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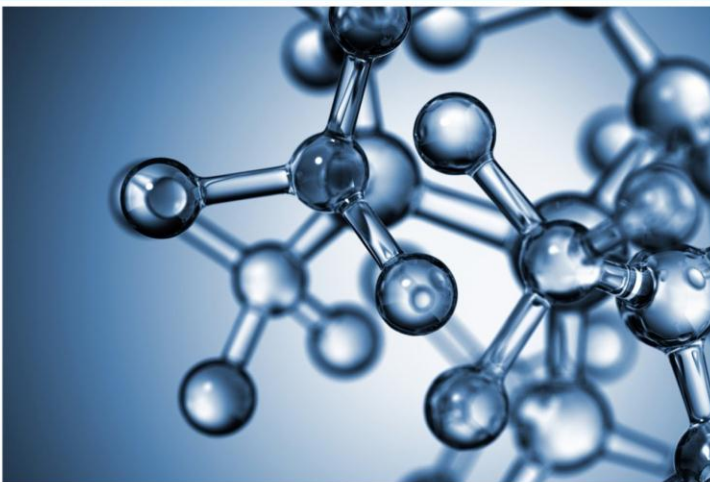
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CHEMICAL ENGINEERING MCQS

In the reaction, represented by, $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$; $\Delta H = -42 \text{ kcal}$; the forward reaction will be favoured by-----?

- A. Low temperature
- B. High pressure
- C. Both A. and B (Answer)
- D. Neither A. nor B

Chemical potential is a/an-----?

- A. Extensive property
- B. Intensive property
- C. Force which drives the chemical system to equilibrium
- D. Both B. and C (Answer)

Tea kept in a thermos flask is vigorously shaken. If the tea is considered as a system, then its temperature will-----?

- A. Increase (Answer)
- B. Decrease
- C. Remain unchanged
- D. First fall and then rise

The temperature at which both liquid and gas phases are identical, is called the ----- point?

- A. Critical (Answer)
- B. Triple
- C. Freezing
- D. Boiling

If an ideal solution is formed by mixing two pure liquids in any proportion, then the ----- of mixing is zero?

- A. Enthalpy
- B. Volume
- C. Both A. & B. (Answer)
- D. Neither A nor B

Entropy is a/an-----?

- A. State function
- B. Macroscopic property
- C. Extensive property
- D. (Answer)

Isentropic process means a constant ----- process ?

- A. Enthalpy
- B. Pressure
- C. Entropy (Answer)
- D. None Of Above

For an ideal solution, the value of activity co-efficient is-----?

- A. 0
- B. 1 (Answer)
- C. 1 (Answer)
- D. None of Above

Heat pump-----?

- A. Accomplishes only space heating in winter
- B. Accomplishes only space cooling in summer
- C. Accomplishes both A. and B (Answer)
- D. Works on Carnot cycle

The equation $Tds = dE - PdV$ applies to-----?

- A. Single phase fluid of varying composition
- B. Single phase fluid of constant composition
- C. Open as well as closed systems
- D. Both B. and C (Answer)

Throttling (Joule-Thomson effect) process is a constant ----- process?

- A. Enthalpy (Answer)
- B. Entropy
- C. Pressure
- D. None Of Above

What is the value of maximum COP in case of absorption refrigeration, if refrigeration provided is at temperature, T_R (where, T_1 and T_2 are source & surrounding temperatures respectively.) ?

- A. $T_R / (T_2 - T_R) \times (T_1 - T_2) / T_1$ (Answer)
- B. $T_R / (T_2 - T_R) \times T_1 / (T_1 - T_2)$
- C. $T_R / (T_1 - T_R) \times (T_1 - T_2) / T_1$
- D. None Of Above

Number of degrees of freedom for a three phase system in equilibrium comprising of three non-reacting chemical species is-----?

- A. 2 (Answer)
- B. 0
- C. 1
- D. 3

Entropy change of mixing two liquid substances depends upon the-----?

- A. Molar concentration
- B. Quantity (i.e. number of moles)
- C. Both A. and B (Answer)
- D. Neither A. nor B

Free energy change at equilibrium is-----?

- A. Zero (Answer)
- B. Positive
- C. Negative
- D. Indeterminate

Extensive properties of a thermodynamic system depend upon the ----- of the system?

- A. Specific volume
- B. Temperature
- C. Mass (Answer)
- D. Pressure

The chemical potential for a pure substance is ----- its partial molal free energy?

- A. More than

- B. Less than
- C. Equal to (Answer)
- D. Not related to

A closed system is cooled reversibly from 100°C to 50°C. If no work is done on the system-----?

- A. its internal energy (U) decreases and its entropy (S) increases
- B. U and S both decreases (Answer)
- C. U decreases but S is constant
- D. U is constant but S decreases

Enthalpy 'H' is defined as-----?

- A. $H = E - PV$
- B. $H = F - TS$
- C. $H - E = PV$ (Answer)
- D. None Of Above

The Joule-Thomson co-efficient is defined as $(\partial T / \partial P)_H$. Its value at the inversion point is-----?

- A. ?
- B. 1
- C. 0 (Answer)
- D. -ve

When a gas in a vessel expands, its internal energy decreases. The process involved is-----?

- A. Reversible (Answer)
- B. Irreversible
- C. Isothermal
- D. Adiabatic

For a single component two phase mixture, the number of independent variable properties are-----?

- A. Two
- B. One (Answer)
- C. Zero
- D. Three

Change of heat content when one mole of compound is burnt in oxygen at constant pressure is called the-----
-----?

- A. Calorific value
- B. Heat of reaction
- C. Heat of combustion (Answer)
- D. Heat of formation

What is the value of $\ln \gamma$ (where γ = activity co-efficient) for ideal gases ?

- A. Zero (Answer)
- B. Unity
- C. Infinity
- D. Negative

What is the number of degree of freedom for a system of two miscible non-reacting species in vapor-liquid equilibrium forming an azeotrope ?

- A. 0
- B. 2
- C. 1 (Answer)
- D. 3

In the ammonia synthesis reaction, $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3 + 22.4 \text{ kcal}$, the formation of NH_3 will be favoured by-----
-----?

- A. High temperature
- B. Low pressure
- C. Low temperature only
- D. Both low temperature and high pressure (Answer)

Grams of butane (C_4H_{10}) formed by the liquefaction of 448 litres of the gas (measured at (STP) would be-----
-----?

- A. 580
- B. 640
- C. 1160 (Answer)
- D. Data insufficient; can't be computed

Joule-Thomson co-efficient for a perfect gas is-----?

- A. Zero (Answer)
- B. Positive
- C. Negative

D. None Of Above

Equation which relates pressure, volume and temperature of a gas is called the-----?

- A. Equation of state (Answer)
- B. Gibbs Duhem equation
- C. Ideal gas equation
- D. None Of Above

At triple point (for one component system), vapour pressure of solid as compared to that of liquid will be-----
---?

- A. More
- B. Less
- C. Same (Answer)
- D. More or less; depending on the system

Mollier diagram is a plot of-----?

- A. Temperature vs. enthalpy
- B. Temperature vs. enthalpy
- C. Entropy vs. enthalpy (Answer)
- D. Temperature vs. internal energy

The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called the -----
temperature?

- A. Critical
- B. Boyle (Answer)
- C. Inversion
- D. Reduced

Compressibility factor (i.e., the ratio of actual volume of gas to the volume predicted by ideal gas law) for all
gases are-----?

- A. Always greater than one
- B. Same at the same reduced temperature
- C. Same at the same reduced pressure
- D. Both B. & C (Answer)

In a turbine, the fluid expands almost-----?

- A. Isothermally
- B. Isobarically
- C. Adiabatically (Answer)
- D. None Of Above

The number of degrees of freedom at the triple point of water is-----?

- A. 0 (Answer)
- B. 1
- C. 2
- D. 3

Which of the following is not correct for a reversible adiabatic process ?

- A. $TV^{\gamma-1} = \text{constant}$
- B. $p_1^{-\gamma} T_1^{\gamma} = \text{constant}$
- C. $PV^{\gamma} = \text{constant}$
- D. (Answer)

A butane isomerisation process produces 70 kmole/hr of pure iso-butane. A purge stream removed continuously, contains 85% n-butane and 15% impurity (mole%). The feed stream is n-butane containing 1% impurity (mole%). The flow rate of the purge stream will be-----?

- A. 3 kmole/hr
- B. 4 kmole/hr
- C. 5 kmole/hr (Answer)
- D. 6 kmole/hr

The molecules of a liquid which is in equilibrium with its vapor at its boiling point on an average have equal ---- in the two phases?

- A. Potential energy
- B. Intermolecular forces
- C. Kinetic energy (Answer)
- D. Total energy

$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystals are formed by cooling 100 Kg of 30% by weight aqueous solution of Na_2SO_4 . The final concentration of the solute in the solution is 10%. The weight of crystals is-----?

- A. 20

- B. 32.2
- C. 45.35
- D. 58.65 (Answer)

At a temperature of 0°K , the molecules of a gas have only ----- energy?

- A. Rotational
- B. Vibrational
- C. Translational (Answer)
- D. None Of Above

On mixing 56 gm of CaO with 63 gm of HNO_3 , the amount of $\text{Ca}(\text{NO}_3)_2$ formed is ----- gm?

- A. 82 (Answer)
- B. 164
- C. 41
- D. 8.2

Atmospheric pressure corresponds to a hydrostatic head of-----?

- A. 13.6 cms of Hg
- B. 34 ft of H_2O (Answer)
- C. 1 metre of H_2O
- D. 13.6 metres of Hg

The density of a gas 'X' is twice that of another gas 'Y'. If the molecular weight of gas 'Y' is 'M'; then the molecular weight of the gas 'X' will be-----?

- A. 2M (Answer)
- B. $M/2$
- C. M
- D. $M/4$

Air at a temperature of 20°C and 750 mm Hg pressure has a relative humidity of 80%. What is its percentage humidity? Vapour pressure of water at 20°C is 17.5 mm Hg?

- A. 80.38
- B. 80
- C. 79.62 (Answer)
- D. 78.51

Clausius Clapeyron equation applies to the ----- process?

- A. Sublimation
- B. Melting
- C. Vaporisation
- D. All A., B. & C. (Answer)

80 kg of Na_2SO_4 (molecular weight = 142) is present in 330 kg of an aqueous solution. The solution is cooled such that 80 kg of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystals separate out. The weight fraction of Na_2SO_4 in the remaining solution is-----?

- A. 0.00
- B. 0.18 (Answer)
- C. 0.24
- D. 1.00

The viscosity of water at room temperature may be around one -----?

- A. Centipoise (Answer)
- B. Poise
- C. Stoke
- D. Both B. & C.

----- chart is a graph related to Antoine equation ?

- A. Ostwald
- B. Cox (Answer)
- C. Mollier's
- D. Enthalpy-concentration

The molar composition of a gas is 10% H_2 , 10% O_2 , 30% CO_2 and balance H_2O . If 50% H_2O condenses, the final mole percent of H_2 in the gas on a dry basis will be-----?

- A. 10%
- B. 5%
- C. 18.18%
- D. 20% (Answer)

The atomic weight of helium is 4 times that of hydrogen. Its diffusion rate as compared to hydrogen will be ---- times?

- A. 1/2

- B. 4
- C. $\frac{1}{2}$ (Answer)
- D. $\frac{1}{4}$

If a solution of eutectic composition is cooled, ----- reaching the eutectic temperature ?

- A. The solvent begins to freeze out even before
- B. It will undergo no change until (Answer)
- C. It will not solidify even on
- D. None Of Above

Assuming applicability of ideal gas law, the pure component volume of the vapor in a saturated gas can be calculated from theoretical relationship. The volumetric composition of a vapor saturated gas is independent of the-----?

- A. Nature of the liquid
- B. Nature of the gas (Answer)
- C. Temperature of the liquid
- D. Total pressure

Enthalpy change resulting, when unit mass of solid is wetted with sufficient liquid, so that further addition of liquid produces no additional thermal effect, is called the heat of-----?

- A. Mixing
- B. Adsorption
- C. Wetting
- D. Complete wetting (Answer)

The heat of solution depends upon the-----?

- A. Nature of solvent
- B. Concentration of solution
- C. Nature of solute
- D. All A., B. & C. (Answer)

PH value of a solution containing equal concentration of hydroxyl and hydrogen ions will be-----?

- A. 0
- B. 10
- C. 7 (Answer)
- D. 14

In a chemical process, the recycle stream is purged for-----?

- A. Increasing the product yield
- B. Enriching the product
- C. Limiting the inerts (Answer)
- D. Heat conservation

Which of the following gases will have the- highest kinetic energy per mole at the same pressure & temperature ?

- A. Chlorine
- B. Nitrogen
- C. Ethane
- D. All the gases will have the same KE (Answer)

If 1 Nm³ of O₂ contains 'N' number of molecules, then number of molecules in 2Nm³ of SO₂ will be-----?

- A. N
- B. N/2
- C. 2N (Answer)
- D. 4N

The heat capacity of a substance is -----?

- A. Greater for liquid state than for solid state (Answer)
- B. Lower for liquid state than for gaseous state
- C. Higher for solid state than for liquid state
- D. Equal for solid

The total number of atoms in 8.5 gm of NH₃ is ----- × 10²³?

- A. 9.03 (Answer)
- B. 3.01
- C. 1.204
- D. 6.02

As per Kirchhoff s equation, the heat of reaction is affected by the-----?

- A. Pressure
- B. Volume
- C. Temperature (Answer)

D. Molecularity

A perfectly insulated container of volume V is divided into two equal halves by a partition. One side is under vacuum, while the other side has one mole of an ideal gas (with constant heat capacity) at 298 K. If the partition is broken, the final temperature of the gas in the container-----?

- A. Will be greater than 298 K
- B. Will be 298 K
- C. Will be less than 298 K (Answer)
- D. Cannot be determined

"The equilibrium value of the mole fraction of the gas dissolved in a liquid is directly proportional to the partial pressure of that gas above the liquid surface". This statement pertaining to the solubility of gases in liquid is the ----- law?

- A. Raoult's
- B. Henry's (Answer)
- C. Amagat's
- D. None Of Above

----- equation gives the effect of temperature on heat of reaction ?

- A. Kirchoff's (Answer)
- B. Maxwell's
- C. Antoine
- D. Kistakowsky

Addition of a non-volatile solute to a pure solvent -----?

- A. Increases its freezing point
- B. Increases its boiling point
- C. Decreases its freezing point
- D. Both B. and C. (Answer)

If the partial pressure of the solvent in the vapor phase is equal to the vapor pressure of the solvent at that temperature, then the system is said to be at its-----?

- A. Bubble point
- B. Saturation temperature
- C. Dew point
- D. Both B. and C. (Answer)

Saturated solution of benzene in water is in equilibrium with a mixture of air and vapours of benzene and water at room temperature and pressure. Mole fraction of benzene in liquid is x_B and the vapour pressures of benzene and water at these conditions are p_v^B and p_v^w respectively. The partial pressure of benzene in air-vapour mixture is-----?

- A. p_v^B
- B. $x_B \cdot p_v^B$ (Answer)
- C. $(p_{atm} - p_v^w) x_B$
- D. $x_B \cdot p_{atm}$

1 torr is equal to ----- mm Hg column?

- A. 1 (Answer)
- B. 0.1
- C. 10
- D. 1000

The quantity of heat required to evaporate 1 kg of a saturated liquid is called -----?

- A. Specific heat
- B. 1 Kcal
- C. Sensible heat
- D. Latent heat (Answer)

Unrestrained expansion of an ideal gas does not result in its cooling due to the reason that the gas molecules - -----?

- A. Do not lose energy on collision
- B. Are above the inversion temperature
- C. Do not exert attractive force on each other (Answer)
- D. Do work equal to loss in kinetic energy

Which of the following is not a colligative property ?

- A. Osmotic pressure
- B. Depression of freezing point
- C. Lowering of vapor pressure
- D. (Answer)

Total energy at a point comprises of ----- energy?

- A. Potential & kinetic
- B. Pressure
- C. Internal
- D. All A., B. & C. (Answer)

The temperature of a gas in a closed container is 27°C . If the temperature of the gas is increased to 300°C , then the pressure exerted is-----?

- A. Doubled
- B. Halved
- C. Trebled
- D. Unpredictable (Answer)

A gas mixture contains 6 moles of H_2 and 2 moles of N_2 . If the total pressure of the gaseous mixture is 4 kgf/cm²; then the partial pressure of N_2 in the mixture will be ----- kgf/cm² ?

- A. 1 (Answer)
- B. 2
- C. 4
- D. 8

Hess's law of constant heat summation is based on conservation of mass. It deals with -----?

- A. Equilibrium constant
- B. Reaction rate
- C. Changes in heat of reaction (Answer)
- D. None Of Above

In a neutral solution -----?

- A. H^+ ions are absent
- B. OH^- ions are absent
- C. Both H^+ and OH^- ions are present in very small but equal concentration (Answer)
- D. None Of Above

Number of gm moles of solute dissolved in one liter of a solution is called its-----?

- A. Equivalent weight
- B. Molarity (Answer)
- C. Molality

D. Normality

A gaseous mixture contains 14 kg of N_2 , 16 kg of O_2 and 17 kg of NH_3 . The mole fraction of oxygen is-----
?

- A. 0.16
- B. 0.33 (Answer)
- C. 0.66
- D. 0.47

Vapor pressure of a solution is proportional to (where, S_v and S_t are mole fraction of solvent and solute respectively) ?

- A. S_v (Answer)
- B. $1/S_t$
- C. S_t
- D. $1/S_v$

The value of gas constant 'R' is ----- kcal/kg.mole. $^{\circ}C$?

- A. 2.79
- B. 1.987
- C. 3.99
- D. (Answer)

In a binary liquid system, the composition expressed as ----- is independent of the temperature & pressure?

- A. Kg of solute/kg of solvent
- B. Kg-mole of solute/kg-mole of solvent
- C. Kg-mole of solute/1000 kg of solvent
- D. All A., B. & C. (Answer)

Unit of mass velocity is-----?

- A. kg/m.hr
- B. kg/m².hr (Answer)
- C. kg/hr
- D. kg/m²

The internal energy of an ideal gas is a function of its ----- only?

- A. Molecular size
- B. Volume
- C. Pressure
- D. Temperature (Answer)

“The fugacity of a gas in a mixture is equal to the product of its mole fraction and its fugacity in the pure state at the total pressure of the mixture”. This is-----?

- A. The statement as per Gibbs-Helmholtz
- B. Called Lewis-Randall rule (Answer)
- C. Henry's law
- D. None Of Above

If two gases have same reduced temperature and reduced pressure, then they will have the same-----?

- A. Volume
- B. Mass
- C. Critical temperature
- D. (Answer)

Third law of thermodynamics is concerned with the-----?

- A. Value of absolute entropy (Answer)
- B. Energy transfer
- C. Direction of energy transfer
- D. None Of Above

Fugacity and pressure are numerically equal, when the gas is-----?

- A. In standard state
- B. At high pressure
- C. At low temperature
- D. In ideal state (Answer)

Activity co-efficient is a measure of the-----?

- A. Departure from ideal solution behaviour (Answer)
- B. Departure of gas phase from ideal gas law
- C. Vapour pressure of liquid
- D. None Of Above

If two pure liquid constituents are mixed in any proportion to give an ideal solution, there is no change in-----
----?

- A. Volume
- B. Enthalpy
- C. Both A. & B (Answer)
- D. Neither A. nor B

$C_p - C_v = R$ is valid for ----- gases?

- A. Ideal (Answer)
- B. Very high pressure
- C. Very low temperature
- D. All of the above

Which of the following is Clausius-Clapeyron Equation for vaporisation of an ideal gas under the condition that the molar volume of liquid is negligible compared to that of the vapor ?

- A. $d \ln p/dt = H_{vap}/RT^2$ (Answer)
- B. $d \ln p/dt = RT^2/H_{vap}$
- C. $dp/dt = RT^2/H_{vap}$
- D. $dp/dt = H_{vap}/RT^2$

Pressure-enthalpy chart is useful in refrigeration. The change in internal energy of an ideal fluid used in ideal refrigeration cycle is-----?

- A. Positive
- B. Negative
- C. Zero (Answer)
- D. Infinity

Which of the following non-flow reversible compression processes require maximum work ?

- A. Adiabatic process (Answer)
- B. Isothermal process
- C. Isobaric process
- D. All require same work

In an ideal solution, the activity of a component equals its -----?

- A. Mole fraction (Answer)
- B. Fugacity at the same temperature and pressure
- C. Partial pressure
- D. None Of Above

What is the degree of freedom for a system comprising liquid water equilibrium with its vapour ?

- A. 0
- B. 1 (Answer)
- C. 2
- D. 3

During adiabatic expansion of gas-----?

- A. Pressure remains constant
- B. Pressure is increased
- C. Temperature remains constant
- D. (Answer)

Enthalpy changes over a constant pressure path are always zero for ----- gas?

- A. Any
- B. A perfect (Answer)
- C. An easily liquefiable
- D. A real

The most important application of distribution law is in-----?

- A. Evaporation
- B. Liquid extraction (Answer)
- C. Drying
- D. Distillation

The standard Gibbs free energy change of a reaction depends on the equilibrium-----?

- A. Pressure
- B. Temperature (Answer)
- C. Composition
- D. All A, B. and C

The molar excess Gibbs free energy, g_E , for a binary liquid mixture at T and P is given by, $(g_E/RT) = A \cdot x_1 \cdot x_2$, where A is a constant. The corresponding equation for $\ln \gamma_1$, where γ_1 is the activity co-efficient of component 1, is-----?

- A. $A \cdot x_2^2$ (Answer)
- B. Ax_1
- C. Ax_2
- D. Ax_1^2

For an isothermal process, the internal energy of a gas-----?

- A. Increases
- B. Decreases
- C. Remains unchanged (Answer)
- D. Data insufficient, can't be predicted

Ideal gas law is applicable at-----?

- A. Low T , low P
- B. High T , high P
- C. Low T , high P
- D. High T , low P (Answer)

Work done in case of free expansion is-----?

- A. Indeterminate
- B. Zero (Answer)
- C. Negative
- D. None Of Above

When a gas is subjected to adiabatic expansion, it gets cooled due to-----?

- A. Decrease in velocity
- B. Decrease in temperature
- C. Decrease in kinetic energy
- D. Energy spent in doing work (Answer)

A solid is transformed into vapour without going to the liquid phase at-----?

- A. Triple point (Answer)
- B. Boiling point
- C. Below triple point
- D. Always

A Carnot cycle consists of the following steps ?

- A. Two isothermal and two isentropic (Answer)
- B. Two isobaric and two isothermal
- C. Two isochoric and two isobaric
- D. Two isothermals and two isochoric

“The rate at which a substance reacts is proportional to its active mass and the rate of a chemical reaction is proportional to the product of active masses of the reacting substances”. This is the-----?

- A. Lewis-Randall rule
- B. Statement of Van't Hoff Equation
- C. Le-Chatelier's principle
- D. (Answer)

Claude's liquefaction process employs the cooling of gases by-----?

- A. Expansion in an engine (Answer)
- B. Following a constant pressure cycle
- C. Throttling
- D. None Of Above

The shape of T-S diagram for Carnot Cycle is a-----?

- A. Rectangle (Answer)
- B. Rhombus
- C. Trapezoid
- D. Circle

Trouton's ratio of ----- liquids is calculated using Kistyakowsky equation?

- A. Polar
- B. Non-polar (Answer)
- C. Both A. & B
- D. Neither A. nor B

One mole of nitrogen at 8 bar and 600 K is contained in a piston-cylinder arrangement. It is brought to 1 bar isothermally against a resisting pressure of 1 bar. The work done (in Joules) by the gas is-----?

- A. 30554

- B. 10373 (Answer)
- C. 4988.4
- D. 4364.9

Chemical potential (an intensive property) of a substance is a force that drives the chemical system to equilibrium and is equal to its partial molar properties. The ratio of chemical potential to free energy of a pure substance at constant temperature and pressure is-----?

- A. 0
- B. 1 (Answer)
- C. ?
- D. None Of Above

A cyclic engine exchanges heat with two reservoirs maintained at 100 and 300°C respectively. The maximum work (in J) that can be obtained from 1000 J of heat extracted from the hot reservoir is-----?

- A. 349 (Answer)
- B. 651
- C. 667
- D. 1000

A gas mixture of three components is brought in contact with a dispersion of an organic phase in water. The degree of freedom of the system is-----?

- A. 3 (Answer)
- B. 4
- C. 5
- D. 6

In Joule-Thomson porous plug experiment, the-----?

- A. Enthalpy does not remain constant
- B. Entire apparatus is exposed to surroundings
- C. Temperature remains constant
- D. (Answer)

There is a change in ----- during the phase transition?

- A. Volume (Answer)
- B. Pressure
- C. Temperature

D. All a, b & c

C_v is given by-----?

A. $(\partial E / \partial T)_V$ (Answer)

B. $(\partial E / \partial V)_T$

C. $(\partial E / \partial P)_V$

D. $(\partial V / \partial T)_P$

The equation relating E , P , V and T which is true for all substances under all conditions is given by $(\partial E / \partial V)_T = T(\partial P / \partial T)_H - P$. This equation is called the -----?

A. Maxwell's equation

B. Thermodynamic equation of state (Answer)

C. Equation of state

D. Redlich-Kwong equation of state

A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown below in the P-V diagram. The net work done during the complete cycle is given by the area covered by-----?

A. $P_1ACBP_2P_1$

B. $ACBB_1A_1A$

C. ACBDA (Answer)

D. $A_1DBB_1A_1A$

The main pollutant in waste water discharged from a petroleum refinery is oil (both in free and emulsified form). Free oil is removed by-----?

A. Biological oxygen pond

B. Aerated lagoons

C. Trickling filters

D. Gravity separator having oil skimming devices (Answer)

Noise emitted by a ventilation fan at a distance of 3 metres is about ----- decibels?

A. 85

B. 105 (Answer)

C. 125

D. 145

Presence of ----- in water stream are deleterious to aquatic life?

- A. Soluble and toxic organics
- B. Suspended solids
- C. Heavy metals and cyanides
- D. All A., B. & C. (Answer)

Tolerable limit of nitrogen oxides in air is ----- ppm?

- A. 0.1
- B. 1
- C. 5 (Answer)
- D. 25

BOD of raw municipal sewage may be in the range of about ----- mg/litre?

- A. 1-2
- B. 5-10
- C. 150-300 (Answer)
- D. 2000-3000

Iron & manganese present in the polluted water is removed by -----?

- A. Simple filtration
- B. Oxidation followed by settling & filtration (Answer)
- C. Chemical coagulation
- D. Chlorination only

TLV of aldrin in public water supply system is about ----- ?g/litre?

- A. 0.5
- B. 17 (Answer)
- C. 357
- D. 1097

Presence of excess fluorine in water causes-----?

- A. Dental cavity
- B. Tooth decay
- C. Fluorosis (Answer)
- D. Respiratory disease

Direct reaction of unsaturated hydrocarbons with either NO or NO₂ produces an eye irritating pollutant compound known as-----?

- A. Photochemical smog
- B. Peroxyacetyl nitrate (PAN) or methyl nitrite (Answer)
- C. Benzopyrene
- D. Polyacrylonitrile

Dissolved oxygen content in river water is around ----- ppm?

- A. 5 (Answer)
- B. 100
- C. 250
- D. 500

Maximum allowable concentration of CO₂ in air for safe working is ----- ppm (parts per million)?

- A. 50
- B. 1000
- C. 2000
- D. 5000 (Answer)

----- substances present in sewage are removed in grit chamber during sewage treatment?

- A. Organic
- B. Fatty
- C. Inorganic (Answer)
- D. Dissolved

Industrial workers working in leather tanning & manufacturing units are prone to suffer from -----?

- A. Respiratory ailments (e.g. bronchitis)
- B. Skin diseases (e.g. dermatitis) (Answer)
- C. Silicosis
- D. Blurred vision

Phenolic water generated in coke ovens & by-product plant attached to an integrated steel plant containing phenol in concentration of less than 100 mg/litre can be removed by-----?

- A. Chlorination

- B. Treating in biological oxygen pond (Answer)
- C. Chemical coagulation
- D. None Of Above

Ionisation potential employed in the industrial electrostatic precipitator is of the order of-----?

- A. 30 to 70 kV DC (Answer)
- B. 30 to 70 kV AC
- C. 230 V AC
- D. 230 V DC

Noise level during normal conversation among men is about ----- decibels?

- A. 10
- B. 45 (Answer)
- C. 90
- D. 115

Exposure to small amount of ----- results in high blood pressure & heart disease in human beings?

- A. Hydrogen sulphide
- B. Mercury
- C. Cadmium (Answer)
- D. Asbestos

Which of the following acts as a natural source of air pollution ?

- A. Forest fire
- B. Deforestation
- C. Volcanic eruption (Answer)
- D. None Of Above

Moist atmospheric air at high temperature (e.g., in summer) having high concentration of sulphur dioxide causes-----?

- A. Fading of dyes on textiles
- B. Corrosion, tarnishing & soiling of metals
- C. Reduced strength of textiles
- D. All A., B. and C. (Answer)

Tri-sodium phosphate is used in boiler water treatment to reduce-----?

- A. Turbidity
- B. Caustic embrittlement (Answer)
- C. Suspended silica
- D. Dissolved oxygen

Which of the following is the most major constituents of air pollutants ?

- A. Oxides of sulphur (Answer)
- B. Oxides of nitrogen
- C. Carbon monoxide
- D. Hydrogen sulphide

----- cannot control the noise pollution ?

- A. Use of silencers
- B. Green house gases (Answer)
- C. Vibration damping
- D. Tree plantation

Fluorosis (a bone disease) is caused by the presence of high concentration of ----- in atmospheric air?

- A. Hydrocarbons
- B. Hydrogen fluoride (Answer)
- C. Hydrogen sulphides
- D. Nitrogen dioxide

Death may occur, when SO₂ concentration in atmospheric air exceeds ----- ppm?

- A. 20
- B. 100
- C. 400 (Answer)
- D. 200

Sound produced by an automobile horn heard at a distance of 1.5 metres corresponds to about ----- decibels?

- A. 90
- B. 120 (Answer)
- C. 150
- D. 180

Most of the atmospheric air pollutants are present in large quantity in-----?

- A. Stratosphere
- B. Thermosphere
- C. Troposphere (Answer)
- D. Mesosphere

----- is removed from water by lime-soda process?

- A. Foul smell and taste
- B. Iron and manganese
- C. Temporary hardness (Answer)
- D. Permanent hardness

Atmospheric pollution caused by the exhaust gas of supersonic transport air-crafts is mostly in the atmospheric region called-----?

- A. Thermosphere
- B. Stratosphere (Answer)
- C. Troposphere
- D. Mesosphere

Which of the following is the most detrimental for water used in high pressure boiler ?

- A. Silica (Answer)
- B. Turbidity
- C. Phenol
- D. Dissolved oxygen

Septic tanks are used for the ----- of the deposited solids?

- A. Separation
- B. Anaerobic decomposition (Answer)
- C. Aerobic decomposition
- D. None Of Above

Waste/polluted water discharged from electroplating, blast furnace and coal mining industries contain mainly ----- substances?

- A. Radioactive

- B. Organic
- C. Inorganic (Answer)
- D. None Of Above

Particulates ($< 1\mu\text{m}$ size) remaining suspended in air indefinitely and transported by wind currents are called-----?

- A. Fumes
- B. Mists
- C. Smoke
- D. Aerosols (Answer)

Biological oxidation ponds remove organic matters present in the polluted water by -----?

- A. Using the activities of bacteria and other micro organisms
- B. Aerobic oxidation
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

Black smoke coming out of the chimney of a furnace is an indication of the use of ----- in the furnace?

- A. Low amount of excess combustion air (Answer)
- B. Large quantity of excess combustion air
- C. Hydrocarbon fuel
- D. Pulverised coal as fuel

Presence of nitrates in water in excess of 50 ppm causes-----?

- A. Methemoglobinemia (Answer)
- B. Gastroenteritis
- C. Asphyxiation
- D. Tooth decay

Which is the most efficient dust removal equipment for removal of submicronic dust particles from blast furnace gas ?

- A. Packed scrubber
- B. Gravity settling chamber
- C. Electrostatic precipitator (Answer)
- D. Hydrocyclone

Ethanolamine is an absorbent used for the removal of ----- from air/gas?

- A. HF
- B. SO₂
- C. H₂S
- D. Both B. & C. (Answer)

Threshold limit value (TLV) of CO in air is ----- ppm?

- A. 5
- B. 50 (Answer)
- C. 2000
- D. 5000

There are five concentric layers within the atmosphere which is differentiated on the basis of temperature. The atmospheric layer which lies close to the earth's surface in which human being along with other organisms live is called troposphere. The rate at which air temperature in the troposphere gradually decreases with height is about ----- °C/km?

- A. 0.05
- B. 1
- C. 6.5 (Answer)
- D. 15

Which of the following is the most widely used disinfectant in water treatment ?

- A. Chlorine (Answer)
- B. Irradiation of water by ultraviolet light
- C. Cation exchanger
- D. Coagulation

Which of the following is not a natural source of air pollution ?

- A. Volcanic eruptions and lightening discharges
- B. Biological decay of vegetable matter
- C. Photochemical oxidation of organic matter
- D. (Answer)

Removal of ----- results from the disinfection of water?

- A. Turbidity
- B. Odour

- C. Hardness
- D. Bacteria (Answer)

A standard test for determination of hardness in water is termed as ----- test?

- A. EDTA (Answer)
- B. Electrometric
- C. Total count
- D. Presumptive

The function of skimming tank in sewage treatment is to remove ----- substances?

- A. Dissolved solid
- B. Suspended solid
- C. Oil & fatty (Answer)
- D. Gritty & inorganic

Lung cancer & DNA breakage are the major ill effects of excessive ozone exposure to human beings. Ozone layer depletion in the atmosphere is mainly caused by the presence of-----?

- A. CO₂
- B. SO₂
- C. Hydrocarbons
- D. CFC (chloro fluoro carbon) (Answer)

Which of the following is the most active zone of atmosphere in which weathering events like rain, storm & lightning occur ?

- A. Thermosphere
- B. Troposphere (Answer)
- C. Stratosphere
- D. None Of Above

Which of the following is a manmade source of air pollution ?

- A. Automobile exhaust (Answer)
- B. Forest fire
- C. Bacterial action in soil and swamp areas
- D. All A., B. and C.

Workers working in ----- industry are most prone to white lung cancer?

- A. Coal mining
- B. Limestone mining
- C. Textile (Answer)
- D. Asbestos

The weakest sound that can be heard by a person in a quiet environment is equivalent to ----- decibel ?

- A. 1 (Answer)
- B. 5
- C. 10
- D. 50

----- content of the phosphate rock is the pollutant of primary interest in a phosphatic fertiliser plant ?

- A. Calcium
- B. Fluorine (Answer)
- C. Phosphorous
- D. Sulphur

Oilish impurities present the effluent discharged from the electroplating industry is normally not removed by -
-----?

- A. Chemical coagulation (Answer)
- B. Flootation & skimming
- C. Centrifugation
- D. Ultra filtration

Ringelmann chart No. 2 corresponds to ----- percent black smoke?

- A. 10
- B. 20
- C. 40 (Answer)
- D. 80

Global warming may result in -----?

- A. Flood
- B. Cyclone
- C. Decrease in food productivity
- D. All A., B. and C. (Answer)

Disinfection of water is done to destroy pathogenic bacteria and thus prevent water-borne diseases.

Disinfection of water may be done by the use of-----?

- A. Ozone and iodine
- B. Chlorine or its compounds
- C. Ultraviolet light for irradiation of water
- D. All A., B. & C. (Answer)

The effect of increase in carbon dioxide level of the atmosphere and its profound effect on our climate is called the -----?

- A. Catalytic conversion
- B. Green house effect
- C. Global warming
- D. Both B. and C. (Answer)

Which of the following is an adsorbent for removal of nitrogen oxides from gas/air ?

- A. Active carbon
- B. Silica gel (Answer)
- C. Bog iron (iron oxide)
- D. Pulverised limestone

Green house gases blanket/block the infrared radiation from earth's surface to the atmosphere leading to its progressive warming up. Which of the following gases does not exhibit green house effect ?

- A. CO₂
- B. H₂
- C. SO₃ (Answer)
- D. N₂

High noise levels produced during operation of fans and compressors can be reduced by using-----?

- A. Mufflers (silencers) (Answer)
- B. Acoustic absorbent
- C. Lagging of noisy duct
- D. None Of Above

Salt content in sea water is about ----- percent?

- A. 0.5
- B. 1
- C. 3.5 (Answer)
- D. 9.05

----- is the process of killing organism in water ?

- A. Coagulation
- B. Sterilisation
- C. Disinfection (Answer)
- D. Sedimentation

Fresh sewage is ----- in nature?

- A. Acidic
- B. Neutral
- C. Alkaline (Answer)
- D. Highly acidic

From pollution control point of view, the maximum permissible concentration of sulphur dioxide in atmospheric air is about ----- ppm?

- A. 5 (Answer)
- B. 50
- C. 500
- D. 5000

Maximum permissible concentration (i.e. TLV) of DDT in public water supply system is ----- micro gram (? g)/litre?

- A. 22
- B. 42 (Answer)
- C. 332
- D. 1050

Which of the following fine dust removal equipments is the most efficient ?

- A. Bag filter
- B. Scrubber
- C. Electrostatic precipitator (Answer)
- D. Cyclone separator

Noise level in a quiet private business office is about ----- decibels?

- A. 25
- B. 50 (Answer)
- C. 70
- D. 85

Which of the following is not a weightless pollutant ?

- A. SPM (Answer)
- B. Thermal pollution
- C. Radioactive rays
- D. Noise pollution

Noise pollution level in a chemical plant is expressed in -----?

- A. Roentgen
- B. Decibel (Answer)
- C. Hertz
- D. None Of Above

Smog is -----?

- A. Nothing but black smoke
- B. A combination of smoke and fog (Answer)
- C. A liquid particle resulting from vapor condensation
- D. A solid particle e.g. fly-ash

For existence of aquatic life in water, the dissolved oxygen content in it, should not be less than ----- ppm?

- A. 10000
- B. 5 (Answer)
- C. 500
- D. 1000

Very small amount of air pollutants are present in stratosphere also; though most of the atmospheric pollutants are present in the troposphere. Which of the following atmospheric pollutants does not cause the ozone layer depletion in atmosphere at tremendous rate ?

- A. CO (Answer)

- B. SO₂
- C. NO_x
- D. CFC (chloro fluoro carbons)

The term Biological Oxygen Demand (BOD) is used in relation to -----?

- A. Potable water
- B. Cooling water
- C. Distilled water
- D. Industrial effluents (Answer)

The upper layer of atmosphere is called the -----?

- A. Stratosphere (Answer)
- B. Troposphere
- C. Ionosphere
- D. None Of Above

CFC (chloro fluoro carbon) is very highly reactive in causing depletion of ozone layer in the atmosphere. Each atom of chlorine liberated from CFC is capable of decomposing ----- molecules of ozone?

- A. 102
- B. 105 (Answer)
- C. 109
- D. 1015

The average thickness of ozone layer in stratosphere is about ----- dobson unit (DU)?

- A. 20
- B. 230 (Answer)
- C. 750
- D. 1500

Noise level audible to audience sitting in the 5th row from the stage during a large orchestra show corresponds to about ----- decibels?

- A. 105
- B. 135 (Answer)
- C. 160
- D. 185

Disinfection of water is done to remove -----?

- A. Color
- B. Bad taste
- C. Foul odour
- D. Bacteria (Answer)

In water treatment plant, zeolite process is used to remove the ----- of water?

- A. Acidity
- B. Alkalinity
- C. Hardness (Answer)
- D. Iron & zinc

There are thirteen metals which are treated as pollutants. Which of the following metals is not a pollutant ?

- A. Mercury
- B. Arsenic
- C. Aluminium (Answer)
- D. Lead

Oxidation of ammonia is-----?

- A. Exothermic (Answer)
- B. Endothermic
- C. Non-catalytic
- D. Autocatalytic

In the manufacture of H_3PO_4 (ortho); strong H_2SO_4 leaching wet process as compared to electric furnace process-----?

- A. Uses lower grade phosphate rock
- B. Requires lower capital investment in the plant
- C. Produces lower purity acid (Answer)
- D. Is very costly

Though liquid ammonia itself is a fertiliser (with 82% nitrogen content) yet it is commonly not used as such in a tropical country like India, because it-----?

- A. Has a pungent smell
- B. Vaporises at normal temperature (Answer)

- C. Is toxic and highly corrosive
- D. Is in short supply

PH value of soil is maintained at ----- by the addition of fertiliser for optimum growth and health of the plant?

- A. 4-5
- B. 7-8 (Answer)
- C. 9-10
- D. 12-13

Which of the following fertilisers contains the least percentage of nitrogen ?

- A. Liquid ammonia
- B. Urea
- C. Ammonium phosphate (Answer)
- D. Ammonium sulphate

Heating a mixture of phosphate rock, coke and sand in an electric furnace produces-----?

- A. Phosphoric acid
- B. Ammonium phosphate
- C. Phosphorous (Answer)
- D. Superphosphate

Catalyst used in steam reforming of naphtha is -----?

- A. Bauxite
- B. Cobalt
- C. Nickel oxide on alumina support (Answer)
- D. Chromium

Liquid ammonia and 60% nitric acid reaction (which produces ammonium nitrate) is-----?

- A. Exothermic (Answer)
- B. Endothermic
- C. Autocatalytic
- D. None Of Above

Low grade coal is ----- to produce ammonia synthesis gas?

- A. Hydrogenated

- B. Liquefied
- C. Gasified (Answer)
- D. Dehydrogenated

Main constituent of phosphate rock is-----?

- A. Ammonium phosphate
- B. Flour apatite (Answer)
- C. Calcium fluoride
- D. Calcium phosphate

Gas based fertiliser plants use-----?

- A. Natural gas as a source of hydrogen (Answer)
- B. Natural gas as heating medium
- C. Coal gas as a source of hydrogen
- D. Coal gas as heating medium

Chemical formula of meta-phosphoric acid is -----?

- A. H_3PO_4
- B. $\text{H}_4\text{P}_2\text{O}_7$
- C. HPO_3 (Answer)
- D. Same as that of Pyrophosphoric acid

Which of the following is the costliest source of hydrogen needed for ammonia manufacture under Indian condition -----?

- A. Electrolysis of water (Answer)
- B. Cryogenic removal of H_2 from coke oven gas
- C. Steam reforming of naphtha
- D. Natural gas cracking

A nitrogenous fertiliser contains 20% N_2 . It could be-----?

- A. Ammonium nitrate
- B. Calcium ammonium nitrate (CAN) (Answer)
- C. Urea
- D. Ammonium chloride

Raw materials required for the production of CAN (Calcium ammonium nitrate) is NH_3 -----?

- A. HNO_3 & limestone (Answer)
- B. CO_2 & H_2SO_4
- C. HNO_3 & NH_4Cl
- D. CO_2 & KNO_3

Leaching of phosphate rock by strong ----- acid produces phosphoric acid ?

- A. Sulphuric
- B. Hydrochloric
- C. Either A. or B. (Answer)
- D. Neither A. nor B.

Which of the following is not a mixed fertiliser ?

- A. Nitrophosphate
- B. Calcium ammonium nitrate (CAN) (Answer)
- C. Ammonium phosphate
- D. None Of Above

Flushing liquor used for cooling coke oven gas constitutes of -----?

- A. Ammoniacal liquor (Answer)
- B. K_2CO_3 solution
- C. Dilute H_2SO_4
- D. Dilute HCl

Nitrogen content in ammonium sulphate (a fertiliser) is around ----- percent?

- A. 5
- B. 20 (Answer)
- C. 50
- D. 65

Dehydration of ammonium carbamate to yield urea is a/an ----- reaction?

- A. Exothermic
- B. Endothermic (Answer)
- C. Autocatalytic
- D. Catalytic

Both white phosphorous as well as red phosphorous-----?

- A. Are soluble in CS₂
- B. Burns when heated in air (Answer)
- C. Reacts with hot caustic soda solution to give Phosphine
- D. All A., B., and C.

Which of the following fertilisers is required for the development of fibrous materials of the plants and of the sugar of vegetable & fruits ?

- A. Nitrogenous fertilisers
- B. Phosphatic fertilisers
- C. Potassic fertiliser (Answer)
- D. None Of Above

Prilling tower is found in the flowsheet for the manufacture of-----?

- A. Ammonia
- B. Urea (Answer)
- C. Superphosphate
- D. Triple superphosphate

Heating of ortho-phosphoric acid to about 900°C, produces-----?

- A. Meta-phosphoric acid (Answer)
- B. Pyrophosphoric acid
- C. No change in it
- D. None Of Above

Ammonium nitrate (a fertiliser) is coated with limestone powder to -----?

- A. Increase its nitrogen content
- B. Cut down its production cost
- C. Avoid the risk of explosion (Answer)
- D. Add extra nutrient as fertiliser

Main component of bone ash is -----?

- A. Calcium sulphate
- B. Calcium phosphate (Answer)
- C. Calcium carbonate
- D. Sodium phosphate

Conversion of yellow phosphorous to red phosphorous is done by heating it in covered retorts at ----- °C in absence of air?

- A. 50-80
- B. 250-400 (Answer)
- C. 1000-1200
- D. 800-900

Which of the following gasifiers can be attached to coal based fertiliser plants ?

- A. Lurgi (high pressure) gasifier
- B. Kopper-Totzek gasifier (Answer)
- C. Gasifier working at 20 atm
- D. Gasifier working at 40 atm

Phosphatic fertiliser is graded based on its ----- content?

- A. P_2O_3
- B. PCl_5
- C. P_2O_5 (Answer)
- D. H_3PO_4

Use of catalyst is a must in the ammonia manufacture, because the reaction is reversible as well as the heat of dissociation of N_2 & H_2 is high. The presence of promoter along with the catalyst helps in ----- of the catalyst ?

- A. Stabilisation
- B. Increasing the effectiveness
- C. Improving the strength & heat resistance
- D. All A, B & C (Answer)

Naphtha in a fertiliser plant is used as a source of-----?

- A. Fuel
- B. H_2 (Answer)
- C. N_2
- D. O_2

Low grade phosphate rock can be used in electrical furnace, because-----?

- A. Of the better CaO/SiO₂ balance for slag formation (Answer)
- B. CaO content is less
- C. It is cheap
- D. It produces low cost product

Commercial production of hydrogen for the manufacture of nitrogenous fertilisers is done by-----?

- A. Steam reforming of naphtha and cracking of natural gas
- B. Electrolysis of water
- C. Cryogenic separation of hydrogen from coke oven gas
- D. All A., B. and C. (Answer)

Reaction of Cresylic acid with ----- produces Tricresyl phosphate?

- A. Phosphorous pentoxide
- B. Phosphorous oxychloride (Answer)
- C. Ammonium phosphate
- D. Calcium phosphate

Phosphorus vapour comprises of -----?

- A. P
- B. P₂
- C. P₃
- D. P₄ (Answer)

----- is the most suitable fertiliser for paddy?

- A. Urea
- B. Ammonium sulphate (Answer)
- C. Superphosphate
- D. Potassium nitrate

A mixture of phosphate rock ----- is heated in an electric furnace to produce phosphorous?

- A. Salt & coke
- B. Sand & coke (Answer)
- C. And coke
- D. And sand

Urea is formed only-----?

- A. In liquid phase (Answer)
- B. In vapour phase
- C. At very high temperature
- D. At very low pressure (vacuum)

Which of the following is the costliest method for commercial production of hydrogen for ammonia synthesis ?

- A. H₂ separation from coke oven gas
- B. Steam reforming of naphtha
- C. Cracking of natural gas
- D. Electrolysis of water (Answer)

Sodium tri poly phosphate (STPP) is manufactured by reaction of phosphoric acid with sodium-----?

- A. Carbonate (Answer)
- B. Phosphate
- C. Bicarbonate
- D. Silicate

Montecatini process is used for the manufacture of-----?

- A. Nitric acid
- B. Phosphoric acid
- C. Urea (Answer)
- D. Calcium ammonium nitrate (CAN)

Bio-fertilisers are cheaper, renewable and pollution free. They improve the ----- of the soil?

- A. Nutrient supply
- B. Texture
- C. Water holding capacity
- D. All A., B. and C. (Answer)

Lower temperature and large excess of ammonia in urea melt-----?

- A. Increases biuret formation
- B. Decreases biuret formation (Answer)
- C. Is undesirable
- D. Does not effect biuret formation

Heating of coke, sand & phosphate rock in an electric furnace is done for the manufacture of-----?

- A. Phosphoric acid
- B. Superphosphate
- C. Phosphorous (Answer)
- D. Triple superphosphate

The concentration (weight %) of nitric acid produced by the oxidation of ammonia and absorption of nitrogen oxides with water is about ----- percent?

- A. 60 (Answer)
- B. 30
- C. 95
- D. 100

Yield of urea can be increased with excess ammonia and higher pressure & temperature, but because of ----- this is normally not done?

- A. Increased biuret formation
- B. High corrosion rate
- C. Increased cost of equipment
- D. All A., B. & C. (Answer)

Which of the following is not a measure component necessarily to be present in fertilisers ?

- A. Nitrogen
- B. Potassium
- C. Phosphorous
- D. Sulphur (Answer)

Fertiliser plants get their N₂ requirements -----?

- A. By fractionation of liquefied air (Answer)
- B. By dissociating oxides of nitrogen
- C. From coal gas (coke oven gas)
- D. From producer gas

Maximum nitrogen percentage is in-----?

- A. Ammonium sulphate

- B. Calcium ammonium nitrate
- C. Urea
- D. Liquid ammonia (Answer)

An increase in the NH_3/CO_2 ratio in urea manufacture results in-----?

- A. Increased degree of conversion of CO_2 to urea (Answer)
- B. Decreased degree of conversion of NH_3 to urea
- C. Decreased yield of urea
- D. Decreased specific volume of molten m

Electric furnace method for production of phosphorous uses phosphate rock and -----?

- A. Phosphoric acid
- B. Coke
- C. Sulphuric acid
- D. Silica and coke (Answer)

Urea is a better fertilizer than ammonium sulphate, because-----?

- A. It is cheaper
- B. Nitrogen content is higher (Answer)
- C. It is not poisonous
- D. It is easy to manufacture

Conditioners like finely divided peat are added to the fertiliser to-----?

- A. Counteract burning
- B. Avoid caking & hardening (Answer)
- C. Produce bulk
- D. Increase its solubility

Which of the following is not a commercially used feed-stock for the production of ammonia synthesis gas ?

- A. Water
- B. Naphtha
- C. Tar (Answer)
- D. Coal/coke oven gas

Color of nitric acid is light yellow due to the presence of-----?

- A. NO
- B. NO₂ (Answer)
- C. N₂H₅
- D. NH₃

Catalyst used in steam reforming of naphtha is-----?

- A. Nickel (Answer)
- B. Platinum
- C. Silica gel
- D. Rhodium

Steam reforming of naphtha produces ammonia synthesis gas. This is a/an ----- process?

- A. Autocatalytic
- B. Endothermic (Answer)
- C. Exothermic
- D. Non-catalytic

Multistage operation (as in the case of catalytic oxidation of SO₂) is not carried out for NH₃ synthesis, because of-----?

- A. Comparatively higher pressure drop
- B. High cost of the high pressure vessel used for the reactor (Answer)
- C. Higher pumping cost
- D. Chances of entrainment and disturbance

Nitrolime is-----?

- A. Calcium nitrate
- B. Calcium ammonium nitrate (Answer)
- C. A mixture of nitric acid and lime
- D. A mixture of ammonium nitrate and calcium nitrate

Tricresyl phosphate is chemically represented as-----?

- A. (CH₃ C₆ H₄)₃ PO₄ (Answer)
- B. Ca₁₀(PO₄)₃F₆
- C. (NH₄)₂HPO₄
- D. NH₄H₂PO₄

----- catalyst is used in the production of urea from CO_2 and NH_3 ?

- A. Vanadium pentoxide
- B. No (Answer)
- C. Alumina
- D. Nickel

Triple superphosphate is made by reacting phosphate rock with ----- acid?

- A. Phosphoric (Answer)
- B. Nitric
- C. Sulphuric
- D. Hydrochloric

The most suitable fertiliser for accelerating seeding or fruit formation in later stages of plant growth is ----- fertiliser?

- A. Nitrogenous
- B. Phosphatic (Answer)
- C. Potassic
- D. None Of Above

Which one of the following is used as a nitrogenous fertiliser, as a weed killer in the onion fields and for correcting acidic soils ?

- A. Urea
- B. CAN
- C. Ammonium sulphate
- D. Calcium cyanamide (Answer)

Catalytic ammonia synthesis reaction as in Haber's process is-----?

- A. Endothermic
- B. Exothermic (Answer)
- C. Irreversible
- D. None Of Above

$\text{H}_4\text{P}_2\text{O}_7$ is the chemical formula of ----- phosphoric acid?

- A. Pyro (Answer)
- B. Ortho
- C. Meta

D. None Of Above

-10-5 fertilisers mean that they contain-----?

A. 5, 10, 5% respectively of N_2 , P_2O_5 and K_2O (Answer)

B. Only 5 to 10% active fertiliser constituents

C.

D.

Reaction of anhydrous liquid ammonia with ortho-phosphoric acid produces-----?

A. Ammonium phosphate (Answer)

B. Superphosphate

C. Triple superphosphate

D. None Of Above

In ammonia synthesis ($N_2 + 3H_2 = 2NH_3$), there is a decrease in total volume, hence to get high equilibrium conversion, the reaction should be carried out at-----?

A. Low pressure

B. High pressure (Answer)

C. Very high temperature

D. Atmospheric pressure; as the pressure has no effect on conversion

Nitric acid is produced on commercial scale in a fertiliser plant by-----?

A. Oxidation of ammonia (Answer)

B. $CaNO_3 + H_2SO_4$ reaction

C. Passing air through high voltage electric arc

D. None Of Above

With increases in pressure, the conversion of Ammonium carbamate into urea-----?

A. Increases (Answer)

B. Decreases

C. Remains unaltered

D. Can either increase or decrease depends on biuret content

Nitrogen content of urea is about ----- percent ?

A. 10

- B. 46 (Answer)
- C. 80
- D. 94

Nitrogen content of a nitrogenous fertiliser is 35%. It could be-----?

- A. Urea
- B. Ammonium nitrate (Answer)
- C. Calcium ammonium nitrate (CAN)
- D. Ammonium sulphate

Plant tranquillisers-----?

- A. Hold back stem growth and halt plants at a desired height (Answer)
- B. Cause early maturation of plants
- C. Accelerate ripening of food and grain
- D. Produce seedless fruit

Raw materials for nitric acid manufacture are-----?

- A. Hydrogen peroxide, air and water
- B. Anhydrous ammonia and air
- C. Anhydrous ammonia, air and water (Answer)
- D. Wet ammonia, air and water

Ostwald charts are meant for-----?

- A. Computing the excess/deficiency of combustion air (Answer)
- B. Calculation of flue gas temperature
- C. Computation of flue gas analysis
- D. None Of Above

Which of the following furnaces will have maximum thermal efficiency ?

- A. Soaking pits
- B. Walking beam reheating furnace
- C. Boiler furnace (Answer)
- D. Rotary kilns

The function of an economiser in a boiler is to preheat the -----?

- A. Feedwater (Answer)
- B. Combustion air
- C. Pulverised coal
- D. Furnace oil

Which of the following is not an additive for flue gases from furnace to reduce its dewpoint ?

- A. Ammonia
- B. Fine dolomite
- C. Alkaline powders
- D. (Answer)

Out of the following fuels used in a furnace exhausting flue gas at a temperature of 600°C, the percentage stack loss will be maximum in case of complete combustion of-----?

- A. Furnace oil with air
- B. Furnace oil with oxygen
- C. Blast furnace gas with air (Answer)
- D. Blast furnace gas with oxygen

Fuel economy in an industrial furnace operation cannot be achieved by the use of-----?

- A. Stoichiometric combustion air (Answer)
- B. Non-preheated combustion air
- C. Combustion air not enriched with oxygen
- D. Recuperators

Which furnace employs preheating, heating and soaking zones ?

- A. Soaking pit
- B. Reheating furnace (Answer)
- C. Open hearth furnace
- D. Cupola

Regenerators are normally provided in the-----?

- A. Glass melting furnace
- B. Open hearth furnace
- C. By product coke ovens
- D. All A., B. and C. (Answer)

Which is a continuous furnace ?

- A. Coke ovens
- B. Annealing furnace
- C. Glass tank furnace (Answer)
- D. None Of Above

Turndown ratio of a burner gives an idea of the ----- in the furnace?

- A. Range of fuel firing rates (Answer)
- B. Volume of the combustion chamber
- C. Maximum heat input rate only
- D. Minimum heat input rate only

A refractory wall separating the stock and the source of heat is provided in a-----?

- A. Updraft kiln
- B. Muffle furnace (Answer)
- C. Continuous furnace
- D. None Of Above

Large tonnage of refractory bricks are dried in a-----?

- A. Shaft furnace
- B. Rotary hearth furnace
- C. Tunnel kiln (Answer)
- D. Muffle furnace

Which of the following is the most important deterrents to an extended use of pulverised coal in boiler firing ?

- A. Ash disposal problem (Answer)
- B. Excessive fly ash discharge from the stack
- C. Higher power consumption in its transportation
- D. Erosion of induced draft fan blades

If the flame is produced under the hearth and then sweeps up into the heating chamber, this is called a/an ---- furnace?

- A. Sidefired
- B. Underfired (Answer)
- C. Covered

D. Recirculating

----- atmosphere is maintained inside an iron blast furnace?

- A. Oxidising
- B. Reducing (Answer)
- C. Inert
- D. Decarburising

Which one shows the diagrammatic heat balance in a furnace ?

- A. Sankey diagram (Answer)
- B. Cox chart
- C. Ostwald chart
- D. None Of Above

In reverberatory furnace, charge is heated mainly by-----?

- A. Conduction
- B. Natural convection
- C. Radiation of heat from the roof of the combustion chamber (Answer)
- D. None Of Above

Metallic recuperators are not used for waste heat recovery, if the hot flue gas temperature is above ----- °C, because corrosion prevails at higher temperatures?

- A. 350
- B. 750 (Answer)
- C. 1050
- D. 1250

In practical operation of any furnace, zero oxygen percentage or theoretical CO₂ percentage in flue gas is rarely achieved, because of-----?

- A. Use of non-preheated combustion air
- B. Use of pulverised solid fuels
- C. Imperfect mixing of fuel & air and infiltration of air (Answer)
- D. Use of excessive positive dr

Which of the following is a heat treatment furnace ?

- A. Muffle furnace
- B. Annealing furnace (Answer)
- C. Reheating furnace
- D. Rotary kiln

An electric furnace producing heat by means of an electric arc struck between each of three electrodes and the charge is called ----- furnace?

- A. Resistance
- B. Arc (Answer)
- C. Low frequency induction
- D. None Of Above

Size of the combustion chamber of a furnace depends upon the -----?

- A. Heat release rate of the fuel
- B. Preheat temperature of fuel & air
- C. Method of mixing the fuel & air
- D. All A., B. and C. (Answer)

To reduce the stack loss, heat recovery from flue gas can be done by-----?

- A. Preheating of cold stock
- B. Preheating of combustion air
- C. Steam generation in waste heat boilers
- D. All A., B. and C. (Answer)

----- furnace is not an electric furnace?

- A. Arc
- B. Induction
- C. Pot (Answer)
- D. Resistance

The advantages of firing pulverised coal in the furnace lies in the fact that, it-----?

- A. Permits the use of high ash content coal
- B. Permits the use of low fusion point ash coal
- C. Accelerates the burning rate and economises on fuel consumption (Answer)
- D. All

Which is the most thermally efficient furnace -----?

- A. Reheating furnace
- B. Reverberatory furnace
- C. Rotary kilns
- D. Boiler furnace (Answer)

Fuel economy in furnaces can be achieved by-----?

- A. Using oxygen enriched combustion air
- B. Preheating the combustion air
- C. Reducing the heat loss through furnace openings & doors
- D. All A., B. and C. (Answer)

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----- is an indirectly heated furnace?

- A. Open hearth furnace
- B. Muffle furnace (Answer)
- C. Soaking pit
- D. Reheating furnace

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Furnace pressure is normally controlled by regulating the-----?

- A. Air pressure
- B. Fuel gas pressure
- C. Speed of I.D. fan
- D. Damper (Answer)

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Which one is not an induced draught furnace ?

- A. Blast furnace stove (Answer)
- B. Sintering furnace
- C. High pressure boiler
- D. None Of Above

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Ceramic coating material for furnace refractory, which increases its emissivity and thus the radiation heat transfer rate in the furnace, comprises of-----?

- A. Graphite powder
- B. Thoria
- C. Zircon powder (Answer)
- D. Beryllium

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Heat transfer takes place through a liquid medium surrounding the submerged material under heating, in case of a/an-----?

- A. Blast furnace
- B. Steam boiler
- C. Salt bath furnace (Answer)
- D. Annealing furnace

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Reducing atmosphere is maintained in a-----?

- A. Calcination kiln
- B. Blast furnace (Answer)
- C. Soaking pit
- D. L.D. converter

Reducing atmosphere is maintained in a-----?

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Heat transfer rate to the charge/stock in a furnace does not depend upon the-----?

- A. Type of fuels viz. solid, liquid or gaseous (Answer)
- B. Flue gas temperature
- C. Emissivity of refractory walls
- D. Initial temperature of the charged stock

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Higher furnace temperature cannot be achieved by use of a lean fuel gas in the furnace by-----?

- A. Increasing the draft in the furnace (Answer)
- B. Preheating the fuel gas
- C. Oxygen enrichment of combustion air
- D. Preheating the combustion air

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Overall thermal efficiency of a lumpy coal fired suitably designed heating furnace, if operated & maintained properly may be about ----- percent?

- A. 10-15
- B. 25-30 (Answer)
- C. 45-50
- D. 65-70

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An example of recuperative furnace is the-----?

- A. Soaking pit (Answer)
- B. Open hearth furnace
- C. Coke ovens
- D. None Of Above

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- A. Soaking pit (Answer)
- B. Open hearth furnace

- C. Coke ovens
- D. None Of Above

Which is a regenerative furnace ?

- A. Coke oven heating chamber
- B. Open hearth furnace
- C. Both A. and B. (Answer)
- D. Neither A. nor B.

In order to maintain an oxidising atmosphere in a furnace, it should have-----?

- A. More of excess air (Answer)
- B. Less of excess air
- C. More of CO in flue gas
- D. More of CO₂ in flue gas

Heat transfer rate to the stock/charge in the furnace does not depend upon the-----?

- A. Emissivity of the refractory walls
- B. Size of the furnace
- C. Use of waste heat recovery equipments (Answer)
- D. Thickness of the stock

In a furnace operation, which is not preheated ?

- A. Solid fuels
- B. Hydrocarbon containing fuel gases (e.g. coke oven gas, refinery gas etc.)
- C. Both A. and B. (Answer)
- D. Neither A. nor B.

If fuel and air are mixed ahead of the burner, it is called a/an ----- burner?

- A. Premix (Answer)
- B. Outside mixing type
- C. Rotary
- D. Diffusion

Temperature of a furnace fired with low calorific value fuel gas (i.e. lean gas) can be increased by-----?

- A. Preheating the combustion air

- B. Oxygen enrichment of combustion air
- C. Preheating the fuel gas
- D. All A., B. & C. (Answer)

Example of an indirectly heated furnace is-----?

- A. Hood annealing furnace
- B. Muffle furnace
- C. Both A. and B. (Answer)
- D. Neither A. nor B.

Which of the following advantages is not associated with the use of preheated air for combustion of a fuel in the furnace ?

- A. Increase in calorific value of the fuel (Answer)
- B. Increase in flame temperature
- C. Reduction in scale losses
- D. Saving in fuel consumption

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Which of the following variables does not affect the furnace capacity ?

- A. Size of the furnace
- B. Gas velocity in furnace
- C. Ratio of wall surface to surface of stock
- D. (Answer)

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Dampers are located-----?

- A. Before the I.D fan (Answer)
- B. After the I.D. fan
- C. Near the top of the chimney
- D. Anywhere after the I.D. fan

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In low or standard frequency induction furnace, heat is produced by the-----?

- A. Combination of induced current and skin effect
- B. Induction and resistance (Answer)
- C. Current flow through a heating element
- D. None Of Above

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The rate of scaling of furnace stock depends upon the-----?

- A. Temperature
- B. Time
- C. Nature of atmosphere
- D. All A., B. and C. (Answer)

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Coke ovens in steel plant are heated by-----?

- A. Electricity
- B. Blast furnace gas/mixed gas
- C. Coke oven gas
- D. Both B. and C. (Answer)

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Specific heating capacity of a furnace is expressed as-----?

- A. Weight heated/hr
- B. Weight heated/furnace volume
- C. Weight heated/hr/furnace volume (Answer)
- D. None Of Above

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Unit of furnace loading is-----?

- A. Ton stock/hr/m² hearth area (Answer)
- B. Ton stock/hr
- C. Ton stock/m² hearth area
- D. Both B. and C.

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Maximum thermal efficiency of boiler may be about ----- percent?

- A. 10
- B. 25
- C. 65
- D. 90 (Answer)

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Advantages of use of preheated combustion air are-----?

- A. Saving in fuel consumption
- B. Reduction in scale losses
- C. Increase in flame temperature
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Thermal efficiency of blast furnace stoves used for heating blast (air) may be about ----- percent?

- A. 20
- B. 40
- C. 60
- D. 80 (Answer)

Very high pressure boilers are usually ----- boilers?

- A. Fire tube
- B. Water tube
- C. Waste heat

D. Natural circulation (Answer)

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Soaking pits are meant for heating steel-----?

A. Ingots (Answer)

B. Coils

C. Sheets

D. Slabs

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Rotary kilns are used in the-----?

A. Calcination of limestone & dolomite

B. Cement manufacture

C. Both A. and B. (Answer)

D. Neither A. nor B.

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While the fuel fired furnace can be used upto a maximum temperature of about 1700°C , the electric furnace can be used upto a temperature of about ----- $^{\circ}\text{C}$?

- A. 2000
- B. 3000
- C. 4500 (Answer)
- D. 6000

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Power required in case of forced draught as compared to induced draught (for the same draught produced) is-----?

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- D. Either more or less; depends on the flue gas density

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Thermal efficiency of furnaces can be improved by-----?

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- B. Minimising heat losses from furnace walls
- C. Maintaining proper draught
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In producer gas making furnace, steam is added along with air to mainly control the-----?

- A. Fusion of coal ash & clinker formation (Answer)
- B. C. V. of producer gas
- C. Temperature of producer gas
- D. Tar content in producer gas

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In a heating process, a heat flow diagram in which the quantities of heat in the various items of a heat balance are represented by the width of a band is called the-----?

- A. Ostwald chart
- B. Cox chart
- C. Sankey diagram (Answer)
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Regenerators are installed in-----?

- A. Coke ovens
- B. Open hearth furnace

- C. Both A. & B. (Answer)
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Shaft furnaces are used for-----?

- A. Smelting
- B. Calcining
- C. Roasting
- D. All A., B. and C. (Answer)

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Reheating furnace (pusher type) is used for heating-----?

- A. Ingots
- B. Slabs (Answer)
- C. Steel coils
- D. Steel sheets

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Acid dew point temperature (ADT) of a flue gas produced by the combustion of a fuel containing 1% sulphur may be about ----- °C?

- A. 80
- B. 130 (Answer)
- C. 180
- D. 250

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Protective gas used in the annealing furnace for steel coil comprises of-----?

- A. 95% N₂ + 5% H₂ (Answer)
- B. 5% H₂ + 9% N₂
- C. 100% CO
- D. 100% H₂

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Artificial draught produced by a fan in the furnace can be controlled by the-----?

- A. Speed of the fan
- B. Damper
- C. Variation in the pitch of fan blades
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Which of the following is the most suitable for preheating combustion air above 650°C ?

- A. Regenerator
- B. Metallic recuperator
- C. Ceramic recuperator (Answer)
- D. None Of Above

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The electric furnace in which heat is produced by a combination of induced current and skin effect is called ---- furnace?

- A. Arc
- B. Resistance
- C. Low frequency induction
- D. High frequency induction (Answer)

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Thermal efficiency of an open hearth furnace may be about ----- percent?

- A. 5
- B. 20 (Answer)
- C. 50
- D. 80

Thermal efficiency of an open hearth furnace may be about ----- percent?

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- B. 20 (Answer)

- C. 50
- D. 80

Which of the following is not a directly fired furnace ?

- A. By-product coke oven (Answer)
- B. Calcination kiln
- C. Sintering furnace
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Air filtration in a furnace-----?

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- B. Is indicated by flame sting out
- C. Increases the flue gas temperature
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Ceramic recuperators (made of SiC) is economical, only when used for preheating combustion air above -----
°C?

- A. 250
- B. 650 (Answer)
- C. 850
- D. 1000

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- D. Soaking pits

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Combustion of furnace oil in a furnace (soaking pit) with preheated combustion air at 400°C results in saving of about ----- percent furnace oil as compared to its combustion with atmospheric air, if the flue gas outlet temperature from the soaking pit is 1200°C ?

- A. 5
- B. 60
- C. 20 (Answer)
- D. 40

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- B. 60
- C. 20 (Answer)
- D. 40

Hearth furnaces are not used for-----?

- A. Roasting
- B. Melting
- C. Reheating
- D. (Answer)

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- B. Melting
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- D. (Answer)

Decarburisation of steel-----?

- A. Is the removal of carbon from iron carbide (Fe_3C)
- B. Affects its crystalline structure
- C. Is favoured by CO_2
- D. All A., B. and C. (Answer)

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Maximum heat transfer in high temperature furnaces is by-----?

- A. Conduction
- B. Convection
- C. Radiation (Answer)
- D. Either A., B. or C.; depends on the type of furnace

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- C. Radiation (Answer)
- D. Either A., B. or C.; depends on the type of furnace

Design of waste heat boiler for recovery of waste heat from furnace gases depends upon the-----?

- A. Quantity & temperature of waste gas
- B. Dust concentration & nature of dust in waste gas (Answer)
- C. Corrosive nature of the waste gas
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Ceramic recuperators compared to metallic recuperators for the same duty-----?

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- B. Occupy more space (Answer)
- C. Are less costly
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Combustion of fuel in a furnace with oxygen enriched air results in higher-----?

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Which is not a hearth furnace ?

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- B. Open hearth furnace
- C. Cupola (Answer)
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Turn down ratio of a burner-----?

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- B. Should be 1:1 for a batch type furnace
- C. Is the ratio of maximum to minimum permissible heat input rates (Answer)
- D. Is normal

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Main gas valve in a gaseous fuel burner is a ----- valve?

- A. Gate (Answer)
- B. Butterfly
- C. Globe
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Pulverised fuel fired furnaces employ ----- fuel firing?

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- B. Vertical
- C. Tangential
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Which of the following is a periodic furnace ?

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- B. Rotary kiln
- C. Soaking pit (Answer)
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Furnace aerodynamics is related to the ----- in the furnace?

- A. Movement of gases (Answer)
- B. Measurement of flue gas volume
- C. Temperature control
- D. Pressure adjustment

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The heating capacity of muffle furnace depends on the-----?

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- B. Properties of the muffle wall (temperature, area, and emissivity)
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

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In salt bath furnace, heat is transferred to the charge mainly by -----?

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An example of shaft furnace is the-----?

- A. L.D. converter
- B. Glass melting tank
- C. Blast furnace (Answer)
- D. Soaking pit

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The thermal efficiency of an air/fuel gas preheating recuperator may be as high as ----- percent?

- A. 50
- B. 65
- C. 85 (Answer)
- D. 99

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- B. 65
- C. 85 (Answer)
- D. 99

Which of the following is a batch furnace ?

- A. Cupola (Answer)
- B. Reheating furnace
- C. Glass tank furnace
- D. None Of Above

Flue gas outlet temperature from the chimney of any furnace should be ideally about ----- °C?

- A. 50
- B. 100
- C. 150 (Answer)
- D. 250

Forced recirculation of furnace gases is practised-----?

- A. To increase heat transfer by convection
- B. To ensure uniform temperature
- C. In furnaces, operating below 750°C
- D. All A., B. and C. (Answer)

An improved and fuel efficient version of the pusher type reheating furnace is the ----- furnace?

- A. Walking beam (Answer)
- B. Shaft
- C. Tunnel
- D. Rotary hearth

Scaling of furnace stock is reduced by ----- in flue gas?

- A. CO
- B. H₂
- C. High CO/CO₂
- D. All A., B. & C. (Answer)

Which of the following variables affects the furnace capacity ?

- A. Temperature of flue gas
- B. Thermal conductivity of stock
- C. Thickness of heating stock
- D. All A., B. and C. (Answer)

The range of Mho's scale of hardness is from-----?

- A. 1 to 15
- B. 1 to 8
- C. 1 to 10 (Answer)
- D. 0 to 10

An elastic behaviour of materials is expressed in terms of-----?

- A. Hysteresis loop area
- B. Stress-strain curve
- C. Relaxation time (Answer)
- D. None Of Above

The formation of oxide film on a metal due to atmospheric exposure reduces its-----?

- A. Toughness
- B. Stiffness
- C. Creep limit (Answer)
- D. All A., B. & C.

Which of the following would not be a suitable material of construction for handling aqueous hydrofluoric acid (HF) at 100°C ?

- A. Monel
- B. Stainless steel (Answer)
- C. Graphite
- D. Kel-F and Teflon

Most suitable material of construction for the storage of concentrated nitric acid is-----?

- A. Cast iron
- B. Monel
- C. Karbate
- D. Aluminium or chromium alloys (Cr > 18% for cold acid) (Answer)

A suitable material of construction to use with fuming sulphuric acid is-----?

- A. Carbon steel
- B. Stainless steel type 304
- C. Nickel
- D. Monel (Answer)

Steel tower used for the storage of oleum-----?

- A. Is lined with lead
- B. Need not be lined (Answer)
- C. Is lined with rubber
- D. Is lined with acid-proof bricks

Nickel made/clad equipments are suitable for handling-----?

- A. Ammonia (both aqueous & anhydrous)
- B. Fruit juices, milk & its products and caustic soda solution (Answer)
- C. Nitric acid & hydrochloric acid (concentrated)
- D.

Aluminium as a material of construction suffers from the disadvantage of-----?

- A. Very high cost
- B. Rather low tensile strength (Answer)
- C. Very low strength to weight ratio
- D. Scarce availability

Which metal is protected by the layer of its own oxide ?

- A. Iron
- B. Silver
- C. Calcium
- D. Aluminium (Answer)

In the Contact process of sulphuric acid manufacture, 98% acid cooler is made of-----?

- A. Stainless steel
- B. Cast iron (Answer)
- C. Lead lined steel
- D. Rubber lined steel

White cast iron is not-----?

- A. Malleable (Answer)
- B. Whitish in color
- C. Brittle
- D. Strong and hard

Which one is remelted and poured into moulds to get cast iron ?

- A. Wrought iron
- B. Pig iron (Answer)
- C. Low carbon steel

D. Mild steel

The addition of antimony in tin-based alloys improves its-----?

- A. Rupture strength and hot hardness
- B. Impact strength and bonding strength
- C. Deformation resistance (Answer)
- D. Wear resistance

All materials obey Hooke's law within elastic limit. When elastic limit is reached, the tensile strain-----?

- A. Increases very quickly (Answer)
- B. Decreases very quickly
- C. Increases in proportion to stress
- D. Decreases in proportion to stress

Evaporators used in caustic soda recovery and production plant are made of-----?

- A. Monel metal (Answer)
- B. Gun metal
- C. Wood metal
- D. Babbitt metal

Sulphur melting pit in the sulphuric acid plant is made of-----?

- A. Lead lined stainless steel
- B. Cast iron
- C. Steel or cement-brick lined (Answer)
- D. Hard wood

Which of the following pairs of elements may form an alloy ?

- A. Iron & carbon (Answer)
- B. Iron & mercury
- C. Platinum & mercury
- D. None Of Above

Copper has very low-----?

- A. Malleability
- B. Ductility

- C. Tensile strength (Answer)
- D. Thermal & electrical conductivity

Refined acetic acid storage vessel are made of-----?

- A. Copper
- B. Aluminium (Answer)
- C. High carbon steel
- D. Nickel

Mixing vessel used for the chlorination of methane to produce methyl chloride is made of-----?

- A. Copper
- B. Cast iron (Answer)
- C. Aluminium
- D. High carbon steel

The high expansion metal normally used in the bimetallic thermometer is ----- temperature measurement?

- A. Brass for low
- B. Nickel alloys for high
- C. Both A. & B. (Answer)
- D. Aluminium for all

High speed cutting tool steels contain about ----- percent of tungsten?

- A. 6-8
- B. 18-20 (Answer)
- C. 30-35
- D. 50-55

Hydrochloric acid is stored in a -----vessel?

- A. Lead lined steel
- B. Rubber lined steel (Answer)
- C. Stainless steel
- D. Cast iron

The chlorinator used in the manufacture of DDT is made of-----?

- A. Glass
- B. Glass lined steel (Answer)

- C. Teflon
- D. Bakelite

----- does not contain copper as an alloying element?

- A. Nichrome (Answer)
- B. Manganin
- C. Perminvar
- D. Monel metal

In SO₃ absorber (Contact Process), packing material used is of-----?

- A. Cast iron
- B. Chemical stoneware (Answer)
- C. Karbate
- D. Mild steel

Addition of lead, sulphur and phosphorus to low carbon steel helps in improving its-----?

- A. Corrosion resistance
- B. Tensile strength
- C. Machinability (Answer)
- D. Compressive strength

Bearings subjected to light load are made of-----?

- A. White metal
- B. Phosphorous bronze (Answer)
- C. Monel
- D. Silicon bronze

With increase in the carbon percentage in the steel, its-----?

- A. Hardness increases
- B. Ductility reduces
- C. Tensile strength increases
- D. All A., B. and C. (Answer)

Which of the following has the least value of ultimate tensile strength (UTS) ?

- A. Medium carbon steel

- B. High carbon steel
- C. Cast iron (Answer)
- D. Wrought iron

To improve the machinability of steel by its softening, it is subjected to -----?

- A. Cold working
- B. Annealing (Answer)
- C. Shot blasting
- D. Heating

Bog iron used for the adsorption of H_2S from coke oven gas is-----?

- A. An intimate mixture of saw dust and iron dust (i.e. moist ferric hydroxide) (Answer)
- B. Iron impregnated with resin (usually Bakelite)
- C. Carbon free iron
- D. None Of Above

The specific gravity of coal depends mainly on its ----- content?

- A. Carbon
- B. Volatile matter
- C. Ash (Answer)
- D. Moisture

Bell metal is an alloy of -----?

- A. Copper & zinc
- B. Copper & tin (Answer)
- C. Copper & nickel
- D. Zinc & tin

Most of the common metals have ----- crystal structure?

- A. Cubic (Answer)
- B. Hexagonal
- C. Orthorhombic
- D. None Of Above

Ball bearings are normally made of ----- steel?

- A. High speed
- B. High carbon
- C. Chrome (Answer)
- D. Silicon

Condenser tubes are not made of-----?

- A. Cartridge brass
- B. Muntz brass
- C. Wood metal (Answer)
- D. Aluminium brass alloy

Evaporator used for concentrating tomato juice is made of -----?

- A. Nickel
- B. Brass
- C. Stainless steel-glass lined (Answer)
- D. Cast iron-rubber lined

Lead lined equipments & vessels are suitable for handling -----?

- A. Hydrochloric acid (10%)
- B. Nitric acid
- C. Sulphuric acid upto 60°C (Answer)
- D. All A., B. and C.

Carbon is present in steel wholly in the-----?

- A. Combined form (Answer)
- B. Free state as graphite
- C. Both A. and B.
- D. Neither A. nor B.

Mild steel is a/an ----- steel?

- A. Low carbon (Answer)
- B. Medium carbon
- C. High carbon
- D. High alloy

Maximum permissible sulphur content in steel is ----- percent?

- A. 0.015
- B. 0.055 (Answer)
- C. 0.505
- D. 0.805

Maximum consumption of lead is in the manufacture of -----?

- A. Storage batteries (Answer)
- B. Solder alloys
- C. Electric cable sheathing
- D. Lead lined vessels

Karbate is-----?

- A. A mixture of iron dust and saw dust
- B. Carbon impregnated with resin (usually Bakelite)
- C. An acid resistant material
- D. Both B. and C. (Answer)

Failure of a material is termed as fatigue failure, if it fails below the yield point. The resistance to fatigue failure of a material is measured by the-----?

- A. Ultimate tensile strength (U.T.S.)
- B. Endurance limit (Answer)
- C. Elastic limit
- D. None Of Above

Cast iron is having very high -----?

- A. Proximity between its elastic limit and ultimate breaking strength (Answer)
- B. Ductility
- C. Tensile strength
- D. All A., B. and C.

The crystal structure of most of the common metals is-----?

- A. Orthorhombic
- B. Cubic (Answer)
- C. Hexagonal
- D. None Of Above

Spark plugs are made of-----?

- A. High alumina ceramic (Answer)
- B. Metallic carbides
- C. Corundum
- D. Carborundum

In cold working of metal as compared to its hot working-----?

- A. Cracks and blow holes are eliminated
- B. Ductility and impact strength improves
- C. Appreciable strain hardening is produced (Answer)
- D. Yield stress, hardness and fatigue s

'Age hardening' of duralumin is due to-----?

- A. Copper
- B. Magnesium
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

The softest material just next to talc in the Mho's scale is-----?

- A. Quartz
- B. Gypsum (Answer)
- C. Feldspar
- D. Fluorite

Which of the following comprises of hydrocarbons ?

- A. Mica flakes
- B. Glass
- C. Rubber (Answer)
- D. None Of Above

Alinco, which is a aluminium-cobalt-nickel steel, is used for making -----?

- A. Surgical instruments
- B. Powerful magnets (Answer)
- C. Chemical equipments

D. Boiler tubes

Containers made of high silicon cast iron (14% Si) are not suitable for the storage of -----?

- A. Acetic acid
- B. Benzoic & boric acids
- C. Phosphoric acid (95%) & sulphuric acid (95%)
- D. Hydrochloric acid (concentrated) (Answer)

Gibbs free energy (G) is represented by, $G = H - TS$, whereas Helmholtz free energy, A. is given by, $A = E - TS$. Which of the following is the Gibbs-Helmholtz equation ?

- A. $[\partial(G/T)/\partial T] = - (H/T^2)$
- B. $[\partial(A/T)/\partial T]V = - E/T^2$
- C. Both A. and B. (Answer)
- D. Neither A. nor B.

A refrigerator works on the principle of ----- law of thermodynamics?

- A. Zeroth
- B. First
- C. Second (Answer)
- D. Third

Entropy, which is a measure of the disorder of a system, is-----?

- A. Independent of pressure
- B. Independent of temperature
- C. Zero at absolute zero temperature for a perfect crystalline substance (Answer)
- D. All A, B. & C

One ton of refrigeration capacity is equivalent to the heat removal rate of-----?

- A. 50 kcal/hr
- B. 200 BTU/hr
- C. 200 BTU/minute (Answer)
- D. 200 BTU/day

Which of the following units is not present in both the vapor compression refrigeration system and absorption refrigeration system ?

- A. Expansion valve
- B. Condenser
- C. Refrigerator
- D. Compressor (Answer)

Lenz's law results from the law of conservation of-----?

- A. Mass
- B. Momentum
- C. Energy (Answer)
- D. None Of Above

At constant temperature and pressure, for one mole of a pure substance, the ratio of the free energy to the chemical potential is-----?

- A. Zero
- B. One (Answer)
- C. Infinity
- D. Negative

----- does not change during phase transformation processes like sublimation, melting & vaporisation?

- A. Entropy
- B. Gibbs free energy (Answer)
- C. Internal energy
- D. All (A), B. & (C)

At a given temperature, the volume of a gas dissolved in a solvent ----- with increase in pressure?

- A. Increases
- B. Decreases
- C. Remains unchanged (Answer)
- D. May increase or decrease; depends on the gas

In the reaction; $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$, increasing the pressure will result in-----?

- A. Shifting the equilibrium towards right
- B. Shifting the equilibrium towards left
- C. No change in equilibrium condition (Answer)
- D. None Of Above

1m³ of an ideal gas at 500 K and 1000 kPa expands reversibly to 5 times its initial volume in an insulated container. If the specific heat capacity (at constant pressure) of the gas is 21 J/mole . K, the final temperature will be ?

- A. 35 K
- B. 174 K
- C. 274 K (Answer)
- D. 154 K

Work done may be calculated by the expression $\int p \, dA$ for ----- processes ?

- A. Non-flow reversible
- B. Adiabatic
- C. Both A. and B (Answer)
- D. Neither A. nor B

Sound waves propagation in air exemplifies an ----- process?

- A. Adiabatic (Answer)
- B. Isothermal
- C. Isometric
- D. None Of Above

Which of the following is an undesirable characteristic of a refrigerant ?

- A. It should be non-explosive
- B. It should have a sub-atmospheric vapor pressure at the temperature in refrigerator coils (Answer)
- C. Its vapor pressure at the condenser temperatur
- D.

A globe valve is the most suitable for applications, in which-----?

- A. Fluid flow control is required (Answer)
- B. Fluid contains dispersed solid particles
- C. Valve is required to be either fully open or fully closed
- D. One way flow is require

Buckingham- π theorem states that in any physical problem including 'n' quantities having 'm' dimensions, the quantities can be arranged into ----- independent dimensionless parameters?

- A. m
- B. n

C. n-m (Answer)

D. n/m

When the head pumped against is less than the head of the fluid used for pumping, the usual device is a/an-----?

A. Ejector

B. Blower

C. Injector

D. Airlift (Answer)

The hydraulic radius for flow in a rectangular duct of cross-sectional dimension H, W is-----?

A. $\frac{HW}{2}$

B. $\frac{HW}{2(H+W)}$ (Answer)

C. $\frac{HW}{4(H+W)}$

D. $\frac{2HW}{H+W}$

Permanent pressure loss in a well designed Venturimeter is about ----- percent of the venturi differential?

A. 1

B. 10 (Answer)

C. 30

D. 50

For an ideal fluid flow, Reynolds number is-----?

A. 2100

B. 100

C. 0

D. ? (Answer)

Unit of mass velocity is-----?

A. kg/hr

B. $\frac{\text{kg}}{\text{m}^2 \cdot \text{hr}}$ (Answer)

C. $\frac{\text{kg}}{\text{m}^2}$

D. $\frac{\text{kg}}{\text{m}^3 \cdot \text{hr}}$

The lift of a balloon is-----?

- A. Increased, as it rises to a higher altitude
- B. Due to the weight of the atmospheric air, that it displaces (Answer)
- C. Not dependent on the temperature of the atmosphere
- D.

The most economical flow control valve for use with large diameter pipes is a-----?

- A. Butterfly valve (Answer)
- B. Globe valve
- C. Needle valve
- D. None Of Above

The equivalent diameter for fluid flow through square cross section channel of side 'x', for pressure drop calculation purpose is given by-----?

- A. $4x$
- B. $2x$
- C. x (Answer)
- D. $\frac{x}{2}$

Minimum fluidisation velocity for a specific system depends upon the-----?

- A. Particle size
- B. Fluid viscosity
- C. Density of both the particle & the fluid
- D. All A., B. and C. (Answer)

In case of a pipe of constant cross-sectional area, the maximum fluid velocity obtainable is-----?

- A. The velocity of sound (Answer)
- B. Dependent on its cross-sectional area
- C. Dependent on fluid viscosity
- D. Dependent on fluid density

Pressure drop for laminar fluid flow through a circular pipe is given by-----?

- A. $4f(L/D)(v^2/2gc)$?
- B. $32(\mu LV/gc D^2)$ (Answer)
- C. $16/NRe$
- D. $(fL/D)(v^2/2gc)$

The hydraulic diameter of an annulus of inner and outer radii R_i and R_o respectively is-----?

- A. $4(R_o - R_i)$
- B. $\frac{1}{2}(R_o - R_i)$
- C. $2(R_o - R_i)$ (Answer)
- D. $R_o + R_i$

A pipe has a porous section of length L as shown in the figure. Velocity at the start of this section is V_0 . If fluid leaks into the pipe through the porous section at a volumetric rate per unit area $q(x/L)^2$, what will be axial velocity in the pipe at any x . Assume incompressible one dimensional flow i.e., no gradients in the radial direction ?

- A. $V_x = V_0 + q(x^3/L^2D)$
- B. $V_x = V_0 + \frac{1}{2}q(x^3/L^2)$
- C. $V_x = V_0 + 2q(x^2/LD)$
- D. $V_x = V_0 + (4/3)q(x^3/L^2D)$ (Answer)

Navier-Stokes equation is useful in the analysis of ----- fluid flow problems?

- A. Non-viscous
- B. Viscous (Answer)
- C. Turbulent
- D. Rotational

A centrifugal pump used to pump water is used to pump an oil with specific gravity of 0.8 at the same rate.

The power consumption will now-----?

- A. Increase
- B. Decrease (Answer)
- C. Remain same
- D. Data insufficient to predict

What is the value of Fanning friction factor f' for smooth pipe at $N_{Re} = 106$ approximately ?

- A. 0.003 (Answer)
- B. 0.01
- C. 0.1
- D. 0.3

Reynolds number for flow of water at room temperature through 2 cm dia pipe at an average velocity of 5 cm/sec is around-----?

- A. 2000
- B. 10
- C. 100
- D. 1000 (Answer)

Equivalent length of a pipe fitting is-----?

- A. Dependent on Reynolds number (Answer)
- B. Independent of Reynolds number
- C. Dependent on the length of the pipe
- D. None Of Above

In deriving Bernoulli's equation, fluid is assumed to be-----?

- A. Incompressible, frictionless, steady, along a streamline (Answer)
- B. Uniform, steady, incompressible, along a streamline
- C. Steady, density being pressure dependent, frictionless
- D.

Self-priming centrifugal pump can be used for-----?

- A. Booster service
- B. Pumping liquid fertilisers (e.g. liquid NH₃)
- C. Pumping industrial wastes
- D. All A., B. and C. (Answer)

Discharge in laminar flow through a pipe varies-----?

- A. As the square of the radius (Answer)
- B. Inversely as the pressure drop
- C. Inversely as the viscosity
- D. As the square of the diameter

A centrifugal pump has the following specifications: Power = 4 H.P.; Speed = 800 rpm Head = 8 metres Flow = 1000 litres/minutes. If its speed is halved, the new discharge will be ----- litres/minute ?

- A. 500 (Answer)
- B. 200
- C. 1000

D. 750

Which of the following is most prone to pulsating discharge flow ?

- A. Centrifugal pump
- B. Reciprocating pump
- C. Gear pump (Answer)
- D. Axial flow pump

I.D. of 1/4" schedule 40 pipe is 0.364". I.D. of a 1/2" schedule 40 pipe would be ----- inch?

- A. 4.728
- B. 0.5
- C. 0.622 (Answer)
- D. 0.474

Slurries can be most conveniently pumped by a ----- pump?

- A. Screw
- B. Reciprocating
- C. Gear
- D. Centrifugal (Answer)

Poise is converted into stoke by -----?

- A. Multiplying with density (gm/c.c)
- B. Dividing by density (gm/c.c) (Answer)
- C. Multiplying with specific gravity
- D. Dividing by specific gravity

A tube is specified by its-----?

- A. Thickness only
- B. Outer diameter only
- C. Thickness & outer diameter both (Answer)
- D. Inner diameter

In parallel pipe problems, the-----?

- A. Head loss is the same through each pipe (Answer)
- B. Discharge is the same through all the pipes

- C. Total head loss is equal to the sum of the head losses through each pipe
D.

In Newton's law range, the drag co-efficient for the motion of spherical particle in a stationary fluid is-----
?

- A. 0.44 (Answer)
B. 0.044
C. 4.4
D. 44

What is the shear rate at the pipe wall, in case of laminar flow of Newtonian fluids in a pipe of diameter 'D' & length 'L' incurring a pressure drop ' Δp ' with average velocity ' V_{avg} ' ?

- A. $\Delta p/8L$
B. $\Delta p/4L$
C. $8 V_{avg}/D$ (Answer)
D. $4 V_{avg}/D$

For laminar flow of Newtonian fluid in a circular pipe, the velocity distribution is a function of the distance 'd' measured from the centre line of the pipe, and it follows a ----- relationship?

- A. Logarithmic
B. Parabolic (Answer)
C. Hyperbolic
D. Linear

For laminar flow of a fluid through a packed bed of spheres of diameter d, the pressure drop per unit length of bed depends upon the sphere diameter as-----?

- A. d
B. d^2
C. d^4
D. d^{-2} (Answer)

Which is the most efficient and best for measuring very small flow rate of gases ?

- A. Venturimeter
B. Orificemeter
C. Rotameter (Answer)
D. Flow nozzle

Newton's law of viscosity relates the-----?

- A. Shear stress and velocity
- B. Velocity gradient and pressure intensity
- C. Shear stress and rate of angular deformation in a fluid (Answer)
- D. Pressure gradient and rate of

Horsepower increase of a centrifugal gas compressor without altering the volumetric flow rate will ----- the gas discharge pressure?

- A. Increase (Answer)
- B. Decrease
- C. Not change
- D. Exponentially decrease

Bernoulli's equation is not applicable, when the flow is-----?

- A. Irrotational
- B. Incompressible
- C. Viscous
- D. All A., B. & C. (Answer)

The fluid velocity varies as the square root of the cylindrical pipe diameter in case of steady state laminar flow at constant pressure drop of ----- fluid?

- A. Dilatent (Answer)
- B. Pseudo-plastic
- C. Bingham plastic
- D. Newtonian

In a/an -----, the flow rate of fluids is obtained by measuring the difference between the impact and the static pressure?

- A. Rotameter
- B. Pitot tube (Answer)
- C. Venturimeter
- D. Flow nozzle

----- pump is the most suitable device for discharging a liquid against a pressure of ? 1500 kgf/cm²?

- A. Centrifugal
- B. Piston
- C. Plunger (Answer)
- D. Vane

Pascal law is not applicable for a/an ----- fluid?

- A. Accelerating frictionless
- B. Static
- C. Uniformly moving
- D. (Answer)

The ----- pressure is measured by a static tube?

- A. Dynamic
- B. Static (Answer)
- C. Total
- D. None Of Above

Pressure drop in packed bed for turbulent flow is given by the ----- equation?

- A. Kozeny-Carman
- B. Blake-Plummer (Answer)
- C. Leva's
- D. Hagen-Poiseuille's

Air vessel fitted to a reciprocating pump-----?

- A. Increases the work done
- B. Decreases the work done (Answer)
- C. Causes cavitation
- D. Results in non-uniform discharge

The maximum discharge through a circular channel takes place, when the depth of the fluid flow is ----- times the pipe diameter?

- A. 0.25
- B. 0.5
- C. 0.66
- D. 0.95 (Answer)

A pressure of 10 m head of water is equivalent to ----- kN/m²?

- A. 98 (Answer)
- B. 147
- C. 196
- D. 49

Fanning friction factor equation applies to the ----- fluid flow?

- A. Non-isothermal condition of
- B. Compressible
- C. Both A. and B.
- D. Neither A. nor B. (Answer)

A centrifugal pump is used to pump water through a horizontal distance of 150 m, and then raised to an overhead tank 10 m above. The pipe is smooth with an I.D of 50 mm. What head (m of water) must the pump generate at its exit E. to deliver water at a flow rate of 0.001 m³/s? The Fanning friction factor, f is 0.0062 ?

- A. 10 m
- B. 11 m (Answer)
- C. 11.8 m
- D. 30 m

Air vessel of a reciprocating pump is initially filled with-----?

- A. Atmospheric air
- B. Compressed air (Answer)
- C. Water
- D. None Of Above

Fluid flow through a packed bed is represented by the ----- equation?

- A. Fanning's
- B. Ergun's (Answer)
- C. Hagen-Poiseuille's
- D. None Of Above

The location of centre of pressure, which defines the point of application of the total pressure force on the surface, can be calculated by applying the principle of moments according to which "sum of the moment of the resultant force about an axis is equal to the sum of the components about the same axis". The centre of

pressure of a rectangular surface (of width 'w') immersed vertically in a static mass of fluid is at a depth of (where, y = depth of the liquid) ?

- A. $1/(y/3)$
- B. $2y/3$ (Answer)
- C. $1/(y/4)$
- D. $3y/4$

In a free vortex, the-----?

- A. Velocity changes linearly with radial distance (Answer)
- B. Flow is necessarily rotational
- C. Radial component of velocity is same everywhere
- D. Stream lines are not circular

In continuous fluidisation-----?

- A. Solids are completely entrained (Answer)
- B. The pressure drop is less than that for batch fluidisation
- C. There is no entrainment of solids
- D. Velocity of the fluid is very

Drag co-efficient for flow past immersed body is the ratio of ----- to the product of velocity head and density?

- A. Shear stress
- B. Shear force
- C. Average drag per unit projected area (Answer)
- D. None Of Above

The boundary layer thickness at a given section along a flat plate ----- with increasing Reynold's number?

- A. Increases
- B. Decreases (Answer)
- C. Remain same
- D. May increase or decrease

Transition length for a turbulent fluid entering into a pipe is around ----- times the pipe diameter?

- A. 5
- B. 50 (Answer)
- C. 500

D. 5000

Pressure drop (Δp) for a fluid flowing in turbulent flow through a pipe is a function of velocity (V) as-----?

- A. $V^{1.8}$
- B. $V^{-0.2}$
- C. $V^{2.7}$
- D. V^2 (Answer)

Lower BWG means ----- of the tube?

- A. Lower thickness
- B. Lower cross-section (Answer)
- C. Outer diameter
- D. Inner diameter

Which of the following facilitates close control of flow of fluids ?

- A. Gate valve
- B. Globe valve (Answer)
- C. Butterfly valve
- D. Check valve

What is the maximum theoretical suction lift (metres) of a reciprocating pump ?

- A. 5
- B. 10 (Answer)
- C. 50
- D. 100

In isotropic turbulence, the ----- are equal to each other?

- A. Temporal velocity components
- B. Mean square of velocity fluctuations in the three co-ordinate directions (Answer)
- C. Root mean square of velocity fluctuations in the three co-or
- D.

Purpose of relief valve in a reciprocating pump is to-----?

- A. Protect the pump against developing excessive pressure (Answer)
- B. Facilitate unidirectional flow of liquid

- C. Reduce the discharge pressure
- D. Control the rate of dischar

Stoke's equation is valid in the Reynolds number range-----?

- A. 0.01 to 0.1 (Answer)
- B. 0.1 to 2
- C. 2 to 10
- D. 10 to 100

Carborundum used for making crucibles for melting non-ferrous metals is chemically-----?

- A. Silicon carbide (Answer)
- B. Silicon nitride
- C. Crystalline magnesia
- D. Zirconium sulphate

Permeability of bricks is a measure of the-----?

- A. Refractoriness
- B. Melting point
- C. Rate at which a fluid will pass through the pores (Answer)
- D. Expansion during heating

Fireclay bricks are not used in the-----?

- A. Blast furnace
- B. Hot blast stove
- C. Cupola
- D. Wall of coke oven (Answer)

Which form of silica has the highest specific gravity ?

- A. Quartz (Answer)
- B. Cristobalite
- C. Tridymite
- D. All have the same specific gravity

Thermal conductivity of refractory bricks-----?

- A. Increases with decrease in porosity (Answer)

- B. Decreases with decreases in porosity
- C. Is independent of its porosity and is maximum for insulating bricks
- D. Increases with

Fusion point of a basic refractory material is-----?

- A. Reduced by the addition of acid oxides (Answer)
- B. Increased by the addition of acid oxides
- C. Not affected by the addition of acid oxides
- D. Always less than 1000°C

Fireclay bricks are used in the-----?

- A. Coke ovens regenerator
- B. Outer lining of L.D. converter (Answer)
- C. Hearth bottom of blast furnace
- D. Coke oven walls

Which is not an acidic refractory ?

- A. Silica
- B. Fireclay
- C. High alumina refractory
- D. Carbon black (Answer)

Which is an acidic refractory ?

- A. Magnesite
- B. Dolomite
- C. Fireclay (Answer)
- D. Chrome magnesite

In panel test for spalling resistance, the average face temperature of panel assembly is maintained at ----- °C for 24 hours?

- A. 700
- B. 1000
- C. 1600 (Answer)
- D. 2000

Fireclay bricks is not used for lining the-----?

- A. Cupola
- B. Gas producer
- C. Bottom of hot metal mixer (Answer)
- D. Roof of open hearth furnace

Silica bricks are never used for lining the-----?

- A. Beehive coke ovens (Answer)
- B. By-product coke ovens
- C. Dome of blast furnace stoves
- D. Roof of open hearth furnace

Refractory bricks having lower porosity have-----?

- A. High insulating properties
- B. Low heat capacity
- C. Low thermal conductivity
- D. Greater strength (Answer)

Ceramic recuperators used for waste heat recovery from high temperature flue gas going out of the furnace is made of-----?

- A. Fireclay
- B. Silicon carbide (Answer)
- C. Corundum
- D. Siliceous fireclay

Pure oxide refractories are generally monocrystalline in nature and are self bonded ----- bricks are generally used as moderator in nuclear reactors?

- A. Beryllia (Answer)
- B. Carborundum
- C. Corundum
- D. Thoria

Refractory bricks with lower permeability is produced by using -----?

- A. Higher firing temperature
- B. Higher moulding pressure
- C. Finer grog size

D. All A., B. and C. (Answer)

Refractories subjected to alternate cycles of heating & cooling are liable to loose their resistance to-----?

A. Thermal spalling (Answer)

B. Slag attack

C. Fusion under load

D. CO attack

Addition of zircon to silica refractory brick improves its-----?

A. Crushing strength

B. Resistance to slag attack (Answer)

C. Both A. and B.

D. Neither A. nor B.

Bottom of basic open hearth furnace are constructed of-----?

A. Dead burnt magnesite ramming mass (Answer)

B. Porous fireclay bricks

C. Semi-silica bricks

D. Silicon carbide bricks

Fusion temperature of pure silica (SiO_2) is ----- °C?

A. 1350

B. 1715 (Answer)

C. 2570

D. 2800

Porosity of fireclay refractories is ----- percent?

A. 5-10

B. 10-25 (Answer)

C. 25-35

D. 35-50

High alumina refractory compared to fireclay bricks have-----?

A. Less load bearing capacity

B. Less resistance to slag attack

- C. Low refractoriness
- D. High resistance to thermal shock and creep (Answer)

Mullite is chemically represented by-----?

- A. $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$
- B. $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ (Answer)
- C. $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$
- D. $2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$

Pure bauxite is the best raw material for the manufacture of high alumina refractories, in which maximum alumina content can be as high as ----- percent?

- A. 55
- B. 70
- C. 80
- D. 90 (Answer)

Which one contains minimum percentage of SiO_2 ?

- A. Firebrick
- B. Sillimanite (Answer)
- C. Semi-silica
- D. Aluminous firebrick

----- is the measure of the strength of refractory under the combined effect of temperature & load ?

- A. Porosity
- B. RUL (Answer)
- C. Specific gravity
- D. Thermal conductivity

Which of the following is not a high alumina refractory material ?

- A. Kyanite
- B. Sillimanite
- C. Diaspore
- D. Periclase (Answer)

Which is not a natural insulating material ?

- A. Diatomaceous earth/kieselgur
- B. Asbestos
- C. Vermiculite
- D. (Answer)

Magnesite bricks have poor resistance to attack by ----- slag?

- A. Lime
- B. Basic
- C. Acid (Answer)
- D. None Of Above

----- bricks should not be used in oxidising atmosphere?

- A. Tar dolomite
- B. Carbon (Answer)
- C. Silica
- D. Fireclay

With decrease in porosity, the ----- of the refractories decreases?

- A. Strength
- B. Thermal conductivity
- C. Spalling resistance (Answer)
- D. None Of Above

Which is the stable form of silica upto 1470°C ?

- A. Quartz
- B. Cristobalite
- C. Tridymite (Answer)
- D. None Of Above

Cermets are combination of ceramic and metallic materials due to which they have high strength & resistance to high temperature. Cermets are used in the-----?

- A. Hearth of the blast furnace
- B. Nuclear reactors, missiles & space crafts (Answer)
- C. Insulation of high temperature furnaces
- D. Roof of electric furnaces

Zircon refractories have-----?

- A. Low co-efficient of expansion
- B. High RUL (1600°C) and refractoriness (> 2000°C)
- C. High spalling resistance
- D. All A., B. and C. (Answer)

----- nozzles are used in continuous casting of steel?

- A. Zircon (Answer)
- B. Thoria
- C. Carborundum
- D. Beryllia

Which one expands on heating ?

- A. Silica bricks (Answer)
- B. Fireclay bricks
- C. Both A. & B.
- D. Neither A. nor B.

Ferromagnetic ceramic material is not used in the-----?

- A. Thermal insulation (Answer)
- B. Transformers
- C. Magnetic switches
- D. Television sets

Silica refractories-----?

- A. crack when subjected to sudden change of temperature (Answer)
- B. Cannot be used in the dome of hot blast stoves
- C. Have lower thermal conductivity than fireclay bricks
- D.

Which is not a basic refractory ?

- A. Chrome magnesite
- B. Magnesite
- C. Dolomite
- D. Silicon carbide (Answer)

Which one contains maximum percentage of Al_2O_3 ?

- A. Firebrick
- B. Sillimanite (Answer)
- C. Magnesite
- D. Aluminous firebrick

RUL of refractories depends on the -----?

- A. Chemical composition
- B. Physical structure
- C. Presence of impurities like iron & alkali
- D. All A., B. and C. (Answer)

Periclase is-----?

- A. Crystalline form of MgO (Answer)
- B. $MgCO_3$
- C. $ZrSO_4$
- D. Amorphous magnesite

Silica bricks are attacked by basic slags at high temperature. Which of the following is not used solely as a binding material ?

- A. Aluminium phosphate
- B. Water (Answer)
- C. Lime
- D. Plaster of Paris

Magnesite chrome bricks are used in the-----?

- A. Roof lining of basic open hearth & other basic furnaces
- B. Reheating furnaces
- C. Soaking pits
- D. All A., B. and C. (Answer)

Conversion of silica mineral to Cristobalite is accompanied by reduction in its -----?

- A. Volume
- B. Specific gravity (Answer)

- C. Both A. & B.
- D. Neither A. nor B.

Which of the following does not occur during firing/burning of refractories ?

- A. Removal of water of hydration
- B. Vitrification
- C. Decrease in crushing strength (Answer)
- D. Development of stable mineral form

Grog addition in fireclay during brick manufacture is done to-----?

- A. Reduce its shrinkage on heating
- B. Impart greater spalling resistance
- C. Enhance the strength of fired refractories
- D. All A., B. and C. (Answer)

Carbon bricks are not used in the lining of the-----?

- A. Combustion chamber of blast furnace stoves (Answer)
- B. Electric furnaces
- C. Highly chemical resistant equipments
- D. Blast furnace hearth

Machine moulding of dry mixture of refractories requires a pressure of the order of ----- kg/cm²?

- A. 10
- B. 100
- C. 500
- D. 1000 (Answer)

Porosity is induced in insulating refractories by adding-----?

- A. Powdered naphthalene
- B. Ammonium chloride/sulphate
- C. Calcium phosphate
- D. All A., B. and C. (Answer)

Segar cones are used for the determination of ----- of refractories?

- A. Softening temperature (Answer)

- B. Spalling resistance
- C. Electrical conductivity
- D. Resistance to slag attack

Fusion point of an acidic refractory material is-----?

- A. Increased by the addition of basic oxides
- B. Reduced by the addition of basic oxides (Answer)
- C. Not affected by the addition of basic oxides
- D. Always more than 2500°C

An ideal refractory should have high-----?

- A. Spalling rate
- B. Fusion point (Answer)
- C. Shrinkage ability
- D. None Of Above

Carbon refractories have very high -----?

- A. Wetting characteristics
- B. Refractoriness
- C. Thermal conductivity
- D. Both B. and C. (Answer)

Zirconia refractory-----?

- A. Does not react with basic slags
- B. Is produced from baddeleyite (Answer)
- C. Cannot be used as an insulator
- D. Has poor electrical conductivity at high temperature

Graphite or carbon refractories-----?

- A. Exhibit wetting characteristics
- B. Should be used in neutral or reducing atmosphere (Answer)
- C. Exhibit high shrinkage on thermal treatment
- D. Are not resistant to corrosi

Refractory materials are never used in the construction of -----?

- A. Segar cones
- B. Orton cones
- C. Pressure vessels (Answer)
- D. Ovens & retorts

Chrome magnesite bricks are used in the-----?

- A. Side walls of soaking pits and arc furnaces
- B. Copper melting furnaces & converters
- C. Burner block of glass tanks
- D. All A., B. and C. (Answer)

Roof of a basic open hearth furnace is lined with ----- bricks?

- A. Silica (Answer)
- B. Fireclay
- C. Dolomite
- D. Magnesite

Which of the following bricks has the most close values of RUL and PCE ?

- A. Silica bricks (Answer)
- B. Fireclay bricks
- C. High alumina bricks
- D. Tar dolomite bricks

Which is the most stable crystalline form of silica at room temperature ?

- A. Quartz (Answer)
- B. Cristobalite
- C. Tridymite
- D. None Of Above

Because of its very high refractoriness of the order of ----- °C, silicon carbide refractories are used in zinc smelting furnace, muffle furnace and for supporting the wares in tunnel kilns ?

- A. 1800
- B. 2200
- C. 2400
- D. 2700 (Answer)

Carbon refractories are exclusively used in the-----?

- A. Hearth of blast furnace (Answer)
- B. Walls of coke oven
- C. Regenerators of coke oven
- D. Side wall of soaking pits

Refractory castables are used for-----?

- A. Producing monolithic linings
- B. Patch work
- C. Minimising the number of joints in the structure
- D. All A., B. and C. (Answer)

Which of the following has the lowest electrical resistivity ?

- A. Graphite (Answer)
- B. Fireclay
- C. Alumina
- D. Zircon

Maximum water percentage in refractory mix meant for hand moulding may be as high as ----- percent?

- A. 2-3
- B. 5-7
- C. 7-12
- D. 14-20 (Answer)

----- bricks are used in the burning zone of a cement rotary kiln ?

- A. High alumina (Answer)
- B. Fireclay
- C. Thoria
- D. Silicon carbide

Chrome magnesite is not used in the -----?

- A. Inner lining of L.D. converter
- B. Aluminium melting furnaces
- C. Wear out lining of steel melting furnaces (Answer)
- D. All A., and B. and C.

The linear thermal expansion of ----- bricks upto 1000 °C is very low of the order of ? 0.5 percent?

- A. Fireclay (Answer)
- B. Silica
- C. Magnesite
- D. Corundum

Spalling of a refractory means its-----?

- A. Softening
- B. Fracture due to uneven expansion at high temperature (Answer)
- C. Resistance to compressive loads
- D. Resistance to chemical action of gases and molten fluxes

Bauxite calcining rotary kilns are lined with ----- bricks?

- A. Fireclay
- B. Carbon
- C. 85% alumina (Answer)
- D. Corundum

Lower part of hot metal mixer are lined with ----- bricks?

- A. Superduty fireclay
- B. High alumina
- C. Silica
- D. Carborundum (Answer)

Which of the following consumes the maximum tonnage of refractories annually in an integrated steel plant ?

- A. Soaking pits
- B. Reheating furnace
- C. L.D. converter (Answer)
- D. Rotary lime kiln

Maximum shrinkage in volume occurring during burning/firing of dried refractories may be as high as ----- percent?

- A. 10
- B. 15
- C. 20

D. 30 (Answer)

Chrome magnesite bricks are-----?

- A. Acidic in nature
- B. Neutral in nature
- C. Having higher RUL than silica bricks (Answer)
- D. Made by mixing 30% Chromite and 70% Periclase

Si percentage in silica refractories used in the walls of coke oven is about-----?

- A. 45
- B. 60
- C. 80
- D. 95 (Answer)

In chemical process equipments, the conical bottom heads used, usually has an apex angle of-----?

- A. 20°
- B. 40°
- C. 60° (Answer)
- D. 80°

Lessing ring is formed by the addition of a partition across the centre of a raschig ring, which results in an area increase of about ----- percent?

- A. 5
- B. 20 (Answer)
- C. 35
- D. 55

Carbon Content by weight in air dried wood may be about ----- percent?

- A. 10
- B. 25
- C. 50 (Answer)
- D. 80

Which of the following has the least calorific value (kcal/Nm³) ?

- A. Blast furnace gas (Answer)

- B. Coke oven gas
- C. Sewage gas
- D. Natural gas

Turndown ratio of a gas burner is equal to the ----- ?

- A. Maximum to minimum heat input ratio
- B. Maximum to minimum permissible gas flow rate
- C. Both A. & B. (Answer)
- D. Minimum to maximum heat input ratio

Which of the following gaseous fuels has the lowest calorific value ?

- A. Gobar gas
- B. Refinery gas
- C. Converter gas
- D. Blast furnace gas (Answer)

Ignition temperature of a fuel in air is ----- that in pure oxygen?

- A. More than (Answer)
- B. Less than
- C. Equal to
- D. Either more or less; depends on the type of fuel

Eschka mixture, which is used for the determination of sulphur in coal, is a mixture of -----?

- A. MgO & Na₂CO₃ (Answer)
- B. MgSO₄ & BaCl₂
- C. BaSO₄ & NaCl
- D. MgCO₃ & NaCl

Higher percentage of ash in coal meant for the production of metallurgical grade coke -----?

- A. Decreases the hardness of coke
- B. Decreases the abrasion resistance of coke
- C. Causes brittleness in steel
- D. (Answer)

Coal is heated in presence of air to a temperature of about ----- °C, while determining its ash content for proximate analysis?

- A. 500
- B. 750 (Answer)
- C. 950
- D. 1100

Beehive coke oven-----?

- A. Facilitates by-products recovery
- B. Takes 2-3 days for coking of coal but requires no external fuel for heating (Answer)
- C. Gives larger yield of coke (around 85%) as compared to
- D.

Gross and net calorific value of a fuel will be the same-----?

- A. If its ash content is zero
- B. If its carbon content is very low
- C. If its hydrogen/hydrogen compound content is zero (Answer)
- D. Under no circumstances

Commercial production of petrol from coal (as practised in a factory at Sasol in South Africa) is done by the ----- of coal?

- A. Hydrogenation (Answer)
- B. Gasification
- C. Carbonisation
- D. None Of Above

Explosion limit of blast furnace gas is 37 to 71% gas in gas-air mixture. It means that the blast furnace gas will explode when burnt in a confined space, if its concentration in the gas-air mixture is ----- percent?

- A. 71%
- B.
- C. In between 37 & 71% (Answer)
- D. None Of Above

Quantity of coke produced from metallurgical coal may be around ----- percent?

- A. 30
- B. 50

- C. 75 (Answer)
- D. 95

The liquid used for the washing of coal in an industrial coal washery is a mixture of water and -----?

- A. Carbon tetrachloride
- B. Sand (40%) (Answer)
- C. Mineral oil of high viscosity & specific gravity (1.6)
- D. None Of Above

Which of the following constituents of coal is the most important in the production of coke ?

- A. Moisture
- B. Ash
- C. Volatiles
- D. Carbon (Answer)

The combustion reaction, $C + O_2 = CO_2$, is -----?

- A. Exothermic (Answer)
- B. Endothermic
- C. Autocatalytic
- D. None Of Above

Yield of coke oven gas in low temperature carbonisation of coal is about ----- Nm³ /ton of dry coal?

- A. 60
- B. 160 (Answer)
- C. 500
- D. 750

Blast furnace gas burns with a bluish flame, because of the presence of-----?

- A. CO (Answer)
- B. CH₄
- C. CO₂
- D. S

Calorific value of pitch creosote mixture (PCM) i.e., C.T.F.-200 is about-----?

- A. 8800 kcal/m³

- B. 8800 kcal/kg (Answer)
- C. Same as that of coal middling
- D. 25000 kcal/kg

Fuel gases containing hydrocarbons (e.g. coke oven gas) are not preheated before burning, mainly because -----?

- A. The hydrocarbons crack thereby choking and fouling the heat transfer surface by carbon soot (Answer)
- B. It reduces its calorific value tremendously
- C. It reduces its flame temperature
- D.

Calorific values of both the solid as well as the liquid fuels can be determined by ----- calorimeter?

- A. Bomb (Answer)
- B. Boy's
- C. Junkers
- D. None Of Above

Calorific value of bituminous coal may be around ----- Kcal/kg?

- A. 500
- B. 1500
- C. 6500 (Answer)
- D. 20000

Stack heat losses can be minimised by-----?

- A. Controlling the excess air (Answer)
- B. Oxygen enrichment of combustion air
- C. Using low c.v. fuels
- D. Maintaining proper draft in the furnace

Method of maintaining fires in furnace during standby periods without undue consumption of fuel is called-----?

- A. Back draughting
- B. Banking (Answer)
- C. Under pressurising
- D. None Of Above

By-products are ----- recovered in 'Beehive ovens' ?

- A. Fully
- B. Partially
- C. Not at all (Answer)
- D. Negligibly

A coal containing very high percentage of durain is called ----- coal?

- A. Bright
- B. Splint (Answer)
- C. Non-banded
- D. Boghead

Main use of soft coke is as ----- fuel?

- A. Domestic (Answer)
- B. Blast furnace
- C. Foundry
- D. None Of Above

Gas yield in the Kopper-Totzek coal gasifier is about ----- Nm³/ton coal (ash = 35%)?

- A. 150
- B. 1500 (Answer)
- C. 3500
- D. 5000

'Wobbe index' is a characteristic of-----?

- A. Solid fuels
- B. Gaseous fuels (Answer)
- C. Liquid fuels
- D. Fat coals

Spontaneous combustion of coal on storage results due to-----?

- A. Inadequate ventilation
- B. Low temperature oxidation
- C. Storage in large heaps with small surface to volume ratio
- D. All A., B. and C. (Answer)

White flue gas (resembling steam) coming out of the chimney of a thermal power plant indicates that the fuel used in the boiler furnace is-----?

- A. Tar
- B. Coke oven gas (Answer)
- C. Pitch
- D. Pulverised coke

A coal gasifier operating at 20 atm. (e.g. Lurgi gasifier) as compared to one operating at atmospheric pressure (e.g. Kopper-Totzek or Winkler gasifier) will produce a gas having -----?

- A. Higher methane content and thus higher calorific value (Answer)
- B. Higher carbon monoxide content
- C. Lower carbon dioxide content
- D. None Of Above

For every 10% increase in the excess air; the fuel consumption increases by ----- percent?

- A. 0.1 (Answer)
- B. 0.2
- C. 0.5
- D. 1.0

Main use of hard coke produced by high temperature carbonisation is in the ----- ?

- A. Iron blast furnace (Answer)
- B. Cupola in foundries
- C. Sinter making
- D. Domestic ovens

Percentage of carbon monoxide in blast furnace gas may be around ----- ?

- A. 8
- B. 14
- C. 22 (Answer)
- D. 52

Which is the most matured coal ?

- A. Lignite

- B. Bituminous
- C. Semi-anthracite
- D. Anthracite (Answer)

Pitch creosote mixture (PCM) as compared to furnace oil is a better fuel, because its -----?

- A. Emissivity factor is higher
- B. Sulphur content is lower
- C. Flue gas has lower dew point thereby facilitating more waste heat recovery
- D. All A., B. and C. (Answer)

Incomplete combustion of a fuel is characterised by the high ----- in the flue gas?

- A. Smoke
- B. Temperature
- C. Oxygen
- D. Carbon monoxide (Answer)

Very ----- coals are completely devoid of cokability i.e., it is non-coking ?

- A. Young
- B. Mature
- C. Both A & B (Answer)
- D. Neither A nor B

High excess air in combustion of fuels results in-----?

- A. Increased fuel consumption (Answer)
- B. Incomplete combustion
- C. Smoky flame
- D. None Of Above

“Micum Index” of a coke is a measure of its-----?

- A. Reactivity
- B. Porosity
- C. Bulk density
- D. Hardness & strength (Answer)

----- has the widest inflammability limit (explosion limit) of all the gases?

- A. Hydrogen
- B. Carbon monoxide
- C. Acetylene (Answer)
- D. Methane

A good metallurgical coke-----?

- A. Should have high porosity (Answer)
- B. Should be brittle
- C. Must contain moderate quantities of ash, moisture, sulphur and volatile matters
- D. Should have low fusion point

The cuprous chloride used in orsat apparatus can absorb-----?

- A. Only CO
- B. Both CO and CO₂
- C. Both CO and O₂
- D. All CO, CO₂, and O₂ (Answer)

A gaseous fuel in order to develop luminosity on burning, must contain -----?

- A. Carbon monoxide
- B. Hydrocarbons (Answer)
- C. Hydrogen
- D. Oxygen

L.D. converter gas (produced in steel plant) comprises mainly of -----?

- A. CO (upto 65%) & CO₂ (Answer)
- B. CO₂ & H₂
- C. CO & O₂
- D. CO₂ & O₂

Highly caking coals-----?

- A. Produce weak coke
- B. Produce strong coke
- C. May damage the coke oven walls during carbonisation
- D. Both B. and C. (Answer)

The hottest part of the flame lies in its ----- zone?

- A. Non-luminous (Answer)
- B. Luminous
- C. Yellow
- D. Unburnt gases

The average molecular weight of a flue gas having the composition by volume as $\text{CO}_2 = 25\%$, $\text{O}_2 = 25\%$, $\text{N}_2 = 50\%$ will be-----?

- A. 27.6
- B. 23 (Answer)
- C. 47.3
- D. 42.9

Optimum preheating temperature for pitch creosote mixture (PCM) which is also termed as C.T.F-200, before atomisation through burners is-----?

- A. 200 °F (Answer)
- B. 200 °C
- C. 200 °K
- D. 200 °R

Gross calorific value will be equal to the net calorific value for -----?

- A. H_2
- B. C_2H_2
- C. CO (Answer)
- D. C_2H_6

Which of the following is not endothermic ?

- A. Cracking
- B. Reforming
- C. Gasification
- D. Partial oxidation (Answer)

Cannel coal and boghead coal are the examples of -----?

- A. Humic coals
- B. Liptobiolites
- C. Sapropelic coals (Answer)

D. None Of Above

Main constituent of the gas produced from a gober gas plant is-----?

A. CO₂

B. CH₄ (Answer)

C. H₂

D. CO

Caking index of the coal blend used for the manufacture of metallurgical coke should be around-----?

A. 5

B. 21 (Answer)

C. 40

D. 48

'Wind loss' resulting from unscientific storage of coal may be the order of about ----- percent?

A. 2.5 (Answer)

B. 7.5

C. 10.5

D. 14.5

Laboratory gas is obtained by the cracking of-----?

A. Gasoline

B. Diesel

C. Fuel oil

D. Kerosene (Answer)

Coal is pulverised before burning in large capacity boiler furnaces mainly to----- Chemical Engineering

A. Ensure its complete combustion (Answer)

B. Facilitate easy ash removal

C. Enhance its calorific value

D. Provide trouble free operation

Mott and Wheeler test is conducted on coke to find its -----?

A. Reactivity with O₂ (Answer)

B. Abradability

- C. Phosphorus content
- D. Volatile matter content

A coal having high volatile matter content will -----?

- A. Give less yield of tar and gas on carbonisation
- B. Burn with a small non-smoky flame
- C. Have a very high calorific value
- D. (Answer)

Combustion reaction of fuels is a/an ----- reaction?

- A. Auto catalytic
- B. Exothermic (Answer)
- C. Endothermic
- D. None Of Above

A fuel containing carbon and carbon monoxide (but containing no hydrogen or its compounds) is burnt in pure oxygen at constant pressure. Its gross calorific value as compared to net calorific value will be-----?

- A. More
- B. Less
- C. Same (Answer)
- D. Data insufficient; can't be predicted

Bomb calorimeter can be used to determine the ----- of the coal?

- A. Sulphur content
- B. Calorific value
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

Largest constituent of coke oven gas is-----?

- A. N₂
- B. H₂ (Answer)
- C. CH₄
- D. CO₂

The maximum adiabatic flame temperature in air is ----- the maximum flame temperature in pure oxygen?

- A. Lower than (Answer)
- B. Higher than
- C. Same as
- D. Not related to

The main drawback of supplying more excess air in the combustion of fuel is the-----?

- A. Excessive power requirement of air blower
- B. Enhanced sensible heat loss in the flue gas (Answer)
- C. Intermittent and uncontrolled combustion of the fuel
- D. High exit flue

Bunsen burner is an example of a/an ----- burner?

- A. Inside mixing/premix type (Answer)
- B. Outside mixing/diffusion flame/nozzle mix type
- C. Rotary cup
- D. Submerged combustion

Bulk density of pulverised coal may be about ----- kg/m³?

- A. 100
- B. 500 (Answer)
- C. 1000
- D. 1500

Which of the following would require least amount of secondary air for combustion ?

- A. Coke breeze containing 25% ash and 2% volatile matter (Answer)
- B. Anthracite containing 10% volatile matter and 8% ash
- C. Bituminous coal containing 20% ash and 25% volatile mat
- D.

Calorific value of blast furnace gas is around ----- KCal/Nm³?

- A. 850 (Answer)
- B. 1800
- C. 4200
- D. 6500

Nitrogen in coal-----?

- A. Is present upto 1-2%
- B. Comes from protein in parent vegetable matter
- C. Is recovered as ammonia during its carbonisation
- D. All A., B. and C. (Answer)

The gas which contributes maximum to the heating value of natural gas is -----?

- A. CO
- B. CO₂
- C. H₂
- D. CH₄ (Answer)

To avoid fire by spontaneous combustion of coal due to its low temperature oxidation, it should be stored in-----?

- A. Shallow and small piles (Answer)
- B. Fine sizes without the presence of any lump
- C. Closed space without any ventilation facility
- D. Large heaps with small surface to volume

Washing of coal decreases its-----?

- A. Caking index
- B. Mineral matter content (Answer)
- C. Ash content
- D. Both B. and C.

In flue gas analysis by Orsat's apparatus, carbon monoxide is absorbed by-----?

- A. Cuprous chloride (Answer)
- B. Potassium hydroxide
- C. Alkaline pyrogallol solution
- D. None Of Above

In case of pulverised coal fired steam boiler, the secondary air serves the main purpose of-----?

- A. Transportation of coal
- B. Drying of coal
- C. Combustion of coal by supplying it around the burner (Answer)
- D. Preheating the primary air

----- of the coal is the basis for Saylor's coal classification?

- A. Proximate analysis
- B. Ultimate analysis (Answer)
- C. Caking index
- D. Calorific value

The shift conversion reaction taking place during water gas manufacture is given by-----?

- A. $C + H_2O \leftrightarrow CO + H_2$
- B. $C + 2H_2O \leftrightarrow CO_2 + 2H_2$
- C. $CO + H_2O \leftrightarrow CO_2 + H_2$ (Answer)
- D. None Of Above

Main component of sewage gas produced during anaerobic decomposition of organic waste (by suitable bacteria) during sewage disposal is -----?

- A. H_2
- B. CH_4 (Answer)
- C. CO_2
- D. N_2

Caking index of a coal is a measure of its -----?

- A. Abradability
- B. Reactivity
- C. Agglutinating (binding) properties (Answer)
- D. Porosity

Buna-S is also called-----?

- A. Polyurethane
- B. SBR (Answer)
- C. Teflon
- D. Bakelite

Which of the following is not a polymer of two monomers ?

- A. Teflon (Answer)
- B. Bakelite

- C. SBR
- D. None Of Above

Most commonly used rubber vulcanisation agent is -----?

- A. Sulphur (Answer)
- B. Bromine
- C. Platinum
- D. Alumina

Liners of bags are usually made of -----?

- A. Polythene
- B. PVC
- C. Polypropylene (Answer)
- D. Polyesters

----- is an addition polymer ?

- A. Nylon
- B. Bakelite
- C. Polythene (Answer)
- D. None Of Above

Which of the following is an elastomer ?

- A. Thiokol (Answer)
- B. Phenol formaldehyde
- C. Urea formaldehyde
- D. Polystyrene

Plastic tubes & pipes are generally made by ----- moulding?

- A. Injection
- B. Transfer
- C. Extrusion (Answer)
- D. Compression

Diphenylamine is added to rubber to-----?

- A. Vulcanise it

- B. Protect it from deterioration on exposure to air (Answer)
- C. Make it non-inflammable
- D. Make it thermosetting

Temperature maintained in the emulsion polymerisation reactor for PVC manufacture is about ----- °C?

- A. -20
- B. 50 (Answer)
- C. 250
- D. 500

Plastic articles are normally produced by ----- moulding?

- A. Green sand
- B. Injection (Answer)
- C. Shell
- D. Dry sand

Low pressure Zeigler process for the manufacture of polythene uses a catalyst which is-----?

- A. Ni
- B. V₂O₅
- C. Fe
- D. Aluminium triethyl combined with titanium tetrachloride (Answer)

Polycaprolactam (Nylon – 6) is produced by the condensation polymerisation of caprolactam at 240-280°C in which the conversion of caprolactam is about ----- percent?

- A. 50
- B. 75
- C. 90 (Answer)
- D. 99

Cellulose acetate has very high film permeability among all the polymers of the order of 5000 gm/100 m². Which of the following polymers has the maximum film elongation (of the order of 100%) ?

- A. Water impermeable cellophane
- B. Polythene (Answer)
- C. Cellulose acetate
- D. Teflon

The physical state in which polymers exist is-----?

- A. Melts & rubber like state
- B. Amorphous glassy state
- C. Partially crystalline state
- D. All A., B. and C. (Answer)

Alkyd resin is a/an-----?

- A. Polyamide
- B. Polyester (Answer)
- C. Polyolefin
- D. Addition polymer

Ion exchange resins are made of-----?

- A. Lucite
- B. Sulphonated Bakelite (Answer)
- C. Polystyrene
- D. Teflon

Bristles of tooth brushes are made of-----?

- A. Nylon-6
- B. Nylon-66 (Answer)
- C. Polystyrene
- D. PVC

Most of the plastics are safe to be used upto a maximum temperature of ----- °C?

- A. 100
- B. 150 (Answer)
- C. 350
- D. 450

Contact lenses for eyes are made of Perspex, which is nothing but-----?

- A. poly-methyl-methacrylate (Answer)
- B. Polystyrene
- C. Unsaturated polyester
- D. Polypropylene

Which of the following is not a polyolefin ?

- A. Polystyrene
- B. Polypropylene
- C. Neoprene (Answer)
- D. None Of Above

Vulcanisation of raw rubber makes it-----?

- A. Soft
- B. Less elastic (Answer)
- C. Plastic
- D. Tacky

Poly-methyl-methacrylate, which is an acrylic resin, is also called -----?

- A. Thiokol
- B. Plexiglass or Lucite (Answer)
- C. Dacron
- D. Teflon

Alkyd resin cannot be used for making-----?

- A. Plasticiser
- B. Paint & varnish
- C. Fibers (Answer)
- D. Film forming materials

Buna-N is also called-----?

- A. Butyl rubber
- B. Nitrile rubber (Answer)
- C. Neoprene
- D. Thiokol

Molecular weight of polymers are in the range of-----?

- A. 10 to 103
- B. 102-107 (Answer)
- C. 107-109

D. 109-1011

Nitrile rubber is produced by the polymerisation of-----?

- A. Acrylonitrile & butadiene (Answer)
- B. Acrylonitrile & styrene
- C. Isobutylene & isoprene
- D. None Of Above

Epoxy resin is-----?

- A. Not used for surface coating
- B. A good abrasive (Answer)
- C. An elastomer
- D. A polyester

Lavatory cisterns are normally made of -----?

- A. Expanded polystyrene (Answer)
- B. Saturated polyester
- C. Perspex
- D. PVC

Temperature and gage pressure maintained during the manufacture of hot SBR (styrene butadiene rubber) are-----?

- A. 50°C and 3 – 4 kg/cm² (Answer)
- B. 50°C and 1 kgf/cm²
- C. 250°C and 10 kgf/cm²
- D. 250°C and 1 kgf/cm²

Glyptal used in the manufacture of paints & lacquers is a ----- polymer?

- A. Polyamide
- B. Polystyrene
- C. Polyester (Answer)
- D. Polyacrylonitrile

Main constituent of cotton fiber is -----?

- A. Lignin

- B. Cellulose (Answer)
- C. Starch
- D. Gelatine

Cation exchange resins (0.3 to 1 mm size) used in water treatment is prepared from ----- resins?

- A. Epoxy
- B. Phenol formaldehyde
- C. Urea formaldehyde (Answer)
- D. Melamine formaldehyde

Thermoplastic resins usually-----?

- A. Remain hard as long as they are hot
- B. Cannot be reclaimed from waste
- C. Permanent setting resins
- D. Less brittle than thermosetting resins (Answer)

Cross linked polymers formed from bi-and trifunctional groups in which cross-linkage in three dimensions via few chemical bonding across linear chains occur imparts to the polymer ----- properties?

- A. Thermoplastic
- B. Thermosetting
- C. Elastometric (Answer)
- D. Brittleness

Low pressure Zeigler process of polythene manufacture-----?

- A. Employs a pressure of 30 kgf/cm²
- B. Achieves an yield of 95-98% based on ethylene (Answer)
- C. Produces very low density polythene
- D. Does not use any catalyst for polymeri

----- practically possess no elasticity?

- A. Vulcanite or ebonite (Answer)
- B. Spandex fibre
- C. Polysulphide rubber
- D. Epoxy resin

Buna-S is a ----- material?

- A. Fibrous
- B. Plastic
- C. Resinous
- D. Rubbery (Answer)

Which of the following natural bio polymers are formed as a result of polymerisation of amino-acids ?

- A. Starch
- B. Cellulose
- C. Proteins (Answer)
- D. Nucleic acids

----- resins are produced by the condensation polymerisation of formaldehyde with urea or melamine?

- A. Epoxy
- B. Amino (Answer)
- C. Alkyd
- D. Phenolic

Condensation polymerisation of ----- produces Bakelite?

- A. Propylene
- B. Phenol & formaldehyde (Answer)
- C. Phenol & acetaldehyde
- D. Urea & formaldehyde

Polystyrene is a ----- plastic at room temperature?

- A. Ductile
- B. Brittle (Answer)
- C. Malleable
- D. None Of Above

SBR is produced by the copolymerisation of butadiene & styrene by employing emulsion polymerisation. The weight ratio of styrene and butadiene is maintained at-----?

- A. 1: 3 (Answer)
- B. 3 : 1
- C. 1 : 2
- D. 2 : 1

A copolymer of vinyl and vinylidene chloride is called-----?

- A. Treylene
- B. Orlon
- C. Saran (Answer)
- D. Dacron

Poly-methyl-methacrylate (PMMA) is known as-----?

- A. Bakelite
- B. Teflon
- C. Perspex (Answer)
- D. Nylon-6

Molecular weights of plastics ranges from-----?

- A. 1000 to 5000
- B. 5000 to 1000
- C. 20000 to 25000 (Answer)
- D. 109 to 1011

In a cross linked polymer, the monomeric units are linked together to constitute a three dimensional network.

Which of the following is a cross-linked polymer ?

- A. Bakelite (phenol formaldehyde) (Answer)
- B. Polyester
- C. Polythene
- D. Nylon-6

Polyvinyl alcohol is used as a-----?

- A. Cation/anion exchanger
- B. Water soluble adhesive (Answer)
- C. Textile fibre
- D. Non-sticky coating on frying pans

Caprolactam, a raw material for the manufacture of nylon-6, is produced from-----?

- A. Phenol
- B. Naphthalene

- C. Benzene (Answer)
- D. Pyridine

The conversion of caprolactam in the above case is about ----- percent?

- A. 25
- B. 50
- C. 70
- D. 90 (Answer)

Styrene butadiene rubber (SBR) as compared to natural rubber has-----?

- A. Poor tensile strength
- B. Poorer resistance
- C. Greater amount of heat build up heavy loading
- D. All A., B. and C. (Answer)

The synthetic fibres produced from ----- are known as rayon?

- A. Lignin
- B. Cellulose (Answer)
- C. Polyamides
- D. Ethylene glycol

----- polymer is used for making unbreakable crockery?

- A. Thermoplastic
- B. Melamine (Answer)
- C. Addition
- D. None Of Above

Neoprene is the trade name of-----?

- A. Polyurethane
- B. Phenol formaldehyde
- C. Polychlorophrene (Answer)
- D. Styrene butadiene rubber (SBR)

Polythene is a/an-----?

- A. Addition polymerisation product (Answer)

- B. Condensation polymerisation product
- C. Thermosetting material
- D. None Of Above

Mastication of rubber means-----?

- A. Its softening (Answer)
- B. A treatment to retard its deterioration due to oxidation
- C. Improving its curing rate
- D. Depression of its freezing point

Which of the following types of polymers has the strongest inter particle forces ?

- A. Elastomers
- B. Fibres
- C. Thermoplastics
- D. Thermosetting polymers (Answer)

Natural rubber is obtained from latex, which is a colloidal dispersion of rubber in water. Which of the following is used as a coagulant in latex ?

- A. Ammonium alum
- B. Potassium alum
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

Nylon-6 as compared to nylon-66 is-----?

- A. Harder
- B. More abrasion resistant
- C. Having higher melting point
- D. (Answer)

Polypropylene compared to polythene is-----?

- A. Harder
- B. Stronger
- C. Lighter
- D. All A., B. and C. (Answer)

Zeigler process-----?

- A. Produces high density polythene (Answer)
- B. Uses no catalyst
- C. Produces low density polythene
- D. Employs very high pressure

Neoprene which is used for making shoe heels & belts is superior to natural rubber in its stability to aerial oxidation and resistance to oils & other solvents. The monomer used for making neoprene is-----?

- A. Chloroethane
- B. Chloroprene (Answer)
- C. Isoprene
- D. None Of Above

Orlan fibre which is used as a wool substitute is -----?

- A. An amorphous polymer
- B. A natural polymeric fibre
- C. Polyacrylonitrile (Answer)
- D. Poly-methyl-methacrylate (PMMA)

Teflon is-----?

- A. Phenol formaldehyde
- B. An inorganic polymer
- C. Polytetrafluroethylene (PTFE) (Answer)
- D. A monomer

The main use of butadiene is-----?

- A. As a plasticiser for unsaturated polyester
- B. In the manufacture of synthetic rubber (Answer)
- C. As an anti-skimming agent in paint
- D. None Of Above

In case of dry spinning of polymers, the polymer solution in a volatile solvent is forced through the spinnerates into a warm air chamber, where the solvent evaporates leaving behind the polymer in the filament form. Dry spinning is used for ----- fibres?

- A. Polythene
- B. PVC (Answer)

- C. Rayon
- D. Polyvinyl acetate

Automobile steering wheels are normally made of-----?

- A. Cellulose acetate (Answer)
- B. Cellulose nitrate
- C. PVC
- D. High density polythene

Tyres are made by-----?

- A. Injection moulding
- B. Extrusion
- C. Rotational moulding (Answer)
- D. Compression moulding

Celluloid is-----?

- A. Cellulose acetate
- B. Regenerated cellulose
- C. Cellulose nitrate (Answer)
- D. Cellulose acetate butyrate

Cation exchange resins used in water treatment is made from ----- resin?

- A. Urea formaldehyde (Answer)
- B. Epoxy
- C. Amino
- D. Phenolic

Fillers such as zinc oxide and carbon black are added to the crude natural rubber before vulcanisation in order to improve its-----?

- A. Elasticity
- B. Strength
- C. Plasticity
- D. Weathering characteristics (Answer)

Silicone resins, which are highly water repellent and has good heat resistance cannot be used-----?

- A. As room temperature adhesive (Answer)
- B. As grease & lubricant
- C. Hydraulic fluid for heat transfer
- D. Resin for lamination

Transistor parts and refrigerator components are normally made of-----?

- A. Polystyrene (Answer)
- B. Polyester
- C. High density polythene
- D. Polyurethane

Which of the following has the weakest intermolecular forces ?

- A. Polyisoprene (Answer)
- B. Nylon-66
- C. Polystyrene
- D. Bakelite

Epoxy resin is a polymer containing two or more groups of the bellow fig. is called epoxide group or ethoxyline group. It is a -----?

- A. Polyamide & an elastomer
- B. Good adhesive
- C. Surface coating agent
- D. Both B. and C. (Answer)

Which of the following is an inorganic polymer ?

- A. Teflon
- B. Perspex
- C. Silicones (Answer)
- D. Bakelite

Polyurethane cannot be used for making-----?

- A. Mattresses & foam
- B. Coating material
- C. Adhesives
- D. Bottles (Answer)

Which one is the radioactive isotope of hydrogen ?

- A. Deuterium
- B. Ortho-hydrogen
- C. Tritium (Answer)
- D. None Of Above

Candu reactor is a ----- nuclear reactor?

- A. Natural uranium fuelled heavy water cooled & moderated (Answer)
- B. Highly enriched uranium (85% U-235) fuelled
- C. Homogeneous
- D. Fast breeder

Heavy water is used as a moderator in a -----?

- A. Pressurised water reactor (PWR)
- B. Boiling water reactor (BWR)
- C. Candu reactor (Answer)
- D. Molten sodium cooled reactor

Which is a fertile nuclear fuel ?

- A. U-233
- B. U-235
- C. Pu-239
- D. Th-232 (Answer)

Which is a fertile nuclear fuel ?

- A. U-233
- B. U-235
- C. Pu-239
- D. Th-232 (Answer)

Enriched uranium means that, it contains-----?

- A. More than 0.71% of U-235 (Answer)
- B. Only fertile material
- C. Only fissile material
- D. No impurities

Enriched uranium means that, it contains-----?

- A. More than 0.71% of U-235 (Answer)
- B. Only fertile material
- C. Only fissile material
- D. No impurities

The decay product of tritium (a beta emitter) is-----?

- A. Lithium
- B. Helium (Answer)
- C. Deuterium
- D. Hydrogen

The decay product of tritium (a beta emitter) is-----?

- A. Lithium
- B. Helium (Answer)
- C. Deuterium
- D. Hydrogen

A radioactive isotope undergoes decay with respect to time following ----- law?

- A. Logarithmic
- B. Exponential (Answer)
- C. Linear
- D. Inverse square

'Light water' used as a coolant in nuclear reactor is nothing but-----?

- A. Ordinary water (Answer)
- B. Mildly acidic (pH = 6) water
- C. Mildly alkaline (pH = 8) water
- D. None Of Above

How many atoms are present in one gm-atom of an element ?

- A. 2×10^{23}
- B. 6×10^{23} (Answer)
- C. 6×10^{32}

D. 5×10^5

Which of the following is a fuel for a fusion reactor (thermonuclear reactor) ?

- A. Deuterium and tritium (Answer)
- B. U-233
- C. Thorium
- D. Heavy water

Nuclear fuel complex, Hyderabad is engaged in the job of -----?

- A. Manufacture of nuclear fuel elements/assemblies (Answer)
- B. Processing of uranium ore
- C. Treatment of spent fuel
- D. None Of Above

Which of the following is not, a fertile material ?

- A. Th-232
- B. U-238
- C. U-233 (Answer)
- D. None Of Above

Which of the following is a non-fissile material ?

- A. Plutonium-239
- B. Uranium-235
- C. Uranium-233
- D. Thorium-232 (Answer)

The new nucleus formed after β^- -decay of a radioactive element has-----?

- A. Less atomic number (Answer)
- B. Less atomic weight
- C. More atomic number
- D. More atomic weight

If 4 gm of a radioisotope has a half life period of 10 days, the half life of 2 gm of the same isotope will be ----- days?

- A. 5

- B. 10 (Answer)
- C. 20
- D. 30

The critical mass of a fissionable material can be reduced by-----?

- A. Heating it
- B. Cooling it
- C. Surrounding it by neutron reflecting material (Answer)
- D. Surrounding it by neutron absorbing material

Energy equivalent to one atomic mass unit (amu) is ----- MeV?

- A. 9.31
- B. 93.1
- C. 931 (Answer)
- D. 9310

Which of the following is the most harmful for the human being ?

- A. γ -rays (Answer)
- B. X-rays
- C. β -rays (Answer)
- D. Ultra violet rays

A fast breeder reactor employs-----?

- A. Graphite as moderator
- B. Water as coolant
- C. Molten sodium as coolant as well as moderator
- D. U-235 as fuel (Answer)

Both tritium and deuterium have the same number of-----?

- A. Neutrons (Answer)
- B. Electrons
- C. Protons
- D. Nucleons

Main source of ----- is monazite sand?

- A. Uranium
- B. Polonium
- C. Hafnium
- D. Thorium (Answer)

Artificially produced radioactive isotopes are used for-----?

- A. Power generation
- B. Treatment of certain diseases (Answer)
- C. Initiating nuclear fission and fusion
- D. All A., B. and C.

Which one is different for the neutral atoms of the isotopes of an element ?

- A. Atomic weights (Answer)
- B. Atomic numbers
- C. Number of protons
- D. Number of electrons

Uranium is recovered from its ore (pitchblende) by-----?

- A. Froth floatation technique
- B. Leaching with sulphuric acid (Answer)
- C. Smelting in a furnace
- D. Dissolving in water

Which of the following is not an ore of uranium ?

- A. Pitchblende
- B. Kyanite (Answer)
- C. Carnotite
- D. Rescolite

Which of the following may be used to measure the rate of nuclear disintegration ?

- A. Geiger-Muller Counter (Answer)
- B. Cyclotron
- C. Cold chamber
- D. Mass spectrograph

Pressure of CO₂ gas (which is a coolant) in the Calder-Hall nuclear reactor is ----- kgf/cm²?

- A. 0.2
- B. 7 (Answer)
- C. 35
- D. 50

Hydrogen bomb employs the nuclear fusion of ----- ?

- A. Hydrogen
- B. Deuterium (Answer)
- C. Tritium
- D. Helium

Coolant used in a fast breeder reactor is-----?

- A. Molten sodium (Answer)
- B. Heavy water
- C. Ordinary water
- D. Helium

Uranium Corporation of India Limited (UCIL) engaged in the mining & concentration of uranium ore is located at-----?

- A. Alwaye (in Kerala)
- B. Jadugoda (in Jharkhand) (Answer)
- C. Kalpakkam (in Tamilnadu)
- D. Gopalpur coast (in Orissa)

Which of the following types of nuclear reactors is most prone to radioactive hazards ?

- A. Pressurised water reactor
- B. Gas cooled reactor
- C. Molten sodium cooled reactor
- D. Boiling water reactor (Answer)

A control rod-----?

- A. Should have small absorption cross-section
- B. Is generally made of boron, hafnium or cadmium
- C. Should have large absorption cross-section
- D. Both B. and C. (Answer)

The ratio of volume of an atom to that of its nucleus is-----?

- A. 10¹² (Answer)
- B. 10⁻¹²
- C. 10⁻⁸
- D. 10⁸

Heavy water used in the nuclear reactors to slow down the speed of neutrons is -----?

- A. Highly purified water
- B. A compound of oxygen and deuterium (Answer)
- C. Water having dissolved salts of heavy metals
- D. None Of Above

Solar energy results from ----- reaction?

- A. Fission
- B. Combustion
- C. Thermonuclear (Answer)
- D. None Of Above

Emission of α -particles during radioactive decay of a substance is from-----?

- A. Innermost shell
- B. Nucleus (Answer)
- C. Outermost shell
- D. None Of Above

Which of the following nuclear reactors is the most efficient thermodynamically while operating between the same temperature and pressure limits of the reactor ?

- A. Molten sodium cooled
- B. CO₂ gas cooled
- C. Pressurised water
- D. Boiling water (Answer)

Which of the following is not a naturally occurring nuclear fuel ?

- A. Uranium-238
- B. Thorium-233

- C. Plutonium-239 (Answer)
- D. None Of Above

Safety rods provided in nuclear reactors to guard against accidents, in case of earthquake are made of-----
-?

- A. High carbon steel
- B. Molybdenum
- C. Zircaloy
- D. Boron or cadmium (Answer)

Percentage of U-238 in natural uranium is around-----?

- A. 0.71
- B. 99.29 (Answer)
- C. 0.015
- D. 29.71

Which of the following is not a good moderating material ?

- A. Concrete
- B. Boron
- C. 18/8 stainless steel
- D. All A., B. and C. (Answer)

The electric power generation cost in nuclear power plant is less than that in a coal based thermal power plant, mainly because the-----?

- A. Fuel cost per unit power generated is less (Answer)
- B. Thermal efficiency of the former is higher
- C. Maintenance cost of the former is less
- D. None Of Above

Which is used as a coolant in nuclear reactor due to its high capture cross-section ?

- A. H₂ (Answer)
- B. N₂
- C. He
- D. CO₂

?-rays emission in radioactive disintegration is always accompanied by the emission of-----?

- A. ?-rays (Answer)
- B. ?-rays (Answer)
- C. Neutrons
- D. None Of Above

Final product of uranium extraction plant at Jadugoda (Bihar) is-----?

- A. Uranium
- B. Uranium oxide
- C. Uranium carbide
- D. Magnesium diuranate (Answer)

Thorium-232 (a fertile material) on absorption of a neutron gets converted into ---- , which is a fissile material?

- A. Thorium-233
- B. Uranium-235
- C. Uranium-233 (Answer)
- D. Plutonium-239

Plutonium-----?

- A. Is recovered from spent fuel from thermal nuclear reactor
- B. Has much lower melting point (640°C) compared to thorium (1690°C)
- C. Both A. and B. (Answer)
- D. Neither A. no

Which of the following ores contains maximum percentage of uranium ?

- A. Carnotite
- B. Thorium
- C. Rescolite
- D. Pitchblende (Answer)

In nuclear reactions, ----- number is conserved?

- A. Mass
- B. Atomic
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

Net efficiency of ordinary light water cooled nuclear reactor is about ----- percent?

- A. 32 (Answer)
- B. 52
- C. 72
- D. 88

Which of the following may not need a moderator ?

- A. Candu reactor
- B. Fast breeder reactor (Answer)
- C. Homogeneous reactor
- D. Pressurised water reactor

Graphite is used in nuclear reactor as-----?

- A. Insulation lining of the reactor
- B. Fuel
- C. Lubricant
- D. Retarder of neutron velocity (Answer)

Which of the following factors is the most important in the site selection for a nuclear power plant ?

- A. Absence of earthquake prone zone in nearby areas (Answer)
- B. Abundant availability of water
- C. Remotely located from residential areas
- D. Proximity to fuel source

A nuclear reactor can't be used for-----?

- A. The production of radioisotopes
- B. Supplying intense fields or beams of neutron for scientific experiments
- C. Marine ship propulsion
- D. (Answer)

Use of molten metal as a coolant in fast breeder reactor helps in-----?

- A. Rapid heat transfer from the core (Answer)
- B. Accelerating the reaction rate in the core
- C. Breeding neutrons

D. Accelerating the neutrons

Isotopes of an element have the same-----?

- A. Number of neutrons
- B. Mass number
- C. Electronic configuration (Answer)
- D. Atomic weight

Thorium can be converted into U-233 in a ----- reactor?

- A. Liquid metal cooled
- B. Fast breeder (Answer)
- C. Thermal
- D. Swimming pool

Number of secondary neutron emitted on fission of an atom of U-235 by slow neutron bombardment is-----
-?

- A. 3 (Answer)
- B. 235
- C. 200
- D. 92

The decrease in the atomic number is not observed in case of-----?

- A. Electron capture
- B. β^- -emission (Answer)
- C. β^+ -emission (Answer)
- D. Positron emission

Radioactive decay of a material involves a ----- order reaction?

- A. Third
- B. Second
- C. First (Answer)
- D. Zero

Out of the following places, a nuclear power plant is not located at-----?

- A. Talcher (Orissa) (Answer)

- B. Kaiga (Karnataka)
- C. Rawatbhata (Rajasthan)
- D. Kalpakkam (Tamilnadu)

Unit of radioactivity is-----?

- A. Barn
- B. Fermi
- C. Angstrom
- D. Curie (Answer)

Liquid metal (e.g., molten sodium) is preferred as a coolant in case of a/an ----- reactor?

- A. Homogeneous
- B. Graphite moderated
- C. Fast breeder (Answer)
- D. Enriched uranium (3% U-235) fuelled

The half life period of a radioactive substance is best determined by counting the number of alpha particles emitted per second in a Geiger Muller counter from its known quantity. If the half life period of a radioactive substance is one month, then-----?

- A. 3/4th of it will disintegrate in two months
- B. It will completely disintegrate in two months (Answer)
- C. It will completely disintegrate in four months
- D. 1/8th of it will

Fuel for a nuclear reactor (thermal) is-----?

- A. Uranium (Answer)
- B. Plutonium
- C. Radium
- D. None Of Above

Fast breeder nuclear reactors using enriched uranium as fuel may contain upto a maximum of ----- percent of U-235 (i.e. fissile material)?

- A. 15
- B. 45
- C. 65
- D. 85 (Answer)

Primary purpose of a ----- nuclear reactor is to supply a high neutron flux of the order of 10^{13} to 10^{14} neutrons/cm² second?

- A. Research (Answer)
- B. Power
- C. Breeder
- D. Homogeneous

The time taken for a radioactive element to reduce to 50% of its original weight is ----- years, if its half life period is 12 years?

- A. 24
- B. 18 (Answer)
- C. 6
- D. 36

The number of neutrons accompanying the formation of $^{139}_{54}\text{Xe}$ and $^{94}_{38}\text{Sr}$ from the absorption of a slow neutron by $^{235}_{92}\text{U}$, followed by nuclear fission is -----?

- A. 1
- B. 2
- C. 3 (Answer)
- D. 4

The frequency at which maximum amplitude ratio is attained is called the ----- frequency?

- A. Corner
- B. Resonant (Answer)
- C. Cross-over
- D. Natural

Thermocouple is suitable for measuring-----?

- A. Liquid temperatures only
- B. Very high temperatures only
- C. Very low temperatures only
- D. Both high and low temperatures (Answer)

For the time domain function $f(t) = t$, the Laplace transform of $\int_0^t f(t) dt$ is given by-----?

- A. 1/2 S3
- B. 2/S3
- C. 1/S3 (Answer)
- D. 2/S2

Phase margin is equal to-----?

- A. 180° – phase lag (Answer)
- B. Phase lag – 180°
- C. Phase lag + 180°
- D. Phase lag + 90°

Continuous flue gas analyser makes use of paramagnetic properties of some of its constituents, which move towards the strongest part of the magnetic field thus displacing diamagnetic gases. Which of the following gases is diamagnetic ?

- A. CO₂ (Answer)
- B. O₂
- C. NO
- D. NO₂

A non-linear chemical system is exemplified by a/an-----?

- A. Isothermal CSTR
- B. Mixer
- C. Non-isothermal CSTR (Answer)
- D. None Of Above

All the thermocouples used for temperature measurement use dissimilar metal -----?

- A. Strips
- B. Bars
- C. Wires (Answer)
- D. Beads

Dead zone is the-----?

- A. Same as time constant
- B. Same as transportation lag
- C. Maximum change in the variable that does not change the reading of the instrument (Answer)
- D. None Of Above

The time constant of a unity gain, first order plus time delay process is 5 min. If the phase lag at a frequency of 0.2 rad/min is 60° , then the dead time (in minutes) is-----?

- A. $5\pi/12$ (Answer)
- B. $\pi/6$
- C. $\pi/12$
- D. $\pi/3$

The transfer function for a P-D controller is-----?

- A. $K_c(1+\pi D s)$ (Answer)
- B. $K_c(1 + 1/\pi D s)$
- C. $K_c \pi D s$
- D. $K_c/\pi D s$

Water is entering a storage tank at a temperature T_0 and flow rate Q_0 and leaving at a flow rate Q and temperature T . There are negligible heat losses in the tank. The area of cross-section of the tank is A_0 . The model that describes the dynamic variation of temperature of water in the tank with time is given as-----?

- A. $Q_0(T_0 - T) = A_c \cdot h (dT/dt)$ (Answer)
- B. $Q_0 T_0 - Q T = A_c \cdot h (dT/dt)$
- C. $Q(T_0 - T) = A_c \cdot h (dT/dt)$
- D. $Q(T_0 - T) = A_c \cdot (dTH/dt)$

The root locus plot of the roots of the characteristics equation of a closed loop system having the open loop transfer function $K(s+1)/[2(2s+1)(3s+1)]$ will have a definite number of loci for variation of K from 0 to ∞ . The number of loci is-----?

- A. 1
- B. 2
- C. 3 (Answer)
- D. 4

Which of the following filled system expansion thermometers has the lowest positive temperature measurement capability ?

- A. Mercury in glass thermometer
- B. Alcohol in glass thermometer (Answer)
- C. Fused metal (Na or K) in steel thermometer
- D. Nitrogen in steel thermometer

Working principle of mercury in glass thermometer is-----?

- A. Volumetric expansion (Answer)
- B. Pressure rise with temperature
- C. Linear expansion
- D. None Of Above

In a closed loop system, the process to be controlled is an integrating process with transfer function $1/2s$. The controller proposed to be used is an integral controller with transfer function $1/T1s$. When a step change in set point is applied to such a closed loop system, the controlled variable will exhibit-----?

- A. Overdamped response
- B. Underdamped response (Answer)
- C. Undamped response
- D. Unstable response

A typical example of a physical system with under damped characteristic is a-----?

- A. U-tube manometer
- B. Spring loaded diaphragm valve (Answer)
- C. CSTR with first order reaction
- D. Thermocouple kept immersed in a liquid filled thermowell

"A control system is unstable, if the open loop frequency response exhibits an amplitude ratio exceeding unity at the crossover frequency." This is ----- criterion?

- A. Bode stability (Answer)
- B. Nyquist
- C. Routh stability
- D. None Of Above

Which of the following cannot measure a temperature of 1600°C ?

- A. Platinum resistance thermometer (Answer)
- B. Thermocouple
- C. Photo-electric pyrometer
- D. Radiation pyrometer

Which of the following instruments is not used for measuring sub-zero ($<0^{\circ}$) temperatures ?

- A. Platinum resistance thermometer
- B. Mercury in glass thermometer
- C. Vapor pressure thermometer
- D. Radiation pyrometer (Answer)

Maximum differential pressure in liquid manometer is ----- psi?

- A. 20
- B. 30 (Answer)
- C. 40
- D. 50

Which is the strongest paramagnetic gas ?

- A. CO₂
- B. O₂ (Answer)
- C. NO
- D. NO₂

Continuous measurement of moisture content of paper in paper industry is done by measuring the-----?

- A. Thermal conductivity through the paper
- B. Electrical resistance through the paper (Answer)
- C. Magnetic susceptibility
- D. None Of Above

McLeod gauge measures the ----- pressure?

- A. Positive
- B. Sub-atmospheric (Answer)
- C. Very high
- D. Atmospheric

According to Bode stability criterion, a system is unstable, if the open loop frequency response exhibits an amplitude ratio exceeding unity at frequency for which phase lag is-----?

- A. 0°
- B. 45°
- C. 90°
- D. 180° (Answer)

Ordinary mercury in glass thermometer is used for measuring temperature upto 120°C . However, for measuring higher temperature upto ----- $^{\circ}\text{C}$, thermometer is made by filling nitrogen under pressure above the mercury, which stops the evaporation of mercury and reduces the chance of broken thread of mercury?

- A. 250
- B. 350
- C. 550 (Answer)
- D. 700

Pyrometry refers to the measurement of temperature-----?

- A. With the mercurial thermometer upto 350°C
- B. Directly
- C. Which is of higher magnitude (Answer)
- D. All A., B. & C.

Which of the following is not suitable for measuring the temperature of a red hot object in the range of $800 - 1600^{\circ}\text{C}$?

- A. Optical pyrometer
- B. Radiation pyrometer
- C. Photoelectric pyrometer
- D. Thermocouples (Answer)

Water is flowing through a series of four tanks and getting heated as shown in figure. It is desired to design a cascade control scheme for controlling the temperature of water leaving the tank 4 as there is a disturbance in the temperature of a second stream entering the tank 2. Select the best place to take the secondary measurement for the second loop?

- A. Tank 1
- B. Tank 2
- C. Tank 3 (Answer)
- D. Tank 4

A first order system with unity gain and time constant τ is subjected to a sinusoidal input of frequency $\omega = 1/\tau$. The amplitude ratio for this system is-----?

- A. 1
- B. 0.5
- C. $1/\sqrt{2}$ (Answer)
- D. 0.25

Silver point temperature is ----- °C?

- A. 760.5
- B. 860.5
- C. 960.5 (Answer)
- D. 1060.5

What is the Laplace transform of $\sin t$?

- A. $1/(s^2 + 1)$ (Answer)
- B. $s/(1 + s^2)$
- C. $1/(s^2 - 1)$
- D. $s/(s^2 - 1)$

Thermistors which have a very high temperature co-efficient of resistivity belong to the class of solid called -----?

- A. Dielectrics
- B. Insulators
- C. Semi conductors (Answer)
- D. Conductors

Which of the following thermocouples can measure the maximum temperature ?

- A. Platinum-rhodium
- B. Tungsten-molybdenum (Answer)
- C. Chromel-alumel
- D. Iron-constantan

Emf generated in a thermocouple depends on the temperature -----?

- A. Of cold junction only
- B. Of hot junction only
- C. Difference between hot and cold junctions (Answer)
- D. Difference between cold junction and atmospheric temperature

Which of the following filled system expansion thermometer has the capability to measure the lowest temperature ?

- A. Mercury in glass thermometer

- B. Mercury in steel thermometer
- C. Alcohol in glass thermometer (Answer)
- D. Fused metal (Na or K) in steel thermometer

Working principle of mercury in glass thermometer is based on volumetric expansion of mercury with increase in temperature. Which of the following undergoes minimum volumetric expansion for a given temperature change ?

- A. Water
- B. Mercury (Answer)
- C. Methyl alcohol
- D. Carbon-tetrachloride

Flow rate of those fluids which are insensitive to changes in their density, viscosity or flow velocity profile can be best measured by a -----?

- A. Magnetic flowmeter (Answer)
- B. Pitot tube
- C. Flow nozzle type flowmeter
- D. Turbine flowmeter

PH meter has -----?

- A. One cell
- B. Two cells (Answer)
- C. Three cells
- D. No cell

Relationship between absorption/evolution of heat at the thermocouple junctions and the current flow in the circuit is given by ----- effect?

- A. Peltier (Answer)
- B. Thomson
- C. Seebeck
- D. None Of Above

Dilatometer is used to measure -----?

- A. Stress
- B. Strain
- C. Deflection

D. Contraction/expansion due to changes in temperature (Answer)

Working principle of disappearing filament type optical pyrometer is based on the -----?

- A. Wien's law (Answer)
- B. Seebeck effect
- C. Kirchoff's law
- D. Peltier effect

A system with a double pole at the origin is unstable since the corresponding term in the time domain-----?

- A. Is a constant
- B. Grows exponentially with time
- C. Grows linearly with time (Answer)
- D. Decays linearly with time

Gas chromatography is used for the measurement of -----?

- A. Temperature
- B. Pressure
- C. Concentration (Answer)
- D. Flow rate

Concentration of sugar solution can be determined by the-----?

- A. Polarimetry (Answer)
- B. Flame photometry
- C. Emission spectroscopy
- D. Oscillometry

A constant volume gas thermometer employing ----- is used to measure sub-zero (i.e., $< 0^{\circ}\text{C}$) temperature?

- A. Helium (Answer)
- B. Hydrogen
- C. Nitrogen
- D. None Of Above

Measurement of pressure in ammonia reactor is done by -----?

- A. Bourdon gauge (Answer)
- B. U-tube manometer

- C. Inclined tube manometer
- D. Pirani gauge

Composition of alloys can be determined by -----?

- A. Polarograph (Answer)
- B. Chromatograph
- C. Refractometer
- D. None Of Above

The inverse Laplace transform of the function $f(S) = 1/S (1 + S)$ is-----?

- A. $1 + e^t$
- B. $1 - e^t$
- C. $1 + e^{-t}$
- D. $1 - e^{-t}$ (Answer)

A barometer measures the ----- pressure?

- A. Absolute (Answer)
- B. Gauge
- C. Absolute as well as gauge
- D. dynamic

A photo electric device in which the resistance of the metal is directly proportional to the light striking on it, is known as photo-conductive cell. Photoelectric transducers are used for the measurement of those parameters, which can be used to produce variation in-----?

- A. Light intensity (Answer)
- B. Current
- C. Flux density
- D. Voltage

The frequency response of a first order system, has a phase shift with lower and upper bounds given by-----?

- A. $-\pi, \pi/2$
- B. $-\pi/2, \pi/2$
- C. $-\pi/2, 0$
- D. $0, \pi/2$ (Answer)

Which of the following does not figure in the list of seven substances selected for international temperature scale ?

- A. Ice (F.P) and steam (B.P)
- B. Oxygen and sulphur (B.P)
- C. Antimony and silver (F.P)
- D. Zinc (B.P) and mercury (F.P) (Answer)

Bode diagram are generated from output response of the system subjected to which of the following input ?

- A. Impulse
- B. Step
- C. Ramp
- D. Sinusoidal (Answer)

In a single tank system, the transfer function of ----- to inlet flow rate is $1/(TS+1)$?

- A. Outlet flow rate (Answer)
- B. Level
- C. Both A. & B.
- D. Neither A. nor B.

Identify an unbounded input from inputs whose transfer functions are given below-----?

- A. 1
- B. $1/S$
- C. $1/S^2$ (Answer)
- D. $1/(S^2 + 1)$

The transfer function of a first order system is-----?

- A. $1/(Ts + 1)$ (Answer)
- B. $1/Ts$
- C. $s/(Ts + 1)$
- D. None Of Above

Find the ultimate gain and frequency for a proportional controller in the case of a process having the transfer function $G_p(s) = 1/(4s + 1)(2s + 1)(s + 1)$?

- A. $\omega = 1/\sqrt{14}$, $K_c = 45/7$?14
- B. $\omega = \sqrt{7/6}$, $K_c = 46/3$ (Answer)

- C. $w = 1$, $K_c = 13$
- D. $w = \sqrt{7/8}$, $K_c = 45/4$

Normal mercury thermometer can be used to measure a temperature of about 300°C . However, its maximum temperature measurement range can be increased upto about 500°C by-----?

- A. Filling nitrogen under pressure in the stem (Answer)
- B. Increasing the diameter of the tube
- C. Using steel tube in place of glass tube
- D. Accounting for the tube expansion

The initial value ($t = 0$) of the unit step response of the transfer function $[(s + 1)/(2s + 1)]$ is-----?

- A. 0
- B. $\frac{1}{2}$ (Answer)
- C. 1
- D. 2

Stabilising time for the controllers is the time required for the response to reach ----- percent of its ultimate value?

- A. 63.2
- B. 87.5
- C. 95 (Answer)
- D. 100

Thermistors are made of-----?

- A. Ultra pure metals
- B. Metal oxides (Answer)
- C. Iron-copper alloys
- D. Nickel-chromium alloys

A pyranometer is an instrument used for measuring the-----?

- A. Beam radiation
- B. Global radiation (Answer)
- C. Bright sunshine period
- D. None Of Above

The transfer function for an ideal proportional plus reset controller (reset time T) is-----?

- A. $K_c[1 + (1/TS)]$ (Answer)
- B. $K_c(1 + TS)$
- C. $K_c/(1 + TS)$
- D. $K_c/[1 + (s/T)]$

Radiation thermometer cannot measure the temperature -----?

- A. Inside a pressure vessel
- B. Of an object without coming in contact with it
- C. Of liquid oxygen (Answer)
- D. Of moving objects at high temperature

Which of the following thermocouples has the least temperature measurement range ?

- A. Copper-constantan (Answer)
- B. Chromel-alumel
- C. Platinum-platinum/rhodium
- D. Iron-constantan

Platinum resistance thermometer can be used upto antimony point which is ----- °C, and is the temperature of equilibrium between solid antimony & liquid antimony at normal atmospheric pressure?

- A. 961.93
- B. 630.74 (Answer)
- C. 1064.43
- D. 1261.93

Temperature of ----- cannot be measured by an optical or radiation pyrometer?

- A. Hot blast (air) from stoves (Answer)
- B. Molten slag flowing out of blast furnace
- C. Combustion space in boilers
- D. Rotary limestone calcination kiln

The Laplace transform of $\exp(at)$, where $a > 0$, is defined only for the Laplace parameter, $s > a$ since-----?

- A. The function is exponential
- B. The Laplace transform of integral of $\exp(at)$ has finite values only for $s > a$ (Answer)
- C. The Laplace transform integral of $\exp(at)$ has initial
- D.

Mercury thermometer can be used to measure the temperature upto ----- °C?

- A. 100
- B. 250
- C. 350 (Answer)
- D. 750

In a feed-back control system G and H denote open loop and close loop transfer functions respectively. The output-input relationship is-----?

- A. $G/(1 + H)$
- B. $H/(1 + G)$ (Answer)
- C. G/H
- D. H/G

On-off control which is a special case of proportional control, has a band width of about ----- percent?

- A. 100
- B. 75
- C. 25
- D. 0 (Answer)

A non-linear system will have ----- steady state values?

- A. One
- B. More than one (Answer)
- C. Two
- D. Three

McLeod gauge is used to measure the -----?

- A. Point velocity
- B. Flow rate
- C. Vacuum (Answer)
- D. Pressure

Change of angle of refraction with composition comprises the working principle of a-----?

- A. Polarimeter
- B. Polarograph

- C. Spectrometer
- D. Refractometer (Answer)

Working principle of mercury in glass thermometer is based on the ----- of mercury with increase in temperature?

- A. Increase of pressure
- B. Increase of thermal conductivity
- C. Volumetric expansion (Answer)
- D. Differential linear expansion

What is the overall transfer function (C/R) of the following block diagram if $G = G_1 \cdot G_2 \cdot G_3$ and $H = H_1 \cdot H_2$?

- A. $1/(1 + GH)$
- B. $G/(1 + GH)$ (Answer)
- C. $H/(1 + GH)$
- D. $G/(1 - GH)$

Very low pressure is expressed in microns (?), which is equal to ----- mm of Hg column (absolute) at 0°C ?

- A. 0.0001
- B. 0.001 (Answer)
- C. 0.01
- D. 0.1

The time constant of a first order process with resistance R and capacitance C is-----?

- A. $R + C$
- B. $R - C$
- C. RC (Answer)
- D. $1/RC$

A bolometer is -----?

- A. Used for the measurement of thermal radiation
- B. An element which senses optical input and delivers thermal output
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

The number of H^+ in 1 c.c solution of pH 13 is-----?

- A. 6.023×10^{13}
- B. 6.023×10^{10}
- C. 6.023×10^7 (Answer)
- D. 10^{13}

If 1.5 moles of oxygen combines with aluminium to form Al_2O_3 , then the weight of aluminium (atomic weight = 27) used in this reaction is ----- gm?

- A. 27
- B. 54 (Answer)
- C. 5.4
- D. 2.7

In physical adsorption, as compared to chemisorption, the-----?

- A. Quantity adsorbed per unit mass is higher (Answer)
- B. Rate of adsorption is controlled by the resistance to surface reaction
- C. Activation energy is very high
- D. Heat of a

Measurement of the amount of dry gas collected over water from volume of moist gas is based on the-----?

- A. Charle's law
- B. Dalton's law of partial pressures (Answer)
- C. Avogadro's hypothesis
- D. Boyle's law

How many phases are present at eutectic point ?

- A. 2
- B. 1
- C. 3 (Answer)
- D. unpredictable

The atomic heat capacities of all solid elements ----- with decrease in temperature?

- A. Increases
- B. Decreases (Answer)
- C. Remains unchanged
- D. Approach zero at 0°C

The value of the gas-law constant 'R' is 1.987 ?

- A. kcal/kg-mole.°C
- B. Btu/lb-mole.°R
- C. kcal/kg-mole.°K
- D. Both B. & C. (Answer)

Avogadro's number is equal to-----?

- A. 6.023×10^{23} molecules/kg.mole
- B. 6.023×10^{23} molecules/gm.mole (Answer)
- C. 6.023×10^{16} molecules/kg.mole
- D. 6.023×10^{26} molecules/gm.mole

The density of a liquid is 1500 kg/m³. Its value in gin/litre will be equal to-----?

- A. 1.5
- B. 15
- C. 150
- D. 1500 (Answer)

A saturated vapor on being compressed would-----?

- A. Condense
- B. Form wet steam
- C. Both A. & B. (Answer)
- D. Neither A. nor B.

A liquid is in equilibrium with its vapor at its boiling point. On an average, the molecules in the liquid and gaseous phases have equal-----?

- A. Kinetic energy (Answer)
- B. Intermolecular forces of attraction
- C. Potential energy
- D. Total energy

With rise in temperature, the solubility of ammonia in water at a fixed pressure-----?

- A. Increases
- B. Decreases (Answer)

- C. Remains unchanged
- D. Increases exponentially

One micron is equal to ----- cm?

- A. 10^{-2}
- B. 10^{-4} (Answer)
- C. 10^{-6}
- D. 10^{-8}

Kopp's rule is useful for the determination of-----?

- A. Molal heat capacities of gases
- B. Heat capacities of solids (Answer)
- C. Activation energy
- D. Heat capacities of gases

The unit of specific heat at constant pressure, C_p , in SI unit is-----?

- A. $\text{W/m}^2\text{°C}$
- B. J/kg°K (Answer)
- C. W/m°K
- D. $\text{J/m}^3\text{°K}$

For an ideal solution, the total vapor pressure varies ----- with the composition (expressed as mole fraction)?

- A. Inversely
- B. Exponentially
- C. Linearly (Answer)
- D. Negligibly

Dry air is a mixture of-----?

- A. Vapors
- B. Gases (Answer)
- C. Both A. & B.
- D. Neither A. nor B.

The reaction $A + B \rightarrow C$ has been conducted in a reactor as shown below. The numbers of balances (material) that can be made around the reactor are-----?

- A. 1
- B. 2
- C. 3 (Answer)
- D. 4

An equation for calculating vapour pressure is given by, $\log_{10} P = A - B(t + c)$. This is called the-----?

- A. Kistyakowsky equation
- B. Antoine equation (Answer)
- C. Kopp's rule
- D. Trouton's rule

A gas occupies a volume of 283 c.c at 10°C. If it is heated to 20°C at constant pressure, the new volume of the gas will be ----- c.c?

- A. 283
- B. 566
- C. 293 (Answer)
- D. 141.5

1 BTU/lb.°F is equivalent to ----- kcal/kg.°C?

- A. 1 (Answer)
- B. 2.42
- C. 1.987
- D. 4.97

Which of the following is insensitive to changes in pressure ?

- A. Heat of vaporisation
- B. Melting point
- C. Heat of fusion
- D. Both B. and C. (Answer)

°API gravity of water at N.T.P. is about-----?

- A. 0
- B. 1
- C. 10 (Answer)
- D. 100

Pick out the wrong unit conversion of heat transfer rate?

- A. $1 \text{ kcal/hr} = 1.163 \text{ Watt}$
- B. $1 \text{ Watt} = 1.163 \text{ kcal/hr}$ (Answer)
- C. $1 \text{ BTU/ft}^2\cdot\text{hr} = 2.712 \text{ kcal/m}^2\cdot\text{hr}$
- D. $1 \text{ kcal/m}^2\cdot\text{hr} = 0.3687 \text{ BTU/ft}^2\cdot\text{hr} = 1.163 \text{ Watt/m}^2$

Othmer chart is useful in estimating the heat of-----?

- A. Mixing
- B. Wetting
- C. Adsorption (Answer)
- D. None Of Above

Concentration of a solution expressed in terms of ----- is independent of temperature?

- A. Molarity
- B. Normality
- C. Molality (Answer)
- D. None Of Above

Methane is mixed with stoichiometric proportion of oxygen and completely combusted. The number of additional specifications required to determine the product flow rate and composition is-----?

- A. 0 (Answer)
- B. 1
- C. 2
- D. 3

The reaction $A + B \rightarrow C$ has been conducted in a reactor as shown below. The number of boundaries around which material balance can be written, are-----?

- A. 1
- B. 6
- C. 3
- D. 4 (Answer)

Applicability of Clausius-Clapeyron Equation is subject to the condition that the -----?

- A. Vapor follows ideal gas law
- B. Volume in the liquid state is negligible

- C. Both A. & B. (Answer)
- D. Neither A. nor B.

A vapor whose partial pressure is less than its equilibrium vapor pressure is called a ----- vapor?

- A. Saturated
- B. Supersaturated
- C. Superheated (Answer)
- D. None Of Above

Lower wall courses of soaking pits are made of ----- bricks to avoid the action of molten slag & scale?

- A. Chrome or magnesite (Answer)
- B. Silicon carbide
- C. Silica
- D. Low duty fireclay

Refractories used in/for ----- should have low thermal conductivity?

- A. Coke ovens
- B. Insulation (Answer)
- C. Regenerators
- D. Muffle furnaces

Faster rate of drying of moulded refractories results in high ----- of refractories?

- A. Green strength
- B. Voids
- C. Shrinkage
- D. Both B. and C. (Answer)

Carborundum used for making crucibles for melting non-ferrous metals is chemically-----?

- A. Silicon carbide (Answer)
- B. Silicon nitride
- C. Crystalline magnesite
- D. Zirconium sulphate

Permeability of bricks is a measure of the-----?

- A. Refractoriness

- B. Melting point
- C. Rate at which a fluid will pass through the pores (Answer)
- D. Expansion during heating

Fireclay bricks are not used in the-----?

- A. Blast furnace
- B. Hot blast stove
- C. Cupola
- D. Wall of coke oven (Answer)

Which form of silica has the highest specific gravity ?

- A. Quartz (Answer)
- B. Cristobalite
- C. Tridymite
- D. All have the same specific gravity

Thermal conductivity of refractory bricks-----?

- A. Increases with decrease in porosity (Answer)
- B. Decreases with decreases in porosity
- C. Is independent of its porosity and is maximum for insulating bricks
- D. Increases wi

Magnesite refractories are generally not used in the-----?

- A. Electric furnace walls
- B. Steel melting furnace (Answer)
- C. Open hearth furnace
- D. Burning zone of cement kilns

Which is not an acidic refractory ?

- A. Silica
- B. Fireclay
- C. High alumina refractory
- D. Carbon black (Answer)

Which is a neutral refractory ?

- A. Graphite (Answer)
- B. Magnesite chrome
- C. Silica
- D. Magnesia

Which is an acidic refractory ?

- A. Magnesite
- B. Dolomite
- C. Fireclay (Answer)
- D. Chrome magnesite

In panel test for spalling resistance, the average face temperature of panel assembly is maintained at ----- °C for 24 hours?

- A. 700
- B. 1000
- C. 1600 (Answer)
- D. 2000

Fireclay bricks is not used for lining the-----?

- A. Cupola
- B. Gas producer
- C. Bottom of hot metal mixer (Answer)
- D. Roof of open hearth furnace

Silica bricks are never used for lining the-----?

- A. Beehive coke ovens (Answer)
- B. By-product coke ovens
- C. Dome of blast furnace stoves
- D. Roof of open hearth furnace

Refractory bricks having lower porosity have -----?

- A. High insulating properties
- B. Low heat capacity
- C. Low thermal conductivity
- D. Greater strength (Answer)

Ceramic recuperators used for waste heat recovery from high temperature flue gas going out of the furnace is made of -----?

- A. Fireclay
- B. Silicon carbide (Answer)
- C. Corundum
- D. Siliceous fireclay

Pure oxide refractories are generally monocrystalline in nature and are self bonded ----- bricks are generally used as moderator in nuclear reactors?

- A. Beryllia (Answer)
- B. Carborundum
- C. Corundum
- D. Thoria

With increase in the porosity, thermal spalling resistance of fireclay brick-----?

- A. Increases (Answer)
- B. Decreases
- C. Remain same
- D. May increase or decrease

Refractoriness/fusion points of 'Superduty' refractories is ----- °C?

- A. 1520-1630
- B. 1630-1670
- C. > 1730 (Answer)
- D. > 2000

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