SO_3(aq) \rightarrow Na_2SO_4(aq) + H_2O(l) + SO_2(g)$

Suggested Solutions

Question 3

(a) The relative isotopic mass is the mass of an isotope relative to $^{12}C_6$ which is taken as exactly 12. $^{12}C_6$ is the reference point. Naturally occurring chlorine is a mixture of isotopes with different relative isotopic masses and different abundances. The relative atomic mass of chlorine is a weighted average of these relative isotopic masses. When calculated it equals 35.5 (approximately)

(b) Percentage of chlorine in $CHCl_3$ = $\frac{3x35.5}{(12.0+1.0+(3x35.5))} = \frac{106.5}{119.5}$ x 100 = 89.1 % **ANS**

Question 4

(a) $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2H_2O(l)$ white precipitate

(b) The balanced equation is: $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2H_2O(l)$
$n(H_2SO_4) = 0.2 \times 1 = 0.2$ and $n(Ba(OH)_2) = 0.05 \times 1 = 0.05$
Hence, the sulfuric acid is in excess. Therefore, from the balanced equation,
$n(BaSO_4)$ formed = $n(Ba(OH)_2)$ used up = 0.05
Hence, $m(BaSO_4)$ formed = $n \times M_r$ = 0.05 x (137.3 + 32.1 + 64)
= 0.05 x 233.4 = 11.7 g **ANS**

Question 5

(a) (i) $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

(ii) Carbon dioxide gas will extinguish a flame and will form a slightly acidic solution in water. It will also turn limewater milky.

(b) (i) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

(ii) Hydrogen gas will react explosively with the oxygen in the air to form water. Safety glasses must be worn during this preparation and testing and only very small amounts of hydrogen should be prepared and tested.

Suggested Solutions

Question 6

(a) Neon is unreactive because an atom of neon has a full second shell of electrons.
Neon can be used to fill electric discharge tubes to provide coloured lighting.

(b) $n(Ne) = \frac{PV}{RT} = \frac{10^5 \text{x} 0.5 \text{x} 10^{-3}}{8.31 \text{x} 298} = 0.02$ **ANS**

(c) At constant pressure, $\frac{V_1}{T_1} = \frac{V_2}{T_2}$. Hence, $\frac{V_2}{(273+50)} = \frac{0.5}{(273+25)}$

$V_2 = 0.5 \text{ x } \frac{323}{298} = 0.54$ L **ANS**

Question 7

(a) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

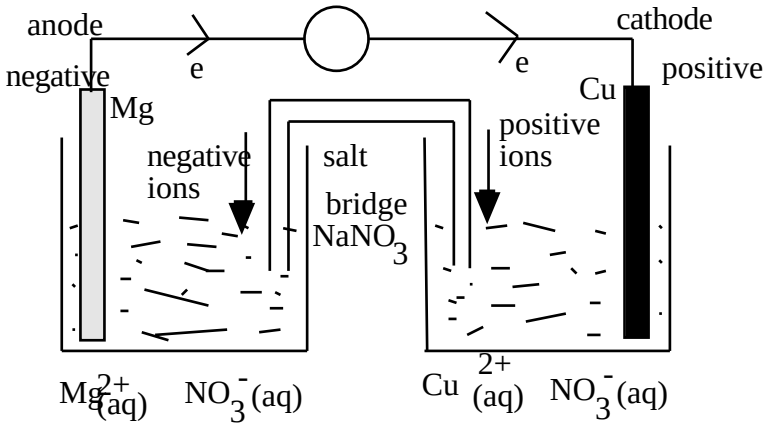
(b) $n(H_2)$ initially $= \frac{50}{2} = 25$. $n(O_2)$ initially $= \frac{50}{32} = 1.5625$.
Since 2 mol of hydrogen gas reacts exactly with 1 mol of oxygen gas, the hydrogen gas is in excess and all of the oxygen will be used up
Now, $n(H_2)$ used $= 2 \text{ x } n(O_2) = 2 \text{ x } 1.5625 = 3.125$
Hence, $m(H_2)$ used $= 3.125 \text{ x } 2 = 6.25$ g **ANS**

(c) $n(H_2O)$ produced = $n(H_2)$ used up = 3.125 mol.
Hence, $V(H_2O)$ at STP $= 3.125 \text{ x } 22.4 \text{ L} = 70 \text{ L } (dm^3)$ **ANS**

Suggested Solutions

Question 8

(a)



(b) Anode: $Mg(s) \rightarrow Mg^{2+}(aq) + 2e^-$

(c) Cathode: $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

(d) Overall reaction: $Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$

END OF SUGGESTED SOLUTIONS 1996 CHEMISTRY UNIT 2

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