Experiment(1)

* Volumetric glass ware & Balances:-

- analytical glass ware <u>only</u>:-

1). Volumetric flask.
2). Volumetric Piptte.
3). Piptte
4). Burret

* Cylender is not analytical glass ware. - لا يعتبر من الأواني الزجاجية التحليلية.
- لا يجوز استخدامها لقياس حجم عينة داخل بالحسابات .
⇓
حساباته غير دقيقة .

* analytical Balance is the balance that measure(3) Points of right Coma 0.000

* ترتيب الأدوات حسب الدقة :-

Volumetric Piptte / Volumetric flask > Piptte > Burret > graduated cylinder > Beaker and erlenmenyer flask.

تقيس الأحجام الكبيرة قد تصل إلى 500mL بشكل تقريبي وغير دقيق .

* نسبة الخطأ بالأدوات المدرجة = $\frac{\text{أقل تدريج}}{2}$

ex):- Beaker

$\frac{50}{2} = 25\,mL.$

↳ معنى ذلك :- عند استخدام الـ Beaker للقياس قد تكون القراءة مزيود عليها (+25mL) أو منقوص منها (-25mL) مثلاً ⇐ (150mL ± 25mL)

* $V_{actual} = \frac{mass\,(g)}{density\,(mL)}$
الحجم

* إذا كانت الوحدة بالامتحان بهذا الشكل (g/mL)
↳ نحسب الحجم عن طريق هذا القانون ⇐ $(V = \frac{m}{d})$

* إذا كانت الوحدة بهذا الشكل (mL/g) معكوسة (انظر الجدول بالمانيوال ص2)
↳ نحسب الحجم عن طريق هذا القانون ⇐ $(V = m * d)$.

* Volume in 1g $\xrightarrow[\text{الوحدة}]{\text{يعني}}$ (mL/g).

* $\boxed{mL = cm^3}$

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*نسبة الخطأ بال Burrette ⟵ $\frac{0.1}{2} = 0.05$

errors

initial & final reading

خطأ ناتج من القراءة

*معناها: قراءة فردية (الناتج عملي) من الجهاز Burret

أول إشي: بنسأل حالك من وين أجت النتائج

عن طريق Burret (ناتج عملي)

عن طريق قانون

- غير مطلوب Actual volume
- ✓ Apparent volume
- ✓ Weight of water

خطأ ناتج من القانون

error الجهاز

Burret

$\frac{0.1}{2} = \boxed{0.05}$

الميزان Balance

(flask)

(تصفير القراءة وآخر منزلة بنحطها واحد (1)).

$\boxed{0.001}$

إذا كان أصل القانون :-

جمع أو طرح

error

$$\sqrt{(error)^2+(error)^2}$$

بنعوض القيمة $\boxed{0.05}$ إذا كان قانون Apparent volume

بنعوض القيمة $\boxed{0.001}$ إذا كان قانون weight of water.

ضرب أو قسمة

error

$$= Z\sqrt{\left(\frac{error}{\text{قيمة}}\right)^2+\left(\frac{error}{\text{قيمة}}\right)^2}$$

Z: قيمة actual volume غير مطلوب

*لما يكون تصفيرك للميزان $\boxed{0.00}$

→ error = 0.01g

ex):- 5.30 ± 0.01 g

*لما يكون تصفيرك للميزان $\boxed{0.000}$

→ error = 0.0001g

ex):- 5.3000 ± 0.0001g

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* قوانين التجربة :-

- APParent volume (ml) = final Burret reading – initial Burret reading
  ↳ Burret باستخدام ال
- weight of water (g) = final of flask – initial of flask
  ↳ Balance باستخدام ال
- Actual volume (ml) = weight of water * volume of 1 g of water (جدول ص2)
- Correction (ml) = | Actual volume – APParent volume |.

* الأسئلة من ٤ ⑥ ص7 وسؤال ② ص8 بالمانيوال مش مطلوبة.

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(١) 2) Order in increasing accuracy of volumetric measurement tools:

أدوات القياس الحجمية
رتبها حسب دقتها

a) burret, beaker, graduated cylinder, pipette

b) graduated cylinder, beaker, pipette, burret

c) beaker, graduated cylinder, pipette, burret

d) beaker, graduated cylinder, burret, pipette

أقل دقة ⟶ أعلى دقة

Answer: (D)

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(١)-

9) A 10 ml pipette was used to deliver 10 ml of four substances: A, B, C and D. If the mass of 10 ml of each substances was found to be: 8.9 g./9.2g/9.1g./9.0g respectively. Order the substances in order of density decreasing

A / B / C / d

رتّب هذه المواد حسب تناقص الكثافة

أعلى كثافة هو الأعلى وزنة

Answer: B, C, D, A

أعلى كثافة ⟶ أقل كثافة

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Experiment (2)

* Determination of sampling error.

* الهدف من التجربة حساب ال Standard divation لعينة نقية ولعينة غير نقية.

hetrogeneous sample → هنا العينة فيها :-

KHP + diluent

homogeneous sample. → هنا العينة تحتوي فقط KHP

* KHP: Potasium Hydrogen Phthalate.

* في هذه التجربة الكاشف (indicator) هو Ph.Ph .

عديم اللون بالوسط الحمضي.

Colurless in acidic media.

لونه زهري بالوسط القاعدي.

Pink in Basic media.

* end Point:- النقطة التي يتغير عندها اللون

Change color.

$\boxed{PH > 9.5}$

* لما يصير لون المحلول زهري فاتح بنوقف عند عمل التايتريشن.

* equivelant Point :- نقطة التعادل تكون عندما عدد مولات الحمض = عدد مولات القاعدة -

$\boxed{PH > 7}$

# of moles acids (KHP + Ph.Ph) = # of moles Base (NaoH)

انت بتوزنها ← Mass

0.2g باللاب KHP

$$\frac{Mass}{M.w} = M * V$$

204.2 ← M.w

M ← مطلوب ؟

V → باللتر (L) → من الـ Burret وهو الحجم اللي حدث عنده نقطة التعادل.

* حجم الماء ليس له دخل بالحسابات.

Part (a) homo:- (KHP فقط) S_a حساب   a:- analysis.

↳ standard divation analysis.

* الإنحراف المعياري الناتج من تحليل العينة وليس من نفس العينة لأنها (Pure KHP)

* هنا الخطأ سيكون ناتج من التحليل.

Part (b) Non-homo:- (KHP + diluent) S_o حساب   o:- overall.

↳ standard divation overall.

* الإنحراف المعياري الناتج من → خطأ بالتحليل.
→ خطأ في تحضير العينة.

أول مطلوب بالجدول الثاني ↳ Mass of sample (KHP + diluent)(g):- نقسم وزنه KHP على ②

→ لأنه الـ KHP مخلوط معه سكر بنسبة (50% 50%) (1:1) فأنا بحتاج وزنه KHP لوحده نقسم على ②.

* القوانين :-

$$S_s = \sqrt{S_o^2 - S_a^2}$$

* دائماً قيمة S_o (KHP + سكر) أكبر من قيمة S_a (KHP فقط) لأنها تحتوي سكر.

$$S = \sqrt{\frac{\sum_{n=1}^{i} (x_i - \bar{x})^2}{N-1}}$$

→ نستطيع حساب S إمّا يدوي أو عن طريق الآلة الحاسبة مباشرة.

x_i : Molarity of NaoH (mol/L).

$\bar{X}$: Average molarity of NaoH (mol/L).

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* حساب قيمة S عن طريق الآلة الحاسبة مباشرة (حاسبة عادية مش العلمية).

mode ← ندخل البيانات (الأعداد) وبعد إدخال أول عدد نكبس بعده (M+) ثم العدد الثاني ونكبس بعده (M+) لحد إدخال آخر عدد ونكبس بعده (M+) ← عند آخر كبسة يظهر n = (عدد القيم المدخلة) ← نكبس shift ← نكبس 2 ← نكبس 3 ← نكبس مرتين = ويظهر الناتج.

* حذف القراءات السابقة (إرجاع الحاسبة لوضعها الطبيعي)

shift ← mode ← 3 ← نكبس مرتين = .

②

1) A student found the standard deviation for molarities of a homogenous sample to be 0.04, and the standard deviation for molarities of heterogeneous sample to be 0.09 Find the standard deviation of sampling.

S_a homo

S_o hetro

$$S_s = \sqrt{S_o^2 - S_a^2}$$

$$= \sqrt{(0.09)^2 - (0.04)^2} = 0.081$$

Answer: 0.081

Q-8) A student [illegible] has calculated the standard deviation for molarities of a homogenous sample to be 0.04, and the standard deviation for molarities of heterogenous sample to be 0.06. Find the standard deviation of sampling.

Sa homo

So hetero

$\boxed{0.045}$ ✓

$$S_s = \sqrt{S_o^2 - S_a^2}$$

② بحث.

mid

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Q.8]

✓

$S_a = 0.04$

$S_T = 0.06$

$$S_s = \sqrt{S_T^2 - S_a^2}$$

$$= \sqrt{0.06^2 - 0.04^2} = 0.0447$$

$$\boxed{\sim 0.045}$$

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EXP 3 & 4

*gravimetric analysis

* الهدف من التجربة حساب كتلة (mass) الأنيون (unknown) (Cl^-) بإستخدام الراسب ($AgCl$).

Cl^- + $Ag^{+} \longrightarrow AgCl$

unknown (analyte) — الراسب (ppt).

$$\underset{\text{عامل مترسب لترسيب } Cl^-}{Cl^-_{(aq)} + AgNO_{3\,(aq)}} \longrightarrow AgCl_{(s)}$$

القانون Mass of $\overset{\text{الأنيون}}{Cl}$ in the volume used (g) = mass of $\overset{\text{الراسب}}{AgCl}$ * $\dfrac{M.W\ Cl}{M.W\ AgCl}$

35.5 g/mol

143.3 g/mol

الوحدة → unit: $\overset{mass}{(g)}$ in 1L → $\dfrac{mass\,g}{10 * 10^{-3}\,L}$

(g/L)

$(mL \xrightarrow{*10^{-3}} L)$

OR $\overset{mass}{(mg)}$ in 1L → $\dfrac{mass * 10^{3}\,mg}{10 * 10^{-3}\,L}$

(mg/L)

نفسها → (ppm).

$(g \xrightarrow{*10^{3}} mg)$

$(mL \xrightarrow{*10^{-3}} L)$

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* the Processes of gravimetric analysis

هضم

①- Preparation of anlyte solution. ② Precipitation. ③ digestion.
④- filtration. ⑤- washing. ⑥- drying. ⑦ weighing.

(1) تحضير ← (2) ترسيب ← (3) هضم ← (4) فلترة ← (5) غسل ← (6) تجفيف ← (7) توزين.

- digestion: Δ for one hour.
- filtration: collection of ppt using gooch crucibles.
- washing: the ppt. (AgCl) wasched with HNO_3 in order to (Prevent Piptization).

* Desired Properties of Product :- ① Law solubility. قليل الذائبية
② - easy to filter & wash. (سهل الفلترة الغسيل) ③ - Large Particles. جزيئات كبيرة. ④ unreactive. غير متفاعل
⑤ Known composition. تركيب معروف

* Properties of Collored ppt :- ① - hard to settled & filtered. (صعب التسوية الفلترة.)
② impure (غير نقي): Because adsorption of contamination (Co Precipitation)

(digestion Δ) ← تجميع
* Coagulation of Collorde ppt :- ①. heating. تسخين
② stirring تحريك ③ adding electrolyte solution.
nitric acid.

* $\boxed{HNO_3}$ employed for washing ppt :- ① it is Prevent Piptization. تفكيك
②- readrly volatiLe. تتطاير بسرعة لكي لا يؤثر على وزنة ppt.
عكسه Coagulation.
(1)+(2) جواب سؤال $\boxed{3}$ بالمانيوال ص23.

* AgCl is Light sensitive :-

$AgCl \xrightarrow{h\nu} 2Ag + Cl_2$. (Ag, remain (يبقى) Collordly dispersed in the AgCl and imparts a purple color).

$Cl_2 + 5Ag^+ + 3H_2O \rightleftharpoons 5AgCl + ClO_3^- + 6H^+$

المانيوال
Q2 ص23 what is digestion of a ppt? why is it necessary?
It's necessary to Coagulation & increase Particle size.
$\boxed{6}$ ♡ heat for Long time to

Q1 المانيوال
ص 23

ماذا يحدث ل Cl بالحالات من a–g

a) Insufficient amount of $AgNO_3$ added. dec ↓

غير كافية · كمية · عامل مرسب · ل · إضافة.

اذا قلّ نيابة Cl يقل.

b). Incomplete transfer of the precipitate. dec ↓

نقل بشكل غير كامل · الراسب

c). Coprecipitation. المحلول تكتّل كوتّس (اكبر حجم الجزيئات) inc ↑

d). Washing too little. غسيل الشوائب جيداً. inc ↑

e). Washing too much. غسيل كثير وجيد (راسب يذوب ↓ (↓ Cl) dec ↓

f). Incomplete drying of precipitate. inc ↑

لم نجفف الراسب منيح (وزنه الراسب عالي ↑ (↑ Cl

g). Photodecomposition of silver chloride. inc ↑

(حفظ) الضوء يزيد الوزنه.

3

8) An excess of $AgNO_3$ was added to a 0.24 g sample of 70.6% $CaCl_2$ (111 g/mol). What is the mass of AgCl precipitated? (M.wt AgCl=143.5 g/mol, M.wt =35.5 g/mol)

Agcl

cl

Answer: 0.44 g

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No.

* $AgNO_3$ excess (8 حل سؤال)

* mass sample = 0.24 g * 70.6% ($CaCl_2$) mm = 111

* find mass AgCl ppt??

$$\frac{\text{mass } CaCl_2}{\text{mass sample}} * 100\% = 70.6\%$$

$$\frac{0.24}{100} * \left(\frac{\text{mass } CaCl_2}{0.24} * 100\right) = (70.6) * \frac{0.24}{100}$$

$$\boxed{\text{mass } CaCl_2 = 0.16944}$$

$$\# \, CaCl_2 = \frac{\text{mass}}{mm} = \frac{0.16944}{111} = \boxed{1.526 * 10^{-3}}$$

$$\underline{\underline{1}} CaCl_2 + 2AgNO_3 \longrightarrow \underline{\underline{2}} AgCl$$

1 mole ⟶ 2 mole

~~#~~ ⟶ # = ?.?

$\# = 1.52 * 10^{-3}$

$$\boxed{\# \text{ of moles } AgCl = 3.053 * 10^{-3}}$$

$$\# \, AgCl = \frac{\text{mass}}{mm} \Rightarrow \text{mass} = \# * mm = 3.053 * 10^{-3} * 143.5$$

$$\boxed{\text{mass } AgCl = 0.44 \text{ g}}$$

Q $\boxed{8}$ ترياق

$\boxed{\text{Exp 3}}$

* Excess of $AgNO_3$
* Sample → 0.24 g 70.6% $Cacl_2$ (111 g/mol)
* Find mass of Agcl precipitate?

السؤال بدو كتلة ال ppt (الذي ترسب (Agcl)

$$\boxed{1} Cacl_2 + 2AgNO_3 \rightarrow \boxed{2} Agcl$$

① نكتب المعادلة
② نوزنها
③ نكتب العلاقة بين المولات

$$\boxed{\frac{Cacl_2}{1} = \frac{Agcl}{2}}$$

$$\boxed{\text{Mass Agcl} = \text{Moles Agcl} * MM = \text{Moles} * 143.5}$$

$$\#Agcl = \frac{mass}{MM}$$

$$\boxed{mass = \# * 143.5}$$

مولات ال Agcl بنطلعها من مولات ال $Cacl_2$ ، لذلك الهدف ايجاد مولات ال $Cacl_2$ ، معي MM الها ، بس نحتاج Mass من وين ؟ من ال sample

$$\frac{\text{Mass } Cacl_2}{\text{Mass sample}} * 100\% = 70.6\%$$

$$\frac{\text{Mass } cacl_2}{0.24} * 100 = 70.6$$

So Mass $Cacl_2$ = $\boxed{0.16944}$

$$\text{Moles } Cacl_2 = \frac{0.16944}{111} = 1.526 * 10^{-3}$$

من علاقة المولات

$$\frac{Cacl_2}{1} = \frac{Agcl}{2} \text{ moles}$$

$$\text{moles Agcl} = 2 * Cacl_2 = 2 * 1.526 * 10^{-3} = 3.053 * 10^{-3}$$

So Mass Agcl = $3.053 * 10^{-3} * 143.5$

$$\boxed{= 0.44}$$

(الفكرة في حساب ال Mass ال $Cacl_2$ من النسبة تبعت ال sample)

Good Luck <3

③ [illegible]

mid

Q.4) What is the mass of AgCl (143.5 g/mol) precipitated when excess $AgNO_3$ was added to a 0.24g sample that contains 50.6% $CaCl_2$ (111 g/mol) ?

[Cl = 35.5 g/mol]

①

$\boxed{0.31\text{ g}}$ ✓

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Q.4] ✓

0.24 g sample

contains 50.6 % $CaCl_2$ (111 g/mol)

~~then~~ Vs

cl (35.5 g/mol)

excess $AgNO_3$

$$\downarrow$$

mass ?   AgCl (143.5 g/mol)

mass $CaCl_2$ = $\frac{50.6}{100} * 0.24$ = 0.12144 g

mol $CaCl_2$ = $\frac{0.12144}{111}$ = 1.094 mol

$$CaCl_2 + 2AgNO_3 \longrightarrow 2AgCl + Ca(NO_3)_2$$

mol AgCl = 2 mol $CaCl_2$

mol = $\frac{mass}{Mwt}$

= $\boxed{2 * 1.094}$

mass ~~$CaCl_2$~~ AgCl = $2 * 1.094$ * 143.5

= 313.9 mg

$\boxed{0.31g}$

EXP (4)

$Ni^{2+}_{(aq)} + 2HDMG \rightleftharpoons Ni(DMG)_{2(s)} + 2H^+$

unknown — عامل مرسب excess — الراسب

نفس قانون تجربة 3

→ Dmg HCl لكي نضمن تذويبه بالكامل نضيف معه

*HDMG: dimethylglyoxime.

*الراسب $Ni(DMG)_2$:- ① bulky ppt. (ضخم) ② tends to creep up (ارتفاع) wavs of the Beaker contaning it ③ has a bright strawberry color. اللون زهري لامع.

*إجابات الأسئلة ص 27

Q1). ① HDMG is specific for Ni^{2+} in weakly Basic solution.
② = = = = Pd^{2+} in acid medium. وسط حمضي.

Q2). Because $Ni(DMG)_2$ is bulky ppt when first precipitate.

Q3). to get red excess HDMG using rabber Policeman to remove any solid Particles hering to the Beaker.

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4

3) In a gravimetric determination of nickel, a 10 ml was taken from an unknown sample contains Ni^{+2} (58.7 g/mol). the mass of the empty crucible was 30.107 g, and the mass of the crucible with the $Ni(DMG)_2$ (288.7 g/mol) was 30.3 g. Find the concentration of Ni^{+2} in mg/L? → PPm

V mL

mm

Answer: $3.9*10^{+3}$ mg/L

mass الرا $Ni(DMG)_2 = 30.3 - 30.107 = \boxed{0.193\ g}$

$$\text{mass}\ (Ni^{+2}) = \text{mass}\ Ni(DMG)_2 * \frac{mm\ Ni^{+2}}{mm\ Ni(DMG)_2}$$

$$= 0.193 * \frac{58.7}{288.7} \simeq \boxed{0.04\ g} \xrightarrow{g/L} \frac{0.04}{10\times10^{-3}} = \boxed{4\ g/L} \xrightarrow{mg/L} \boxed{4\times10^{3}\ mg/L}$$

③ Ni^{+2} $ppm = \text{Mass ppt} * \frac{58.7}{288.7}$

$= 0.193 * \frac{58.7}{288.7} = 0.03924\ \underline{\underline{g}}$

~~$\frac{3.9}{10 * 10^{-3}}$~~ $\frac{0.03924}{10 * 10^{-3}} = 3.924\ g/L$

$3.924 * \underline{\underline{10^{3}}} = 3924.2\ mg/L$

مهم

$1g = \underline{\underline{1000 mg}}$

$1L = 1000 mL$

$50 mL = 10^{-3} L$

كرباتي مقربيت 3.924 ل 3.9 g/L

So $3.9 * 10^3 = 3900\ mg/L$

(مهم التقريب 6 بلكي كان هيك خيار الامتحان)

(4) 4) A $\overset{m}{\underline{10\text{ g}}}$ sample of soil contain $MgCl_2$ $\underline{(\overset{mm}{95.3}\text{ g/mol})}$ was dissolved in 500 ml distilled water. A 25 ml aliquote was taken and titrated with $AgNO_3$,which produces 0.0411 g silver chloride (143.5 g/mol). Find the concentration of $MgCl_2$ in the soil sample.

Answer: 2.7%

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mass sample = 10 g / 500 mL water   حل سؤال (4)

$MgCl_2$ $MM = 95.3\ g/mol$ / 25 mL

$AgNO_3 \rightarrow ppb \rightarrow \boxed{AgCl} \xrightarrow{mass} = 0.0411\ g$ $MM = 143.5\ g/mol$

تركيز

find [ ] $MgCl_2$ in sample ??

$$[\ ]\,MgCl_2 \text{ in sample} = \frac{[MgCl_2]\ g/L}{[sample]\ g/L} \times 100\%$$

$$\rightarrow \frac{g}{L} = \frac{10\ g}{500\ mL \times 10^{-3}\ L} = \boxed{20}$$

$$[MgCl_2] = \frac{g}{L}$$

$$= \frac{(g)\ \text{مجهول}}{25\ mL \times 10^{-3}\ L}$$

$$1\,MgCl_2 + 2\,AgNO_3 \rightarrow 2\,AgCl$$

1 mole ⟶ 2 mole

$$\# = \frac{mass}{mm} = \frac{0.0411}{143.5} = \boxed{2.86 \times 10^{-4}}$$

#?? ⟶ $\boxed{2.86}$

$$\frac{2\#}{2} = \frac{2.86 \times 10^{-4}}{2}$$

$$\boxed{\#\ of\ MgCl_2 = 1.4 \times 10^{-4}}$$

$$\# = \frac{mass}{mm}$$

$$1.4 \times 10^{-4} = \frac{mass}{95.3}$$

mass $MgCl_2$ = $\boxed{0.013\ g}$

$$[MgCl_2] = \frac{g}{L} = \frac{0.013}{25 \times 10^{-3}}$$

$$= \boxed{5.2 \times 10^{-7}}$$

$$[MgCl \text{ insample}] = \frac{5.2 \times 10^{-7}}{20} \times 100\% = \boxed{2.7\%}$$

(٢) تمارين

حل ٧

water

Sample $\boxed{10\ g}$ / $\boxed{500\ mL}$

$MgCl_2$ $\boxed{95.3\ g/mol}$ / $\boxed{25\ mL}$
mm

$AgNO_3 \rightarrow$ ppt $\rightarrow$ $\boxed{0.0411\ g}$ / $\boxed{143.5\ g/mol}$
produce $\boxed{AgCl}$ AgCl

Find the conc. of $MgCl_2$ in the sample .

$$\left(\text{Conc. of } MgCl_2 \text{ in sample} = \frac{\text{Cons. of } MgCl_2 \ g/L}{\text{Cons. of sample } g/L} * 100\% \right)$$

✓ Conc. of $MgCl_2$

$$\boxed{\text{Concentarton means}} = \frac{g}{L} = \frac{g}{25*10^{-3}}$$

المجهول هو $\boxed{g}$

✓ من خلال العلاقة (توزنة)

$$\boxed{1} MgCl_2 + 2AgNO_3 \rightarrow \boxed{2} AgCl$$

$$\frac{MgCl_2}{1\ mol} \longrightarrow \frac{AgCl}{2\ mol}$$

(العلاقة بين المولات مهمة لايجاد ال $\boxed{g}$)

✓ Conc. of sample

$$\boxed{Conc = \frac{g}{L}}$$

$$M = \frac{10g}{500*10^{-3}} = \boxed{20}$$

Mass of AgCl = 0.0411 (معطى) ✓

moles of AgCl $= \frac{0.0411}{143.5} = 2.86*10^{-4}$ ✓

~~moles of~~

$$\frac{MgCl_2}{1 mol} = \frac{AgCl}{2mol}$$

moles $MgCl_2$ $= \frac{\text{moles AgCl}}{2} = 1.43*10^{-4}$ ✓

Mass $MgCl_2$ = Mols * MM = 0.01365 g ✓

$$\frac{\frac{0.01365}{25*10^{-3}}}{20} * 100\% = 2.7\%$$

٤

7) A 1.8636 g sample contain Ni^{+2} (58.7 g/mol) was dissolved in 250 ml distilled water. A 50 ml aliquot was precipitated into $Ni(DMG)_2$ (288.7 g/mol). The mass of the precipitated was 0.4016 g. Find the concentration of Ni^{+2} in the sample (%).

نفس فكرة سؤال (٤) [illegible]

a)22%

b)44%

c)74%

answer: A

معطى * ⑦ Mass of sample = 1.8636 g / 250 mL ⑦

النسبة
1:1
لذلك الحل
سهل و غير معقد

Ni^{+2} Mw = 58.7 g/mol / 50 mL

Vol of D.W = 250 mL

50 mL ترسيب اي $\rightarrow$ $Ni(DMG)_2$ M.wt = 288.7 $\rightarrow$ mass = 0.4016 g

Mass of ppt = 0.4016 g

Find the conc of Ni^{+2} in sample %

Answer: Exp 3/4

$$\text{Mass of } Ni^{+2} = \text{Mass of ppt} * \frac{\text{Mm of } Ni^{+2}}{\text{Mm of ppt}}$$

$$= 0.4016\ g * \frac{58.7\ \frac{g}{mol}}{288.7\ \frac{g}{mol}}$$

$$\text{mass } Ni^{+2} = \boxed{0.082\ g}$$

$$\text{Conc of } Ni^{+2} = \frac{0.082\ g}{50 * 10^{-3}} = \boxed{1.64}\ \boxed{g/L}$$

عكس السؤال يريد Conc في ال Sample

$$\text{Conc in sample} = \frac{\text{Conc of } Ni^{+2}\ \frac{g}{L}}{\text{Conc of sample}\ \frac{g}{L}} \cdot 100\%$$

$$\frac{1.64}{7.45\times10^{-6}} \times 100\%$$

$$= \frac{1.64}{\frac{\text{Mass}}{\text{MW}} \frac{g}{L} = \frac{1.8636}{250\times10^{-3}} = \boxed{7.45\times10^{-6}}} * 100\% = ? = \boxed{22}\ \%$$

$M = \frac{g}{L}$ أو مول

الفكرة هي حساب ال conc لل sample

$$M = \frac{g}{L} = \frac{\frac{\frac{\text{moles}}{\cancel{\text{Mol}}}}{L}\ Ni^{+2}}{\frac{\frac{\text{moles}}{\text{Mm}}}{L}\ \text{sample}}$$

EXP (5)

* Neutralisation titration in aqueous medium.

BCG → وسط حمضي

Ph.Ph → وسط قاعدي

* أنواع المحاليل :-

① - 1° standard : KHP / Na_2CO_3 / $K_2Cr_2O_7$ (تجربة 7)

② - 2° standard : NaOH / HCl / Na_2SO_3 / $S_2O_3^-$ / KSCN ⑥ / Ag^+ ($AgNO_3$) ⑥ / I^2 ⑧

EDTA تجربة ⑨

Ⓐ - عايرت NaOH باستخدام مادة أولية (1°) وهي KHP

$(KHP = KHC_8H_4O_4)$

(KHP)

Ph.Ph — BCG

$$1KHP + 1NaOH \xrightarrow[\boxed{1:1}]{\boxed{Ph.Ph}} NaKP + H_2O$$

# of mole KHP = # of mole NaOH

$$(M*V)_{KHP} = (M*V)_{NaOH}$$

Ⓐ - عايرت HCl باستخدام مادة أولية (1°) وهي Na_2CO_3

(Na_2CO_3)

* end Point : (# of moles HCl = # of mole Na_2CO_3)

$$1HCl + 1Na_2CO_3 \xrightarrow[\boxed{1:1}]{\boxed{Ph.Ph}} NaHCO_3 + NaCl$$

→ use Ph.Ph $(\underset{?}{M}*\underset{\text{Burret}}{V})_{HCl} = (\overset{✓}{M}*\underset{\text{10mL}}{V})_{Na_2CO_3}$

$$2HCl + 1Na_2CO_3 \xrightarrow[\boxed{2:1}]{\boxed{BCG}} \overset{\to CO_2 + H_2O}{H_2CO_3} + 2NaCl$$

use BCG $\left(\frac{\text{\# of mole HCl}}{2} = \text{\# of mole } Na_2CO_3\right)$

BCG : blue (Base)

yellow (acid)

PH = (3.8 – 5.4)

Ⓑ (HCl / NaOH) الهدف أنه أعاير NaOH وأفاعله مع مادة أخرى لكي أحسب تركيزه.

$$1HCl + 1NaOH \xrightarrow[\boxed{BCG}]{\boxed{Ph.Ph}} NaCl + H_2O$$

هنا النسبة (1:1) عادي لو استخدمت أي كاشف منهما.

$\boxed{1:1}$ → PH = (8.3 – 10)

* end Point : (# of mole HCl = # of mole NaOH)

→ $(\overset{\text{من Ⓐ}}{M}*\overset{\to \text{Burret}}{V})_{HCl} = (\overset{?}{M}*\overset{\to \text{10mL}}{V})_{NaOH}$

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Ⓒ- Determination of H_3PO_4 Concentration.

$\boxed{1}$ - Using BCG:-

$1H_3PO_4 + 1NaOH \xrightarrow[\boxed{1:1}]{\boxed{BCG}} H_2PO_4^- + \cdots\cdots$ PH = (2-4) BCG

*end Point: $(\underset{?}{M} * \underset{10mL}{V}) = (\underset{Ⓑ \text{من}}{M} * \underset{Burret}{V})$

$\boxed{2}$ - Using (Ph.Ph):-

$1H_3PO_4 + 2NaOH \xrightarrow[\boxed{1:2}]{\boxed{Ph.Ph}} HPO_4^{2-} + \cdots\cdots$ PH = (9-11) Ph.Ph

*end Point: $(M * V) = \left(\frac{M * V}{2}\right)$

---

*Neutralization titration in aqueos medium:-

*HCl & NaOH are not Standard solution.

$H_3PO_4 + \textcircled{2}NaOH \xrightarrow{Ph.Ph} Na_{\textcircled{2}}HPO_4 + \textcircled{2}H_2O$

$H_3PO_4 + NaOH \xrightarrow{BCG} NaH_{\textcircled{2}}PO_4 + H_2O$

$M = \frac{n}{V}$ * تذكر

		PH
$H_3PO_4 \longrightarrow \overset{\text{نزع}}{H^+}$	$+ H_2PO_4^-$	4.6
$H_2PO_4^- \longrightarrow H^+$	$+ HPO_4^{2-}$	9.7
$HPO_4^{2-} \longrightarrow H^+$	$+ PO_4^{3-}$	12.6

	Base	acid
Ph.Ph	Pink	Colorless
BCG	blue	yellow

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⑤

H_3PO_4

5) 10 ml of phosphoric acid (98 g/mol) needed 32 ml of 0.1 M NaOH to reach bromo cresol green end point. Find the concentration of H_3PO_4 (g/L) BCG

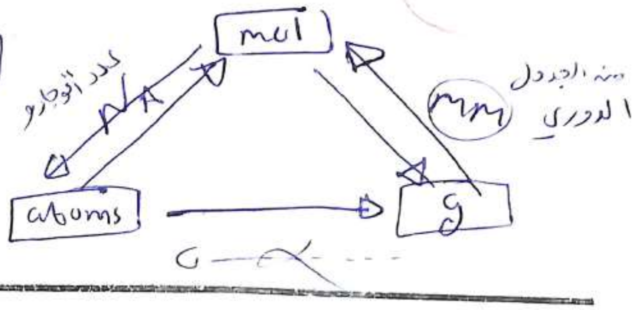
اصفر

Answer : 31.36 g/L

$V_{H_3PO_4} = 10\ ml$ $mm = 98\ g/mol$ / $M_{H_3PO_4}$?? g/L

$V_{NaOH} = 32\ ml$

$M_{NaOH} = 0.1\ M$



كرياني ⑥

H_3PO_4 10mL 98 g/mol

NaOH 0.1 M 32mL

Find the concentration of H_3PO_4 (g/L)

32 مش بالمانيوال بحتويات

($\frac{g}{L}$ يعني g concentration
$\frac{mol}{L}$ يعني Molar concentration) مهم جداً التمييز بين

Answer : from $\boxed{Exp. 5}$ هذا السؤال

$$(MV)_{H_3PO_4} = (MV)_{NaOH}$$

$$M * 10\,\cancel{mL} = 0.1 * 32\,\cancel{mL} \quad ①$$

$$(M = 0.32\ M) \quad \text{means} \quad \boxed{0.32\ \frac{mol}{L}} \xrightarrow{\text{تحويل}} \frac{g}{L}$$

هو المطلوب

$$0.32\ \frac{mol}{L} \xrightarrow[\text{إزاي}]{\text{نحولها}} \frac{g}{L}$$

~~0.32 mol/L~~

* هذا التحويل من مادة التحليلية *

$$0.32\ mol \longrightarrow g$$

~~MM H3PO4 = 3×1~~

سهل جداً) تضرب ب Mm لأن (

$$M.m = \frac{g}{mol}$$

$$98 = \frac{g}{0.32}$$

② الوحدة

$$mm = \frac{g}{mol}$$

$$98 = \frac{g}{0.32\,mol}$$

$$\boxed{\text{So}\quad \frac{g}{L} = 31.36}$$

④ $M_{H_3PO_4} = 31.36\ \frac{g}{L}$

③ $MM\ H_3PO_4 = 3 \times 1.008 + 1 \times 30.97 + 4 \times 16.00 = \boxed{98}$

mole KHP = mole NaOH = $\boxed{0.003}$

$n = \frac{mass}{mm} \rightarrow 0.003 = \frac{mass}{204.2} = \boxed{0.6126}$

mm

mass??

5

6) A sample of KHP (204.2 g/mol) was titrated with 0.003 mol NaOH. How many grams of KHP is in this sample?

Answer: 0.6126 g

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⑤ 10) An 15 ml aliquot of Na_2CO_3 (106 g/mol) was taken from 100 ml sample then titrated with 6.5 ml of 0.12 M HCL to reach BCG endpoint. What is the mass of Na_2CO_3 in that sample?

g??

Answer: 0.3 g

$V_{Na_2Co_3} = 15ml$ $mm = 106$ $\xrightarrow{taken}$ 100ml sample

$V_{Hcl} = 6.5ml$ $M_{Hcl} = 0.12m\ (\frac{mol}{L})$

$\underline{2}Hcl + \underline{1}Na_2Co_3 \xrightarrow{BCG}$ [illegible] H_2Co_3 + Nacl

10) تريكات 10

sample → $\boxed{100\ mL}$

Na_2CO_3 → $\boxed{15\ mL}$ / $\boxed{106\ g/mol}$

Hcl → $\boxed{6.5\ mL}$ / $\boxed{0.12\ M}$ $\boxed{\text{In BCG}}$

Find Mass of Na_2CO_3 in that sample ?

Answer

$$\boxed{1}Na_2CO_3 + \boxed{2}Hcl \xrightarrow{BCG} H_2CO_3$$

① نكتب المعادلة

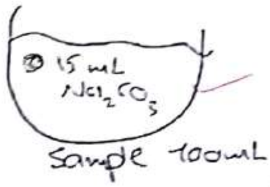
(وزن المعادلة)

$$\frac{\text{moles Hcl}}{2} = \text{Moles } Na_2CO_3$$

$$\left(\frac{MV}{2}\right)_{Hcl} = (MV)_{Na_2CO_3}$$

$$\frac{0.12 * 6.5\cancel{mL}}{2} = M * 15\ \cancel{mL}$$

$$(M_{Na_2CO_3 \text{ in } 15\ mL} = 0.026)$$



السؤال طلب كتلة ال Na_2CO_3 في العينة

$\# = \frac{mass}{mm} \rightarrow mass = \# \times mm$

$$\text{Mass } Na_2CO_3 \boxed{\text{in sample}} = \text{Moles } Na_2CO_3 \boxed{\text{in sample}} * M_{m\ Na_2CO_3}$$

Mass = Moles * M.m

كيف نوجد مولات ال Na_2CO_3 في العينة ؟

من تركيز ال Na_2CO_3

$m = \frac{n}{V(L)} \rightarrow 0.026 = \frac{n}{100 \times 10^{-3}}$

$\boxed{n = 2.6 \times 10^{-3}}$

$$M = \frac{\text{Moles}}{V}$$

(لا تنس التحويل)

$$\text{Moles} = MV = 0.026 * \underbrace{100 * 10^{-3}}$$ → عوضنا V = 100 لأننا نحتاج المولات في ال sample

$$\text{Mass in sample} = \underbrace{2.6 * 10^{-3}}_{\text{مولات ال } Na_2CO_3 \text{ في ال sample}} * \underset{Mm}{\underline{106}} = 0.27 \simeq 0.3$$

Q.6) A 15 ml aliqout ~~of 100 ml~~ was taken from 100 ml

(5) عَ.جْ. µ4d 100 ml sample solution of Na_2CO_3 (106 g/mol), and titrated

with 0.12 M HCl. it required 9.5 ml to reach

β GG 2:1

the bromocresol green end point.

what is the mass of Na_2CO_3 in ~~the~~ this 100 ml solution

المطلوب Mass

مش (M) ، المطلوب التركيز

$\boxed{0.4028}$ ✓

سؤال عن ال cases

⑤ which is correct

In titrations involving $AgNO_3$, it shouldnt be in alkaline medium / why?

① to prevent production of Ag_2O

2- to inhance ________ of NO_2^-

3- to avoid foramation of $Fe(OH)_3$

4- to gain a distinct indicator color

(Q.6) 15 ml Na_2CO_3 (106 g/mol) of 100 ml solution

VS 0.12 M , 9.5 ml HCl BCG

خضران

$$Na_2CO_3 + 2HCl \longrightarrow H_2CO_3 + 2NaCl$$

2H

$$mol\ Na_2CO_3 = \frac{1}{2}\ mol\ HCl$$

$$= \frac{1}{2} * 0.12 * 9.5 * 10^{-3}$$

$$= 5.7 * 10^{-4}\ mol$$

$$M = \frac{mol}{volume}$$

$$= \frac{5.7 * 10^{-4}}{15 * 10^{-3}} = 0.038\ M$$

BCG ~~5~~ 3

Ph. ph. 8

$$mol = M * V$$

$$= 0.038 * 100 * 10^{-3} = 3.8 * 10^{-3}\ mol$$

$$mass = mol * M.Wt$$

$$= 3.8 * 10^{-3} * 106$$

$$= 0.4028$$

EXP (6)

* Precipitaion titrations (Argentimetry).

القوانين :- $\boxed{A}$- St. of $AgNO_3$ by Mohr's method:-

Ⓐ- $(\overset{\checkmark}{M} * \overset{10mL}{V})_{AgNO_3} = (\overset{?}{M} * \overset{\text{Burret}}{V})_{NaCl}$

ملاحظة $\boxed{HCO_3^-}$ → Nutral soln, the color of the soln (the end point is (reddish brown)).
(chromate) الكاشف

$\boxed{B}$- St. of $AgNO_3$ by Fajan's method:-

ملاحظة $\boxed{F^-}$ الكاشف → the color becomes (Pink).

$\boxed{C}$- St. of ~~Ag~~ KSCN by Volhard's method:-

Ⓒ- $(\overset{\text{Ⓑ or Ⓐ}}{M} * \overset{10mL}{V})_{AgNO_3} = (\overset{?}{M} * \overset{\text{Burret}}{V})_{KSCN}$ (Ⓑ or Ⓐ من)

ملاحظة $\boxed{Fe^{3+}}$ الكاشف → Ferric ion, the color becomes (reddish brown).
→ كاشف يعمل كوسط حمضي .

$\boxed{D}$- Det. of amixture of holides (NaCl + KCl):-

our unknown is (NaCl+KCl) mixture, in the 10.00mL unknown sample you have 0.065 g from (NaCl+KCl).

افترض
Suppose :- mass of NaCl = $\boxed{X}$ mass of KCl = $\boxed{y}$.

then: in your sample (10 mL) ⟹ $\boxed{X + y = 0.065\ g}$

① using Mohr's method:-

$X + y = 0.065\ g$ in 10.00mL sample.

*end point ⟹ (moles (NaCl+KCl) = moles $AgNO_3$).

$$\frac{\text{mass NaCl}}{\text{M.W NaCl}} + \frac{\text{mass KCl}}{\text{M.W KCl}} = (M * \overset{\text{Ⓛ}}{V})_{AgNO_3}.$$

(Ⓛ باللتر)

$$\frac{X}{58.5} + \frac{y}{74.5} = (\underset{\text{Ⓑ or Ⓐ}}{M} * \underset{\text{Burret}}{\overset{\text{Ⓛ}}{V}})_{AgNO_3}$$

(Ⓑ or Ⓐ من)

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② **Using Volhard's method** :- (Back Titration).

$x + y = 0.065\ g$ — ①

* end Point ⇒ (total moles of $AgNO_3$ = moles $(NaCl + KCl)$ + moles $KSCN$) — ②

$$\text{moles}(NaCl + KCl) = \text{moles } AgNO_3 - \text{moles } KSCN$$

$$\left(\frac{x}{58.5} + \frac{y}{74.5}\right) = \Big(\underset{\underset{\text{Ⓑ or Ⓐ}}{\downarrow}}{M} \times \overset{\text{Ⓛ}}{\underset{\underset{15\,mL}{\downarrow}}{V}}\Big)_{AgNO_3} - \Big(\underset{\underset{\text{Ⓒ}}{\downarrow}}{M} \times \overset{\text{Ⓛ}}{\underset{\underset{\text{Burret}}{\downarrow}}{V}}\Big)_{KSCN}$$

Preciptation titration (Argentimetry) : Exp 6

*Argentimetry : silver nitrate is used as titrant in this method. and used for determine different anions. such as (halides, cyan

* The general method of argentimetry :

① **Mohr's method** : the determination of halid ion in the titration of neutral or very alkaline solution [6.5 - 9] of halid with silver nitrate solution.

— Potassium (KCO_3) chromate solution is added as indicator.

— $Ag^+ + Cl^- \longrightarrow AgCl_{(s)} \downarrow$ white ppt "

— but at the end point :

$2Ag^+ + CrO_4^{-2} \rightleftharpoons Ag_2CrO_4{}_{(s)} \downarrow$ reddish brown ppt.

why neutral or very low alkaline solution within (6.5 - 9) ??

in acidic : $2CrO_4^{-2} + 2H^+ \rightleftharpoons Cr_2O_7^{2-} + H_2O$

and then : $2Ag^+ + Cr_2O_7^{-2} \longrightarrow Ag_2Cr_2O_7$ (s). ppt.

and because Solubility of $Ag_2CrO_4 > AgCl > Ag_2Cr_2O_7$

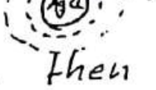
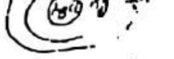
then we can't use $Cr_2O_7^{-2}$ as indicator because it will precipitate befor AgCl.

in basic : $Ag^+ + {}^-OH \longrightarrow \frac{1}{2}Ag_2O_{(s)} + \frac{1}{2}H_2O$

② **Fajan's method :** in this method, at equiv. point the Indicator is adsorped by ppt., and due to this process. / the color of ppt. is changed.

adsorption indicator : it is either acid dyes such as Flluorescein series or basic dyes such as Rhodamin series.

fluorescein series : $HIn \rightleftharpoons H^+ + In^-$ → fluoresein ion.

during titration, just one drop excess from $AgNO_3$ / enough to make a double layer around AgCl  , but (In^-) is adsorbed more than NO_3^-  , then due to that adsorption the color of ppt. change to pink.

[illegible]

In acidic : $HIn \rightleftharpoons H^+ + In^-$ [the form of Indicator is always HIn

In basic : $Ag^+ + \bar{O}H \rightleftharpoons \frac{1}{2}Ag_2O_{(s)} + \frac{1}{2}H_2O$

NOTE : Fajan's method is more accurate than Mohr's meth

3) **Volhard's method** : it is indirect method, where a known excess of silver nitrate is added to the halide solution and the residual $AgNO_3$ is back titrated with standred SCN^- solution using Fe^{3+} as indicator.

- titration is carried out in acidic solution to prevent the following rxn. :

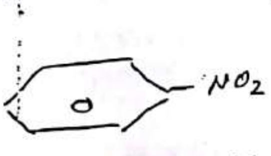
$$Fe^{3+} + 3\bar{O}H \rightleftharpoons Fe(OH)_3$$
$$2Fe(OH)_3 \rightleftharpoons Fe_2O_{3(s)} + 3H_2O$$

- Indicator : Fe^{3+}
- chemical rxns :

$$\underset{\text{excess}}{Ag^+} + Cl^- \longrightarrow AgCl_{(s)}$$
$$\underset{\text{remained}}{Ag^+} + SCN^- \longrightarrow \underset{\text{white ppt}}{AgSCN_{(s)}}$$

- at the end point :

$$Fe^{3+} + SCN^- \rightleftharpoons FeSCN^{2+}$$ "red complex ion"

-  (nitrobenzene) is added to coat AgCl

to prevent the following rxn. :

$$AgCl + SCN^- \longrightarrow AgSCN + Cl^-$$

and ; If this happen, it will cause a ve+ error in volume of of SCN^- solution during titration.

الجزء ٢

[illegible]

ⓐ - Molarity of NaCl $= \dfrac{\overset{\text{mass}}{\text{wt. of NaCl}}}{(58.45\ \underset{\text{mm}}{g/mol})(0.1\,L)} = (\qquad)\,M$

- $M_{AgNO_3} = \dfrac{M_{NaCl}\,(10)}{V_{AgNO_3}\,(\text{Mohr's})}$

- $M_{AgNO_3}(g/L) = M_{AgNO_3} \times 169.86\,\dfrac{g}{mol} = (\qquad)\,\dfrac{g}{L}$

ⓑ $M_{AgNO_3} = \dfrac{M_{NaCl}\,(10)}{V_{AgNO_3}\,(\text{Fajan's})} \Longrightarrow M_{AgNO_3}(g/L) = M_{AgNO_3} \times 169.86\,\dfrac{}{L}$

ⓒ $M_{SCN^-} = \dfrac{M_{AgNO_3}(\text{Fajan's})\,(10)}{V_{SCN^-}} \Longrightarrow M_{SCN^-}(g/L) = M_{SCN^-} \times 97.16$

Ⓓ 1-. $\boxed{\text{moles of } AgNO_3 = (\underset{\text{Mohr's}}{M}V)_{AgNO_3} = (MV)_{\text{unknown [KCl + NaCl]}}}$

If you take 10 mL from unknown, and If you know that conc. of unknown is 6.5 g/L, then the wt. of NaCl and KCl is equal $(6.5\,\frac{g}{L} \times 0.01\,L) = 0.065\,g$.

- If we suppose, $x = \overset{\text{وزن}}{\text{wt.}}$ of NaCl
$y = \overset{\text{وزن}}{\text{wt.}}$ of KCl.

- then: $x + y = 0.065 \longrightarrow$ ①

$\dfrac{x}{58.5} + \dfrac{y}{74.5} = (MV)_{\text{Mohr's } AgNO_3} \longrightarrow$ ②

two equ. and two unknowns:

- then we find x and y per unit volume;

$\boxed{M_{NaCl} = \dfrac{x\,(g)}{0.01\,L}}$

② * أمثلة عن القوانين : (من الريبورت الخاص باللاب)

قانون ① $(MV)_{AgNO_3} = (MV)_{NaCl}$ or قانون ② $(MV)_{AgNO_3} = (MV)_{KSCN}$

Example:

M for $AgNO_3$ = 0.0714 / V for KSCN = 11.5 mL

V for $AgNO_3$ = 10 mL / Calculate the M for KSCN

$$(MV)_{AgNO_3} = (MV)_{KSCN}$$

$$0.0714 * 10\,\cancel{mL} = M * 11.5\,\cancel{mL}$$

$$M \text{ of } KSCN = 0.062 \text{ mol/L}$$

قانون ③ Moles $(NaCl + KCl)$ = Moles $AgNO_3$

التطبيق على هذا القانون كان الجزء D1 من التجربة وهذا الجزء محذوف من الريبورت . لان الحل يحتاجه فرع D2

قانون ④ $(MV)\ AgNO_3$ = Moles $(NaCl + KCl) + (MV)\ KSCN$

Example:

M for $AgNO_3$ = 0.0714
V 〃 $AgNO_3 = 15 * 10^{-3}$

M for KSCN = 0.061
V for KSCN = $1.8 * 10^{-3}$

* Calculate the moles of Anion (NaCl) (KCl)

المطلوب هو مجهولين لذلك نحتاج معادلتين

المعادلة ① : $(MV)AgNO_3$ = Moles $(NaCl + KCl) + (MV)KSCN$

$$\left(\overset{m}{0.0714} * \overset{V}{15*10^{-3}}\right)_{L\ AgNO_3} = \frac{X\ Mass\ NaCl}{58.5\ mm} + \frac{Y\ Mass\ KCl}{74.5\ mm} + \left(\overset{m}{0.061} * \overset{V}{1.8*10^{-3}}\right)_{L\ KSCN}$$

① $$\boxed{\frac{Mass\ NaCl\ (X)}{58.5} + \frac{Mass\ KCl\ (Y)}{74.5} = 9.612 * 10^{-4}}$$

② المعادلة : $\boxed{X + Y = 0.0650}$ تعطى من السؤال

X = Mass NaCl = 0.024

Y = Mass KCl = 0.0408

* نحل المعادلتين بالحذف أو التعويض (رياضيات)
* أو باستخدام الآلة الحاسبة .

طبعًا بدول Moles 6 مرة تطلب ← Calculate the conc of NaCl/KCl in g/L

Moles = $\frac{Mass}{M.wt}$

نتكلم عن الحجم باللتر وبكون معطى بالسؤال الحجم ← Calculate the conc of NaCl/KCl in g/L

③. * حل المعادلتين باستخدام الآلة الحاسبة:

حسب نوع آلتك تطلع الطريقة على اليوتيوب

Casio fx-991ES Plus

mode → 5: EQN → 1: $a_nX + b_nY = C_n$ → دخل القيم → =

بطلع الناتج

سؤال سنوات

Q: 50.5 mL of 0.092 M $AgNO_3$ was added to 10 mL of KCl. The excess $AgNO_3$ was titrated with 10 mL of 0.088 M KSCN. What is the concentration of KCl in (g/L) Mwt = (74.5) g/mol

الحل: نلاحظ ان المعطيات فيها (KSCN) لذلك القانون الرابع هو القانون المناسب لكن السؤال مسهل علينا و طالب بس معلومات عن (KCl) ومش ذاكر NaCl لشي ؟ عشان ما تضطر تحل مجهولين و تستخدم معادلتين ، لذلك المطلوب هو مجهول واحد بكفيه معادلة وحدة.

$$(MV)_{AgNO_3} = \text{Moles KCl} + (MV)_{KSCN}$$

$$0.092 * \frac{50.5}{1000} L = \text{Moles KCl} + 0.088 * \frac{10}{1000} L$$

$$\boxed{\text{moles KCl} = 3.766 * 10^{-3}}$$

يجب ان يكون (V) باللتر

$$\text{Concentration of KCl in } \frac{g}{L} = \frac{\text{Mass (g)}}{(L)\ 10 * 10^{-3}}$$

$$= \frac{\text{moles} * \text{Mwt}}{10 * 10^{-3}} = \frac{3.766 * 10^{-3} * 74.5}{10 * 10^{-3}} = 28.057 \text{ g/L}$$

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Q.2) [illegible]

Exp6

✓

50.5 ml of 0.092 M $AgNO_3$ was added to 10 ml of KCl. The excess $AgNO_3$ was titrated with 10 ml of 0.088 M KSCN. What is the concentration of KCl in (g/L).

23.0567

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Q.2] 10 ml KCl (vs) excess 50.5 ml of 0.092 M $AgNO_3$

$n = \frac{mass}{mm}$

bibilabeh

excess $AgNO_3$ (vs) 10 ml of 0.088 M KSCN

KSCN

Total moles $AgNO_3$ = $50.5 * 10^{-3} * 0.092$

= $4.646 * 10^{-3}$ mol

excess moles = $10 * 10^{-3}$ * ~~0.8~~ 0.088 = $8.8 * 10^{-4}$ mol

reacted moles of Ag = moles KCl = $\boxed{3.766} * 10^{-3}$ mol

mass = mol * M.wt

= * 74.5

= $\frac{0.28 \text{ g}}{10 * 10^{-3}}$

= 28.0567

[illegible]

حل Q.3) In titrations involving $AgNO_3$, it shouldn't ~~[illegible]~~ be done in alkaline medium, why?

لا يجب

بوسط قلوي

Grp6

[✓ A.] to prevent production of Ag_2O

✓

B- to inhance ionization ؟ of NO_3^-.

C- to avoid the formation of $Fe(OH)_3$

D. to gain a distinct indicator color

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Q3] is [illegible]

✓ basis is Ag [illegible]

Q.4] ✓

0.24 g sample

contains 50.6 % $CaCl_2$ (111 g/mol)

~~then~~ (Vs)

Cl (35.5 g/mol)

$$\xrightarrow{\text{excess } AgNO_3}$$

mass ? AgCl (143.5 g/mol)

$$\text{mass } CaCl_2 = \frac{50.6}{100} * 0.24 = 0.12144 \text{ g}$$

$$\text{mol } CaCl_2 = \frac{0.12144}{111} = 1.094 \text{ mol}$$

$$CaCl_2 + 2AgNO_3 \longrightarrow 2AgCl + Ca(NO_3)_2$$

$$\text{mol AgCl} = 2 \text{ mol } CaCl_2$$

$\text{mol} = \frac{\text{mass}}{Mwt}$

$$= \boxed{2 * 1.094}$$

$$\text{mass AgCl} = \quad * 143.5$$

$$= 313.9 \text{ mg}$$

$\boxed{0.31 g}$

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6

Q.5) Which of the followings is correct in using ~~HCl~~ hydrochloric acid as the titrant for determination of bases?

[✓ A.] the titrant is hydrochloric acid

B. Ph.ph indicator has pink color in the acidic medium

color less

C. Ph.ph was the only indicator we've used in this experiement

+BCG

D- Sodium phosphorate is one of the bases we wanted to determine.

EXP (7)

* redox titration (Dichromate titration)

diphenyl amine الكاشف :-

* الكاشف عبارة عن محلول فيه مزيج من $Fe^{3+} + Fe^{2+}$

* سوف نُفاعل (10mL) من الأنونه مع $K_2Cr_2O_7$ بوجود وسط حمضي.

$\boxed{B_1}$ * at the end Point → the color changes to Violet-blue using diphenyl amine indecator.

this indecator is an oxidizing agent & will oxidize Fe^{2+} to Fe^{3+} & Fe^{3+} that Present in the unknown sample will not react.

* end Point ⇒ $\frac{\text{moles } Fe^{2+}}{6} = \text{moles } Cr_2O_7^{2-}$

$$\Rightarrow \boxed{\text{moles } Fe^{2+} = 6 * (M * \overset{Ⓛ}{V})_{Cr_2O_7^{2-}}}$$

$$\Rightarrow \boxed{g/L\ Fe^{2+}}$$

$\boxed{B_2}$ we will first reduce all Fe^{3+} in the 10.00mL unknown sample to Fe^{2+} using Johnes reductor (Zinc amalgam (ZnHg)).

* end Point ⇒ (moles Fe^{2+}) + (moles Fe^{2+} that comed from Fe^{3+}) = 6 * moles $Cr_2O_7^{2-}$

$$\boxed{\text{moles } Fe^{2+} + \text{moles } Fe^{3+} = 6 * (M * \overset{Ⓛ}{V})_{Cr_2O_7^{2-}}}$$

* by substract ⇒ we will obtain moles Fe^{3+}

⇒ then find $\boxed{\frac{g}{L} \text{ of } Fe^{3+}}$

* $K_2Cr_2O_7$ is : oxidizing agent. * Fe^{2+} is : red agent.

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Redox (1) Exp 7

* the chemical rxn. in our exp. i's:

✓ $Cr_2O_7^{-2} + 6Fe^{2+} + 14H^+ \xrightarrow{\text{diphenylamine}} 2Cr^{3+} + 6Fe^{3+} + 7$

(diphenylamine ↓ colorless → (violet to blue))

it i's aredox rxn.

عامل مؤكسد

* $K_2Cr_2O_7$ is oxidizing agent and Fe^{2+} i's red agent. agent.

* determination of Fe^{2+} and Fe^{3+} in a mixture:

1- Determination of Fe^{2+} in the mix.:

in this part $Cr_2O_7^{-2}$ reacts only with Fe^{2+} so;

moles of Fe^{2+} = $6(MV_1)_{Cr_2O_7^{-2}}$

$$- \quad M_{Fe^{2+}}(g/L) = \frac{\text{moles}}{0.01\,L} \times 55.85\,\frac{g}{mol}$$

2- determination of Fe^{3+} in the mix.:

ⓐ: preparation of the Johnes reductor (ZnHg):

$$2Zn_{(s)} + Hg^{2+} \longrightarrow Zn^{2+} + \underbrace{ZnHg_{(s)}}_{R.A}$$

ⓑ reduction of Fe^{3+} to Fe^{2+}:

$$2Fe^{3+} + ZnHg \longrightarrow 2Fe^{2+} + Zn + Hg^{2+}$$

, we use SCN^- to test presence of Fe^{3+}

$$Fe^{3+} + SCN^- \longrightarrow \underset{\text{red}}{FeSCN^{2+}} \text{ complex.}$$

then we continue the titration as in part 1:

total moles $Fe^{2+} + Fe^{3+}$ = $6MV_2$

− $M_{Fe^{3+}}(g/L) = \frac{\text{moles of } Fe^{3+}}{0.01} \times 55.85 \frac{g}{mol}$.

❋ NOTES :

− why you add. H_2SO_4 , H_3PO_4 . ?

H_2SO_4 : (to get acidic medium.)

H_3PO_4 : −(to minimize the potential between $Cr_2O_7^{-2}$ and Fe^{2+})

− and H_3PO_4 form complex with Fe^{3+} , so we get sharp end point for this rxn.

− diphenylamine : (i's aredox indicator change from colorless to (violet to blue) in color.)

①

FINAL حلو

3/7

Analytical lab

A 20 ml aliqout of 16.4 g/L mixture of Fe^{2+}/Fe^{3+} was titrated ~~to~~ with 13.1 ml of 0.03 M $K_2Cr_2O_7$. What is the mass of Fe^{2+} in ~~this aliquot~~ ?
↳ one liter (g/L) ?

[illegible] (Molar weight of Fe^{3+} = 55.8 g/mol)

$\boxed{6.57} \times 10^{-6}$

Final ← (1/2/3 17/9/11 (H))

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M

Q.1 20 ml aliquot contains 16.4 g/L of mixture Fe^{2+}/Fe^{3+}

FWAI

Vs

V 13.1 ml of $\overset{m}{0.03}$ M $K_2Cr_2O_7$

Analytical lab

MM $[Fe^{3+}]$ 55.8 g/mol is (g/L)

$n = M * V$ $M = \frac{n}{V}$

$$\frac{mol\ Fe^{2+}}{6} = mol\ K_2Cr_2O_7$$

$$mol\ Fe^{2+} = 6 * \overset{V}{13.1} * \overset{M}{0.03} * \overset{L}{10^{-3}}$$

$$= 2.358 * 10^{-3} = \frac{mass}{55.8} = \boxed{0.13\,g}$$

$$\frac{0.13\,g}{20 * 10^{-3}} = 6.57\,\frac{g}{L}$$

$$\frac{mass}{M.Wt} \Rightarrow mass = \frac{0.13\ g}{20 * 10^{-3}} = 6.57 ~~* 10^{-3}~~$$

* redox titration (Iodine titration). Exp (8)

ⓐ St. of $S_2O_3^{2-}$:- I_2: is oxidant agent.

$$M \text{ of } KIO_3 = \frac{n}{V_{(L)}} = \frac{\frac{mass}{m.w}}{V} = \square \text{ mol/L}$$

- M of $Na_2S_2O_3$:-

$$\text{Moles } KIO_3 = \frac{\text{Moles } S_2O_3^{2-}}{6}$$

$$(\underset{\checkmark}{M}*\underset{10mL}{V})_{KIO_3} = \left(\frac{\overset{?}{M}*\underset{Burret}{V}}{6}\right)_{S_2O_3^{2-}} \qquad \text{mol/L}$$

ⓑ St. of I_2 :-

- M of I_2:-

$$\text{Moles } I_2 = \frac{\text{Moles } S_2O_3^{2-}}{2}$$

$$(\underset{?}{M}*\underset{10mL}{V})_{I_2} = \left(\frac{\underset{ⓐ's}{M}*\underset{Burret}{V}}{2}\right)_{S_2O_3^{2-}} \qquad \text{mol/L}$$

ⓒ Det. of (Sn^{2+}) in an unknown sample:- (Back tit)

* $Sn^{2+} + I_2 \longrightarrow Sn^{4+} + 2I^-$

I_2 will oxidize Sn^{2+} $\xrightarrow{to}$ Sn^{4+}

- M of Sn^{2+} :-

$$\text{total moles of } I_2 = \text{moles } Sn^{2+} + \frac{\text{moles } S_2O_3^{2-}}{2}$$

$$(\underset{ⓑ's}{M}*\underset{15mL}{V})_{I_2} = (\underset{?}{M}*\underset{10mL}{V})_{Sn^{2+}} + \left(\frac{\underset{ⓐ}{M}*\underset{Burret}{V}}{2}\right)_{S_2O_3^{2-}}$$

→ Calculate $M_{Sn^{2+}}$ in $\frac{mol}{L}$ → then Calculate $\left(\frac{g}{L}\ Sn^{2+}\right)$.

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Final
8 تجربة

Q.9) A 15 ml sample that contains tin (Sn = 118.7 g/mol) was titrated with 15 ml of 0.12 M I_2. The excess I_2 was titrated with 5.5 ml of 0.11 M $Na_2S_2O_3$.
What is the molar concentration of Sn ?

$\boxed{0.0\cancel{79}\ M}$ 0.09983

---

8 تجربة
Final

Q.10) 15.5 ml of 0.5 M S_2O_3 was titrated with 10 ml I_2.
What is the molar concentration of I_2 ?

$V_{S_2O_3} = 15\ ml \longrightarrow I_2$
$M_{S_2O_3} = 0.5$
$V = 10\ ml$

$\boxed{0.39\ M}$

Final
8 تجربة

Q.11) 0.4 g of KIO_3 (214 g/mol) was titrated with 25 ml of $Na_2S_2O_3$. What is the molarity of $Na_2S_2O_3$?

$\boxed{0.45\ M}$

mass KIO_3 = 0.4 g
mm = 214

$V_{Na_2S_2O_3}$ = 25 ml

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Q.9]

[Sn] = ?

molar con. ?

15 ml sample (tin) Sn (118.7 g/mol)

Vs 15 ml of 0.12 M I_2

excess I_2 with 5.5 ml of 0.11 M

$M = n/V$ $\quad n = M \times V$

V M L

$Na_2S_2O_3$

* Total moles I_2 = 15 * 0.12 * 10^{-3} = 1.8 * 10^{-3} mol

~~mol~~ $\dfrac{M \times V \ S_2O_3}{2}$ = (~~molL~~ * V) I_2

moles excess I_2 = $\frac{1}{2}$ * 5.5 * 10^{-3} * 0.11 = 3.03 * 10^{-4}

= 6.05 * 10^{-4} mol

reacted I_2 = 1.195 * 10^{-3} mol

mol Sn = mol I_2

$$M = \frac{1.195 \times 10^{-3}}{15 \times 10^{-3}}$$

= ~~0.079~~ M

0.09983

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Q.10] $15.5\ ml$ of $0.5\ M$ S_2O_3 Vs $10\ ml$ I_2

$$(M * V)_{I_2} = \frac{M * V}{2}$$

$$M * 10 = \frac{1}{2} * 0.5 * 15.5$$

$$M_{I_2} = 0.3875 \sim \underline{\underline{0.39}}\ M$$

Q.11] $2(KIO_3 + 5KI + 6HCl \rightarrow 3H_2O + 6KCl + 3$

$3(I_2 + 2S_2O_3 \rightarrow S_4O_6 + 2I^-)$

$0.4\ g$ KIO_3 ($214\ g/mol$)

$KIO_3 + 6\ S_2O_3$

$25\ ml$ $Na_2S_2O_3$ $M = ?$

mol # $KIO_3 = \frac{mass}{M.wt} = \frac{0.4}{214} = 1.869 * 10^{-3}$

$6 * mol\ KIO_3 = mol\ S_2O_3$

$$M_{S_2O_3} * 25 * \cancel{10^{-3}} = 6 * 1.869 * \cancel{10^{-3}}$$

$= 0.45\ M$

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Exp (9)

* Complexometric titration (titration with EDTA)

ما الكاشف

EDTA لما يكون حوله أيون بهاجم الأيون ويعمل معه Complex ← يكون بين ال metal وبين ال ion
بين ال titrant وبين ال analyte

والعلاقة (النسبة) 1:1 مع الأيون.

EDTA has Tetraprotic acid يعني فيه 4H.

ثابت التفكك
*** Dissociation Constant**

Ka for 1H → $K_a = 10^{-3}$

Ka
- 10^{-5} وأقل — الحمض ضعيف.
- 10^{-5} وأكثر — الحمض قوي.

EDTA تتفاعل مع أي معدن (metal) شحنة (+2) مثل:- $Zn^{+2}/Mg^{+2}/Ca^{+2}$

* بالسؤال معطي ال M و V لل EDTA ومعطي M ل Zn^{+2} وطالب حساب V لل Zn^{+2} ← تطبيق مباشر $(\check{M}*\check{V})_{EDTA}=(\check{M}*\overset{?}{V})_{Zn^{+2}}$

*EDTA : Ethylen Diamine Tetra Acetic acid.

ⓐ St. of EDTA :-

* end Point :-

Moles Zn^{2+} = moles EDTA

$$(\underset{\text{calculate above}}{M}*\underset{10mL}{V})_{Zn^{2+}}=(\underset{?}{M}*\underset{\text{Burret}}{V})_{EDTA}$$

ⓑ Def. of water hardness :-

[1] * end Point :-

Moles Ca^{2+} + moles Mg^{2+} = moles EDTA

$$(\text{moles } Ca^{2+}+Mg^{2+})=(\underset{\text{Ⓐ من}}{M}*\underset{\text{Burret}}{V_1})_{EDTA}$$

[2] adding 1mL of 5.0 M NaOH will react with Mg^{2+} to precipitate it as $Mg(OH)_{2(s)}$, then we have only Ca^{2+} (end Point)
(moles Ca^{2+} = moles EDTA)
moles Ca^{2+} = $(M*V_2)_{EDTA}$

[3]

moles Mg^{2+} = mole EDTA − mole Ca^{2+}

$(M*V)=(M*V)-(M*V)$ (V_2-V_1)

بغياب NaOH

بوجود NaOH

ppm (mg/L) of $CaCO_3$
- أقل من 400 لا يوجد عسر ماء.
- أكثر من 400 يوجد عسر ماء.

* القيمة المحددة لعسر الماء = water hardness $= \text{ppm from } Ca^{2+} * \frac{MM(CaCO_3)}{MM(Ca^{2+})}$

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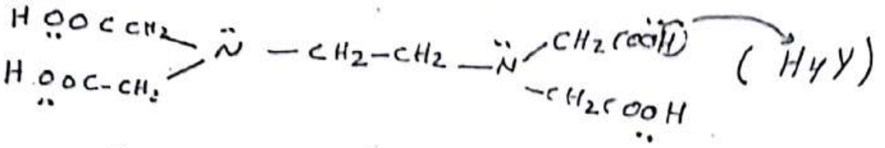
$M.W\,(ZnSO_4 \cdot 7H_2O) = 287.97$

$161.97 + 7 * (18)$

* إذا جاب M.W لـ ($ZnSO_4$) لحالها يجب إضافة (7×18).

Complexometric titration EDTA   Exp 9

EDTA : ethylendiamine tetraacetic acid.



* The usefulness of EDTA as atitrant is due to :

- the presense of four or six atoms (~~a vacito~~ available for coordination to metal cation) in such away five membered ring produces

— EDTA has four acid dissociation constants, $PKa_1 = 2.0$, $PKa_2 = 2.7$, $PKa_3 = 6.2$, $PKa_4 = 10.3$.

— PKa_1 and PKa_2 \ for two strongly acidic protons

$PKa_3 = PKa_4$! " " = weakly acidic protons.

— EDTA forms stable, water soluble 1:1 chelates with polyvalent metal ions

$$M^{n+} + \underset{\text{disodium salt of EDTA}}{H_2Y^{2-}} \rightleftharpoons MY^{n-4} + 2H^+$$

— Ionization of MY^{n-4} complex depend upon the PH of solution, so lowering the PH decrease the stability of complex. also increasing PH of reaction tend to form slightly soluble metallic hydroxide is enhanced.

$$MY^{n-4} + n\bar{O}H \rightleftharpoons M(OH)_n + Y^{4-}$$

and this depend on Ksp for $M(OH)_n$.

— for that reasons, it is advisable to do the reaction in a buffer medium.

- Indicators: organic dyes that form colored chelates with metal ions which must be weaker than chelate formed by the metal with EDTA, most of these indicators possesss acid - base indicator properties (depend on PH value).

- examples of Indicators !

(✓)

• sulphonic group in ECBT gives up its proton long below PH range (7-12), so we only considered the two protons of phenolic ~~grop~~ groups.

- at PH < 5.5 : H_2In^- has red color
- at 7 < PH < 11 : HIn^{2-} " blue "
- at PH > 11.5 : In^{3-} " orange "

* at PH range (7-11), the color of ECBT is blue, but addition of metal ions produces change in color to red.

$$\underset{\text{blue}}{M^{2+} + HIn^{2-}} \longrightarrow \underset{\text{red}}{MIn^-} + H^+$$

2 - ~~Merodi~~ Murexide Indicator. (change ~~color from~~ pink to violet)

Calculations:

① $M_{Zn^{2+}} = \dfrac{(wt.\ of\ ZnSO_4 \cdot 7H_2O / M.wt.)}{0.1\ L.}$

② $M_{EDTA} = \dfrac{(MV)_{Zn^{2+}}}{V_{EDTA},\ mL}$

① $M_{Ca^{2+}} = \dfrac{(MV_2)_{EDTA}}{50\ mL} \times \dfrac{40.1\ g}{1\ mol} \times \dfrac{1000\ mg}{1\ g} = (\quad)\ ppm$

② $M_{Mg^{2+}} = \dfrac{[M(V_1 - V_2)]_{EDTA}}{50\ mL} \times \dfrac{24.3\ g}{1\ mol} \times 1000 = (\quad)\ ppm$

③ Total water hardness $= \dfrac{(MV_2)_{EDTA}}{50\ mL} \times \underset{Mwt.CaCO_3}{100.1} \times 1000 = (\quad)\ ppm$

① $M_{Ca^{2+}} = \dfrac{(MV_2)_{EDTA}}{10\ mL} \times 40.1 \times 1000$

$M_{Mg^{2+}} = \dfrac{M(V_1 - V_2)_{EDTA}}{10} \times 24.3 \times 1000$

Q.7) ~~What is the molarity of 20 ml of EDTA, what~~

فاينل ~~What is~~ A 20 ml of EDTA was titrated with 45 ml of 0.05 M Zn^{2+}. What is the molarity of this EDTA Solution ?

زمرة 9

20ml EDta

$V_{Zn^{2+}} = 45ml$

$M_{Zn^{+2}} = 0.05$

$\boxed{0.113\ M}$

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Q.7] ✓

20 ml EDTA VS 45 ml of 0.05 M Zn^{2+}

$M = ?$

$$M * V = M * V$$

$$M * 20 = 0.05 * 45$$

$$M = 0.1125\,M \sim 0.113\,M$$

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المحتوي

Q.H) A 0.5 g sample contains both Ca^{2+} (40.08 g/mol)

(a بتجربة and Mg^{2+} (24.3 g/mol) was titrated with 60 ml of

60 ml of 0.01 M EDTA with the presence of NaOH.

Find the percentages of Ca^{2+} and Mg^{2+}. (g/g)

Sand

$$\boxed{\begin{array}{l} \% \ Ca^{2+} = 4.81 \ \% \\ \% \ Mg^{2+} = 95.2 \ \% \end{array}}$$

$M = \frac{n}{V}$

$$\text{Total mol EDTA} = M \times V = 0.01 \times 60 \times 10^{-3} = \boxed{6 \times 10^{-4} \text{ mol}}$$

$$\text{mol } Ca^{2+} = \text{mol EDTA} = \underline{6 \times 10^{-4}}$$

$$\# \ Ca^{2+} = \frac{\text{mass}}{\text{mm}} \rightarrow 6 \times 10^{-4} = \frac{\text{mass}}{40.08}$$

$$\text{mass } Ca^{2+} = \boxed{0.024 \text{ g}}$$

$$\% Ca^{+2} = \frac{\text{mass } Ca^{+2}}{\text{mass sample}} \times 100\% = \frac{0.024}{0.5} \times 100\% = \boxed{4.8\%} \text{ (a)}$$

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$$\% mg^{+2} = 100\% - \% Ca^{+2}$$
$$= 100\% - 4.8\% = \boxed{95.2\%}$$

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EXP (11)

*Determination of unknown Bases by standardized HCl :-

Constituents in sample	Relation between $V_{ph.ph}$ & V_{BCG}	
① $NaoH$	$V_{ph.ph} = V_{BCG}$	moles $NaoH = M_{HCl} * V_{BCG}$ mols $NaoH = M_{HCl} * V_{ph.ph}$
② Na_2CO_3	$V_{ph.ph} = 1/2 V_{BCG}$	mols $Na_2CO_3 = M_{HCl} * V_{ph.ph}$ mols $Na_2CO_3 = M_{HCl} * 1/2 V_{BCG}$
⑤ Na_2CO_3 , $NaHCO_3$	$V_{ph.ph} \leq 1/2 V_{BCG}$	$\boxed{\text{mols } Na_2CO_3} = M_{HCl} * V_{ph.ph}$ $\boxed{\text{moles } NaHCO_3} + \text{mols } Na_2CO_3 = M_{HCl} * (V_{BCG} - V_{ph.ph})$ $\to$ mols $NaHCO_3$
③ $NaHCO_3$	$V_{ph.ph} = 0$; $V_{BCG} > 0$	mols $NaHCO_3 = M_{HCl} * V_{BCG}$
④ $NaoH$, Na_2CO_3	$V_{ph.ph} > 1/2 V_{BCG}$	mols $Na_2CO_3 = M_{HCl} * (V_{BCG} - V_{ph.ph})$ mols $NaoH$ + mols $Na_2CO_3 = M_{HCl} * V_{ph.ph}$ $\to$ mols $NaoH$

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11 ⑧ تجربة

Q.12) 0.2 g base (قاعدة) was titrated with 0.3M HCl. It required 25 ml to reach Ph.ph end point and required 50 ml to reach the BCG end point. Find the components (مكونات) and moles of this base.

$Na_2CO_3 = 0.3M$

n??

$\boxed{0.0075 \text{ mol } Na_2CO_3}$

③

Q.13) Which of the followings gives off the results of the titration of Sodium hydrogen carbonates ($NaHCO_3$) with ~~the~~ hydrochloride acid. HCl

$NaHCO_3$

(the first number is the volume required to reach Ph.ph end point, and the second number indicates the volume required to reach BCG end point).

Mixd

(B) [illegible]

(11

	Ph.Ph	BCG
A -	25	25
[✓ B.]	0	25
C.	17	25
D.	28	50
E.	25	50

$NaHCO_3$ لها حالتين

① $V_{phph} = 0$ و $V_{BCG} > 0$

② $V_{phph} < \frac{1}{2} V_{BCG}$

Q.12] ✓

تحدد ال Components
ع الخطوات

0.2 g base $\boxed{Vs}$ 0.3 M HCl

$V_{ph.ph} = 25$ ml

$V_{BCG} = 50$ ml

$V_{BCG} = 2 V_{ph.ph}$ vp. $\boxed{V_{ph.ph} = 1/2 V_{BCG}}$

$\boxed{Na_2CO_3}$ ~~$NaHCO_3$~~

$M = \frac{n}{V(L)}$

moles $Na_2CO_3 = 0.3 * 25 * 10^{-3}$

$7.5 * 10^{-3}$

$NaHCO_3$ 0.0075 mol Na_2CO_3

0

صيغ يعرعي

$\boxed{Q.13}$ تفاعل HCl

ع

✓ Sodium hydrogen carbonate

25, 25

→ 0, 25

17, 50

28, 50

25, 50