# ELECTRO CHEMISTRY UNIT-I
## (OBJECTIVE MATERIAL)

1. Which of the following constitutes Daniel cell?                    [     ]
   a. Zn-Cu cell        b. Zn-Ag cell            c. Cu-Ag cell        d. none

2. The EMF of a cell is                              [        ]
   a. Sum of the two oxidation potential
   b. Sum of the two reduction potential
   c. Difference of two electrode potential
   d. None

3. An electrochemical cell stops working after sometime because       [        ]
   a. electrode potential of the both the electrodes become equal in magnatitude but opposite in sign
   b. Electrode potential of the both the electrode goes on decreasing.
   c. Electrode potential of the both the electrode goes on increasing.
   d. None

4. Four metals A,B,C,D are having standard electrode potentials as -3.05 V,-1.66v,-.40 V, and 0.80 V
   respectively. Which one will be the most reducing?                 [        ]
   a. A          b. B                 c. C                 d. D

5. The standard EMF for the cell reaction  $Zn + Cu^{++} \rightarrow Zn^{++} + Cu$           [        ]
   Is 1.1 V at $25^0C$
   The EMF of the cell reaction when 0.1 M $Cu^{++}$ and 0.1 M $Zn^{++}$ solutions are used at $25^0C$  [    ]
   a. 1.10V             b. 0.10V                 c. -1.10V                d -0.110 V

6. in an electrochemical cell                              [        ]
   a. potential energy decreases
   b. kinetic energy decreases.
   c. potential energy changes into electrical energy
   d. chemical energy changes into electrical energy.

7. Cell reaction is spontaneous when                          [        ]
   A $E^0$ Red is positive      b. $G^0$ is negative      c. $G^0$ is positive      d. $E^0$ red is negative

8. Electrode potential of the both the electrode goes on decreasing       [        ]
   a. 1          b 2          c. 1.018                 d. 0

9. In the concentration cells, the electrical energy is due to          [        ]
   a. oxidation of fuel b. heat energy c. chemical reaction d. transfer of substance from one solution to
   another.

10 The Galvanic cells are used to convert                          [        ]
   a. Chemical energy to electrical energy                c. kinetic energy to potential energy
   b. electrical energy to chemical energy                d. potential energy to kinetic energy

11. If a salt bridge is removed between the half cells, the voltage       [        ]
   a. decreases to zero b. increases rapidly   c. increases    d. do not changes

12. In an electrochemical cell, the electrons flow                    [        ]
   a. from cathode to anode                          c. from anode to the solution
   b. from anode to cathode                          d. from the solution to  cathode

13. For a galvanic cell, which one is wrong?                                                    [       ]
a. anode is negatively charged                          c. reduction takes place at anode
b. cathode is positively charged                        d. reduction takes place at cathode

14. In the cell $Zn/Zn^{++}//Cu^{++}/Cu$,                                                        [       ]
A. copper gets reduced
b. Zinc gets oxidized
c. Zinc gets oxidized and copper gets reduced
d. copper gets oxidized

15. The EMF of a Galvanic cell can be calculated from                                            [       ]
a. the size if the electrode b. the pH of the solution
c. the amount of metal in the anode d. The E0 values of the half cells

16. The difference of the potentials of two electrodes of the galvanic cells is called [     ]
a. potential difference      b. ionic difference
c. EMF                        d. electrode difference

17. Nernest equation is                                                                          [       ]
a. $E=E^0 - 0.0591/n \ log \ [Red \ n \ ]/[Oxd \ n]$            c. $E=E^0 - 0.0591/n \ log \ [Red \ n \ ]/[Oxd \ n]$
b. $E=E^0 + 0.0591/n \ log \ [Oxd \ n]/Red \ n \ ]$            d. $E=E^0 + 0.0591/n \ log \ [Oxd \ n]/ \ [Red \ n \ ]$

18. Which atom forms an ion that would migrate towards the cathode in a electrolytic cell? [     ]
a. F                  b. I                  c. Na            d. C

19. In the standard notation for a galvanic cell, a vertical double (||) line represents      [       ]
a.   a phase boundary b. a gas boundary c. a metal connection c salt bridge

20. For a galvanic cell, which of the following statements are correct?                          [       ]
(I) Reduction occurs at the cathode (II)the anode gains mass during discharge
(III) The voltage is less than or equal to zero
a. Only III          b. Only II              c.Only I                d. I,II,III

21. In the salt bridge, KCl is used because                                                      [       ]
a. KCl is an electrolyte                            c. $K^+$ and Cl⁻ have same mobility
b. $K^+$ and Cl⁻ ions are isoelectric              d. none

22. A,B,C, and D are four elements whose standard oxidation potentials are +2.82V, +2.17V, +1.67V
and -2.87 V . The strongest reducing agent is                                                    [       ]
**a**. A b. B c. C d. D

23. The reactions that takes place at anode and cathode are respectively          [       ]
a. reduction , oxidation              **b**. Oxidation, reduction
c. reduction, hydrolysis              d. Oxidation , hydrolysis.

24. Electrolytes can conduct electricity, because

a)  Their molecules contain unpaired electrons, which are mobile

b)  Their molecules contain loosely held electrons, which become free under the influence of voltage.

c)  The molecules break up into ions, when a voltage is applied.

d)  The molecules are broken up into ions, when the electrolyte is fused (or ) dissolved in the solvent.

25. Which one of the following is an electrolyte?

a) $C_6H_6$     b) $CHCl_3$     c) $C_6H_5Cl$     d) NaCN

26. Ionization of an electrolyte in aqueous solution is due to

a) Instability of the compound in aqueous medium.

b) Hydrolysis of the electrolyte

c) Decrease in the electrostatic forces of attraction between appositely charged ions.

d) Increase in the electrostatic forces of attraction between the ions.

27. Specific conductance is the conductance of solution of volume

a) $1000 \ Cm^3$    b) $1000 \ Cm^3$    c) $1000 \ Cm^3$    d) $1000 \ Cm^3$

28. The unit of specific conductance is

a) ohm $Cm^{-1}$    b) $Ohm^{-1}$ cm    c) Ohm Cm    d) $Ohm^{-1} \ Cm^{-1}$

29. Which of the following features is correct, when concentrated solution of an electrolyte is diluted?

a) Its equivalent conductance decreases.

b) Its specific conductance decreases

c) Both equivalent and specific conductance increase.

d) Its specific conductance decreases and equivalent conductance increases.

30. Which of the following features is correct, when concentrated solution of an electrolyte is diluted.

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31. The relationship between specific conductivity and equivalent equivalent conductance is

a) $\lambda eq = C \times 100/ K$       c) $\lambda eq = C \times 1000 /K$

b) $\lambda eq = K.C / 1000$       d) $\lambda eq = K \times 1000 / C$

32. Specific conductance of 0.1 M nitric acid is $6.3 \times 10^{-2}$ Ohm$^{-1}$ Cm$^{-1.}$ The molar conductance of the solution in [ Ohm$^{-1}$ Cm$^2$ mol$^{-1}$] is

   a)  630  b)  315  c)  100  d)  6300

33. Specific conductance of a decinormal solution of KCl is 0.0112 ohm$^{-1}$ Cm$^{-1}$. The resistance of a cell containing the solution was found to be 56. The cell constant is in Cm$^{-1}$

   a)  2 Cm $^{-1}$  b)  1.5231 Cm $^{-1}$  c)  0.6272 Cm $^{-1}$  d)  3.123 Cm $^{-1}$

34.  A solution of salt 1.ON surrounding two pt electrodes 2.1 Cm apart and 4.2 Cm2 in area was found to go offer a resistance of 50 ohms. The equivalent conductivity of the solution is in
Ohm-1 Cm-2 eq-1

   a)  10  b)  20  c)  30  d)  40

35.  A galvanic cell converts

   a)  Electrical energy into chemical energy

   b)  Chemical energy into electrical energy

   c)  Electrical energy into heat energy

   d)  Chemical energy into heat energy

36.  In the electrochemical series, elements are arranged in the

   a)  Decreasing order of SRP (Standard reduction potential)

   b)  Increasing order of SRP

   c)  Increasing order of Oxidation potential

   d)  Increasing order of equivalent weights

37.  The standard reduction potential of Zn and Fe are –0.76V and –0.41V respectively. The emf for the cell reaction; $Fe^{+2} + Zn \rightarrow Zn^{+2} + Fe$ is

   a)  –0.35V  b)  + 0.35 V  c)  + 1.17V  d)  –1.17 V

38. The conductivity of 0.1 N KCl is 0.01120 Mho Cm-1 if the cell constant is equal to 0.5 Cm-1 , the conductance is equal to
A. $2.24 \times 10^{-3}$ eq$^{-1}$    B. $5.6 \times 10^{-3}$ mhos      C. 224 mhos       D. 560 mhos

39. The quantity of electricity transported in one second by a current of One ampere is

   a)  Volt  b)  Ohm  c)  Coulomb  d)  Mhos

40. The resistance of a conductor is 5 x 10-2 ohms conductance is

   a)  200  b)  20 mhos  c)  500 Mhos  d)  50 Mhos

41. If a salt bridge is removed between the half cells the voltage

a) Increases rapidly
b) Decreases to Zero

c) Increases
d) Do not change

42. $Li^+$ has a smaller ionic mobility than $K^+$ because of the

a) Larger size of $Li^+$
b) Larger radius to charge ratio of $Li^+$

c) smaller nuclear charge of $Li^+$
d) Greater degree of hydration of Li

43. In the concentration cells, the electrical energy is due to

a) Oxidation of fuel
b) hear energy
c) Chemical reaction

d) Transfer of substance from one solution to another

44. Cell constant of a conduct metric cell

a) In increases with dilution
b) Decrease with dilution

c) Depends on the nature of electrolyte
d) Independent of the nature of electrolyte

45. In the salt bridge, KCl is used because

a) KCl is an electrolyte
b) K+ and Cl- ions are isoelectronic
c) K+ and Cl- have the same mobility
d) None

**Answers**

| Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ans | c | c | a | d | a | d | b | d | d | a | a | b | c | c | d | c | b | c | d | c |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| c | a | b | d | d | c | a | d | c | c | d | a | c | a | b | b | b | a | c | b | b |
| 42 | 43 | 44 | 45 | | | | | | | | | | | | | | | | | |
| d | d | d | c | | | | | | | | | | | | | | | | | |

## ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS:

1. Calomel electrode is constructed using a solution of
a. saturated KCl          b. saturated $CaCl_2$          c. saturated $NH_4Cl$          d. saturated NaCl

2. The standard reduction potential at 298K for $Zn^{+2}$, $Cr^{+3}$, $H^+$ an $dFe^{+3}$ are 0.76V, -0.74V, -0.0V and 0.77V respectively, the strongest reducing agent among there is
   a.  $H^+$              b. $Cr^{+3}$              c. $Zn^{+2}$                  d. $Fe^{+3}$

3. Calomel is
   a.  mercuric sulphide        b. mercurous sulphate        c. mercurous chloride        d. none

4. A storage cell is a device that can operate
a. both as voltage cell & electrical cell        b. as voltaic cell        c. as electrical cell        d. none

5. An electrochemical cell or several electrochemical cells connected in series, that can be used as a source or direct electric current at a constant voltage is called
   a.  battery        b. voltaic cell          c. electrolytic cell          d. metal conductor

6. The cathode of Ni-Cd battery is composed of
   a.  cadmium          b. nickel          c. paste of NiO(OH)          d. paste of $Cd(OH)_2$

7. A fuel cell converts
a. chemical energy of fuels directly to electricity          b. chemical energy of fuels directly to heat
c. chemical energy of fuels directly to pressure          d. none

8. When hydrogen is used as fuel in hydrogen-oxygen fuel cell, the electrode are made of
   a.  an alloy of palladium and silver          b. aluminum          c. iron          d. cadmium

9. When storage cell is operating as voltaic cell it is said to be
   a.  charging          b. discharging          c. neutral          d. none

10. in lead-acid storage cell during discharging operation the concentration of H2SO4
    a.  increases          b. decreases          c. increase-decrease          d. none

11. Electrolyte can conduct electricity because
    a.  Their molecules contains unpaired electrons which are mobile
        b. their molecules contains loosely held electrons which become free under the influence of voltage.        C. their molecules are broken up into ions, when the electrolyte is fused or dissolved in a solvent.        D. their molecules break up into ions when voltage is applied.

12. HCl is called an electrolyte because
    a.  Its molecules are made of electrically charged particles          b. its breaks up into ions when current is passed through it          c. it ionizes when electric current is passed through it          d. it ionizes when dissolved in a proper solvent.

13. Which of the following is a weak electrolyte?
    a.  $NH_4OH$          b. NaOH          c. HCl          d. NaCl

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14. Ionization of an electrolyte in aqueous solution is due to
   a. Hydrolysis of electrolyte        b. increase in electrostatic forces of attraction between the ions
      c. instability of the compound in aqueous medium        d. decrease in the electrostatic forces of
      attraction between the oppositely charged ions.

15. An ionizing solvent has
   a. low value of dielectric constant                        b. a dielectric constant equal to one
      c. a high melting point                              d. a high value of dielectric constant

16. Which of the following does not conduct electricity?
   a. Molten NaCl            b. solution of NaCl in $H_2O$                c. NaCl crystals    d. none.

17. The specific conductance of solution increases with
   a. Increase in concentration   b. decrease in concentration   c. decrease in temperature    d. none.

18. The ionization of a strong electrolyte increases when the solution is diluted and the relation is given
by
   a. nernst equation        b. Ostwald,s law        c. arrhennius equation        d. law of mass action

19. Acetic acid is a weak electrolyte because
   a. Its molecular weight is high                            b. it is weakly ionized
      c. it is a covalent compound                           d. it is highly unstable.

20. The degree of dissociation of acetic acid in an aqueous solution of the acid is practically unaffected.
   a. By adding a pinch of NaCl                          b. by adding a drop of concentrated HCl
      c. by diluting with water                             d. by raising the temperature.

21. Solid NaCl is a bad conductor of electricity because
   a. it contains only molecules                          b. the ions present in its are not free to move
      c. it does not possess ions                          d. it does not contain free molecules.

22. The equivalent conductance of 0.1N NaCl at 25 $^0C$ is 25.2 mho cm2 eq-1. the equivalent
conductance at infinite dilution of NaCl is 126 mho m2 eq-1. the degree of ionization of the 0.1N NaCl
is
   a. 0.5                    b. 0.2                    c. 0.4                    d. 0.1

23. Pure water does not conduct electricity because, it is
   a. Acidic      b. low boiling        c. almost not ionize        d. decomposed easily

24. The molar conductivity of a solution of any electrolyte is the product obtained by multiplying
   a. Specific conductivity with molecular weight      b. specific conductivity with the volume of the
      solution containing 1 gm mole of the electrolyte.      C. reciprocal of conductivity with volume
      d. specific conductivity with equivalent weight.

25. A galvanic cell converts
a. electrical energy into chemical energy                  b. chemical energy into electrical energy
c. electrical energy into heat energy                      d. chemical energy into heat energy.

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26. The potential of standard hydrogen electrode dipped in a solution of 1M concentration and hydrogen gas is passed at 1 atm pressure
    a. 1 volt          b. 10 volt          c. 0 volt          d. 100 volts

27. The potentials of two metals electrodes used in a cell are 0.35V and 0.8 V. the emf of the cell formed by combining them is
    a. 1.2 V          b. 1.15 V          c. -0.5 V          d. 0.5V

28. In electrochemical series the elements are arranged in the
    a. Decreasing order of standard reduction potentials        b. increasing order of standard reduction potentials        c. increasing order of equivalent weights
    d. increasing order of oxidation potentials.

29. Calomel electrode is reversible with respect to
    a. Mercury ion          b. chloride ion          c. both ions          d. none.

30. The electrode potential is the tendency of a metal
    a. to gain electrons          b. to lose electrons          c. either to lose or gain electrons     d. none.

### FILL IN THE BLANKS:

1. On dilution the specific conductivity of an electrolyte _____
2. Specific conductivity of an electrolyte is calculated by the _____
3. Specific conductance is expressed in _____ units.
4. The units or resistivity are _____
5. The total conductance of 1 gm equivalent of an electrolyte at a given dilution is called _____
6. The unit of equivalent conductance is _____
7. The total conductance of all ions is present in one mole of an electrolyte in the solution is called _____
8. The unit of molar conductivity is _____
9. The equivalent conductivity is related to normality by _____ equation.
10. The equivalent and molar conductivities are related by _____ equation.
11. A device which converts electrical energy to chemical energy is called _____
12. Nernst equation for electrode reaction is _____
13. The equivalent conductance _____ on dilution.
14. The relation between the electrode potential E and concentration of an ion is given as (a) _____ equation (b) as _____.
15. The standard electrode potential of saturated calomel electrode at 25 0C is _____
16. The equivalent conductance at infinite dilution of a weak electrolyte is calculated by _____ law.
17. The transport number of an anion is calculated by _____
18. Speed ration of the cation and anion is given by _____
19. A cell whose reaction is not reversible is called _____
20. _____ are the cells which do not store energy.
21. The resistance of a metallic conductor _____ as the temperature is increased.
22. A substance which in aqueous solution or in molten liberates ions and allows electronic current to pass through is called _____
23. The substance which conduct electricity without decomposition is called _____
24. Graphite is a _____ conductor.
25. A substance which allows the electric current to pass through it is called _____

ANSWERS:

| Q.NO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Ans | A | C | C | A | A | C | A | A | B | B | C | D | A | D | D |
| Q.NO | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Ans | C | A | C | B | C | B | B | B | B | B | C | B | B | B | C |

FILL IN THE BLANKS:
1. DECREASES          2. K = 1/P = 1/R X l/S               3. Ohm-1, cm-1               4. ohm
5. EQUIVALENT CONDCUTANCE          6. ohm-1, cm2, gm eq-1   7. MOLAR CONDUCTANCE
8. ohm-1, cm2, gm, mol-1          9. = k x 1000/N 10. = normality / molarity          11. Electrolytic cell
12. E = E0 -0.0591/n  X log (ion)          13. INCREASES   14. A. NERNST  B. E= 0.0592/nc X log (ion)
15. 0.24 or 0.338          16. KOHLRAUSCH'S LAW                    17. n = v / (u+v)          18. = (1-n)/n
19. Primary cell          20. Fuel cell          21. Decreases                    22. Electrolyte
23. metallic conductor          24. metallic          25. conductor

1.  an inhibitor which when added in small quantities to aqueous corrosive environment
a effectively decreases the corrosion of the metal
b. increases the corrosion of a metal
c. no effect on the corrosion of metal
d. increases the corrosion nature of the environment.

2. in the electrochemical corrosion
a. anode undergoes oxidation
b. cathode undergoes oxidation
c. anode undergoes reduction
d. both cathode and anode under goes oxidation

3. The deciding factor in atmospheric corrosion is
a presence of oxygen in air                          c. humidity of air
b. presence of gases like $SO_2$                     d. frequency of rainfall

4. during corrosion of iron in aqueous solution
a corrosion occurs at cathode
b. corrosion product is deposited at anode
c. corrosion occurs at anode
d. corrosion occurs at cathode with deposition of rust at cathode.

5. The metal at the top of the electrochemical series is
a. most stable              b. most noble              c. least active              d. more active

6.  The following metal is used for the cladding of aluminum
a.   99.5% pure Al                                    c.   98.5 % pure Al
b.    100% pure Al                                    d.   99% pure Al

7. Opacity and desired colour to paint is provided by
a. pigments          b. extenders    c. dries          d. thinners

8. The oxygen carriers of the paint is provided by
a. drier      b. pigments    c. thinner        d. drying oil

9. Cathodic coatings if punctured
a.   have affect on the base metal
b.   causes less corrosion of the base metal
c.   causes accelerated corrosion of the base metal
d.   Cathodic coating corrodes first followed by the corrosion of base metal.

10. The rusting of iron is catalyzed by one of the following
        a. Fe    b. $O_2$    c. Zn    d. $H^+$

11. Corrosion is an example of
a.   oxidation                b.   reduction              c.   electrolysis              d.   erosion

12. For the corrosion of iron one of the following factors is essential
a.   presence of moisture                             c.   presence3 of hydrogen
b.   presence of both moisture and oxygen            d.   presence of strong  acid

13. The buried pipeline is protected from corrosion by connecting to Mg block it is called
a.   impressed voltage protection                    b.   sacrificial cathodic protection

c. sacrificial anodic protection

d. any of these

14. during wet corrosion
    a. the anodic part undergoes oxidation
    b. the cathodic part undergoes oxidation
    c. the anodic part undergoes reduction

    d. Neither cathodic nor anodic part undergoes any change.

15. The rate of corrosion of iron in atmosphere depends on
    a. Humidity of atmosphere b. degree of pollution in atmosphere c. frequency of rain fall d. all the above.

16. In water line corrosion the maximum amount of corrosion takes place
    a. Along the line just above the level of water meniscus b. along the line at the level of water meniscus c. along the line just below the level of water meniscus d. at the bottom of the vessel.

17. Addition of hydrazine hydrate to corrosive environment
    a. Retards anodic reaction b. prevents diffusion of proton to cathode c. retards cathodic reaction by consuming dissolved oxygen. D. increases hydrogen over voltage.

18. Anodic coating protects the underlined metal
    a. Due to its nobel character b. sacrificially c. due to its higher electrode potential d. none.

19. Drying oils supply to paint film
    a. main film forming constituents b. medium or vehicle c. water proof-ness d. all the above

20. The function of ammonium chloride used as flux in galvanization is to
    a. Prevent oxide formation. B. prevent deposition of impurities c. reduce the content of base metal and coating metal. D. none.

21. The process of covering steel with tin to prevent it from corrosion is called
    a. galvanizing b. tinning c. metal cladding d. electro plating

22. Sand blasting is used for removing the following from the metal surfaces
    a. oxide scale b. oils c. greases d. old paints

23. Acid pickling of steel is carried out by dipping in
    a. dil HCl  b. warm Dil HCl. C. warm Dil $H_2SO_4$ d. dil $H_2SO_4$

24. The following reagents are used for solvent cleaning of metal surface
    a. Naphtha b. acid c. alkali d. sodium carbonate.

25. Electroplating is process of depositing a thin layer of
    a. Superior metal over inferior base metal. B. inferior metal over superior base metal c. superior metal over superior base metal d. inferior metal over inferior base metal

26. Anodic coating protects underlined metal
    a. due to noble character b. higher oxidation potential c. due to its lower oxidation potential d. due to its higher reduction potential

1. A 2. A 3.A 4.C 5.D 6.A 7.A  8. A 9. C 10.D 11. A 12.B  13.C  14.A 15. D 16. C 17. C 18. B 19. D 20. A 21. B 22. A 23. B 24. A 25. B 26.B

## FILL IN THE BLANKS:

1. Galvanization means coating of _____ on the iron and steel objects.
2. In chromium plating the electrolytic solution contains _____ as electrolyte.
3. _____ Sheeting consists of plate of duraluminium sandwitched between two layers of aluminium of 99.5% pure.
4. An example of cathodic coating _____.
5. corrosion is a gradual decay of metal by the attack of _____.
6. soil corrosion is pure _____ in character.
7. the phenomenon of a metal or an alloy exhibiting a much higher corrosion resistance than expected is called as _____.
8. the corrosion that results in the formation of pin holes, pits and cavities in the metal is _____--.
9. the type of corrosion which occurs along grain boundarys is called___.
10. the rate of corrosion increases with ___ in pH.
11. impurities in metal causes_____.
12. the mechanical dispersion of mixture of one or more pigments in a vehicle is called __.
13. _____ oils are used as vehicle in paints.
14. the oxygen carriers in paints are called _____.
15. __ coating are produced from coating metals which are anodic to the base metal.
16. Cathodic coatings are obtained by coating a _____ metal than the base metal.
17. The process by which coating metal is deposited on the base metal by passing a direct current through an electrolytic solution containing soluble salt of the metal is _____.
18. _____ is used to remove oils , greases, buffing compounds and fatty substances from the base metal surfaces.
19. sand blasting is used for removing __ scales.
20. _____ method is more widely used for common metal spraying.
21. During colorizing the composition of the protecting layer formed is ___.
22. _____ is produced by the interaction of a mixture of volatile chromos chloride and hydrogen with steel parts at $1050^0$C.
23. _____ are inorganic surface barrier, produced by chemical or electrochemical reaction, brought at the surface of the base metal.
24. An example of anodic corrosion inhibitor_____.
25. when the ratio of anodic to cathodic area decreases the rate of corrosion_____.
26. the chemical composition of the corrosion prodect of iron is _____.
27. in acidic environment lower the value of hydrogen over voltage ___ is the rate of corrosion.
28. in galvanic corrosion the metal having relatively _____ Eo value will undergo corrosion.
29. formation of _____ type of metal oxide causes rapid and continous corrosion.
30. pickling method is used for the removal of _____ deposits on the metal surface

**Answers:**1. Zinc 2. $H_2CrO_4 + H_2SO_4$ 3. Alclad 4. Tinning 5.Environment 6.Electrochemical 7.Passivity 8.Pitting corrosion 9.Intergranular 10. increases 11.Heterogenisity 12. Paint 13.Drying oils 14. Driers 15. Anodic 16. Noble 17. Electroplating 18.Solvent Cleaning 19.Oxide 20.Wire Gun method 21. $Al_3F_2$ 22. Chromising 23. Chemical conversion coating 24.Chromate or Phosphate 25.Increase 26.$Fe_2O_3.3H_2O$ 27.Higher 28.Lower 29.Volatile and porous 30.Scale or rust