

**PRACTICE PAPER**

**CHEMISTRY**

**Q1**

In the extraction of iron, the furnace charge 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<sub>12</sub>
- (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 HCl 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 NaCl 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) NaCl crystals
- (b)  $BaCl_2 \cdot 2H_2O$  crystals
- (c)  $Ba(HCO_3)_2$  crystals
- (d)  $BaSO_4$  crystals

**Q10**

In a crystal of KCl, how many Cl<sup>-</sup> ions surround K<sup>+</sup> ions?

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

**Q11**

Amalgam is a solution of

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

**Q12**

Which of the following will not form a solution?

- (a) Salicylic 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  $\text{XeF}_6$  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<sub>2</sub>O
- (b) H<sub>2</sub>S
- (c) H<sub>2</sub>Se
- (d) H<sub>2</sub>Te

**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<sub>2</sub>H<sub>5</sub>CN (in the presence of KOH, H<sub>2</sub>O) → ?], what are the products?

- (a) C<sub>2</sub>H<sub>5</sub>OH + CO<sub>2</sub> + NH<sub>2</sub>
- (b) C<sub>2</sub>H<sub>5</sub>OH + HCOOH + NO
- (c) C<sub>2</sub>H<sub>5</sub>COOK + NH<sub>3</sub>
- (d) C<sub>2</sub>H<sub>5</sub>COOK + NH<sub>2</sub>

**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) all cis 1, 4- polyisopropene
- (c) only cis-trans, 1, 4 - polyisopropene
- (d) only cis trans 1, 2 - polyisopropene

**Q23**

Cell membrane is a

- (a) bilayer of lipids interspersed proteins
- (b) bilayer of lipids and proteins interspersed with polysaccharides
- (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**

Which of the following undergoes Friedel Craft reaction?

- (a)  $C_6H_5COOH$
- (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 +  $SO_2$  + HCl
- (b) Chloroacetic acid +  $SO_2$
- (c)  $ClCH_2COCl$  +  $SO_2$
- (d) Acetyldichloride +  $SO_2$  + HCl

**Q28**

Butyl methyl ether [ $(CH_3)_3C - O - CH_3$ ] may be easily prepared by the reaction of

- (a)  $(CH_3)_3C - Cl$  with  $NaOCH_3$
- (b)  $(CH_3)_3C - Cl$  with  $CH_2OH$
- (c)  $(CH_3)_3C - O^-$  with  $CH_3Cl$
- (d)  $(CH_3)_3C - OH$  with  $CH_3Cl$

**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  $CCl_4$
- (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  $\beta$  kg block at rest requires a force of  $(\alpha - \gamma)$  N is required to keep block in uniform motion. The coefficient of friction is

- (a)  $\frac{\beta}{\alpha}$
- (b)  $\frac{9.8\beta}{\alpha - \gamma}$
- (c)  $\frac{\alpha - \gamma}{9.8\beta}$
- (d)  $\frac{\alpha}{9.8\beta}$

### 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  $45^\circ$ . The angle of twist is

- (a)  $0.009^\circ$
- (b)  $0.09^\circ$
- (c)  $0.9^\circ$
- (d)  $9^\circ$

**Q8**

Two stars radiate maximum energy at wavelength  $3.6 \times 10^{-7}$  m and  $4.8 \times 10^{-7}$  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  $\gamma$  for the mixture is

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



**Q10**

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

- (a) Pendulum A
- (b) Pendulum B
- (c) Both 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)  $5500 \times 10^7$
- (c)  $5500 \times 10^{-7}$
- (d) 5501

**Q15**

A magnet of length 12 cm has pole strength 10 units. The magnet is placed at an angle of  $30^\circ$  with the direction of a uniform field of strength 0.5 Oersted. 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)  $1 \times 10^{-2}$
- (b)  $2 \times 10^{-2}$  s
- (c)  $50 \times 10^{-3}$
- (d)  $5 \times 10^{-3}$  s

**Q18**

If  $V_\gamma$ ,  $V_x$  and  $V_M$  are the speed of  $\gamma$  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  $3 \times 10^{-4}$  m<sup>2</sup>, which rotates about the axis of the ray with an angular velocity of 31.4 rads<sup>-1</sup>

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  $10^{-3} \text{ W}$ , is

- (a)  $\frac{3}{5} \text{ Wm}^{-2}$
- (b)  $\frac{5}{3} \text{ Wm}^{-2}$
- (c)  $\frac{2}{5} \text{ Wm}^{-2}$
- (d)  $\frac{1}{5} \text{ Wm}^{-2}$

**Q20**

Energy of light passing through polarizer is

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

**Q21**

Two points separated by a distance of 0.1 mm can just be seen with a microscope with a light of wavelength  $6000 \text{ \AA}$ . If the light of wavelength  $4800 \text{ \AA}$  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



**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 rest 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  $\omega$ . The ratio of the magnitude of its magnetic moment to that of angular momentum depends on

- (a)  $\omega$  and  $q$
- (b)  $\omega$ ,  $q$  and  $m$
- (c)  $q$  and  $m$
- (d)  $\omega$  and  $m$

### MATHEMATICS

**Q1**

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

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

**Q3**

The sum of the series  $30 + 28 + 26 \dots\dots\dots$

- (a) 120
- (b) 30
- (c) 40
- (d) 50

**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 not 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 in  $2^3$  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<sup>th</sup> time at the 8<sup>th</sup> 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**

$\lim_{x \rightarrow 0} \frac{1 - \cos x \cos 4x \cos 5x}{\sin^2 x}$  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)  $\{\frac{1}{3}, \frac{1}{5}\}$  (d) None of these

**Q13**

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

- (a)  $\frac{\ln x - 2}{(\ln x)^2}$   
 (b)  $\frac{\ln x}{(\ln x - 1)^2}$   
 (c)  $\frac{\ln x - 2}{\ln x - 1}$   
 (d) None of these

**Q14**

The equation of tangent at the origin to the curve  $y = \cos x$  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)  $f(x) = \begin{cases} \cos xx & \neq 0 \\ 1 & x = 0 \end{cases}$   
 (b)  $f(x) = |x|$   
 (c)  $f(x) = x|x|$   
 (d)  $f(x) = \begin{cases} \frac{1}{3} - x, & x < \frac{1}{3} \\ (\frac{1}{3} - x)^2, & x \geq \frac{1}{3} \end{cases}$

**Q16**

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

- (a)  $\cos 2 - \cos 1$  (b)  $\sin 2 - \sin 1$   
 (c) 1 (d)  $\frac{5}{2} + (\sin 2 - \sin 1)$



**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)  $E$
- (d) None of these

**Q19**

Area enclosed by the curve  $|x + y - 1| + |2y - 1| = 1$  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  $\frac{d^4 y}{dx^4} + \left(\frac{dy}{dx}\right)^3 + y = 3$  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 distinct 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)  $P^2 = q^2$

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

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

**Q27**

Let P be any point on the plane  $lx + my + nz = p$  and Q be a point on line OP such that  $OP \cdot OQ = p^2$ . The focus 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  $x = \sin\theta$ ,  $y = \cos\theta$ ,  $\frac{\pi}{2} \leq \theta \leq \pi$  then

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

**Q29**

$|\cot x + \operatorname{cosec} x| = |\cot x| + |\operatorname{cosec} x|$ ,  $x \in [0, 2\pi]$  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)  $\pi$