PRACTICE PAPER

CHEMISTRY

Q1.

Given that, for the reaction H^+ (aq) + OH^- (aq) H_2O (I), energy released is 57.1 kJ. Three reactions are given as follows

(1) 0.25 mole of HCI in solution is neutralized by 0.25 mole of NaOH; heat released is ΔH_1.

(2) 0.5 mole of HNO_3 in solution is mixed with 0.2 mole of KOH solution; heat released is ΔH_2.

(3) 200 cm^3 of 0.2 M HCI solution is mixed with 300 cm^3 of 0.1 M NaOH solution heat released is ΔH_3.

The correct order for the numerical value of ΔH_1, ΔH_2, ΔH_3 would be

    (a) $\Delta H_1 > \Delta H_2 > \Delta H_3$
    (b) $\Delta H_1 > \Delta H_3 > \Delta H_{32}$
    (c) $\Delta H_3 > \Delta H_2 > \Delta H_1$
    (d) $\Delta H_2 > \Delta H_1 > \Delta H_3$

Q2.

Given the following standard electrode potentials :

Element   Electrode reaction

$E°_{(298)}$ (Volts)

$Zn/Zn^{2+}_{(aq)} + 2e \rightarrow Zn_{(s)} - 0.76$

$Sn/Sn^{2+}_{(aq)} + 2e^- \rightarrow Sn_{(s)} - 0.14$

$Pb/Pb^{2+}_{(aq)} + 2e^- \rightarrow Pb_{(s)} - 0.13$

$Cu/cu^{2+} + 2e^- \rightarrow Cu_{(s)} + 0.34$

Based on the above data, identify the correct answer. From an aqueous solution of the salts

    (a) Zinc can displace tin, lead, copper
    (b) Tin can displace zinc, lead, copper
    (c) Copper can displace zinc, tin, lead
    (d) Lead can displace zinc, tin, copper

Q3.

The electron energy for the quantum number n = 2 in a hydrogen atom is

   (a) $- 1.312 \times 10^6$ Jmol.$^{-1}$
   (b) $- 3.28 \times 10^5$ Jmol.$^{-1}$
   (c) $+ 3.28 \times 10^5$ Jmol.$^{-1}$
   (d) $+ 1.312 \times 10^6$ Jmol.$^{-1}$

Given, m = 9.1×10^{-31} kg; e = 1.6×10^{-19} C; h = 6.6×10^{-34} kgm^2 s^{-1}

Q4.

The percent void space in close fcc packing of sphere is

   (a) 31.98 %
   (b) 25.96 %
   (c) 47.64 %
   (d) 74.04 %

Q5.

If the value for equilibrium constant for the reaction, A_2 (g) + 2 B_2 (g) $\rightleftharpoons$ 4 C (g) is 2. What is the equilibrium constant for the reaction:

2 (c) (g) $\rightleftharpoons$ ½ A_2 (g) + B_2 (g)
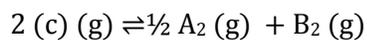
   (a) 2
   (b) 4
   (c) $\sqrt{2}$
   (d) $\frac{1}{\sqrt{2}}$

Q6.

Solution with reversed acidity and alkalinity are known as

   (a) Isotonic solutions
   (b) Iso-hydric solutions
   (c) Buffer solutions
   (d) None of these

Q7.

The rate of a second order reaction is 5×10^{-5} mol L^{-1} S^{-1}. When the initial concentration of the reactant is 0.25 mol L^{-1}, the value of the rate is

(a) 8×10^{-4} Lmol^{-1}
(b) 2×10^{-4}- moll^{-1}
(c) 8×10^{-4} molL^{-1}
(d) 2×10^{-4} Lmol^{-1}

Q8.

The reverse of chemilumiescene is called

(a) Fluorescence
(b) Photochemical reaction
(c) Phosphorescence
(d) Photosensitization

Q9.

Which of the following molecules has unpaired electron in antibonding molecular orbital?

(a) O_2
(b) F_2
(c) N_2
(d) C_2

Q10.

The pH of a buffer solution containing 0.1M acetic acid and 0.1 M sodium acetate (pKa of a acetic acid is 4.74) is

(a) 4.74
(b) 5.74
(c) 3.74
(d) 9.48

Q11.

What is the hybridization of orbitals of boron and nitrogen, respectively, in BF_3. NH_3?

(a) Sp^2, sp^3
(b) Dsp^2, sp^3
(c) Sp^2, sp^2
(d) Sp^2d, sp^2

Q12.

Which of the following compounds is used testing iron in its trivalent state to give intense blue colour for its confirmation?

    (a) KSCN
    (b) K_3 Fe $(CM)_6$
    (c) K_4 Fe $(CN)_6$
    (d) NH_4 NCS

Q13.

The slag formed in blast furnace in metallurgy of iron is due to a reaction between:

    (a) Calcium & SiO_2
    (b) Calcium carbonate & Fe_2O_3
    (c) Calcium oxide & SiO_2
    (d) Calcium chloride & Fe_2O_3

Q14.

Which of the following compounds contains coordinate covalent bond?

    (a) $N_2H_5{}^+$
    (b) HCI
    (c) $BaCI_2$
    (d) H_2O

Q15.

Which of the following compound does contain peroxide bridge?

    (a) Na_2O_2
    (b) BaO_2
    (c) H_2O_2
    (d) SrO_2

Q16.

Amongst the inert gases most abundant gas in the atmosphere is

    (a) He
    (b) Kr
    (c) Ne
    (d) Ar

Q17.

The Green House effect in the atmosphere is exhibited due to the presence of following as in atmosphere.

  (a) CO_2
  (b) O_3
  (c) CO
  (d) all of these

Q18.

Which of the following has highest lattice energy?

  (a) $Be(OH)_2$
  (b) $Ca (OH)_2$
  (c) $Na(OH)_2$
  (d) $Ba(OH)_2$

Q19.

An atom or ion in an octahedral hole of a close packed structure has how many nearest neighbours?

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

Q20.

Out of the following vlues, which value is not correct for 20 volume solution of $H_2 O_2$?

  (a) It contains 60.7 gm/ltr of H_2O_2
  (b) It is 6.07 % weight / volume
  (c) It is 1.8 molar solution of H_2O_2
  (d) It liberates 40 litres of oxygen on decomposition.

Q21.

Besides Ba_2O, CaO and SiO_2, pyrex glass contains two more oxides. Which of the following are correct?

  (a) $Fe_2 O_3$, $Al_2 O_3$
  (b) PbO, ZnO
  (c) TiO_2, B_2O_3
  (d) B_2O_3, $Al_2 O_3$

Q22.

Which of the following reactions is not correct?

    (a) SO_3 (in the presence of H_2O) → H_2SO_4
    (b) P_2O_5 (in the presence of H_2O) → HPO_3
    (c) N_2O (in the presence of H_2O) → HNO_2
    (d) B_2O_3 (in the presence of H_2O) → HBO_2

Q23.

Which of the following compounds is formed when 'hypo' dissolves silver bromide?

    (a) $Na_3[Ag(S_2O_3)_2]$
    (b) $Na_2[Ag(SO_3 Br)]$
    (c) $Na[Ag(SO_3)_3]$
    (d) $Na[Ag(S_2O_3)_2]$

Q24.

Which of the following is the allotrope of carbon ?

    (a) Fullerene
    (b) Freon
    (c) Ferrocene
    (d) Furazine

Q25.

The diamagnetic species is

    (a) $[Ni(CN)_4]^{2-}$
    (b) $[NiCI_4]^{2-}$
    (c) $[CoCI_4]^{2-}$
    (d) $[CoF_6]^{2-}$

Q26.

The product in the following reaction is:

    (a) $CH_3CH_2CH_2CH_3$
    (b) $(CH_3)_2CH_2CH_2CH_2CH_2 CH_3$
    (c) $(CH_3)_2 CH_2 CH_2 CH_2 CH_3$
    (d) $CH_3 CH_2 CH_2 CH_3$

Q27.

Nitration of aniline in strongly acidic medium, results in the formation of m- nitroaline also

This is because

    (a) Amino group is meta orienting during electrophonic substitution reaction
    (b) Nitro groups goes always to the meta position irrespective of the substituents
    (c) Nitration of aniline is a nucleophilic substitution reaction in strongly acidic medium
    (d) In strongly acidic conditions aniline is present as anilinium ion.

Q28.

State the product available by the following reaction.

$$CH_3CH_2\,CN + \text{ethanol} + H_2\,O \xrightarrow[\Delta]{conc.H_2\,SO_4}$$
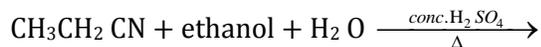
    (a) Ethyl formate $+ NH_3$
    (b) Ethyl propanoate $+ NH_3$
    (c) Ethyl nutanoate $+ NH_3$
    (d) Ethyl acetate $+ NH_3$

Q29.

An organic compound contains 49.3 % carbon 6.84 % hydrogen and its vapour density is 73. Molecular formula of the compound is

    (a) $C_3H_8O_2$
    (b) $C_3H_{10}\,O_2$
    (c) $C_6H_{10}\,O_4$
    (d) $C_4\,H_{10}\,O_2$

Q30.

Which is the most thermodynamically stable allotropic form of phosphorus?

    (a) Red
    (b) Black
    (c) White
    (d) Yellow

Q1.

A quantity $X = \varepsilon_0 \, L \, \frac{\Delta V}{\Delta t}$ where ε_0 is absolute permittivity, L is length, ΔV is change in potential difference and Δt is change in time, Dimensions of X are same as that of

(a) Resistance
(b) Charge
(c) Voltage
(d) Current

Q2.

A player throws a ball upwards with an initial speed of 294 ms^{-1}. The height to which the ball rises and the time taken to reach the player's hands are assessed in different manners. The correct choice is

(a) The height is 34.4 m
(b) The time is 6s
(c) The time is 3s
(d) The height is 44 m

Q3.

A man fires a bullet of mass 200g at a speed of 5ms^{-1} with a gun of 1kg mass. By what velocity the gun rebounds back?

(a) 0.1 1ms^{-1}
(b) (b) 10ms^{-1}
(c) 1ms^{-1}
(d) 0.01ms^{-1}

Q4.

The moment of inertia of a square plate about a diagonal is I_d and that about a median is I_m, then

(a) $I_m = I_d$
(b) $I_m < I_d$
(c) $I_m > I_d$
(d) None of these

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

Q5.

Statement 1 : Engine always works to keep a car Statement 2 : Engine always works to keep a car moving

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

Q6.

A quantity $X = \varepsilon_0 \, L \, \frac{\Delta V}{\Delta t}$ where ε_0 is absolute permittivity, L is length, ΔV is change in potential difference and Δt is change in time. Dimensions of X are same as that of

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(b) The time is 6s
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Q8.

Three rods of equal length / are joined to form an equilateral triangle PQR. O is the mid point is PQ. Distance OR remains same for small change in temperature. Coefficient of linear expansion, α_1 for PR and α_2 for RQ are same. Then

    (a) $\alpha_2 = 3\,\alpha_1$
    (b) $\alpha_2 = 4\alpha_1$
    (c) $\alpha_1 = 3\alpha_2$
    (d) $\alpha_1\ 4\alpha_2$

Q9.

If v is the mean speed, v_{rms} is the root mean square speed and V_p is the most probable speed of an ideal monoatomic gas at absolute temperature and mass of a gas molecule is m, then average kinetic energy of a molecule is

    (a) $\frac{1}{2}\ mv^2$
    (b) $\frac{3}{4}\ mv^2$
    (c) $\frac{3}{4}\ mv_{rms}^2$
    (d) $\frac{3}{4}\ mv_p^2$

Q10.

A simple pendulum with length l and bob mass m is executing SHM of small amplitude A. The maximum tension in the string will be

    (a) mg $(1 + A/l)$
    (b) mg $(1 + a/l)^2$
    (c) mg $[1 + (A / l)^2]$
    (d) mg

Q11.

The bob of a simple pendulum of length l is released at time $t = 0$ from the position of small angular displacement θ. Linear displacement of the bob at any time t is given as

    (a) $l\theta \cos(gt/l)^{1/2}$
    (b) $l\cos (gt / l)^{1/2}$
    (c) $lg\sin \theta$
    (d) $l\ \theta\sin (gt/l)^{1/2}$

Q12.

1000 drops of water of radius 1 cm each carrying a charge of 10 esu combine to form a single drop. The capacitance of combined drop increases

  (a) 1 time
  (b) 10 times
  (c) 100 times
  (d) 1000 times

Q13.

The length of given cylindrical wire is increased by 100%. Due to consequent decrease in diameter the change in the resistance of the wire will be

  (a) 300 %
  (b) 200 %
  (c) 100 %
  (d) 50 %

Read the following paragraph

A thin magnetic needle has a time period of vibration as 6s in earth's magnetic field. It suddenly breaks into two pieces of half lengths. Let T be the time period of unbroken needle and T' be the time period of the broken piece.

Now answer the following questions:

Q14.

Ratio of moment of inertia of broken needle to normal is

  (a) 1 : 1
  (b) 1 : 2
  (c) 1 : 4
  (d) 1 : 8

Q15.

Ratio of magnetic moment of broken needle to normal needle is

  (a) 1 : 1
  (b) 1 : 2
  (c) 1 : 4
  (d) 1 : 8

Q16.

An inductor resistance battery circuit is switched on at t = 0. If the emf of battery is E, the charge passing through the battery in time constant T is

(a) ET / Re
(b) eET / R
(c) ET / Rπe
(d) 2ET / eR

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Q17.

Statement 1 : Energy currents of mechanical type have an aluminium disc.

Statement 2 : Eddy currents or Foucalt's currents are produced I the metallic disc when it is rotated in the magnetic field to move the counters of the metre.

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

Q18.

An electromagnetic radiation has an energy 14.4 eV. To which region of electromagnetic spectrum does it belong?

(a) Ultraviolet region
(b) Visible region
(c) X-ray region
(d) γ – region

Q19.

To increase both the resolving power and magnifying power of a telescope

  (a) Both the focal length and aperture of the objective has to be increased.
  (b) The focal length of the objective has to be increased.
  (c) The aperture of the objective has to be increased.
  (d) The wavelength of light has to be decreased.

Q20.

H Polaroid is prepared by

  (a) Orienting herapathite crystals in the same direction
  (b) Using thin tourmaline crystals
  (c) Stretching polyvinyl alcojol and then heating with dehydrating agent
  (d) Stretching polyvinyl alcohol and then impregnating with iodine

Q21.

An ideal mirror has an area a. light energy of frequency v and velocity c falling on this mirror per unit area is E for n photons in unit time. Then

  (a) No force is exerted on the mirror
  (b) A non calculable force exerts on the mirror
  (c) Force acted is given by 2nhv/c
  (d) No force but some pressure is exerted on the mirror.

Q22.

If the refractive index of a material of equilateral prism is $\sqrt{.}$, the angle of minimum deviation of the prism is

  (a) 30°
  (b) 45°
  (c) 60°
  (d) 75°

Q23.

A proton and an α particle have kinetic energy in the ratio 16 : 1. The ratio of de Broglie waves associated with them is

  (a) 100 µs
  (b) 200 µs
  (c) 300 µs
  (d) 400 µs

Q25.

When a transistor is used in a circuit

    (a) The emitter base junction is forward biased and base collector junction is reverse biased
    (b) The emitter base junction is reverse biased and the base collector junction is forward biased
    (c) Both junctions are reverse biased.
    (d) None of these

Q26.

How many geo synchronous satellites are required to provide the communication over the whole part of the earth?

    (a) Minimum three
    (b) Minimum one
    (c) Minimum three
    (d) Minimum four

Q27.

An ionized gas contains both positive and negative ions. If it is subjected simultaneously to an electric field along the positive x direction and a magnetic field along the positive z direction, then

    (a) Positive ions deflect towards positive y direction and negative ion towards negative y direction
    (b) All ions deflect towards positive y direction
    (c) All ions deflect towards positive y direction
    (d) Positive ions deflect towards negative y direction and negative ions towards negative y direction

Q28.

A satellite is moving with a constant speed v n a circular orbit about the earth. An object of mss m is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is

    (a) $\frac{1}{2}mv^2$
    (b) mv^2
    (c) $\frac{3}{2}mv^2$
    (d) $2mv^2$

Q29.

An idea spring with spring constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. The maximum extension in the spring is

(a) $\frac{4\,Mg}{k}$

(b) $\frac{2\,Mg}{k}$

(c) $\frac{Mg}{k}$

(d) $\frac{Mg}{k}$

Q30.

Two blocks of masses 10 kg and 4 kg are connected by a spring of negligible mass and placed on a frictionless horizontal surface. An impulse gives a velocity of 14 m/s to the heavier block in the direction of the lighter block. The velocity of the centre of mass is

(a) 30 m/s
(b) 20 m/s
(c) 10 m/s
(d) 5 m/s
(e)

MATHEMATICS

Q1.

In a survey of political preference, asked to give their preference on three government proposals I, II and III, 78% were in favor of at least on the proposals, 50% favored proposal I, 30% favored proposal II, 20% favored proposal III. If 5% favored all the three proposals, what % favored more than one of the three proposals?

(a) 2
(b) 11
(c) 13
(d) 17

Q2.

The range of the function $f\,(x) = [\sin x]$ is

(a) {- 1, 1}
(b) [- 1, 1]
(c) {- 1, 0, 1}
(d) [0, 1]

Q3.

The locus of a point z satisfying $|2z - 1| = |z - 2|$ is a/an

(a) Straight line
(b) Cirlce
(c) Ellipse
(d) None of these

Q4.

The only of the root of $ax^3 + bx + c = 0$, $\alpha \neq 0$, is zero, if

(a) $c = 0$
(b) $c = 0, b \neq 0$
(c) $b = 0, c = 0$
(d) $b = 0, c \neq 0$

Q5.

If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$, α, β are the roots of

(a) $2x^2 - 7x + 16 = 0$
(b) $3x^2 + 9x + 11 = 0$
(c) $9x^2 - 27x + 20 = 0$
(d) None of these

Q6.

Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b\,6c \end{vmatrix}$, $where$

$a = i, b = w, c = w^2$, then Δ is equal to

(a) -1
(b) 1
(c) –i
(d) i

Q7.

The number of ways of painting the faces of a cube with six different colour is

(a) 2!
(b) 3!
(c) 6!
(d) None of these

Q8.

$$^nC_0 - \frac{1}{2}{}^nC_1 + \frac{1}{3}{}^nC_2 + \ldots\ldots\ldots\ldots + (-1)^n{}^nC_n / n + 1 =$$

(a) n

(b) $1/n$

(c) $\frac{1}{n+1}$

(d) $\frac{1}{n-1}$

Q9.

The sum of first two terms of an infinite G.P. is 1 and every term is twice the sum of the successive terms. Its first term is

(a) ½

(b) 1/3

(c) 2/3

(d) 3/4

Q10.

$$\frac{3+5+7+\ldots\ldots\ldots+n \ terms}{5+8+11+\ldots\ldots+10 \ terms} = 7, \text{ then the value of n is}$$

(a) 19

(b) 22

(c) 33

(d) 35

Q11.

If the sum of an infinite G.P. is 3 and the sum of the square of its terms is also 3, then its first term and common ratio are

(a) $\frac{1}{2}, \frac{1}{3}$

(b) $\frac{3}{2}, \frac{1}{2}$

(c) $\frac{1}{3}, \frac{1}{4}$

(d) None of these

Q12.

$$Lt_{x \to \infty} \left(\frac{x+5}{x+1}\right)^{x+4} \text{ is equal to}$$

(a) e

(b) e^2

(c) e^3

(d) e^4

Q13.

$\text{Lt}_{x \to 0} \dfrac{1-cosx}{x}$ is equal to

(a) 0
(b) ½
(c) 1
(d) does not exists

Q14.

Let $f(x) = x^{3/2}$, then $f'(0) =$

(a) 0
(b) ½
(c) 1
(d) Does not exists

Q15.

If y = 4x – 5 is tangent to the curve y² = px³ + q at (2, 3), then

(a) p = 2, q = 3
(b) p = 2, q = -7
(c) p = 3, q = 7
(d) p = 2, q = -3

Q16.

$$\int \sqrt{1 + \cos\ (x\ /4)}\ dx =$$

(a) $8\sqrt{2} \sin(x\ /8)\ + c$
(b) $-8\sqrt{2} \cos(x\ /\ 8) + c$
(c) $8\sqrt{2}\ sin\ \left(\dfrac{x}{4}\right) + c$
(d) None of these

Q17.

$$\int logx\ dx =$$

(a) x (1 – log x) + c
(b) x (logx – 1) + c
(c) (1 + x) logx + c
(d) (1 – x) logx + c

Q18.

$\int_0^\pi \sqrt{1 - \cos x}\ dx =$

    (a) $\sqrt{2}$
    (b) 1
    (c) 2
    (d) $2\sqrt{2}$

Q19.

The order of a differential equation whose solution is $y = \alpha\cos x + b\sin x$, where α and b are arbitrary constants, is

    (a) 1
    (b) 2
    (c) 3
    (d) Cannot be determined

Q20.

If $\dfrac{dy}{dx} + \dfrac{1}{y\sqrt{1-x^2}} = 0$, then which of the following statements is true?

    (a) $y^2 + 2\sin^{-1}x = c$
    (b) $x^2 + 2\sin^{-1}y = c$
    (c) $x^2 + 2\sin^{-1}x = c$
    (d) None of these

Q21.

The vertices of Δ are $(0, 0)$, $(3, 0)$ and $(0, 4)$. Its orthocenter is at

    (a) $(0, 0)$
    (b) $(1/2, \frac{1}{2})$
    (c) $(1/2, 3/2)$
    (d) $(1, 3/2)$

Q22.

The equation $\dfrac{x^2}{a^2} + \dfrac{x^2}{b^2} = 1$ represents a vertical ellipse if

    (a) $a^2 = b^2$
    (b) $a^2 > b^2$
    (c) $a^2 < b^2$
    (d) None of these

Q23.

The points (5, - 4, 2), (4, - 3, 1) (7, -6 , 4), (8, -7, 5) are the vertices of

(a) Parallelogram
(b) Square
(c) Rectangle
(d) Rhombus

Q24.

A particle acted on the constant forces $4\hat{\imath} + \hat{\jmath} - 3\hat{k}$ and $3\hat{\imath} + \hat{\jmath} - 3\hat{k}$ to the point $5\hat{\imath} + 4\hat{\jmath} + \hat{k}$. the total work done by the forces is

(a) 10 units
(b) 20 units
(c) 30 units
(d) 0 units

Q25.

The probability that a man will live 10 more years is ¼ and the probability that his wife will live 10 more years is 1/3 . then the probability that neither of them will be alive in 10 years is

(a) 11 /12
(b) ½
(c) 7/12
(d) None of these

Q26.

Period of cot3x – cos (4x + 3) is

(a) π/3
(b) π/4
(c) π
(d) π/2

Q27.

(a) $\sin^{-1}\frac{65}{56}$
(b) $\sin^{-1}\frac{56}{65}$
(c) $\cos^{-1}\frac{13}{25}$
(d) None of these

Q28.

The area of the figure bounded by curves $y^2 = 2x + 1$ and $x - y = 1$ is

  (a) 16/3
  (b) 18/3
  (c) 21/2
  (d) None of these

Q29.

$\log (1 - x) = - \left(x + \frac{x^2}{2} + \frac{x^3}{3} + \ldots \right)$ is valid for

  (a) all $x \in R$
  (b) $-1 < x < 1$
  (c) $-1 < x \leq 1$
  (d) $-1 \leq x \leq 1$

Q30.

$1 + \log_e z + \frac{(\log_e z)^2}{2!} + \frac{(\log_e z)^3}{3!} + \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$ is equal to

  (a) z
  (b) z^{-1}
  (c) togz
  (d) None of these