PRACTICE PAPER

CHEMISTRY

Q1

In the extraction of iron, the furnace consists of iron ore, coke and lime stone. The function of lime stone is to act as :

(a) oxidising agent
(b) reducing agent
(c) flux
(d) slag

Q2

Identify the bidentate ligand

(a) Bipyridine
(b) Ethylene diammine
(c) Oxalate
(d) All of these

Q3

Which of the following is an antibiotic?

(a) Aspirin
(b) Chloroquinine
(c) Chloromycetin
(d) Paraetamol

Q4

Identify which is a protein based fibre

(a) Rayon
(b) Polyester
(c) Silk
(d) Cotton

Q5

Ascorbic Acid is

(a) Vitamin A
(b) Vitamin D
(c) Vitamin B_{12}
(d) Vitamin C

Q6

Which of the following is a polysaccharide?

(a) Cellulose
(b) Glycogen
(c) Starch
(d) All of these

Q7

To a solution of ammonium hydroxide some solid ammonium chloride is added. Then

(a) $[NH_4^+]$ as well as $[OH^-]$ will increase
(b) $[NH_4^+]$ as well as $[OH^-]$ will decrease
(c) $[NH_4^+]$ will increase and $[OH^-]$ will decrease
(d) $[NH_4^+]$ will decrease and $[OH^-]$ will increase

Q8

One litre of a 0.02 M solution of HCI is mixed with one litre of a 0.01 M solution of NaOH. The pH of the resulting solution will be

(a) $-\log [0.01]$
(b) $+\log [0.01]$
(c) $-\log [0.005]$
(d) $+\log [0.005]$

Q9

Crystalline barium chloride is not so soluble in water as crystalline sodium chloride is. On adding a saturated solution of barium chloride to a saturated solution of table salt (which is NaCI with negligible impurities of $NaHCO_3$ and Na_2SO_4), a dense crystalline white substance is deposited. The deposit will most probably be of

(a) NaCI crystals
(b) $BaCI_2 \cdot 2H_2O$ crystals
(c) $Ba(HCO_3)_2$ crystals
(d) $BaSO_4$ crystals

Q10

In a crystal of KCI, how many Cl ions surround K^+ ions?

(a) 8
(b) 12
(c) 6
(d) 4

Q11

Amalgam is a solution of

(a) gas in solid
(b) liguid in solid
(c) solid in liquid
(d) liquid in liquid

Q12

Which of the following will not form a solution?

(a) Salicyclic acid and water
(b) Methanol and water
(c) Carbon tetrachloride and water
(d) Acetic acid and water

Q13

Which type of saline water is used for intravenous injections?

(a) Brine
(b) Isotonic
(c) Hypertonic
(d) Hypotonic

Q14

What is the shape of XeF_6 molecule?

(a) Trigonalbipyramidal
(b) Octahedral
(c) Distorted octahedral
(d) Square planar

Q15

Which of the following transition metals displays maximum number of oxidation states?

(a) Iron
(b) Manganese
(c) Vanadium
(d) Chromium

Q16

Which of the following elements does not impart a color to the flame?

(a) Calcium
(b) Strontium
(c) Barium
(d) Beryllium

Q17

Which of the following has a higher reducing power?

(a) H_2O
(b) H_2S
(c) H_2Se
(d) H_2Te

Q18

The preferred method of separation of a mixture of benzoic acid and naphthalene is

(a) Sublimation
(b) Crystallization
(c) Distillation
(d) Chromatography

Q19

The biuret test is given by

(a) Carbohydrates
(b) Proteins
(c) Nucleic acids
(d) Lipids

Q20

When ethylcyanide is treated with KOH solution [i.e., C_2H_5CN (in the presence of KOH, H_2O) → ?], what are the products?

(a) $C_2H_5OH + CO_2 + NH_2$
(b) $C_2H_5OH + HCOOH + NO$
(c) $C_2H_5\ COOK + NH_3$
(d) $C_2H_5\ COOK + NH_2$

Q21

To which carbon of sugar in RNA a base molecule is attached.

(a) 2
(b) 3
(c) 5
(d) 1

Q22

Rubber is a natural polymer containing

(a) all trans 1, 4 – polyisopropene
(b) allcis 1, 4- polyisopropene
(c) onlycis-trans, 1, 4 - polyisopropene
(d) onlycis trans 1, 2 - polyisopropene

Q23

Cell membrane is a

(a) bilayer of lipids interspersed proteins
(b) bilayer of lipids and proteins interspersed with bpolysaccharides
(c) bilayer of polysaccharides of proteins intersperse with lipids
(d) bilayer of protein and RNA interspersed with lipids.

Q24

On heating ammonium dichromate the gas evolved is

(a) O_2
(b) NH_3
(c) N_2O
(d) N_2

Q25

The green house effect is caused by

(a) NO_2
(b) CO_2
(c) CO
(d) O

Q26

Whichof the following undergoes Friedel Craft reaction?

(a) C_6H_5 COOH
(b) $C_6H_5NH_2$
(c) $C_6H_5NO_2$
(d) None of these

Q27

Acetic acid when reacted with thionyl chloride yields which of the following?

(a) Acetylchloride + SO_2 + HCI
(b) Chloroacetic acid + SO_2
(c) $ClCH_2COCl + SO_2$
(d) Acetyldichloride + SO_2 + HCI

Q28

Butyl methyl ether [$(CH_3)_3$ C – O – CH_3] may be easily prepared by the reaction of

(a) $(CH_3)_3$ C – CI with $NaOCH_3$
(b) $(CH_3)_3$ C – CI with CH_2 OH
(c) $(CH_3)_3$ C – O^- with CH_3 CI
(d) $(CH_3)_3$ C – OH with CH_3CI

Q29

A colourless water soluble organic compound decomposes sodium carbonate and liberates carbon dioxide. It produces a silver mirror with Tollen's reagent. The liquid is

(a) Acetaldehyde
(b) Benzoic acid
(c) Formic acid
(d) Salicylic acid

Q30

Bromobenzene may be obtained by reaction of benzene with

(a) Bromine water
(b) Bromine in CCI_4
(c) Bromine
(d) Bromine and $FeBr_3$

PHYSICS

Q1

A student makes an error of 1% in measuring length of pendulum and negative error of 3% in value of time periods. The percentage error in measurement of value of g will be

(a) 5%
(b) 1%
(c) 7%
(d) 2%

Q2

A ball is dropped vertically and another ball is thrown horizontally with the same velocities from same height and at the same time. If the resistance is neglected, then

(a) Ball P reaches the ground first
(b) Ball Q reaches the ground first
(c) Both reach the ground at same time
(d) The time is decided by the masses of two balls

Q3

A ß kg block at rest requires a force of (α – γ) N is required to keep block in uniform motion. The coefficient of friction is

(a) $\frac{ß}{\alpha}$
(b) $\frac{9{,}8ß}{\alpha-\gamma}$
(c) $\frac{\alpha-\gamma}{9.8\,ß}$
(d) $\frac{\alpha}{9.8\,ß}$

Q4

Two springs have their force constants k_1 and $k_2$stretched through same distance. The ratio of their potential energies is

(a) $\sqrt{k_1} : \sqrt{k_2}$
(b) $K_2 : k_1$
(c) $K_1 : k_2$
(d) $K_2 : k_1$

Q5

Which of the following is a correct statement?

(a) Centre of gravity of solid body always lies within the body
(b) Centre of gravity of a planet-satellite lies closer to the satellite
(c) A high jumper can pass a bar while his centre of gravity passes below the bar
(d) A high jumper can pass a bar with his centre of gravity above the bar only

Q6

The acceleration on the surface of the earth varies

(a) Inversely with latitude
(b) Directly with latitude
(c) Directly with longitude
(d) Inversely with longitude

Q7

The upper end of a wire 1 metre long and 2 mm radius is fixed and the lower end is twisted through angle 45°. The angle of twist is

(a) 0.009°
(b) 0.09°
(c) 0.9°
(d) 9°

Q8

Two stars radiate maximum energy at wavelength 3.6×10^{-7} m and 4.8×10^{-7} m respectively. Their temperatures are in ratio of

(a) 2/3
(b) 1/2
(c) 3/5
(d) 4/3

Q9

If one mole of a monoatomic gas ($\gamma = 5/3$) is mixed with one mole of a diatomic gas ($\gamma = 7/5$), the value of γ for the mixture is

(a) 1.40
(b) 1.50
(c) 1.53
(d) 3.07

Q10

Two simple pendulums Anad B of same lengths have bobs of same diameter but of masses m and M (M > m) resopectively and have been set into motion in a real medium. The pendulum having greater logarithmic decrement is

(a) Pendulum A
(b) Pendulum B
(c) Bothe will have same logarithmic decrement
(d) Any of the pendulums A or B depending upon the nature of medium

Q11

Four wires of identical lengths, diameters and of the same material are stretched on a sonometer wire. The ratio of their tensions is 1 : 4: 9: 16. Their fundamental frequencies will be in the ratio of

(a) 1: 4: 9: 16
(b) 4: 3: 2: 1
(c) 1: 2: 3: 4
(d) 16: 9: 4: 1

Q12

Ratio of electric fields due to cylindrical charge of infinite length at a distance equal to its radius from its surface to that from its surface to that from its axis is

(a) 3 (b) 1/3

(c) 2 (d) 1/2

Q13

In an electric circuit of complex nature when a current gets divided in accordance with Kirchoff's law into a number of branches, the heating effect is

(a) Maximum
(b) Minimum
(c) Infinite
(d) Zero

Q14

Relative permeability of iron is 5500. Its magnetic susceptibility will be

(a) 5499
(b) 5500×10^{7}
(c) 5500×10^{-7}
(d) 5501

Q15

A magnet of length 12 cm has pole strength 10 units. The magnet is placed at an angle of 30° with the direction of a uniform field of strength 0.5 Oerested. The torque acting on the magnet is

(a) 30 dyne cm
(b) 20 dyne cm
(c) 40 dyne cm
(d) 36 dyne cm

Q16

In an a.c. circuit the reactance of coil is $\sqrt{3}$ times its resistance. The phase difference between the voltage across the coil to the current through coil is

(a) $\pi/4$
(b) $\pi/6$
(c) $\pi/2$
(d) $\pi/3$

Q17

The time taken by a.c. of 50 Hz in reaching from zero to maximum value is

(a) 1×10^{-2}
(b) 2×10^{-2} s
(c) 50×10^{-3}
(d) 5×10^{-3} s

Q18

If V_γ, V_x and V_M are the speed of γ rays, X rays and microwaves respectively in vacuum, then

(a) $V_\gamma < V_x < V_M$
(b) $V_\gamma > V_x > V_M$
(c) $V_\gamma > V_x < V_M$
(d) $V_\gamma = V_x = V_M$

Read the following paragraph :

A beam of plane polarized light is incident normally on a polarizer having X sectional area of 3×10^{-4} m^2, which rotates about the axis of the ray with an angular velocity of 31.4 $rads^{-1}$

Now answer the following questions:

Q19

Intensity of emergent beam of light passing through the polarizer per revolution, If flux of energy of incident ray is 10^{-3} W, is

(a) 3/5 Wm^{-2}
(b) 5/3 Wm^{-2}
(c) 2/5 Wm^{-2}
(d) 1/5 Wm^{-2}

Q20

Energy of light passing through polarizer is

(a) 10^{-1} J
(b) 10^{-2} J
(c) 10^{-3} J
(d) 10^{-4} J

Q21

Two points separated by a distance of 0.1 mm can just be seen with a microscope with a light of wavelength 6000A°. If the light of wavelength 4800 A° is used, the limit of resolution will be

(a) 7 cm
(b) 9 cm
(c) 0.08 mm
(d) 8 mm

Q22

Which of the following is correct?

(a) Only a charged particle in motion is accompanied by matter waves
(b) Only subatomic particles in motion are accompanied by matter waves
(c) Any particle in motion, whether charged or uncharged, is accompanied by matter waves
(d) No particle, whether at rest or in motion, is ever accompanied by matter waves

Q23

In a nuclear reactor 0.01 mg of a fissile material is totally converted into energy in one second. The power of reactor in MW is

(a) 1000
(b) 900
(c) 0.01
(d) 100

Following question consists of two statements printed as Statement 1 and Statement 2. While answering these questions you are required to select any one of the responses indicated as

1. If both Statement 1 and Statement 2 are true and Statement 2 is a correct explanation of Statement 1.
2. If both Statement 1 and statement 1 and statement 2 are true but the Statement 2 is not a correct explanation of Statement 1.
3. If Statement 1 is true but the Statement 2 is false.
4. If Statement 1 is false but Statement 2 is true.

Q24

Statement 1: Binding energy per nucleon of heavy nuclei is small, so they are unstable

Statement 2: Binding energy per nucleon is the energy required to extract a nucleon from the nucleus and determines the stability of the nucleus.

(a) 1 (b) 2

(c) 3 (d) 4

Q25

Decimal number 53 is equal to binary number

(a) 11 11 11
(b) 10 10 10
(c) 10 11 10
(d) 11 01 01

Q26

The length of dipole antenna for a carrier wave of $5x\ 10^8$ Hz is

(a) 0.1 mm
(b) 0.2 mm
(c) 0.3 mm
(d) 0.4 mm

Q27

A block of mass 2kg rests on a rough inclined plane making an angle of 30° with the horizontal. the coefficient of static friction between the block and the plane is 0.7. The frictional force o the block is

(a) 9.8 N
(b) $0.7x\ 9.8x\ \sqrt{3}$ N
(c) $9.8x\ \sqrt{3}$ N
(d) 0.7 x 9.8 N

Q28

A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

(a) -1.5D
(b) -6.5 D
(c) +6.5 D
(d) +6.67 D

Q29

Two equal negative charges –q are fixed at points (0, -a) and (0, a) on y-axis. A positive charge Q is released from next at the point (2a, 0) on the x, axis, The charge Q will

(a) Execute simple harmonic motion about the origin
(b) Move to the origin and remain at rest
(c) Move to infinity
(d) Execute oscillatory but not simple harmonic motion

Q30

A particle of charge q and mass m moves in a circular orbit of radius r with angular speed ω. The ratio of the magnitude of its magnetic moment to that of angular momentum depends on

(a) ω and q
(b) ω, q and m
(c) q and m
(d) ω and m

MATHEMATICS

Q1

If a, b, c, be three cube roots of unity then $\begin{vmatrix} e^a & e^{2a} & e^{3a}-1 \\ e^b & e^{2b} & e^{3b}-1 \\ e^c & e^{2c} & e^{3b}-1 \end{vmatrix}$ *is*

(a) 0
(b) a + 2b + 3c
(c) 1 + a + b + c
(d) None of these

Q2

If one root of this equation $x^2 - \lambda x + 12 = 0$ is even prime and $x^2 + \lambda x + \mu = 0$ has equal roots, then μ is

(a) 32
(b) 16
(c) 8
(d) None of these

Q3

The sum of the series $30 + 28 + 26 \ldots\ldots\ldots\ldots + 0$.

(a) 120
(b) 30
(c) 40
(d) 240

Q4

The number of arrangements of the letters of word BANANA in which two N's do not appear adjacently is

(a) 20
(b) 30
(c) 40
(d) 50

Q5

If number of terms is $\left(x + \frac{1}{x}\right)^n$ is |0| then n is

(a) 50
(b) 52
(c) 48
(d) None of these

Q6

The equations $\lambda x - y = 2$, $2x - 3y = -\lambda$, $3x - 2y + 1 -= 0$ are consistent for

(a) $\lambda = 1$
(b) $\lambda = -4$
(c) $\lambda = -1, 4$
(d) $\lambda = 1, -4$

Q7

If A is skew symmetric matrix, then trace of A is

(a) 1 (b) 3

(c) 9 (d) 0

Q8

If $\log_{10} 2 = 0.301$, the number of digits is 2^{6^3} is

(a) 20
(b) 19
(c) 21
(d) None of these

Q9

A man is throwing stones at a target. The probability of hitting the target at any trial is $\frac{1}{3}$. The probability of hitting the target 4^{th} time at the 8^{th} throw is

(a) $\frac{35(4)^2}{(3)^3}$
(b) $\frac{35(4)^4}{(3)^8}$
(c) $\frac{(4)^4}{(3)^8}$
(d) None of these

Q10

Range of the function f defined by $f(x) = \left[\frac{1}{\tan\{x\}}\right]$, where [,] and {,} respectively denoted the greatest integer and the fractional part function is

(a) I, the set of integers
(b) Q, the set of rationals
(c) N, the set of natural numbers
(d) R, the set of real numbers.

Q11

$\text{Lt}_{x\to 0} \frac{1-Cosx\ \ cos4x\ \ cos5x}{\sin^2 x}$ is

(a) 15
(b) 21
(c) 26
(d) None of these

Q12

If f(x) = $\frac{1}{(x-3)(x-5)}$ and g(x) = $\frac{1}{x}$ then the points of discontinuity of f (g (x)) are

(a) {0, 1}

(b) {3, 5}

(c) $\left\{\frac{1}{3}, \frac{1}{5}\right\}$

(d) None of these

Q13

If $x^y = e^{x+y}$ then $\frac{dy}{dx}$ is

(a) $\frac{lnx-2}{(lnx)^2}$

(b) $\frac{lnx}{(lnx-1)^2}$

(c) $\frac{lnx-2}{lnx-1}$

(d) None of these

Q14

The equation of tangent at the origin to the curve y = Sin x is

(a) y = 0

(b) y = x

(c) x = 0

(d) None of these

Q15

If [0, 1], lagrange mean value theorem is not applicable to

(a) $f(x) = \begin{cases} cosxx & x \neq 0 \\ 1 & x = 0 \end{cases}$

(b) $f(x) = |x|$

(c) $f(x) = x\,|x|$

(d) $f(x) = \begin{cases} \frac{1}{3} - x, & x < \frac{1}{3} \\ \left(\frac{1}{3} - x\right)^2, & x \geq \frac{1}{3} \end{cases}$

Q16

The difference between the greater and the least value of the function f (x) = $\int_0^x (x + 1 + cost)dt \; for \; x \in [1, 2]$ is

(a) cos2 – cos 1

(b) sin 2 – sin 1

(c) 1

(d) $\frac{5}{2}$ + (sin2 - sin)

Q17

If $x \in (1, \infty)$ then $\int |\ln x|\, dx$ is

(a) $x|\ln x| + c$
(b) $x|\ln x| - x + c$
(c) $x\ln x + x + c$
(d) None of these

Q18

$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{e^x \sec^2 x}{e^x - 1} dx$ is equal to

(a) 2e
(b) 0
(c) π
(d) None of these

Q19

Area enclosed by the curve $|x + y - 1| + |u + 2y - 1| = 1$ is

(a) 2 sq. units
(b) 3 sq. units
(c) 4 sq. units
(d) None of these

Q20

The order and degree of the differential equation $\frac{d^4y}{dx^4} + \left(\frac{dy}{dx}\right)^3 + y = 3$ is

(a) 1, 3
(b) 4, 3
(c) 3, 4
(d) 4, 1

Q21

If the distance of any point (x, y) from origin is defined as $d(x,y) = |x| + |y|$ then the locus of $d(x,y) = 2$ is

(a) square of area 2 sq. units
(b) square of area 4 sq. units
(c) square of area 8 sq. units
(d) None of these

Q22

The equation of pairs of lines passing through origin and having slope m for which equation $(x - 2)(x + m) + 1 = 0$ has integral roots is

(a) $y^2 + 4xy + x^2 = 0$
(b) $y^2 + 2xy + x^2 = 0$
(c) $y^2 + xy = 0$
(d) None of these

Q23

Two distinet chords drawn from the point (p,q) on the circle $x^2 + y^2 = px + qy$ where $pq \neq 0$ are bisected by the x axis, then

(a) $p^2 = 8q^2$ (b) $p^2 > 8q^2$
(c) $q^2 > 8p^2$ (d) $q^2 = q^2$

Q24

A parabola is drawn with focus at (3,3) and vertex at the focus of the parabola $y^2 - 12x - 4y + 4 = 0$. The equation of parabola is

(a) $x^2 + 6x + y = 0$
(b) $x^2 - 6x - 4y + 21 = 0$
(c) $x^2 + 6x - 4y - 21 = 0$
(d) None of these

Q25

If $\frac{x^2}{f(3a)} + \frac{y^2}{f(a^2-4)}$ represents an ellipse with major axis as y axis and f is a decreasing function, then

(a) $a \in (1, 4)$
(b) $a \in (-1, 4)$
(c) $a \in (1, 3)$
(d) $a \in (-1, 3)$

Q26

If the eccentricity of the hyperbola $x^2 - y^2 \operatorname{cosec}^2\alpha = 5$ is $\sqrt{3}$ times the eccentricity of ellipse $x^2 \operatorname{cosec}^2 \alpha + y^2 = 25$, then the value of α is

(a) $\frac{\pi}{2}$ (b) $\frac{5\pi}{4}$
(c) $\frac{\pi}{3}$ (d) $\frac{9\pi}{4}$

Q27 Let P the any point on the plane $lx + my + nz = p$ and Q be a point on line OP such that $OP.\ OQ = p^2$ The Locus of the point Q is

(a) $x^2 + y^2 + z^2 = p^2$
(b) $lx + my + nz = p\ (x^2 + y^2 + z^2)$
(c) $p\ (lx + my + nz) = x^2 + y^2 + z^2$
(d) $lx + my + nz = x^2 + y^2 + z^2 - p$

Q28

If $x = Sin\theta\ |Sin\theta|$, $y = Cos\theta\ |Cos\theta|$, $\frac{\pi}{2} \leq \theta \leq \pi$ then

(a) $x - y = 1$
(b) $y - x = 1$
(c) $x + y = 1$
(d) $x + y = -1$

Q29

$|cotx + cosecx| = |cotx| + |cosecx|$, $x \in [0, 2\pi]$ if and only if x belongs to the interval

(a) $\left[0, \frac{\pi}{2}\right]$
(b) $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$
(c) $\left[\frac{-\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$
(d) None of these

Q30

If $x \in \left(\frac{3\pi}{2}, 2\pi\right)$, then the value of the expression $\cos^{-1}[\sin\{\cos^{-1}(\cos x) + \sin^{-1}(\sin x)\}]$, is

(a) $\frac{\pi}{2}$
(b) 0
(c) $\frac{-\pi}{2}$
(d) π