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PSF 1303 HOME ASSIGNMENT I 2009/2010

1. (a) Write the full electron configurations ($1S^2$, $2S^2$.....) of the following ions.
K^+, Ca^{2+}, Cl^-, S^{2-}
With which noble gas are these ions isoelectronic.

(b) Write balanced chemical equations for the following reactions;
- (i) reaction of aqueous $H_2C_2O_4$ with NaOH
- (ii) oxidation of Fe^{2+} by $K_2Cr_2O_7$ in acidic medium
- (iii) dissociation of N_2O_4

(c) The density of germanium, Ge is 5.23 g cm^{-3}. Express in SI units,
- (i) the volume
- (ii) the mass

of a cube of germanium with an edge length of 80.5 mm

(d) The percentage of H_3PO_4 in syrupy phosphoric acid is 98% by w/v. Density of syrupy phosphoric acid is 1.89 g cm^{-3}. Calculate the volume of syrupy phosphoric acid needed to prepare 1.5 dm^3 of 3.8 M (mol dm^{-3}) aqueous H_3PO_4 solution.

(e) A compound of nitrogen (N) and oxygen(O) has the weight composition of 1.52 g N and 3.47 g O. The molar mass of this compound is known to be between 90 g and 95 g. Determine the molecular formula of the compound.(N = 14, O = 16)

2. (a) (i) Define the term 'first ionisation energy' of an element.
(ii) Write an equation to illustrate the second ionization energy of lithium.

(b) Explain why the first electron affinity of oxygen atoms,

$$O(g) + e^- \rightarrow O^-(g) \quad \text{is exothermic,}$$

whereas the second stage,

$$O^-(g) + e^- \rightarrow O^{2-}(g) \quad \text{is endothermic.}$$

© Draw dot and cross diagrams of the following molecules.
(i) CCl_4 (ii) CO_3^{2-} (iii) IF_5 (iv) H_3O^+

(d) (i) What is meant by the term "dipole moment"?
(ii) Explain why CHF_3 possess a dipole moment but CF_4 molecule does not?

(f) Explain the following:
- (i) The radius of a cation is less than that of the relevant atom whereas radius of an anion is higher than that of the relevant atom.
- (ii) Lithium and Magnesium show some similar chemical properties, although the two elements belong to different groups.
- (iii) Lithium iodide and caesium iodide are both ionic compounds. Which has the greater covalent character.
- (iv) Ammonia has the highest boiling point among the hydrides of group V elements.
- (v) Copper and sodium are not classified in the same block of the periodic table.

ශ්‍රී ලංකා විවෘත විශ්වවිද්‍යාලය

PSF 1303 2009/2010

පැවරුම I

(1) a) පහත දැක්වෙන අයනයන්හි ඉලෙක්ට්‍රෝනික වින්‍යාසයන් s හා p ඉලෙක්ට්‍රෝන($1s^2$...) අනුසාරයෙන් ලියා දක්වන්න.

K^+ , Ca^{2+} , Cl^- , S^{2-}

මෙම අයන සමඉලෙක්ට්‍රෝනික (isoelectronic) වන්නේ කුමන නිශ්ක්‍රිය වායුන් සමග ද ?

b) පහත ප්‍රතික්‍රියා සඳහා තුලිත රසායනික සමීකරණ ලියන්න.

i) ජලීය $H_2C_2O_4$ සහ $NaOH$ අතර ප්‍රතික්‍රියාව.

ii) $K_2Cr_2O_7$ මගින් ආම්ලික මාධ්‍යයේදී Fe^{2+} ඔක්සිකරණය

iii) N_2O_4 හි වියෝජනය.

c) ජර්මේනියම් (Ge) වල ඝනත්වය 5.23 g cm^{-3}, දිග 80.5 mm වූ ජර්මේනියම් ඝනයක,

i) පරිමාව

ii) ස්කන්ධය

SI ඒකක වලින් දක්වන්න.

d) උකු පොස්පරික් අම්ලයේ H_3PO_4 ප්‍රතිශතය 98% w/w වේ. මෙම පොස්පොරික් අම්ලයේ ඝනත්වය 1.89 g cm^{-3} වේ. 3.8 M (mol dm^{-3}) සාන්ද්‍රණයෙන් යුත් ජලීය පොස්පරික් අම්ල ද්‍රාවණ 1.5 dm^3 සෑදීම සඳහා අවශ්‍යවන උකු පොස්පරික් අම්ල පරිමාව ගණනය කරන්න.

e). N හා O වලින් සමන්විත සංයෝගයක බර අනුව N 1.52 g ද, O 3.47 g අඩංගු වේ. මෙම සංයෝගයේ මවුලික ස්කන්ධය 90 g හා 95 g අතර වේ. මෙම සංයෝගයේ අණුක සූත්‍රය නිර්ණය කරන්න. (N=14 , O=16)

(2) a) i) මූලද්‍රව්‍යක "පළමු අයනීකරණ ශක්තිය" අර්ථ දක්වන්න.

ii) ලිතියම් (Li) හි දෙවන අයනීකරණ ශක්තිය විදහා දැක්වීමට සමීකරණයක් ලියන්න.

b) ඔක්සිජන් පරමාණුවේ පළමුවන ඉලෙක්ට්‍රෝන බන්ධුතාවය

$$O_{(g)} + e \longrightarrow O^{-}_{(g)}$$ තාපදායී ද,

දෙවන අවස්ථාවේ දී,

$$O^{-}_{(g)} + e \longrightarrow O^{2-}_{(g)}$$ තාප අවශෝෂක ද

වන්නේ මන්දැයි පැහැදිලි කරන්න.

c) පහත අණු සඳහා තිත් කතිර සටහන් අඳින්න.

i) CCl_4 ii) CO_3^{2-} iii) IF_5 iv) H_3O^+

d). i) "ද්විධ්‍රැව ඝූර්ණය" (dipole moment) යන්නෙන් අදහස් වන්නේ කුමක් ද?

ii) CF_4 සඳහා ද්විධ්‍රැව ඝූර්ණයක් නැතත් CHF_3 සඳහා ද්විධ්‍රැව ඝූර්ණයක් පවතින්නේ මන්දැයි පැහැදිලි කරන්න.

f) පහත දෑ පැහැදිලි කරන්න.

i) කැටායනික අරය, අදාල පරමාණුක අරයට වඩා අඩු වෙතත්, ඇනායනික අරය අදාල පරමාණුක අරයට වඩා වැඩිවේ.

ii) ලිතියම් සහ මැග්නීසියම් කාණ්ඩ 2 ට අයත් වුවද සමාන රසායනික ගුණ පෙන්වයි.

iii). ලිතියම් අයඩයිඩ් සහ සීසියම් අයඩයිඩ් යන දෙකම අයනික සංයෝග වන නමුත් වැඩිම සහසංයුජ ගුණ

දක්වන්නේ කුමන සංයෝගය ද ?

iv) V වන කාණ්ඩයේ මූලද්‍රව්‍යයන්හි හයිඩ්‍රයිඩ අතුරින් වැඩිම තාපාංකය ඇමෝනියා .. පෙන්වයි.

v) කොපර් සහ සෝඩියම් ආවර්තිතා වගුවේ එකම ගොනුවට වර්ගීකරණය කර නොමැත.

PSF 1303 மதிப்பீடு 01 2009/2010

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1. (a) பின்வரும் அயன்களுக்குரிய இலத்திரன் நிலையமைப்பை $1s^2, 2s^2$ .... எனும் வடிவில் எழுதுக? இவ் அயன்கள் எச்சடத்துவ வாயுவுடன் சம இலத்திரன் நிலையமைப்பைக் கொண்டுள்ளன?

$$K^+ ,\ Ca^{2+} ,Cl^-,\ S^{2-}$$

(b) பின்வரும் தாக்கங்களுக்குரிய சமப்படுத்தப்பட்ட இரசாயன சமன்பாடுகளை எழுதுக?
(i) $H_2C_2O_4$ நீர்க்கரைசலுடன் NaOH இன் தாக்கம்
(ii) அமில ஊடகத்தில் $K_2Cr_2O_7$ இனால் Fe^{2+} இன் ஒட்சியேற்றம்
(iii) N_2O_4 இன் பிரிகைத் தாக்கம்

(c) ஜேமானியத்தின், Ge அடர்த்தி 5.23 gcm^{-3} ஆகும். SI அலகில் 80.5 mm நீளமுடைய கனவடிவ ஜேமானியத்தின் ,
(i) கனவளவு
(ii) திணிவு
என்பனவற்றைக் கணிக்குக?

(d) பாகு நிலை பொஸ்போரிக்கமிலத்தில் H_3PO_4 இன் திணிவு/கனவளவு வீதம் 98% ஆகும். பாகு நிலை பொஸ்போரிக்கமிலத்தின் அடர்த்தி 1.89 gcm^{-3} . 3.8M (Mol dm^{-3}) செறிவுடைய H_3PO_4 நீர்க் கரைசலின் 1.5 dm^3 கரைசலைத் தயாரிக்கத் தேவையான பொஸ்போரிக்கமிலத்தின் கனவளவைக் கணிக்குக?

(e) ஒரு சேர்வை 1.52 g நைதரசனையும் 3.47 g ஒட்சிசனையும் திணிவு அமைப்பாக கொண்டுள்ளது. இந்த சேர்வையின் மூலரத் திணிவு 90-95 g இற்கு இடைப்பட்டதாகும். இச்சேர்வையின் மூலக்கூற்றுச் சூத்திரத்தைப் பெறுக? (N=14 , O=16)

2.(a) (i) மூலகம் ஒன்றின் முதலாம் அயனாக்கற் சக்தி எனும் பதத்தை வரையறுக்குக?
(ii) லிதியத்தின் இரண்டாம் அயனாக்கற் சக்தி எனும் பதத்தை விபரிப்பதற்குப் பொருத்தமான சமன்பாடு ஒன்றை எழுதுக?

(b) ஏன் ஒட்சிசன் அணுவின் முதலாம் இலத்திரன் நாட்டற் சக்தி புற வெப்பமாகவும் இரண்டாம் இலத்திரன் நாட்டற் சக்தி அக வெப்பமாகவும் இருக்கின்றது எனவும் விளக்குக?

$O(g) + e \longrightarrow O^-(g)$ புறவெப்பம்

$O^-(g) + e \longrightarrow O^{2-}(g)$ அகவெப்பம்

PSF 1303
Home Assignment 1 – 2009/2010
Answer guide

1) a)

K^+ - $s^2 2s^2 2p^6 3s^2 3p^6$
Ca^{2+} - $s^2 2s^2 2p^6 3s^2 3p^6$
Cl^- - $1s^2 2s^2 2p^6 3s^2 3p^6$
S^{2-} - $s^2 2s^2 2p^6 3s^2 3p^6$

Ar is isoelectronic with all these ions

b) i) $H_2C_2O_4 + 2NaOH \longrightarrow Na_2C_2O_4 + 2H_2O$

ii)
$$\begin{array}{l} Fe^{2+} \longrightarrow Fe^{3+} + e \\ Cr_2O_7^{2-} + 14\,H^+ + 6e \longrightarrow 2Cr^{3+} + 7\,H_2O \\ \hline 6Fe^{2+} + Cr_2O_7^{2-} + 14\,H^+ \longrightarrow 6\,Fe^{3+} + 2Cr^{3+} + 7H_2O \end{array}$$

iii) $N_2O_4(g) \rightleftharpoons 2NO_2$

c) Density $= 5.23 \times 10^3 kgm^{-3}$

i) Volume of a cube of Ge $= (80.5 \times 10^{-3}\,m)^3$
$= \underline{\underline{5.216 \times 10^{-4}\,m^3}}$

ii) The mass of a cube of Ge $= 5.23 \times 10^3\,kgm^{-3} \times 5.216 \times 10^{-4}\,m^3$

$= \underline{\underline{27.30 \times 10^{-1}\,kg}}$

d) Density $= 1.89\,g\,cm^{-3}$
No: of mol in $1cm^3$ $= \frac{1.89\,g}{98\,gmol^{-1}} \times \frac{98}{100}$

$= 1.89 \times 10^{-2}\,mol$

No: of mol in $1000\,cm^3 = 1.89 \times 10\,mol$

Concentration of syrupy H_3PO_4 acid $= 18.9\,moldm^{-3}$

No: of mols in $1.5\,dm^{-3}$ of $3.8\,moldm^{-3}$ H_3PO_4 acid $= 3.8\,moldm^{-3} \times 1.5dm^{-3}$
$= 5.7\,mol$

Volume required by the syrupy H_3PO_4 acid to prepare the above H_3PO_4 (aq) solution $= \frac{5.7 \text{ mol}}{18.9 \text{ moldm}^{-3}}$

$= 0.302 \text{ dm}^3$

$= \underline{\underline{302 \text{ cm}^3}}$

e)	N	O
Weight	1.52 g	3.47 g
No: of mols	$\frac{1.52 \text{ g}}{14 \text{ gmol}^{-1}}$	$\frac{3.47 \text{ g}}{16 \text{ gmol}^{-1}}$
	0.108 mol	0.216 mol
Molar ratio	1	2

$(NO_2)x = 90$ (95)

$(14 + (16 * 2))\, x = 90$

$46\, x = 90$

$x = 2$

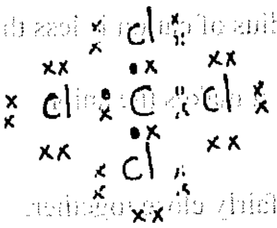
Molecular fomula $\underline{\underline{N_2O_4}}$

2) a) i) The energy required to remove an electron from an atom in the gaseous state to an infinitely large distance.

ii) $Li^{+} \longrightarrow Li^{2+} + e$

b) Electron affinity is the energy required to gain an electron to an atom in the gaseous state. The second electron affinity will take a large positive value because the second electron must be forced on against the net negative charge of the ion. Therefore that Energy should be supplied from the out side to force an electron to combine with the gaseous atom to form an ion. i.e The process is endothermic.

c) i) CCl_4



C — 4

4 (Cl) — 28

Total en: — 32

For bonding — 8

24 ÷ 2

12 Pairs

ii) CO_3^{2-}

C — 4

3(O) — 18

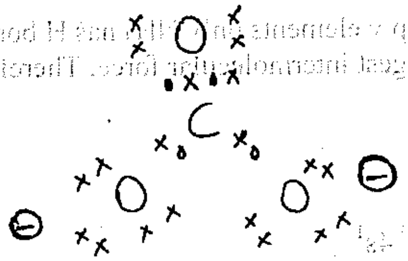
Total 22

charge + 2

24 — 6

18 ÷ 2

9 Pairs.



iii). IF_5

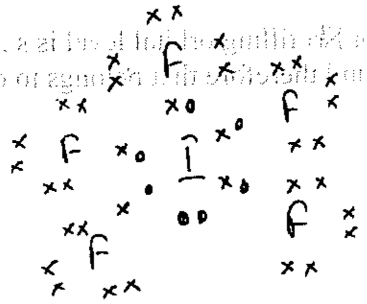
I — 7

5 (F) — 35

42 — 10

32 ÷ 2

16 Pairs



iv). H_3O^+

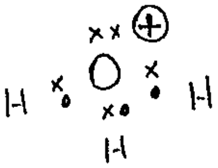
3 (H) — 3

O — 6

9 — 1

8 — 6

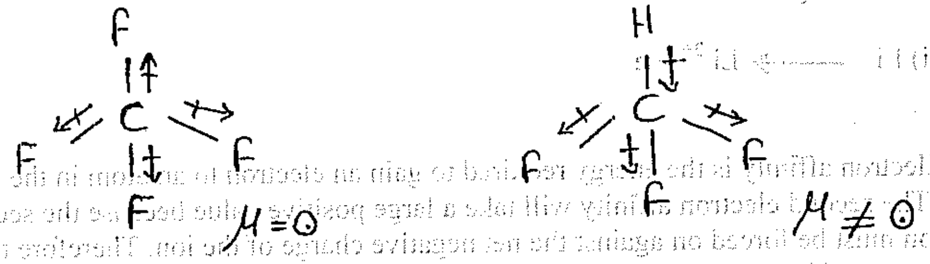
2 ÷ 2



d) i) The measured polarity of a covalent bond of a compound .

Dipole moment (μ) = charge of the atom x bond distance

ii)



The dipole moment of CH_4 is zero since the dipole moment of the C- F bonds are cancelled out. But in CHF_3 there is a dipole moment because there are 2 different types of dipole moments and there is no cancellation of dipole moments.

e) i) The no: of electrons in a cation is less compared to its atom therefore more(+)ve charge on nucleus attract electron cloud towards it. Therefore radius of cation is less than that of the relevant atom.

In anion, there is an en –en repulsion between electrons and it makes the anion larger than the atom.

ii) Ionic potential (Ionic charge / ionic radius) of Li and Mg are fairly close together. That means those two show diagonal relationship.

iii) LiI.Both Li and Cs belong to group I. Electro negativity difference between Li and I is lower than that of Cs and I. Therefore Li I has more covalent character.

iv) Among hydrides of group v elements only NH_3 has H bonds as its intermolecular forces. H bonds are the strongest intermolecular force. Therefore NH_3 has the highest boiling point among these.

v) Na - $1s^2\,2s^2\,2p^6 3s^1$

Cu - $1s^2\,2s^2\,2p^6 3s^2 3p^6\,3d^{10}\,4s^1$

For Na filling orbital level is s .Therefore that belongs to s. For Cu filling orbital level is d and therefore that belongs to d block.

PSF 1303 HOME ASSIGNMENT II 2009/2010

1. (a) (i) Write down a mathematical expression for the Raoult's law, as applied to an ideal binary liquid system A and B. Identify all the terms in your expression.

(ii) A solution contain 15.00 g of urea $\{CO(NH_2)_2\}$ in 0.200 kg of water. If vapour pressure of water at 25°C is 23.7 torr, calculate the partial vapour pressure of water in solution at 25°C.

(b) A solution is formed by mixing two volatile solvents C & D, shows large positive deviations from ideal behaviour.

(i) Draw the plot of vapour pressure against mole fraction of D. (vapour pressure of pure C is higher than that of pure D)

(ii) If the solution forms a constant boiling mixture, draw the plot of temperature versus mole fraction of D. (pressure remains constant)

© A volatile liquid A has saturated vapour pressure 68 torr at 30 °C. 5 g of a non volatile substance B, is dissolved in 150 g of liquid A. Then the vapour pressure of the solution is 67 torr. Calculate the relative molecular/molar mass of B if that of liquid A is 30.

2. (a) The lattice enthalpy of an ionic solid cannot be measured directly by experiment.

(i) Write an equation to define what is meant by lattice enthalpy

(ii) Name all the enthalpy changes that need to be measured to calculate the lattice enthalpy of a simple ionic compound MX. In each case write an equation to represent the change that occurs.

(b) (i) Draw the Born-Haber cycle for CaO given the following data in kJ mol^{-1}.

For Calcium	Atomisation enthalpy	+177
	1st ionisation enthalpy	+590
	2nd ionisation enthalpy	+1145
For Oxygen	Atomisation enthalpy	+249
	1st electron affinity	-141
	2nd electron affinity	+798
	Enthalpy of formation for CaO	-635

(iii) Explain why the second ionisation enthalpy of calcium is greater than the first ionisation enthalpy.

(iii) Compare the first ionisation enthalpy of calcium with that of magnesium.

ශ්‍රී ලංකා විවෘත විශ්වවිද්‍යාලය.

PSE 1303 - 2009/2010

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පැවරුම II

1) a) i) A හා B අඩංගු පරිපූර්ණ, ද්විසංඝටක ද්‍රව පද්ධතියක් සඳහා රවුල්ගේ නියමය ගණිතමය ප්‍රකාශයක් ලෙස ලියා දක්වන්න. සියලුම පද හඳුන්වන්න.

ii) ද්‍රාවණයක ජලය 0.200 kg තුළ යූරියා [$CO(NH_2)_2$] 15.00 g අඩංගු වේ. ජලයේ වාෂ්ප පීඩනය 25 °C දී ටෝර් (torr) 23.7 වේ. 25 °C දී මෙම ද්‍රාවණයේ ආංශික වාෂ්ප පීඩනය ගණනය කරන්න.

b). C හා D නමැති වාෂ්පශීලී ද්‍රාවක දෙකක් මිශ්‍ර කිරීමෙන් සෑදෙන ද්‍රාවණයක් පරිපූර්ණ හැසිරීමෙන් විශාල ධන අපගමනයක් පෙන්වයි.

i) D හි මවුලික භාගයට එදිරියෙන් වාෂ්ප පීඩනය ප්‍රස්තාරගත කරන්න. (සංශුද්ධ C හි වාෂ්ප පීඩනය සංශුද්ධ D හි සංශුද්ධ වාෂ්ප පීඩනයට වඩා වැඩිය)

ii). මෙම ද්‍රාවණය නියත තාප මිශ්‍රණයක් සාදයි නම්, D හි මවුල භාගයට එදිරියෙන් උෂ්ණත්වය ප්‍රස්තාරගත කරන්න. (පීඩනය නියතයක්ව පවතී)

c). A නම් වාෂ්පශීලී ද්‍රවයක සංතෘප්ත වාෂ්ප පීඩනය 30 °C දී ටෝර් (torr) 68 වේ. B නම් වාෂ්පශීලී නොවන ද්‍රව්‍යයක 5 g ක්, A ද්‍රවය 150 g ක දිය කළ විට ද්‍රාවණයේ වාෂ්ප පීඩනය ටෝර් 67 වේ. A හි සාපේක්ෂ අණුක / මවුලික ස්කන්ධය 30 නම්, B හි සාපේක්ෂ අණුක ස්කන්ධය ගණනය කරන්න.

a) අයනික සංයෝගයක දැලිස එන්තැල්පිය පරීක්ෂණ මගින් කෙලින්ම මැනිය නොහැක.

i) දැලිස එන්තැල්පිය අර්ථ දැක්වෙන ලෙස සමීකරණයක් ලියන්න.

ii) සරල අයනික සංයෝගයක (MX) දැලිස එන්තැල්පිය ගණනය කිරීම සඳහා මැනිය යුතු සියළුම එන්තැල්පි වෙනස් වීම් නම් කරන්න. සෑම වෙනස්වීම නම් කරන්න. සෑම වෙනස් වීමක්ම නිරූපනය වන ලෙස සමීකරණ ලියා දක්වන්න.

b) i) kJ mol^{-1} වලින් දී ඇති පහත දත්ත උපයෝගී කරගනිමින් CaO සඳහා බෝන්-හේබර් චක්‍රය ඇඳ දක්වන්න.

කැල්සියම් සඳහා,

තූකරණ ශක්තිය (atomization E)	+ 177
පළමුවන අයනීකරණ ශක්තිය	+ 590
දෙවන අයනීකරණ ශක්තිය	+ 1145

ඔක්සිජන් සඳහා,

තූකරණ ශක්තිය (atomization E)	+ 249
පළමු වන ඉලෙක්ට්‍රොන බන්ධුතාව	- 141
දෙවන ඉලෙක්ට්‍රොන බන්ධුතාව	+ 798
CaO හි උත්පාදනය එන්තැල්පිය	- 635

iii) කැල්සියම්හි දෙවන අයනීකරණ ශක්තිය, පළමු වන අයනීකරණ ශක්තියට වඩා විශාල වන්නේ මන්දැයි පහදන්න.

iv). කැල්සියම් හි පළමුවන අයනීකරණ ශක්තිය, මැග්නීසියම් හි පළමුවන අයනීකරණ ශක්තිය හා සසඳන්න

PSF 1303 மதிப்பீடு II 2009/2010

5 copie)

1(a)

(i) A,B ஆகிய துவித திரவங்களைக் கொண்ட இலட்சியக் கரைசல தொகுதிக்கு பிரயோகிக்கக் கூடிய இரவோற்றின் விதியின் கணித வடிவக் கோவையினை எழுதுக.

(ii) கரைசலொன்று 0.2 kg நீரில் 15.00g யூரியாவினைக் , $(Co(NH_2)_2)$ கொண்டுள்ளது. 25°C இல் நீரின் ஆவியமுக்கம் 23.7 torr எனின் 25°C இல் கரைசலில் நீரினது பகுதி ஆவிஅமுக்கம் யாது?

(b) C,D எனும் இரண்டு ஆவிப்பறப்புடைய கரைப்பான்களைக் கலப்பதன் மூலம் உருவாக்கப்பட்ட கரைசலானது இலட்சிய நடத்தையிலிருந்து பெரிய நேர் விலகலைக் காட்டுகின்றது

(i) ஆவிஅமுக்கம் எதிர் D இன் மூல்ப்பின்னம் வரைபினை வரைக. (தூய C யினது ஆவியமுக்கம் தூய D இனது ஆவியமுக்கத்தினை விட அதிகமாகும்.)

(ii) இக்கரைசல் மாறா கொதிநிலைக் கலவையினை உருவாக்கின் வெப்பநிலை எதிர் D இன் மூல்ப்பின்ன வரைபினை வரைக. (அமுக்கம் மாறாது உள்ளது)

(c) ஆவிப்பறப்புடைய திரவம் A, 30°C இல் 68 torr நிரம்பல் ஆவியமுக்கத்தினைக் கொண்டுள்ளது. 5g ஆவிப்பறப்பற்ற சேர்வை B ஆனது A இன் 150g இல் கரைக்கப்பட்டது. அதன் பின்னர் கரைசலின் ஆவியமுக்கம் 67 torr ஆகும். திரவம் A இன் மூலக்கூற்று / மூலர்த்திணிவு 30 எனின் B இன் மூலர்த்திணிவினைக் கணிக்க.

2

(a) அயன் திண்மம் ஒன்றின் சாலகச் சக்தியினைப் பரிசோதனை ரீதியாக நேரடியாகத் துணியமுடியாது.

(i) சாலகச் சக்தி என்பதால் யாது விளங்குகின்றீர் என்பதனை சமன்பாடு ஒன்றின் மூலம் வரையறுக்க.

(ii) எளிய அயன் சேர்வை MX இன் சாலகச் சக்தியினைக் கணிப்பதற்கு அளவிடப்பட வேண்டிய சகல எந்தல்பி மாற்றங்களையும் பெயரிடுக. ஒவ்வொரு சந்தர்ப்பத்திலும் நடைபெறும் மாற்றங்களைச் சுட்டிக் காட்டுவதற்கு சமன்பாடு ஒன்றினை எழுதுக.

(b)

(i) CaO இன் Born-Haber சக்கரத்தினை வரைக, பின்வரும் தரவுகள் $KJmol^{-1}$ இல் தரப்பட்டுள்ளன.

கல்சியத்திற்கு	அணுவாதல் வெப்பவுள்ளுறை	+ 177
	முதலாம் அயனாக்கற்சக்தி	+ 590
	இரண்டாம் அயனாக்கற்சக்தி	+ 1145

ஒட்சிசனிற்கு	அணுவாதல் வெப்பவுள்ளுறை	+ 249
	முதலாம் இலத்திரன் நாட்டற்சக்தி	- 141
	இரண்டாம் இலத்திரன் நாட்டற்சக்தி	+ 798
	CaO இன் தோன்றல் வெப்பவுள்ளுறை	- 635

(ii) கல்சியத்தின் இரண்டாம் அயனாக்கல் வெப்பவுள்ளுறை முதலாம் அயனாதல் வெப்பவுள்ளுறையினை விட அதிகமாகும் என விளக்குக

(iii) கல்சியத்தின் முதலாம் அயனாக்கல் வெப்பவுள்ளுறை யினை மக்னீசியத்துடன் ஒப்பிடுக.

PSF 1303

Home Assignment II - Answer guide (2009/2010)

a) i)

$p_A = p^0_A \; x_A$

or

$p_A = p^0_A \; (1 - x_B)$

p_A = Patial Vapour pressure of compound A

p^0_A = Vapour pressure of pure A.

x_B = Mole fraction of A

x_B = Mole fraction of B

ii) $p_{H_2O} = p^0_{H_2O} \cdot x_{H_2O}$

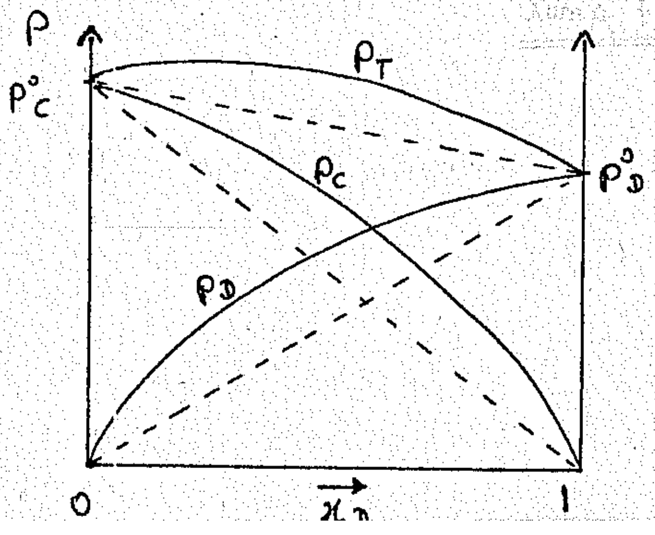
$$x_{H_2O} = \frac{0.2 \times 10^3 g / 18 g mol^{-1}}{0.2 \times 10^3 g / 18 g mol^{-1} + 15.00 g / 60 g mol^{-1}}$$

$x_{H_2O} = 0.977$

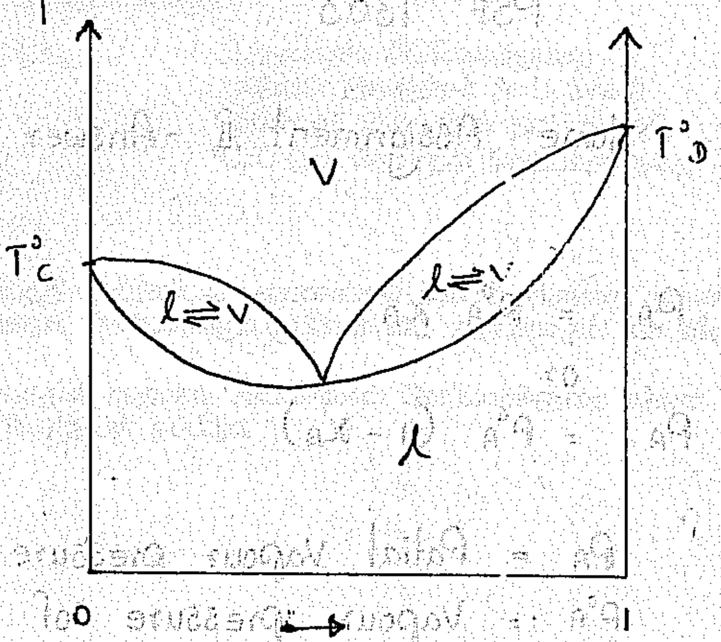
$p_{H_2O} = 23.7$ torr $\times 0.977$

$\underline{\underline{p_{H_2O} = 23.17 \text{ torr}}}$

b) i)



ii)



c)

$$P_A = P^0_A \, x_A$$

$$P_A = P^0_A \, (1 - x_B)$$

$$x_B = \frac{m_B/M_B}{m_B/M_B + m_A/M_A}$$

$$67 \text{ torr} = 68 \text{ torr} \, (1 - x_B)$$

$$68 \, x_B = 1$$

$$x_B = \frac{1}{68}$$

$$\underline{\underline{M_B = 67 \text{ gmol}^{-1}}}$$

a) i)

$$Mx_{(s)} \longrightarrow M^{+}_{(g)} + X^{-}_{(g)}$$

ii)

i) Atomization of $M_{(s)}$

$$M_{(s)} \xrightarrow[\Delta H \text{ atom}]{} M_{(g)}$$

ii) Ionization enthalpy of $M_{(g)}$

$$M_{(g)} \longrightarrow M^{+}_{(g)} + e$$

iii) Atomization enthalpy of $x_2\,_{(g)}$

$$\tfrac{1}{2}\, x_{2\,(g)} \longrightarrow x_{(g)}$$

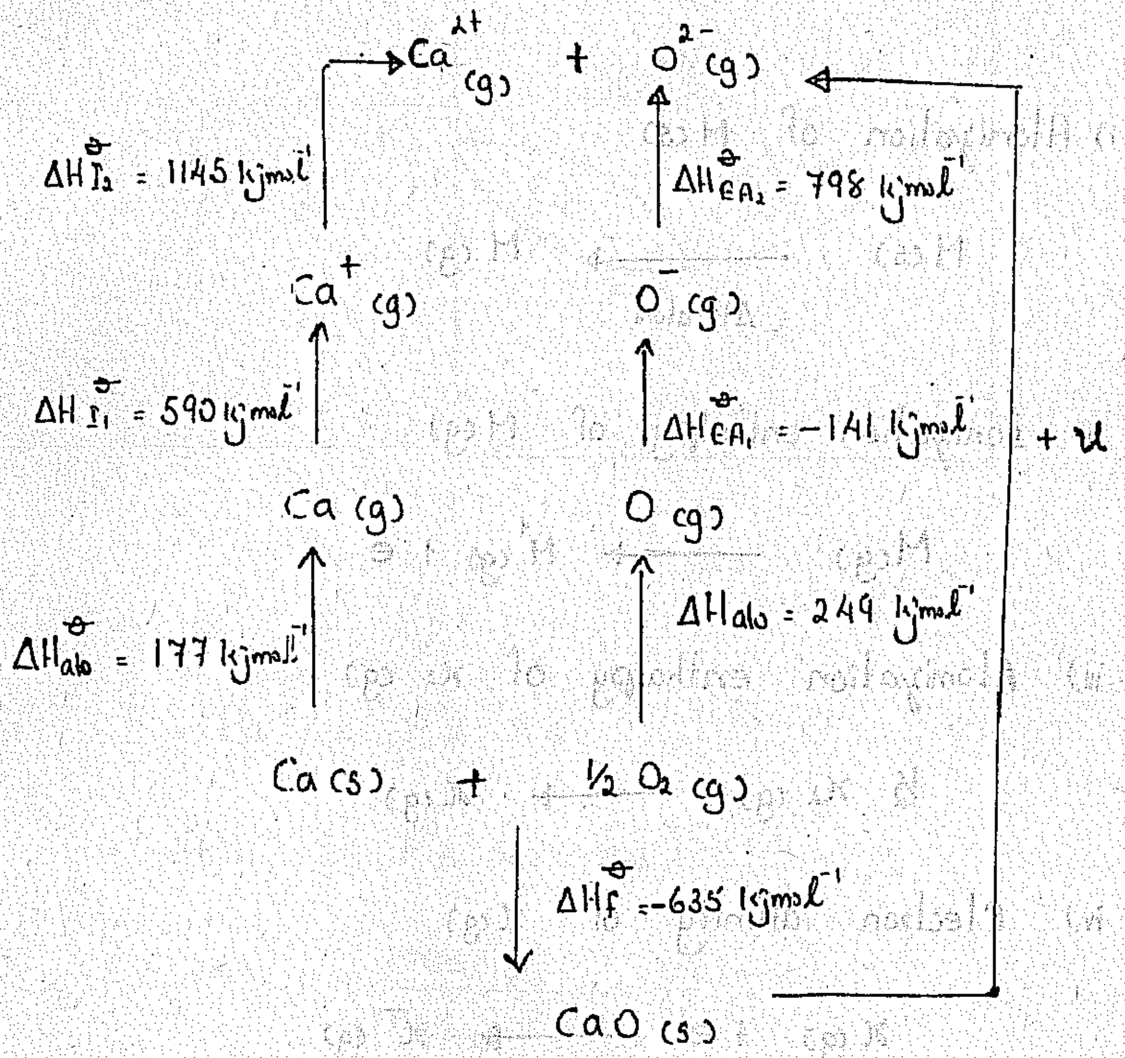
iv) Electron affinity of $x_{(g)}$

$$x_{(g)} + e \longrightarrow x^{-}_{(g)}$$

v) Enthalpy of formation of Mx

$$M_{(s)} + \tfrac{1}{2} X_{2\,(g)} \longrightarrow Mx_{(s)}$$

b)



$177\ \text{kjmol}^{-1} + 590\ \text{kjmol}^{-1} + 1145\ \text{kjmol}^{-1} + 249\ \text{kjmol}^{-1} + (-141\ \text{kjmol}^{-1}) + 798\ \text{kjmol}^{-1}$

$$\shortparallel$$

$$-635\ \text{kjmol}^{-1} + U$$

$$\underline{\underline{U = 3453\ \text{kjmol}^{-1}}}$$

iii) Ca - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

During the 1st ionization process, 1 electron can easily removed from 4s orbital.
But in the second stage effective nuclear charge on $4s^1$ electron is large and therefore need more energy to remove the 2nd electron.

iv). Mg - $1s^2 2s^2 2p^6 3s^2$

Ca - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Both Mg & Ca belong to Group II, Ca has higher atomic radius than that of Mg. Therefore Mg nucleus attract 3s electron more towards it and need more energy to remove that. Therefore 1st ionization energy of Mg is a larger value compared to that of Ca.