500 questions
for lab Chemist interview
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المقدمة

بسم الله الرحمن الرحيم

الحمد لله نحمد ونستعينه ونعوذ به من شرور أنفسنا ومن سيئات أعمالنا من يهده الله فلا مضل له ومن يضلل فلا هدي له واشهد أن لا إله إلا الله وأشهد أن محمد عبده ورسوله وعلي أله وصحبه ومن دعا وإلي يوم الدين.

يحتوي الملف علي 500 سؤال وجواب لأهم أسئلة الكيمياء الوارد ذكرها في المقابلة الشخصية للكيميائيين

أسأل الله التوفيق للجميع

ولا تنسونا بخالص الدعاء

كيميائي / احمد طلعت النجار

1.Do you know what is GLP?

GLP means Good Laboratory Practice. It is a framework or pattern under which research work are planned, performed, monitored, recorded, reported and archived.

2.Do you know what is Calibration Curve?

Calibration curve is the relationship between the various concentration of analyte in a suitable solvent or matrix and the signal response of the instrument.

3.Do you know what is co-chromatography?

Co-chromatography is the procedure used to detect an unknown substance by comparing the chromatic comparison with a known substance.

4.Tell me what do you know about MSDS?

Material Safety Data Sheets are used to handle chemical use in a laboratory. They are issued with every chemical that any lab uses or stocks.

5.Do you know what is blank?

Blank term is used to refer the sample tube which does not contain the analyte.

6.Do you know why GLP is followed in the lab?

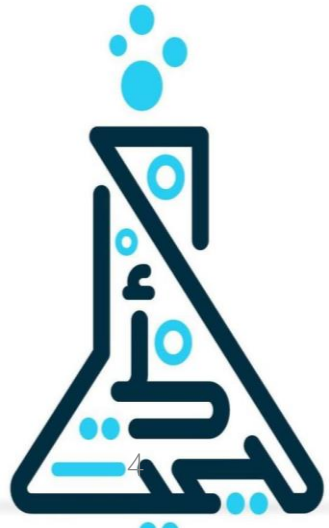
☛ Following GLP standard, minimizes the chance of error occurs due to humans.
☛ It supports for product registration, also assures the suitability of data to the regulatory authorities.
☛ It helps to reduce the cost of industry and governments by avoiding duplicative testing.
☛ It helps to re-create a study from the recorded data and information.

7.Tell me what are the factors on which the gas sterilization depends on?

Gas sterilization depends on factors like
☛ Concentration of the gas
☛ Humidity
☛ Time of exposure
☛ Temperature
☛ Nature of the load

8.Do you know what does a quality control chemist do?

☛ quality control: testing samples of raw materials or products either in mid-stage or close to final stage to make sure that they are of high enough quality, reaching the standards and qualifications, before the product can be mass produced.



9.What Is Titration?

"Titration is a process of determining molarity of a base or an acid."

10.Explain the term Aliquot and Diluent?

Aliquot: It is a measured sub-volume of the original sample

Diluent: Material with which sample is diluted

11.What is molality?

Molality is the number of solutes that are present in 1 kg of a solvent.

12.What is titration?

Titration is a process to determine the molarity of a base or an acid. In this process, a reaction is carried out between the known volumes of a solution with a known concentration, against the known volume of a solution with an unknown concentration.

13.Mention the formula to calculate pH of a solution?

In order to calculate the pH of a solution you have to use the formula

pH= -log [H+] or pH = -log [H3O+]

14.What is buffer?

A buffer is an aqueous solution which has highly stable pH. It is a blend of a weak acid and its conjugate base or vice versa. On adding a small amount of base or acid to buffer, its pH hardly changes.

While when you select an acid as a buffer solution, try to use an acid that has a pH closed to your desired pH. This will help your buffer to achieve a nearly equivalent amount of acid and conjugate base, so that it will enable to neutralize as much as H+ and OH -.

15.What is a mole?

Mole is the unit used to define the number of chemical substance present in a substance. It is the amount of substance which consists of the same number of chemical units as there are atoms in exactly 12gram of pure carbon-12.

16.Mention the formula to calculate pH of a solution?

In order to calculate the pH of a solution you have to use the formula

pH= -log [H+] or pH = -log [H3O+].

17.How will you calculate how many moles of glucose present in 320 mL of 5.0 M of glucose solution?

First step: Convert the volume from milli litres to litres
320 X (1 litre/1000mL) = 0.320 L solution Second use the formula = M x V
= 5.0 moles glucose/ litre solution X 0.320 L solution
= 1.6 moles of glucose present in 320mL of solution

18.What is the difference between Molarity and Normality?

Both techniques are used to the amount of chemical present in the solution. However, they are almost similar but differs in

Molarity

Molarity is used to know the total amount of molecules in a 1-liter solution
It is expressed as moles of a compound per liter of solution

Normality

Normality is used to know the total number of reactive units in 1liter of solution
It is expressed in equivalent per liter

19.What is Valency?

Valency is a property of groups or atoms, equal to the number of atoms of hydrogen that the group or atom could combine with or displace it in forming compounds.

20.What is Avogadro's law?

According to Avogadro's law, at the same temperature and pressure, an equal volume of gases contains the same number or molecules.

What is the metal used to extract copper from the solution of copper sulfate?
Fe or ferrous is the metal that is used to extract copper from the solution of copper sulfate.

21.What is the chemical composition of fat in the human body?

Fat found in the human body is mainly composed of
Glycerides
Glycerides + Phospholipids
Glycolipids
Phosphoinositides
Tocopherol

22.What makes a molecule into organic molecule?

In a molecule when a hydrogen atom is less than the ratio of a carbon atom, then such molecules are referred to as an organic molecule.

23.What is the formula you will use to calculate how many milliliters of 5.5 M NaOH are required to prepare 400 mLof 1.5M NaOH?

To know the amount or volume of NaOH to prepare 400 mL of 1.5 M NaOH, we use formula

M1 X V1 = M2 X V2

5.5 X V1 = 1.5 M x 0.4 L

V1 = 1.5 M X 0.4L/ 5.5

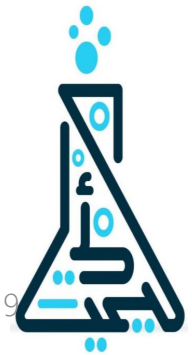
V1= 0.10 L

V1 = 100mL

So, you need 100mL of 5.5 NaOH

24.Why graphite rod is used in nuclear reactor?

Graphite rod is used in nuclear reactor to convert fast-moving neutrons into thermal neutrons.



25.Mention how many millilitre is equal to 1 litre and how many microliter is equal to litre?

1 millilitre = 0.0001 litre

1 microliter = 0.0000001 litre

26.What is oxidation and reduction reaction?

Oxidation = When there is a loss of hydrogen or electrons OR gain of oxygen is known as Oxidation reaction.

Reduction = When there is a gain of hydrogen or electron OR loss of oxygen is known as a reduction reaction

Example of oxidation-reduction reaction is observed in the human body when an electron is transferred into the cell and oxidation of glucose take place from which we get the energy.

27.What is the concentration, in parts per billion, of asolution that contains 1 microgram of solute per liter?

1 PPB

28.Never found uncombined on Earth, what elementoccurs abundantly in limestone, gypsum and fluorite:

Calcium

29.To the nearest whole number, convert 0.300atmosphere into millimeters of mercury, or torr: 228 Millimeters Of Mercury, Or Torr

30. (4.0) liters of oxygen are mixed with 8.0 liters of nitrogen. Identify the solute and solvent in this mixture:
Oxygen Is The Solute; Nitrogen Is The Solvent

31.The reaction of an acid with an alcohol to form an ester and water is called:
Esterification

32.Carbohydrates are made of what three elements?
Carbon,
Hydrogen
Oxygen

33.What are the two most common end-products of alcoholic fermentation?
Ethanol And Carbon Dioxide

34.How many milliliters of water would you add to 100milliliters of a 0.350 molar solution to make a 0.100 molar solution?

250 Milliliters

35.What is the term for the pH at which an amino acid orprotein becomes electrically neutral?

Isoelectric Point

36.Many of the groups of elements in the periodic tablehave acquired common names. The elements in Group IA,with the exception of hydrogen, are called what?

Alkali Metals

37.Name the two most abundant elements in the universe?

Hyydrogen And Helium

38.Give the symbol for the element that is derived fromthe Latin word Plumbum?

Pb

39.In order to compare two different gas samples, scientists use what is called the STP. What does STP stand for?

Standard Temperature And Pressure

40.What colorless liquid was originally produced from the distillation of wood and is often referred to as wood alcohol:

Methanol

41.What is the acid anhydride of H2CO3?

CO2

42.What is dipole-dipole force?

Dipole-dipole force is weak attraction that occurs between two polar molecules.

43.What is pH?

pH is the negative logarithm of hydrogen ion concentrated.

44.What are substrates?

A substrate is a surface on which a plant or animal grows or is attached.

pH= -log [H+]

45.What kind of bond does HCl have?

The bond between hydrogen and chlorine in HCl is polar covalent bond because of large electro negativity difference between the two bonded atoms.

46.What is the dipole moment direction for methanol?

The direction is towards the oxygen since the Oxygen atom has amuch higher electronegative than either of the three Hydrogen atoms or the Carbon atom itself.

47.What is the difference between HCl acid and HCl gas?

HCl gas is molecular HCl in the gaseous phase, HCl acid is HCl in solution with water, and can be said to be in the form H+ Cl-.(Alternatively, to be a pendant, H3O+ Cl- as technically protons does not exist on their own in solution.) It is this dissociation of the molecule into constituent ions, which gives an acid its properties.

On a physical level, HCl gas is a yellow/green gas, and HCl acid is a clear solution.

48.What is the pH of an Alkyl Halide?

The pH is usually on acidic side (i.e. pH < 7). The reason being, some of the alkyl halides tend to decompose via beta hydride elimination process generating hydro-halo acids that impart acidity, e.g. tertiary butyl chloride decomposes to produce HCl or hydrochloric acid.

49.What is Chemical formula for glass?

Silica is one of the main components in glass. The chemical formula for Silica is Si02.

50.What is a hydrogen bond?

A hydrogen bond is a special type of attractive interaction (perhaps a variation of a dipole-dipole bond) that exists between an electronegative atom and a hydrogen atom bonded to another electronegative atom. This type of bond always involves a hydrogen atom, thus the name. Hydrogen bonds can occur between molecules(intermolecular) or within different parts of a single molecule(intra molecularly). The typical hydrogen bond is stronger than van-der-Waals forces, but weaker than covalent or ionic bonds.

51.What is the only known substance for which there is no triple point?

Helium

52.Convert 673 Kelvin into degrees centigrade?

400 degree C

53.What is an oxidizing agent?

Any chemical species that has a tendency to accept electrons and thereby undergoing reduction themselves is known as an oxidizing agent.

54.How do you prepare a solution of 1 M HCl?

Exactly how you prepare will depend on what you are starting with. Typically, to make a 1 M HCl solution, you will be starting with a stock solution of more concentrated HCl that you will then dilute.

55.Is DNA organic?

Of, relating to, or derived from living organisms: organic matter.
Of, relating to, or affecting a bodily organ: an organic disease.
In addition, DNA would chemically be considered organic since it contains carbon as the primary chemical backbone of the molecule.

56.How many electrons are in benzene?

There are 30 electrons in benzene. This includes 24 carbon electronsand 6 hydrogen electrons. There are 12 electrons shared between Cand H, and 18 between C and C. (6 electrons in up ring, 6 in down ringand 6 between C and C).

57.What is a dipole moment?

Dipole moment is the measure polarity of a polar covalent bond. It isdefined as the product magnitude of charge on the atoms and thedistance between the two bonded atoms.
Its common unit is debyeand SI unit is columb meter.

58.How many moles of HCl are present in .70 L of a .33 M HCl solution?

► First, remember definition of M (moles), M = moles of species / L.

0.33 M = 0.33 moles HCl / L

► Then, multiple your volume by the molar concentration:

0.33 moles HCl / L x 0.70 L = 0.231 moles HCl

It is helpful to carry the units with your calculations. That way you can check that numerators and denominators cancel to give you the units of your answer.

59.How do you solve Ideal Gas Law problems?

The Ideal Gas Law is used to relate the pressure, volume, temperature, and amount of an "ideal" gas. Although many gases are not ideal in reality, you can usually use the Ideal Gas Law anyway. Here is how you solve these problems!

The Ideal Gas Law is PV = nRT.

60.Is HCl an acid or a base?

HCl, or hydrochloric acid, as the name implies, is an acid. In fact, it is considered a strong acid because it dissociates completely in water to form H3O+ and Cl-.

However, it can also act as a base in reactions with acids stronger than it can like HClO4.

61.What wavelengths can the human eye see?

Human eye is sensitive to an approximate range of wavelength of radiations from 380nm to 760nm. This portion of electromagnetic spectrum is identified as Light.

62.How does spontaneous combustion occur?

It is caused by a build up of sulfur in a person's body that eventually reacts to increased body heat.

63.What is the use of glacial acetic acid?

There are no medical uses to pure GAA, dilute concentrations can be used to remove warts or verucas; it can also be used via iontophoresis to treat bone spurs. Industrial uses include photography and the manufacturing of aspirin.

64.How do you separate the colors of ink?

The colors of ink can be separated by chromatography.

65.What Is Standard Deviation?

Standard deviation tells about the widely spread out of the measured analytical data points. Highly precised measurements are less standard deviation.

66.How To Calculate Signal To Noise Ratio By This Formula 2h/h Where H From Where And How To Measure?

The H is the height of the main peak and the h is the lowest height of a peak in the range of X5 the main peak (around the amin peak).

67.Explain What Is A Base Line?

Base line is nothing but the detectors response to the mobile phase.(gc,hplc)
Base line should be stable to start a run.
Un stabilized base line is called as base line noise.
Base line noise is of many types..

- Cyclic base line
- Synchorinise noise
- Asynchorinise noise
- Base line drift
- Spikes
- Negative peaks
- No peaks

Base line noise is attributed due to mobile phase, sample, system problems. Leaks in the system, temperature variations in lab etc..

68.What Is Deference Between The Working Standard And Reference Standard?

Reference std is like USP,EP std , in this std we get COA including results of Potency by HPLC , NMR & XRPD data. whenever there is requirement of w. std preparation first we have get API raw material from warehouse & we check assay , water content or LOD & Related substances aganist reference std . Some times we are doing analysis in duplicate & get mean value.
then we decide final assay or potency value & it's validity one year.

69.How Do We Fix The Sample Concentaryion In Hplc Method Development. What Is The Basis?

If all impurities at spec level are meeting s/n ratio more than 60 at that particular concentration as wel as no column overload.

70.Suppose We Prepared Ph Buffer Solution In Lab.and Calibrate Against Nist Solution, And Same Shall Going To Used Up To 30 Days. Is It Possible To Stable Ph And Appearance? Suggest?

PH of the buffer solution will be change, as due to presence of nitrogen containing substances and also due to microbial growth. but if stored at 4 degree centi. it may used to some extent.

71.Define Octane Number?

It is the resistance to the detonation of fuel in a spark-ignition engine compared to the isooctane-n-heptane mixture.

72.What Is Gibbs Free Energy?

It is the available energy or the greatest amount of mechanical work done by a system at constant temperature and pressure.

73.What Is Entropy?

Entropy is a measure of disorderliness. It explains the system's closeness to equilibrium.

74.Why Are Decomposition Reactions Called The Opposite Of Combination Reactions?

In a decomposition reaction a single substance splits to form two or more than two substances, whereas, in a combination reaction two or more substances combine to form a single substance So, it is opposite to each other.

75.What Is The Role of A Catalyst?

A catalyst reduces the energy of activation for a reaction by providing an alternative pathway. In this way, it speeds up the reaction and allows it to proceed under milder conditions.

76.Why Are Olefins (alkenes) Good Monomers For Polymerization Reactions?

The electrons in the weak p-bonds can be used to form strong s bonds to other monomer units.

77.How many ml. of 1 M H SO solution is required to neutralize 10ml. of 1M NaOH solution?

A) 2.5 ml
B) 5.0 ml
C) 10 ml
D) 20 ml

Answer - B

78.Aniline is separated from a mixture by_____

A) Fractional crystallization
B) Fractional distillation
C) Steam distillation
D) Vacuum distillation

Answer : C

79.Spectroscopy deals with interaction of electromagnetic radiation with matter. What is the speed of this radiation in vacuum in m/s?

A) 6 x 108
B) 5 x 108
C) 7 x 108
D) 3 x 108

Answer: D

80.Which of the following is not a property or parameter of electromagnetic radiation?

A) Wavelength
B) Voltage
C) Wave number
D) Amplitude

Answer: B

81.Which of the following is not a type of Spectroscopy?

A) Gamma ray
B) X ray
C) Nuclear magnetic resonance
D) Sound

Answer: D

82.Which of the following is the wavenumber of UV and Visible radiation?

A) 1 x 106 to 1.3 x 104 m-1
B) 1 x 106 to 1.3 x 104 m
C) 13 – 27 m-1
D) 1 x 106 to 1.3 x 104 m2

Answer: A

83.Chromatography is a physical method that is used to separate and analyse _____

A) Simple mixtures
B) Complex mixtures
C) Viscous mixtures
D) Metals

Answer: B

84. In chromatography, the stationary phase can be _____ supported on a solid.

A) Solid or liquid
B) Liquid or gas
C) Solid only
D) Liquid only

Answer: A

85.In chromatography, which of the following can the mobile phase be made of?

A) Solid or liquid
B) Liquid or gas
C) Gas only
D) Liquid only

Answer: B

86. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

A) Solid, liquid
B) Liquid, liquid
C) Liquid, gas
D) Solid, gas

Answer: A

87. Which of the following is not correct about High pressure liquid chromatography (HPLC)?

A) It requires high pressure for the separation of the specious
B) There is no need to vaporize the samples
C) It is performed in columns
D) It has high sensitivity

Answer: A

88. Quantum dots is widely used in the following research field_____

A) Crystallography
B) Mechanics
C) Optoelectronics
D) Quantum physics

Answer: C

89.Mark the compound which turn black with Ammonium Hydroxide.

A) Lead chloride
B) Mercurous chloride
C) Mercuric chloride
D) Silver chloride

Answer :B

90.All of the following methods are used for the analysis of precipitate, EXCEPT?

A) Volhard's method
B) Haber's method
C) Fajan's method
D) Mohr's method

Answer: B

91. What is the cell voltage at reaction equilibrium?

A) Zero
B) It is reduced
C) It is oxidized
D) None of the above

Answer: A

92. Which of the following substances CANNOT be separated by distillation?

A) A mixture of proteins
B) Crude oil fractions
C) Oxygen and nitrogen in air
D) Water in salt solution

Answer: A

93.Which of the following sulphides is not soluble in hot dil Nitric acid ?

A) CuS
B) ZnS
C) NiS
D) CdS

Answer : C

94. Aniline is separated from a mixture by_____

A) Fractional crystallization
B) Fractional distillation
C) Steam distillation
D) Vacuum distillation

Answer: C

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Answer: A

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A) CuS
B) ZnS
C) NiS
D) CdS

Answer : C

97. Aniline is separated from a mixture by_____

A) Fractional crystallization
B) Fractional distillation
C) Steam distillation
D) Vacuum distillation

Answer: C

98.

Find the number of moles and millimoles of benzoic acid ($\mathcal{M}$ = 122.1 g/mol) that are contained in 2.00 g of the pure acid.

Solution

If we use HBz to represent benzoic acid, we can write that 1 mole of HBz has a mass of 122.1 g. Therefore,

$$\text{amount HBz} = n_{\text{HBz}} = 2.00 \text{ g HBz} \times \frac{1 \text{ mol HBz}}{122.1 \text{ g HBz}} \qquad (4\text{-}1)$$

$$= 0.0164 \text{ mol HBz}$$

To obtain the number of millimoles, we divide by the millimolar mass (0.1221 g/mmol), that is,

$$\text{amount HBz} = 2.00 \text{ g HBz} \times \frac{1 \text{ mmol HBz}}{0.1221 \text{ g HBz}} = 16.4 \text{ mmol HBz}$$

99.

What is the mass in grams of Na^+ (22.99 g/mol) in 25.0 g of Na_2SO_4 (142.0 g/mol)?

Solution

The chemical formula tells us that 1 mole of Na_2SO_4 contains 2 moles of Na^+, that is,

$$\text{amount } Na^+ = n_{Na^+} = \text{mol } Na_2SO_4 \times \frac{2 \text{ mol } Na^+}{\text{mol } Na_2SO_4}$$

To find the number of moles of Na_2SO_4, we proceed as in Example 4-1:

$$\text{amount } Na_2SO_4 = n_{Na_2SO_4} = 25.0 \text{ g } Na_2SO_4 \times \frac{1 \text{ mol } Na_2SO_4}{142.0 \text{ g } Na_2SO_4}$$

Combining this equation with the first leads to

$$\text{amount } Na^+ = n_{Na^+} = 25.0 \text{ g } Na_2SO_4 \times \frac{1 \text{ mol } Na_2SO_4}{142.0 \text{ g } Na_2SO_4} \times \frac{2 \text{ mol } Na^+}{\text{mol } Na_2SO_4}$$

To obtain the mass of sodium in 25.0 g of Na_2SO_4, we multiply the number of moles of Na^+ by the molar mass of Na^+, or 22.99 g. And so,

$$\text{mass } Na^+ = \text{mol } Na^+ \times \frac{22.99 \text{ g } Na^+}{\text{mol } Na^+}$$

Substituting the previous equation gives the mass in grams of Na^+:

$$\text{mass } Na^+ = 25.0 \text{ g } Na_2SO_4 \times \frac{1 \text{ mol } Na_2SO_4}{142.0 \text{ g } Na_2SO_4} \times \frac{2 \text{ mol } Na^+}{\text{mol } Na_2SO_4} \times \frac{22.99 \text{ g } Na^+}{\text{mol } Na^+}$$

$$= 8.10 \text{ g } Na^+$$

100.

Calculate the molar concentration of ethanol in an aqueous solution that contains 2.30 g of C_2H_5OH (46.07 g/mol) in 3.50 L of solution.

Solution

To calculate molar concentration, we must find both the amount of ethanol and the volume of the solution. The volume is given as 3.50 L, so all we need to do is convert the mass of ethanol to the corresponding amount of ethanol in moles.

$$\text{amount } C_2H_5OH = n_{C_2H_5OH} = 2.30 \text{ g } \cancel{C_2H_5OH} \times \frac{1 \text{ mol } C_2H_5OH}{46.07 \text{ g } \cancel{C_2H_5OH}}$$

$$= 0.04992 \text{ mol } C_2H_5OH$$

To obtain the molar concentration, $c_{C_2H_5OH}$, we divide the amount by the volume. Thus,

$$c_{C_2H_5OH} = \frac{2.30 \text{ g } \cancel{C_2H_5OH} \times \frac{1 \text{ mol } C_2H_5OH}{46.07 \text{ g } \cancel{C_2H_5OH}}}{3.50 \text{ L}}$$

$$= 0.0143 \text{ mol } C_2H_5OH/L = 0.0143 \text{ M}$$

101.

Describe the preparation of 2.00 L of 0.108 M $BaCl_2$ from $BaCl_2 \cdot 2H_2O$ (244.3 g/mol).

Solution

To determine the number of grams of solute to be dissolved and diluted to 2.00 L, we note that 1 mole of the dihydrate yields 1 mole of $BaCl_2$. Therefore, to produce this solution we will need

$$2.00 \text{ L} \times \frac{0.108 \text{ mol } BaCl_2 \cdot 2H_2O}{\text{L}} = 0.216 \text{ mol } BaCl_2 \cdot 2H_2O$$

The mass of $BaCl_2 \cdot 2H_2O$ is then

$$0.216 \text{ mol } BaCl_2 \cdot 2H_2O \times \frac{244.3 \text{ g } BaCl_2 \cdot 2H_2O}{\text{mol } BaCl_2 \cdot 2H_2O} = 52.8 \text{ g } BaCl_2 \cdot 2H_2O$$

Dissolve 52.8 g of $BaCl_2 \cdot 2H_2O$ in water and dilute to 2.00 L.

102.

Describe the preparation of 500 mL of 0.0740 M Cl^- solution from solid $BaCl_2 \cdot 2H_2O$ (244.3 g/mol).

Solution

$$\text{mass } BaCl_2 \cdot 2H_2O = \frac{0.0740 \text{ mol Cl}}{\text{L}} \times 0.500 \text{ L} \times \frac{1 \text{ mol } BaCl_2 \cdot 2H_2O}{2 \text{ mol Cl}}$$

$$\times \frac{244.3 \text{ g } BaCl_2 \cdot 2H_2O}{\text{mol } BaCl_2 \cdot 2H_2O} = 4.52 \text{ g } BaCl_2 \cdot 2H_2O$$

Dissolve 4.52 g of $BaCl_2 \cdot 2H_2O$ in water and dilute to 0.500 L or 500 mL.

103.

What is the molar concentration of K^+ in a solution that contains 63.3 ppm of $K_3Fe(CN)_6$ (329.3 g/mol)?

Solution

Because the solution is so dilute, it is reasonable to assume that its density is 1.00 g/mL. Therefore, according to Equation 4-2,

$$63.3 \text{ ppm } K_3Fe(CN)_6 = 63.3 \text{ mg } K_3Fe(CN)_6/L$$

$$\frac{\text{no. mol } K_3Fe(CN)_6}{L} = \frac{63.3 \text{ mg } K_3Fe(CN)_6}{L} \times \frac{1 \text{ g } K_3Fe(CN)_6}{1000 \text{ mg } K_3Fe(CN)_6}$$

$$\times \frac{1 \text{ mol } K_3Fe(CN)_6}{329.3 \text{ g } K_3Fe(CN)_6} = 1.922 \times 10^{-4} \frac{\text{mol}}{L}$$

$$= 1.922 \times 10^{-4} \text{ M}$$

$$[K^+] = \frac{1.922 \times 10^{-4} \text{ mol } K_3Fe(CN)_6}{L} \times \frac{3 \text{ mol } K^+}{1 \text{ mol } K_3Fe(CN)_6}$$

$$= 5.77 \times 10^{-4} \frac{\text{mol } K^+}{L} = 5.77 \times 10^{-4} \text{ M}$$

104.

Calculate the p-value for each ion in a solution that is 2.00×10^{-3} M in NaCl and 5.4×10^{-4} M in HCl.

Solution

$$pH = -\log [H^+] = -\log (5.4 \times 10^{-4}) = 3.27$$

To obtain pNa, we write

$$pNa = -\log[Na^+] = -\log (2.00 \times 10^{-3}) = -\log (2.00 \times 10^{-3}) = 2.699$$

The total Cl^- concentration is given by the sum of the concentrations of the two solutes:

$$\begin{aligned}[Cl^-] &= 2.00 \times 10^{-3}\ M + 5.4 \times 10^{-4}\ M \\ &= 2.00 \times 10^{-3}\ M + 0.54 \times 10^{-3}\ M = 2.54 \times 10^{-3}\ M \\ pCl &= -\log[Cl^-] = -\log 2.54 \times 10^{-3} = 2.595\end{aligned}$$

EXAMPLE 4-9

Calculate the molar concentration of Ag^+ in a solution that has a pAg of 6.372.

Solution

$$\begin{aligned}pAg &= -\log [Ag^+] = 6.372 \\ \log [Ag^+] &= -6.372 \\ [Ag^+] &= 4.246 \times 10^{-7} \approx 4.25 \times 10^{-7}\ M\end{aligned}$$

105.

Calculate the molar concentration of HNO_3 (63.0 g/mol) in a solution that has a specific gravity of 1.42 and is 70.5% HNO_3 (w/w).

Solution

Let us first calculate the mass of acid per liter of concentrated solution

$$\frac{\text{g HNO}_3}{\text{L reagent}} = \frac{1.42\ \cancel{\text{kg reagent}}}{\text{L reagent}} \times \frac{10^3\ \cancel{\text{g reagent}}}{\cancel{\text{kg reagent}}} \times \frac{70.5\ \text{g HNO}_3}{100\ \cancel{\text{g reagent}}} = \frac{1001\ \text{g HNO}_3}{\text{L reagent}}$$

Then,

$$c_{HNO_3} = \frac{1001\ \cancel{\text{g HNO}_3}}{\text{L reagent}} \times \frac{1\ \text{mol HNO}_3}{63.0\ \cancel{\text{g HNO}_3}} = \frac{15.9\ \text{mol HNO}_3}{\text{L reagent}} \approx 16\ \text{M}$$

106.

Describe the preparation of 100 mL of 6.0 M HCl from a concentrated solution that has a specific gravity of 1.18 and is 37% (w/w) HCl (36.5 g/mol).

Solution

Proceeding as in Example 4-10, we first calculate the molar concentration of the concentrated reagent. We then calculate the number of moles of acid that we need for the diluted solution. Finally, we divide the second figure by the first to obtain the volume of concentrated acid required. Thus, to obtain the concentration of the reagent, we write

$$c_{HCl} = \frac{1.18 \times 10^3 \text{ g reagent}}{\text{L reagent}} \times \frac{37 \text{ g HCl}}{100 \text{ g reagent}} \times \frac{1 \text{ mol HCl}}{36.5 \text{ g HCl}} = 12.0 \text{ M}$$

The number of moles HCl required is given by

$$\text{no. mol HCl} = 100 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{6.0 \text{ mol HCl}}{\text{L}} = 0.600 \text{ mol HCl}$$

Finally, to obtain the volume of concentrated reagent, we write

$$\text{vol concd reagent} = 0.600 \text{ mol HCl} \times \frac{1 \text{ L reagent}}{12.0 \text{ mol HCl}} = 0.0500 \text{ L or } 50.0 \text{ mL}$$

Therefore, dilute 50 mL of the concentrated reagent to 600 mL.

107.

(a) What mass of $AgNO_3$ (169.9 g/mol) is needed to convert 2.33 g of Na_2CO_3 (106.0 g/mol) to Ag_2CO_3? (b) What mass of Ag_2CO_3 (275.7 g/mol) will be formed?

Solution

(a) $Na_2CO_3(aq) + 2AgNO_3(aq) \rightarrow Ag_2CO_3(s) + 2NaNO_3(aq)$

Step 1.

$$\text{amount } Na_2CO_3 = n_{Na_2CO_3} = 2.33 \text{ g } \cancel{Na_2CO_3} \times \frac{1 \text{ mol } Na_2CO_3}{106.0 \text{ g } \cancel{Na_2CO_3}}$$

$$= 0.02198 \text{ mol } Na_2CO_3$$

Step 2. The balanced equation reveals that

$$\text{amount } AgNO_3 = n_{AgNO_3} = 0.02198 \cancel{\text{ mol } Na_2CO_3} \times \frac{2 \text{ mol } AgNO_3}{1 \cancel{\text{ mol } Na_2CO_3}}$$

$$= 0.04396 \text{ mol } AgNO_3$$

In this instance, the stoichiometric factor is (2 mol $AgNO_3$)/(1 mol Na_2CO_3).

Step 3.

$$\text{mass } AgNO_3 = 0.04396 \cancel{\text{ mol } AgNO_3} \times \frac{169.9 \text{ g } AgNO_3}{\cancel{\text{mol } AgNO_3}} = 7.47 \text{ g } AgNO_3$$

(b) amount Ag_2CO_3 = amount Na_2CO_3 = 0.02198 mol

$$\text{mass } Ag_2CO_3 = 0.02198 \cancel{\text{ mol } Ag_2CO_3} \times \frac{275.7 \text{ g } Ag_2CO_3}{\cancel{\text{mol } Ag_2CO_3}} = 6.06 \text{ g } Ag_2CO_3$$

108.

What will be the molar analytical concentration of Na_2CO_3 in the solution produced when 25.0 mL of 0.200 M $AgNO_3$ is mixed with 50.0 mL of 0.0800 M Na_2CO_3?

Solution

We have seen in the previous example that formation of 5.00×10^{-3} mol of $AgNO_3$ requires 2.50×10^{-3} mol of Na_2CO_3. The number of moles of unreacted Na_2CO_3 is then given by

$$n_{Na_2CO_3} = 4.00 \times 10^{-3} \text{ mol } Na_2CO_3 - 5.00 \times 10^{-3} \text{ mol } AgNO_3 \times \frac{1 \text{ mol } Na_2CO_3}{2 \text{ mol } AgNO_3}$$

$$= 1.50 \times 10^{-3} \text{ mol } Na_2CO_3$$

By definition, the molar concentration is the number of moles of Na_2CO_3/L. Therefore,

$$c_{Na_2CO_3} = \frac{1.50 \times 10^{-3} \text{ mol } Na_2CO_3}{(50.0 + 25.0) \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.0200 \text{ M } Na_2CO_3$$

Analytical Instrumentation Questions & Answers

109. Spectroscopy deals with interaction of electromagnetic radiation with matter. What is the speed of this radiation in vacuum in m/s?

a)$6x10^8$
b)$5x10^8$
c)$7x10^8$
d) $3 x 10^8$

Answer: d

Explanation: Speed of light is also the speed of all electromagnetic radiations. Speed of light is $3 x 10^8$m/s.

110. Which type of Quantum Transition takes place in Ultra Violet and Visible spectroscopy?

a) Rotation of molecules
b) Nuclear
c) Bonding electrons
d) Spin of nuclei in magnetic field

Answer: c

Explanation: In UV and Visible Spectroscopy, type of Quantum Transmission is Bonding electrons. The rest of the options are Quantum Transmission type of other spectroscopic methods.

111. Which of the following is not a property or parameter of electromagnetic radiation?

a)Wavelength
b)Voltage
c)Wavenumber
d) Amplitude

Answer: b

Explanation: Wavelength, Amplitude and Wave number are parameters of electromagnetic radiation. Other parameters are Velocity and Frequency.

112. Which of the following is not a type of Spectroscopy?

a) Gamma ray
b) X ray
c) Nuclear magnetic resonance
d) Sound

Answer: d

Explanation: Sound is not a type of electromagnetic radiation. Hence, it is not a type of Spectroscopy.

113.Electromagnetic radiation can travel through vacuum.

a)True
b) False

Answer: a

Explanation: Electromagnetic radiation can travel through vacuum. It does not need a medium for propagation

114. Which of the following is false about wavelengths of electromagnetic radiation?

a) Radiation with short wavelengths have high energies
b) Energy does not depend on wavelength
c) Radiation with long wavelengths have low energies
d) Energy depends on wavelength

Answer: b

Explanation: The radiations with short wavelength have high energies and vice versa. Thus, energy depends on wavelength.

115. Which of the following is the wavelength of microwave radiation?

a) 10 – 780nm
b) 0.78 – 30µm
c) 0.6 – 10 m
d) 0.75 – 3.75 mm

Answer: d

Explanation: The wavelength of Microwave radiation is 0.75 – 3.75 mm. The rest of the options are the wavelength of other Electro Magnetic radiations.

116. How is wave number of electromagnetic radiation related to wavelength?

a)It is the reciprocal of wavelength
b)It is directly proportional to wavelength
c)It is not related to wavelength
d) It is equal to wavelength

Answer: a

Explanation: Wave number is the number of waves spread in a length of one centimeter. It is the reciprocal of wavelength.

117. Which of the following is the wavenumber of UV and Visible radiation?

a) 1 x 106 to 1.3 x 104 m-1
b) 1 x 106 to 1.3 x 104 m
c) 13 – 27 m-1

Answer: a

Explanation: Wavenumber of UV, Visible radiation is 1 x 10^6 to 1.3 x 10^4 m^{-1}. Wavenumber is the reciprocal of wavelength. So,the unit is m^{-1}.

118. Velocity of electromagnetic radiation is more in vacuum than in any medium.

a) True
b) False

Answer: a

Explanations: Velocity of electromagnetic radiation tends to decrease when a medium is present. Hence, it attains maximum speed in vacuum.

119.Beer Lambert's law gives the relation between which of the following?

a)Reflected radiation and concentration
b) Scattered radiation and concentration
c) Energy absorption and concentration
d) Energy absorption and reflected radiation

Answer: c

Explanation: Beer Lambert's law gives the relation between Energy absorption and Concentration. It was proposed by Beer and Lambert.

120.In which of the following ways, absorption is related to transmittance?

a) Absorption is the logarithm of transmittance
b) Absorption is the reciprocal of transmittance
c) Absorption is the negative logarithm of transmittance
d) Absorption is a multiple of transmittance

Answer: c

Explanation:

Transmittance is the ratio of the radiant power transmitted by a sample to the radiant power incident on the sample. Absorption is the negative logarithm of transmittance.

121.Which of the following is not a limitation of Beer Lambert's law, which gives the relation between absorption, thickness, and concentration?

a) Concentration must be lower
b) Radiation must have higher bandwidth
c) Radiation source must be monochromatic
d) Does not consider factors other than thickness and concentration that affect absorbance

Answer: b

Explanation: The law is derived assuming that the radiation is monochromatic. So, if bandwidth increases it will create deviation.

122.Beer's law states that the intensity of light decreases with respect to _____

a) Concentration
b) Distance
c) Composition
d) Volume

Answer: a

Explanation:

Beer's law states that the intensity of light decreases with the concentration of the medium. It was stated by Beer.

123.Lambert's law states that the intensity of light decreases with respect to _

a) Concentration
b) Distance
c) Composition
d) Volume

Answer: b

Explanation: Lambert's law states that the intensity of light decreases with respect to the concentration of the medium. It was stated by Lambert.

124.The representation of Beer Lambert's law is given as A = abc. If 'b' represents distance, 'c' represents concentration and 'A' represents absorption, what does 'a' represent?

a) Intensity
b) Transmittance
c) Absorptivity
d) Admittance

Answer: c

Explanation: 'a' represents the absorption constant. It is also known as absorptivity.

125.Which of the following is not true about Absorption spectroscopy?

a) It involves transmission
b) Scattering is kept minimum
c) Reflection is kept maximum
d) Intensity of radiation leaving the substance is an indication of concentration

Answer: c

Explanation: In Absorption spectroscopy, reflection must also be kept minimum along with scattering. Amount of absorption depends on the number of molecules in the material.

126.Transmittance is given as $T = P/P_o$. If P_o is the power incident on the sample, what does P represent?

a) Radiant power transmitted by the sample
b) Radiant power absorbed by the sample
c) Sum of powers absorbed and scattered
d) Sum of powers transmitted and reflected

Answer: a

Explanation: P represents radiant power transmitted by the sample. Transmittance is the ratio of radiant power transmitted by the sample to the radiant power that is incident on it.

127.What is the unit of absorbance which can be derived from Beer Lambert's law?

a) L mol^{-1} cm^{-1}
b) L gm^{-1} cm^{-1}
c) Cm
d) No unit

Answer: d

Explanation: Absorbance has no unit. The units of absorptivity, distance, and concentration cancel each other. Hence, absorption has no unit.

128.What is the unit of molar absorptivity or absorptivity which is used to determine absorbance A in Beer Lambert's formula?

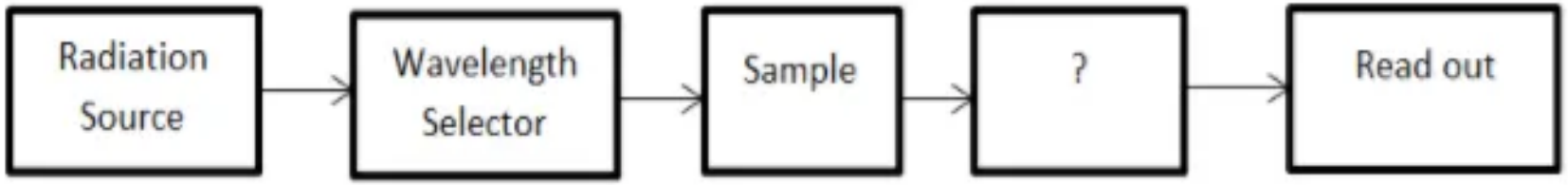
a) L mol^{-1} cm^{-1}
b) L gm^{-1} cm^{-1}
c) Cm
d) No unit

Answer: a

Explanation:

The unit of absorptivity is L mol^{-1} cm^{-1}.If the concentration is represented as gm per litre it is L gm^{-1} cm^{-1}.

129. Which is the missing block in the block diagram for Absorption of Radiation Instrument given below?



a) Filter
b) Reflector
c) Converging lens
d) Detector

Answer: d

Explanation:

To measure the amount of radiation absorbed and transmitted detector is very important. It detects the amount of radiation which is then inferred using read out device.

130. Which of the following detectors does not require a battery and is also known as barrier layer cell?

a) Photomultiplier tube
b) Photovoltaic cell
c) Photo emissive tubes
d) Photo reflector

Answer: b

Explanation:

Photovoltaic cell does not require a battery for operation. Its working is entirely different from Photomultiplier tube or Photo emissive tubes.

131.Which of the following detectors is used to detect light intensities which are very weak?

a) Photomultiplier tube
b) Photovoltaic cell
c) Photo emissive tubes
d) Photo reflector

Answer: a

Explanation:

PMT is used for detection of light intensities which are weak. As the name suggests, Photomultiplier tube multiplies the incident electrons using dynodes causing an avalanche of electrons.

132.How is Tungsten Halogen lamp differ from normal Tungsten filament lamp used in absorption spectroscopy?

a) It has a tungsten filament and is filled with inert gas
b) Iodine is added to normal filling gas
c) Iodine is coated on tungsten filament
d) Iodine is added to inert gas

Answer: b

Explanation:

In Tungsten filament lamp tungsten filament is enclosed in a bulb of glass filled with inert gas or vacuum.
In Tungsten Halogen lamp iodine is added to normal filling glass.

133.Instead of glass filters, why gelatin filters could not be used for a long period while both are Absorption filters?

a) Gelatin tends to evaporate and hence they deteriorate
b) Gelatin is affected by humidity in environment
c) They deteriorate due to absorption of heat leading to changes in gelatin
d) Gelation is affected by temperature in environment

Answer: c

Explanation: With absorption of heat they deteriorate due to changes in gelatin. Bleaching of dye occurs.

134.How does continuous wedge filter differ from normal interference filter used in absorption spectroscopy?

a) It permits continuous selection of different wavelength
b) It allows narrow band of wavelengths to pass
c) It has two semi-transparent layers of silver
d) Space layer is made of a substance having low refractive index

Answer: a

Explanation:

It allows continuous selection of wavelength by using a spacer film of graded thickness. Rest of the options are properties of normal interference filters.

135.Which of the following could be used as the layer of dielectric in interference filters used in Absorption Spectroscopy?

a) Graphite
b) MgF_2
c) Fe
d) $AgNO_3$

Answer: b

Explanation:

MgF_2 is used as layer of dielectric in interference filters. Other material that can be used is ZnS.

136.How can stability of radiation be achieved in incandescent or discharge source used in Absorption Spectroscopy?

a) Using filters
b) Using monochromators
c) Using slits
d) By controlling the source voltage

Answer: d

Explanation:

The intensity of radiation in incandescent source is proportional to the lamp source voltage. Therefore, by controlling the source voltage stability can be achieved.

137.To tolerate high operating temperatures, which of the following has to be done in incandescent or tungsten filament lamps?

a) Alloys must be used
b) Nitrogen be used instead of inert gas
c) Envelope is fabricated with quartz
d) Envelope is fabricated with copper

Answer: c

Explanation:

The envelope is fabricated with quartz to allow high operating temperatures. Tungsten filament and inert gas are generally used and are not modified.

138.Which of the following is not a reason for laser not being generally used as a source of radiation for UV, Visible Spectroscopy?

a) High cost
b) Limited range of wavelength
c) Less intensity
d) Complex to work with

Answer: c

Explanation:

Laser has high intensity. It is used in special applications where cost is not a matter and limited range of wavelength is required.

139.Which of the following statements is false about single beam absorption instruments?

a) Tungsten bulb is used as source
b) Beam splitter is used to get parallel beam
c) Test tube is used as sample holder
d) Photovoltaic cell as detector

Answer: b

Explanation:

Single beam instruments make use of one beam. Therefore, beam splitters are not required in single beam instruments.

140.Which of the following statement is false about double beam absorption instruments?

a) It is similar to single beam instruments except two beams are present
b) Tungsten bulb is used as source
c) Reference beam must have higher intensity than sample beam
d) Both the beams after they pass through respective samples are compared

Answer: c

Explanation:

Reference beam cannot have the higher intensity than sample beam. The beam is split into two beams of equal intensity.

141.Which of the following is not an application of colorimeter?

a) Paints
b) Inks
c) Cosmetics
d) Composition detection

Answer: d

Explanation:

Colorimeter is not used to determine composition. Its application is paints, dyes, inks, cosmetics, and plastics.

142.In photometers, the readings of the specimen are initially obtained in the form of which of the following parameters?

a) Transmittance
b) Absorption
c) Wavelengths
d) Volume

Answer: a

Explanation:

In photometers, the reading is initially obtained in the form of transmittance as some radiation is absorbed by the sample and the rest of the beam is transmitted. This transmitted beam is measured by the detector.

143Colorimeters are used in applications where great accuracy is required.

a) True

b) False

Answer:b

Explanation:

Colorimeters are used in applications where great accuracy is not required. They are also known as photometers.

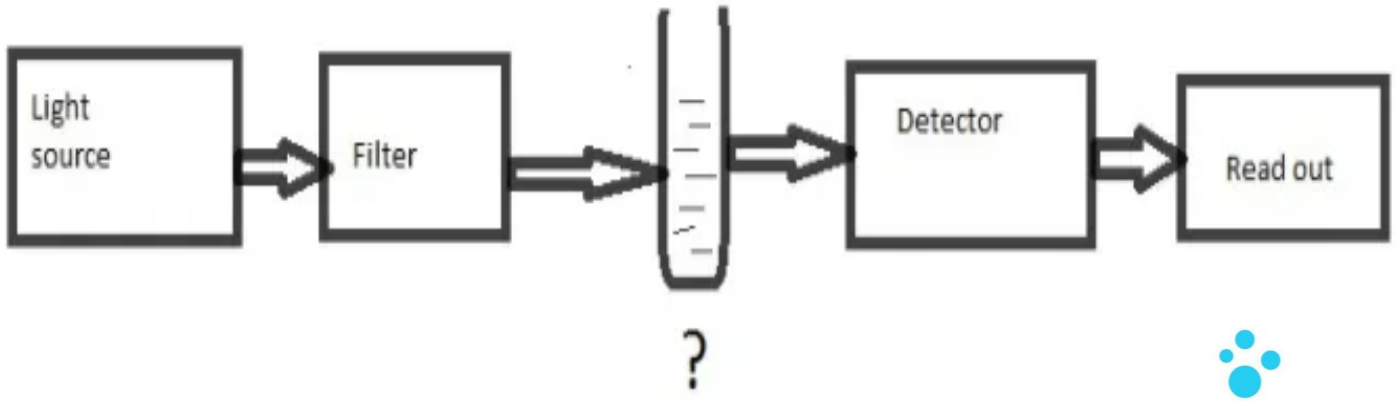
144.In the diagram of single beam photometer given below, identify the component that is not marked.

a) Monochromator

b) Absorption filter

c) Sample holder

d) Interference filter



Answer: c

Explanation:

In single beam spectrophotometer, the beam passed through the sample which is held in the sample holder. The transmitted beam is measured by the detector.

145.Colorimeters are used to determine the concentration of solutions.

a) True

b) False

Answer: a

Explanation:

Calorimetry is the science of color measurement. It is used to determine concentrations of solutions.

146.Which of the following is the purpose of balance indicator in double beam photometer or colorimeter?

a) Selects particular wavelength

b) Splits the wavelength selected into two equal beams

c) Detects and indicates the amount of light falling on it

d) Indicates the difference between the output of two photometers

Answer: d

Explanation:

It compares the output of the two photometers obtained using two beams. It indicates the output.
is the science of color measurement. It is used to determine concentrations of solutions.

147.Which of the following is the purpose of the beam splitter in double beam photometer or colorimeter?

a) Splits beam into two equal intensity beams
b) Splits beam in such a way that sample beam has higher intensity
c) Splits beam in such a way that reference beam has higher intensity
d) Merge two equal intensity beams into single beam

Answer: a

Explanation:

Beam splitter splits the beam into two equal intensity beams. One beam passes through the sample and other through the reference.

148.Which of the following is a source used in spectroscopy?

a) LASER
b) Tube light
c) Sodium vapor lamp
d) Tungsten lamp

Answer: d

Explanation:

Tungsten lamp is the source used in spectroscopy. It is the source used in UV, Visible spectroscopy.

149.Which of the following is not a source used in Mid Infrared Spectrophotometer?

a) Nernst glower
b) High pressure mercury arc lamp
c) Globar
d) Nichrome wire

Answer: b

Explanation: High pressure mercury arc lamp is used as the source for Far IR Spectrophotometer. Rest of the options are used as source in Mid Infrared Spectrophotometer.

150. Which of the following is the wave number of near infrared spectrometer?

a) 4000 – 200 cm^{-1}
b) 200 – 10 cm^{-1}
c) 12500 – 4000 cm^{-1}
d) 50 – 1000 cm^{-1}

Answer: c

Explanation: The wave number of near infrared spectrometer ranges between 12500 – 4000. Wavenumber is the reciprocal of wavelength.

151. Which of the following options are correct in terms of wavelength for the different types of IR spectrometer?

a) Near IR: 0.8 – 2.5 mm
b) Mid IR: 0.8 – 2.5 mm
c) Far IR: 2.5 – 50 mm
d) Mid IR: 50 – 100 mm

Answer: a

Explanation:

Wavelength of near IR is 0.8 – 2.5 mm and for mid IR it is 2.5 – 50 mm. The wavelength of far IR is 50 – 1000 mm.

152. Which of the following is not a composition of Nernst glower or Nernst filament?

a) Oxides of Zirconium
b) Oxides of Barium
c) Oxides of Yitrium
d) Oxides of Thorium

Answer: b

Explanation:

Oxides of Barium is not present in Nernst glower. They are constructed by fusing oxides of Zirconium, yitrium and thorium.

153. What is the composition of Globar rod which is used as a source in Mid IR spectroscopy?

a) Silicon carbide
b) Silver chloride
c) Silicon dioxide
d) Silver carbide

Answer: a

Explanation:

Globar is a silicon carbide rod. It is 5mm in diameter and 50mm long.

154. Bolometer, a type of detector, is also known as:

a) Resistance temperature detector (RTD)
b) Thermistor
c) Thermocouple
d) Golay cell

Answer: b

Explanation:

Bolometers are also known as thermistors. It is a type of resistance thermometer constructed of metals such as platinum or nickel.

155.Which of the following is not a technique for preparing solid samples in IR spectroscopy?

a) Solids run in solution
b) Mull technique
c) Solid films
d) Thin films

Answer: d

Explanation:

Four techniques are generally used to prepare solid samples. They are: Solids run in solution, Mull technique, Solid films and pressed pellet techniques.

156.. Which of the following is not used as pyroelectric material used in pyroelectric transducers in Infrared spectroscopy?

a) Triglycine Sulphate
b) Deutrated Triglycine Sulphate
c) Some Polymers
d) Tetraglycine sulphate

Answer: d

Explanation:

Pyroelectric materials are deutrated triglycine sulphate, triglycine sulphate and some polymers. They give rise to a potential when subjected to a heating or cooling effect.

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c) Some Polymers
d) Tetraglycine sulphate

Answer: d

Explanation:

Pyroelectric materials are deutrated triglycine sulphate, triglycine sulphate and some polymers. They give rise to a potential when subjected to a heating or cooling effect.

159. Which of the following is not true about Fourier Transform Infrared (FTIR) spectrometer?

a) It is of non-dispersive type
b) It is useful where repetitive analysis is required
c) Size has been reduced over the years
d) Size has increased over the years

Answer: d

Explanation:

FTIR is of non-dispersive type of instruments and is used for repetitive analysis. Initially, it was bulky and cost was high and hence, it was limited to special application. Now, the size has been reduced.

160. In the most widely used beam splitter, a thin film of _____ is sandwiched between two plates of low refractive index solid. Fill the blank with the suitable option.

a) Mylar
b) Silicon carbide
c) Ferrous oxide
d) Silver chloride

Answer: a

Explanation:

Generally, mylar is the thin film used in beam splitters. Beam splitter has to pass 50% of the radiation and reflect 50% of the radiation.

161.Which of the following is not the function of drive mechanism in Fourier Transform Infrared Spectrophotometer?

a) Movement of mirror to obtain a satisfactory interferogram
b) Acquire a good interferogram pattern
c) Allow 50% of the beam to pass
d) Keep the speed of the moving mirror constant

Answer: c

Explanation:

Drive mechanism does the functions specified in the other options. It the function of the beam splitter to allow 50% of the beam to pass through.

162. Only pyroelectric transducer or pyroelectric crystals are used as detectors in Fourier Transform Infrared Spectrophotometer (FTIR). What is the main reason for other types of thermal detectors are not being used in FTIR spectrophotometer?

a) Less accuracy
b) Slower response
c) Less precision
d) Less sensitivity

Answer: b

Explanation:

Other thermal detectors are not employed due to slower response of the detectors. Pyroelectric transducers or pyroelectric crystals are chosen for their high speed, accuracy, precision, sensitivity and resolution.

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a) Movement of mirror to obtain a satisfactory interferogram
b) Acquire a good interferogram pattern
c) Allow 50% of the beam to pass
d) Keep the speed of the moving mirror constant

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Answer: b

Explanation:

Other thermal detectors are not employed due to slower response of the detectors.
Pyroelectric transducers or pyroelectric crystals are chosen for their high speed, accuracy, precision, sensitivity and resolution.

165.Computer accepts analog signals directly.

a) True

b) False

Answer: b

Explanation:

Computer does not accept analog signals directly. An A/D converter is required to feed the signals to the computer.

167. Which of the following is the reference that is generally used in FTIR interferometer?

a) Air

b) NaCl solution

c) Alcohol

d) Base solution

Answer: a

Explanation:

Air is generally used as the reference. It is scanned for about 20 to 30 times and the results are stored in a computer.

168. In Michelson Interferometer, if the reflected and transmitted beams are in phase at the beam splitter, then maximum intensity will reach the detector.

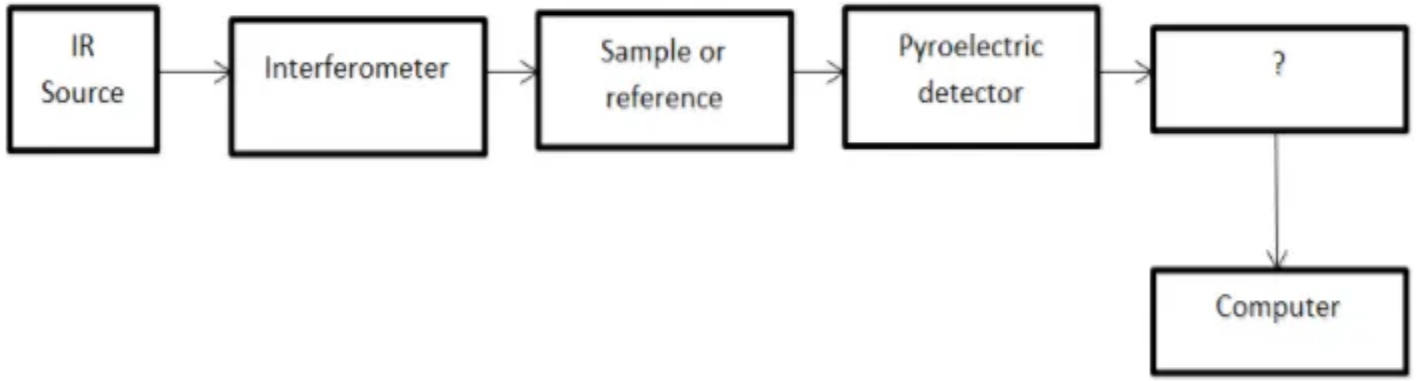
a) True
b) False

Answer: a

Explanation:

If the reflected and transmitted beams are in phase at the beam splitter then maximum intensity will reach the detector. If they are out of phase, then minimum intensity will reach the detector.

169. The diagram given below is the representation of Fourier transform interferometer. Identify the missing block in the block diagram.



a) Pyroelectric crystal
b) Display
c) High speed plotter
d) A/D converter

Answer: d

Explanation:

Computer does not accept analog signals directly. An A/D converter is required to feed the signals to the computer.

170.In Michelson's interferometer, the frequency of the detector output can be determined by translating the _____ of movable mirror and the _____ of monochromatic radiation.

a) Velocity, wavelength
b) Thickness, intensity
c) Length, velocity
d) Angle, intensity

Answer: a

Explanation:

The frequency can be determined by translating the velocity of the movable mirror and the wavelength of monochromatic radiation. The reflected beam passes towards the movable mirror.

171. In Michelson's interferometer, the _____ of the detector output will depend upon the intensity of incoming radiation.

a) Velocity
b) Frequency
c) Amplitude
d) Phase

Answer: c

Explanation:

In Michelson's interferometer, the amplitude of the detector output will depend upon the intensity of incoming radiation. If movable mirror is moved uniformly, the output will be a sine wave.

172.Why is the computer necessary in Fourier Transform Spectrometer?

a) To display the detector output
b) To process the detector output
c) To determine the amplitude
d) To determine the frequency

Answer: b

Explanation:

The computer is necessary to process the output of the detector. The Fourier Transform of output is determined using software using computers.

173.Which of the following is the principle of Atomic Absorption Spectroscopy?

a) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states
b) Medium absorbs radiation and transmitted radiation is measured
c) Colour is measured
d) Colour is simply observed

Answer: a

Explanation:

Atoms in gaseous state absorb the radiation and are excited to higher state. Since, the higher state is unstable the atom returns the ground state with the emission of radiation which is measured.

174. In Atomic Absorption Spectroscopy, which of the following is the generally used radiation source?

a) Tungsten lamp
b) Xenon mercury arc lamp
c) Hydrogen or deuterium discharge lamp
d) Hollow cathode lamp

Answer: d

Explanation:

Hollow cathode lamp is the source used in Atomic Absorption Spectroscopy. It emits stable and intense radiation.

175. In Atomic Absorption Spectroscopy, with what material is the cathode in Hollow cathode lamp constructed?

a) Tungsten
b) Quartz
c) Element to be investigated
d) Aluminium

Answer: c

Explanation:

The cathode in Hollow cathode lamp is constructed of the element to be investigated. The anode is made of tungsten.

176. How can the intensity of radiation be increased in Hollow cathode lamp?

a) Addition of non-conductive protective shield of mica
b) Addition of nitrogen to neon or argon in the lamp
c) Increasing the pressure of the filling gas
d) Changing the metal of the anode

Answer: a

Explanation:

The intensity of radiation is increased in Hollow cathode lamp by the addition of non-conductive protective shield of mica. The protective shield can be made of glass too.

177. Which of the following is the function of the chopper in Atomic Absorption Spectroscopy?

a) To split the beam into two
b) To break the steady light into pulsating light
c) To filter unwanted components
d) To reduce the sample into atomic state

Answer: b

Explanation:

The function of the chopper in Atomic Absorption Spectroscopy is to break the steady light into pulsating light. It is a rotating wheel placed between the flame and the source.

178. Which of the following is the function of Flame or Emission system in Atomic Absorption Spectroscopy?

a) To split the beam into two
b) To break the steady light into pulsating light
c) To filter unwanted components
d) To reduce the sample into atomic state

Answer: d

Explanation:

The function of Flame or Emission system in Atomic Absorption Spectroscopy is to reduce the sample into atomic state. In Atomic Absorption Spectroscopy, the production of atomic vapour by flame is the most important phase.

179. Which of the following is the function of the chopper in Atomic Absorption Spectroscopy?

a) To split the beam into two
b) To break the steady light into pulsating light
c) To filter unwanted components
d) To reduce the sample into atomic state

Answer: b

Explanation:

The function of the chopper in Atomic Absorption Spectroscopy is to break the steady light into pulsating light. It is a rotating wheel placed between the flame and the source.

180. Which of the following is the function of Flame or Emission system in Atomic Absorption Spectroscopy?

a) To split the beam into two
b) To break the steady light into pulsating light
c) To filter unwanted components
d) To reduce the sample into atomic state

Answer: d

Explanation:

The function of Flame or Emission system in Atomic Absorption Spectroscopy is to reduce the sample into atomic state. In Atomic Absorption Spectroscopy, the production of atomic vapour by flame is the most important phase.

181. Which of the following is the function of atomiser in the emission system of Atomic Absorption Spectroscopy?

a) To split the beam into two
b) To break the steady light into pulsating light
c) To break large mass of liquid into small drops
d) To reduce the sample into atomic state

Answer: c

Explanation:

The function of atomiser in the emission system of Atomic Absorption Spectroscopy is to break large mass of liquid into small drops. It also introduces liquid sample into the flame at a stable rate.

182. Which of the following is not a fuel used in flame photometry?

a) Acetylene
b) Propane
c) Hydrogen
d) Camphor oil

Answer: d

Explanation:

The commonly used fuel gases in flame photometry are acetylene, propane and hydrogen. Oxygen supply is given to the fuel gases.

183. Which of the following is not the requirement of a good flame in flame photometer?

a) Liquid sample must be evaporated to form solid residue
b) Solid residue must decompose to form atoms
c) Atoms must be produced such that they have the ability to get excited to higher states
d) Atoms must be produced such that they are in stable state

Answer: d

Explanation:

Atoms must be produced such that they have the ability to get excited to higher states. These atoms in higher states return to ground state with the emission of photons.

184. Atomic Absorption Spectroscopy is used for the analysis of metals.

a) True
b) False

Answer: a

Explanation:

Atomic Absorption Spectroscopy is used for the analysis of metals.

185. Which of the following options explains the process of 'sputtering' that occurs in Hollow Cathode Lamp?

a) Positive ions collide with cathode surface and metal atoms from cathode are ejected
b) Negative ions collide with cathode surface and metal atoms from anode are ejected
c) Positive ions collide with negative ions and metal atoms from anode are ejected
d) Positive ions collide with negative ions and photons are ejected

Answer: a

Explanation:

When potential is applied across the electrode, the gas filled in tube ionises and flow of current occurs. Positive ions collide with negatively charged cathode surface and metal atoms from cathode are ejected.

186. At what pressure should the gases in the sealed tube be maintained in the Hollow cathode lamp?

a) 1 to 5 torr
b) 20 to 30 torr
c) 40 to 50 torr
d) 50 to 55 torr

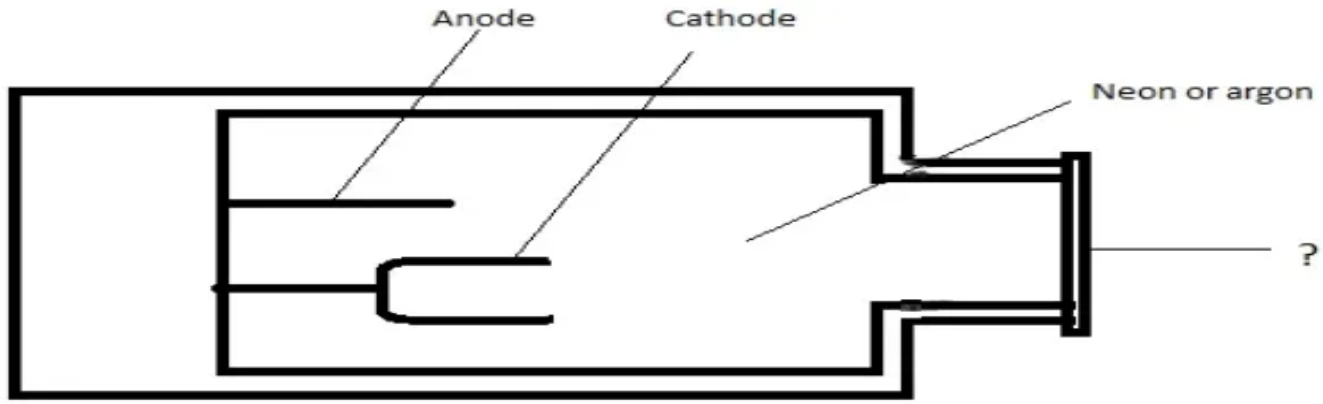
Answer: a

Explanation:

It consists of a cylindrical cathode and an anode made of tungsten. The tube is sealed and neon and argon are filled at a pressure of 1 to 5 torr.

187. The diagram show below is the picture of Hollow cathode lamp. Identify the unmarked component.

a) Glass tube
b) Quartz window
c) Non- conducting glass
d) Mica shield



Answer: b

Explanation:

The unmarked portion is Quartz window. The window can be made of quartz or borosilicate glass.

188. The function of pressure regulators in emission system of flame photometer is to have a steady flame which is free from flickers.

a) True
b) False

Answer: a

Explanation: The function of pressure regulators is to have a steady flame which is free from flickers. Pressure gauges indicate the pressure.

189. In Total consumption burner, only samples of particular droplet size will enter the burner.

a) True
b) False

Answer: b

Explanation:

Samples will enter the burner irrespective of their droplet size. Hence, it has the name Total consumption burner.

190. Which of the following is the principle of Flame emission photometers?

a) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states
b) Medium absorbs radiation and transmitted radiation is measured
c) Colour and wavelength of the flame is measured
d) Only wavelength of the flame is measured

Answer: c

Explanation:

In Flame emission photometers, colour and intensity of the flame is measured. The intensity of light emitted when sample is introduced into the flame is also measured.

191. In Flame emission photometers, the measurement of _____ is used for qualitative analysis.

a) Colour
b) Intensity
c) Velocity
d) Frequency

Answer: a

Explanation:

The colour and the wavelength of the flame are used for qualitative analysis. It is used to determine the element which is present in the sample.

192. In Flame emission photometers, the measurement of _____ is used for quantitative analysis.

a) Colour
b) Intensity
c) Velocity
d) Frequency

Answer: b

Explanation:

The intensity of the flame is used for quantitative analysis. It is used to determine the amount of element present in the sample.

193. Which of the following is not an advantage of Laminar flow burner used in Flame photometry?

a) Noiseless
b) Stable flame for analysis
c) Efficient atomization of sample
d) Sample containing two or more solvents can be burned efficiently

Answer: d

Explanation:

Sample containing two or more solvents cannot be burned efficiently in Laminar flow burner. One more advantage of laminar flow burner is that it allows steady movement of gas flow.

194. Laminar flow burner used in Flame photometers is also known as _____

a) Turbulent burner
b) Premix burner
c) Total consumption burner
d) Nozzle mix burner

Answer: b

Explanation:

Laminar flow burner used in Flame photometers is also known as Premix burner. Sample, fuel and oxidant are mixed thoroughly before reaching the burner.

195. Which of the following is the advantage of prism monochromators?

a) Dispersion is non-overlapping
b) Dispersion occurs in non-linear manner
c) Dispersion is overlapping
d) Dispersion occurs in a linear manner

Answer: a

Explanation:

The advantage of prism is that, dispersion that occurs is non-overlapping.
The disadvantage is that it occurs in a non-linear manner.

196. Laminar flow burner used in Flame photometers is also known as _____

a) Turbulent burner
b) Premix burner
c) Total consumption burner
d) Nozzle mix burner

Answer: b

Explanation:

Laminar flow burner used in Flame photometers is also known as Premix burner. Sample, fuel and oxidant are mixed thoroughly before reaching the burner.

197. Which of the following is the advantage of prism monochromators?

a) Dispersion is non-overlapping
b) Dispersion occurs in non-linear manner
c) Dispersion is overlapping
d) Dispersion occurs in a linear manner

Answer: a

Explanation:

The advantage of prism is that, dispersion that occurs is non-overlapping.
The disadvantage is that it occurs in a non-linear manner.

198. Phototubes are more sensitive than photovoltaic cells.

a) True

b) False

Answer: a

Explanation:

Phototubes are more sensitive than photovoltaic cells. Therefore, it can be used to measure low intensities.

199. Which of the following is not an application of Flame emission photometers?

a) Analysis of biological fluids

b) Determination of sodium, potassium in soil

c) Determination of metals such as Mn, Cu

d) Analysis of complex mixtures

Answer: d

Explanation:

The applications of Flame emission photometers are analysis of biological fluids, determination of sodium and potassium in soil and determination of metals such as Mn and Cu. It is also used for the analysis of plant materials and industrial cements.

200.Chromatography is a physical method that is used to separate and analyse _____

a) Simple mixtures
b) Complex mixtures
c) Viscous mixtures
d) Metals

Answer: b

Explanation:

Chromatography is a physical method that is used to separate complex mixtures. The mixture of different components is flushed through the system at different rates.

201.In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

a) Column chromatography
b) Planar chromatography
c) Liquid chromatography
d) Gas chromatography

Answer: a

Explanation:

In Column chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure. It is carried out in a long glass column having a stop-cock near the bottom.

202. In chromatography, the stationary phase can be _____ supported on a solid.

a) Solid or liquid
b) Liquid or gas
c) Solid only
d) Liquid only

Answer: a

Explanation:

In chromatography, there are two phases namely, stationary phase and mobile phase. The stationary phase can be solid or liquid supported on a solid.

203. In chromatography, which of the following can the mobile phase be made of?

a) Solid or liquid
b) Liquid or gas
c) Gas only
d) Liquid only

Answer: b

Explanation:

In chromatography, the mobile phase can be composed of liquid or gas. It cannot be a solid material.

204. Which of the following cannot be used as adsorbent in Column adsorption chromatography?

a) Magnesium oxide
b) Silica gel
c) Activated alumina
d) Potassium permanganate

Answer: d

Explanation:

The given options are all examples of adsorbents in Column adsorption except potassium permanganate. Some other adsorbents are starch and chromatographic purified siliceous earth.

205. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?

a) Gas liquid
b) Column
c) Thin layer
d) Paper

Answer: c

Explanation:

Thin layer chromatography involves the separation of substances of a mixture over a 0.2mm thick layer (thin layer) of an adsorbent. The adsorbent can be silica gel or alumina.

206. Chromatography cannot be used to purify volatile substances.

a) True

b) False

Answer: b

Explanation:

Chromatography can be used to purify volatile substances if the carrier fluid, operating conditions and right adsorbent material are employed.

207. In Column chromatography, the stationary phase is made of _____ and the mobile phase is made of

a) Solid, liquid

b) Liquid, liquid

c) Liquid, gas

d) Solid, gas

Answer: a

Explanation:

In Column chromatography, the stationary phase is made of solid and the mobile phase is made of liquid. It is carried out in a long glass column which has a stop-cock near the bottom.

208. Chromatography cannot be used to separate delicate products.

a) True

b) False

Answer: b

Explanation:

Chromatography can be used to separate delicate products. This is because chromatography is not performed under severe conditions.

209. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of ..

a) Solid, liquid

b) Liquid, liquid

c) Liquid, gas

d) Solid, gas

Answer: a

Explanation:

In Thin layer chromatography, the stationary phase is made of solid and the mobile phase is made of liquid.

210. In which of the following type of paper, chromatography does the mobile phase move horizontally over a circular sheet of paper?

a) Ascending paper chromatography
b) Descending paper chromatography
c) Radial paper chromatography
d) Ascending – descending chromatography

Answer: c

Explanation:

In Radial paper chromatography, the mobile phase moves horizontally over a circular sheet of paper. Separation takes place based on partition.

211. Liquid chromatography can be performed in which of the following ways?

a) Only in columns
b) Only on plane surfaces
c) Either in columns or on plane surfaces
d) Neither in columns nor on plane surfaces

Answer: c

Explanation:

Liquid chromatography can be performed either in columns or on plane surfaces.
It could be liquid-solid chromatography or liquid-liquid chromatography.

212. Gas chromatography can be performed in which of the following ways?

a) Only in columns
b) Only on plane surfaces
c) Either in columns or on plane surfaces
d) Neither in columns nor on plane surfaces

Answer: a

Explanation:

Gas chromatography can be performed only in columns. It could be gas-solid chromatography or gas-liquid chromatography.

213. In Gas-liquid phase chromatography, the stationary phase is composed of _____ and the mobile phase is made of _____

a) Solid, liquid
b) Liquid, liquid
c) Liquid, gas
d) Solid, gas

Answer: c

Explanation:

In Gas-liquid phase chromatography, the stationary phase is made of liquid and the mobile phase is made of gas. Separation is based on partition.

214. Which of the following types of chromatography involves the process, where mobile phase moves through the stationary phase by the influence of gravity or capillary action?

a) Column Chromatography
b) High Pressure Liquid Chromatography
c) Gas Chromatography
d) Planar Chromatography

Answer: d

Explanation:

In Planar Chromatography, stationary phase is supported on flat plate of paper. The mobile phase moves by the influence of gravity or capillary action.

215. Which of the following steps takes place after injection of feed in Column chromatography?

a) Detection of components
b) Separation in column
c) Elution from the column
d) Collection of eluted component

Answer: b

Explanation:

The operation that occurs after the injection of feed is a separation in the column. After that, elution from the column and detection of components takes place.

216. Components with the strong attraction to the support move more slowly than components with weak attraction.

a) True
b) False

Answer: a

Explanation:

Different components will adsorb to the stationary phase in varying degrees. Components with the strong attraction to the support move more slowly than components with weak attraction.

217. What happens during the 'elution from the column' phase chromatography?

a) Components with the greatest affinity elute first
b) Components with least affinity elute first
c) Components elute in a random manner
d) Components elute according to their concentration in the mixture

Answer: b

Explanation:

During the elution phase, different components elute at different times. Components with least affinity elute first.

218. In chromatogram, the position of peaks on the time axis can be used to determine which of the following?

a) Components of sample
b) Amount of component in sample
c) Column efficiency
d) Column resolution

Answer: a

Explanation:

Chromatogram is a detector that responds to concentration solute and is placed at the end of the column. The position of peaks on the time axis can be used to determine components of the sample.

219. In chromatogram, the area under the peak can be used to determine which of the following?

a) Components of sample
b) Amount of component in sample
c) Column efficiency
d) Column resolution

Answer: b

Explanation:

Chromatogram is a detector that responds to concentration solute and is placed at the end of the column. The area under the peak can be used to determine an amount of component in the sample.

220. The stationary phase could be a viscous liquid coated over a surface of solid particles.

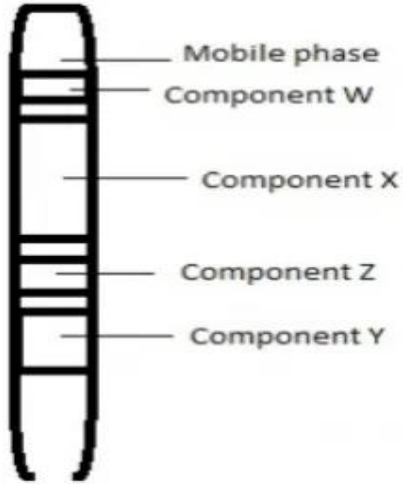
a) True
b) False

Answer: a

Explanation:

The stationary phase could be a viscous liquid coated over a surface of solid particles. The solid particles can also be the stationary phase.

221. Given below is a diagram of separation of two components of a mixture in a chromatographic column. From the diagram, infer which component has a lesser affinity to the stationary phase.



a) W
b) X
c) Y
d) Z

Answer: c

Explanation:

Y will elute from the column first. Components with least affinity to the stationary phase will elute first.

222. Using Chromatogram as detector in Chromatography, a graph is obtained between _____ and time.

a) Quantity
b) Density
c) Concentration
d) Specific gravity

Answer: c

Explanation:

Using Chromatogram as a detector in Chromatography, a graph is obtained between concentration and time. The detector is placed at the bottom of the column.

223. In older analytical methods, which of the following methods were used to allow movement of mobile phase?

a) Pumps
b) Pressure
c) Gravity
d) Blowing air into the column

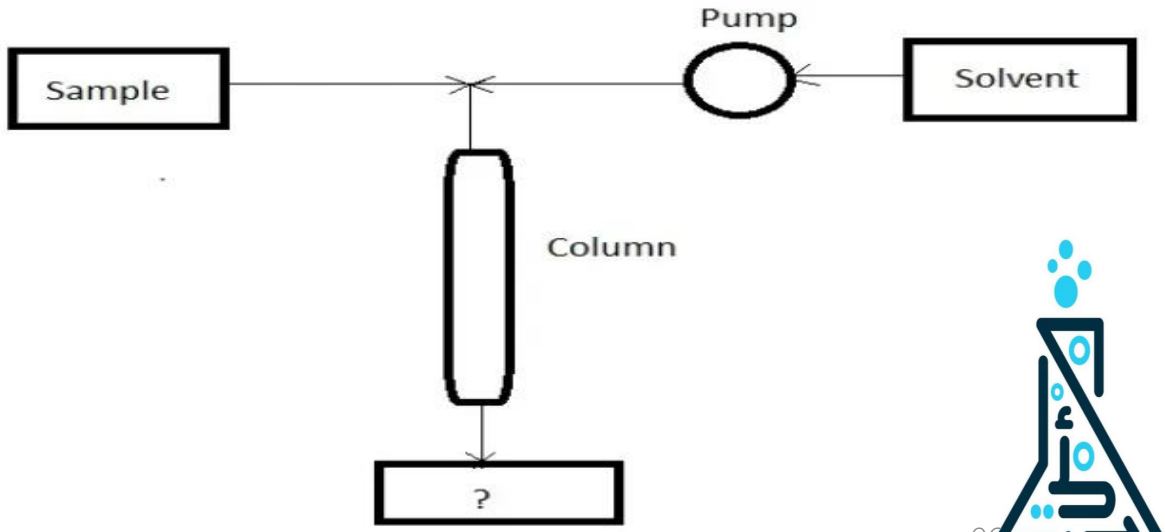
Answer: c

Explanation:

In older analytical methods, gravity facilitated the movement of the mobile phase. The effect of capillary action was also employed to allow movement.

224. Given below is the diagram of 'Process of chromatographic column'. Identify the unmarked component in the process.

a) Reservoir
b) Collection tank
c) Microprocessor
d) Detector



Answer: d

Explanation:

The unmarked component is the detector.
It is placed at the bottom of the column. It responds to solute concentration.

225. How is molar concentration of solute in stationary phase related to molar concentration of solute in mobile phase?

a) Directly proportional
b) Inversely proportional
c) Equal
d) Not related

Answer: a

Explanation:

In chromatography, molar concentration of solute in stationary phase is directly proportional to molar concentration of solute in mobile phase.

$C_s \alpha C_m$ $C_s = k C_m$ 'k' is the distribution constant.

226. If the value of the distribution constant 'k' is one, then what could be inferred about the distribution of solute?

a) Its distribution in stationary phase is greater
b) Its distribution in mobile phase is greater
c) It is equally distributed in stationary and mobile phase
d) It is distributed in a random manner

Answer: c

Explanation:

In chromatography,

$C_s \alpha C_m$ $C_s = k C_m$

If k=1, it denotes that the solute is equally distributed in mobile and stationary phase.

227. The time taken by the analyte after sample injection to reach the detector is called _____

a) Dead time
b) Solute migration rate
c) Adjusted retention time
d) Retention time

Answer: d

Explanation:

The time taken by the analyte after sample injection to reach the detector is called retention time. The retention of a solute in the system can be used to identify the solute.

228. The time required for a molecule of the mobile phase to pass through the column is called _____

a) Dead time
b) Solute migration rate
c) Adjusted retention time
d) Retention time

Answer: a

Explanation:

The time required for a molecule of the mobile phase to pass through the column is called dead time.
The effectiveness of the system depends on dead time.

229. Adjusted retention time is the remaining retention time after subtracting _____ from _____

a) Solute migration rate and retention time
b) Retention time and solute migration rate
c) Dead time and retention time
d) Retention time and dead time

Answer: c

Explanation:

Adjusted retention time is the remaining retention time after subtracting dead time from retention time. It affects the effectiveness of the system.

230. Which of the following is the volume of mobile phase required to make a solute band move from the point of injection through the column to the detector?

a) Dead volume
b) Retention volume
c) Void volume
d) Adjusted retention volume

Answer: b

Explanation:

Retention volume is the volume of mobile phase required to make a solute band move from the point of injection through the column to the detector.

231. Adjusted retention volume is the remaining retention volume after subtracting _____ from

a) Solute migration rate and retention volume
b) Retention volume and solute migration rate
c) Dead volume and retention volume
d) Retention volume and dead volume

Answer: c

Explanation:

Adjusted retention volume is the remaining retention volume after subtracting dead volume from retention volume.

$V_{adjusted\ retention} = V_{retention} - V_{dead}$

232. Which of the following is defined as the ratio of moles of solute in stationary phase to the moles of solute in mobile phase?

a) Distribution constant
b) Volumetric phase ratio
c) Retention factor
d) Total porosity

Answer: c

Explanation:

Retention factor is defined as the ratio of moles of solute in stationary phase to the moles of solute in mobile phase. It is used for determining the migration rates of solutes in the column.

234. Which of the following is the ratio of interstitial volume of packing to the volume of its total mass?

a) Distribution constant
b) Volumetric phase ratio
c) Retention factor
d) Total porosity

Answer: d

Explanation:

Total porosity is the ratio of interstitial volume of packing to the volume of its total mass. In capillary column, total porosity is 1.

235. Which of the following is the ratio of length of column packing to dead time?

a) Average linear rate of solute migration
b) Average linear rate of mobile migration
c) Relative migration rate
d) Selectivity factor

Answer: b

Explanation:

Average linear rate of mobile migration is the ratio of length of column packing to dead time.
It influences the effectiveness of the column in separating solutes.

236. Which of the following is the ratio of length of column packing to retention time?

a) Average linear rate of solute migration
b) Average linear rate of mobile migration
c) Relative migration rate
d) Selectivity factor

Answer: a

Explanation:

Average linear rate of solute migration is the ratio of length of column packing to retention time. It influences the effectiveness of the column in separating solutes.

237. Retention distance is the distance between point of injection and minimum peak in the recorder or computer generated chart.

a) True
b) False

Answer: b

Explanation:

Retention distance is the distance between point of injection and maximum peak in the recorder. The chart is drawn between time and concentration of the solute.

238. Which of the following is the ratio of length of column packing to retention time?

a) Average linear rate of solute migration
b) Average linear rate of mobile migration
c) Relative migration rate
d) Selectivity factor

Answer: a

Explanation:

Average linear rate of solute migration is the ratio of length of column packing to retention time. It influences the effectiveness of the column in separating solutes.

239. Retention distance is the distance between point of injection and minimum peak in the recorder or computer generated chart.

a) True
b) False

Answer: b

Explanation:

Retention distance is the distance between point of injection and maximum peak in the recorder. The chart is drawn between time and concentration of the solute.

240. What must be the value of selectivity factor?

a) Equal to 1
b) Less than 1
c) Greater than 1
d) Greater than 0

Answer: c

Explanation:

Selectivity factor/ Relative retention must always be greater than 1. It is also known as Relative migration rate.

241. Which of the following is the distance that the solute moves while undergoing one partition?

a) Retention distance
b) Distribution constant
c) Plate height
d) Column packing length

Answer: c

Explanation:

Plate height is the distance that the solute moves while undergoing one partition. It is expressed in lei

242. Which of the following conditions will cause the efficiency of the column to increase?

a) Plate number becomes greater, plate height becomes smaller
b) Plate number becomes smaller, plate height becomes smaller
c) Plate number becomes greater, plate height becomes larger
d) Plate number becomes greater, plate height becomes larger

Answer: a

Explanation:

The efficiency of the column increases when the plate number becomes greater and the plate height becomes smaller. Column efficiency greatly depends on plate height and plate number.

243. Which of the following is the expression for Eddy diffusion in the column, if 'γ' represents obstruction factor, 'd_p' represents particle diameter, 'D_M' represents Solute diffusion coefficient and 'λ' represents function for packing uniformity?

a) λ d_M
b) 2 γ D_M
c) D_M γ
d) λ/d_M

Answer: a

Explanation:

Eddy diffusion is given as, A = λ dp. It is also called multipath term.

244. Which of the following is the expression for longitudinal diffusion in the column, if 'γ' represents obstruction factor, 'd_M' represents particle diameter, 'D_M' represents Solute diffusion coefficient and 'λ' represents function for packing uniformity?

a) λ d_M
b) 2 γ D_M
c) D_M γ
d) λ/d_M

Answer: b

Explanation:

Longitudinal diffusion is given as, B = 2 γ D_M.It is also called axial diffusion.

245. In gas-liquid chromatography, when films are used in the interior of the capillary column, then what is the value of Eddy diffusion?

a) Greater than 1
b) Less than 1
c) Zero
d) Less than zero

Answer: c

Explanation:

In gas-liquid chromatography, when films are used in the interior of the capillary column the value of Eddy diffusion (A) is zero. To minimize A, the diameter of packing should be small and uniform.

246. For an unpacked coated capillary column, the obstruction factor takes which of the following values?

a) 0
b) 0.6
c) 1
d) 1.6

Answer: c

Explanation:

For an unpacked coated capillary column, the value of obstruction factor is 1. For a packed column, the value is 0.6.

247. Baseline resolution is achieved when degree of resolution/separation is _____

a) 1
b) 0
c) 0.5
d) 1.5

Answer: d

Explanation:

Baseline resolution is achieved when the degree of resolution/separation is 1.5. The baseline bandwidths of adjacent bands are almost constant.

248. Which of the following equations give the expression for the plate number, N when 't_R' is the adjusted retention time and 'W_b' is the width at the base of the peak which is equal to 4 standard deviations.

a) $16\ t_R^2/W_b$
b) $4\ t_R^2/W_b$
c) $(4t_R/W_b)^2$
d) $4\ (t_R/W_b)^2$

Answer: c

Explanation:

The expression for the plate number, N is given as $N = (4t_R/W_b)^2$. It is a dimensionless quantity.

249. It is more difficult to measure the width at half peak height than the base width in the detector output.

a) True

b) False

Answer: b

Explanation:

The width at half peak height is easier to measure than the base width. Hence, the plate number is calculated at peak height.

250. The solute, while moving in the column is always in equilibrium with both the stationary phase and the mobile phase.

a) True

b) False

Answer: a

Explanation:

The solute, while moving in the column is always in equilibrium with both the stationary phase and the mobile phase. But, the two phases will never be in equilibrium with each other.

251. For the separation of which of the following substances, Gas-solid chromatography is being used?

a) Thermally stable organic components
b) Volatile organic components
c) Thermally stable inorganic components
d) Low molecular weight gaseous species

Answer: d

Explanation:

Gas-solid chromatography is used for the separation of low molecular weight gaseous species. Its application is limited because of semi-permanent retention of the analyte.

252. Which of the following is not a feature of carrier gas used in gas chromatography?

a) It must be chemically inert
b) It should be suitable for the detector employed
c) It should not be completely pure
d) It should be cheap

Answer: c

Explanation:

It should be highly pure. Further, it should be readily available and non-inflammable.

253. Which of the following is the disadvantage of hydrogen, which can be used as carrier gas in gas chromatography?

a) Dangerous to use
b) Expensive
c) Reduced sensitivity
d) High density

Answer: a

Explanation:

Hydrogen is dangerous to use. It has better thermal conductivity and lower density.

254. Which of the following is the disadvantage of helium, which can be used as carrier gas in gas chromatography?

a) Dangerous to use
b) Expensive
c) Reduced sensitivity
d) High density

Answer: b

Explanation:

Helium is expensive. Its advantages are that it has low density and it allows greater flow rates.

255. Which of the following is the disadvantage of nitrogen, which can be used as carrier gas in gas chromatography?

a) Dangerous to use
b) Expensive
c) Reduced sensitivity
d) High density

Answer: c

Explanation:

Nitrogen has reduced sensitivity. It is still one of the commonly used carrier gas in gas chromatography.

256. Slow injection of large samples leads to band broadening and loss of resolution.

a) True
b) False

Answer: b

Explanation:

Slow injection of large samples leads to band broadening and loss of resolution. Hence, for desired column efficiency, samples should not be too large.

257. In which of the following methods are liquid samples injected into the column in gas chromatography?

a) Gas-tight syringe
b) Micro-syringe
c) Rotary sample valve
d) Solid injection syringes

Answer: b

Explanation:

Liquid samples injected into the column in gas chromatography using micro-syringe. Syringes of various capacities are available.

258. What must be done to the solid samples for it to be introduced into the column without using solid injection syringes in gas chromatography?

a) Introduced in hot-zone of the column
b) Dissolved in volatile liquids
c) Introduced using rotary sample valve
d) Introduced using sampling loops

Answer: b

Explanation:

Solid samples must be dissolved in volatile liquids for introducing it into the column.
They can be introduced directly using solid injection syringes.

259. Which of the following is the commonly used support material for the packed column in gas chromatography?

a) Glass
b) Metal
c) Diatomaceous earth
d) Stainless steel

Answer: c

Explanation:

Diatomaceous earth is the commonly used support material for the packed column in gas chromatography. The columns could be made of glass or metal.

260. Which of the following is the advantage of straight packed column?

a) It can be packed uniformly
b) It can be repacked easily
c) It is compact
d) It is easier to heat it evenly

Answer: c

Explanation:

The advantage of straight column is that it can be repacked easily. It is not compact in size.

261. Which of the following is the commonly used support material for the packed column in gas chromatography?

a) Glass
b) Metal
c) Diatomaceous earth
d) Stainless steel

Answer: c

Explanation:

Diatomaceous earth is the commonly used support material for the packed column in gas chromatography. The columns could be made of glass or metal.

262. Which of the following is the advantage of straight packed column?

a) It can be packed uniformly
b) It can be repacked easily
c) It is compact
d) It is easier to heat it evenly

Answer: c

Explanation:

The advantage of straight column is that it can be repacked easily. It is not compact in size.

263. Sample injection port must be maintained at a temperature at which rapid vapourisation occurs but thermal degradation does not occur.

a) True
b) False

Answer: a

Explanation:

Sample injection port must be maintained at a temperature at which rapid vaporization occurs but thermal degradation does not occur. The column is maintained at a different temperature.

264. Which of the following is not a desirable feature of the ovens used in gas chromatography?

a) It must have a fast rate of heating
b) Power consumption should be kept low
c) It must have maximum thermal gradients
d) It should have proper insulation

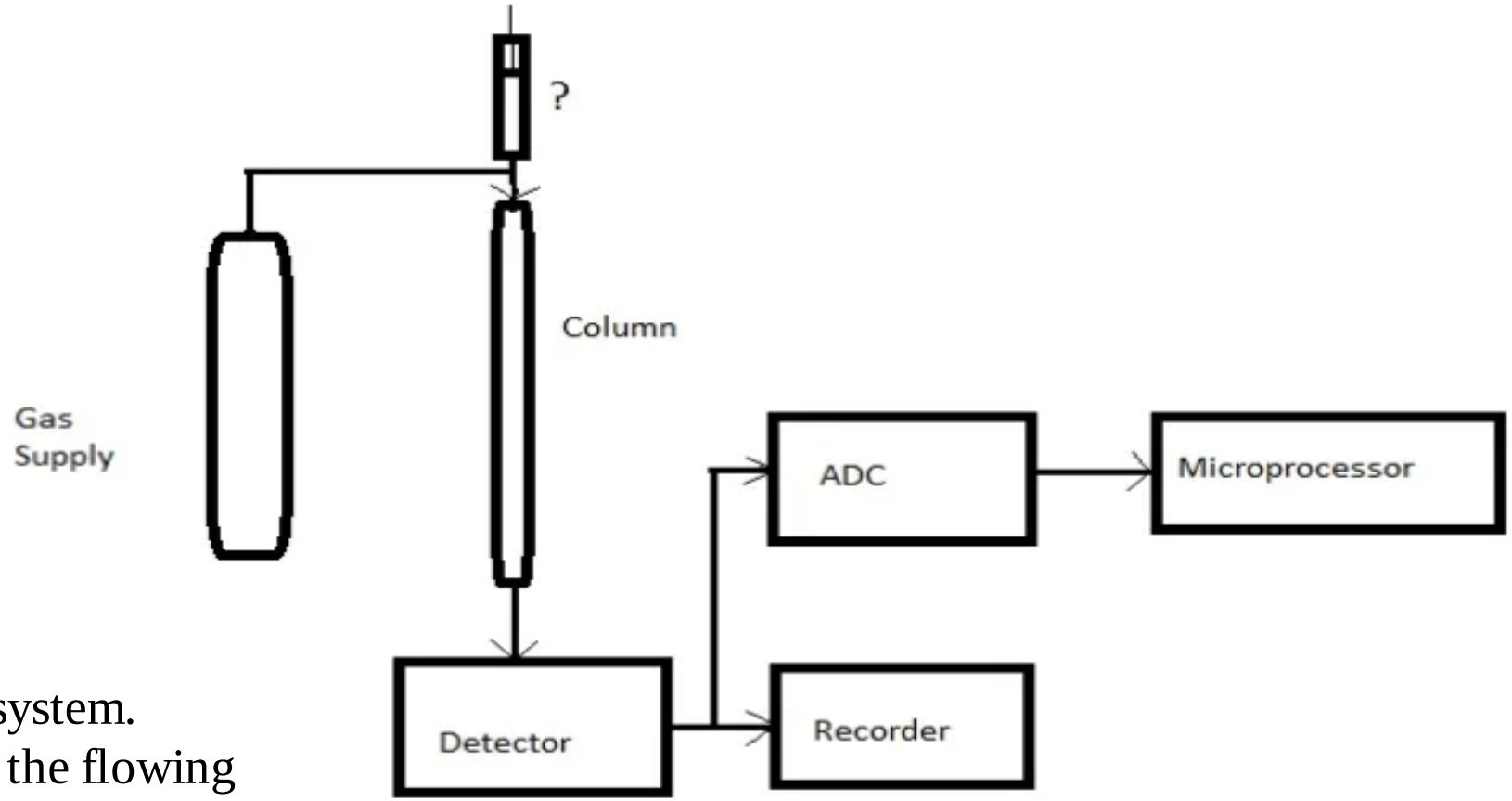
Answer: c

Explanation:

The ovens used in gas chromatography must have maximum thermal gradients.
The temperature must be uniform over the whole column.

265. Given below is the block diagram of gas chromatography. Identify the unmarked component.

a) Pumping system
b) Pressure regulator
c) Flow regulator
d) Sample injection system



Answer: d

Explanation:

The unmarked component is syringe.
Hence, the answer is sample injection system.
It is for the introduction of sample into the flowing gas stream.

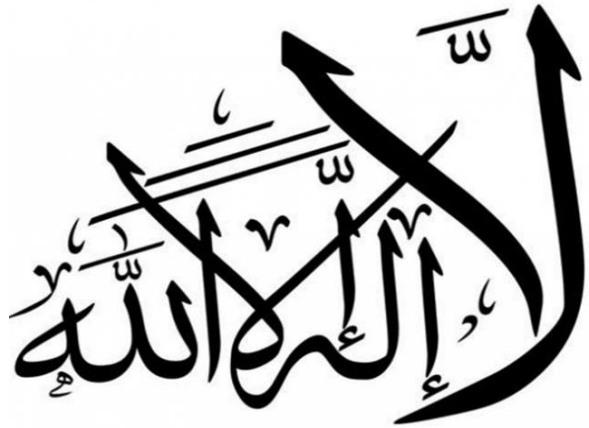
266. Which of the following is not an ideal characteristic of a detector used in gas chromatography?

a) Linear response to the solutes
b) Short response time
c) High reliability
d) Sensitive to the changes in the flow rate of carrier gas

Answer: d

Explanation:

The detector used in gas chromatography must be insensitive to the changes in flow rate of carrier gas. There are many detectors used in gas chromatography.



267. Which of the following is not a type of detector used in gas chromatography?

a) Argon ionization detector
b) Thermal conductivity detector
c) UV visible spectrometric detector
d) Electron capture detector

Answer: c

Explanation:

UV visible spectrometric detector is not used in gas chromatography. It is used in liquid chromatography.

268. Which of the following detectors have high sensitivity to all organic compounds?

a) Sulphur chemiluminescense detector
b) Thermionic emission detector
c) Flame ionization detector
d) Argon ionization detector

Answer: c

Explanation:

Flame ionization detector has high sensitivity to all organic compounds. It is the commonly used detector for gas chromatography.

269. Which of the following is not the advantage of thermal conductivity detector used in gas chromatography?

a) Simple in construction
b) High sensitivity
c) Large linear dynamic range
d) Non-destructive character

Answer: b

Explanation:

Thermal conductivity detector has relatively low density when compared to other detectors used in gas chromatography. It is based on the principle that all gases conduct heat in varying degrees.

270. Which of the following detectors is widely used to detect environmental samples like chlorinated pesticides and polychlorinated biphenyls?

a) Flame ionization detector
b) Thermal conductivity detector
c) Argon ionization detector
d) Electron capture detector

Answer: d

Explanation:

Electron capture detector is used to detect environmental samples like polychlorinated biphenyls and chlorinated pesticides. It is highly sensitive to molecules containing functional groups such as halogen and phosphorous.

271. In which of the following detector is the eluent mixed with hydrogen and burned and then mixed with ozone and its intensity is measured?

a) Sulphur chemiluminescense detector
b) Thermal conductivity detector
c) Flame ionization detector
d) Electron capture detector

Answer: a

Explanation:

In Sulphur chemiluminescense detector, the eluent is mixed with hydrogen and burned and then mixed with ozone and its intensity is measured. The resultant is a measure of Sulphur compounds present.

272. Filter photometer detector is primarily responsive to which of the following compounds/elements?

a) Volatile Sulphur or phosphorous compounds
b) Nitrogen
c) Halogen
d) Potassium

Answer: a

Explanation:

Flame photometric detector is primarily responsive to volatile Sulphur or phosphorous compounds. It is also responsive to tin and nitrogen.

273. Which of the following detector uses ultraviolet radiation from lamps to produce ionisation of solute molecules?

a) Sulphur chemiluminescense detector
b) Thermal conductivity detector
c) Photo ionization detector
d) Electron capture detector

Answer: c

Explanation:

Photo ionization detector uses ultraviolet radiation from lamps to produce ionization of solute molecules.
The current produced is measured and recorded.

274. Flame ionization detector is also known as Katharometer.

a) True
b) False

Answer: b

Explanation:

Thermal conductivity detector is known as Katharometer. It uses heated filament as sensing element and it is placed in the emerging gas stream.

275. Thermionic emission detector used in gas chromatography is most sensitive to which of the following elements?

a) Nitrogen
b) Phosphorous
c) Halogen
d) Carbon

Answer: b

Explanation:

Thermionic emission detector used in gas chromatography is most sensitive to phosphorous.
It is 500 times more sensitive to phosphorous than Flame ionization detector.

276. Which of the following detectors has a non-volatile bead of rubidium silicate placed above the flame tip?

a) Argon ionization detector
b) Thermionic emission detector
c) Flame ionization detector
d) Electron capture detector

Answer: b

Explanation:

Thermionic emission detector has a non-volatile bead of rubidium silicate placed above the flame tip. It is maintained at about 180V with respect to the collector.

278. In which of the following detectors, the carrier gas is excited by a radioactive source and the atoms of carrier gas are excited to metastable state?

a) Argon ionization detector
b) Thermionic emission detector
c) Flame ionization detector
d) Electron capture detector

Answer: a

Explanation:

In Argon ionization detector, the carrier gas is excited by a radioactive source and the atoms of carrier gas are excited to metastable state. It uses argon as carrier gas.

279. Which of the following is not used as a heating element in Thermal conductivity detector?

a) Platinum
b) Gold
c) Graphite
d) Tungsten wire

Answer: c

Explanation:

Graphite is not used as heating element in Thermal conductivity detector. Platinum, gold and tungsten wire are used as heating elements.

280. Electron capture detector is much less susceptible to contamination when nickel is used instead of tritium.

a) True
b) False

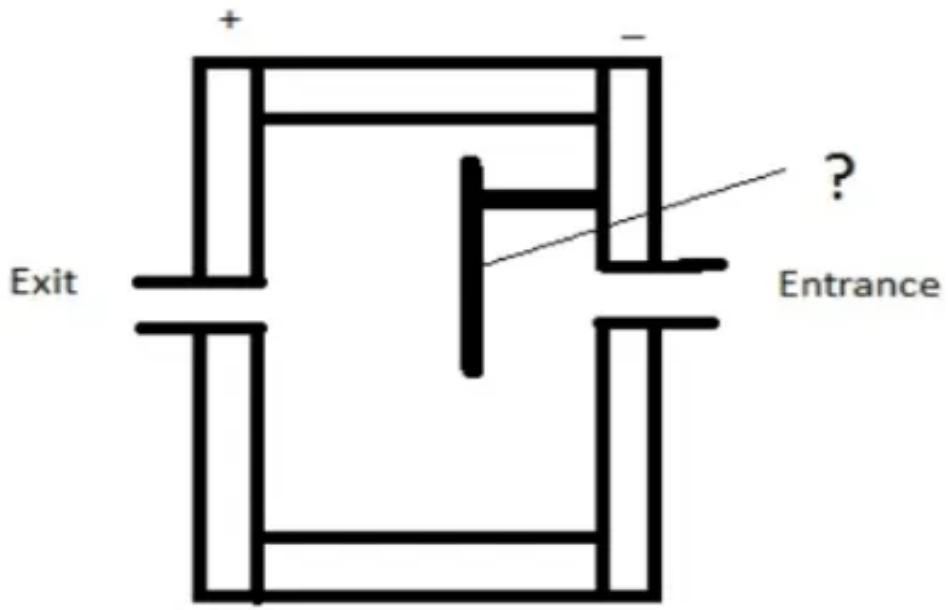
Answer: a

Explanation:

Electron capture detector is much less susceptible to contamination when nickel is used instead of tritium.
The sensitivity of nickel is less than that of tritium.

281. Given below is a diagram of electron capture detector. Identify the unmarked component in the diagram.

a) Glass shield
b) Electrode
c) Quartz shield
d) Radioactive β- emitter



Answer: d

Explanation:

The unmarked component is Radioactive β- emitter.
Nitrogen and hydrogen are the best carrier gases for these detectors.

282. Gas-solid chromatography is based on which of the following processes?

a) Partition of the analyte between a gaseous mobile phase and a stationary liquid phase
b) Adsorption of gaseous substances on solid surface
c) Ion exchange
d) Large molecules cannot penetrate through the gel

Answer: b

Explanation:

Gas-solid chromatography is based on the adsorption of gaseous substances on a solid surface. It is useful for the separation of rare gases.

283. Which of the following components cannot be retained by gas-liquid columns but can be separated by using gas-solid chromatography?

a) Formaldehyde
b) Hydrogen sulphide
c) Benzene
d) Carbon dioxide

Answer: b

Explanation:

Hydrogen sulphide cannot be retained by gas-liquid columns. It can be separated using gas-solid chromatography.

284. Which of the following is not an advantage of gas-solid chromatography?

a) Increased column life
b) Can be used for separation of rare gases
c) Leads to semi-permanent retention of analyte
d) Ability to retain some components that cannot be easily retained by other gas chromatography method

Answer: c

Explanation:

Gas-solid chromatography leads to semi-permanent retention of analyte. Hence, it is used for limited applications.

285. The distribution coefficients of Gas-solid chromatography are greater than that of Gas-liquid chromatography.

a) True
b) False

Answer: a

Explanation:

The distribution coefficients of Gas-solid chromatography are greater than that of Gas-liquid chromatography. The stationary phase is a solid particle.

286. Which of the following columns can be used in Gas-solid chromatography?

a) Open tubular column
b) Analytical column
c) Separation column
d) Guard column

Answer: a

Explanation:

Open tubular column can be used in Gas-solid chromatography. Analytical/separation column and guard column is used in liquid chromatography.

287. Which of the following is not an advantage for the conversion of packed columns into wide bore capillaries?

a) Longer retention times
b) Longer life
c) Higher efficiency
d) Greater inertness

Answer: a

Explanation:

Wide bore capillary has shorter retention time. It is an advantage. It is undesirable to have longer retention time.

288. Which of the following is not a disadvantage of gas-solid chromatography?

a) Strong retention of polar solutes
b) Lifetime is short
c) Occurrence of catalytic changes
d) Cannot be used for very wide range of components

Answer: b

Explanation:

The lifetime of gas-solid chromatography is long. It can be used for geometrical isomers.

289. Gas-solid chromatography can be used only for separation of certain low molecular weight gaseous species.

a) True
b) False

Answer: a

Explanation:

Gas-solid chromatography can be used only for separation of certain low molecular weight gaseous species. This is because in gas-solid chromatography, semi-permanent retention of analyte only takes place.

290. Which of the following is a special adsorbent used in gas-solid chromatography?

a) Molecular sieves
b) Silica gel
c) Alumina
d) Starch

Answer: a

Explanation:

Molecular sieves are a special adsorbent used in gas-solid chromatography. It is used in open tubular columns.

291. Which of the following properties of molecular sieves make it ideal for exclusion mechanism of separation?

a) High thermal stability
b) Large inner surface area
c) Variable framework charge
d) Ability to distinguish materials on the basis of their size

Answer: d

Explanation:

Molecular sieves have the ability to distinguish materials on the basis of their size.
This property can be used in separating molecules of linear structure from bulky ones.

292. Which of the following is the disadvantage of reciprocating pump used in liquid chromatography?

a) Produces pulsed flow
b) Corrosive components
c) Does not have small hold-up value
d) Does not have moderate flow rate

Answer: a

Explanation:

The disadvantage of reciprocating pump used in liquid chromatography is that it produces pulsed flow. Therefore, the flow must be damped before it affects the column.

293. Which of the following is not a disadvantage of Pneumatic pumps used in liquid chromatography?

a) Pulsed output
b) Dependent on solvent viscosity
c) Dependent on back pressure
d) Inconvenient for solvent gradient elution

Answer: a

Explanation:

Pneumatic pumps provide pulse free output. They are inexpensive.

294. Which of the following is not a desired characteristic of pulse dampers or flow smootheners used in liquid chromatography?

a) Easy mobile phase change over
b) Constant flow must be maintained
c) Should be effective at low system pressure
d) Maximal dead volume

Answer: d

Explanation:

Pulse dampers are used to avoid variations in flow. They must have minimal dead volume.

295. Which of the following will improve the efficiency of separation process in liquid chromatography?

a) Increase in sample size, increase in column diameter
b) Reduction in sample size, increase in column diameter
c) Increase in sample size, reduction in column diameter
d) Reduction in sample size, reduction in column diameter

Answer: d

Explanation:

Reduction in sample size and reduction in column diameter will improve the efficiency of separation process in liquid chromatography. The effect of uneven flow will also be reduced.

296. Which of the following are the practical problems that arise due to the decrease in column diameter?

a) Requirement of large particle size and high pressure drop
b) Requirement of large particle size and low pressure drop
c) Requirement of small particle size and high pressure drop
d) Requirement of small particle size and low pressure drop

Answer: c

Explanation:

The practical problems that arise due to decrease in column diameter are requirement of small particle size and high pressure drop. But, it increases column efficiency.

297. Which of the following is not true about guard column used in liquid chromatography?

a) It filters particles that clog the separation column
b) It extends the lifetime of separation column
c) It allows particles that cause precipitation upon contact with stationary or mobile phase
d) The size of packing varies with the type of protection needed

Answer: c

Explanation:

Guard column removes particles that cause precipitation upon contact with stationary or mobile phase.
It is placed before the separation column.

298. Which of the following columns are not used in liquid or high performance liquid chromatography?

a) Analytical column
b) Separation column
c) Guard column
d) Capillary column

Answer: d

Explanation:

Capillary column is used in gas chromatography. Analytical column is also known as separation column.

299. Which of the following is not a Column-type Liquid chromatography?

a) Gel permeation
b) Ion exchange
c) Liquid-solid
d) Paper

Answer: d

Explanation:

Paper chromatography is not a column-type chromatography. It makes use of strips of hollow cylinders of filter paper.

300. Which of the following is not true about radial compression column when compared to standard separation column?

a) Internal diameter decreases
b) Overall operating pressure decreases
c) Analysis time decreases
d) Solvent flow increases

Answer: a

Explanation:

Radial compression columns have a wider diameter than standard separation column. The cartridges used are of low cost.

301. Which of the following is not true about narrow bore column when compared to standard columns?

a) Internal diameter decreases
b) Volumetric flow decreases
c) Solvent cost is saved
d) Detector response time increases

Answer: d

Explanation:

Detector response time increases in narrow bore columns. High purity solvents must be used in these columns.

302. Which of the following types of liquid chromatography uses immobilized biochemical as stationary phase?

a) Ion exchange chromatography
b) Exclusion chromatography
c) Affinity chromatography
d) Gel permeation chromatography

Answer: c

Explanation:

In Affinity chromatography, immobilized biochemical is used as stationary phase. It is used to separate one or few solutes from hundreds of unretained solutes.

303. Which of the following is not true about High-pressure liquid chromatography (HPLC)?

a) It requires high pressure for the separation of the specious
b) There is no need to vaporize the samples
c) It is performed in columns
d) It has high sensitivity

Answer: b

Explanation:

In High-pressure liquid chromatography (HPLC), samples need to be vaporized. It has high sensitivity.

304. High-pressure liquid chromatography can be performed only in columns.

a) True
b) False

Answer: a

Explanation:

High-pressure liquid chromatography can be performed only in columns. This is because application of high pressure in open bed will not be effective.

305. Which of the following is not an advantage of Syringe type pumps used in High-pressure liquid chromatography?

a) Independent of viscosity
b) Pulse-less flow
c) High-pressure capability
d) Unlimited solvent capacity

Answer: d

Explanation:

The limitation of Syringe type pump is that it has the limited solvent capacity and is inconvenient when solvents are to be changed.

306. Which of the following is not true about solvent programming which is done in high-performance liquid chromatography?

a) It provides unequal bandwidths
b) It provides fast overall separation
c) It provides maximum resolution
d) It provides maximum sensitivity

Answer: a

Explanation:

Solvent programming is done to provide equal bandwidths. It provides maximum sensitivity for every solute in the sample.

307. Which of the following pulse damper takes up some amount of the pulsation energy which is released to provide smooth pressure without pulsations?

a) Flexible bellows or compressible gas passed through tee columns
b) Flexible inert diaphragm
c) Electronic pulse damper
d) Electrical pulse damper

Answer: a

Explanation:

Flexible bellows or compressible gas passed through tee columns take up some of the pulsation energy which is released to provide smooth pressure without pulsations. Its main purpose is to avoid pulses.

308. Which of the following is not a characteristic of the syringe pump used in high-pressure liquid chromatography?

a) Pressure capability is high
b) Maintenance is frequent
c) Limited reservoir capability
d) Slight change of flow rate when extremely high pressure compresses the solvent

Answer: b

Explanation:

In syringe pumps, maintenance is infrequent. However, it has high pressure capability.

309. Syringe pumps used in High-pressure liquid chromatography are most suitable for which of the following columns?

a) Capillary columns
b) Guard columns
c) Short-fast columns
d) Small bore columns

View Answer

Answer: d

Explanation:

Syringe pumps used in High-pressure liquid chromatography are most suitable for small bore columns.
It is the most commonly used piston type pump.

310. Gravity feed method for solvent delivery is not used with narrow bore columns packed with fine mesh particles.

a) True
b) False

Answer: a

Explanation:

Gravity feed method for solvent delivery is not used with narrow bore columns packed with fine mesh particles. This is because they cannot deliver solvent at high pressure.

320. Which of the following cannot be done to reduce ripple in High-pressure liquid chromatography?

a) Using bellows
b) Using restrictors
c) Using long nylon tube between pump and column
d) Avoiding the use of solvent pump

Answer: d

Explanation:

Solvent pumps have to be used to reduce pulses in the solvent flow. When there is a pulsed flow, the efficiency of c decreases.

321. Which of the following is not true about Hydraulic capacitance flow control system used in HPLC?

a) It can be used only for liquids with low viscosity
b) It is irrespective of solvent compressibility
c) It maintains constant flow
d) It smoothens high-pressure pump pulsations

Answer: a

Explanation:

Hydraulic capacitance flow control system used in HPLC is irrespective of the solvent viscosity. It is also irrespective of the solvent compressibility.

322. Bulk property detectors used in liquid chromatography does not respond to which of the following properties?

a) Refractive index
b) Density
c) Properties of solutes
d) Dielectric constant

Answer: c

Explanation:

Bulk property detectors respond only to bulk properties of mobile phase. It does not respond to properties of solutes.

323. Which of the following is not a property of a good detector used in liquid chromatography?

a) Good sensitivity
b) Ability to function in the presence of large background signal
c) Short response time
d) Volume of detector must be large

Answer: d

Explanation:

The volume of detector must be small. If the volume of the detector is large it may lead to band broadening.

324. Detector selectivity is more important in Liquid chromatography than in Gas chromatography.

a) True
b) False

Answer: a

Explanation:

Detector selectivity is more important in Liquid chromatography than in Gas chromatography. This is be
in liquid chromatography, chances of overlapping are higher.

325. Which of the following UV absorbance detectors provide a real-time spectrum of the component of interest?

a) Continuous wavelength detector
b) Variable wavelength detector
c) Scanning wavelength detector
d) Fixed wavelength detector

Answer: c

Explanation:

Scanning wavelength detector provides a real time spectrum of the component of interest. UV visible detector is the most widely used detection system.

326. Fluorescence detection is less selective than absorption detection.

a) True
b) False

Answer: b

Explanation:

Fluorescence detection is more selective than absorption detection. This is because of its high sensitivity.

327. Which of the following detectors depend on Snell's law at the interface between the cell wall and the flowing liquid to deflect the light beam?

a) Electrochemical detectors
b) Fluorescence detectors
c) Refractive index detectors
d) Thermal conductivity detectors

Answer: c

Explanation:

Refractive index detectors depend on Snell's law at the interface between the cell wall and the flowing liquid to deflect the light beam. Changes in refractive index are monitored by a position sensor.

328. Refractive index detectors used in liquid chromatography are not based on which of the following processes?

a) Interference
b) Refraction
c) Reflection
d) Absorption

Answer: d

Explanation:

Refractive index detectors used in liquid chromatography are not dependent on absorption. It depends on reflection, refraction and interference.

329. Which of the following detectors can be used for detection of amino acids in protein hydrolyzates by introducing the reagent dansyl chloride in the sample?

a) Electrochemical detectors
b) Fluorescence detectors
c) Refractive index detectors
d) Thermal conductivity detectors

Answer: b

Explanation:

Fluorescence detectors can be used for detection of amino acids in protein hydrolyzates by introducing the reagent dansylchloride in the sample. Other compounds that can be detected are petroleum products and natural products.

330. The reference cell is packed with which of the following in the Adsorption detector used in liquid chromatography?

a) Inactive glass beads
b) Porous glass beads
c) Alumina
d) Silica

Answer: a

Explanation:

In Adsorption detector used in liquid chromatography, the reference cell is packed with inactive glass beads. The other detector cavity is packed with silica, alumina or porous glass beads.

331. Which of the following is true about Laser detectors used in liquid chromatography?

a) Causes thermal distortion, has decreased sensitivity
b) Causes thermal distortion, has increased sensitivity
c) Does not cause thermal distortion, has decreased sensitivity
d) Does not cause thermal distortion, has increased sensitivity

Answer: a

Explanation:

Laser detectors used in liquid chromatography cause thermal distortion and have decreased sensitivity. This is because of the high energies of laser.

332. Which of the following detectors used in liquid chromatography is also called micro-adsorption detector?

a) Electrochemical detectors
b) Fluorescence detectors
c) Refractive index detectors
d) Thermal detectors

Answer: d

Explanation:

Another name for the thermal detector is micro-adsorption detector.
The operation depends upon temperature changes taking place due to the heat of adsorption.

333. In UV-Visible detectors, the cells are not made of which of the following materials?

a) Quartz
b) Teflon
c) Silica
d) KELF

Answer: c

Explanation:

The cells in UV-Visible detectors are made of quartz, KELF and Teflon. They are not made of silica.

334. Which of the following is not a feature of refractive index type detectors?

a) Higher potential sensitivity
b) Low cost
c) High volume flow rates
d) Easy cell accessibility

Answer: c

Explanation:

Refractive index type detectors have low volume flow rates. It is one of the major advantages of the refractive index type of detectors.

335. Which of the following detectors can detect almost any component?

a) Combining two UV detectors
b) Combining RI and UV detectors
c) Mass detector
d) Laser-based detectors

Answer: b

Explanation:

Combining RI and UV detectors almost any component can be detected. In some cases, single detection system may give incorrect results.

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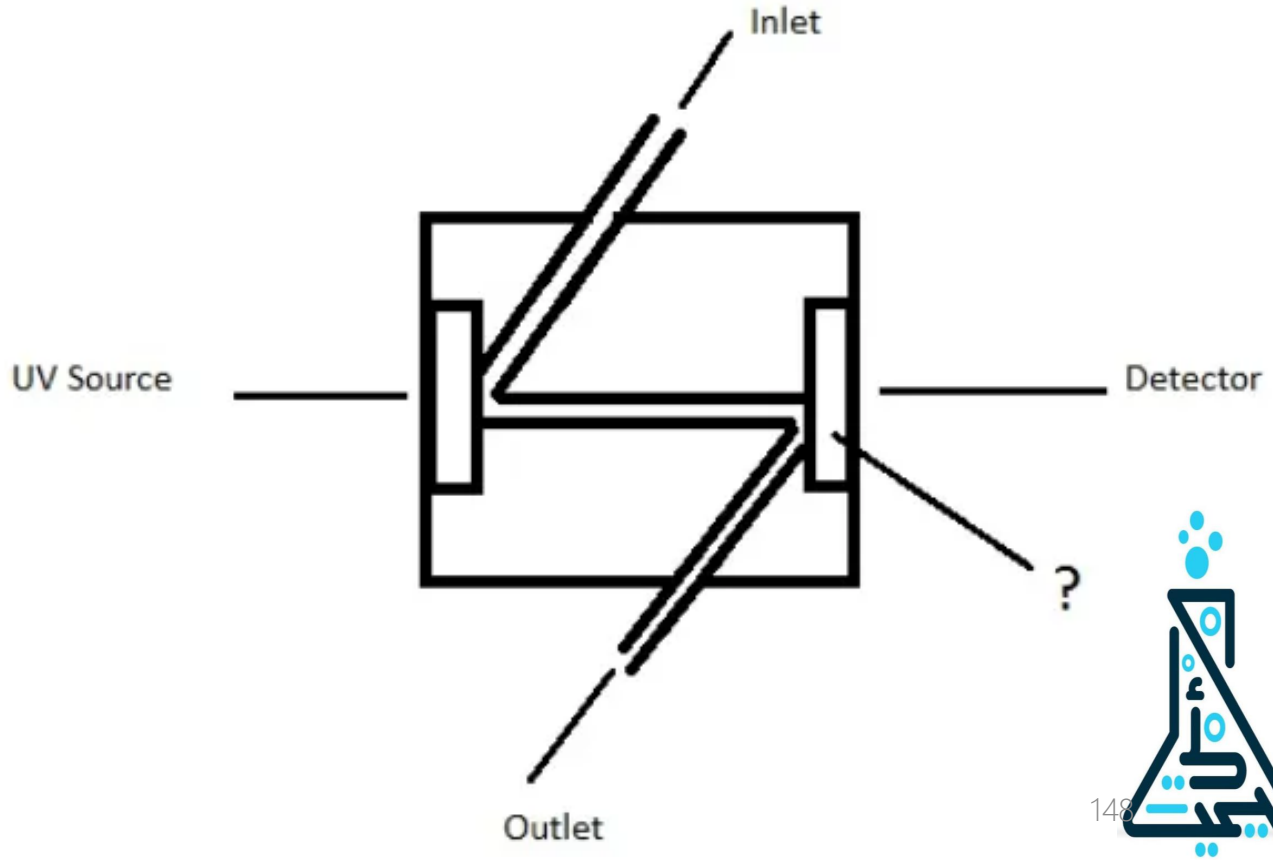
336. Given below is the diagram of Ultraviolet detector used in liquid chromatography.
Identify the unmarked component.



a) Collimator
b) Lens
c) Monochromator
d) Quartz window

Answer: d

Explanation:

The part that is not marked is quartz window.
This detector is used to detect components that absorb any wavelength in the UV-Visible region.

337. Which of the following is the formula for pH calculation?

a) log10[H+].
b) -log10[H+].
c) log2[H+].
d) -log2[H+].

Answer: b

Explanation:

pH is defined as the negative logarithm of hydrogen ion concentration. Hence, its formula is -log10[H+].

338. Pure water is known to be which of the following?

a) Weak electrolyte
b) Strong electrolyte
c) Neither weak nor strong
d) Not an electrolyte

Answer: a

Explanation:

Pure water is a weak electrolyte. It dissociates to form hydrogen ions and hydroxyl ions.

339. Which of the following is the value of hydrogen ion concentration of pure water?

a) 1×10^{7} moles/litre
b) 1×10^{5} moles/litre
c) 1×10^{6} moles/litre
d) 1×10^{8} moles/litre

Answer: a

Explanation:

The hydrogen ion concentration of pure water is 1×10^{7} moles/litre. It can be represented as $[H+]=1\times10^{7}$ moles/litre.

340. Which of the following is the value of hydroxyl ion concentration of pure water?

a) 1×10^{7} moles/litre
b) 1×10^{5} moles/litre
c) 1×10^{6} moles/litre
d) 1×10^{8} moles/litre

Answer: a

Explanation:

The hydroxyl ion concentration of pure water is 1×10^{7} moles/litre. It can be represented as $[OH-]=1\times10^{7}$ moles/litre.

341. Which of the following is the relation between hydrogen and hydroxyl ion concentration of pure water?

a) Value of hydrogen ion concentration is greater
b) Value of hydroxyl ion concentration is greater
c) They are both always the same
d) The concentrations keep changing

Answer: c

Explanation:

In water, the value of hydrogen and hydroxyl ion concentrations are the same. It can be represented as [H+]=[OH-].

342. The Nernst equation is given by which of the following statements?

a) $E=E_o + 2.303\ RT/F \log CH$
b) $E=E_o - 2.303\ RT/F \log CH$
c) $E=E_o + 2.303\ RT\times F \log CH$
d) $E=E_o - 2.303\ RT\times F \log CH$

Answer: a

Explanation:

The Nernst equation is represented as, $E=E_o + 2.303\ RT/F \log CH$.
it is used for measuring the potential of electrodes.

343. Which of the following is the relation between concentration of hydrogen and hydroxyl ions in an acidic solution?

a) Value of hydrogen ion concentration is greater
b) Value of hydroxyl ion concentration is greater
c) They are both always the same
d) The concentrations keep changing

Answer: a

Explanation:

In acidic solution, the value of hydrogen ion concentration is greater than that of hydroxyl ion concentration.
It can be represented as [H+]>[OH-].

344. Which of the following is the relation between concentration of hydrogen and hydroxyl ions in a basic solution?

a) Value of hydrogen ion concentration is greater
b) Value of hydroxyl ion concentration is greater
c) They are both always the same
d) The concentrations keep changing

Answer: b

Explanation:

In basic solution, the value of hydroxyl ion concentration is greater than that of hydrogen ion concentration.
It can be represented as [H+]<[OH-].

345. The measurement of hydrogen ion concentration can be made by measuring the potential developed in an electrochemical cell.

a) True
b) False

Answer: a

Explanation:

The measurement of hydrogen ion concentration can be made by measuring the potential developed in an electrochemical cell.

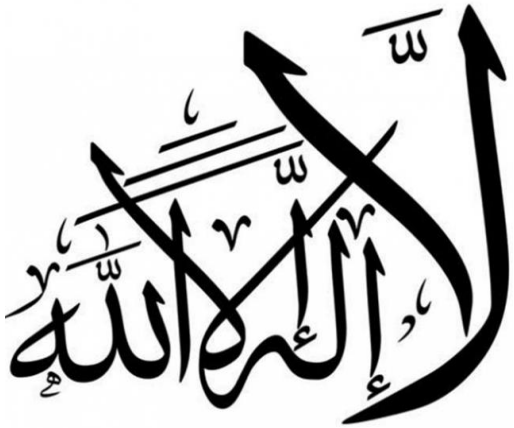
346. Slope factor is independent of temperature.

a) True
b) False

Answer: b

Explanation:

Slope factor is dependent on temperature. Slope factor is given by – 2.303 RT/F.



347. Which of the following is not the characteristic of a reference electrode?

a) It must have a known output potential
b) It must have a constant output potential
c) Its output potential is dependent on the composition of the solution
d) It is employed in conjunction with the indicator or working electrode

Answer: c

Explanation:

The output potential of a reference electrode must be insensitive to the composition of the solution.

348. Why is Standard hydrogen electrode called as the primary reference electrode?

a) It has a known output potential
b) It has a constant output potential
c) Its output potential is independent of the composition of the solution
d) Its output potential is zero volts

Answer: d

Explanation:

Standard hydrogen electrode is called the primary reference electrode as its output potential is zero volts.
It is employed in conjunction with the indicator or working electrode.

349. Which of the following is the simple and most convenient hydrogen electrode?

a) Pascal Hydrogen electrode
b) Bourne Hydrogen electrode
c) Hilderbant Hydrogen electrode
d) West Hydrogen electrode

Answer: c

Explanation:

The hydrogen electrode given by Hilderbant is the simple and most convenient hydrogen electrode.
A number of hydrogen electrodes are available.

350. Which of the following is not the disadvantage of hydrogen electrode?

a) Platinum can be easily poisoned
b) Presence of oxidizing agents alters the potential
c) It gives salt error
d) H2 gas at 1 atmospheric pressure is difficult to set up and transport

Answer: c

Explanation:

Hydrogen electrode does not give salt error.
A number of hydrogen electrodes are available.

351. In Hydrogen electrode, the electrode is placed in a solution of ____ M Hcl. Fill in the blank.

a) 0.5
b) 1
c) 2
d) 3

Answer: b

Explanation:

In Hydrogen electrode, the electrode is placed in a solution of 1M Hcl. H_2 gas at 1 atm pressure is passed through the side arm in such a way that the platinum is half immersed in Hcl.

352. Hydrogen electrode which is the reference electrode can be used as which of the following?

a) Anode only
b) Cathode only
c) Anode or Cathode
d) Salt bridge

Answer: c

Explanation:

Hydrogen electrode which is the reference electrode can be used as the anode or the cathode.
It depends on the half-cell to which it is coupled.

353. If hydrogen electrode acts as cathode, hydrogen is reduced.

a) True

b) False

Answer: a

Explanation:

If hydrogen electrode acts as cathode, hydrogen is reduced. If hydrogen electrode acts as anode, hydrogen is oxidized.

354. Given below is a diagram of hydrogen electrode. Identify the unmarked component.

a) Hydrogen at 1 atm

b) Hydrogen at 10 atm

c) Helium at 1 atm

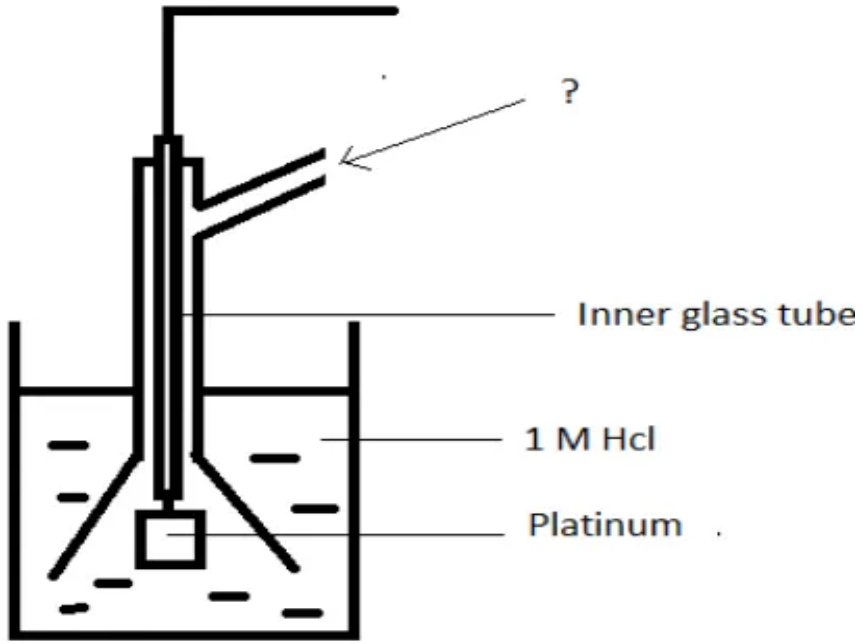
d) Helium at 10 atm

Answer: a

Explanation:

Hydrogen at 1 atm is sent through the side tube.

The electrode is placed in a solution of 1M Hcl.



355. The composition of glass membrane in glass electrode cannot have which of the following?

a) Sodium silicate
b) Calcium silicate
c) Lithium silicate
d) Barium silicate

Answer: d

Explanation:

Glass electrode consists of either sodium or calcium silicate or lithium silicates containing glass membrane. It has lanthanum and barium ions added to the membrane.

356. Which of the following is the purpose of added membranes in the glass membrane of the glass electrode?

a) They act as tightners
b) They act as filters
c) They act as conditioners
d) They act as collectors

Answer: a

Explanation:

The ions in the added membranes act as tightners. They reduce the mobility of sodium ion.

357. Which of the following cannot form the inner reference electrode in glass electrodes?

a) Silver electrode
b) Copper electrode
c) Calomel electrode
d) Silver chloride electrode

Answer: b

Explanation:

Copper electrode cannot form the inner reference electrode in glass electrodes.
Inner reference electrode is immersed in a buffer solution.

358. The pH response of glass electrode is limited entirely to the area of the special glass membrane bulb.

a) True
b) False

Answer: a

Explanation:

The pH response of glass electrode is limited entirely to the area of the special glass membrane bulb.
The response of the electrode is independent of the depth of immersion.

359. Which of the following is not the advantage of glass electrodes?

a) It gives accurate results for high as well as low pH values
b) It is simple to operate
c) It has no salt error
d) Modern electrodes can withstand severe treatment

Answer: a

Explanation:

It gives accurate results for low pH values only ie. from 0 to 9. For high pH values, the glass becomes responsive to sodium and other cations.

360. Which of the following is not the disadvantage of glass electrodes?

a) Poor readings are obtained in buffered or unbuffered solutions
b) The electrode must be washed thoroughly with distilled water to obtain proper results
c) Materials suspended on glass should be wiped out neatly to obtain proper results
d) It is affected by oxidation reduction potentials in the solution

Answer: d

Explanation:

It is affected by oxidation reduction potentials in the solution. It is an advantage of the glass electrode.

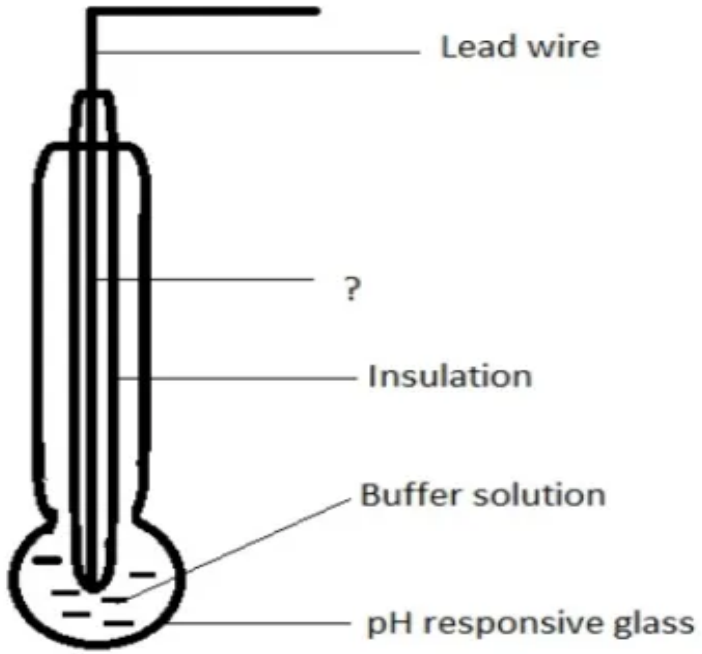
361. Given below is the diagram of glass electrode. Identify the unmarked component.

a) Platinum leads
b) Silver wire coated with silver chloride
c) Copper wire
d) Platinum reference electrode

Answer: b

Explanation:

The unmarked component is silver wire coated with silver chloride.
It forms the inner reference electrode.



362. Which of the following cannot be used as secondary reference electrode?

a) Calomel electrode
b) Silver-silver chloride electrode
c) Mercury-mercury sulphate electrode
d) Glass electrode

Answer: d

Explanation:

Glass electrode cannot be used as secondary reference electrode. It is an indicator electrode.
It responds to the changes in the activity of the analyte ion.

363. Which of the following is known as calomel?

a) Silver chloride
b) Mercury chloride
c) Potassium chloride
d) Mercury sulphate

Answer: b

Explanation:

Mercury chloride is known as calomel.
The most important general purpose secondary electrode is calomel electrode.

364. The calomel electrodes are classified based on which of the following?

a) Materials used in the electrode
b) Amount of mercury present
c) Concentration of Kcl
d) Purity of mercury

Answer: c

Explanation:

Several convenient calomel electrodes are available. They are classified based on the concentration of Kcl.

365. Which of the following calomel electrodes are used for accurate work?

a) Saturated calomel electrode
b) Electrode with 0.1M Kcl
c) Electrode with 1M Kcl
d) Electrode with 2M Kcl

Answer: b

Explanation:

Calomel electrode with 0.1M Kcl is used for accurate work.
Saturated calomel electrodes are easy to prepare and maintain.

366. Calomel electrode can behave as which of the following components?

a) Anode only
b) Cathode only
c) Anode or cathode
d) Salt bridge

Answer: c

Explanation:

Calomel electrode can behave as anode or cathode depending upon the half cell. A salt bridge is used for coupling.

367. When the calomel electrode acts as the cathode which of the following does not occur?

a) Mercury ions are discharged at the electrode
b) More calomel passes into the solution
c) There is a decrease in the concentration of chloride ions
d) There is an increase in the concentration of chloride ions

Answer: d

Explanation:

When the calomel electrode acts as the cathode.
When the calomel electrode acts as the cathode, mercury ions are discharged at the electrode.
More calomel passes into the solution. Hence, there is an increase in the concentration of chloride ions.

368. Which of the following is not the characteristics of calomel electrode?

a) The potential of electrode is not temperature dependent
b) Preparation of electrode is easy
c) Value of potential or emf is higher for lower concentration of Kcl
d) Value of potential decreases with increasing concentration of Kcl

Answer: a

Explanation:

The potential of calomel electrode is temperature dependent.
When temperature changes potential comes to a new value.
It cannot be used in places where high temperatures exist.

369. Which of the following is not the characteristics of silver/silver chloride electrode?

a) These electrodes have good electrical and chemical stability
b) It can be used in temperatures greater than 600_oC
c) It can be used in places or solutions that have strong reducing agents
d) It should not be used in solutions that contain proteins, sulphide or bromide

Answer: c

Explanation:

The silver/silver chloride electrode cannot be used in places or solutions that have strong reducing agents.
They will reduce the silver ions to silver metal.

370. While using reference electrodes, the internal liquid level should always be kept above that of the sample solution.

a) True
b) False

Answer: a

Explanation:

While using reference electrodes, the internal liquid level should always be kept above that of the sample solution. This is done to prevent contamination of the electrolyte solution.

371. Which of the following salt bridge solutions must be used for silver/silver chloride electrode?

a) Saturated KCl
b) Saturated K_2SO_4
c) Saturated LiCl
d) Saturated KNO_3

Answer: a

Explanation:

Saturated KCl is used as the salt bridge solution for silver/silver chloride electrode. It can also be used for calomel electrode.

372. LiCl salt bridge is more suitable in organic solvents than KCl.

a) True
b) False

Answer: a

Explanation:

LiCl salt bridge is more suitable in organic solvents than KCl.
It is used for the measurement of non-aqueous solutions.

373. pH meters can be considered as voltage sources with which of the following internal resistances?

a) Very low resistance
b) Moderate resistance
c) Very high resistance
d) No resistance

Answer: c

Explanation:

pH meters can be considered as voltage sources with very high internal resistance. In order to eliminate errors no current should flow from the source.

374. The electrodes used in pH measurement have which of the following internal resistances?

a) Very low resistance
b) Moderate resistance
c) Very high resistance
d) No resistance

Answer: c

Explanation:

The electrodes used in pH measurement have very high internal resistance.
It is of the order of 1000M ohm.

375. In Ammonia electrode, diffusion of dissolved ammonia occurs through the membrane until which of the following conditions occur?

a) Concentration becomes equal on both sides
b) Activity becomes equal on both sides
c) Partial pressure becomes equal on both sides
d) Differential pressure is low

Answer: c

Explanation:

In Ammonia electrode, diffusion of dissolved ammonia occurs through the membrane until partial pressure becomes equal on both sides. Partial pressure is proportional to its concentration.

376. When electrode potential response is plotted as a function of ammonia concentration on a semi-log graph, the graph obtained will be _____

a) A straight line
b) Parabolic
c) Sigmoidal
d) A curve

Answer: a

Explanation:

When electrode potential response is plotted as a function of ammonia concentration, the graph obtained will be a straight line. The slope will be about 58mV per decade.

377. How can samples above 1M in ammonia concentration be measured using ammonia electrode?

a) It must be diluted and measured
b) It cannot be measured
c) The electrode has to be modified for measuring
d) It can be measured directly

Answer: a

Explanation:

Samples above 1M in ammonia concentration be measured by diluting the solution. Samples having concentrations below that can be measured directly.

378. The dilution of solution must not reduce the level of ammonia below _____

a) 10^{-2} M
a) 10^{-5} M
a) 10^{-8} M
a) 10^{-9} M

Answer: a

Explanation:

The dilution of solution must not reduce the level of ammonia below 10^{-5} M.
The total level of dissolved species must be below 1M.

379. Which of the following factors does not the reproducibility of the ammonia electrode?

a) Temperature
b) Drift
c) Noise
d) Dilution

Answer: d

Explanation:

Dilution does not affect reproducibility. The other three factors affect the reproducibility.

380. The performance of ammonia electrode is not affected by sample colour and turbidity.

a) True
b) False

Answer: a

Explanation:

The performance of ammonia electrode is not affected by sample color and turbidity.
Temperature affects its output.

381. In fluoride ion electrode, the potential corresponding to level of the fluoride ion is described by which of the following equations when E is the measured electrode potential, E_o is the reference potential and A is the level of fluoride ions in solution?

a) $E=E_o+0.0591 \log A$
b) $E=E_o-0.0591 \log A$
c) $E=E_o+0.0896 \log A$
d) $E=E_o-0.0896 \log A$

Answer: b

Explanation:

In fluoride ion electrode, the potential corresponding to level of the fluoride ion is described by the equation, $E=E_o-0.0591 \log A$. A is the activity or effective concentration of fluoride ions.

382. What does TISAB which is used to overcome interferences stand for?

a) Total Isolation Strength Absolute Buffer
b) Total Ionic Strength Absolute Buffer
c) Total Ionic Strength Adjustment Buffer
d) Total Isolation Strength Adjustment Buffer

Answer: c

Explanation:

TISAB stands for 'Total Ionic Strength Adjustment Buffer'.
It is added in excessand in exactly the same amount to each of the solution that is to be measured.

Water Treatment Analysis Questions

Zero hardness of water is achieved by

1. using lime soda process
2. excess lime treatment
3. ion exchange method
4. using excess alum dosage

Answer (Detailed Solution Below)

Option 3 : ion exchange method

For a given discharge, the efficiency of sedimentation tank can be increased by:

1. Increasing the depth of the tank
2. Increasing the surface area of the tank
3. Decreasing the depth of the tank
4. Decreasing the surface area of the tank

Answer (Detailed Solution Below)

Option 2 : Increasing the surface area of the tank

Which coagulant is widely used for sewage treatment?

1. Lime
2. Alum
3. Ferric chloride
4. Ferric sulphate

Answer (Detailed Solution Below)

Option 3 : Ferric chloride

What will happen when the alum is mixed with water as coagulant?

1. Decrease pH value of water
2. Increase pH value of water
3. Does not affect pH value of water
4. None of these

Answer (Detailed Solution Below)

Option 1 : Decrease pH value of water

Concept:

When alum is added in water, it **reacts with alkalinity present in water** and leads to formation of sticky gelatinous precipitate of Aluminium hydroxide which attracts fine suspended impurities in water over its surface and gets easily settled in the following sedimentation process.

The following typical chemical reaction takes place:

$$Al_2(SO_4)_3.18H_2O + 3Ca(HCO_3)_2 \longrightarrow 2Al(OH)_3\downarrow + 3CaSO_4 + 6CO_2$$

(Alum) (Alkailinity)

From above chemical reaction following may be concluded:

1. **The carbon dioxide is formed which further reacts with and leads to formation of carbonic acid and hence, reduces the pH of water.**

2. The bicarbonate hardness or temporary hardness (i.e. Ca $(HCO_3)_2$) is removed by alum, however, non-carbonate hardness ($CaSO_4$) is introduced by alum.

Concept:

- **Water softening:** It is the process of hardness removal from the water. It is caused by multivalent cation and affects water quality.

- **Lime soda method:** It is a water softening method in which lime and soda ash are added to the water, which causes the precipitation of multivalent cation as $CaCO_3$.
- Precipitation of $CaCO_3$ occurs only when the **pH of water is greater than 9**, so in case of less pH alkalinity is added to the water. In this process small amount of Ca^{2+} and Mg^{2+} precipitates very late, which will create incrustation in the pipe, so to avoid this recarbonation is done to dissolve back this small amount of cation.
- Due to this, the method does not give zero hardness.

- **Ion Exchange Process:** Ion-exchange resin, (zeolite) exchanges one ion from the water being treated for another ion that is in the resin (sodium is one component of softening salt, with chlorine being the other). Zeolite resin exchanges sodium for calcium and magnesium. **It can produce water with zero hardness.**

Which of the following is used in water purification?

1. Turgor pressure
2. Osmosis
3. Reverse Osmosis
4. Cytolysis

Answer (Detailed Solution Below)

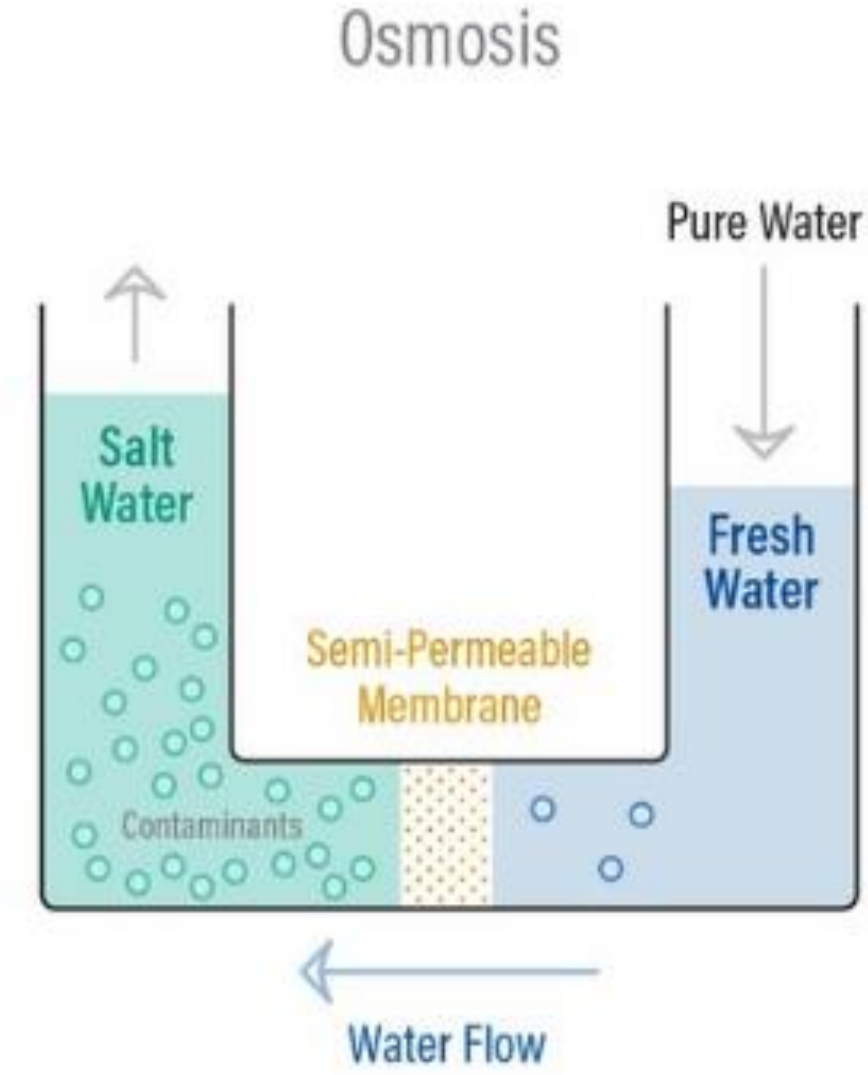
Option 3 : Reverse Osmosis

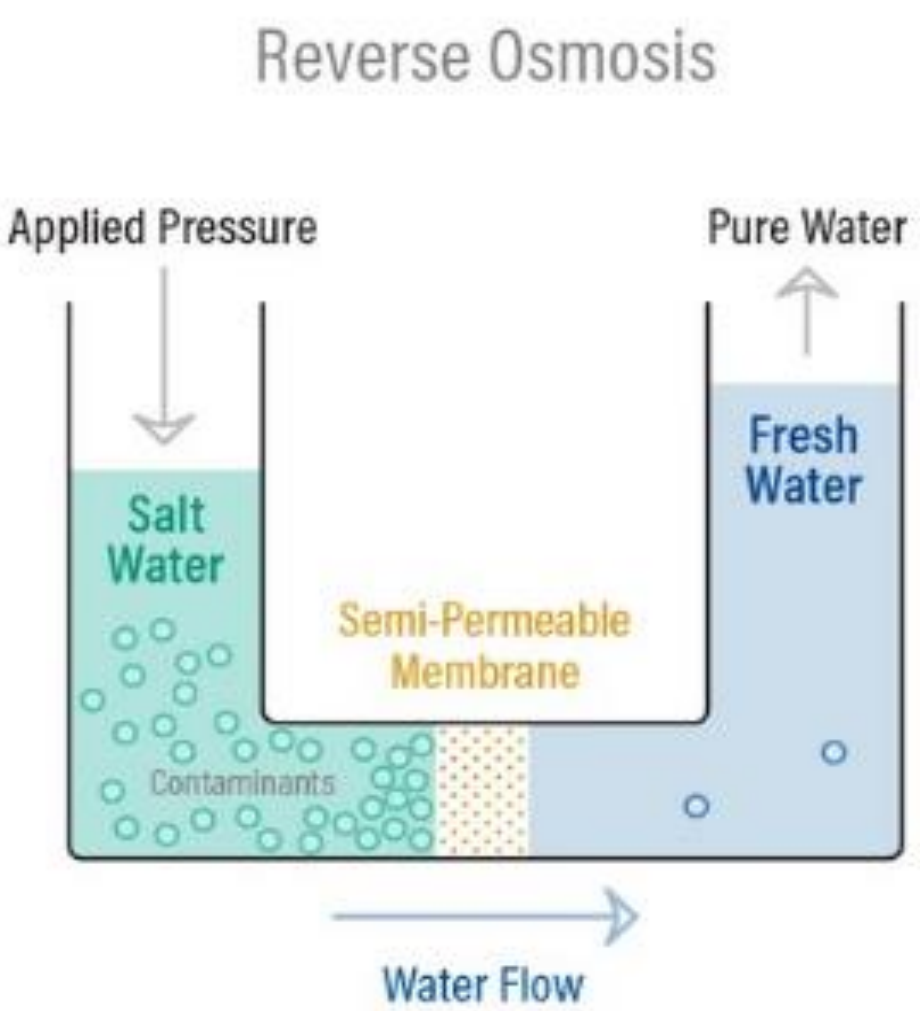
- Reverse Osmosis is a technology that is used to **remove a large majority of contaminants** from water by **pushing the water under pressure through a semi-permeable membrane**.
  - It is a process where you **demineralize or deionize** water by pushing it under pressure through a **semi-permeable Reverse Osmosis Membrane**.

Important Points

Turgor pressure	Turgor pressure is exerted by fluid in a cell that presses the cell membrane against the cell wall. Fungi, protists, bacteria, and plants all secrete various extracellular molecules form together to create a solid wall on the outside of their cells. As water fills the cells, it pushes against the cell membrane and cell wall, producing turgor pressure.
Osmosis	It is a process where a weaker saline solution will tend to migrate to a strong saline solution. Examples of osmosis are when plant roots absorb water from the soil and our kidneys absorb water from our blood.
Cytolysis	It is also known as osmotic lysis, which occurs when a cell bursts and releases its contents into the extracellular body due to a large influx of water into the cell, far exceeding the capacity of the cell membrane to contain the extra volume.

Osmosis


Osmosis
Pure Water
Salt Water
Fresh Water
Semi-Permeable Membrane
Contaminants
Water Flow


Reverse Osmosis
Applied Pressure
Pure Water
Salt Water
Fresh Water
Semi-Permeable Membrane
Contaminants
Water Flow

The most commonly used disinfectant for drinking water throughout the world is

1. alum
2. nitrogen
3. lime
4. chlorine

Answer (Detailed Solution Below)

Option 4 : chlorine

The most commonly used chemicals as primary disinfectants are chlorine, chlorine dioxide and ozone. **Among them Chlorine is the most widely used primary disinfectant throughout the world.**

<u>Properties of a good disinfectant:</u>

1. It should be persistent enough to prevent the regrowth of organisms in the distribution system so that the water will be safe from future recontamination.

2. It must be toxic to micro-organisms at concentrations well below the toxic thresholds of humans and higher animals so that it cannot negatively affect the animals or humans.

3. It should have a fast rate of kill of micro-organisms.

4. It should be active and stable and environmentally safe.

5. It should not leave damage and odour.

Alum is added in water in order to remove the very fine suspended particles in water by the process of coagulation and sedimentation. It also removes phosphorous from water.

Lime is added in water to lower the hardness of water. It is generally removed the temporary hardness i.e. hardness due to multivalent cations of carbonate and bicarbonate ions in water.

When chlorine is dissolved in water, it reacts to form hypochlorous acid and hypochlorite ions. At pH < 5, chlorine exists in water as

1. Elemental or molecular chlorine
2. Remains in the form of hypochlorous acid
3. Remains in the form of hypochlorite ions
4. Remains in the form of both hypochlorous acid and hypochlorite ions

Answer (Detailed Solution Below)

Option 1 : Elemental or molecular chlorine

In the process of chlorination chlorine reacts with water to form Hypochlorous acid as given in the below equation.

$$Cl_2 + H_2O \underset{}{\overset{pH>5}{\rightleftharpoons}} HOCl + HCl$$

$$HOCl \underset{pH<7}{\overset{pH>8}{\rightleftharpoons}} OCl^- + H^+$$

At pH < 5, chlorine does not react with water and remains in elemental or molecular chlorine form.

Other important points:

Effectivity in disinfection-

ClO_2> HOCl> Chloroamines> Hypochlorite ion (OCl^-)

Some of the dechlorinating agents are -

1. $Na_2S_2O_3$ (Sodium thiosulphate)
2. $Na_2S_2O_5$ (Sodium metabisulphate)
3. Na_2HSO_3 (Sodium bisulphide)
4. SO_2 and Activated carbon

Blue baby disease found in infants is due to excessive _____ in drinking water.

1. Colour
2. Sulphates
3. Carbonates
4. Nitrates

Answer (Detailed Solution Below)

Option 4 : Nitrates

A 25 ml sample was diluted to 250 ml with odourless distilled water so that the odour of the sample no longer perceivable. What was the Threshold odour number ?

1. 11
2. 10
3. 25
4. 05

Answer (Detailed Solution Below)

Option 2 : 10

Odour and taste are expressed by threshold odour number (T.O.N.) as it represents the dilution ratio at which odour can not be detected.

$$T.O.N. = \frac{A+B}{A} = \frac{volume\ of\ diluted\ sample}{Volume\ of\ undiluted\ sample}$$

where A = Volume of water sample undiluted

B = volume of distilled water required to be added to remove the odour.

Calculation:

Given,

A + B = 250 ml

A = 25 ml

$$T.O.N. = \frac{A+B}{A} = \frac{250}{25}$$

T.O.N. = 10

Water sample of pH = 4 when compared to sample of pH = 7, will be more acidic by:

1. 3 times
2. 300 times
3. 1000 times
4. None of these

Answer (Detailed Solution Below)

Option 3 : 1000 times

Concept

We know, pH is defined as the negative logarithm of $[H]^+$ ion.

So,

$pH = -\log_{10} [H^+]$

$-\log_{10} [H^+] = pH$

$[H^+] = 10^{-pH}$

Calculation

pH of water samples are

$pH = 4 \Rightarrow [H^+] = 10^{-4}$

$pH = 7 \Rightarrow [H+] = 10^{-7}$

Comparing Both $[H^+]$

$$\frac{[H^+]_I}{[H^+]_{II}} = \frac{10^{-4}}{10^{-7}} = 10^3 = 1000$$

Hence, first sample is 1000 times acidic than second sample.

High turbidity of water can be determined by :

1. Jacksons turbidimeter
2. turbidity tube
3. Bayli's turbidimeter
4. none of these

Answer (Detailed Solution Below)

Option 1 : Jacksons turbidimeter

Explanation:

Turbidity:

- It is a **surface phenomenon.**
- It is a measure of the resistance offered by the particles present in water to the passage of light through water.
- Turbidity is opaqueness in water. It is caused by **suspended and colloidal particles.**
- The smaller the size of the particle **higher is the turbidity**.
- Turbidity is measured on **a silica scale** and expressed in terms of **Turbid Units (TU)**

Devices used to measure the turbidity in water are as follows:

Jackson's Turbidimeter:

- **It is used to measure high turbidity, i.e 25 – 1000 mg/l**
- **It cannot measure the turbidity less than 25 mg/l**

Bayli's meter:

- It is used to measure low turbidity, i.e less than 10 mg/l.

Ratio Turbidimeter:

- When a turbidity meter is measuring with "ratio on" it will use data from several detectors and take an average, in order to correct for changes caused by this particle size difference

Nephelometer:

- This works on the principle of light scattering.
- It is a digital electronic device that measures low turbidity in water with very high precision in no time
- It measures the turbidity in terms of NTU (Nephelometric Turbidity Unit)

Which water characteristic is measured in the laboratory using a Nessler tube?

1. Colour
2. Dirt
3. Taste
4. Specific conductivity of water

Answer (Detailed Solution Below)

Option 1 : Colour

Which of the following instrument is used to measure small colour intensities precisely?

1. Nephelometer
2. Tintometer
3. Baylis turbidimeter
4. Nessler tubes

Answer (Detailed Solution Below)

Option 2 : Tintometer

Explanation:

- **The intensity of colour** in the water is **measured** using the **colour matching technique** in **Tintometer by Nessler tube** and it is expressed in terms of standard unit obtained by the addition of platinum in the form of chloroplatinate in 1 litre of pure water and is **represented as TCU (true colour unit)**.

Water Quality parameter	Instrument used
Turbidity	• Turbidity Rod (Absorption principle field method) • Jackson Turbidmeter method (Absorption principle laboratory method) • **Baylis turbidimeter (Absorption principle)** • **Nephelometer (Scattering principle)**
Colour	• **Tintometer (using nessler tubes)**
Taste and odour	• Osmoscope

406.What is wastewater?

* Wastewater is any water that has been affected by human use, this can be from domestic, industrial, commercial or agricultural activities. It can be transported to sewers or wastewater treatment plants.
When wastewater is discharged into the environment without suitable treatment this then causes water pollution. Last month saw Southern Water penalised with a £126m payout due to spillage of wastewater into the environment.

* As society is becoming more eco-conscious, regulations and rules are becoming stricter.
Penalties are also becoming heavier, the managing director of the business that fails to meet regulations could face imprisonment.

* Having the correct wastewater treatment and management is crucial to your business. Not only to meet regulations but it can also save money by reusing water that would otherwise get disposed of.
Below is a list of some of the industries that generate wastewater through production:

* Automotive
* Food And Beverage
* Agriculture
* Finishing
* Aerospace
* Industrial
* Pharmaceutical

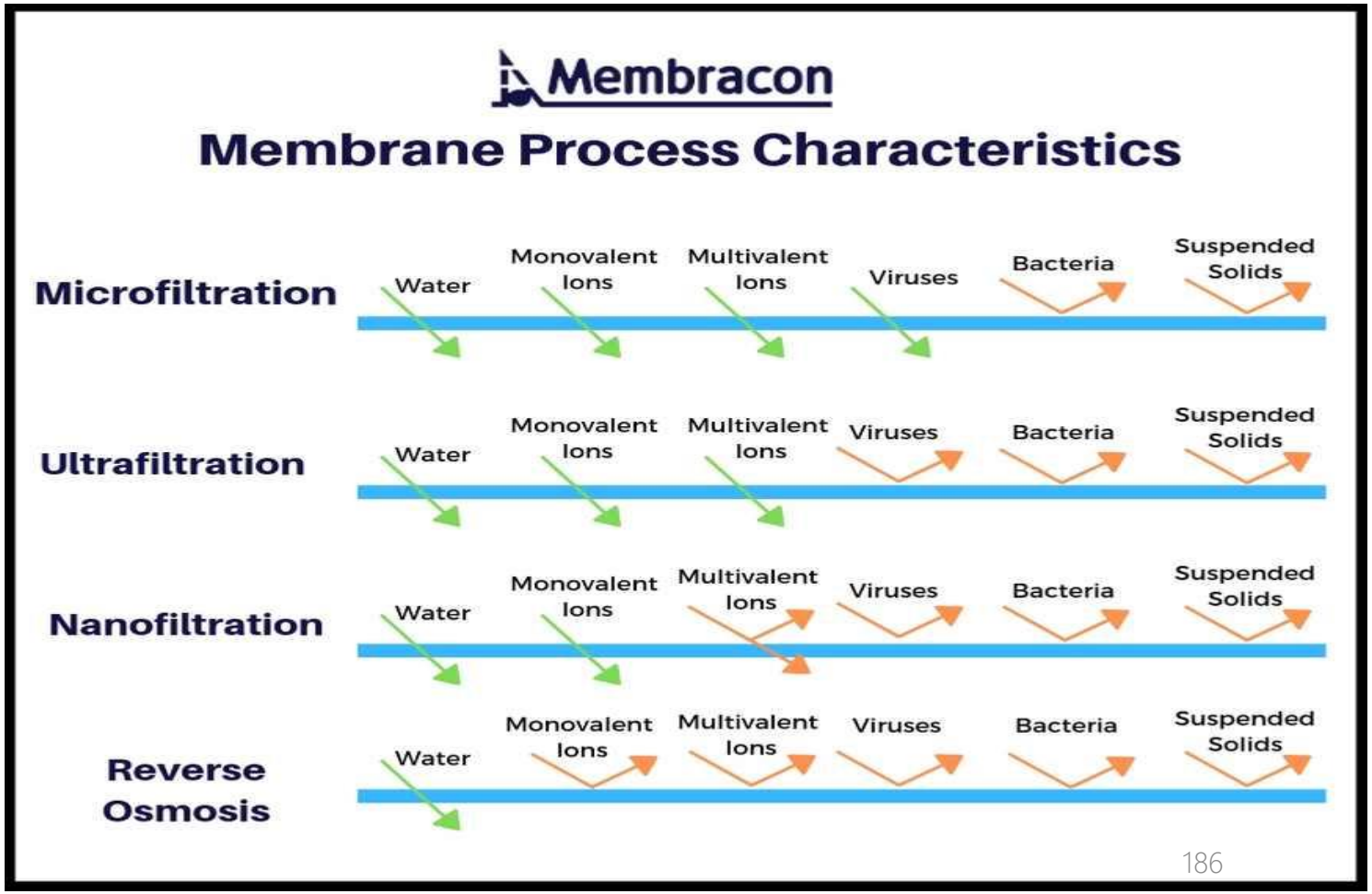
408.How can reverse osmosis be used to treat wastewater

Although there's a variety of water filtration solutions to manage and treat wastewater, RO is becoming increasingly popular. RO is capable of rejecting 99.9% of bacteria.

Reverse Osmosis systems can be used combined with other water filtration units. Dependent on each water solution is the quality of water you have to treat and the desired quality of water for reuse.

This will differ for each solution as raw water quality varies with location. It also depends on the contaminants that have been used in production.

RO works by removing impurities from contaminated water. It does this through the process of pressure, forcing the contaminated solution through membranes. After the water is treated it can be reused in production or can be disposed of safely.



409. Is RO a green solution for industrial waste water treatment?

* Traditional water treatment methods require chemicals, which poses more than one risk. Holding chemicals on-site, transporting them and having someone manage them are all health and safety risks.

* It's also better for the environment if the treatment takes place on-site as opposed to frequent collections of wastewater by truck.

* Modern membrane technologies used in RO don't require any chemicals, it uses electricity and high-pressure water.

* RO systems also require very little maintenance, they are self-cleaning, self-contained units.

* The wastewater they treat can be disposed of safely or reused and recycled back into production. This is a huge benefit as it saves storage space and saves money.

General Questions

410.Describe proper glassware washing technique.

ANSWER:

Some of cleaning solutions are harmless to skin contact, therefore always use and wear chemical resistant gloves, a lab safety coat, and eye protection.

The most common procedure that will be effective against most dirty glassware will be to first rinse with an organic solvent, and then second, to wash and scrub with warm, soapy water.

Then the glassware needs to be rinsed with tap water, deionized water, and finally with acetone before placing on a rack to air dry. When this fails to clean the glassware, depending on the experiment and the type of glassware, additional steps to clean with acid or base (or both)

411.Write only ten general laboratory safety rules for a chemical laboratory.

ANSWER:

1.Be sure to read all fire alarm and safety signs and follow the instructions in the event of an accident or emergency.

2. Ensure you are fully aware of your facility's/building's evacuation procedures.

3. Make sure you know where your lab's safety equipment—including first aid kit(s), fire extinguishers, eye wash stations, and safety showers—is located and how to properly use it.

4. Know emergency phone numbers to use to call for help in case of an emergency.

5. Lab areas containing carcinogens, radioisotopes, biohazards, and lasers should be properly marked with the appropriate warning signs.

6. Open flames should never be used in the laboratory unless you have permission from a qualified supervisor.

7. Make sure you are aware of where your lab's exits and fire alarms are located.

8. An area of 36" diameter must be kept clear at all times around all fire sprinkler heads.

9. If there is a fire drill, be sure to turn off all electrical equipment and close all containers.

10. Always work in properly-ventilated areas.

412.Write chemical symbols, atomic mass and atomic number of following Elements..

Chlorine
Calcium
Aluminum
Iron
Cobalt
Zinc
Fluoride
Hydrogen
Oxygen
Potassium

Name of elements	Symbol	Atomic Mass	Atomic Number
ChlorineG	Cl	35.5G	17
CalciumG	Ca	40G	20
AluminumG	Al	27G	13
Iron	Fe	56G	26
Cobalt	Co	59G	27
Zinc	Zn	65G	30
Fluoride	F	56G	26
HydrogenG	H	1G	1
OxygenG	O	16G	8
PotassiumG	K	39G	19

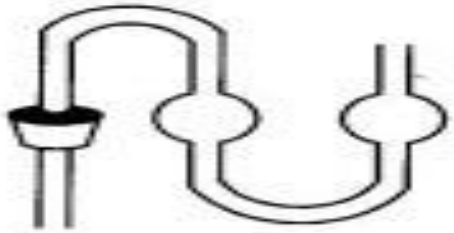
413. Write names of following laboratory equipment.

Test tube

Centrifuging tube

Boiling tube

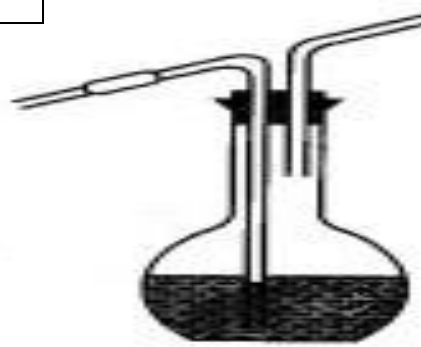
Test tube brush



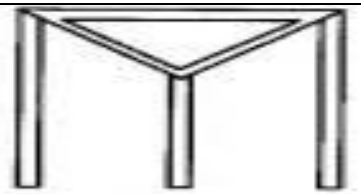
Gas detector

Funnel Stand

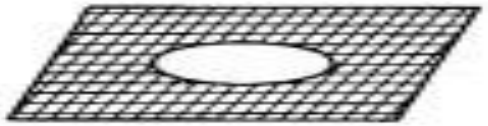
Funnel



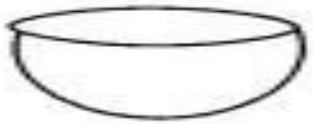
Distillation bottle



Tripod Stand



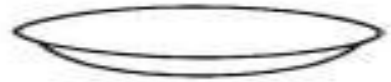
Wire gauze



China dish

Glass rod

Blue glass



Watch glass

414.Write the names of following safety indications, you have seen in your practical book or in laboratory.

Flamable

Poison/Toxic

Oxidizer

Harmful/Irritant

Explosion

Environmental Hazard

Corrosive

Biohazard

Radioactive

415.Define mass, volume and density and relation among these three terms.

Answer:

Mass (gram)

can be defined as the amount of matter in a body

Volume (liter)

can be defined as the space occupied by a body

Density (gram/ liter)

can be defined as the amount of matter in a unit volume

Relation

416.Why raw water is treated with chlorine.

Answer

As a halogen, chlorine is a highly efficient disinfectant, and is added to public water supplies to kill disease-causing pathogens, such as bacteria, viruses, and protozoans, that commonly grow in water supply reservoirs, on the walls of water mains and in storage tanks.

417.What is meant by residual chlorine? How much residual chlorine should be present at the consumer's end?

Answer:

Chlorination is the process of adding chlorine to drinking water to disinfect it and kill germs.

Residual chlorine is the low level amount of chlorine remaining in the water after a certain period or contact time after its initial application.

It constitutes an important safeguard against the risk of subsequent microbial contamination after treatment—a unique and significant benefit for public health.

Typically chlorine doses to final treated waters are in the range 0.2–2.0 mg/l of free chlorine to give a residual of about 0.02–0.3 mg/l at the consumer's tap.

418. Write the name of chemical being used for disinfection of water in Jacobabad. What is its concentration?

Answer:

Sodium hypochlorite (NaOCl) is used as a disinfect at Jacobabad water filter Plant for raw water, according to design study it is recommended to 2 ppm (mg/lit) and practically during testing of water distribution in Mochi Basti this recommendation found correct and we found at least 0.5 ppm at end user houses.

Chlorination is the process of adding chlorine to drinking water to disinfect it and kill germs. Different processes can be used to achieve safe levels of chlorine in drinking water.

Chlorine is available as compressed elemental gas, sodium hypochlorite solution (NaOCl) or solid calcium hypochlorite ($Ca(OCl)_2$).

While the chemicals could be harmful in high doses, when they are added to water, they all mix in and spread out, resulting in low levels that kill germs but are still safe to drink.

419.How can you estimate concentration of Magnesium with the help of concentration of Calcium and water hardness?

Answer:

Concentration of Magnesium = concentration water hardness - concentration of Calcium

420. If 30 ppm Alum is required to treat water calculate the mass of Alum required treating 2 Million. Gallons of raw water.

Data

1 Imperial Gallon = 4.55 Lit then 2000000 IG = 9100000 lit = 9.1 X106 lit Dosing concentration = 30 mg/lit

Solution

1 liter contain = 30 X10-6 Kg/lit then 9.1 X106 lit contain = (9.1 X106 lit)(30 X10-6 Kg/lit) = 273 Kg Answer

421. What is a Chemical Indicator?

422. Write name of any two indicators used for following tests?

a. Test of Chloride

b. Test of bicarbonate,

c. Test of hardness of water

d. Test of Calcium

Name of Test	Name of Indicator
Test of Chloride	Potassium Chromate
Test of bicarbonate	Methyl Orange
Test of hardness of water	Eriochrome black T
Test of Calcium	Murexide

Answer:

A chemical indicator is a substance that undergoes a distinct observable change when conditions in its solution change. This could be a color change, precipitate formation, bubble formation, temperature change, or other measurable quality.

Litmus, Thymol Blue, Phenolphthalein, Phenol Red and Methyl Orange are some example of indicator.

423.Is there any relation between Electrical Conductance and Total Dissolved Solid?

Answer:

Conductivity (EC) and total dissolved solids (TDS) are water quality parameters, which are used to describe salinity level. These two parameters are correlated and usually expressed by a simple

equation:

$$TDS = k\ EC$$

Value of k vary from 0.61 to 0.70 at different condition

424. Describe the difference between Total Suspended Solid (TSS) and Total Dissolved Solid (TDS).

Answer:

Total Dissolved Solids (TDS) are dissolve-able electrolytes. So it is the measure of the total amount of mobile charged ions in milligram, including minerals, salts or metals dissolved in one Liter of water.

Total suspended solids (TSS) are particles suspended in water but not dissolved which will not pass through a filter.

Suspended solids are present in sanitary wastewater and many types of industrial Wastewater. But it is also present in raw water.

425. Define the term turbidity and its unit.

Answer:

Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. The more total suspended solids in the water, the murkier it seems and the higher the turbidity.

Turbidity is considered as a good measure of the quality of water.

The WHO (World Health Organization), establishes that the turbidity of drinking water shouldn't be more than 5 NTU, and should ideally be below 1 NTU.

UNIT:

Turbidity is measured in NTU: Nephelometric Turbidity Units.

The instrument used for measuring it is called nephelometer or turbidimeter, which measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample.

426.Explain Several different theories explain what composes an acid and a base.

Answer:

Several different theories explain what composes an acid and a base.

Arrhenius Acids and Bases

An acid is a substance which dissociates in water to produce one or more hydrogen ions (H^+).
A base is a substance which dissociates in water to produce one or more hydroxide ions (OH^-).

Brønsted-Lowry Acids and Bases

An acid is a substance from which a proton (H^+ ion) can be removed. Essentially, an acid *donates* protons to bases.
A base is a substance to which a proton (H^+) can be added. Essentially, a base *accepts* protons from acids.

Lewis Acids and Bases

An acid is a substance that accepts a lone pair of electrons.
A base is a substance that donates a lone pair electrons.

427.What Personal Protective Equipment (PPE) is needed when working with chlorine?

Answer:

Personal Protective Equipment (PPE) is needed when working with chlorine

Eye/Face Protection:

Eye/Face Protection: Wear chemical safety goggles. A face shield (with safety goggles) may also be necessary.

Skin Protection:

Wear chemical protective clothing e.g. gloves, aprons, boots. Coveralls or long sleeve shirts and pants in some operations. Wear a chemical protective, full-body encapsulating suit and self-contained breathing apparatus (SCBA).

428.Define alum and general formula of alum?

Answer:

Alum is a compound made up of hyderated double sulphate salt.

General chemical formula for Alum is-

$$XAl(SO4)2{\cdot}12H2O$$

Where, X= Potassium, Sodium & Ammonium (Mono-valent) So we can say, basically we have **3 Types** of Alum based on the chemical salt.

1. Potassium Alum= $KAl(SO4)2{\cdot}12H2O$
2. Sodium Alum= $NaAl(SO4)2{\cdot}12H2O$
3. Ammonium Alum= $NH4Al(SO4)2{\cdot}12H2O$

Aluminum Sulfate or Alum is used as a Flocculants to Remove Unwanted Color and Turbidity from Water Supplies. It has been used since Ancient times for this Purpose and its use together with Filtration is Standard Practice in Conventional Water Treatment Processes around the World.

429.How much water do you need to prepare 2 ppm residual chlorine solution from 0.5 liter of 12.5 % NaOCl solution?

Answer (Solution):

100 liter solution contain = 12.5 kg

0.5 liter solution contain = (12.5/100) (0.5) = 0.0625 Kg

For preparation 2 ppm solution

0.000002 Kg Chlorine present in = 1 liter

1 Kg Chlorine present in = (1 liter/0.000002 Kg)

0.0625 Kg Chlorine present in = (1 liter/0.000002 Kg)(0.0625 Kg)

0.0625 Kg Chlorine present in = 31250 liter Answer

430.What data is necessary for Labeling of water sample bottle?

Answer:

Following data are necessary for Labeling of water sample bottle

1. Your reference
2. Site Code
3. Location
4. Time
5. Date
6. Sample description
7. Type of water (raw or waste water)
8. Shift of collection
9. Shift in which water will be analyze
10. Temperature of water at time of collection and Transport temperature
11. Number of samples (Composite or Grab)
12. Use of preservative
13. Name of sample collector
14. Sampling agency (or company name)
15. And all necessary information according to particular situation

431.Trimethylamine Is A Pyramidal Molecule. What Is The Hybridization At Nitrogen?

Answer :

The nitrogen is bonded to three CH3 groups and has a lone pair, so the hybridisation is sp3.

432.How Many Stereoisomers Of Phenylpropylene Oxide Are There?

Answer :

Two positional isomer A and B & two Stereoisomer of each so, total 4 isomers.

433.Which One Of The Following Is Not Aromatic? 1)cyclotetrane 2)benzene 3)napthalene 4)anthracene ?

Answer :

cyclotetrane, because of the double bonds are not conjugation

434.What Are The 4 Classes Of Unsaturated Fatty Acids?

Answer :

1.Monounsaturated fat: This is a type of fat found in a variety of foods and oils.
2.Polyunsaturated fat: This is a type of fat found in plant-based foods and oils.They can be divided into two groups known as omega-3 fats and omega-6 fats.
3.Omega-3 fatty acids: One type of polyunsaturated fat made up of mainly omega-3 fatty acids and may be beneficial to heart.
4.Omega-6 fats decrease risk of heart disease when they are consumed in place of saturated and trans fats.

435.What Is The Difference Between Coordinate Covalent Bond And Covalent Bond?

Answer :

IN coordinate covalent bond electrons which are shared by both the atoms are comtributed by only one atom . This is otherwise known as dative bond.
In covalent bond the electrons shared by both the atoms are contributed by both the atoms equally.

436.What Happens When Aminoacids React With Alcohols?

Answer :

when alcohols reats with aminoacids esters are formed.
The esters are volatile in contrast to free aminoacids.
R-CH-COOH + H2O-C2H5 -> R-CH-COO-C2H5 + H2O
NH2 NH2

437.What Are Ligases? which Type Of Reactions They Will Catalyse?

Answer :

Ligases are the group of enzymes that catalyse the transfer of a group from one kind of molecule to another. These are also called transferases.

438.NH2-CH2-cooh Belongs To What Structure?

Answer :

its the structure of amino acid glacine

439.Mention The Factors Affecting Solubility Of Compounds?

Answer :

temperature, pH, structure of compound i.e., whether the compd is straight chain or branched & molecular weight of compd.

440.What Are Geometrical Isomerism? Explain Them With An Example?

Answer :

Geometrical isomerism is an example of stereo-isomerism.

This occurs when substances have the same molecular formula, but a different arrangement of their atoms in space. There are three ways that this can happen:

where there is a C=C bond in the molecule;

where a molecule has rings; or

where there is a >C=N bond.

441.What Is Saponification Of Oils?

Answer :

When fats are hydrolysed with alkhali,the free fatty acids react with alkali to form metallic acids.these salts are soaps and this process is called saponification.

442.What Is Redox Potential Of An Organic Compound?

Answer :

The quantitative measure of the affinity of a compound to lose or gain electrons is the redox potential.

443.What Is Difference Between Anti-aromatic And Non-aromatic Compounds?

Answer :

Anti aromatic compounds follows 4npi electron rule and are cyclic compounds, planar, where as non aromatic are non planar or planar, cyclic or acyclic.

444.What Is The Range Of Uv & Vis Lamp In Spectrophotometer?

Answer :

•uv lamp range is 200 nm to 340 nm.

•vis lamp range is 320 nm to 1100 nm.

both of lamp range is mfg instument company voice of record is enculd the data range in lamp is 200 nm to 1200 nm.

445.If Benzene And Tolune Both Can Be Mixed... What Is The Boiling Point For The Mixture And Its Density?

Answer :

If benzene and toluene mixed the boiling point will be ~ 90oC. Density will not change.

446.Benzoic Acid Is A Weaker Than Para Nitro Benzoic Acid?

Answer :

in p-nitrobenzoic acid due to -I effect of nitro group hydrogen present in acia become more elecronegative and easily remove as proton and act like strong acid.

447.What Is The Difference Between Pvc And Upvc Plastic?

Answer :

PVC-POLYVINYL CHLORIDE AND uPVC IS THE Unplasticized polyvinyl chloride IT IS USED FOR building industry as a low-maintenance material.

448.What Mean By Organic Chemistry?

Answer :

Organic Chemistry is a branch of Science, which deals study about carbon compounds except Carbon monoxide, Carbon di oxide and corbonates.

449.Which Organic Compound Is Used As A Fuel In Jet Air Crafts? A. 100 Octane B. 90 Octane C. Kerosine Oil D. Diesel Oil

Answer :

Kerosine oil

450.What Is The Difference Between An Ion And A Radical?

Answer :

An ion is a specie that have no unpaired electron and is charged, either positively or negatively i.e. may be a cation or an anion. It is formed due to heterolysis of a molecule
e.g HCl----> H+ + Cl-
A radical is a neutral specie having atleast one unpaired electron and is formed due to homolysis of a molecule
e.g H-H -------> H* + H*
The * shows an unpaired electron. Similarly CH3* is a radical.

451.How To Synthsis Toluene To Benzaldehyde?

Answer :

from directly reaction of toluene to cromyl chloride (CrO2Cl2) at room temp. to form benzaldehyde.

452.How We Can Differentiate Between Oxalic Acid And Tartaric Acid?

Answer :

By Fluorescein test ... where tartaric acid " used in baking powder and found in many food products oxalic acid : harmful in contact with skin or eyes toxic .remove Ca ions From blood and also block Kidneys Fluoresce in test depended on Light passes & usually in UV light.

453.How to synthsis toluene to benzaldehyde?

Answer:

from directly reaction of toluene to cromyl chloride (CrO2Cl2)
at room temp. to form benzaldehyde.

454.Name the geometry of the central oxygen atom in the ozone molecule (O3).

a) Trigonal planar
b) Linear
c) Tetrahedral
d) Pyramidal

Answer: a

Explanation:

It forms a single bond with one oxygen atom, double bond with another oxygen atom and there exists one more non-bonded atom. Thus, it forms a trigonal planar structure.

455.In which molecule there is a complete linear arrangement of all atoms?

a) BF_3
b) NH_3
c) CO_2
d) CH_4

Answer: c

Explanation:

BF_3 has trigonal planar structure, NH_3 has a trigonal bipyramidal structure, CH_4 has tetragonal structure and hence CO_2 is the one with linear structure.

456.Choose the incorrect option.

a) BrO_4 – tetrahedral
b) PF_3 – pyramidal
c) ClO_4 – tetrahedral
d) $BeBr_2$ – linear

Answer: b

Explanation:

PF_3 has a trigonal pyramidal structure as it has three bonding pairs and one non-bonding pair.

457.Which among the following is not a physical property?

a) Melting point
b) Boiling point
c) Solubility
d) Reactivity

Answer: d

Explanation:

Reactivity is a chemical property and it is not a physical property.

458.A crystalline solid possess which one of the following property?

a) Irregularity
b) Non- symmetric
c) Perfect geometric pattern
d) non- stability

Answer: c

Explanation:

A crystalline solid is one which possesses perfect geometry, high stability, symmetric and regularly arranged.

459.Melting is process which can be stated by the below statements except?

a) Change from a highly disordered stated to an ordered state
b) Change from particles in crystal lattice to liquid state
c) Thermal energy of particles overcome the intercrystalline forces that hold them
d) Change from low temperature to high temperature

Answer: a

Explanation:

Melting is a process which proceeds by changing from a highly ordered state to a disordered state.

460.Which among the following is not associated with intermolecular forces?

a) They hold neutral molecules
b) Non- electrostatic in nature
c) attraction of oppositely charged particles
d) dipole-dipole interaction and van der Waals forces

Answer: b

Explanation:

Intermolecular forces are electrostatic in nature.

461.Which among the following statement is not true?

a) In liquid, particles are less regularly arranged and are free to move
b) Boiling involves breaking up of group of molecules in liquid
c) Boiling involves clubbing of oppositely charged ions
d) Thermal energy of particles overcome cohesive forces that hold them

Answer: c

Explanation:

Boiling involves separation of oppositely charged ions and makes them as individual ions.

462.When one of the Hydrogen in Methane(CH_4) is replaced by a hydroxyl group, then structurally methane resembles?

a) Methanol
b) Ethanol
c) Water
d) Both methanol and water

Answer: d

Explanation:

Like water, it is a liquid with boiling point which is abnormally high for a compound of its size and polarity.

463.Which among the following does not match with the term solubility?

a) The structural units get separated from each other
b) The ion-dipole bond is very strong
c) The spaces in between the structures are occupied by solvent molecules
d) The electrostatic attraction between the oppositely charged ions and their corresponding ends are called ion-dipole bond

Answer: b

Explanation:

The bond is weak but in the aggregate they supply enough energy to overcome the interionic forces.

464.Identify the one which does not come under the chemical methods of quantitative analysis?

a) Gravimetric
b) Titrimetric
c) Volumetric
d) Magnetic suceptibility

Answer: d

Explanation:

Magnetic suceptibility comes under physical methods of qunatitative analysis and hence the answer.

466.Quantitative analysis is one which is used for separating out the specific constituents from a mixture.

a) True

b) False

Answer: b

Explanation: Quantitative analysis is used to measure the quantity, (i.e the amount) present and the above mentioned statement defines qualitative analysis.

467.Select the incorrect statement regarding analytical balance.

a) It is the fundamental kit in quantitative analysis

b) It measures samples very accurately

c) It could measure the difference in mass upto 0.1 mg

d) It is not a sensitive instrument

Answer: d

Explanation:

It is a very sensitive instrument as it could accurately measure the weight of a particular compound of upto 0.1 mg.

468.Which among the following is not a physical method?

a) X-ray fluorescence spectroscopy
b) Atomic emission spectroscopy
c) Inert gas fusion
d) Trace element analysis

Answer: c

Explanation:

Inert gas fusion is an example of chemical methods of quantitative analysis, as it involves chemical reaction such as oxidation.

469.Select the inappropriate statement regarding quantitative analysis.

a) It helps in determining the outcome of the product
b) It helps in determining the impurities in the sample
c) It fails to indicate the presence of lead in some compound
d) It could identify the amounts of dosage present in the drug

Answer: c

Explanation:

It can identify the presence of lead and could also account for its concentration in case of paints and toys.

470.Identify the test which is not a part of qualitative analysis?

a) Litmus test
b) Kastle-Meyer test
c) Iodine test
d) Flame test

Answer: a

Explanation:

Kastle-meyer test is done for identification of blood, Iodine test is done for identification of starch and Flame test is done to identify Barium.

471.Covalent molecules can be identified using quantitative methods.

a) False
b) True

Answer: a

Explanation:

The qualitative analysis is used to identify covalent molecules by distinguishing them using physical properties such as melting point, etc.470.

472.Identify the reagent which is not commonly used in qualitative analysis?

a) 6M NaOH
b) 6M HCl
c) 6M HNO3
d) 6M NH4

Answer: d

Explanation:

6M NH3 is the reagent commonly used in qualitative analysis because it is used in almost every group procedures.

473.Select the correct statement about the reagent 6M HNO3.

a) It forms hydroxo complexes
b) It destroys hydroxo and ammonia complexes
c) It forms NH3 complexes
d) It decreases the H+ ion concentration

Answer: b

Explanation:

It is a good oxidizing agent, dissolves in insoluble hydroxides and it destroys hydroxo and ammonia complexes.

474.Why we are carrying standardization of karl fisher auto titrator with water and disodium tartarate?

The standardisation of karlfischer reagent is very important before starting the experiment because the reagent is always in contact with air and absorbs the moisture and results in the dilution of the reagent. So it will be better to standardise the reagent either with water or di sodium tartarate

475.Number Of Sigma Bonds Present In Benzene Are Same As ..?

Answer :

Number of Sigma bonds present in Benzene are same as Borazine (inorganic Benzene).
no. of sigma bonds in Benzene= 12 (C_6H_6)
no. of sigma bonds in Borazine= 12 ($B_3N_3H_6$)

476.The Name Benzene Was Proposed By?

Answer :

Kekule

477.What Is The Difference Between Sulphated Ash And Roi?

Answer :

There no difference between procedure, both are same.
we generally term it as sulphated ash test/roi.in indian pharmacoepia, called it as roi and in usp, called it as sulphated ash tesh.
both are used for the determination of content of inorganic matter in an organic substance.

478.How To Make A 100ml Solution With Given 10gm Of Naoh?

Answer :

Take 100ml water and pore 10gr NaOH pellets sterr with gently boil. NaOH sol ready.

479.Examine Samples Of Ldpe (sandwich Bag, Squeeze Bottle) And Hdpe (milk Jug, Grocery Bag). What Are Some Of The Differences In The Physical Properties Of These Substances?

Answer :

LDPE – more transparent, flexible, waxy.
HDPE – more opaque, rigid, non-waxy.

480.What Are Some Of The Polymers That You Encounter Every Day? Describe Their Physical Properties.

Answer :

Sandwich bags, carpets, nylon stockings, stackable chains, milk cartons, etc.

481.Why Do Different Polymers Have Different Properties?

Answer :

They have different chemical compositions (different monomer units), different structures, different ways of being fabricated, etc.

482.What Kinds Of Structural Changes Accompany Bond-breaking And Bond-forming In Olefin Polymerization?

Answer :

The olefin monomers are flat (two-dimensional) molecules with sp2-hybridized carbon atoms.
The polymers are three-dimensional molecules in which the carbon atoms are sp3 hybridized.

483.How Does The Molecular-level Structure Of These Polymers Influence Their Physical Properties?

Answer :

The structure (e.g., extent of branching) determines how the individual polymer molecules can orient (or "pack") in the solid state. This, in turn, influences physical properties such as density, crystallinity, melting point, and strength.

484.Besides The Extent Of Branching, Can You Think Of Any Other Structural Parameters That Might Lead To Differences In Physical Properties?

Answer :

The average value of n (the number of monomer units in the polymer) and the range in individual values of n.

485.Does Ethylene Polymerize Under Mild Conditions In The Absence Of A Catalyst?

Answer :

No, in the absence of a catalyst, ethylene molecules would need to collide at very high energy in order to react with each other.

486.What Is The Role Of A Catalyst?

Answer :

A catalyst reduces the energy of activation for a reaction by providing an alternative pathway. In this way, it speeds up the reaction and allows it to proceed under milder conditions.

487.Why Are Metals Often Good Catalysts?

Answer :

They provide a site where organic molecules can come together and react.

488.What Is The Nature Of The Bonding Interaction Between A Metal And An Olefin?

Answer :

The olefin uses the electrons in its p-bond to interact with the metal.

489.Consider The Polymerization Of Vinylidene Chloride, Ch2=ccl2. What Structural Variations Are Possible In Poly(vinylidene Chloride)?

Answer :

Orientation of the monomer units along the chain.

490.Consider The Polymerization Of 1,2-dichloroethylene, H(cl)c=c(cl)h. What Structural Variations Are Possible In Poly(1,2-dichloroethylene)?

Answer :

Tacticity.

491.Can Inform Me About Your Educational Background And Credentials, Such As What Undergraduate Degree You Graduated With, Master's Degree, Professional Degrees, Etc.?

Answer :

Master's degree in chemistry (specifically in polymer) at University of Detroit.
Undergrad degree in organic chemistry in China.

492.When something is wrong with the raw materials:

If sample is not good, call the raw material manufacturing company, and send back the materials.

493.When something is wrong with the final products:

- If sample is not good, keep hold of product and find out the problem by contacting the different departments.
- Solving the problem is hard; meeting with different departments to solve the problem.
- Tracing back to the processing stages of product.

494.Could You Give Me An Example Of The Methods You Use In Quality Control?

Answer :

For detergent: check the colour, smell the odour.
Check the pH is in the range using pH meter: specific ranges for specific products.
Specific gravity is in the range.
Check the viscosity with viscometer.
Wet chemical method/titration used to check percentage of efficient chemical and concentrations.
Micro confirmation test: Make sure no bacteria in the product.

495.What Is Deference Between The Working Standard And Reference Standard?

Answer :

Reference std is like USP,EP std , in this std we get COA including results of Potency by HPLC , NMR & XRPD data. whenever there is requirement of w.std preparation first we have get API rawmaterial from warehouse & we check assay , water content or LOD & Related substances aganist reference std . Some times we are doing analysis in duplicate & get mean value.then we decide final assay or potency value & it's validity one year.

496.In The Gas Chromatography What Is Used Carrier Gas And Make Up Gas?

Answer :

In the gas chromatography, nitrogen gas is used carrier gas and make up gas.

497.What Is Difference Between Silica Used In Tlc And Hplc Column?

Answer :

Tlc is called thin layer chromatography. The simple technique works on the principle of adsorption, where as HPLC is a sophisticated technique works on partition principle.

498.What Is Heavy Water?

Answer :

Isotopes of H2O, D2O.

499.Question 11. How To Know Hplc Column Performance?

Answer :

Check for the number of plates that it maintains stady all over the run ,
check the SST at avery run that cpmplies the acceptance criterias of the method.

500. In Ph Calibration,calibration Is Done For Ph Meter Or Electrode?how Will You Judge That The Meter To Be Calibrated With 4,7,9.2 Buffers?explain Temperature Effects On Ph?

Answer :

calibration is also one of the system suitability test,whether the system working satisfactory or not physically so when you do the calibration for pH meter with standard pH buffer solution (which is from NIST-it may accurate solution for actual pH)and once if your instrument has calibrated,you can cross verify your insrument against those pH buffer solution (NIST) and the acceptable range is +/- 0.02 then you can conclude for. once if temperature raises the pH will decrease and its not all cases.

Thank You

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