मध्यप्रदेश लोक सेवा आयोग
रेसीडेन्सी एरिया
इन्दौर

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राज्य वन सेवा परीक्षा —2014 उत्तर कुंजी

—:: विज्ञप्ति ::—

आयोग के विज्ञापन क्रमांक—04/परीक्षा/2014 दिनांक 30.12.2014 के अंतर्गत आयोजित राज्य वन सेवा परीक्षा—2014 (ऐच्छिक विषय— केमिकल इंजीनियरिंग) की परीक्षा दिनांक 20.01.2016 को वस्तुनिष्ठ प्रकार के प्रश्न पत्रों की प्रावधिक उत्तर कुंजी परीक्षा परिणाम बनाने के पूर्व आयोग की वेबसाईट पर प्रकाशित की जा रही है। अभ्यर्थी आयोग की वेबसाईट पर अपना रोल नंबर एवं प्रवेश पत्र पर दिये गये पासवर्ड की सहायता से लॉग—इन कर अपनी रिस्पांस शीट का अवलोकन कर सकते हैं। यदि इस प्रावधिक उत्तर कुंजी के संबंध में किसी परीक्षार्थियों को कोई आपत्ति हो तो वे ऑनलाईन आपत्तियां 07 दिवस के अन्दर प्रस्तुत कर सकते हैं। इस हेतु अभ्यर्थी प्रश्न क्रमांक, संदर्भ ग्रंथों का नाम अंकित करें। प्रावधिक उत्तर कुंजी आयोग की वेबसाईट पर अपलोड होने की तिथि से 07 दिवस की समयावधि के पश्चात प्राप्त आपत्तियों पर विचार नहीं किया जायेगा। यह विज्ञप्ति आयोग की वेबसाईट www.mppsc.com & www.mppsc.nic.in, www.mppscdemo.in पर दिनांक 20.01.2016 से उपलब्ध है।

(डॉ. आर.आर. कान्हेरे)
परीक्षा नियंत्रक

State Forest Service Examination - 2014
(Provisional Model Answer Key)

Chemical Engineering

Q1 : The absolute entropy is zero for all perfect crystalline substances at absolute zero temperature. This statement is known as

A Zeroth law of thermodynamics

B First law of thermodynamics

C Second law of thermodynamics

D Third law of thermodynamics

Answer Key: **D**

Q2 : For liquid acetone at 20^0C and 1 bar, the volume expansivity β is $1.43 \times 10^{-30}C^{-1}$ and the isothermal compressibility k is 62×10^{-6} bar-1. If β and k are constant, the pressure generated by heating liquid acetone at constant V from 200C and 1 bar to 300C is

A 241 bar

B 3.4 bar

C 2.4 bar

D 1.33 bar

Answer Key: **A**

Q3 : For an ideal gas, C_p and C_v are functions of temperature only and the difference $C_p - C_v$

A Varies linearly with temperature

B Varies non linearly with temperature

C Is always equal to R(Universal gas constant)

D Is always equal to zero

Answer Key: **C**

Q4 :

For a pure substance $\left(\dfrac{\partial s}{\partial p}\right)_H$ is equal to

A $- V/T$

B T/V

C	C_p/P
D	C_v/P

Answer Key: **A**

Q5 : For ideal gases the entropy change of mixing depends on

A	Pressure of the mixture
B	Temperature of the mixture
C	Composition of the mixture
D	Pressure, temperature and composition of the mixture

Answer Key: **C**

Q6 : For ideal gases the partial molar property is identical with the pure species property at mixture temperature and pressure. This statement is valid for

A	Volume
B	Enthalpy
C	Entropy
D	Gibbs energy

Answer Key: **A**

Q7 : Which of the following conditions is not satisfied by an ideal solution

A	$\Delta H_{mixing} = 0$
B	$\Delta V_{mixing} = 0$
C	$\Delta U_{mixing} = 0$
D	$\Delta S_{mixing} = 0$

Answer Key: **D**

Q8 : Which of the following thermodynamic function for a binary solution of species 1 and 2 tends to zero as $x_1 \longrightarrow 0$

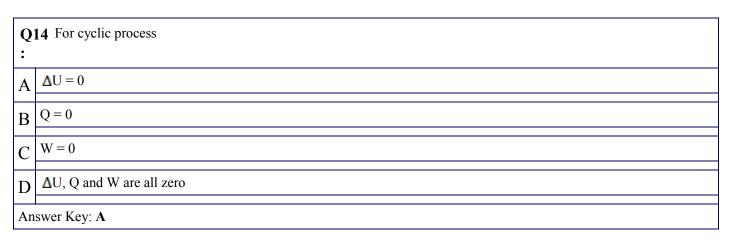| A	$G^{E/RT} x_1 x_2$
B	$G^{E/RT}$
C	$ln\, \gamma_1$

D	γ_1

Answer Key: **B**

Q9 : The fugacity of an ideal gas is equal to its

A	Temperature
B	Volume
C	Pressure
D	Density

Answer Key: **C**

Q10 : A criterion of chemical reaction equilibrium is

A	$\sum_i \nu_i \mu_i = 0$
B	$\sum_i \nu_i \mu_i = 1$
C	$\sum_i (\mu_i / \nu_i) = 0$
D	$\sum_i (\mu_i / \nu_i) = 1$

Answer Key: **A**

Q11 : If the door of a running refrigerator inside a room is left open then

A	The room will be cooled slightly
B	The room will be warmed up gradually
C	The room will be cooled to the temperature inside the refrigerator
D	The temperature of the room will be unaffected

Answer Key: **B**

Q12 : The efficiency of carnot cycle is 1/6. By lowering the temperature of cold reservoir by 65K, it increases to 1/3. The initial and final temperatures of the cold reservoir are
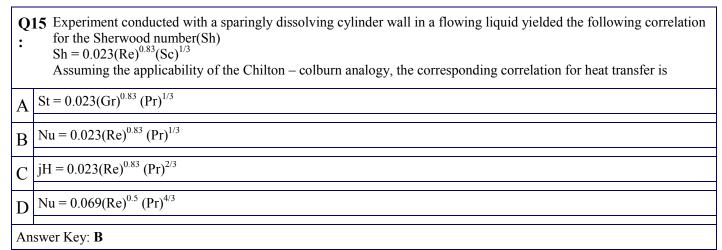
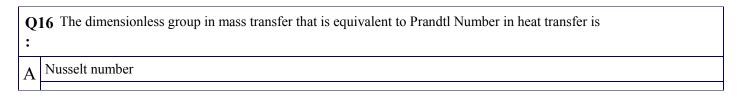| A	325K, 260K
B	345K, 280K

C	365K, 300K
D	340K, 275K

Answer Key: **A**

Q13 : The standard free energy change (ΔG^0), standard entropy change (ΔS^0) and standard heat of reaction (ΔH^0) are related by

A	$\Delta G^0 = \Delta H^0 + T\,\Delta S^0$
B	$\Delta G^0 = \Delta H^0 - T\,\Delta S^0$
C	$\Delta G^0 = \Delta H^0 + RT\,\Delta S^0$
D	$\Delta G^0 = \Delta H^0 - R\,T\,\Delta S^0$

Answer Key: **B**

Q14 : For cyclic process

A	$\Delta U = 0$
B	$Q = 0$
C	$W = 0$
D	ΔU, Q and W are all zero

Answer Key: **A**

Q15 : Experiment conducted with a sparingly dissolving cylinder wall in a flowing liquid yielded the following correlation for the Sherwood number(Sh)

$Sh = 0.023(Re)^{0.83}(Sc)^{1/3}$

Assuming the applicability of the Chilton – colburn analogy, the corresponding correlation for heat transfer is

A	$St = 0.023(Gr)^{0.83}\,(Pr)^{1/3}$
B	$Nu = 0.023(Re)^{0.83}\,(Pr)^{1/3}$
C	$jH = 0.023(Re)^{0.83}\,(Pr)^{2/3}$
D	$Nu = 0.069(Re)^{0.5}\,(Pr)^{4/3}$

Answer Key: **B**

Q16 : The dimensionless group in mass transfer that is equivalent to Prandtl Number in heat transfer is

A	Nusselt number

B	Sherwood number
C	Schmidt number
D	Stanton number

Answer Key: **C**

Q17 : Molecular diffusivity of a liquid

A	Increases with temperature
B	Decreases with temperature
C	May increase or decrease with temperature
D	Is independent of temperature

Answer Key: **A**

Q18 : Mass transfer coefficient according to penetration theory varies with mass diffusivity as

A	$D^{0.5}$
B	D
C	$1/D$
D	$D^{1.5}$

Answer Key: **A**

Q19 : Kremser – Brown – sonders equation is used to calculate

A	Height of a transfer unit
B	Plate spacing in the plate column
C	Number of ideal plates in the plate column
D	Number of transfer units

Answer Key: **C**

Q20 : Ficks second law of diffusion in one dimension is

A	$J_A = -D_{AB} \dfrac{\partial C_A}{\partial z}$

B	$\dfrac{\partial c_A}{\partial \theta} = -D_{AB} \dfrac{\partial^2 c_A}{\partial z^2}$
C	$J_A = -D_{AB} \dfrac{\partial^2 c_A}{\partial z^2}$
D	$\dfrac{\partial c_A}{\partial \theta} = D_{AB} \dfrac{\partial^2 c_A}{\partial z^2}$

Answer Key: **D**

Q21 : The relative volatility of a binary mixture at the azeotropic composition is

A Zero

B Infinity

C Unity

D Either less than or more than unity

Answer Key: **C**

Q22 : If the McCabe-Thiele assumptions are valid, the molal flow rates of liquid stream in the enriching and stripping sections are equal for

A Subcooled liquid feed

B Saturated liquid feed

C Saturated vapor feed

D Super heated vapor feed

Answer Key: **C**

Q23 : Which method will produce distillate richer in more volatile component from the same binary feed

A Single stage flash vaporization

B Differential distillation

C Both will produce distillate of the same average composition

D Single stage flash vaporization for $\alpha > 1$ and differential distillation for $1 < \alpha < 2$

Answer Key: **B**

Q24 : Constant rate period is that drying period during which

A	The moisture content of the substance remains constant
B	The rate of vaporization per unit of drying surface area is constant
C	The rate of vaporization increases with time
D	The rate of vaporization decreases with time

Answer Key: **B**

Q25 : When hysteresis is observed, the desorption equilibrium pressure

A	Is always equal to that obtained by adsorption
B	Is always higher than that obtained by adsorption
C	Is always lower than that obtained by adsorption
D	May be equal to or higher than that obtained by adsorption

Answer Key: **C**

Q26 : If the percent humidity of air (30^0C, total pressure 100KPa) is 24% and the saturation pressure of water vapor at that temperature is 4KPa, the percent relative humidity and the absolute humidity of air are

A	25.2, 0.0062
B	25, 0.0035
C	20.7, 0.0055
D	18.2, 0.0035

Answer Key: **A**

Q27 : In solvent extraction operation, the selectivity of solvent

A	Decreases with decrease in temperature
B	Increases with decrease in temperature
C	Is independent of temperature
D	Increases only linearly with decrease in temperature

Answer Key: **A**

Q28 : The McCabe ΔL law states that the

A	Molar heats of vaporization of components are nearly equal
B	Linear crystal growth rate depends on the degree of super saturation
C	Linear crystal growth rate does not depend on the crystal size
D	Linear crystal growth rate depends on the crystal size

Answer Key: **C**

Q29 : The thermal conductivity of a gas

A	Decreases with increasing temperature
B	Increases with increasing temperature
C	Is independent of temperature
D	Is greater than the thermal conductivity of water at the same temperature

Answer Key: **B**

Q30 : Heat transfer by conduction is directly proportional to

A	Thermal potential difference / Thermal resistance
B	Thermal resistance / Thermal potential difference
C	Thermal potential difference x Thermal resistance
D	Thermal resistance

Answer Key: **A**

Q31 : Fouling factor (R_f) is defined as

A	$R_f = U_{clean} - U_{dirty}$
B	$R_f = (1/U_{dirty}) - (1/U_{clean})$
C	$R_f = (1/U_{clean}) - (1/U_{dirty})$
D	$R_f = \dfrac{1}{\sqrt{U_{clean} \times U_{dirty}}}$

Answer Key: **B**

Q32 Baffles used on shell side of a heat exchanger will

:	
A	Decrease heat transfer rate
B	Increase heat transfer rate
C	Not affect heat transfer rate
D	Decrease pressure drop on shell side
Answer Key: **B**	

Q33 :	In forced convention, fluid moves under the influence of
A	Changes in fluid pressure produced by external work
B	Buoyant forces arising from changes in density
C	Elastic forces
D	Surface tension forces
Answer Key: **A**	

Q34 :	For the same process temperatures, the ratio of the LMTD in parallel flow to the LMTD in counter flow in Liquid – Liquid heat exchanger is always
A	1
B	< 1
C	> 1
D	∞
Answer Key: **B**	

Q35 :	What does 1-4 shell and tube heat exchanger imply
A	4 shell side passes and 4 tube side passes
B	4 shell side passes and 1 tube side passes
C	1 shell side pass and 4 tube side passes
D	4 tubes per pass
Answer Key: **C**	

Q36	A black body does not

:	
A	Emit radiation
B	Absorb radiation
C	Reflect radiation
D	Follow Stefan – Boltzmann's law
Answer Key: **C**	

Q37 :	According to Duhring's rule, the boiling point of a given solution is
A	A linear function of the concentration of the solute
B	A linear function of the boiling point of water at the same pressure
C	A linear function of the pressure
D	An exponential function of the boiling point of pure water at the same pressure
Answer Key: **B**	

Q38 :	In a finned tube heat exchanger
A	Only heat transfer area is augmented
B	Only film coefficient is augmented
C	Both heat transfer area and film coefficient are augmented
D	None of these
Answer Key: **A**	

Q39 :	In natural convection heat transfer the correlating parameter is
A	Graetz number
B	Eckert number
C	Grashof number
D	Bond number
Answer Key: **C**	

Q40	The critical radius(r) of insulation on a pipe is given by

:	
A	r = 2k/h
B	r = k/h
C	r = k/2h
D	r = h/k
Answer Key: **B**	

Q41 :	The peak heat flux in a boiling curve is called
A	Burnout point
B	Leidenfrost point
C	Boiling point
D	Nusselt point
Answer Key: **A**	

Q42 :	Which of the following is usually not used as the heat exchange fluid in a flat plate solar collector
A	Air
B	Fuel oil
C	Water
D	Ethylene glycol and water
Answer Key: **B**	

Q43 :	The volume percent of a component in a gas mixture equals to its mole percent. This is strictly valid for
A	Ideal gases
B	Real gases
C	Ideal as well as Real gases
D	Neither Real nor Ideal gases
Answer Key: **A**	

Q44	A sample of natural gas containing 80% Methane and the rest Nitrogen(N_2) is burnt with 20% excess air, with 80%

:	of the combustibles producing CO_2 and the remainder going to CO, the orsat analysis in volume percent is
A	CO_2 : 6.26, CO : 1.56, O_2 : 3 : 91, H_2O : 15.66, N_2 : 72.60
B	CO_2 : 7.42, CO : 1.86, O_2 : 4.64, N_2 : 86.02
C	CO_2 : 6.39, CO : 1.60, O_2 : 3.99, H_2O : 15.96, N_2 : 72.06
D	CO_2 : 7.60, CO : 1.90, O_2 : 4.75, N_2 : 85.74

Answer Key: **B**

Q45 : The vapor pressure of water is given by $\ln P^{Sat} = A - (5000/T)$, where A is a constant, P^{Sat} is vapor pressure in atm and T is temperature in K. The vapor pressure of water in atm at 50^0C is approximately

A	0.07
B	0.09
C	0.11
D	0.13

Answer Key: **D**

Q46 : At standard conditions,

$N_2 + 2O_2 \rightleftharpoons 2NO_2 \quad \Delta G^0 = 100kJ/mol$

$NO + \frac{1}{2}O_2 \rightleftharpoons NO_2 \quad \Delta G^0 = -35 \, kJ/mol$

The standard free energy of formation of NO in kJ/mol is

A	15
B	85
C	30
D	170

Answer Key: **B**

Q47 : It is desired to concentrate a 20% salt solution (20kg of salt in 100kg of solution) to a 30% salt solution in an evaporation. Consider a feed of 300kg/min at 30^0C. The boiling point of solution is 110^0C, the latent heat of vaporization is 2100 kJ/kg and the specific heat of the solution is 4kJ/kg K. The rate at which heat has to be supplied (in KJ/min) to the evaporator is

A	3.06×10^5
B	6.12×10^5
C	7.24×10^5
D	9.08×10^5

Q48 : The molar density of water vapor at the normal boiling point of water is 33 mol/m^3. The compressibility factor under these condition is

A | 0.75

B | 0.99

C | 1.25

D | 1.5

Answer Key: **B**

Q49 : Which of the following is a formation reaction

A | $H_2O + SO_2 \longrightarrow H_2SO_4$

B | $4HCl + O_2 \longrightarrow 2H_2O + 2Cl_2$

C | $H_2O + CO_2 \longrightarrow H_2CO_3$

D | $C + \dfrac{1}{2} O_2 + 2H_2 \longrightarrow CH_3OH$

Answer Key: **D**

Q50 : The maximum adiabatic flame temperature is attained when the fuel is burned with

A | The theoretically required amount of air

B | The theoretically required amount of pure oxygen

C | More than the theoretically required amount of pure oxygen

D | Less than the theoretically required amount of pure oxygen

Answer Key: **B**

Q51 : Which is not a combustible gas

A | Carbon monoxide

B | Carbon dioxide

C | Hydrogen

D | Gobar gas

Q52 : Air constains 79 mol% N_2 and 21 mol% O_2. its average molecular weight is equal to

A | 28

B | 32

C | 28.84

D | 27

Answer Key: **C**

Q53 : The pseudocritical property of a component in the mixture is equal to the molefraction multiplied by critical property of the component. This is known as

A | Kay's rule

B | Lewis rule

C | Raoult's law

D | Henry's law

Answer Key: **A**

Q54 : pure A in gas phase enters a reactor, 50% of this A is converted to B through the reaction A ———► 3B. Mole fraction of A in the exit stream is

A | 1/2

B | 1/3

C | 1/4

D | 1/5

Answer Key: **C**

Q55 : A vacuum of 100 mm Hg is equivalent to an absolute pressure of

A | 100 mm Hg

B | 660 mm Hg

C | 860 mm Hg

D | 100/760 mm Hg

Answer Key: **B**

Q56 : H/C ratio (by weight) for the same number of carbon atoms is the lowest in

A | Paraffins

B | Napthenes

C | Olefins

D | Aromatics

Answer Key: **D**

Q57 : Methyl alcohol from wood is manufactured by

A | Fractional distillation

B | Dehydration

C | Fermentation

D | Destructive distillation

Answer Key: **D**

Q58 : Ethyl alcohol from molasses is manufactured by

A | Fractional distillation

B | Dehydrogenation

C | Fermentation

D | Dehydration

Answer Key: **C**

Q59 : In the sulphate (Kraft) pulp process, the essential chemical reagents used in digester are

A | Caustic soda, sodium sulphide, soda ash

B | Slaked lime, salt cake, mercaptans

C | Caustic soda, mercaptans, ethylene oxide

D | Quick lime, baking soda, dimethyl sulphide

Answer Key: **A**

Q60 : Soap may be prepared by

A | Hydrolysis of tallow

B | Hydrogenation of vegetable oils

C | Boiling the vegetable oil or tallow with caustic soda solution

D | Oxidation of tallow

Answer Key: **C**

Q61 : Sodium dodecyl benzene sulphate is

A | A drug

B | A detergent

C | An explosive

D | An artificial fiber

Answer Key: **B**

Q62 : Vanaspati is produced by the process of

A | Hydrolysis

B | Oxidation

C | Reduction

D | Hydrogenation

Answer Key: **D**

Q63 : Electrical desalting of crude petroleum is done for

A | Removal of oleophilic impurities

B | Removal of oleophobic impurities

C | Removal of both oleophilic and oleophobic impurities

D | The purpose other than the removel of oleophobic and oteophilic impurities

Answer Key: **B**

Q64 : The desirable reactions in the catalytic reforming of naptha are

A Slightly exothermic

B Endothermic

C Autocatalytic

D Highly exothermic

Answer Key: **B**

Q65 : Heavy vacuum gas oil obtained from vacuum distillation unit is mainly used for

A Blending component for gasoline

B Blending component for kerosene

C Feed stock for fluid catalytic cracking unit

D Blending component for ATF

Answer Key: **C**

Q66 : The chemical formula of vinyl chloride is

A CH_3CH_2Cl

B $ClCH = CHCl$

C $CH_2 = CCl_2$

D $CH_2 = CHCl$

Answer Key: **D**

Q67 : Styrene is produced by

A Catalytic oxidation of cumene

B Catalytic oxidation of toluene

C Dehydrogenation of ethyl benzene

D Catalytic oxidation of xylene

Answer Key: **C**

Q68 : A glass with high refractive index and used in optical instruments is

A | Pyrex glass

B | Jena glass

C | Flint glass

D | Crookes glass

Answer Key: **C**

Q69 : In the Haber's process for the manufacture of ammonia

A | Finely divided iron is used as catalyst

B | Finely divided molybdenum is used as catalyst

C | Finely divided nickel is used as catalyst

D | No catalyst is required

Answer Key: **A**

Q70 : Coal tar produced by high temperature carbonization of coal is the main source of

A | Aliphatic compounds

B | Aromatic compounds

C | Paraffins

D | Cycloalkane

Answer Key: **B**

Q71 : The viscosity of a gas

A | Increases with increase in temperature

B | Decreases with increase in temperature

C | Remains unaffected with change in temperature

D | Is greater than the viscosity of a liquid

Q72 : For laminar flow of Newtonian fluid in a pipe of circular cross-section, the ratio of the maximum velocity to the average velocity is

A 2

B 0.8

C 0.5

D 1.2

Answer Key: **A**

Q73 : The continuity equation in fluid mechanics is a mathematical statement using

A The principle of conservation of momentum

B The principle of conservation of mass

C The principle of conservation of energy

D The principle of conservation of mass and energy

Answer Key: **B**

Q74 : The friction factor

A Is dimension less

B Has the units of energy per unit weight of fluid

C Is inversely proportional to Reynolds number

D Appears in pressure drop relation for laminar flow through pipes

Answer Key: **A**

Q75 : The tube is said to be hydraulically smooth

A If the friction factor is zero for all values of Reynolds number

B If the friction factor for a given Reynolds number does not change by further smoothing of pipe

C If the friction factor for a given Reynolds number changes by further smoothing of pipe

D If the friction factor is independent of Reynolds number

Q76
: The purpose of providing check valve in the discharge line of a centrifugal pump is

A | To control the flow of fluid when pump is running

B | To prevent back flow when pump is stopped

C | To control the discharge pressure

D | To control the discharge temperature

Answer Key: **B**

Q77
: The compression ratio is maximum for

A | Fans

B | Blowers

C | Compressors

D | Vacuum pumps

Answer Key: **D**

Q78
: The power number is proportional to

A | The ratio of the drag force acting on a unit area of the impeller to the inertial stress

B | The ratio of internal stress to the gravitational force per unit area acting on the fluid

C | The ratio of the pressure force acting on a unit area of the impeller to the gravitational force per unit area acting on the fluid

D | The ratio of the drag force acting on a unit area of the impeller to the surface tension force per unit area acting on the fluid

Answer Key: **A**

Q79
: The crushing energy required to create new surface is given by

A | Fick's law

B | Rittinger's law

C | Fourier's law

D	Kopp's law

Answer Key: **B**

Q80: Fluid-energy mill is an example of

A	Crusher
B	Grinder
C	Ultrafine grinder
D	Cutting machine

Answer Key: **C**

Q81: A filter aid is added to the slurry before filtration to

A	Decrease the porosity of the cake
B	Increase the porosity of the cake
C	Increase the compressibility coefficient of the cake
D	Decrease the compressibility coefficient of the cake

Answer Key: **B**

Q82: For motion of spherical particles in a stationary fluid, the drag coefficient in hindered settling is

A	Always equal to that in free settling
B	Always less than in free settling
C	Always greater than in free settling
D	Equal to or less than in free settling

Answer Key: **C**

Q83: Fluidized beds are formed when

A	Fluid friction is zero
B	Gravity force is less than fluid friction
C	Pressure forces equal gravity forces

D	Sum of fluid friction and pressure forces is equal and opposite to gravity forces

Answer Key: **C**

Q84 :	For a fluidized bed, with the increase in expansion of the bed up to solids carry over from the bed, the pressure drop across the bed
A	Increase rapidly
B	Decrease rapidly
C	First increases then decreases
D	Remains essentially constant

Answer Key: **D**

Q85 :	For a cylindrical internally pressurized vessel, which of the following closure types would withstand highest pressure if each closure is of the same material and thickness
A	Hemispherical
B	Ellipsoidal (2:1)
C	Conical
D	Flat plate

Answer Key: **A**

Q86 :	The volume capacity of 2:1 ellipsoidal head is
A	$\pi/24 \times Da^3$
B	$\pi/12 \times Da^3$
C	$\pi/18 \times Da^3$
D	$\pi/6 \times Da^3$

Answer Key: **A**

Q87 :	The thickness of a flat plate required to resist a given pressure load is
A	Directly proportional to the effective plate diameter
B	Directly proportional to the square root of the internal pressure
C	Inversely proportional to the square root of the maximum allowable stress

D	All options are correct

Answer Key: **D**

Q88 : In a spherical vessel subjected to internal pressure, the longitudinal stress σ_L and the circumferential stress σ_n are related by

A	$\sigma_n = \sigma_L$
B	$\sigma_n = 2\sigma_L$
C	$\sigma_n = \sigma_{L/2}$
D	$\sigma_n = \sqrt{\sigma_L}$

Answer Key: **A**

Q89 : Which of the following materials is most suitable for fabrication of pressure vessels

A	Aluminum alloy
B	Plastic
C	Plain carbon steel
D	Copper

Answer Key: **C**

Q90 : In an ellipsoidal head with major axis 2a and minor axis 2b, the circumferential stress will be negative (compressive) if

A	a/b > 2
B	$a^2/b^2 > 2$
C	a/b > 1
D	$a^2/b^2 > 4$

Answer Key: **B**

Q91 : When can a cylindrical storage tank have a self supported conical roof

A	If its diameter is more than 50 m
B	If its diameter is less than 20 m
C	Whatever is the diameter

D	If the thickness of the roof is more than that of the cylindrical shell

Answer Key: **B**

Q92 What is the effect of increasing carbon content in the steel
:

A	Decreases its strength
B	Increases its ductility
C	Increases its strength
D	None of these

Answer Key: **C**

Q93 stainless steel contains iron, carbon and which of the following elements
:

A	Aluminium
B	Chromium
C	Zinc
D	Lead

Answer Key: **B**

Q94 What is the purpose of galvanizing iron sheets
:

A	To increase its luster
B	Prevent action of oxygen
C	Prevent action of water
D	To harden the surface

Answer Key: **C**

Q95 Tensile strength is maximum in which of the following iron
:

A	Pig iron
B	Nodular cast iron
C	Grey cast iron

D	White cast iron

Answer Key: **B**

Q96 : To get bronze, copper is alloyed with

A	Zinc
B	Aluminium
C	Beryllium
D	Tin

Answer Key: **D**

Q97 : Low temperature carbonization process for coal which is generally carried out at a temperature of 600^0C has the primary product semi coke or smokeless char whose yield is around

A	75 to 80%
B	70 to 75%
C	60 to 70%
D	50 to 60%

Answer Key: **A**

Q98 : Protection of iron by coating it with zinc is called

A	Nitriding
B	Smelting
C	Galvanizing
D	Tempering

Answer Key: **C**

Q99 : Break even point is reached

A	When total production cost becomes exactly equal to the total income from sale of the product
B	When operating becomes exactly equal to the total income from sale of all product
C	When annual operating cost becomes exactly equal to the annual depreciation charge

D	When total product cost becomes exactly equal to the net profit

Answer Key: **A**

Q100 : A column costs Rs 5.0 lakhs and has a useful life of 10years. Using the double decling balance depreciation method, the book value of the unit at the end of five years in lakhs of ruppes is

A	1.21
B	1.64
C	1.31
D	2.05

Answer Key: **B**

Q101 : Which of the following is correct

A	Profit = Revenue - Book valve
B	Profit = Revenue - Total cost
C	Profit = Revenue - Fixed cost
D	Profit = Revenue - operating cost

Answer Key: **B**

Q102 : If there is a single lump sum expenditure of Rs 10 crores and it generates a constant annual cashflow of Rs 2 crores in each subsequent year, calculate the pay back period (in years) if the scrap value of the capital outlay is zero

A	10
B	5
C	20
D	1

Answer Key: **B**

Q103 : Direct Costs component in the fixed capital is due to

A	Contingency
B	Onsite and offsite costs
C	Labour costs

D	Raw material costs

Answer Key: **B**

Q104 : A series of equal payments made at equal intervals of time like deposit or cost is know as

A	Captial charge factor
B	Future worth
C	Annuity
D	Perpetuity

Answer Key: **C**

Q105 : The total measurement in a project (whose life is 10 years) is Rs 10 lakhs and the annual profit is Rs 1.5 lakhs, then the simple rate of return on investment is

A	15%
B	1.5%
C	150%
D	10%

Answer Key: **A**

Q106 : During cost estimation, the effect of inflation on equipment cost is taken care by using

A	Lang factor
B	Turn over ratio
C	Six-tenths rule
D	Cost indices

Answer Key: **D**

Q107 : Project scheduling is done by

A	PERT and CPM
B	Cost estimation
C	Break even analysis

D	Payback analysis

Answer Key: **A**

Q108 For any typical project the cumulative cash flow is zero at
:

A	End of the design stage
B	End of the project life
C	Break even point
D	Start up

Answer Key: **C**

Q109 Book value of an equipment is equal to its original price minus
:

A	Current valve of the equipment
B	Amount of money obtainable from the sale of the equipment
C	Total depreciation charged
D	Amount spent on its maintenance

Answer Key: **C**

Q110 Inflation
:

A	Affects the time value of money
B	Refers to the increase in prices of goods and services over time
C	Concept based upon the fact that physical facilities decline in usefulness with time
D	Does not affect the amount of money required to purchase goods and services.

Answer Key: **B**

Q111 Discounted cash -flow analysis is used to calculate
:

A	Life of the project
B	Payback period
C	Future worth of present investment

D	Present worth of future earnings

Answer Key: **D**

Q112 : Turnover ratio is defined as

A	Fixed capital Investment/gross annual sales
B	Working capital /Fixed capital investment
C	Gross Annual sales/ Fixed capital investment
D	Gross Annual sales/ Fixed capital investment + working capital

Answer Key: **C**

Q113 : Ecosystem refers to

A	A group of individuals of one kind
B	All population in a given area
C	A portion of earth where living objects can be found
D	The community and non living environment working together

Answer Key: **D**

Q114 : Selection of suitable solvents for the removal of gaseous air pollutants is important and from this consideration, sodium hydroxide is widely used one. Which of the pollutants given below cannot be removed by this solvent

A	Sulphur dioxide
B	Hydrochloric acid
C	Phosgene
D	Nitrogen dioxide

Answer Key: **B**

Q115 : Which of the following is primary air pollutant

A	Ozone
B	PAN
C	Photochemical smog

D	Particulate matter

Answer Key: **D**

Q116 : What of the following is secondary parameter that influence air pollution dispersion

A	Wind direction and speed
B	Temperature
C	Mixing Height
D	Precipitation

Answer Key: **D**

Q117 : Which of the following method converts organic matter in the solid waste into humus

A	Incineration
B	Composting
C	Pulverisation
D	Leaching

Answer Key: **B**

Q118 : Colour in the water though harmless is objectionable on grounds of appearance and hence an estimation in domestic water is mandatory. The permissible colour for domestic water on platinum - cobalt scale is

A	5 mg/liter
B	25 mg/liter
C	50 mg/liter
D	150 mg/liter

Answer Key: **C**

Q119 : A sample of waste water is diluted with specially prepared dilution water with a dilution factor of 150. The contents of dissolved oxygen in the begning and end of test were found to be 11 ppm and 7 ppm respectively calculate BOD_5 (5 days BOD)

A	600 ppm
B	150 ppm
C	700 ppm
D	

D	250 ppm

Answer Key: **A**

Q120 : The operations of a cyclone separation relies on

A	Diffusion of dust particles
B	Creation of intimate contact between a stream of gas and flow of scrubbing liquour
C	Producing electric charge on the particle
D	Centrifugal force acting on the particle

Answer Key: **D**

Q121 : Which of the following devices of particular collection is the least effective

A	Cyclone separator
B	Electrostatic precipitator
C	Wet scrubber
D	Fabric filter

Answer Key: **A**

Q122 : In order to protect aquatic life in fresh water stream, sewage effluent should never lower the dissolved oxygen less than

A	5 ppm
B	10 ppm
C	15 ppm
D	20 ppm

Answer Key: **A**

Q123 : Which of the following device does not discharge collected particulates as a dry solid

A	Cyclone separator
B	Wet scrubber
C	Electrostatic precipitator

D	Fabric filter

Answer Key: **B**

Q124: Determine total solids from the following data

Weight of sample of sewage =1000 gm

Weight of solids after evaporation of liquid= 0.952 gm

Weight of dry residue after ignition =0.516 gm

A	852 ppm
B	952 ppm
C	752 ppm
D	516 ppm

Answer Key: **B**

Q125: Which of the following refers to discrete types of settling

A	Type I sedimentation
B	Type II sedimentation
C	Type III sedimentation
D	Type IV sedimentation

Answer Key: **A**

Q126: Smoke which is formed by combustion of other chemical process contains fine particles of liquid or solid of the size range

A	0.001 - 0.20 μm
B	0.01 - 1.0 μm
C	0.1 -1.0 μm
D	1 - 10 μm

Answer Key: **B**

Q127: The principle behind ordinary mercury in glass thermometer is

A	Decrease of vapor pressure with increase in temperature

B	Increase of vapor pressure with increase in temperature
C	Increase of electrical resistance with increase in temperature
D	Increase in volume of mercury with increase in temperature

Answer Key: **D**

Q128 : Hot wire anemometer is used for measuring

A	Temperature of gases
B	Velocity of gases
C	Pressure of gases
D	Temperature of liquids

Answer Key: **B**

Q129 : Which of the following is not a variable head meter

A	V-notch
B	Venturimeter
C	Rota meter
D	Pitot tube

Answer Key: **C**

Q130 : Cavitation in pump reduces capacity and causes severe erosion.This occurs when

A	Suction pressure is greater than the vapour pressure of the liquid
B	Suction pressure is equal to vapour pressure
C	Suction pressure is only slightly greater than the vapour pressure
D	Suction pressure is less than vapour pressure

Answer Key: **C**

Q131 : To avoid separation of flow in the divergence section of a venturimeter the limiting cone angle for the section is

A	8^0

B	12^0
C	15^0
D	18^0

Answer Key: **A**

Q132 : In radiation pyrometer the working principle is based on

A	Seebeck effect
B	Stefan -boltzamann law
C	Ohm's law
D	Curie's law

Answer Key: **B**

Q133 : Optimum controller setting for a PI controller as given by Ziegler Nichols is 0.45 K_c max for which the reset time(T_R) is

A	$T_R = P_u$
B	$T_R = P_u/1.2$
C	$T_R = P_u/2$
D	$T_R = P_u/8$

Answer Key: **B**

Q134 : Which of the following input increases linearly with time

A	Impulse
B	Ramp
C	Step
D	sinusoidal

Answer Key: **B**

Q135 : Damping coefficient (ε) for an under damped second order response is

A	Less than 1

B	Greater than 1
C	Equal to 1
D	Equal to zero

Answer Key: **A**

Q136 : Which of the following controllers have maximum offset

A	PID
B	PI
C	PD
D	P

Answer Key: **D**

Q137 : Rooth-Hurwitz procedure is used to determine

A	Roots of the characteristic equation
B	Check the stability of the closed loop system
C	Calculate the zeros and poles of the transfer function
D	None of these

Answer Key: **B**

Q138 : Ziegler-Nichols tuning technique is based on

A	Process reaction curve
B	Real process data from the system response
C	Open loop frequency response analysis
D	Closed loop frequency response analysis

Answer Key: **C**

Q139 : For a given reaction A+B ⟶ C+D the experimentally determined overall order is 2. Then it could be concluded that

A	Reaction is elementary with a molecularity of 2

B	Molecularity of the reaction is 2 but the reaction may not be elementary
C	Reaction is elementary but molecularity may not be 2.
D	Reaction is elementary with a molecularity of 4

Answer Key: **B**

Q140 : For the Reaction A+2B ⟶ 3B +C then

A	$r_A = r_B$
B	$r_A = -r_B$
C	$r_A = 4r_B$
D	$4r_A = r_B$

Answer Key: **B**

Q141 : If for a system density is constant than the performance equations are identical for

A	Batch reactor and plug flow reactor
B	Batch reactor and CSTR
C	PFR and CSTR
D	Batch reactor, PFR and CSTR

Answer Key: **A**

Q142 : For a given isothermal gas phase reaction A ⟶ 3B, the traction change in volume of the system between no conversion and complete conversion is

A	2
B	3
C	1
D	4

Answer Key: **A**

Q143 : For an elementary liquid phase decomposition reaction A ⟶ 2B which is carried out in a CSTR. The design equation is

A	$K\tau = X_A/(1 - X_A)$

B	$K\tau = X_A/(1 - X_A)^2$
C	$K\tau = X_A/(1 + X_A)/(1 - X_A)$
D	$K\tau\, C_{A0} = \dfrac{X_A/(1+X_A)^2}{(1-X_A)^2}$

Answer Key: **A**

Q144 :

$$A \underset{k_2}{\overset{k_1}{\rightleftharpoons}} B$$

A first order reversible reaction occurs in a batch reactor. The exponential decay of the concentration of A has a time constant of

A	$1/k_1$
B	$1/k_2$
C	$\dfrac{1}{k_1 - k_2}$
D	$\dfrac{1}{k_1 + k_2}$

Answer Key: **A**

Q145 : From collision theory , the reaction rate constant is proportional to

A	$\sqrt{T}$
B	$T^{1/2} \exp(-E/RT)$
C	$\exp(-E/RT)$
D	$\exp(-E/2RT)$

Answer Key: **B**

Q146 : The ratio of the heterogeneous catalytic reaction [A(g)+B(g) $\longrightarrow$ c(g)] is

$$-r_A = \frac{kk_A P_A P_B}{1 + K_A P_A + K_C P_C} \quad k_A \text{ and } k_C$$

are adsorption constants. The rate controlling step is

A	Adsorption of A
B	Surface reaction b/w adsorbed A and adsorbed B

C	Surface reaction between adsorbed A and B in the gas phase
D	Surface reaction between A in the gas phase and adsorbed B

Answer Key: **C**

Q147 : A catalyst is a substance which

A	Increases the equilibrium concentration of the product
B	Change the equilibrium constant of the reaction
C	Supplies energy to the reaction
D	Decreases the Activation energy

Answer Key: **D**

Q148 : Tracer input signal is used to

A	Study the reaction mechanism
B	Study the extent of non ideal flow in the reactor
C	Know reaction rate constants
D	Know Activation energy

Answer Key: **B**

Q149 : For an ideal CSTR the residence time distribution is given by

A	$\frac{1}{\tau}\exp(-t/\tau)$
B	$\tau \exp(-t/\tau)$
C	$\exp(-t/\tau)$
D	$\frac{1}{\tau}\exp(-\tau /t)$

Answer Key: **A**

Q150 : The sequence in which 3 CSTRS of volumes 10,15,20 m^3 will be connected in series to obtain the maximum production in a second order irreversible reaction is

A	20,15,10

B	10,15,20
C	15,10,20
D	20,10,15

Answer Key: **B**