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تلخيص

Chemistry lab

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لجنة كلية الهندسة الكهربائية - الجامعة الهاشمية

Chemistry Lab Summarization

Exp1 Safety and Equipment. There is aquiz for the exp.

المطلوب: حفظ الأدوات صفحة 4 - 7 + حفظ قواعد السلامة من 1 - 13 ص 6
+ حفظ أدوات السلامة ص 8 + 9.

التريب حسب الدقة

فقط volumetric pipette & volumetric flask > pipette & Bruette > graduated cylinder > Beaker & Er. flask

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Exp2 Emprical formula of a compound. There is a quiz for the exp.

* هذه التجربة تحتوي جانب نظري وجانب حسابي
* النظري يتعلق بالعلاقات والحسابي يتعلق بالتحويلات بناء على الجدول الدوري كما في المادة الأصلية (أساسيات الكيمياء)

Calculation Part:-

Ex) How many grams of Magnesium combine with 1.5g of chloride ions in $MgCl_2$?

Sol → الحل كاملي كما في المادة النظرية

$$1.5g\,Cl * \frac{1\ mol\ Cl}{35.4g\ Cl} * \frac{1\ mol\ MgCl}{2\ mol\ Cl} * \frac{24.31\ g\ Mg}{1\ mol\ Mg}$$

$$= 0.514\ g\ Mg$$

Ex) If 11.8 g of iron reacts with 5.06 g of Oxygen. Detrmine the empirical formula of the resulting Oxide?

Sol → الخطوات

Fe	:	O
11.8 g	:	5.06 g
$\frac{11.8}{55.8} = 0.211\ mol$	:	$\frac{5.06\ g}{16} = 0.316\ mol$
$\frac{0.211}{0.211} = 1$	:	$\frac{0.316}{0.211} = 1.5$
$1 * 2 = 2$	:	$1.5 * 2 = 3$

① تحويل لغرامات
② تحويل لمولات
③ القسمة على أصغر عدد
④ جبر الرقم

$\therefore Fe_2O_3$ #

Ex) Nicotine is a compound containing C, H and N
A 2.5 g Sample of the compound is burned and Produces 6.78 g of CO_2, 1.94 g of H_2O, and 0.43 g of N_2. What is the empirical formula of nicotine?

Sol →

C : H : N

$6.78\,g\,CO_2 \times \frac{1\,mol\,CO_2}{44\,g\,CO_2} \times \frac{1\,mol\,C}{1\,mol\,CO_2}$; $1.94\,g\,H_2O \times \frac{1\,mol\,H_2O}{18\,g}$; $0.43\,g\,N_2 \times \frac{1\,mol\,N_2}{28\,g\,N_2}$ ① إيجاد مولات كل عنصر

$= 0.154$ mol $\times \frac{2\,mol\,H}{1\,mol\,H_2O}$ $\times \frac{2\,mol\,N}{1\,mol\,N_2}$

$= 0.216$ mol $= 0.031$ mol

$0.154/0.031 = 5$: $0.216/0.031 = 7$; $0.031/0.031 = 1$ ② القسمة على أصغر رقم

∴ C_5H_7N

Ex) When 0.288 g of P is burned, 0.66 g of white Phosphorus oxide is obtained, determine the empirical formula of this oxide?

Sol → we have 0.288 g P & 0.66 g of Oxide

∴ Mass of O = Mass of Oxide − Mass of P = 0.66 − 0.288
= 0.372 g

P : O

① 0.288 g : 0.372 g

② $\frac{0.288}{31} = 0.0093$ mol : $\frac{0.372}{16} = 0.0233$ mole

③ $\frac{0.0093}{0.0093} = 1$: $\frac{0.0233}{0.0093} = 2.5$

④ $1 \times 2 = 2$: $2.5 \times 2 = 5$

∴ P_2O_5

Ex) A 2.00-g Sample of a bromide oxide is converted to 2.936 g of AgBr, Calculate the empirical formula of the oxide, (M.wt for AgBr = 187.78 g/mol, Br: 80 g/mol and O = 16 g/mol)

Sol→ Br نفس فكرة السؤال السابق لكن يجب أولا إيجاد كتلة

$$2.936\ g\ AgBr \times \frac{1\ mol\ AgBr}{187.78\ g\ AgBr} \times \frac{1\ mol\ Br}{1\ mol\ AgBr} \times \frac{80\ g\ Br}{1\ mol\ Br}$$

$= 1.25\ g\ Br$

Mass O: Mass Oxide − Mass Br = 2 g − 1.25 g = 0.75 g O

Br	:	O
$\frac{1.25}{80} = 0.0156$ mol	:	$\frac{0.75}{16} = 0.0468$
$\frac{0.0156}{0.0156} = 1$	:	$\frac{0.0468}{0.0156} = 3$

BrO_3

* أسئلة الحسابات في هذه التجربة لا تتعدى الأفكار السابقة

The Other Part:-

① أسئلة تتعلق بالتجربة :

Why ?

[1] Heating before starting? To remove the moisture الرطوبة

[2] Don't wheight the crucible when it's hot? It gives wrong accurate

[3] Don't Cover the Crucible widley? It burns Mg brightly

[4] Adding a few water drops? To decompose Mg_3N_2

Postlab questions ⑤

What is the effect of Mg:O mole ratio if :-

[1] Mg_3N_2 Not decomposed completly → increased
↖ OR The formation of side Product.

[2] Mg_3N_2 decomposed completly → no effect.

[3] Carbon deposited on the crucible surface → decrease

[4] Carbon not deposited on the crucible surface → no effect

[5] Magnesium oxide ash is not dried completely → decrease

[6] Magnesium oxide ash is dried completely → no effect

[7] Rapid Oxidation of Magnesium → increase

[8] Air is not sufficient to ~~react~~ react with all the Mg → increase

[9] Air is sufficient to react with all the Mg → no effect

[10] Nonvolatile and unreactive impurities in the crucible during oxidation → decrease

[11] Nonvolatile and unreactive impurities in the crucible from the begining → no effect

[12] If the balance reads ±0.02g for any reading → no effect

x بالنسبة لـ 10+ || باختصار ← ① وجود مواد غير متطايرة قبل التأكسد لا يؤثر و أثناء التأكسد يؤثر. (dec)

② وجود مواد متطايرة قبل أو أثناء التأكسد لا يؤثر.

* لو طلب O:Mg ← تعكس العلاقات أعلاه

Eq → beef

[1] The formation of Mg_3N_2 (side reaction) → $3Mg + N_2 \rightarrow Mg_3N_2$

[2] The reaction between magnesium Nitride and water → $Mg_3N_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2NH_3$

[3] Heating Mg to ash → $Mg(OH)_2 \xrightarrow{\Delta} MgO + H_2O$

Exp3 → Limiting Reactant.

* No quiz for the exp.

* الهدف من هذه التجربة هو معرفة كيفية تحديد ال L.R

(*) Calculation Part →

$$\text{Percent yield} = \frac{\text{Actual yield}}{\text{Theorical Yeild}} \times 100\%$$

Actual yield → given

Theorical Yeild → Calculated

= How to determine the theorical yield?

① we find the L.R by → [1] convert each element to moles
[2] Divide each element on it's coefficient
[3] The smallest number is the LR

② we use only the L.R in our normal calculation.

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*Before we start8 -

$3Ba^{+2} + 2PO_4^{-3} \longrightarrow Ba_3(PO_4)_2$

244.2 g/mole 380.2 g/mole 602.2 g/mole.

* التجربة سوف تقوم على إيجاد هذه المعادلة فهي حفظ

Ex) A 25 g sample of $Na_3PO_4 \cdot 12H_2O$ react with excess $BaCl_2 \cdot H_2O$. If the mass of $Ba_3(PO_4)_2$ obtained is 17.56g. Calculate the % yield of $Ba_3(PO_4)_2$?

Sol →

The eq:- $3Ba^{+2} + 2PO_4^{-3} \rightarrow Ba_3(PO_4)_2$

[1] Determine the LR → given Ba^{+2} excess so PO_4^{-3} is LR

[2] use grams of PO_4^{-3} in Our normal calculations:-

$$25\ g\ PO_4^{-3} * \frac{1\ mol\ PO_4^{-3}}{380.2\ g\ PO_4^{-3}} * \frac{1\ mol\ Ba_3(PO_4)_2}{2\ mol\ PO_4^{-3}} \times \frac{602.2\ g\ Ba_3(PO_4)_2}{1\ mol\ Ba_3(PO_4)_2}$$

(from the eq)

Theorical Actual yield = 19.798 → % yield $= \frac{17.56}{19.8} = 88.68\%$

Ex) A mixture containing 40 g of $Na_3PO_4 \cdot 12H_2O$ and 30 g of $BaCl_2 \cdot 2H_2O$ is dissolved in water. A precipitate of $Ba_3(PO_4)_2$ weighing 22.65 g is produced. Calculate the % yield of $Ba_3(PO_4)_2$. ↳ actual yield.

Sol → $3Ba^{+2} + 2PO_4^{-3} \rightarrow Ba_3(PO_4)_2$

[1] Determine the L.R

$$\frac{40\ g\ PO_4^{-3}}{380.2} = 0.105\ mole \rightarrow \frac{0.105\ mole}{\text{coefficient } 2} = 0.0525$$

$$\frac{30\ g\ Ba^{+2}}{244.2} = 0.123\ mole \rightarrow \frac{0.123\ mole}{3} = 0.041 \rightarrow \text{The smallest}$$

∴ Ba^{+2} is L.R

[2]

$$0.123\ mol\ Ba^{+2} * \frac{1\ mol\ Ba_3(PO_4)_2}{3\ mol\ Ba^{+2}} * \frac{602.7\ g\ Ba_3(PO_4)_2}{1\ mol\ Ba_3(PO_4)_2}$$

Theorical yield = 24.69 g

% yield = $\frac{22.65}{24.69} * 100\% = 91.7\%$

Ex) 10 g of a unknown mixture containing $Na_3PO_4 \cdot 12H_2O$ and $BaCl_2 \cdot 2H_2O$ is dissolved in distilled water. The mass of $Ba_3(PO_4)_2$ Precipitated is 3.5 g. calculate the % of each salt present in the mixture. if the $BaCl_2$ is the limiting reactant?

[1] Ba^{+2} is L.R $\quad 3Ba^{+2} + 2PO_4^{-3} \rightarrow Ba_3(PO_4)_2$

we have given 3.5 g $Ba_3(PO_4)_2$ ∴

$$3.5\ g\ Ba_3(PO_4)_2 * \frac{1\ mol\ Ba_3(PO_4)_2}{602.7\ g\ Ba_3(PO_4)_2} * \frac{3\ mol\ Ba^{+2}}{1\ mole\ Ba_3(PO_4)_2} * \frac{244.2\ g\ Ba^{+2}}{1\ Mol\ Ba^{+2}}$$

(L.R)

Mass Ba^{+2} = 4.25 g

% $Ba^{+2} = \frac{4.25\ g}{10\ g} * 100\% = 42.5\%$

% PO_4^{-3} = (100 − 42.5)% = 57.5%

* Procedures Part →

why?

[1] Don't boil the solution → To minimize the lost of the mass

[2] Using distilled water → To provide the reactions of the unknowns

* What is the supernatant liquid?

It is the clear liquid above a precipitate.

* يعني في طبقتين طبقة راسب، طبقة السائل

* Determination of the L.R →

[1] Test for excess PO_4^{-3} OR Limiting Ba^{+2} →

Add 2 drops of 0.5M $BaCl_2$ to the solution. If a precipitate is formed then PO_4^{3-} is the excess and Ba^{+2} is the l.R.

If a precipitate is not formed the PO_4^{3-} is the L.R and Ba^{+2} is the excess.

[2] Test for excess Ba^{+2} OR Limiting PO_4^{-3} →

Add 2 drops of 0.5M Na_3PO_4 to the solution. If appt. is formed then Ba^{+2} is the excess and PO_4^{-3} in the l.R.

If appt. is not formed then Ba^{+2} is the L.R and PO_4^{-3} is the excess.

Post Lab Part

=What is the effect of heating the solution on the particle size of $Ba_3(PO_4)_2$ ppt.? It makes a congulation

= what is the effect on the actual yield of the $Ba_3(PO_4)_2$ of:

[1] Using a coarse paper → decrease

[2] Inefficient washing of the ppt. → increase.

[3] Using Acidic to wash the solution → decrease.

[4] The ppt. wasn't dried completely → increase.

There is no quiz for the exp.

Exp4 Tests For Cations and Anions

* المطلوب من هذه التجربة هو فقط الكتون أدناه .
* المعادلات ليست محفوظ لكن المطلوب أسماء المركبات وكيفية الكشف والكواشف ولون الناتج والوسط الموضوع فيه فقط .

Cations →

[1] Ca^{+2} , Calcium test

$Ca(NO_3)_2 + Na_2C_2O_4 \longrightarrow CaC_2O_4 + NaNO_3$

Calcium Nitrate — Sodium Oxalate — Calcium Oxalate (white ppt.)

[2] Fe^{3+} , Ferric test

$Fe_2(SO_4)_2 + KSCN \longrightarrow K_2SO_4 + Fe(SCN)_2^{+3}$

Iron Sulfate — Potassium thiocyanate — red. Sol.

[3] NH_4^+ ammonium test

$NH_4NO_3 + NaOH \xrightarrow{\Delta} NaNO_3 + NH_4OH$

ammonium nitrade — وسط قاعدي Basic — convert red litmus to blue.

Anions →

[1] SO_4^{-2} (sulfate test)

$Na_2SO_4 + HCl + BaCl_2 \xrightarrow[\text{gently}]{\text{shaking}} NaCl + Ba(SO_4)_2$

Sodium sulfate — Acidic وسط حمضي — Barium Chloride. — white ppt.

[2] HCO_3^- - test

$NaHCO_3 + HCl \longrightarrow H_2CO_3 + NaCl$

Sodium hydrogen Carbonate — وسط حمضي

$H_2O + CO_2 \uparrow$ (Air bubbles)

[3] Test of Cl^-, Br^-

Sodium Chloride $NaCl + HNO_3 + AgNO_3 \longrightarrow AgCl \downarrow$ white ppt.

" Bromide $NaBr + HNO_3 + AgNO_3 \longrightarrow AgBr \downarrow$ yellow or Pale ppt.

وسط حمضي — Silver nitrate

Exp5 Identification of A compound:

Physical properties. There is no quiz for the exp.

* Prelab →

[1] Define

A. Solubility → The maximum mass of Solute that can be dissolved in a fixed mass of Solvent at a given tempreture.

B. Boiling Point → [1] The tempreture at which the liquid starts to boil

[2] The tempreture at which bubble form spontaneously and continue to form until the entire volume of the liquid has been converted to a gas.

[3] The tempreture where the vapor pressure is equal to the atmospheric pressure.

[2] A students liquid unknown boils at approximately 69°C, is insoluble in wate but soluble in cyclohexane. It's density is 0.65 g/mole, which Chemical in table (Page 41) is the unkown?

* هذا السؤال إذا أجى بيجي معه جدول, فاعليك الاقارن بين المعطيات والجدول وقتها.

The unknown is → n-hexane.

[3] What physical property, measurable in this experiment, distinguishes cyclohexane from cyclohexene?

Boiling point.

[4] Using apparatus described in this experiment, when should the boiling point of a liquid be recorded?

When the bubbles cease to escape and before the liquid re-enters the capillary tube.

* The exp.

[1] Solubility → الذائبية

Solution = Solute + Solvent
محلول مذاب مذيب

* Likes dissolves in Like

[1] Polar - Polar → Soluble (Miscible) يذوب
[2] nonPolar - nonpolar → Soluble (miscible) يذوب
[3] Polar - Salt → Soluble (Miscible) يذوب
[4] nonPolar - Salt → insoluble (immiscible) لايذوب
[5] Polar - nonpolar → insoluble (immiscible) لا يذوب

* Levels of solubility →

[1] Complete dissolving ذوبان كامل [2] Partial dissolving ذوبان جزئي. [3] insoluble. غير ذائب (عديم).

[2] Density = $\frac{\text{mass}}{\text{Volume}}$, $\rho = \frac{m}{V}$ 1 L = 1000 mL

[3] Boiling point , B.P

* it called normal B.P if the vapor pressure = $P_{atm} = 1$
* B.P solution > B.P ~~solute~~ Solvent → why? Because it has stronger intermolecular forces.

* we are dealing with 3 solvents in this expiremnt.

① Water (H_2O) → Polar
② Cyclohexane → C_6H_{12} → non-Polar
③ Ethanol (C_2H_5OH) → Polar.

*PostLab →

[1] How does atmospheric pressure affect the boiling Point of a liquid?
directly → طردياً

* Also →
How does Intermolecular forces affect the boiling Point of a liquid?
directly

[2] If several drops of liquid unknown cling (التصق) to the pipette wall after delivery will the density of the unknown be reported too high or too Low?

too low because mass will decrease then due to the relation $\rho = \frac{m}{V}$, the density will decrease.

[3] A. If the Boiling pt. is recorded when bubbles are rapidly escaping the capillary tube, will it be recorded too high or too low? Explain.

* إذا قرأنا بعد ما طلع الماء من الأنبوب ← القراءة > الأصلية

temp > true B.P , because V.p > Patm

B. If the Boiling pt. is recorded after the liquids enters the capillary tube (after the heat is removed), will it be recorded too high or too Low? Explain.

* إذا قرأنا بعد ما دخل الماء إلى الأنبوب ← القراءة < الأصلية.

temp. < true B.P , because V.P < Patm.

C. If the Boiling pt. is recorded when the liquids cease to escape and before the liquids re-enters the Capillary tube?

* إذا قرأنا أثناء الخروج وقبل الدخول إلى الأنبوب ← القراءة = الأصلية.

temp = true B.P , because V.p = Patm.

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* إذا أجا أي سؤال بيحكيلك أي المواد الآتية تصلح للتجربة إختار اللي درجة غليانها أقل من 100 (أقل من درجة غليان الماء).

* إذا أجا أي سؤال بيحكيلك أي المواد الآتية لا تصلح للتجربة إختار اللي درجة غليانها أكبر من 100 (أكبر من درجة غليان الماء).

Can you predict when the V.p = Patm, theoritically? No

Test banks

Exp 1

Q1) The correct statement concerning handling of chemicals in lab is:-

1. Direct contact with chemicals is allowed.
2. No need to read the label on the reagent bottles.
3. Smelling and tasting chemicals are not allowed.
4. Toxic chemicals can be used outside the fume hood.
5. All of the above.

Ans: 3

Q2) which of the following is not a safety tool?

1. First aid Equipment.
2. Fire distinguisher
3. Graduated cylinder
4. Fume hood
5. Fire blanket.

Ans: 3

Q3) Which of the following is not a safety equipment?

1. Beaker 2. Goggle 3. First aid equipments 4. Fire blanket

Ans: 1

Q4) Write down T or F:.

T - Do not point your test tube at your face when heating anything to watch what happening exactly.

F Open sandals, short skirts and shorts are allowed in the lab.

Q5) When a metal (M) with atomic mass 56 g/mol was oxidized to a metal oxide that contains 36.4% by mass O (Atomic weight O = 16 g/mol), the empirical formula of the metal oxide is:-

1. MO_2
2. MO_3
3. M_2O_3
4. M_3O_4
5. M_2O_5

Sol → 36.4 % O → 36.4 g O

%M = (100 − 36.4)% = 63.6 % → 63.3 g M } تحويل لمزاجات

M :	O
$\frac{63.3\ g}{56}$	$\frac{36.4\ g}{16}$
$\frac{1.13\ mol}{1.13}$:	$\frac{2.275\ mol}{1.13}$
1 :	2

تحويل لمولات

العنصر كل أصغر رقم

Ans: 1

So MO_2

Q6) In the empirical formula experiment which statement below is incorrect :-

1. (Mg to O) mole ratio will not affect, if the balance is always read 0.05 g higher than the actual value.
2. The side product that formed is Mg_3N_2.
3. If the magnesium oxide is not dried completely the reported value of (Mg to O) mole ratio will decrease.
4. (Mg to O) mole ratio will increase if air is not sufficient to react with all the magnesium.
5. (Mg to O) mole ratio will decrease if a rapid oxidation is occur and some of the magnesium is lost. Ans: 5

Q7) A compound of iridium, Ir (M.wt = 192.2 g/mol), and oxygen, O (M.wt = 16 g/mol), was produced in a Lab by heating iridium in a crucible, the data was collected:

Mass of crucible 38.26 g
Mass of crucible and iridium 39.63 g
Mass of crucible and iridium oxide 39.74 g
What is the empirical formula of this compound?

1. IrO_2 2. IrO 3. Ir_2O_3 4. Ir_3O_4

Sol →

Mass Ir = 39.63 g − 38.26 g = 1.37 g

Mass iridium oxide = 39.74 g − 38.26 = 1.48 g

Mass O = 1.48 − 1.37 = 0.11 g

Ir	:	O
$\frac{1.37\ g}{192.2}$		$\frac{0.11\ g}{16}$
$\frac{7.12 \times 10^{-3}}{6.87 \times 10^{-3}}$	:	$\frac{6.87 \times 10^{-3}}{6.87 \times 10^{-3}}$
1	:	1

Ans: 2

∴ IrO

Q8) A 0.1000 g sample containing C (FM = 12), H (FM = 1) and O (FM = 16) only, and produced 0.1910 g of CO_2 and 0.1172 g of H_2O, what is the empirical formula of the compound?

1. C_3H_8O
2. $C_5H_{12}O$
3. $C_4H_{10}O$
4. C_2H_6O
5. C_2H_4O

Sol →

Mass C → $0.1910\ g\ CO_2 \times \frac{1\ mol\ CO_2}{44\ g\ CO_2} \times \frac{1\ mol\ C}{1\ mol\ CO_2} \times \frac{12\ g\ C}{1\ mol\ C}$

$= 4.34 \times 10^{-3}\ mol\ C = 0.052\ g\ C$

Mass H → $0.1172\ g\ H_2O \times \frac{1\ mol\ H_2O}{18\ g\ H_2O} \times \frac{2\ mol\ H}{1\ mol\ H_2O} \times \frac{1\ g\ H}{1\ mol\ H}$

$= 0.013\ mol\ H = 0.013\ g\ H$

Mass O → $0.100 - (0.052 + 0.013) = 0.035\ g\ O = 2.1875 \times 10^{-3}\ mol\ O$

C	:	H	:	O
$\frac{4.34 \times 10^{-3}}{2.1875 \times 10^{-3}}$		$\frac{0.013}{2.1875 \times 10^{-3}}$		$\frac{2.1875 \times 10^{-3}}{2.1875 \times 10^{-3}}$
2	:	6	:	1

C_2H_6O

Ans: 4

For exp1

Q9) Which of the following statement is not correct?

1. Open Sandals, short skirts and shorts are not allowed in the lab.
2. When dealing with flammable material, don't heat with direct flame.
3. You should return excess chemicals to their reagent bottles
4. Never taste or smell chemicals or solutions in the lab.
5. Laboratory work can't be started as soon as you enter the lab, unless the teacher is present.

Ans: 3

Q10) Given the equation $A + 3B \rightarrow C + D$ by reacting 1 moles of A with 2 moles of B, which of the following is true?

1. A is Limiting reactant because of it's higher molar mass.
2. B is limiting reactant because of it's higher molar mass
3. A is Limiting reactant because you have fewer moles of A than B
4. B is Limiting reactant because you have fewer moles of A than B
5. B is Limiting reactant because you need 3 moles of B and you have 2.

Sol → $\frac{1A}{1} = 1A$ $\qquad \frac{2B}{3} = 0.67B$ B is LR

(3 ← coefficient)

Ans: 5

Q11) If 3.28 g unknown mixture containing $Na_3.PO_4.12H_2O$ (M.wt = 380.2 g/mol) and $BaCl_2.2H_2O$ ((M.Wt) = 244.2 g/ml) is dissolved in distilled water, The mass of $Ba_3(PO_4)_2$ (M.Wt = 602.2 g/ml) precipitate is 1.75 g. Calculate the % of $Na_3PO_4 \cdot 12H_2O$ in the mixture if the $BaCl_2$ is the limiting reactant.

1. 44.19 %
2. 35.09 %
3. 65.58 %
4. 57.42 %
5. 75.00 %

Sol → $3Ba^{+2} + 2PO_4^{-3} \rightarrow Ba_3(PO_4)_2$

(L.R)

$$1.75\ g\ Ba_3(PO_4)_2 \times \frac{1\ mol\ Ba_3(PO_4)_2}{602.2\ g\ Ba_3(PO_4)_2} \times \frac{3\ mol\ Ba^{+2}}{1\ mol\ Ba_3(PO_4)_2} \times \frac{244.2\ g\ Ba^{+2}}{1\ mol\ Ba^{+2}} = 2.128\ g\ Ba^{+2}$$

Mass $PO_4^{-3} = 3.28 - 2.128 = 1.15\ g$

$$\% Na_3PO_4.12H_2O = \frac{1.15}{3.28} \times 100\ \% = 35.09\%$$

Ans: 2

Q12) A mixture containing equal masses (x) of $Na_3PO_4 \cdot 12H_2O$ (M.wt = 380.2 g/mole) and $BaCl_2 \cdot 2H_2O$ (M.Wt = 244.2 g/mole) is dissolved in water, A ppt. of $Ba_3(PO_4)_2$ (M.Wt) = 602.2 g/mole) was produced with a mass 0.2 x of the starting materials. Then the Percentage yield of $Ba_3(PO_4)_2$ is :-

1) 37.9 % 2) 63.1 % 3) 88.3 % 4) 25.3 %

Sol → $3Ba^{+2} + 2PO_4^{-3} \rightarrow Ba_3(PO_4)_2$

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theorical yield}} \times 100\%$$

mass Ba^{+2} = mass PO_4^{-3} = x g

III Find the L.R

Ba^{+2} → $\frac{x\ g}{244.2\ g/mole} = \frac{x}{244.2}$ mole $/_3$ (coefficient) $= \frac{x}{732.6}$

PO_4^{-3} → $\frac{x\ g}{380.2\ g/mole} = \frac{x}{380.2}$ mole $/_2 = \frac{x}{760.4}$ /// smaller than

∴ PO_4^{-3} is L.R

$$\frac{x}{380.2} \text{ mole } PO_4^{-3} \times \frac{1 \text{ mole } Ba_3(PO_4)_2}{2 \text{ mole } PO_4^{-3}} \times \frac{602.2 \text{ g } Ba_3(PO_4)_2}{1 \text{ mol } Ba_3(PO_4)_2}$$

$= 0.791\ x$ g ≡ Theorical yield, Actual yield = 0.2 x g

$$\% \text{ yield} = \frac{0.2x}{0.791x} \times 100\% = 25.3\ \%$$ Ans: 4

Q13) In the Limiting reactant of salt mixture exp. to test for Limiting Ba^{+2} ion :- Ans: 1

1. Add few drops of Barium ion (0.5 M) to the supernatant and ppt. will appear
2. Heat the mixture solution in the water bath for 30 minutes.
3. Add few drops of phosphate ion (0.5 M) to the supernatant and ppt. will appear.
4. Add few drops of Barium ion (0.5 M) to the supernatant and ppt. will not appear.
5. none of the above.

Q14) The Sulfate ion can be detected by:-

1. Adding $BaCl_2$ Solution in acidic media and a white ppt. will appear.
2. Adding $BaCl_2$ Solution in basic media and a whit ppt. will appear.
3. Adding HCl Solution, a gas will change the wet red litmus to blue.
4. Adding NaOH Solution, a gas will change the wet blue Litmus to red
5. Adding NaOH Solution, ammonia smell can be detected.

Ans: 1

Q15) The Cl^- can be detected by:-

1. Sodium oxalate
2. Potasium thiocyanate
3. Silver nitrate + acid
4. Barium chloride + acid
5. Hydrochloric acid.

Ans: 3

Q16) When an unknown react with Sodium hydroxide (NaOH) Solution, it evolved a gas which convert the wet red litmus paper to blue. The resulted aqueous layer from the previous reaction was treated with hydrochloric acid solution and Carbon dioxide evolved immediately as a result of reaction, The unknown is:- (H_2CO_3)

1. $CaCl_2$ 2. $Ca(HCO_3)_2$ 3. NH_4Cl 4. NH_4HCO_3

Ans: 4

Q17) An unknown Salt give a gas that convert the Litmus Paper from red to blue when deteted with Sodium hydroxide and a Pale yellow precipitate when reacted with Silver nitrate in acidic media. The formula of the salt is:-

1. $CaBr_2$ 2. $Fe_2(SO_4)_3$ 3. NH_4HCO_3 4. $FeBr_3$ 5. NH_4Br

Ans: 5

Q18) The iron(III) ion can be detected by:- Ans: 2

1. Adding $BaCl_2$ Solution, in acidic media and a white ppt. will appear
2. Adding KSCN Solution, and a red color will appear
3. Adding HCl solution, a gas will change the wet red litmus Paper to blue
4. Adding NaOH solution, a gas will change the wet blue litmus paper to red
5. Adding KSCN solution, and a white color will appear.

Q19) which of the following pair of liquids are miscible?

1. Polar + Salt
2. non-Polar + non-Polar
3. a and b will be miscible
4. Non-polar + Polar
5. Non-polar + Salt.

Ans: 3

Q20) which of the following statement is correct?

1. The boiling point is the tempreture at which the vapor pressure of the liquid is higher than the atmospheric pressure
2. If the boiling point is recorded while the bubble escaping from the capillary tube (and the heat is removed), the recorded Boiling point will be too low
3. The boiling point of the substance increase as the intermolecular forces between molecules decrease.
4. If the boiling point is recorded after the liquid enters the capillary tube (after the heat is removed), the reorded boiling point will be too high.
5. As the tempreture increases the vapor pressure of the liquid increases.

Ans: 5

* Relations →

[1] Inter molecular forces ↑ vapor pressure ↓

[2] Tempreture ↑ vapor pressure ↑

[3] Boiling point ↑ vapor pressure ↓

And So on ---

Q21) If you need 10 ml pipette to weight 10 ml of three unknowns liquid substances A, B and C. you find that the weight of the 10 ml of each substance is the following A=9.2 g, B= 9.0g, C=8.9 g. The order of density decreasing of these liquids is:-

1. C>A>B 2. B>C>A 3. A>B>C 4. A>C>B

Ans: 3

Q22)

A students liquid unknown boils at approximately 79°C, is insoluble in water but soluble in cyclohexane and ethanol. The mass of 2ml of the unknown = 1.75 g, from the table below the unkown is:

Compound	Density g/ml	Boiling Point (C°)	Solubility S: Soluble, i: insoluble		
			H_2O	C_6H_{12}	C_2H_5OH
X	0.79	68	SIS	S	i
Y	0.90	60	S	S	S
Z	0.59	78	i	S	S
R	0.89	80	i	S	S
Q	0.89	79	i	S	i
P	0.79	59	S	S	S

1. X 2. Z 3. Q 4. R

Density = $\frac{m}{V} = \frac{1.75}{2} = 0.88$ g/ml Ans: 4

exp4

Q23) The following results were obtained for an unknown containing a cation and an anion.

Cation test	Sodium oxalate	Potassium thyocanate	Sodium hydroxide (with litmus paper test)
	-ve	+ve	-ve
Anion test	Barium chloride (in acidic medium)	Silver nitrate (in acidic medium)	Hydrochloric acid (immediate reaction)
	+ve	-ve	-ve

1. $FeCl_3$ 2. $(NH_4)_2SO_4$ 3. $Fe_2(SO_4)_3$ 4. NH_4Cl

Ans: 3