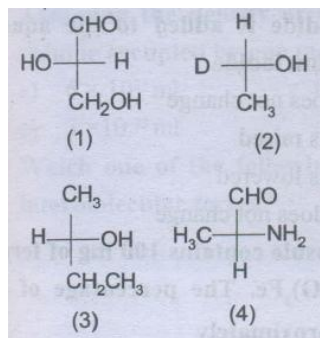


MODEL TEST PAPER XII

CHEMISTRY

Q.1

The R – isomers among the following are



- (a) 1 and 2
 (b) Only 2
 (c) 3 and 4
 (d) Only 4

Q.2

Match the compounds in List I with their nature from List II, as seen in aqueous medium from the combination shown.

List I

1. Acetamide
2. Benzonitrile
3. Triethylamine
4. Phenol

List II

- A. Acidic
- B. Basic
- C. Neutral

- (a) I – C; II – C; III – B; IV – A
 (b) I – B; II – C; III – C; IV – A
 (c) I – C; II – B; III – B; IV – C
 (d) I – A; II – A; III – C; IV – B

Q.3

The IUPAC name of the following compound is $\text{CH}_2 = \text{CH} - \text{CH}(\text{CH}_3)_2$

- (a) 3-Methyl-1-butene
- (b) 2-Vinylpropane
- (c) 1-Isopropyl ethylene
- (d) 1,1-Dimethyl-2-propane

Q.4

The organic reaction product from the reaction of methyl magnesium bromide and ethyl alcohol is

- (a) Methane
- (b) Ethane
- (c) Propane
- (d) Butane

Q.5

Which of the following reagents can distinguish $\text{C}_2\text{H}_5\text{OH}$ from CH_3OH ?

- (a) H_2O
- (b) NH_3
- (c) $\text{I}_2 + \text{KOH}$
- (d) HCl

Q.6

The yellow colour of chromate changes to orange on acidification due to the formation of

- (a) Cr^{3+}
- (b) Cr_2O_3
- (c) $\text{Cr}_2\text{O}_7^{2-}$
- (d) CrO_4

Q.7

An organic compound of molecular formula $(\text{C}_3\text{H}_5\text{O}_2\text{Br})$ is optically active. Which one of the following represents the above optically active compound ?

- (a) $\text{CH}_3 - \text{O} - \text{CH}_2 - \text{COBr}$
- (b) $\text{BrCH}_2 - \text{CH}_2 - \text{CO}_2\text{H}$
- (c) $\text{BrCH}_2 - \text{O} - \text{CO} - \text{CH}_3$
- (d) $\text{CH}_3 - \text{CH}(\text{Br}) - \text{CO}_2\text{H}$

Which among the following reacts with NaNH_2 in liquid ammonia to furnish the corresponding sodio-derivative?

- (a) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$
- (b) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{Br}$
- (c) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{C}_2\text{H}_5$
- (d) $\text{CH}_3 - \text{C} \equiv \text{CH}$

Q.9

Cottrell precipitator works on the principle of

- (a) Distribution law
- (b) Neutralization of charge
- (c) Le-chatelier's principle
- (d) Partition law

Q.10

Which of the following oxides of vanadium is likely to be most basic ?

- (a) VO
- (b) V_2O_3
- (c) VO_2
- (d) V_2O_5

Q.11

Hydrometallurgy is based on :

- (a) Calcination
- (b) Roasting
- (c) Leaching
- (d) Oxidation

Q.12

Of the following metals the one which cannot be obtained by electrolysis of the aqueous solution of its salt?

- (a) Ag
- (b) Mg
- (c) Cu
- (d) Au

In analogy to $O_2^+[PtF_6]^-$ a compound $N_2^+[PtF_6]^-$ will not be formed because

- (a) The ionization enthalpy of N_2 gas is higher than that of O_2 gas
- (b) The ionization enthalpy of N_2 gas is lower than that of O_2 gas
- (c) The ionization enthalpy of N_2 gas is higher than that of N atom
- (d) None of these

Q.14

If ionization potential for hydrogen atom is 13.6 eV, then ionization potential for He^+ will be

- (a) 54.4 eV
- (b) 6.8 eV
- (c) 13.6 eV
- (d) 24.5 eV

Q.15

15 which does not exist ?

- (a) $[CCl_6]^{2-}$
- (b) $[SiCl_6]^{2-}$
- (c) $[GeF_6]^{2-}$
- (d) $[SnCl_6]^{2-}$

Q.16

Amongst TiF_6^{2-} , CoF_6^{3-} , Cu_2Cl_2 and $NiCl_4^{2-}$ (At. Nos. Ti = 22, Co = 27, Cu = 29, Ni = 28) the colourless species are

- (a) CoF_6^{3-} and $NiCl_4^{2-}$
- (b) CoF_6 and TiF_6^{2-}
- (c) Cu_2Cl_2 and $NiCl_4^{2-}$
- (d) TiF_6^{2-} and

Q.17

Which one of the following groups of oxides can be reduced by v carbon to give the respectively metal

- (a) Cu_2O - SnO_2
- (b) Fe_2O_3 ZnO
- (c) PbO , $()$, Fe_3ZnO
- (d) CaO , K_2O

The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order K_2CO_3 , $MgCO_3$, $(II) BeCO_3$, (IV)

- (a) I<II<III<IV
- (b) IV<II<III<I
- (c) IV<II<I<III
- (d) II<IV<III<I

Q.19

Which of the following compounds liberates iodine when its aqueous solution is treated with KI solution ?

- (a) $ZnSO_4$
- (b) $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$
- (c) $CuSO_4 \cdot 5H_2O$
- (d) $Na_2SO_4 \cdot 10H_2O$

Q.20

When mercuric iodide is added to the aqueous solution of potassium iodide

- (a) Boiling point does not change
- (b) Freezing point is raised
- (c) Freezing point is lowered
- (d) Freezing point does not change

Q.21

A 400 mg iron capsule contains 100 mg of ferrous fumarate $(CHCOO)_2Fe$. The percentage of iron present in it is approximately

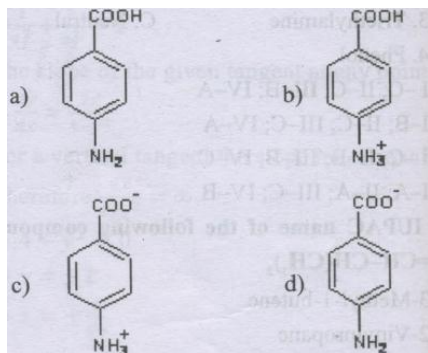
- (a) 33%
- (b) 25%
- (c) 14%
- (d) 8%

Q.22

The size of the nucleus of an atom is of the order of

- (a) 10^{-10} m
- (b) 10^{-15} m
- (c) 10^{-6} m
- (d) 10^{-8} m

The structure of p-aminobenzoic acid at its isoelectric point is:



Q.24

Chemical name of vitamin C is :

- (a) Ascorbic acid
- (b) Thiamime
- (c) Riboflavin
- (d) Calciferol

Q.25

Na_2CO_3 is prepared by Solvay process but K_2CO_3 cannot be prepared by the same because

- (a) K_2CO_3 is highly soluble in water
- (b) KHCO_3 is appreciably soluble
- (c) KHCO_3 is sparingly soluble
- (d) KHCO_3 decomposes

Q.26

Out of the following halides of sodium, which one has greatest covalent character ?

- (a) NaCl
- (b) NaBr
- (c) NaI
- (d) NaF

Q.27

Assuming the density of water to be 1 g/ml the volume occupied by one molecule of water is

(a) 6×10^{23} ml

(b) 6×10^{-23} ml

(c) 3×10^{-23} ml

(d) 3×10^{24} ml

Which one of the following exhibits the weakest intermolecular forces ?

- (a) NH_3
- (b) H_2O
- (c) He
- (d) HCl

Q.29

The angle between two covalent bonds is maximum in :

- (a) NH_3
- (b) CH_4
- (c) H_2O
- (d) CO_2

Q.30

Which of the following is the strongest acid ?

- (a) Phenol
- (b) *p*-chlorophenol
- (c) *p*-nitrophenol
- (d) 2,4-dinitrophenol

PHYSICS

Q.1

A cube has a side of length 1.2×10^{-2} m. Its volume will be

- (a) $1.7 \times 10^{-6} \text{m}^3$
- (b) $1.73 \times 10^{-6} \text{m}^3$
- (c) $1.70 \times 10^{-6} \text{m}^3$
- (d) $1.732 \times 10^{-6} \text{m}^3$

Q.2

A string of length 1 m is fixed at one end and carries a mass of 100 g at the other end. The string makes $2/\pi$ revolutions per second around the vertical axis through the fixed end. If angle of inclination of string with the vertical is $\cos^{-1}(5/8)$, the linear velocity of mass is

- (a) 1 m/s
- (b) 2 m/s
- (c) 3 m/s

A block kept on a frictionless inclined surface with angle of inclination ϕ . The incline is given an acceleration a to keep the block stationary. The acceleration a is equal to

- (a) $g/\tan\phi$
- (b) $g \operatorname{cosec} \phi$
- (c) g
- (d) $g \tan\phi$

Q.4

The kinetic energy of a body becomes four times its initial value. The new linear momentum will be

- (a) Twice the initial value
- (b) Same as the initial value
- (c) Four times the initial value
- (d) Thrice the initial value

Q.5

Moment of inertia of a solid cylinder of mass M and radius R about a line parallel to the axis of cylinder and lying on the surface of the cylinder is

- (a) $2MR^2/5$
- (b) $3MR^2/5$
- (c) $3MR^2/2$
- (d) $5MR^2/2$

Q.6

A satellite revolves around a planet in circular orbit of radius R with time period of revolution T . If the satellite is stopped and brought to rest in its orbit, then

- (a) It will not fall into the planet
- (b) It will fall into the planet so the time of fall of satellite is meaning less
- (c) The time of fall of satellite is $T/\sqrt{8}$
- (d) The time of fall of satellite into the planet is $\sqrt{2}T/8$

Q.7

The excess pressure inside a soap bubble is three times that inside another bubble. The ratio of volume of first to second bubble is given by

- (a) 3 : 1
- (b) 7 : 9
- (c) 1 : 27
- (d) 27 : 1

Temperature of a cup of tea is decreased by dipping a spoon in it. The most suitable material for same mass is

- (a) Aluminium
- (b) Steel
- (c) Iron
- (d) Copper

Q.9

Real gases obey ideal gas laws more closely at

- (a) High pressure and low temperature
- (b) Low pressure and high temperature
- (c) High pressure and high temperature
- (d) Low pressure and low temperature

Q.10

A particle executes simple harmonic motion with a frequency. The frequency of kinetic energy will be

- (a) $2n$
- (b) N
- (c) $n/2$
- (d) $3n$

Q.11

A point particle of mass 0.1 kg is executing simple harmonic motion of amplitude 0.1 m. When the particle passes through the mean position, its kinetic energy is 8×10^{-3} J. The equation of motion of the particle at the initial phase of oscillation of 45° , is given by

- (a) $0.1 \cos (4t+\pi/4)$
- (b) $0.1 \sin (4t+\pi/4)$
- (c) $0.4 \sin (t+\pi/4)$
- (d) $0.2 \sin (\pi/2+2t)$

An electron of mass m_e , initially at rest, moves through a certain distance in a uniform electric field in time t_1 . A proton of mass m_p , also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2/t_1 is nearly equal to

- (a) 1
- (b) $(m_p/m_e)^{1/2}$
- (c) $(m_e m_p)^{1/2}$
- (d) 1.8

Q.13

A wire of length 100 cm is connected to a cell of 2V. The resistance of the wire is 3Ω . The additional resistance required to produce a potential difference of 1 mV/cm is

- (a) 60Ω
- (b) 47Ω
- (c) 57Ω
- (d) 35Ω

Q.14

The strength of the magnetic field at a point distance r near a long straight current carrying wire is B . the field at a distance $r/2$ will be

- (a) $B/2$
- (b) $B/4$
- (c) $4B$
- (d) $2B$

Q.15

A current of 2 A flows in a long, straight wire of radius 2 mm. The intensity of magnetic field at the axis of the wire is

- (a) $\frac{\mu_0}{\pi} \times 10^3$ Tesla
- (b) $\frac{\mu_0}{2\pi} \times 10^3$ Tesla
- (c) $\frac{2\mu_0}{\pi} \times 10^3$ Tesla
- (d) Zero

Q.16

When an alternating potential $V = V_0 \sin(\omega t - \pi/2)$ flows in a given circuit. The electric power consumed in the given circuit per cycle is

- (a) $2I_0 V_0$
- (b) $\sqrt{2} I_0 V_0$
- (c) $I_0 V_0/2$
- (d) Zero

Large transformers, when used for sometime, become hot and are cooled by circulating oil. The heating of transformer is due to

- (a) Heating effect of current alone
- (b) Hysteresis loss alone
- (c) Both hysteresis loss and heating effect of current
- (d) None of the above

Following question consist 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 2 are true but the Statement 2 is not 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 .

Q.18

Statement 1: The process of superimposing low frequency audio wave on the high frequency carrier wave is called modulation

Statement 2: The process of separating the audio wave from carrier wave is called demodulation

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Q.19

When light falls on a given plate at an angle of incidence 60° , the reflected and refracted rays are found to be normal to each other. The refractive index of the material of the plate is then

- (a) 0.866
- (b) 1.5
- (c) 1.732
- (d) 2

Q.20

Which of the following can not be used to get a sharp image of the object ?

- (a) Using two parallel slits
- (b) Using lenses
- (c) Using diffraction grating
- (d) Using Polaroid sheets

In diffraction grating experiment, the pattern can be enhanced by

- (a) Increasing wavelength
- (b) Decreasing wavelength
- (c) Constant wavelength
- (d) None of the above

Q.22

The penetrating power of X rays can be increased by

- (a) Increasing the current in filament
- (b) Decreasing the current in filament
- (c) Increasing the potential difference between the cathode and the anode
- (d) Decreasing the potential difference between the cathode and the anode

Q.23

The wavelength of maximum energy, released during an atomic explosion, was 2.93×10^{-10} m. If the wein's constant is 2.93×10^{-3} mK, the maximum temperature attained must be of the order of

- (a) 10^{-7} K
- (b) 10^7 K
- (c) 10^{-13} K
- (d) 5.86×10^7 K

Q.24

The half life of radium is 1600 years. The number of un decayed atoms of radium after 4800 years will be

- (a) 1/8b)
- (b) 1/16
- (c) 7/8d)
- (d) 8/7

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Q.25

Statement 1: Forbidden energy gap may be zero in case of a conductor so it conducts electricity, where as in case insulator forbidden energy gap is very large and hence can not conduct electricity.

Statement 2: A substance can conduct electricity if an electron jumps from valence band to conduction band by over- coming the forbidden energy gap.

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Sol.26

If a star can convert all the He nuclei completely into oxygen nuclei, the energy released per oxygen nuclei is

(Given mass of the helium nucleus = 4.0026 amu and mass of oxygen nucleus = 15.9994 amu)

- (a) 7.6 MeV
- (b) 56.12 MeV
- (c) 10.24 MeV
- (d) 23.4 MeV

Sol.27

The magnetic of electric field E in the annular region of a charged cylindrical capacitor

- (a) Is same through out
- (b) Is higher near the outer cylinder than near the inner cylinder
- (c) Varies as $1/r$ where r is the distance from the axis
- (d) Varies as $1/r^2$ where r is the distance from the axis

Sol.28

A given quantity of an ideal gas is at pressure p and absolute temperature T. The isothermal bulk modulus of the gas is

- (a) $\frac{2}{3}p$
- (b) p
- (c) $\frac{3}{2}p$
- (d) 2p

Sol.29
Steam at 100°C is passed into 1.1 kg of water contained in a calorimeter of water equivalent 0.02 kg at 15°C till the temperature of the calorimeter and its contents rises to 80°C . The mass of the steam condensed in kg is

- (a) 0.130
- (b) 0.065
- (c) 0.260
- (d) 0.135

Sol.30

A real image of a distant object is formed by a planoconvex lens on its principle axis. Spherical aberrations

- (a) Is absent
- (b) Is smaller if the curved surface of the lens faces the object
- (c) Is smaller if the plane surface of the lens faces the object
- (d) Is the same whichever side of the lens faces the object

MATHEMATICS

Q.1

Let $f: R \rightarrow R$ be such that $f(x) = 2^x = 2^x$. Then the range of f is

- (a) $(1, \infty)$
- (b) $[1, \infty)$
- (c) R
- (d) $R - \{0\}$

Q.2

If $\sin\theta = -\frac{2\sqrt{6}}{5}$ and θ lies in third quadrant. Then $\tan\theta$ is equal to

- (a) $2\sqrt{6}$
- (b) $\sqrt{6}$
- (c) $\frac{2}{5}$
- (d) $-\frac{\sqrt{6}}{5}$

$(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2$ is equal to

- (a) $4\cos^2\left(\frac{\alpha+\beta}{2}\right)$
- (b) $4\cos^2\left(\frac{\alpha-\beta}{2}\right)$
- (c) $4\sin^2\left(\frac{\alpha+\beta}{2}\right)$
- (d) $4\sin^2\left(\frac{\alpha-\beta}{2}\right)$

Q.4

In any triangle ABC, $a\cos A + b\cos B + c\cos C$ is equal to

- (a) $2a \sin B \sin C$
- (b) $2a \cos B \cos C$
- (c) $A \cos B \sin C$
- (d) $A \sin B \cos C$

Q.5

If $(1+i)y^2 + (6+i) = (2+i)x$, then the value of x and y are

- (a) $x = 5, y = \pm 2$
- (b) $x = \pm 5, y = 2$
- (c) $x = 2, y = \pm 5$
- (d) $x = \pm 2, y = 5$

Q.6

The roots of $x^2 - 5ix - 6 = 0$ are

- (a) $2i, 1 + 2i$
- (b) $3i, 2i$
- (c) $1 + 3i, 1 + 2i$
- (d) $1 + 2i, 1 - 2i$

Q.7

If ${}^{22}P_{r+1} : {}^{20}P_{r+2} = 11 : 52$, then the value of r is

- (a) 5
- (b) 6
- (c) 7
- (d) 8

The number of four letter words that can be formed using the letters of the word 'FAILURE' are

- (a) 300
- (b) 315
- (c) 345
- (d) 360

Q.9

The term which is independent of x in the expansion of $\left(x - \frac{1}{x}\right)^{12}$ is

- (a) ${}^{12}C_2$
- (b) ${}^{12}C_3$
- (c) ${}^{12}C_4$
- (d) ${}^{12}C_6$

Q.10

If an A.P. 3rd term is 7 and 7th term is two more than thrice of its 3rd term. Then sum of first 20 terms is

- (a) 700
- (b) 740
- (c) 760
- (d) 800

Q.11

The sum of an infinite G.P. is 8 and its second term is 2. Then the first term of G.P. is

- (a) 4
- (b) 5
- (c) -7
- (d) -10

Q.12

A straight line passes through the point (3, 4) and the sum of its intercepts on the axes is 14. The equation of the line is

- (a) $2x + 3y = 4$
- (b) $x + 3y = 5$
- (c) $x + y = 7$
- (d) $3x + 4y = 6$

The number of three digit numbers that can be formed without using the digits 0, 2, 4, 5 and 6

- (a) 24
- (b) 30
- (c) 56
- (d) 64

Q.14

Out of 7 consonants and 4 vowels, the number of words that can be formed from 3 consonants and 2 vowels are

- (a) 25200
- (b) 30500
- (c) 32750
- (d) 36250

Q.15

$(99)^5$ is equal to

- (a) 9509900899
- (b) 9509900499
- (c) 9509900100
- (d) 9509900900

Q.16

The sum of the series $5 + 55 + 555 + \dots$ n terms is equal to

- (a) $\frac{5}{81} [10^{n+1} - 1 - 9n]$
- (b) $\frac{5}{81} [10^{n+1} - n - 8]$
- (c) $\frac{5}{81} [10^{n+1} - 10 - 9n]$
- (d) $\frac{5}{81} [10^{n+1} - 2n + 1]$

Q.17

The equation of line which is parallel to line $3x - 4y - 5 = 0$ and at a unit distance from it, is

- (a) $3x - 4y - 10 = 0$
- (b) $3x - 4y + 12 = 0$
- (c) $3x - 4y + 15 = 0$
- (d) $3x - 4y + 20 = 0$

The equation of the circle which passes through (1, 0) (-1,0) and (0, 1) is

- (a) $x^2 + y^2 = 9$
- (b) $x^2 + y^2 = 1$
- (c) $x^2 + y^2 = 4$
- (d) $x^2 + y^2 = 16$

Q.19

$\lim_{x \rightarrow 4} \frac{3 - \sqrt{5+x}}{1 - \sqrt{5-x}}$ is equal to

- (a) $\frac{1}{3}$
- (b) $\frac{1}{2}$
- (c) $-\frac{1}{3}$
- (d) $\frac{1}{4}$

Q.20

The probability that in a random arrangement of letters of word 'UNIVERSITY' the two I's come together is

- (a) $\frac{1}{5}$
- (b) $\frac{1}{10}$
- (c) $\frac{1}{12}$
- (d) $\frac{1}{15}$

Q.21

If $f(x) = \frac{3x-2}{2x-3}$ then Range (f) is

- (a) R
- (b) $-\left\{\frac{3}{2}\right\}$
- (c) $(0, \infty)$
- (d) $(-\infty, 0)$

If $-\frac{\pi}{4} < x < \frac{\pi}{4}$ then $\sin^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right)$ is equal to

- (a) $\frac{\pi}{4}$
- (b) $x + \frac{\pi}{2}$
- (c) $x + \frac{\pi}{4}$
- (d) x

Q.23

$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ is equal to

- (a) abc
- (b) $a^2b^2c^2$
- (c) ab^2c
- (d) $4a^2b^2c^2$

Q.24

$\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{8}{17}$ is equal to

- (a) $\sin^{-1}\frac{77}{85}$
- (b) $\cos^{-1}\frac{77}{85}$
- (c) $\sin^{-1}\frac{24}{85}$
- (d) $\cos^{-1}\frac{24}{85}$

Q.25

The function $f(x) = \frac{4+x^2}{4x-x^3}$ is discontinuous at

- (a) One point
- (b) Two points
- (c) Three points
- (d) None of these

Let $f(x) = |x|$ and $g(x) = |x^3|$, then

- (a) $f(x)$ and $g(x)$ both are continuous at $x = 0$
- (b) $f(x)$ and $g(x)$ both are differentiable at $x = 0$
- (c) $f(x)$ is differentiable but $g(x)$ is not differentiable at $x = 0$
- (d) $f(x)$ and $g(x)$ both are not differentiable at $x = 0$

Q.27

The slope of the normal to the curve $x^2 + 3y + y^2 = 5$ at $(1, 1)$ is

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

Q.28

The function $f(x) = \frac{x}{x^2+1}$ is increasing in interval

- (a) $(1, \infty)$
- (b) $[1, \infty)$
- (c) $[0, 1]$
- (d) $(-1, 1)$

Q.29

$\int \tan^{-1} \left\{ \sqrt{\frac{1-\sin x}{1+\sin x}} \right\} dx, -\frac{\pi}{2} < x < \frac{\pi}{2}$ is equal to

- (a) $\frac{\pi}{4}x + c$
- (b) $\frac{\pi}{4}x - \frac{x^2}{2} + c$
- (c) $\frac{x^2}{2} + c$
- (d) $\frac{\pi}{4} + \frac{x^2}{2} + c$

Q.30 $\int_0^1 \frac{e^{-x}}{1+x} dx$ is equal to

- a. $\log \frac{1+e}{2} - \frac{1}{e}$
- b. $\log \frac{e}{2} - e$
- c. $\log \frac{1+e}{e}$
- d. $\log \frac{e}{e-1}$

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