

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Chemistry

Semester: Spring

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Write the mechanism of buffer action of a solution containing a mixture of benzoic acid and sodium benzoate. Calculate the PH of 500ml of a buffer solution containing 0.2M ammonium sulphate and 0.3M ammonia which is 2.1% ionized in dilute solution. 7
- b) What do you mean by standard electrode potential? How single electrode is potential originated? Calculate the emf of the following cell at 25° C $Zn/Zn^{++}(0.01M)//Cu^{++}(0.1M)/Cu$. 8
- Given,
 $E^{\circ} Zn/Zn^{++} = 0.76V$
 $E^{\circ} Cu/Cu^{++} = -0.34V$
 $R = 8.314 JK^{-1} mol^{-1}$, $F = 96500C$
- a) Give reasons 8
- Transition elements form significant number of complexes.
 - $TiCl_3$ compounds are coloured but those of $TiCl_4$ are colorless.
 - Zn is not considered as true transition elements
 - Transition elements show variable valency.
- b) Define Ionization Energy. Explain the factors affecting electro negativity? Why electron affinity of chlorine is higher than fluorine? 7
- a) How do enantiomers differ from diastereomers? Differentiate between carbocations and carbonanions within their stability. 7
- b) What are elimination reactions? Write the mechanism of E_1 and E_2 reactions giving suitable examples. 8

4.

5.

6.

7.

4. a) Explain addition polymerization. How it differs from condensation polymerization? 7
- b) Write short notes on : 8
- Vulcanization of rubber
 - Nylon 6,6

OR

Explain de-Broglie's Principle of dual nature of electron. Calculate the radius of the orbit of electron of Hydrogen atom which is in the 3rd energy level. (mass of electron = 9.1091×10^{-31} kg, Plank's constant, $h = 6.62 \times 10^{-34}$ Js, permittivity, $\epsilon_0 = 8.85 \times 10^{-12}$ kg⁻¹m⁻³A², charge on electron, $e = 1.6 \times 10^{-19}$ C)

5. a) What do you mean by Paper chromatography? Explain briefly, how it can be used for analyzing solutes present in the given sample 7

OR

Explain the following:

- The compound having metallic bonds are good conductor of heat and electricity. 7
 - Covalent bonds are directional in nature
 - H₂O exist as liquid but H₂S as gas at room temperature
 - Contraction of water takes place up to 4⁰c
- b) What are lubricants? Give its functions. Give the preparation method and used of TNT. 8

OR

Differentiate between Molecular Orbital Theory with Valence Bond Theory. Write the characteristics of S- block elements. 8

6. a) What are the causes of air pollution? Write its impact on human health. Also mention its controlling measures. 7
- b) Define hardness of water. How it is estimated in the laboratory? 8
7. Write short notes on: (Any Two) 2
- Corrosion
 - Ozone layer depletion
 - Green house effect and global warming.

POKHARA UNIVERSITY

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Programme: BE
Course: Chemistry

Semester: Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Write the buffer mechanism of basic buffer solution giving suitable example. Calculate the pH of the solution formed by mixing 500 ml of 0.2 M acetic acid to 500 ml of 0.4 M sodium acetate. Also calculate the pH of resulting solution when 1 ml of 1M HCl is added to the above solution. pK_a for acetic acid is 4.74. 8
- b) How is single electrode potential of Cu electrode measured experimentally? From the given electrode potential values answer the following: 7
- i. Write the electrode reactions.
 - ii. Write the cell reaction.
 - iii. Calculate the e.m.f. of the cell at 27°C when both the electrodes are coupled together
- $E^\circ_{\text{Mg}/\text{Mg}^{++}} = +2.370\text{V}$
 $E^\circ_{\text{Fe}/\text{Fe}^{++}} = +0.440\text{V}$
 $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$
 $F = 96500\text{C}$
 $[\text{Mg}^{++}] = 0.1\text{M}, [\text{Fe}^{++}] = 0.01\text{M}$
2. a) Give reasons: 8
- i. Ionisation energy of nitrogen is greater than oxygen.
 - ii. Electron affinity of chlorine is higher than fluorine.
 - iii. Electro negativity of 'Ga' is higher than 'Al'.
 - iv. Atomic radii go on increasing while moving top to bottom in a group.
- b) Explain why zinc sulphate salt is colorless whereas copper sulphate salt is colorful in nature. Why are transition elements mostly 7

- paramagnetic? Explain.
3. a) Differentiate between enantiomers and diastereomers with examples. What are carbocations? 3° carbocations are more stable than 2° carbocations why?
- b) What are elimination reactions? Write the mechanism of E_2 reaction giving suitable example.
4. a) Write the mechanism of addition polymerization with example. Give the preparation, properties and uses of nylon 66.
- b) Show your acquaintance on:
- Vulcanization of rubber
 - Nylon 6,6.
5. a) Write the procedure involved in TLC. How many NMR signals would you expect in following compounds:
- $CH_3 - O - CH_3$
 - CH_3CH_2OH
- b) How cement can be manufactured? Write the stepwise chemical reaction involved during setting of cement.
6. a) Define water pollution. Mention and explain the causes and effects of water pollution. What can be done to control it?
- b) What are green house gases? How are these gases responsible for global warming? Explain the effects of global warming and how can it be controlled?
7. Write short notes on: (Any two)
- Electrochemical series
 - Determination of hardness of water.
 - Bakelite.

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The figures in the margin indicate full marks.

Attempt all the questions.

6.

7.

- 1) What is buffer solution? Write the mechanism of buffer action of acidic buffer with suitable example. Calculate the pH of buffer solution containing 400 ml of 0.3 M acetic acid and 200 ml of 0.6 M sodium acetate (K_a of acetic acid is 1.8×10^{-5}) 7
- 2) What do you mean by standard hydrogen electrode? Calculate the emf of the following cell 8

$$\text{Zn(s)}/\text{Zn}^{2+}(0.1\text{M})//\text{Cu}^{2+}(1.75\text{M})/\text{Cu(s)} \text{ at } 25^\circ\text{C}$$

$$E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$$

$$E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$$

$$R = 8.314\text{Jmol}^{-1}\text{K}^{-1}$$

$$F = 96500\text{C}$$
- 3) Give reasons for the followings 8
 - i) TiCl_3 is coloured but TiCl_4 is colourless.
 - ii) Transition elements show variable oxidation state.
 - iii) Zn^{2+} salts are white.
 - iv) Cu is not considered as transition element.
- 4) Define ionization energy. Explain the factors affecting negativity. How electron affinity of chlorine is higher than Fluorine. 7
- 5) What are reaction intermediates? Explain the structure and stability of different types of carbocation. 8
- 6) What is $\text{S}_\text{N}1$ reaction? Give reaction mechanism and stereochemistry of $\text{S}_\text{N}1$ reaction in given reaction 7

$$(\text{CH}_3)_3\text{CX} + \text{NaOH(aq.)} \rightarrow (\text{CH}_3)_3\text{C-OH} + \text{NaX}$$
- 7) What is polymerization reaction? Write the different types of polymerization with suitable examples for each. 8

- b) What is rubber? Write the process of vulcanization of rubber 7
5. a) Write principle and important applications of mass spectroscopy in analytical field. Write the applications of TLC 8
- b) What is explosive? Give the methods of preparation of TNT and its important uses. 7
6. a) What is ozone layer depletion? Write its adverse effect to living beings? Describe its photochemistry 8
- b) Define water pollution. Discuss briefly about its sources, effects and control methods 7
7. Write short notes on: (Any two) 2x5
- a) Corrosion, its types and prevention
- b) Difference between E_1 & E_2 reactions
- c) Thermoplastics and Thermosetting Plastics

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Fall

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define buffer solution Explain the mechanism of acidic buffer solution. Calculate the pH of a buffer solution prepared by mixing 400 ml of 0.5M sodium acetate and 800 ml of 0.1M acetic acid which is 1.3% ionized in dilute solution. 8
- b) What is standard hydrogen electrode? How can we determine the standard electrode potential of zinc electrode by using SHE? Determine the reduction potential of zinc electrode when it is dipped in to 0.1M ZnSO_4 solution at 25°C . Given standard oxidation potential of Zinc is 0.76 V. 7
2. a) Explain why ionization energy value of an ion increases as number of positive charge increases. Discuss the factors affecting its value. 7
- b) Give reasons:
 - i. Transition elements show variable oxidation states. 8
 - ii. Mn can form complex compounds but not Mg.
 - iii. Zn is not considered as true transition element.
 - iv. Transition elements are mostly paramagnetic.
3. a) Describe the reaction mechanism and stereochemistry of SN^1 reaction taking suitable example. What are the factors governing the rate of SN^1 and SN^2 reaction? 8
- b) Define carbocation. How are carbocations stabilized? Write any two methods of their formation. 7
4. a) Explain the procedures involved in the preparation of rubber. What do you mean by vulcanization of rubber? 7

OR

Point out the major limitations of Bohr's atomic theory. Derive an

expression so as to calculate the radius of Bohr's third orbit r_3 of an atom.

- b) Write the preparation, properties and uses of PVC. Write the point of differences between thermosetting & thermoplastic polymer.
5. a) Explain the principle, and procedures involved for the separation of mixtures by thin layer chromatography.

OR

Define hybridization. Explain the formation of CH_4 molecule on the basis of hybridization. What is the cause of variation of bond angles between CH_4 , H_2O and NH_3 molecules?

- b) What are lubricants? How are they classified? Write down their uses.

OR

What is metallic bonding? How does electron sea model of metallic bonding explain the metallic properties like metallic luster, thermal and electrical conductivity?

6. a) What is ozone layer depletion? Mention the main causes of it. Explain the consequences of ozone layer depletion. What should be done to control it?
- b) What are the causes of hardness of water? How can it be measured in the laboratory? Describe it.

7. Write short notes on: (Any two)

- a) Corrosion, its types and prevention
- b) Acid rain
- c) Markovnikoff's rule

POKHARA UNIVERSITY

Level: Bachelor
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Course: Chemistry

Semester: Spring

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- 1) What is buffer solution? Write mechanism to show acid buffer solution of benzoic acid and sodium benzoate maintains its P^H constant even after addition of few drop of strong acid or base. Find the P^H of buffer solution which contains 0.1M potassium acetate and 0.2M of acetic acid with 2 % degree of dissociation. What will be changed in PH after addition of $2 \times 10^{-3} M$ KOH solution. (K_a of acetic acid = 1.8×10^{-5}) 8
- 2) How does zinc metal produce single electrode potential? Use SHE to determine single electrode potential copper. Calculate the emf of the cell at 300K from given pairs of half cells. 7

$$Zn(s) \longrightarrow Zn^{+2} (0.1M) + 2e^- \quad E^0 = 0.76 \text{ volts}$$

$$Ag(s) \longrightarrow Ag^+ (0.01M) + e^- \quad E^0 = 0.84 \text{ volts}$$
- 3) a) Give reasons for the followings: 8
 - i. $TiCl_3$ is coloured but $TiCl_4$ is colourless.
 - ii. Transition elements show variable oxidation state.
 - iii. Zn^{+2} salts are white.
 - iv. Cu is not considered as transition element.
- b) Define ionization energy. Explain the factors affecting negativity. How electron affinity of chlorine is higher than Fluorine. 7
- 4) a) What is Elimination reaction? Differentiate between E_1 and E_2 reaction with suitable reaction mechanism. 8
- b) How carbocation are produced? Explain their types along with stability order. 7

4. a) What is polymerization reaction? Write the different types of polymerization with suitable examples for each. 3
- b) Explain briefly: 7
- a) PVC
- b) Vulcanization of rubber
5. a) What is the principle fractional distillation? Write its applications. 5
- b) Write properties, preparation and uses of TNT and TNG. 5
- c) Mention chemistry and setting mechanism of cements. 5
6. a) What is ozone layer depletion? Mention causes, hazardous affects and control measures of global warming. 8
- b) Define alkalinity of water. How is it measure in the laboratory? 7
7. Write short notes on: (Any two) 2×5
- a) Corrosion
- b) Nitration
- c) Thermoplastics and Thermosetting plastics

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Fall

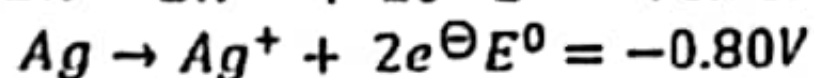
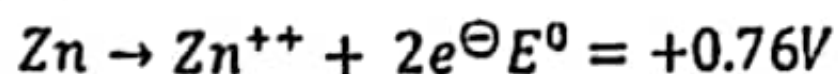
Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Single electrode potential. How do you determine the single electrode potential of Ag – electrode experimentally? Explain. Calculate the emf of the cell at 27°C when given electrodes are coupled together. 2+3+3



$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}, [\text{Zn}^{++}] = 0.2M, [\text{Ag}^+] = 0.1M$$

- b) Define buffer solution. How does basic buffer resist the change in pH on adding few drops of acid and base? The pH of a buffer solution containing 0.5 mol/lit CH_3COOH and 0.5 mol/lit CH_3COONa is found to be 4.76. What will be the pH of this solution after adding 0.1 mol/lit HCl. Assume that the volume is unchanged. ($K_a = 1.75 \times 10^{-5}$) 7

2. a) Give reasons for the followings: 8
- TiCl_3 is coloured but TiCl_4 is colourless.
 - Transition elements show variable oxidation state.
 - Zn^{+2} salts are white.
 - Cu is not considered as transition element.
- b) Differentiate between Electron affinity and Electronegativity. Explain the factor affecting the Ionization potential. 7

OR

What are representative elements? Write their properties.

3. a) What are enantiomers and diastereomers? Write the characteristics of enantiomers. What are free radicals? Explain the factors that stabilize the free radicals. 8

- b) What are Electrophile and Nucleophiles? Write the product and mechanism of the following chemical reactions.
- $CH_3 - CH = CH_2 + HBr \xrightarrow{P-O-O-P}$
 - $(CH_3)_3C - Br + NaOH(aq) \longrightarrow$
 - $C_6H_6 + Conc.HNO_3 \xrightarrow{Conc.H_2SO_4}$
4. a) What is polymerization reaction? Write the different types of polymerization with suitable examples for each.
- b) Write short notes on:
- PVC
 - Vulcanization of rubber
5. a) What is the principle behind mass spectroscopy? Show your acquaintance to parent peak and base peak.
- b) What are lubricants? Explain different kinds of lubricants with example.
6. a) What are the causes of water pollution? Mention its effect on human health and also explain its controlling measures
- b) Define air pollution. What are the factors responsible for ozone layer depletion and what are its hazardous effect? Give your opinion.
7. Write short notes on: (Any two)
- Corrosion
 - Nitration
 - Thermoplastics and Thermosetting plastics

POKHARA UNIVERSITY

Level: Bachelor
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Course: Chemistry

Semester: Fall

Year : 2016
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Pass Marks: 45
Time : 3hrs.

4. a)

b)

Candidates are required to give their answers in their own words as far as practicable.

5. a)

The figures in the margin indicate full marks.

b)

Attempt all the questions.

6. a)

- a) Write the mechanism of buffer action of a solution containing a mixture of methanoic acid and sodium methanoate. 4+4 b)

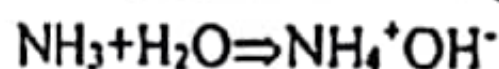
A buffer solution containing 0.4 mol l⁻¹ of ammonia solution and 0.6 mol L⁻¹ of ammonium chloride has prepared. What will be the pH of this solution after 0.075 M HCl has been added to the buffer. (assume that volume is unchanged K_b for NH₃ solution = 1.8 × 10⁻⁵)

7. W

a)

b)

c)



- b) What do you mean by standard hydrogen electrode? Calculate the emf of the following cell. 4+3

Zn(s)/Zn²⁺(0.1M)//Cu²⁺(1.75M)/Cu(s) at 25°C

$$E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$$

$$E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$$

$$R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$$

$$F = 96500 \text{ C}$$

- a) Define Ionization Energy. Why second Ionization Energy is greater than first Ionization Energy? Explain it. Discuss the general trend of its value in the period and group in the periodic table. 1+2+4

- b) Give reason 4×2

- i. Transition elements form significant number of complexes
- ii. s- block elements are reducing in nature
- iii. Transition elements show variable valency
- iv. Zn²⁺ salts are white

- a) What are reaction intermediates? Explain the structure and stability of different types of carbocation. 2+2+4

- b) Point out the differences between SN₁ and SN₂ reactions with suitable 7

- examples.
- a) What is polymerization reaction? Write the different types of polymerization with suitable examples for each. 2+5
4×2
- b) Write short notes on:
- i. PVC
 - ii. Vulcanization of rubber
4. a) Write the procedure involved in mass spectroscopy. How many NMR signals would we expect in compound isomers of C_3H_6O . 5+2
- b) Write the functions of lubricants. How cement can be manufactured. 2+6
5. a) "Kathmandu is considered as one of the very polluted cities in Asia". Discuss its causes, effects to human health and ways to control it. 7
- b) What are the causes of Hardness of water? How it can be measured in the laboratory. Describe it. 2+6
7. Write short notes on: (Any two) 2×5
- a) Ozone layer depletion
 - b) Markovnikoff's rule
 - c) Thermoplastics and Thermosetting plastics

POKHARA UNIVERSITY

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Attempt all the questions.

1. a) Define Buffer solution with types and mechanism of working. 7
b) Define standard electrode potential. The standard reduction potential of Cu^{2+}/Cu and Ni^{2+}/Ni electrodes are +0.34V and -0.25V respectively. Construct a galvanic cell using these electrodes. Write the cell reaction and calculate the standard emf of the cell. For what concentration of Cu^{2+} , the emf will be zero at 25°C if the concentration of the Ni^{2+} is 0.01M. 8
2. a) Differentiate between ionization energy and electron affinity. Why and in what ways does lithium resemble magnesium. 8
b) Give reasons: 7
 - i. Zinc is not considered as a true transition element.
 - ii. $[\text{Mn}(\text{OH})_6]^{2+}$ is pale pink, MnO_2 is black and MnO_4^- is intensely purple colour.
3. a) Differentiate carbocation and carbanion in terms of formation, structure and stability. 7
b) Show the detail mechanism and role of solvent of $\text{S}_\text{N}1$ reaction and $\text{S}_\text{N}2$ reaction. 8
4. a) Write notes on Bakelite, Nylon and polyurethane. 7
b) Describe the method of processing of Natural rubber and vulcanization. 8
5. a) Describe the principle of mass spectroscopy. Give reason why ^{12}C carbon doesn't show NMR phenomenon while ^{13}C shows NMR phenomenon though the relative abundances of ^{12}C and ^{13}C carbon are 98.9% and 1.1% respectively. 8
b) Define lubricants and cements with examples. Describe how cement is 7

6. a) manufactured in industry.
Define Ozone layer with its importance. Describe How does it formed and depeleted.
- b) Show your aquitance with cause of water pollution and its effect in human health. What are the control measures of water pollution.
7. Write short notes on: (Any two)
- a) Thin Layer chromatography
 - b) Polymerization
 - c) Optical activity

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Chemistry

Semester: Spring

Year : 2017
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Pass Marks: 45
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The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is buffer solution? Define acidic and basic buffer. How do you calculate the pH value of buffer mixture? Give your answer illustrating Henderson's Equation. Calculate the pH of resulted solution when 100ml of 0.05M HCL is added to 100 ml of 0.1M ammonia?($pK_b = 4.74$) 8
b) Define electromechanical series with applications. What is the concentration of Ni^{2+} in the cell at $25^\circ C$, if the emf is 0.601V?
$$Ni(s)|Ni^{2+}(a=?)||Cu^{2+}(0.75m)|Cu(s)$$

Given

$$E^0_{Ni|Ni^{2+}} = 0.25V \text{ \& } E^0_{Cu^{2+}|Cu} = 0.34V$$
2. a) Define electron affinity. Explain the factors affecting electron affinity. How electron affinity of Chlorine is higher than Fluorine. 7
b) What are transition elements? Zinc and cadmium are not considered as transition metals give reasons. Explain the characteristics properties of transition element with regard to 8
 - i. complex formation
 - ii. oxidation state
3. a) Describe the structure, stability and reactions of carbocation. 8
b) Describe S_N1 and $E1$ reaction with mechanism. 7
4. a) Write the preparation, properties and uses of Teflon and Polyvinyl chloride. 8
b) What are the demerits of natural rubber? How the properties of it can be improved, explain it. 7
5. a) Give the principle of mass spectroscopy. Write the applications of TLC. 8

- b) What are essential requirements of an explosive? Compare the properties of solid and liquid propellants. 7
6. a) What is green house effect? Describe the photochemistry of ozone layer depletion. 7
- b) Define acid rain and alkalinity. Discuss briefly about source of water pollution, its effects and control measures. 8
7. Write short notes on: (Any two) 2×5
- a) Electronic configuration
- b) Corrosion and its mechanism and control
- c) Principle of paper chromatography

Level: Bachelor
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Semester: Fall

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Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) Derive Henderson-Hassel Balch equation for Acidic buffer. What is the pH of 0.50M aqueous NaCN? P_{Kb} for Cyanide ion is 4.70. 8
- b) Define electrochemical series with applications. Also explain rusting of iron with mechanism. 7
2. a) Define ionization energy. Why second ionization energy is always greater than first ionisation energy? Explain with suitable reason and examples. 7
- b) Give reasons 8
 - i. Transition elements show paramagnetism
 - ii. $[Mn(OH)_6]^{2+}$ is pale pink, MnO_2 is black and MnO_4^- is intensely purple colour
3. a) Define free radicals with formation, structure and stability. 7
- b) Differentiate SN_1 reaction and SN_2 reaction in terms of their mechanism. 8
4. a) Write notes on vulcanization, Nylon and Teflon. 7
- b) Describe the mechanism of condensation and addition polymerization reaction. 8
5. a) Describe the principle of Nuclear Magnetic spectroscopy. 5
- b) Draw a neat and labeled diagram of Mass Spectrometer. 5
- c) Describe the chemistry of cement. 5
6. a) Define Ozone layer with its importance. 5
- b) Show your acquaintance with global warming and green house effect. 5
- c) Write various causes of water pollution. How it can be control. 5
7. Write short notes on: (Any two) 20
 - a) Chromatography
 - b) Chemical oxygen demand
 - c) Optical activity

POKHARA UNIVERSITY

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Semester: Fall

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Attempt all the questions.

1. a) What do you mean by acidic buffer? Derive Henderson Hasselbalch equation for acidic buffer. Calculate the P^H of 100 ml of $0.4NH_3$ solution in which 20ml. of $0.5M$ HCl is added. ($PK_b = 4.74$) 8
- b) What do you mean by standard hydrogen electrode (SHE)? Calculate the emf of the cell at $25^\circ C$. 7

$$\begin{aligned} E^\circ_{Fe/Fe^{++}} &= +0.44V \\ [Fe^{++}] &= 0.5M, \end{aligned}$$

$$\begin{aligned} E^\circ_{Ag/Ag} &= -0.80V \\ [Ag^+] &= 0.2m \end{aligned}$$

2. a) Give reasons: 9
- i) Second ionization energy is greater than first ionization energy
 - ii) Electron affinity of fluorine is less than chlorine
 - iii) Ionization energy of gallium is higher than aluminium
- b) Explain why zinc sulphate salt is colorless whereas copper sulphate salt is blue colored. Transition metal compounds are generally paramagnetic in nature, explain it. 6
3. a) What is elimination reaction? Write the mechanism of E_1 and E_2 reaction with one proper example of each. 8
- b) Define free radical. Write the reaction mechanism of free radical addition reaction. 7
4. a) What is condensation polymerization? Write the preparation, properties and uses of Nylon – 6, 6. 7
- b) Write short note on: 8
- i) Processing of natural rubber
 - ii) Silicones

5. a) What is the principle of TLC? Mention its applications in analytical field. 5
- b) Define explosive. Give the methods of preparation of TNT and its important uses. 5
- c) What are three important raw materials used in the manufacture of cement? Explain reaction mechanism of setting of cement. 5
6. a) What is soil pollution? Discuss its effects on agriculture and living beings. How can it be controlled? 7
- b) What are particulates? Classify particulates, and discuss in brief its effects on human. How can we control global warming and particulates? 8
7. Write short notes on: (Any two) 2×5
- a) Stereoisomerism
- b) Ozone layer Depletion
- c) Mass spectroscopy

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The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Write the mechanism of basic buffer solution giving suitable example. 200ml of 0.1M acetic acid is mixed with 400ml of 0.2M sodium acetate solution. calculate the p^H of resulting mixture. ($P^{K_a}=4.74$) 7
b) What do you mean by standard hydrogen electrode? How can we determine the standard electrode potential of zinc electrode by using SHE? From the given electrode potential values answer the following : 8
 - i. Write the electrode reaction.
 - ii. Write the cell reaction.
 - iii. Calculate the e.m.f. of the cell at $27^\circ C$ when both the electrodes are coupled together .
$$E^0 \text{Mg/Mg}^{++} = + 2.370 \text{ V}$$
$$E^0 \text{Fe/Fe}^{++} = + 0.44 \text{ V}$$
$$R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$$
$$F = 96500 \text{ C}$$
$$[\text{Mg}^{++}] = 0.1 \text{ M} \quad [\text{Fe}^{++}] = 0.01 \text{ M}$$
2. a) Give reasons for the followings: 8
 - i. TiCl_3 is coloured but TiCl_4 is colourless.
 - ii. Transition elements show variable oxidation state.
 - iii. Zn^{+2} salts are white.
 - iv. Zn is not considered as transition element.b) Define ionization energy. Explain the factors affecting negativity. How electron affinity of chlorine is higher than Fluorine. 7
3. a) Define carbocations. How carbocations are stabilized? Write any two 7

methods of their formation.

- | | | |
|-------|--|-----|
| b) | What are elimination reactions? Write the mechanism and stereochemistry of E_1 and E_2 reaction. | 8 |
| 4. a) | Write the mechanism of addition polymerization. | 5 |
| b) | What is condensation polymerization? Write preparation, properties and uses of Nylon 6, 6. | 5 |
| c) | Compare the properties of raw rubber and vulcanized rubber. | 5 |
| 5. a) | Write the principle and applications of mass spectroscopy. | 8 |
| b) | What are lubricants? How are they classified? What are the applications of lubrication? | 7 |
| 6. a) | What is water pollution? Discuss its causes, effects to human health and ways to control it. | 8 |
| b) | What is hard water? How can it be measured in laboratory? | 7 |
| 7. | Write short notes on: (Any two) | 2×5 |
| a) | Mechanism of rusting of iron | |
| b) | Nitration | |
| c) | Ozone layer depletion | |

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Chemistry

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

4. a) Dis

b) W

5. a) W

b) Ex

6. a) W

b) De

7. Write sh

a)
b)
c)

a) What is buffer solution? Write the mechanism of buffer action of acidic buffer with suitable example. Calculate the pH of buffer solution containing 400 ml of 0.3 M acetic acid and 200 ml of 0.6 M sodium acetate (K_a of acetic acid is 1.8×10^{-5}) 8

b) Differentiate between chemical corrosion and electrochemical corrosion. From the given electrode potential values answer the following : 7

i. Write the electrode reaction.

ii. Write the cell reaction.

iii. Calculate the e.m.f. of the cell at 298K when both the electrodes are coupled together .

$$E^0 \text{Zn}^{2+} / \text{Zn} = - 0.76\text{V}$$

$$E^0 \text{Ag}^+ / \text{Ag} = + 0.80 \text{ V}$$

$$R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$$

$$F = 96500\text{C}$$

$$[\text{Zn}^{2+}] = 0.01\text{M} \quad [\text{Ag}^+] = 0.1\text{M}$$

a) Explain the following for the transition elements: 8
i. form colored compounds
ii. paramagnetic in nature

b) What is electron affinity? Write the factors that affect electron affinity. Between nitrogen and oxygen which one has higher ionization energy give reason? 7

a) Explain the mechanism and stereochemistry of $\text{S}_\text{N}2$ reaction. 8

b) What is electrophilic aromatic substitution? Write the mechanism of Halogenation taking suitable example. 7

4. a) Differentiate between thermoplastic and thermosetting plastics. Write the preparation, properties and uses of
i. Teflon
ii. Polyester
iii. PVC 8
- b) What is a chemical composition of natural rubber? How is it processed to obtain crepe rubber and smoked rubber? Write some advantages of vulcanized rubber. 7
5. a) What explosive describe the different types of explosive. Also write the preparation and uses of TNT and TNG 8
- b) Explain briefly: 7
i. Paper chromatography
ii. Mass Spectroscopy
6. a) What is hard water? Write its types and also methods of removal. 8
- b) Define alkalinity. How it can be measured in the laboratory? Describe it. 7
7. Write short notes on: (Any two) 2×5
a) Biological oxygen demand
b) SN_1
c) NMR Spectroscopy

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Chemistry

Semester: Spring

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define buffer solution. Explain the mechanism of acidic buffer solution. Calculate the pH of 500 ml of buffer solution containing 0.2M of ammonium sulphate and 0.3M ammonium hydroxide which is 2.1% ionized in dilute solution. (K_b of ammonium hydroxide is 1.8×10^{-5}) 7
- b) Define electrochemical cell. The standard reduction potentials of Cu²⁺/Cu and Ag⁺/Ag electrodes are 0.34V and 0.80V respectively. Construct a galvanic cell using these E⁰ values. For what concentration of Ag⁺ ions will the emf of the cell at 25°C be zero if the concentration of Cu²⁺ is 0.01M. 8
2. a) Define Ionization energy. What are the factors which affect it? Discuss the variation of I.E in the periodic table. 7
- b) Give reason: 8
 - i) TiCl₃ is colored but TiCl₄ is colorless.
 - ii) Zn²⁺ salts are white.
 - iii) Cu is not considered as transition element.
 - iv) Transition elements show variable oxidation state.
3. a) Define carbocation. How are carbocation stabilized? Write any two methods of their formation. 7
- b) What is β-elimination reaction? Write the differences between SN₁ and SN₂ reaction. 8
4. a) Write notes on 7
 - i. Natural Rubber
 - ii. Nylon-6,6
- b) Define the term polymerization. Explain the free radical mechanism for the polymerization of ethene. 8
5. a) How is cement manufactured? Explain in brief. 7
- b) Write principle and important applications of mass spectrometry in analytical field. Write the application of TLC. 8

6. a) What is water pollution? Point out the major causes of water pollution, their adverse effects and possible remedies.
b) Define alkalinity. How is it estimated in the laboratory, explain?
7. Write short notes on: (Any two)
a) Aromatic electrophilic substitution reaction
b) Chromatography
c) Silicon polymer

POKHARA UNIVERSITY

Level: Bachelor
 Programme: B.E.
 Course: Chemistry

Semester: Fall

Year : 2020
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define buffer solution. Explain the mechanism of basic buffer. Calculate the pH of a buffer solution prepared by mixing 500ml of 0.6M sodium acetate and 700ml of 0.3M acetic acid. 8
- b) Write the mechanism of chemical and electrochemical corrosion. From the given electrode potential values answer the following : 7
 - i. Write the electrode reaction.
 - ii. Write the cell reaction.
 - iii. Calculate the e.m.f. of the cell at 298K when both the electrodes are coupled together.

$E^{\circ} \text{Zn}^{2+} / \text{Zn} = -0.76\text{V}$
 $E^{\circ} \text{Cu}^{2+} / \text{Cu} = +0.34\text{V}$
 $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$
 $F = 96500\text{C}$
 $[\text{Zn}^{2+}] = 0.1\text{M}$ $[\text{Cu}^{2+}] = 1.75\text{M}$
2. a) Give reason: 8
 - i. Transition elements are good in forming complexes.
 - ii. Ionization energy of neon is higher than fluorine.
 - iii. TiO_2 is white but TiCl_3 is violet.
 - iv. Cu(I) is diamagnetic whereas Cu(II) is paramagnetic.
- b) What is electron affinity? Write down the factors that affect the magnitude of electron affinity. Why is electron affinity of chlorine higher than fluorine? 7

3. a) What do you mean by SN_1 and SN_2 reaction? Explain the mechanism with specific example. 8
- b) How do enantiomers differ from diastereomers? Explain the stability of free radicals. 7
4. a) What are polymers? Discuss about the mechanism of condensation polymerization taking a suitable example. 8
- b) What is IUPAC name for monomer of teflon? Show the free radical addition mechanism for the preparation of teflon? 7
5. a) Write the principle of Chromatography. Write the important applications of thin layer chromatography. 8
- b) What is cement? Why gypsum is added in the cement? Write the method of preparations of cement in brief. 7
6. a) Define acid rain. Discuss about the sources, effects and important control methods of acid rain. 8
- b) Define hardness of water. How it can be measured in the laboratory? Describe it. 7
7. Write short notes on: (Any two) 2×5
- a) Mass Spectroscopy.
- b) Lubricants and its types.
- c) Green house effect