



ELECTROCHEMISTRY

Sr. #	Questions	A	B	C	D
1 (b) (2016) (2017) (2023)	Spontaneous chemical reactions take place in: از خود ہونے والا کیمیکل ری ایکشن کس سیل میں ہوتا ہے؟	Electrolytic cell الیکٹرولائٹک سیل	Galvanic cell گیلووانک سیل	Nelson's cell نیلسن سیل	Downs cell ڈاؤنزیل
2 (a) (2019)	Formation of water from hydrogen and oxygen is: ہائیڈروجن اور آکسیجن سے پانی کا بنا کونسا کیمیکل ری ایکشن ہے؟	Redox reaction ریڈاکس ری ایکشن	Acid-base reaction اساس-تیزاب ری ایکشن	Neutralization نیوٹرلائزیشن	Decomposition تخلیل
3 (b)	Which one of the following is not an electrolytic cell? درج ذیل میں سے الیکٹرولائٹک سیل نہیں:	Downs cell ڈاؤنزیل	Galvanic cell گیلووانک سیل	Nelson's cell نیلسن سیل	Both a and c a اور c دونوں
4 (b) (2016) (2017) (2018)	The oxidation number of chromium in $K_2Cr_2O_7$ is: $K_2Cr_2O_7$ میں کرومیم کا آکسیڈیشن نمبر کیا ہوتا ہے؟	+2	+6	+7	+14
5 (a) (2014) (2016) (2018)	Which one of the following is not an electrolyte? درج ذیل میں سے کون سا الیکٹرولائٹ نہیں ہے؟	Sugar solution شوگر کا سلوشن	Sulphuric acid solution سلفیورک ایسڈ کا سلوشن	Lime solution چونے کا سلوشن	Sodium chloride solution سوڈیم کلورائیڈ کا سلوشن
6 (b) (2016)	The most common example of corrosion is: کروڑن کی سب سے عام مثال کون سی ہے؟	Chemical decay کیمیکل توڑ پھوڑ	Rusting of iron لوہے کو زنگ لگنا	Rusting of aluminum ایلو مینیم کو زنگ لگنا	Rusting of tin ٹن کو زنگ لگنا

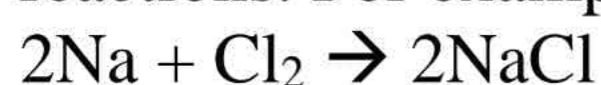
7 (b)	Nelson's cell is used to prepare caustic soda along with gases. Which of the following gas is produced at cathode: نیلسن سیل گیسوں کے ساتھ کاسٹک سوڈا تیار کرنے کے لیے استعمال کیا جاتا ہے۔ درج ذیل میں سے کون سی گیس کیتھوڈ پر پیدا ہوتی ہے؟	Cl ₂	H ₂	O ₃	O ₂
8 (d) (2021)	During the formation of water from hydrogen and oxygen, which of the following does not occur: ہائیڈروجن اور آکسیجن سے پانی بننے کے عمل کے دوران درج ذیل میں سے کیا واقعہ نہیں ہوتا ہے:	Hydrogen has oxidized ہائیڈروجن کی آکسیدیشن ہو گئی ہے	Oxygen has reduced آکسیجن کی ریڈکشن ہو گئی ہے	Oxygen gains electrons آکسیجن الیکٹرون حاصل کرتی ہے	Hydrogen behaves as oxidizing agent ہائیڈروجن آکسیدائزنگ ایجنٹ کے طور پر کام کرتی ہے
9 (a) (2014) (2019) (2023) (2023)	The formula of rust is: زنگ کا فارمولا ہے؟	Fe ₂ O ₃ .nH ₂ O	Fe ₂ O ₃	Fe(OH) ₃ .nH ₂ O	Fe(OH) ₃
10 (b)	In the redox reaction between Zn and HCl, the oxidizing agent is: زنک اور ہائیڈروکلورک ایسڈ کے درمیان ریڈاکس (Redox) ری ایکشن کے دوران آکسیدائزنگ ایجنٹ کون سا ہوتا ہے؟	Zn	H ⁺	Cl ⁻	H ₂
MCQs of previous all Punjab Board papers					
11 (d) (2012)	Whose oxidation number is +2? درج ذیل میں سے کس کا آکسیدیشن نمبر +2 ہے؟	K ⁺	Na ⁺	O ⁻²	Ca ⁺²
12 (b) (2012)	In electroplating of silver, anode is made of? سلور کی الیکٹروپلیٹنگ میں اینوڈ بنا ہوتا ہے:	Copper کاپر کا	Silver سلور کا	Gold گولڈ کا	Zinc زنک کا
13 (b) (2014) (2014) (2015) (2019)	The oxidation number of chlorine in KClO ₃ is? KClO ₃ میں کلورین کا آکسیدیشن نمبر کیا ہوتا ہے؟	+6	+5	+1	-2
14 (b) (2015)	What is obtained from fused NaCl? پگھلے ہوئے سوڈیم کلورائیڈ سے کیا حاصل ہوتا ہے؟	NaOH	Sodium metal سوڈیم میٹل	Both A and B A اور B دونوں	None کوئی بھی نہیں

20 (c) (2015) (2016)	The oxidation number of all elements in free state: آزاد حالت میں ایلیمینٹس کا آکسیدیشن نمبر کیا ہوتا ہے	+1	-1	Zero صفر	+2
16 (c) (2015)	Which one of the following is used for the production of sodium metal: درج ذیل میں سے کونسا سوڈیم میٹل کی تیاری میں استعمال ہوتا ہے:	Galvanic cell گیلووانک سیل	Nelson's cell نیلسن سیل	Downs cell ڈاؤنز	Electroplating الیکٹرو پلیننگ
17 (c) (2016)	The oxidation number of Mn in $KMnO_4$ is: $KMnO_4$ میں Mn کا آکسیدیشن نمبر کیا ہوتا ہے؟	+2	+3	+7	+6
18 (b) (2016)	During electroplating of chromium, the electrolyte which is used in electrolytic cell is: کرومیم کی الیکٹرو پلیننگ میں الیکٹرو لیکٹو سیل میں الیکٹرو لائٹ استعمال ہوتا ہے۔	$CrCl_3$	$Cr_2(SO_4)_3$	$CuSO_4$	$NiSO_4$
19 (d) (2016)	Anode of down's cell is made of: ڈاؤنز سیل میں اینوڈ بنا ہوتا ہے؟	Steel سٹیل کا	Copper کوپر کا	Calcium کیلسیم کا	Carbon کاربن کا
20 (d) (2017)	Depositing of one metal over the other by means of electrolysis is: الیکٹرو لیسز کے ذریعے ایک میٹل کے اوپر دوسری میٹل کی تہ جمانے کے عمل کو کہا جاتا ہے	Corrosion کروژن	Reduction ریڈکشن	Oxidation آکسیدیشن	Electroplating الیکٹرو پلیننگ
21 (c) (2017)	Electrochemistry is branch of chemistry which deals with relationship between: الیکٹرو کیمسٹری، کیمسٹری کی وہ شاخ ہے جو تعلق کو بیان کرتی ہے۔	Carbon and its compounds کاربن اور اس کے کمپاؤنڈز کو	Solute and solutions سولیوٹ اور سلوشن کے	Electricity and chemical reactions الیکٹریٹیٹی اور کیمیکل ری ایکشن کے	Metals and non-metals میٹلز اور نان میٹلز کے
22 (a) (2018)	The oxidation number of hydrogen in HCl is: HCl میں ہائیڈروجن کا آکسیدیشن نمبر ہے۔	+1	+2	+4	+3
23 (d) (2018)	Loss of electron is called: الیکٹرونز کا اخراج کہلاتا ہے:	Hydrogenation ہائیڈرو جینیشن	Hydration ہائیڈریشن	Reduction ریڈکشن	Oxidation آکسیدیشن
24 (d) (2018) (2021)	Which one of the following solution is strong electrolyte? درج ذیل میں سے کون سا سلوشن طاقتور الیکٹرو لائٹ ہے؟	Solution of benzene بینزین کا سلوشن	Solution of acetic acid ایسٹک ایسڈ کا سلوشن	Sugar solution شوگر کا سلوشن	Solution of H_2SO_4 H_2SO_4 کا سلوشن

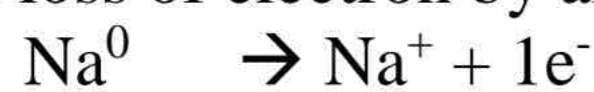
25 (c) (2019)	The oxidation number of sulphur in H ₂ SO ₄ is: H ₂ SO ₄ میں سلفر کا آکسیدیشن نمبر کیا ہوتا ہے؟	+2	+4	+6	+7
26 (b) (2021)	The oxidation number of oxygen in OF ₂ is: OF ₂ میں آکسیجن کا آکسیدیشن نمبر ہے۔	+1	+2	-1	-2
27 (a) (2021)	The oxidation number of oxygen in peroxides is: پروآکسائیڈز میں آکسیجن کا آکسیدیشن نمبر ہے۔	-1	-2	+1	+2
28 (d) (2022)	The oxidation number of oxygen in peroxides is: پروآکسائیڈز میں آکسیجن کا آکسیدیشن نمبر ہے۔	-4	-3	-2	-1
29 (c) (2022)	Slow and continuous eating away of a metal by the surrounding medium is called? کسی میٹل کا ارد گرد کے کسی میڈیم کی وجہ سے کروڑ ہو جانے کا نام ہے؟	Paint پینٹ	Alloy الائے	Corrosion کروژن	Stains سٹینز
30 (d) (2022)	Which one is non-electrolyte? کون سا ایک الیکٹرولائٹ نہیں ہے؟	CH ₃ COOH	NaOH	HCl	Benzene بینزین
31 (b) (2022) (2023)	Which is an example of reducing agent: کون سی ایک ریڈیوسنگ ایجنٹ کی مثال ہے؟	Cl ₂	Zn	Br ₂	O ₂
نوٹ: میٹلز زیادہ تر ریڈیوسنگ ایجنٹ کے طور پر کام کرتی ہیں اور نان میٹلز آکسائیڈائزنگ ایجنٹ کے طور پر۔					

(1) Define redox reaction.

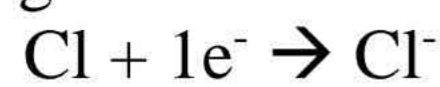
The chemical reactions in which oxidation and reduction processes takes place are called redox reactions. For example formation of NaCl.

**(2) Define oxidation and reduction in terms of electrons. Give an example.**

The loss of electron by an atom or ion is called oxidation e.g.



The gain of electron by an atom or ion is called reduction e.g.

**(3) Differentiate between strong and weak electrolytes. (Also a long question) (پہرے میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)**

Sr. No	Strong electrolytes	Weak electrolytes
1	The electrolytes which completely ionizes in their aqueous solution are called strong electrolytes.	The electrolytes which ionizes to a small extent in their aqueous solution are called weak electrolytes.
2	These are good conductors of electricity.	These are poor conductors of electricity.
3	For example solution of NaOH and HCl.	For example solution of CH ₃ COOH and Ca (OH) ₂ .
4	$\text{NaOH} \rightleftharpoons \text{Na}^+ + \text{OH}^-$	$\text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}^+$

(4) Differentiate between electrolyte and non-electrolyte. (پہرے میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Electrolyte	Non-Electrolyte
1	The substances which can conduct electricity in their aqueous solutions or molten (گھلی ہوئی حالت) state, are called electrolytes.	The substances which do not conduct electricity in their aqueous solutions or molten (گھلی ہوئی حالت) state, are called non-electrolytes.
2	For example solution of salts, acids or bases.	For example sugar solution and benzene.

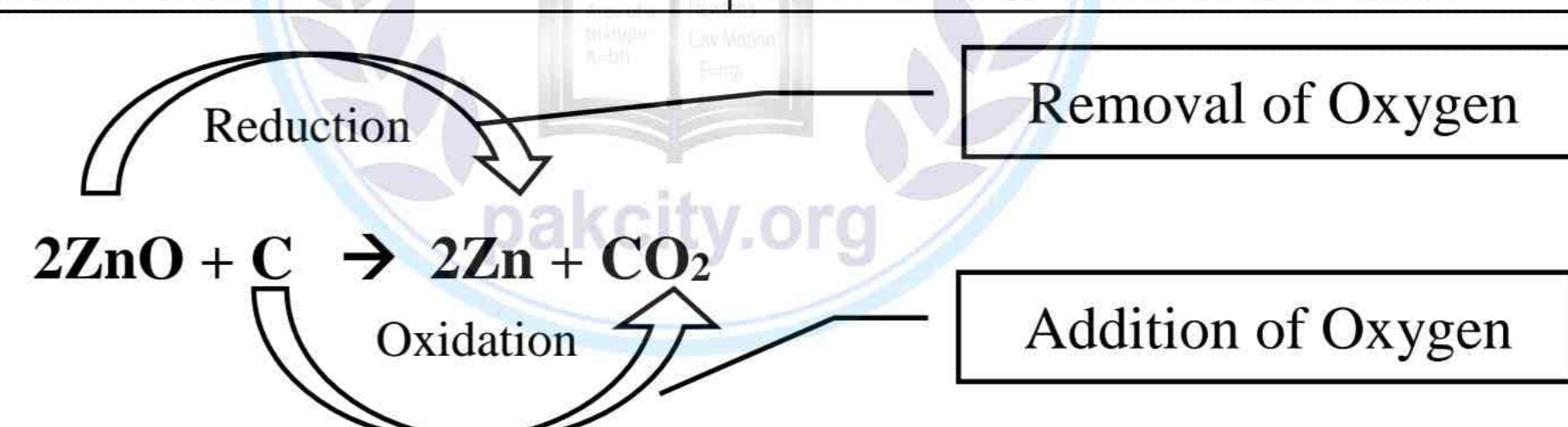
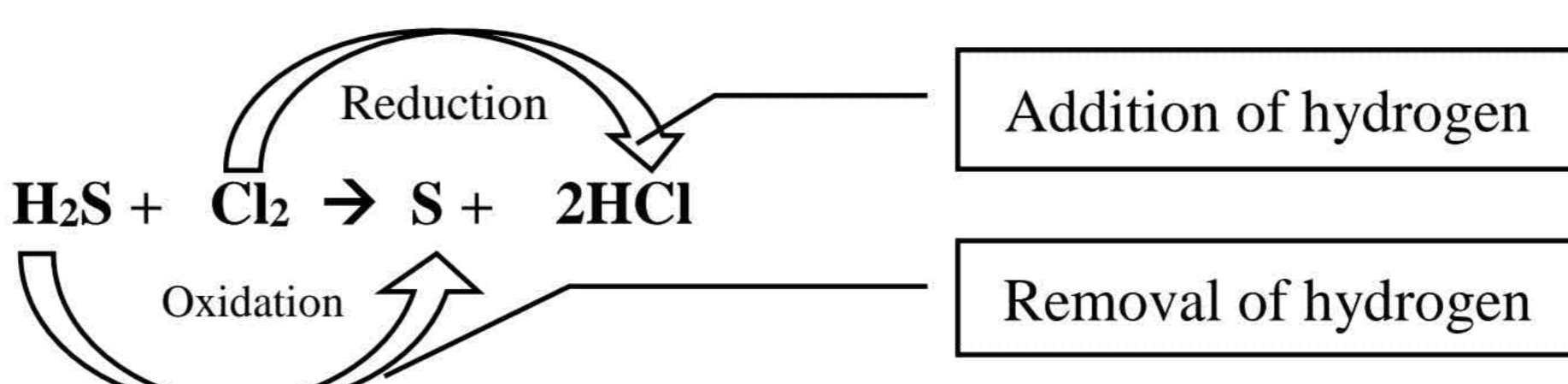
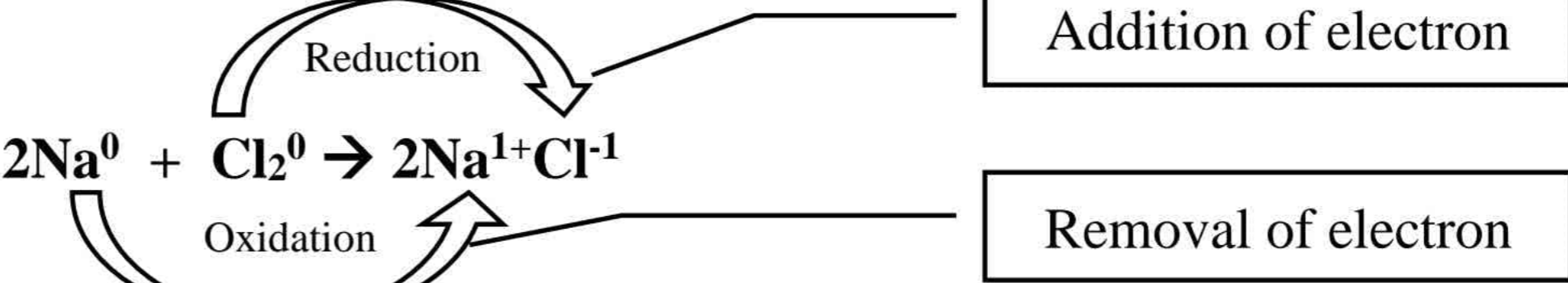
(5) Differentiate between spontaneous and non-spontaneous reaction. (پہرے میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Spontaneous reactions	Non-spontaneous reactions
1	The reactions which takes place by their own without any external agent, are called spontaneous reactions.	The reactions which cannot takes place by their own, are called non-spontaneous reactions.
2	For example reaction in Galvanic cell.	For example reaction in Nelson's cell and Downs cell.

(6) What is the difference between valency and oxidation state? (پہرے میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr.No	Valency	Oxidation State or Oxidation number
1	The combining capacity of an element with other element is called valency.	Apparent charge assigned to an atom of an element in a molecule or in an ion is called oxidation state.
2	It can never be zero.	It may be zero.
3	It is always whole number.	It may be whole number or in fraction.

(7) Define oxidation and reduction with an example. (پہرے میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Oxidation	Reduction
1	The process in which oxygen is added or hydrogen or electron are removed is known as oxidation reaction.	The process in which oxygen is removed or hydrogen or electron are added is known as reduction reaction.
	For example	
	$2\text{ZnO} + \text{C} \rightarrow 2\text{Zn} + \text{CO}_2$ 	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Removal of Oxygen</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Addition of Oxygen</div>
2	$\text{H}_2\text{S} + \text{Cl}_2 \rightarrow \text{S} + 2\text{HCl}$ 	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Addition of hydrogen</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Removal of hydrogen</div>
	$2\text{Na}^0 + \text{Cl}_2^0 \rightarrow 2\text{Na}^{+1} + \text{Cl}^{-1}$ 	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Addition of electron</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Removal of electron</div>

(8) What is galvanizing? Why is galvanizing done?

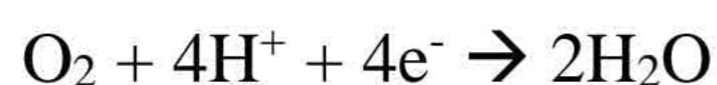
Galvanizing is a process in which a thin Zinc layer is coated on iron sheet. It is done to protect iron from corrosion. It is done to protect iron from corrosion.

(9) Name the metal which is used for galvanizing iron?

Zinc (Zn) is used for the process of galvanizing.

(10) Why is O₂ necessary for rusting?

Oxygen (O₂) is necessary for rusting because there is no rusting without oxygen. Oxygen act as oxidizing agent.



Next the Fe²⁺ ions formed spread throughout the iron sheet and react with oxygen (O₂) to form the salt Fe₂O₃.nH₂O which is called rust.

**(11) What is metallic coating? OR State the best method for protection of metal from corrosion.**

The method in which a layers of metal is coated with another metal is called metallic coating. This is the best method for prevention from corrosion.

(12) Define electroplating. Give its uses.

“The process of depositing (تلاش) of one metal over the other by means of electrolysis is called as electroplating”.

USES:

It is used for silver plating of jewelry, steel and tableware etc.

(13) How is electroplating of tin on steel carried out?

OR

How electroplating of tin is carried out?

- Electroplating of tin on steel is carried out by placing the steel into a container containing solution of tin salt.
- The steel is connected to an electrical circuit, acting as cathode. While the other electrode made of tin metal act as anode.
- When an electrical current is passed through the circuit, tin metal ions present in the solution deposit on steel.

(14) Define electrochemical cell. Write the names of its types.

“It is a system in which two electrodes are dipped in the solution of an electrolyte which are connected to the battery”. It is an energy storage device. It has two types

- i. Electrolytic cell ii. Galvanic cell

(15) Which type of chemical reaction takes place in electrolytic cell?

Non-spontaneous chemical reaction takes place in an electrolytic cell.

(16) What is salt bridge? What is its basic function?

Salt bridge is a U-shaped glass tube. It consist of a saturated solution of strong electrolyte supported in a jelly type material.

Function:

The function of salt bridge is to keep the solutions of two-half cells neutral.

(17) What is difference between anode and cathode? (کوئی سے 2 یاد کریں۔) (پہر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Anode	Cathode
1	The electrode where oxidation takes place is called anode.	The electrode where reduction takes place is called cathode.
2	$\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^{-}$	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
3	In electrolytic cell it is positively charged.	In electrolytic cell it is negatively charged.
4	In galvanic cell it is negatively charged.	In galvanic cell it is positively charged.

(18) What is corrosion? Give its example.

It can be defined as:

“Slow and continuous eating away of a metal by the surrounding medium is called corrosion”.
It is a redox chemical reaction.

Example:

Common example of corrosion is rusting of iron.

(19) Write two methods for prevention of corrosion.

The following methods are used for prevention of corrosion.

- Removal of stains
- Paints and greasing
- Alloying
- Metallic coating

(20) How galvanizing of iron sheets is done?

- The process of coating a thin layer of zinc on iron is called galvanizing.
- This process is carried out by dipping a clean iron sheet in a zinc chloride bath and then heating it.
- After this iron sheet is removed, rolled into molten zinc metal bath and finally air-cooled.

(21) Define alloy and give example.

It can be defined as:

“Alloy is a homogeneous mixture of one metal with one or more other metals or non-metals”.

Example:

The best example of alloy is “stainless steel”, which is a good combination of iron (Fe), Chromium (Cr) and Nickel (Ni).

(22) What is the name of the by-product produced in the Downs cell?

Chlorine (Cl₂) is produced as a byproduct in Downs cell.

(23) Name the by-products produced in Nelson’s cell?

Hydrogen gas (H₂) and chlorine gas (Cl₂) are the byproduct produced in Nelson’s cell.

(24) Find out the oxidation number of chlorine in KClO₃.

OR

Find out the oxidation number of chlorine in KClO₃ as O.N of K = +1 and O.N of O = -2

➔ Oxidation number of Cl in KClO₃

Oxidation number of K = +1

Oxidation number of O = -2

Oxidation number of Cl = ?

[O.N of K] + [O.N of Cl] + 3[O.N of O] = 0

[+1] + [O.N of Cl] + 3[-2] = 0

[O.N of Cl] - 6 + 1 = 0

[O.N of Cl] - 5 = 0

O.N of Cl = +5

So O.N of Cl is +5

(25) Find the oxidation number of nitrogen in HNO₃.

➔ Oxidation number of N in HNO₃

Oxidation number of H = +1

Oxidation number of O = -2

Oxidation number of N = ?

[O.N of H] + [O.N of N] + 3[O.N of O] = 0

[+1] + [O.N of N] + 3[-2] = 0

[O.N of N] - 6 + 1 = 0

[O.N of N] - 5 = 0

O.N of N = +5

So O.N of N is +5

LONG QUESTIONS

I. Define oxidation number. Write four rules for assigning oxidation numbers.

It can be defined as:

“The apparent charge assigned to an atom of an element in a molecule or ion is called oxidation number”.

OR

The apparent charge present on an atom of an element present in a molecule or ion is called oxidation number”.

Example: In HCl, oxidation number of H is +1 and that of Cl is -1.

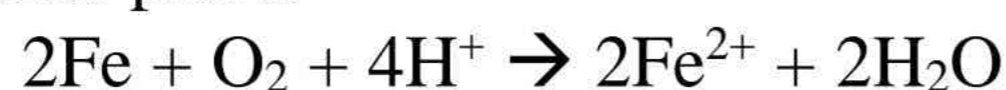
- The O.N of all elements in free state is zero.
- The O.N of simple ion is the charge of the ion. For example O.N of Na⁺ is +1.
- The O.N of hydrogen in its all compounds is +1.
- The O.N of oxygen in its all compounds is -2. In peroxide it is -1 and in OF₂ is +2.
- In any substance, the more E.N. (electronegative) atom gets -ve charge.
- In neutral molecules the algebraic sum of the O.N of all the elements is zero.

II. Discuss the electrolysis of water.

(From book)

**III. What do you know about the rusting of iron?**

The corrosion of iron is called **rusting**. The important condition for rusting is moist air. There will be no rusting if water vapours or air is absent. Stains and dents on the surface of the iron provide the sites for rusting. This region is called anodic region. The loss of electron damages the object. These free electrons reach to an area of relatively high O₂ concentration which acts as cathode. The following redox reaction takes place.



The Fe²⁺ ions formed spreads throughout the surrounding water and reacts with O₂ to form the rust (Fe₂O₃.nH₂O).



This process continues until the whole piece of iron is eaten away.

IV. What is difference between electrolytic and galvanic cell? (پہر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Electrolytic cell	Galvanic cell
1	It consist of one complete cell.	It consist of two half cells.
2	Non-spontaneous chemical reaction takes place.	Spontaneous chemical reaction takes place.
3	Battery is used.	No battery is used.
4	Salt bridge is not used.	Salt bridge is used.
5	Electrical energy is converted into chemical energy.	Chemical energy is converted into electrical energy.
6	Anode has positive charge while cathode has negative charge.	Anode has negative charge while cathode has positive charge.