The Open University of Sri Lanka
Foundation Certificate Course in Science
CMF2205 – 2013 / 2014
Home Assignment I

Answer all Questions.

1 (a) (i) Calculate the energy needed to remove the electron from hydrogen (H) atom and form hydrogen ion (H^+). Energy equation for any atom $E = -4.34\times10^{-18} J/n^2$

(ii) If that required energy is given as light. Calculate the wavelength in(nm) of the photon to associated with this transition.

(iii) Calculate the energy required for the formation of a mole hydrogen ions (H^+).

(b) The mass of a hydrogen atom is 1.67×10^{-27} kg. How many atoms are there in a 8.0 g sample of hydrogen ?

(c) How many protons, neutrons and electrons are present in each of the following species?

(i) $^{20}_{10}Ne$ (ii). $^{9}_{4}Be$ (iii). $^{81}_{37}Rb$ (iv). $^{15}_{8}O$ (v) . $^{118}_{54}Xe$

(d). (i) X, which gives $^{14}_{7}N$ after two successive β-emissions. Identify **X** and **Y**

$$\mathbf{X} \longrightarrow \mathbf{Y} \longrightarrow {}^{14}_{7}N$$

(ii) The isotope of $^{235}_{92}U$ can be converted to $^{231}_{92}U$ .Identify **P** and **Q**

$$^{235}_{92}U \longrightarrow \mathbf{P} \longrightarrow \mathbf{Q} \longrightarrow {}^{231}_{92}U$$

2.(a) The following questions are based on the first eighteen (**18**) elements in the periodic table

(i) Write the two elements that forms a bond with the highest ionic character.

(ii) What elements form the most stable covalent diatomic molecules?.

(iii) Which element has the highest first ionization energy?

(iv) Identify two elements that form electron deficient compounds.

(b) Write down the balance chemical equation for the reaction when CO_2 is bubbled through $Ca(OH)_2$. Write the balance chemical equation and show what will happen if excess CO_2 is bubbled through this solution.?

(c) (i) Draw the graph for first ionization energy versus atomic number of the 2nd periodic of elements in periodic table

(ii) Explain why there is not a gradually change.

(d) . Deduce the relevant oxidation states of P and N in the following compounds.

N_2 P_2O_5 N_2H_4 H_3PO_4

(e) Define the following terms

(i) Isotopes (ii) Atomic Number

(iii) First ionization energy (iv) Radioactivity

(f) Write down the electronic configuration for the following elements

(i.) K (ii). Zn (iii). Cr (iv). Cu (v). Kr

CMF 2205 / (2013/2014) **Reg. No:** | | | | | | | | | | |

Home Assignment 1 – Chemistry 1

- Read the following instructions carefully and act accordingly
- If you have any difficulties in understanding them please contact the junior co-coordinator of the course unit

Ques. No:	Max. Marks	Marks Obtained
1		
2		
Total		
%		

Procedure

1. Write down well focused answers to all(02) questions clearly in sheets of paper.

2. Write down **your registration number, your mailing address**, in block capital letters in the spaces provided overleaf. **Place your signature** in the space provided below and attach this cover page on top of your answer script.

3. Enclose the answer script (+cover page) in an envelope with **"Home Assignment 1 –CMF 2205"** written on the top left hand corner and submit to the chemistry department on or before the deadline date.

Deadline for return

DEADLINE DATE 4th November 2013 . However in order to accommodate postal delays the department would accept assignments received up to seven (07) days later. Please make sure that your assignment is **RECIEVED** by the Chemistry Department not later than 3.30 p.m. on that date. **Assignments received after that time will not be marked.**

Two possible ways of submitting the answer scripts.

- You can drop the envelope containing the answer script in the assignment box in **Block 15** of the Colombo Regional Centre.
- You can post the answer script (so that the department receives it by the deadline described above), preferably via registered post, to the following address.

The Course Coordinator / CMF 2205,
Department of Chemistry,
The Open University of Sri Lanka,
P.O. Box 21, Nawala,
Nugegoda.

The marks of this home assignment will be used in calculating your CAM.

I certify that the answers provided in the attached answer script are mine.

Signature : ..... Date :.....

The Open University of Sri Lanka
Foundation Certificate Course in Science – 2013 / 2014
Faculty of Natural Sciences, Department of Chemistry
CMF2205: Home Assignment I - Answer Guide

1. (a) (i)

$$\text{Energy (E)} = \frac{-\ 4.34 \times 10^{-18}\ \text{J}}{n^2}$$

For Hydrogen Atom n=1, $E_1 = -4.34 \times 10^{-18}$ J

To form H^+ ion n= ∞, $E_\infty = 0$

Energy required to form H^+ ion = 4.34×10^{-18} J

(ii) $E = \frac{hc}{\lambda}$

$$\lambda = \frac{hc}{E} = \frac{6.63 \times 10^{-34}\ \text{Js} \times 3 \times 10^{8}\ \text{ms}^{-1}}{4.34 \times 10^{-18}\ \text{J}}$$

$$= 4.583 \times 10^{-8}\ \text{m} = 45.83\ \text{nm}$$

(iii) $E = 4.34 \times 10^{-18}\ \text{J} \times 6.022 \times 10^{23}\ \text{mol}^{-1}$

$= 26.14 \times 10^{5}\ \text{J mol}^{-1}$

(b) No of atoms in 8.0g = $\frac{8.0}{1.67 \times 10^{-27} \times 10^{3}} = 4.79 \times 10^{24}$

(c).

	Proton - P	Neutron - N	Electron - e
$^{20}_{10}Ne$	10	10	10
$^{9}_{4}Be$	4	5	4
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$^{118}_{54}Xe$	54	64	54

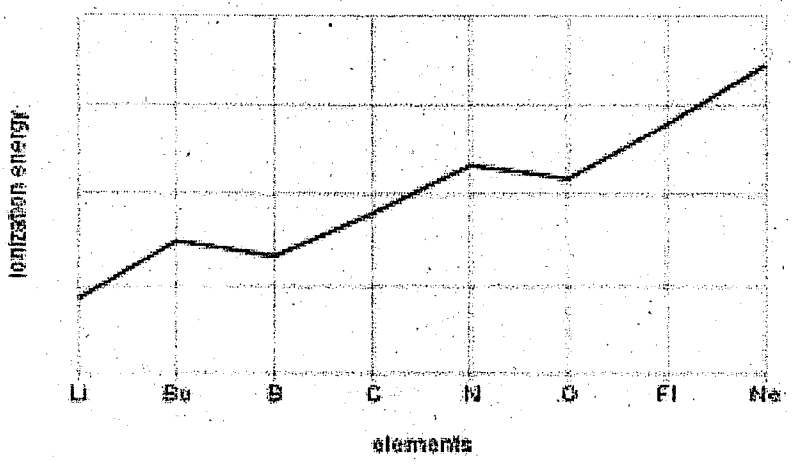
(d) (i) ${}^{14}_{5}X$, ${}^{14}_{6}Y$ (ii) ${}^{235}_{92}U \xrightarrow{{}^{4}_{2}\alpha} {}^{231}_{90}P \xrightarrow{{}^{0}_{-1}\beta} {}^{231}_{91}Q \xrightarrow{{}^{0}_{-1}\beta} {}^{231}_{92}U$

2. (a) (i) Na F (ii) N (iii) He (iv) B, Be

(b) $Ca(OH)_{2(aq)} + CO_{2(g)} \longrightarrow CaCO_{3(s)} + H_2O_{(l)}$

$CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow Ca(HCO_3)_{2(aq)}$

(c)



Be electron configuration $1s^2\ 2s^2$
B electron configuration $1s^2\ 2s^2\ 2p^1$
B can easily remove an electron from 2p and form stable configuration ($1s^2\ 2s^2$)
Be 1st ionization energy > B 1st ionization energy

N electron configuration $1s^2\ 2s^2\ 2p^3$
O electron configuration $1s^2\ 2s^2\ 2p^4$
O can easily remove an electron from 2p and form half filled 2p stable configuration
N 1st ionization energy > O 1st ionization energy

(d) $N_2 = 0$ $N_2H_4 = -2$ $P_2O_5 = +5$ $H_3PO_4 = +5$

(e) (i) Atoms which the atomic number change but the mass number didn't change are called as isotopes
(ii) Number of protons in the nucleus of a given atom is called atomic number
(iii) The energy required to remove the first electron from a neutral gaseous atom.
(iv) Spontaneous emission of radiation from an unstable nucleus.

(f) (i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2$
(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$
(iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$
(v) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$

ශ්‍රී ලංකා විවෘත විශ්ව විද්‍යාලය

විද්‍යා පදනම් පාඨමාලාව

CMF 2205 - 2013/2014

පැවරුම I

සියලුම ප්‍රශ්නවලට පිළිතුරු සපයන්න.

1 (a)

(i) H පරමාණුවෙන් ඉලෙක්ට්‍රෝනයක් ඉවත් කිරීමෙන් H^+ අයනය සෑදීමට ලබා දිය යුතු ශක්තිය ගණනය කරන්න. පරමාණුවක ශක්තිය ගණනයට අඩුළු සම්කරණය වනුයේ, $E = -4.34 \times 10^{-18}\ J/n^2$

(ii) ඉහත ඉලෙක්ට්‍රෝනය සංක්‍රමණයේ අවශ්‍ය ශක්තිය ආවලෝකය ලෙස ලබා දෙන්නේ නම් එම සංක්‍රමණයට අවශ්‍ය තරංග ආයාමය nm වලින් ගණනය කරන්න.

(iii) H^+ අයන මවුලයක් සෑදීමට අවශ්‍ය ශක්තිය ගණනය කරන්න.

(b) H පරමාණුවක ස්කන්ධය වනුයේ 1.67×10^{-27} kg. වේ. H 8.0 g ස්කන්ධයක අඩංගු සාමීපලයන පරමාණු ගණන ගණනය කරන්න.

(c) පහත විශේෂවල ප්‍රෝටෝන, නියුට්‍රෝන සහ ඉලෙක්ට්‍රෝන ගණන ගණනය කරන්න.

(i) $^{20}_{10}Ne$ (ii) $^{9}_{4}Be$ (iii) $^{81}_{37}Rb$ (iv) $^{15}_{8}O$ (v) $^{118}_{54}Xe$

(d)(i) X, සාර්ථක β^- විමෝචන 2 කට පසුව $^{14}_{7}N$ ලබා දෙයි. X සහ Y වනුයේ,

$$X \longrightarrow Y \longrightarrow {}^{14}_{7}N$$

(ii) $^{235}_{92}U$ සමස්ථානිකය $^{231}_{92}U$ බවට පරිවර්තනය කර හැක. P සහ Q වනුයේ,

$$^{235}_{92}U \longrightarrow P \longrightarrow Q \longrightarrow {}^{231}_{92}U$$

2. (a) පහත සඳහන් තුන්න ආවර්තිතා වගුවෙහි මුල් මූලද්‍රව්‍ය 18 හා සම්බන්ධ

(i) තුන්වන ආවර්තය ලක්ෂණ සහිත බන්ධන සාදන මූලද්‍රව්‍ය 2 වනුයේ,

(ii) කුමන මූලද්‍රව්‍ය වෙන්ම ස්ථායී සහසංයුජ ද්විපරමාණුක අණු සාදයි ද?

(iii) තුන්වන පළමු අයනීකරණ ශක්තියක් ඇති මූලද්‍රව්‍ය වනුයේ,

(iv) තුලෙක්ත්‍රෝන ලබන සංයෝග සාදන මූලද්‍රව්‍ය 2 වනුයේ,

(b) $Ca(OH)_2$ හරහා CO_2 බුබුලනය නිරීමට අදාළ තුලිත රසායනික සමීකරණය ලියා දක්වන්න. ද්‍රාවණය තුලින් වැඩිපුර CO_2 බුබුලනය කරවීම සිදුවන දේ තුලිත රසායනික සමීකරණයක් ආධාරයෙන් ලියා දක්වන්න.

(c)(i) ආවර්තිතා වගුවේ 2 වන ආවර්තයේ මූලද්‍රව්‍ය වල පළමු අයනීකරණ ශක්තිය සහ පරමාණුක අංකය අතර ප්‍රස්ථාරය ඇඳ දක්වන්න.

(ii) එහි කුමන වෙනසක් නොමැති වීමට කරුණු දක්වන්න.

(d) පහත සංයෝගවල P සහ N වලට අදාළ ඔක්සිකරණ අංක ලියා දක්වන්න.

(i) N_2 (ii) P_2O_5 (iii) N_2H_4 (iv) H_3PO_4

(e) පහත පද අර්ථ දක්වන්න.

(i) සමස්ථානික (ii) පරමාණුක අංකය

(iii) පළමු අයනීකරණ ශක්තිය (iv) විකිරණශීලතාව

(f) පහත මූලද්‍රව්‍ය වලට අදාළ තුලෙක්ත්‍රෝන වින්‍යාස ලියා දක්වන්න.

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2. (a) (i) Na F (ii) N (iii) He (iv) B, Be

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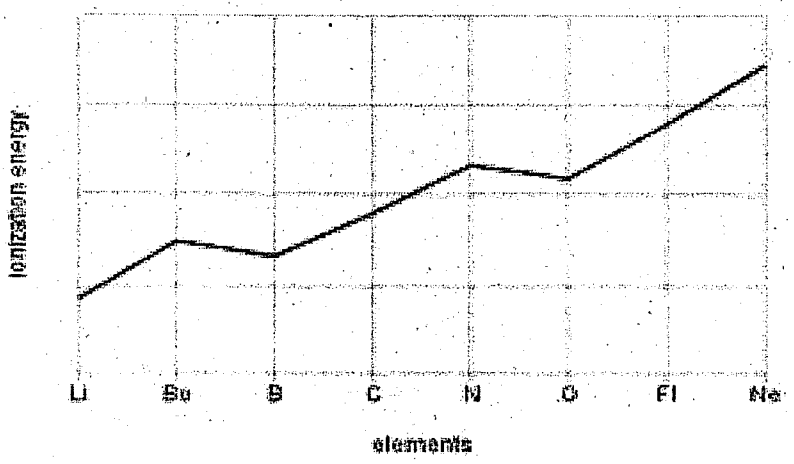
$CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow Ca(HCO_3)_{2(aq)}$

(c)



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Be 1st ionization energy > B 1st ionization energy

N electron configuration $1s^2\ 2s^2\ 2p^3$
O electron configuration $1s^2\ 2s^2\ 2p^4$
O can easily remove an electron from 2p and form half filled 2p stable configuration
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(d) $N_2 = 0$ $N_2H_4 = -2$ $P_2O_5 = +5$ $H_3PO_4 = +5$

(e) (i) Atoms which the atomic number change but the mass number didn't change are called as isotopes
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(f) (i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2$
(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$
(iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$
(v) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$

இலங்கை திறந்த பல்கலைக்கழகம்

விஞ்ஞான அத்திவாரப் பாடநெறி

CMF 2206 - 2012/2013

வீட்டு ஒப்படை - I

எல்லா வினாக்களுக்கும் விடையளிக்க.

(1) (a) (i) ஐதரசன் (H) அணுவொன்றிலிருந்து இலத்திரனொன்றை அகற்றி ஐதரசன் அயனை (H^+) உருவாக்குவதற்கு தேவையான சக்தியை கணிக்க. அணுவொன்றிற்கான சக்தி சமன்பாடு $E = -4.34 \times 10^{-18}\ J/n^2$

(ii) மேற்படி சக்தியானது ஒளியினூடாக கொடுக்கப்படின், இம்மாற்றத்துடன் தொடர்புடைய போட்டோனின் அலைநீளத்தைக் (nm) கணிக்க.

(iii) ஒரு மூல் ஐதரசன் அணுக்களை (H^+) உருவாக்கத் தேவையான சக்தி யாது?

(b) ஐதரசன் அணுவின் திணிவு 1.67×10^{-27} kg எனின், 8.0 g ஐதரசன் மாதிரியிலுள்ள அணுக்களின் எண்ணிக்கை.

(c) பின்வரும் ஒவ்வொரு மூலகத்திலும் காணப்படுகின்ற புரோத்தன்கள், நியூத்திரன்கள் மற்றும் இலத்திரன்களின் எண்ணிக்கை.

(i) $^{20}_{10}Ne$ (ii). $^{9}_{4}Be$ (iii). $^{81}_{37}Rb$ (iv). $^{15}_{8}O$ (v). $^{118}_{54}Xe$

(d) (i) X ஆனது இரண்டு β - காலலினூடாக $^{14}_{7}N$ இனைத் தருகின்றது. X, Y இனை இனங் காண்க.

$$X \longrightarrow Y \longrightarrow {}^{14}_{7}N$$

(ii) $^{235}_{92}U$ சமதானியானது $^{231}_{92}U$ ஆக மாற்றப்படலாம். P மற்றும் Q இனை இனங்காண்க

$$^{235}_{92}U \longrightarrow P \longrightarrow Q \longrightarrow {}^{231}_{92}U$$

(2) (a) பின்வரும் வினாக்கள் ஆவர்த்தன அட்டவணையில் முதல் பதினெட்டு (18) மூலகங்கள் தொடர்பானது.

(i) உயர் அயனியல்பைக் காட்டும் பிணைப்பினை உருவாக்கும் இரு மூலகங்களைத் தருக.

(ii) உறுதியான பங்கீட்டுவலுப்பிணைப்பைக் கொண்ட ஈரணு மூலக்கூறுகளை உருவாக்கும் மூலகங்கள் யாவை?

(iii) உயர் முதலாம் அயனாக்கச்சக்தியைக் கொண்ட மூலகம் யாது?

(iv) இலத்திரன் பற்றாக்குறையான மூலக்கூறுகளை உருவாக்கும் இரு மூலகங்களை கண்டறிக.

(b) $Ca(OH)_2$ கிற்கு CO_2 வாயுக் கலிழ்கள் செலுத்தப்படும் தாக்கத்திற்கான சமப்படுத்தப்பட்ட இரசாயனச் சமன்பாட்டினை எழுதுக. மேலதிக CO_2 வாயுக்கலிழ்கள் கரைசலில் செலுத்தப்படின் நடைபெறும் தாக்கத்திற்கான சமப்படுத்தப்பட்ட இரசாயனச் சமன்பாடு யாது ?

(c) (i) அவர்த்தன அட்டவணையில் இரண்டாம் ஆவர்த்தன மூலகங்களின் முதலாம் அயனாக்கச் சக்திக்கும் அணுவெண்ணிற்குமான வரைபினை வரைக.

(ii) இவ்வரைபானது திடீர்ப்பிடித்தலுக்கு ஏதுவாக காட்டப்படமைக்கான காரணத்தை விளக்குக.

(d) பின்வரும் மூலக்கூறுகளில் P மற்றும் N இன் ஒட்சியேற்ற நிலைகளை உய்த்தறிக.

N_2 P_2O_5 N_2H_4 H_3PO_4

(e) பின்வரும் பதங்களை வரைவிலக்கணப்படுத்துக

(i) சமதானிகள் (ii) அணுவெண் (iii) முதலாம் அயனாக்கச் சக்தி

(iv) கதிர்த்தொழிற்பாடு

(f) பின்வரும் மூலகங்களின் இலத்திரன் நிலையமைப்பை எழுதுக

(i.) K (ii). Zn (iii). Cr (iv). Cu (v). Kr

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CMF2205: Home Assignment I - Answer Guide

1. (a) (i)

$$\text{Energy (E)} = \frac{-\ 4.34 \times 10^{-18}\ \text{J}}{n^2}$$

For Hydrogen Atom n=1, $E_1 = -4.34 \times 10^{-18}$ J

To form H^+ ion n= ∞, $E_\infty = 0$

Energy required to form H^+ ion = 4.34×10^{-18} J

(ii) $E = \frac{hc}{\lambda}$

$$\lambda = \frac{hc}{E} = \frac{6.63 \times 10^{-34}\ \text{Js} \times 3 \times 10^{8}\ \text{ms}^{-1}}{4.34 \times 10^{-18}\ \text{J}}$$

$$= 4.583 \times 10^{-8}\ \text{m} = 45.83\ \text{nm}$$

(iii) $E = 4.34 \times 10^{-18}\ \text{J} \times 6.022 \times 10^{23}\ \text{mol}^{-1}$

$= 26.14 \times 10^{5}\ \text{J mol}^{-1}$

(b) No of atoms in 8.0g = $\frac{8.0}{1.67 \times 10^{-27} \times 10^{3}} = 4.79 \times 10^{24}$

(c).

	Proton - P	Neutron - N	Electron - e
$^{20}_{10}Ne$	10	10	10
$^{9}_{4}Be$	4	5	4
$^{81}_{37}Rb$	37	44	37
$^{15}_{8}O$	8	7	8
$^{118}_{54}Xe$	54	64	54

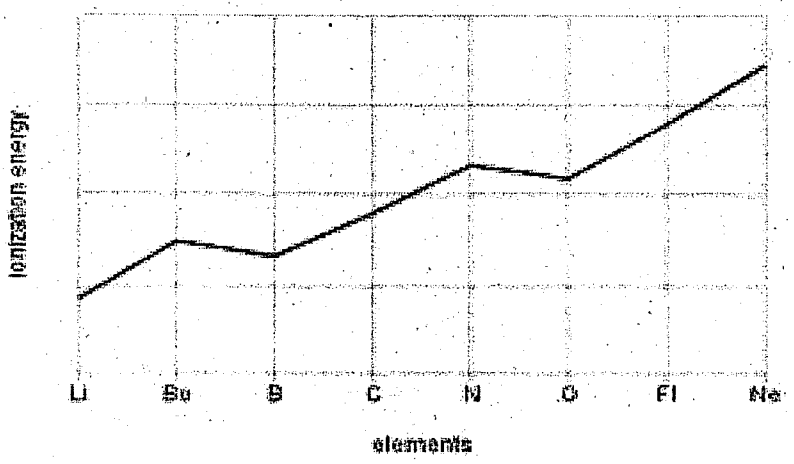
(d) (i) ${}^{14}_{5}X$, ${}^{14}_{6}Y$ (ii) ${}^{235}_{92}U \xrightarrow{{}^{4}_{2}\alpha} {}^{231}_{90}P \xrightarrow{{}^{0}_{-1}\beta} {}^{231}_{91}Q \xrightarrow{{}^{0}_{-1}\beta} {}^{231}_{92}U$

2. (a) (i) Na F (ii) N (iii) He (iv) B, Be

(b) $Ca(OH)_{2(aq)} + CO_{2(g)} \longrightarrow CaCO_{3(s)} + H_2O_{(l)}$

$CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow Ca(HCO_3)_{2(aq)}$

(c)



Be electron configuration $1s^2\ 2s^2$
B electron configuration $1s^2\ 2s^2\ 2p^1$
B can easily remove an electron from 2p and form stable configuration ($1s^2\ 2s^2$)
Be 1st ionization energy > B 1st ionization energy

N electron configuration $1s^2\ 2s^2\ 2p^3$
O electron configuration $1s^2\ 2s^2\ 2p^4$
O can easily remove an electron from 2p and form half filled 2p stable configuration
N 1st ionization energy > O 1st ionization energy

(d) $N_2 = 0$ $N_2H_4 = -2$ $P_2O_5 = +5$ $H_3PO_4 = +5$

(e) (i) Atoms which the atomic number change but the mass number didn't change are called as isotopes
(ii) Number of protons in the nucleus of a given atom is called atomic number
(iii) The energy required to remove the first electron from a neutral gaseous atom.
(iv) Spontaneous emission of radiation from an unstable nucleus.

(f) (i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2$
(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$
(iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$
(v) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$