clamphook

# Shift 3

## Clamphook CBT

## 2080

**Full Marks:** 140 **Time:** 2 hours **Pass Marks:** 56

**1. EMF of a cell is given by EMF $E = \frac{W}{Q}$ where W= work done, Q= charge. The dimension of EMF is:**

a. $[ML^2T^{-2}A^{-2}]$ b. $[ML^2T^{-3}A^{-1}]$

c. $[ML^2T^{-2}A^2]$ d. $[ML^2T^{-2}A]$

**2. The inherent property, with which a body resists any change in its state of motion is known as _____.**

a. Force b. Momentum

c. Inertia d. Acceleration

**3. A satellite is revolving around a planet of radius 'r' with speed '$V_0$'. If the satellite is made to revolve in another planet of twice the mass than original and constant radius then ratio of initial to final velocity is:**

a. $1:1$ b. $1:2$

c. $1:\sqrt{2}$ d. $\sqrt{2}:1$

**4. If length of a pendulum is increased by 21% its time period increases by:**

a. $10\%$ b. $21\%$

c. $11\%$ d. $9.8\%$

**5. The amount of work done in increasing the size of a soap film $10$cm $\times$ $5$cm to $10$cm $\times$ $6$ cm is ($T = 0.04$ N/m)**

a. $24 \times 10^{-6}$J b. $40 \times 10^{-6}$J

c. $80 \times 10^{-6}$J d. $1.6 \times 10^{-5}$J

**6. Melting point of ice**

a. Decrease with decrease of pressure b. Increase with the increase of pressure

c. Is independent of pressure d. Decrease with the increase of pressure

**7. For a gas $\frac{R}{C_v} = 0.67$; this gas is made up of molecules which are**

a. monatomic b. diatomic

c. polyatomic d. mixture of diatomic and polyatomic molecules

**8. Find the focal length of the lens that is made of material of refractive index 1.5 that is made up of two curved surfaces of the radius of curvature 20 cm each.**

a. $10cm$ b. $20cm$

c. $30cm$ d. $40cm$

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**9. A bird in air looks a fish vertically below it inside water . x is the height of the bird above the surface of water and y is the depth of fish below the surface of water . If refractive index of water with respect to air is , the distance of fish as observed by bird is**

a. $x + y$ b. $x + \left(\frac{y}{\mu}\right)$

c. $\mu x + y$ d. $\mu(x + y)$

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**10. There are 10 condensers each of capacity 5 $\mu$ F , The ratio between max. and min. capacity obtained from these condensers will be :**

a. 100 : 1 b. 25 : 5

c. 40 : 1 d. 60 : 3

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**11. the amount of ions liberated by $96500$C of charge passed through the electrolyte is called**

a. ECE b. chemical equivalent

c. gram equivalent d. no one of these

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**12. A direct current is passed through a helical spring. The spring will :**

a. Be stretched b. Begin to rotate about the axis

c. Be compressed d. Begin to move linearly

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**13. In LR circuit**

a. Current and voltage are in phase b. Current leads voltage by π/2

c. Voltage leads current by π/2 d. Current leads voltage by π/2

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**14. If Young's experiment is performed inside water , the fringe width will :**

a. decrease b. remain same

c. increase d. none of the above

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**15. A transverse wave is producing in a string of length 29 m and mass 5g, then the speed of transverse has and the time taken by transverse wave at the middle of string is:**

a. 10 $m/s$, 1.41 sec b. $10\sqrt{2}\,m/s$, 1.42 sec

c. 10 $m/s$, 1 sec d. $10\sqrt{2}\,m/s$, 1 sec

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**16. A proton and an alpha particle are accelerated by same kinetic energy . The ratio of associated de – Broglie wavelength is [IOE 2076]**

a. $1:1$ b. $2:1$

c. $3:1$ d. $4:1$

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**17. Consider the following nuclear reaction**

$X^{200} \rightarrow A^{110} + B^{90} +$ **Energy**

**If the binding per nucleus for $X^{200}$, $A^{110}$ and $B^{90}$ is 7.4 MeV, 8.2 MeV, and 8.2 MeV respectively, what is the energy released?**

a. 320 MeV b. 160 MeV

c. 80 MeV d. 90 MeV

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**18.** If $n(U) = 125, n(A) = 80, n(B) = 65$ then the least value of $n(A \cap B)$ is

a. 40 b. 50

c. 60 d. 20

**19.** If $\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix} X = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$, then X =

a. $\begin{bmatrix} -3 & 4 \\ 14 & 13 \end{bmatrix}$ b. $\begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix}$

c. $\begin{bmatrix} 3 & 4 \\ 14 & -13 \end{bmatrix}$ d. $\begin{bmatrix} -3 & -4 \\ 14 & -13 \end{bmatrix}$

**20.** $a + ib > c + id$ can be explained only when

a. $b = 0, c = 0$ b. $b = 0, d = 0$

c. $a = 0, c = 0$ d. $a = 0, d = 0$

**21.** If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b and c are in GP then x, y and z are in: [IOE 2078]

a. AP b. GP

c. HP d. None

**22.** The number of solution of $\sin x + \cos x = 2$ is [IOE 2075]

a. 0 b. 1

c. 2 d. 3

**23.** If $2\tan^{-1}(\cos\theta) = \tan^{-1}(2\operatorname{cosec}\theta)$ then $\theta$ is :

a. $n\pi - \frac{\pi}{4}$ b. $n\pi + \frac{\pi}{4}$

c. $n\pi + \frac{\pi}{3}$ d. $n\pi - \frac{\pi}{3}$

**24.** In $\Delta ABC, C = 90^\circ$ then, $1 - \tan\frac{A}{2}\tan\frac{B}{2} = ?$ [IOE 2078]

a. $\frac{c}{s}$ b. $\frac{s}{c}$

c. $-\frac{c}{s}$ d. $-\frac{s}{c}$

**25.** In ΔABC, which of the following is true? [IOE 2074]

a. $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = 0$ b. $\overrightarrow{AB} - \overrightarrow{BC} + \overrightarrow{CA} = 0$

c. $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = 0$ d. $\overrightarrow{AB} - \overrightarrow{BC} - \overrightarrow{CA} = 0$

**26.** The lines $ax^2 + 2hxy + by^2 = 0$ are equally inclined to the lines $ax^2 + 2hxy + by^2 + k(x^2 + y^2) = 0$ for :

a. k = 1 only b. k = 2 only

c. k = 0 only d. For any real value of K

**27.** The area of the circle centered at $(1, 2)$ and passing through the point $(4, 6)$ is :

a. 5 π sq .unit b. 10 π sq .unit

c. 25 π sq .unit d. 50 π sq .unit

**28.** Eccentricity of an ellipse is

a. 1 b. <1

c. 1 d. 0

**29. The equation $2x = e^{-x} + e^{x}$ and $2y = e^{x} - e^{-x}$ represent**

a. Circle
b. Ellipse
c. Parabola
d. Hyperbola

**30. The distance of the point $(2, 1, -1)$ from the plane $x - 2y + 4z = 9$ is**

a. $\frac{\sqrt{13}}{\sqrt{7}}$
b. $\frac{\sqrt{13}}{\sqrt{3}}$
c. $\frac{13}{\sqrt{7}\sqrt{3}}$
d. $\frac{\sqrt{7}\sqrt{3}}{13}$

**31. The value of $\lim_{x\to\infty}\left(1 + \frac{2}{x} + \frac{3}{x^2}\right)^{x}$ is equal to**

a. $e^{1}$
b. $e^{2}$
c. $e^{3}$
d. $e^{4}$

**32. Derivative of $\cos^{-1} x$ with respect to x is [IOE 2076]**

a. $-\frac{1}{\sqrt{1-x^2}}$
b. $-\frac{1}{1-x^2}$
c. $\frac{1}{1-x^2}$
d. $\frac{1}{\sqrt{1-x^2}}$

**33. If $x^{y} = a$ then $\frac{dy}{dx} =$ [IOE 2076]**

a. $-\frac{\log a}{x(\log x)}$
b. $\frac{\log a}{x(\log x)}$
c. $\frac{\log a}{x(\log x)^2}$
d. $-\frac{\log a}{x(\log x)^2}$

**34. In case of strictly decreasing functions, the derivative is**

a. zero
b. positive or zero
c. negative
d. positive

**35. A boy is flying a kite with horizontal 3 m/s which is at a height 40m from ground and length of string is 50m, then the rate at which string is released is: [IOE 2077]**

a. 4 m/s
b. 5 m/s
c. 0.56 m/s
d. 1.8 m/s

**36. $\int_{1}^{-1} |1 - x| dx$ is equal to [IOE 2078]**

a. 0
b. 1
c. -1
d. 2

**37. The area bounded by the curve $y = x^3$ from $x = -1$ to $x = 1$ is [IOE 2074]**

a. $\frac{1}{2}$
b. $\frac{1}{4}$
c. 0
d. 1

**38. What method is used to separate methane from a mixture of the gases methane and ethane? [IOE 2078]**

a. Distillation
b. Boiling
c. Filtration
d. Liquefaction

**39. Tetrabromoethane on heating with Zn gives**

a. ethane
b. ethene
c. ethyl bromide
d. ethyne

**40. Ammonia when heated with $CuO$ gives**

a. $NO_2$ b. $N_2O$

c. $N_2$ d. $N_2O_5$

**41. Hard water is not fit for washing clothes because**

a. It contains $Na_2SO_4$ and $KCl$ . b. It gives precipitate with soap.

c. It contains impurities. d. It is acidic in nature.

**42. Alkali metal import colour to Bunsen burner flame due to**

a. The presence of one electron in their outermost orbitals b. Low ionization energy

c. Their softness d. Their reducing nature

**43. The tough cake copper is**

a. 99 % pure b. 95 % pure

c. 90 % pure d. 92 % pure

**44. Rusting of iron is a chemical reaction. The reaction is**

a. Analysis b. Displacement

c. Combination d. Double decomposition

**45. An examples of lewis acid is**

a. $PH_3$ b. $SnCl_4$

c. $BF_4^-$ d. $CH_3NH_2$

**46. Which of the following is the strongest oxidizing agent?**

a. $F_2$ b. $Cl_2$

c. $Br_2$ d. $I_2$

**47. The most electropositive among given elements is [IOE 2078]**

a. Mg b. Al

c. S d. P

**48. Which molecule has a pyramidal arrangement of component atoms?**

a. $AlCl_3$ b. $SiCl_4$

c. $PCl_3$ d. $BeCl_2$

**49. Get ..... the money now.**

a. he b. me

c. she d. they

**50. Which one of the following is correct? [2078]**

a. The earth with other planets is _____ b. The earth with other planets are_____

c. The earth with other planets have_____ d. The earth with other planets has_____

**51. I shall return home_____ 7 o'clock.**

a. at b. by

c. in d. to

**52. When she was driving, she _____ with an accident.**

a. meets b. had meeting

c. will meet d. met

**53. The passive voice of "Switch off the TV" is [IOE 2076]**

a. Let the TV should be switched off
b. The TV was let to be switched off
c. Let the TV be switched off
d. Let the TV be switched off then

**54. In the word …….. the stress falls on the second syllable.**

a. official
b. airport
c. communication
d. algebra

**55. I want to buy new pants and new shoes, but I only have enough money for one.**

a. Simple Sentence
b. Compound Sentence
c. Complex Sentence
d. Compound-Complex Sentence

**56. Parents _____ their children.**

a. care to
b. care at
c. care on
d. care for

**57. Antonym of 'dearth' is:**

a. lack
b. poverty
c. abundance
d. foreign

**58. I ……. swimming if it weren't so rainy. [IOE 2075]**

a. will go
b. go
c. would go
d. would be going

**59. The inmates … well by their caretakers.**

a. Were not being treated
b. Were not treating
c. Have not being treated
d. Was not being treated

**60. I am pleased … the secrets of this family recipe.**

a. told
b. to have told
c. telling
d. to be told

**61. A car accelerates from rest at constant rate of $2m/s^2$ for some limes then it retard at a constant rate of $4m/s^2$ and comes to rest. The maximum speed attained by the car if it remaining motion of 3 seconds is:**

a. 2 m/s
b. 3 m/s
c. 4 m/s
d. 6 m/s

**62. How many days would be in a year if the distance between the earth and the sun were reduced to half of its present value (assuming circular orbit)?**

a. 365 days
b. 730 days
c. 329 days
d. 129 days

**63. The maximum velocity and maximum acceleration of a particle executing SHM are $4\ m/s$ and $2m/s^2$. Then its time period of oscillations will be:**

a. $\frac{\pi}{2}$ sec
b. $2\pi$ sec
c. $\frac{2}{\pi}$ sec
d. $4\pi$ sec

**64. One thousand small water droplets of equal size combine to form a big drop. The ratio of final surface energy to the initial surface energy is: [IOE 2072]**

a. $10:1$
b. $100:1$
c. $1:10$
d. $1:100$

**65. The rms speed of an ideal gas at $300K$ is $1.8km/s$ then $rms$ speed of gas at $1200K$ will be:**

a. $7.2km/s$ b. $3.6km/s$

c. $2.54km/s$ d. $0.9km/s$

**66. Velocity of light is air is $3 \times 10^8$ and refractive index of water is 1.33. the time taken by light to travel a distance of 500m in water in micro-second is: [IOE 2077]**

a. 1.33 b. 2.66

c. 2.21 d. 2

**67. If a 2 $\muF condenser is charged to 200 volts and its plates are connected by a wire, the heat produced in the wires is:**

a. $4 \times 10^{-4}$ Joule b. $4 \times 10^{-2}$ Joule

c. $4 \times 10^{-5}$ Joule d. $2.5 \times 10^{-2}$ Joule

**68. The emf of 1st cell is 10 V and balancing length is obtained at 40 cm. if the balancing length of 2nd cell is obtained at 20 cm, then the emf of second cell is: [IOE 2077]**

a. 2 b. 4

c. 5 d. 7

**69. If a wire carrying current $I$ is bent to two arms making right angle between them the magnetic field intensity $B$ at the distance $a$ from both arms is**

a. $\frac{\mu_o I}{4\pi a}$ b. $\frac{\mu_o I}{2a}$

c. $\frac{\mu_o I}{\sqrt{2}2\pi a}$ d. $\frac{\mu_o I}{2(a+\sqrt{a})}$

**70. The maximum emf induced in a wire of 15 m moving with velocity 10 m/s placed in a magnetic field of strength 5 gauss is [IOE 2075]**

a. $750$ V b. $75$ V

c. $7.5$ V d. $0.075$ V

**71. A string of length $0.4$ and mass $10^{-2}$ kg is tightly clamped at its ends. The tension in the string is $1.6$ N. Identical wave pulses are produced at one end equal intervals of time $\Delta t$, the value of $\Delta t$. which allows construction interference between successive pulses is**

a. 0.05 s b. 0.10 s

c. 0.20 s d. 0.40 s

**72. The frequency heard by a stationary observer is double than that blown by source coming towards it. The velocity of source is (velocity of sound $= 340m/s$) [IOE 2077]**

a. $680m/s$ b. $340m/s$

c. $170m/s$ d. $70m/s$

**73. Light of frequency $5 \times 10^{14}$ Hz. liberated electron with energy $2.31 \times 10^{-19}$ J from a certain metallic surface. What the wavelength of U-V light which liberates electrons of energy $8.93 \times 10^{-19}$ from the same surface?**

a. $5 \times 10^{-7}$ m b. $3 \times 10^{-7}$ m

c. $2 \times 10^{-7}$ m d. $1 \times 10^{-7}$ m

**74. If 20% of material decayed in 10 days , 40% of material will decay in [IOE 2074]**

a. 15 days
b. 20 days
c. 21.8 days
d. 22.9 days

**75. Find the range of $f(x) = x^2 + 4x + 7$ [IOE 2078]**

a. $(-\infty, 3]$
b. $[3, \infty)$
c. $(3, \infty)$
d. $(-\infty, 3)$

**76. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ then $A^{100} =$**

a. $2^{100}A$
b. $2^{99}A$
c. $2^{101}A$
d. $A$

**77.** $\left|\frac{1}{2}(z_1 + z_2) + \sqrt{z_1 z_2}\right| + \left|\frac{1}{2}(z_1 + z_2) - \sqrt{z_1 z_2}\right|$

a. $|z_1 + z_2|$
b. $|z_1 - z_2|$
c. $|z_1| + |z_2|$
d. $|z_1| - |z_2|$

**78. If $a, b$ and $c$ are in GP with common ratio $r(0 < r < 1)$, and $a, 2b, 3c$ are in AP then value of $r$ is [IOE 2077]**

a. $\frac{1}{2}$
b. $\frac{2}{3}$
c. $\frac{3}{2}$
d. $\frac{1}{3}$

**79. The coefficient of $x^6$ in $(1+x)^{21} + (1+x)^{22} + (1+x)^{23} + \ldots + (1+x)^{31}$ is:**

a. $C(31, 6) - C(21, 6)$
b. $C(31, 7) - C(21, 7)$
c. $C(32, 6) - C(22, 6)$
d. $C(32, 7) - C(21, 7)$

**80. If $\sin^2 x - 2\cos x + \frac{1}{4} = 0$, then $x$ is**

a. $2n\pi \pm \frac{\pi}{3}$
b. $2n\pi \pm \frac{\pi}{4}$
c. $2n\pi \pm \frac{\pi}{6}$
d. $2n\pi \pm \frac{\pi}{2}$

**81. If a = 5 cm, b = 4 cm and c = 3 cm then length of perpendicular drawn from vertex A on side BC is [IOE 2077]**

a. $\frac{\sqrt{39}}{2}$ cm
b. $\frac{\sqrt{11}}{2}$ cm
c. $\frac{12}{5}$ cm
d. $\frac{24}{5}$ cm

**82. $20i + j, 5i + pj$ and $10i - j$ are collinear. The value of 'p' is [IOE 2074]**

a. 2
b. -2
c. 1
d. -1

**83. The lines joining the origin to the point of intersection of curve $x^2 + y^2 = a^2$ and the line $lx + my = n$ are at right angles if :**

a. $2n^2 = a^2(l^2 + m^2)$
b. $2m^2 = a^2(l^2 + n^2)$
c. $2l^2 = a^2(m^2 + n^2)$
d. $2n^2 = a^2(m^2 - l^2)$

**84. What is the equation of the circle with centre at (-4, -5) and touching the line 3x -4y + 2 = 0? [IOE 2078]**

a. $x^2 + y^2 + 8x + 10y - 37 = 0$
b. $x^2 + y^2 + 8x - 10y - 37 = 0$

c. $x^2 + y^2 + 8x + 10y + 37 = 0$

d. $x^2 + y^2 - 8x - 10y + 37 = 0$

**85. The equation of tangent to the parabola $y^2 = 5x$ perpendicular to the line x + 2y − 7 = 0 is :**

a. 16x− 8y + 5 = 0

b. 4x− 2y + 8 = 0

c. 4x− 4y + 9 = 0

d. 2x− y + 11 = 0

**86. The length of perpendicular from origin to the plane which meets the axes at intercepts 3 , 4 and 6 is [IOE 2075]**

a. $\frac{29}{\sqrt{12}}$ units

b. $\frac{12}{\sqrt{29}}$ units

c. $\frac{12}{\sqrt{29}}$ units

d. $\frac{\sqrt{26}}{12}$ units

**87. For what value of k the function given by $f(x) = \begin{cases} \frac{2\sin(\pi x)}{5x}, x \neq 0 \\ 2k, x = 0 \end{cases}$ is continuous?**

a. $\frac{3\pi}{10}$

b. $\frac{\pi}{5}$

c. $\frac{\pi}{10}$

d. $\frac{3\pi}{2}$

**88. If $y = \ln(\ln x)$ then $e^y \frac{dy}{dx}$ = [IOE 2075]**

a. 1/x

b. x

c. 1

d. -1

**89. If $y = \frac{\sec x + \tan x}{\sec x - \tan x}$, then dydx equals. [IOE 2078]**

a. $2\cos x(1 - \sin x)^2$

b. $\cos x(1 - \sin x)^2$

c. $2\cos x(1 - \sin x)$

d. $\cos x(1 - \sin x)$

**90. Benzyl alcohol and Anisole are**

a. Functional Isomer

b. Metamer

c. Position Isomer

d. Tautomer

**91. Chlorine react with ammonia to give___.**

a. $NCl_3$

b. $HCl + NCl_3$

c. $N_2 + NCl_3$

d. $N_2 + NH_4Cl$

**92. Heating of pyrites to remove sulphur is called as**

a. Roasting

b. Calcinations

c. Smelting

d. Fluxing

**93. Specific heat of a metal is $0.13 cal/g$ and vapor density of its chloride is $96$. The equivalent weight of metal is [IOE 2077]**

a. $28$

b. $27$

c. $12$

d. $9$

**94. The volume of $0.25\ M\ MgCl_2$ that must be added to $320$ ml of $0.25\ M\ NaCl$ to produce $0.3\ M\ Cl^-$ in the mixture is**

a. 80 ml

b. 90 ml

c. 100 ml

d. 120 ml

**95. The solubility product of AgCl is $1.44 \times 10^{-8}$ at 100°C. The solubility in boiling water may be [IOE 2075]**

a. $0.72 \times 10^{-4}$ M

b. $1.20 \times 10^{-2}$ M

c. $0.72 \times 10^{-2}$ M

d. $1.20 \times 10^{-4}$ M

**96. How many coulombs are required for the oxidation of $1\,\text{mole of } H_2O_2 \text{ to } O_2$?**

a. 93000 C

b. $1.93 \times 10^5$ C

c. $9.65 \times 10^4$ C

d. $19.3 \times 10^2$ C

**Read the following passages carefully and answer the questions given below them.** ***(Questions from 97 to 100)***

Management is a set of processes that can keep a complicated system of people and technology running smoothly. The most important aspects of management include planning, budgeting, organising, staffing, controlling, and problem-solving. Leadership is a set of processes that creates organizations in the first place or adapts them to significantly changing circumstances. Leadership defines what the future should look like, aligns people with that vision, and inspires them to make it happen despite the obstacles. This distinction is absolutely crucial for our purposes here: Successful transformation is 70 to 90 per cent leadership and only 10 to 30 per cent management. Yet for historical reasons, many organizations today don't have much leadership. And almost everyone thinks about the problems here as one of managing change.

For most of this century, as we created thousands and thousands of large organizations for the first time in human history, we didn't have enough good managers to keep all those bureaucracies functioning. So many companies and universities developed management programmes, and hundreds and thousands of people were encouraged to learn management on the job. And they did. But, people were taught little about leadership. To some degree, management was emphasized because it's easier to teach than leadership. But even more so, management was the main item on the twentieth-century agenda because that's what was needed. For every entrepreneur or business builder who was a leader, we needed hundreds of managers to run their ever growing enterprises.

Unfortunately for us today, this emphasis on management has often been institutionalized in corporate cultures that discourage employees from learning how to lead. Ironically, past success is usually the key ingredient in producing this outcome. The syndrome, as I have observed it on

many occasions, goes like this: success creates some degree of market dominance, which in turn produces much growth. After a while keeping the ever larger organization under control becomes the primary challenge. So attention turns inward, and managerial competencies are nurtured. With a strong emphasis on management but not on leadership, bureaucracy and an inward focus take over. But with continued success, the result mostly of market dominance, the problem often goes unaddressed and an unhealthy arrogance begins to evolve. All of these characteristics then make any transformation effort much more difficult.

Arrogant managers can over-evaluate their current performance and competitive position, listen poorly, and learn slowly. Inwardly focused employees can have difficulty seeing the very forces that present threats and opportunities. Bureaucratic cultures can smother those who want to respond to shifting conditions. And the lack of leadership leaves no force inside these organisations to break out of the morass.

**97. Why, according to the author, is a distinction between management and leadership crucial?**

a. Organisations are pursuing the strategy of status quo.

b. In today's context, organisations need leaders much more than managers in transforming them.

c. Organisations are facing problems of not getting good managers.

d. Leaders are reactive whereas managers are proactive.

**98. Why did companies and universities develop programmes to prepare managers in such a large number?**

a. Organisations did not want spend their scarce resources in training managers.

b. Organisations wanted to create communication network through trained managers.

c. A large number of organisations were created and they needed managers in good number.

d. Companies and universities wanted to generate funds through these programmes.

**99. Which of the following statements is NOT TRUE in the context of the passage?**

a. Pressure on managers comes mostly from within.

b. Leadership centres on carrying out important functions such as planning and problemsolving.

c. Leadership produces change and has the potential to establish direction.

d. Bureaucratic culture can smother those who want to respond to changing conditions.

**100. Which of the following is not the characteristic of bureaucratic culture?**

a. Employees clearly see the forces that present threats and opportunities.

b. Prevalence of unhealthy arrogance.

c. Managerial competencies are nurtured.

d. Managers listen poorly and learn slowly.

Answer Key

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1.b | 2.c | 3.c | 4.a | 5.c | 6.d | 7.a | 8.b |
| 9.b | 10.a | 11.c | 12.c | 13.c | 14.a | 15.c | 16.b |
| 17.b | 18.d | 19.b | 20.b | 21.a | 22.a | 23.b | 24.a |
| 25.a | 26.d | 27.c | 28.b | 29.d | 30.c | 31.b | 32.a |
| 33.d | 34.c | 35.d | 36.d | 37.a | 38.a | 39.d | 40.c |
| 41.b | 42.b | 43.a | 44.c | 45.d | 46.a | 47.a | 48.c |
| 49.b | 50.b | 51.a | 52.d | 53.c | 54.a | 55.b | 56.d |
| 57.c | 58.c | 59.a | 60.d | 61.c | 62.d | 63.d | 64.c |
| 65.b | 66.c | 67.a | 68.c | 69.c | 70.d | 71.b | 72.c |
| 73.c | 74.d | 75.b | 76.b | 77.c | 78.d | 79.d | 80.a |
| 81.c | 82.b | 83.a | 84.c | 85.a | 86.b | 87.b | 88.a |
| 89.a | 90.a | 91.d | 92.a | 93.c | 94.a | 95.b | 96.b |
| 97.b | 98.c | 99.b | 100.a | | | | |

## Solutions

1. b

$$E = \frac{W}{Q}$$

$$[E] = \frac{[ML^2T^{-2}]}{[AT]}$$

$$[E] = [ML^2T^{-3}A^{-1}]$$

2. c

3. c

$$V_0 = \sqrt{\frac{GM}{R}}$$

$$V_0 \propto \sqrt{M}$$

$$\therefore \frac{V_1}{V_2} = \sqrt{\frac{M_1}{M_2}} = \sqrt{\frac{M}{2M}} = 1 : \sqrt{2}$$

4. a

5. c

$$W = T \times 2\Delta A$$

6. d

7. a

$$\frac{R}{C_v} = 0.67$$

$$\text{or,} \frac{C_p - C_v}{C_v} = 0.67$$

$$\frac{C_p}{C_v} - 1 = 0.67$$

$$\gamma = 1.67$$

8. b

9. b

Bird sees the fish raised by $\frac{y}{\mu}$ [ AD=$\frac{RD}{\mu}$ ]

.. Total distance of fish w. r. t bird is x + $\frac{y}{\mu}$

10. a

$$\frac{C_p}{C_s} = n^2 = 10^2 = 100:1$$

11. c

12. c

13. c

In L- R circuit : Potential difference across inductance ( Voltage ) leads current by angle π/2 .

In RC circuit : Voltage lags current by angle π/2 .

In purely inductive circuit , the current lags behind the applied voltage by an angle π/2 .

In purely capacitive circuit , the current leads the applied emf by angle π/2 .

14. a

By Cauchy's relation

$\mu = A + \frac{B}{\lambda^2} \ldots\ldots\ldots\ldots\ldots$

But $\mu_w > \mu_a$ so , $\lambda_w < \lambda_a$

Fringe width $\beta_w = \lambda_w \frac{D}{d}$

$\beta_a > \beta_w$ , fringe width decreases is water

15. c

L = 20 cm

Velocity at x = 10 cm = ?

$V = \sqrt{xg} = \sqrt{10 \times 10} = 10m/s$

$t = \sqrt{\frac{x}{g}} = \sqrt{\frac{10}{10}} = 1sec$

16. b

$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$$

For same KE;

$$\frac{\lambda_p}{\lambda_a} = \sqrt{\frac{m_a}{m_p}} = \sqrt{\frac{4m_p}{m_p}} = 2:1$$

17. b

18. d

least value of $n(A \cap B) = n(A) + n(B) - n(U) = 80 + 65 - 125 = 20$

19. b

$$\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix} X = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix} \Rightarrow X = \begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix}$$

As

$$\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix} \begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix} = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$$

20. b

$a + ib > c + id$, it is defined if and only if imaginary parts must be equal to zero

Therefore $ib = id = 0 \rightarrow b = d = 0$

21. a

22. a

$\sin x + \cos x = 2$

or, $\frac{\sin x + \cos x}{\sqrt{1^2 + 1^2}} = \frac{2}{\sqrt{1^2 + 1^2}}$

or, $\frac{1}{\sqrt{2}} \sin x + \cos x . \frac{1}{\sqrt{2}} = \sqrt{2}$

or, $\sin(x + \frac{\pi}{4}) = \sqrt{2}$

as, $\sin x$ cannot be greater than 1. Hence it has no solution.

23. b

$2 \tan^{-1}(\cos\theta) = \tan^{-1}(2 \operatorname{cosec}\theta)$

$\tan^{-1}(\frac{2\cos\theta}{1 - \cos^2\theta}) = \tan^{-1}(2 \operatorname{cosec}\theta)$

$\frac{2\cos\theta}{\sin^2\theta} = \frac{2}{\sin\theta}$

$\cos\theta = \sin\theta$

$\tan\theta = 1 = \tan\frac{\pi}{4}$

$\theta = n\pi + \frac{\pi}{4}$

24. a

25. a

$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA}$

$\overrightarrow{AC} + \overrightarrow{CA}$

$\overrightarrow{AC} - \overrightarrow{AC} = 0$

26. d

Bisectors of $ax^2 + 2hxy + by^2 + k(x^2 + y^2) = 0$

$h(x^2 - y^2) = [(a + k) - (b + k)]xy$

$h(x^2 - y^2) = (a - b)xy$

Hence equation of bisector doesnt depend on value of k.

27. c

Radius = $\sqrt{(4-1)^2 + (6-2)^2} = \sqrt{3^2 + 4^2} = 5$

Hence $A = \pi r^2 = \pi 5^2 = 25\pi$

28. b

29. d

$2x = e^{-x} + e^{x}$

$x = \frac{e^{-x} + e^{x}}{2} = \cosh x$ ... (i)

$2y = e^{x} - e^{-x}$

$y = \frac{e^{x} - e^{-x}}{2} = \sinh x$ ... (ii)

Squaring and subtracting (ii) from (i)

$x^2 - y^2 = \cosh^2 x - \sinh^2 x = 1$

$x^2 - y^2 = 1$

30. c

Distance = $\left| \frac{(2 - 2 - 4 - 9)}{\sqrt{1 + 4 + 16}} \right| = \frac{13}{\sqrt{21}} = \frac{13}{\sqrt{7}\sqrt{3}}.$

31. b

$\lim_{x \to \infty} \left(1 + \frac{2}{x} + \frac{3}{x^2}\right)^{x}$

$\lim_{x \to \infty} \left(\frac{x^2 + 2x + 3}{x^2}\right)^{x}$

$\lim_{x \to \infty} \left(1 + \frac{2x + 3}{x^2}\right)^{x}$

$\lim_{x \to \infty} (1 + \frac{2x + 3}{x^2})^{\frac{x^2}{(2x+3)} \frac{2x+3}{x^2} \frac{x}{1}}$

$\lim_{e^{x \to \infty}} \frac{2x^2 + 3x}{x^2}$

$e^2$

32. a

Let, $y = \cos^{-1} x$

$\cos y = x$

$-\sin y dy = dx$

$\frac{dy}{dx} = -\frac{1}{\sin y} = -\frac{1}{\sqrt{1 - \cos^2 y}} = -\frac{1}{\sqrt{1 - x^2}}$

33. d

$x^y = a$

$y \log x = \log a$

Differentiating with respect to x

$\frac{y}{x} + \log x \frac{dy}{dx} = 0$

$\frac{dy}{dx} = -\frac{y}{x \log x} = -\frac{\log a}{x(\log x)^2}$

34. c

Strictly Increasing: Positive

Neither increasing nor decreasing: 0

Strictly Decreasing: Negative

35. d

36. d

37. a

Area= $\int_{-1}^{1} x^3 dx$

Area= $2 \times \int_{0}^{1} x^3 dx = 2 \times \frac{x^4}{4}\Big|_0^1 = 2 \times \frac{1}{4} = \frac{1}{2}$

38. a

39. d

The reaction between tetra bromoethane with zinc metal is as follows:

$$\mathrm{CHBr_2} - \mathrm{CHBr_2} + 2\,\mathrm{Zn} \longrightarrow \mathrm{CH{\equiv}CH} + 2\,\mathrm{ZnBr}$$

Ethyne will formed.

40. c

$$\mathrm{CuO} + \mathrm{NH_3} \longrightarrow \mathrm{Cu} + \mathrm{N_2} + \mathrm{H_2O}$$

41. b

Hard water contains soluble salts of calcium (Ca) and magnesium (Mg).

It does not give lather with soap. this is because of the precipitation of the insoluble soap.

The hardness of water is due to chloride of calcium and bicarbonate of magnesium

42. b

Alkali metals (or their salts) impart colour to Bunsen flame due to their low ionisation energies.

43. a

Copper obtained after poling is called tough cake copper which is 99% pure.

44. c

Rusting of iron is a combination reaction. It occurs as follows-

$$\mathrm{Fe} + \mathrm{H_2O} + \mathrm{O_2} \longrightarrow \mathrm{Fe_2O_3 \cdot}\, x\, \mathrm{H_2O}$$

45. d

In the Lewis theory of acid-base reactions, bases donate pairs of electrons and acids accept pairs of electrons. A Lewis acid is therefore any substance, that can accept a pair of non-bonding electrons.

46. a

Fluorine is the strongest oxidizing agent because it is the strongest oxidant among all the elements.

47. a

48. c

The shape of a $\mathrm{PCl_3}$ molecule is Trigonal pyramidal.

The central P atom has one lone pair of electrons and three bond pairs of electrons.

It undergoes $\mathrm{sp^3}$ hybridisation which results in tetrahedral electron pair geometry and Trigonal pyramidal molecular geometry.

49. b

50. b

51. a

52. d

53. c

54. a

55. b

56. d

57. c

dearth means an inadequate supply or lack of something; abundance means an ample quantity, or wealth

58. c

59. a

60. d

61. c

$1^{st} case\ v = 2t_1$

$2^{nd}$ case

$u = 2t_1, v = 0$

$v = u - 4t_2$

or,$0 = 2t_1 - 4t2$

or, $2t_1 = 4t_2$

or, $t_2 = \frac{t_1}{2}$

Now, $t_1 + t_2 = 3$ or, $t_1 + \frac{t_1}{2} = 3$

or $3t_1 = 3 \times 2$

or, $t_1 = 2sec$

$v_{max} = 2 \times 2 = 4m/s$

62. d

63. d

$V_{max} = \omega^2 r\ and\ v_{max} = \omega r$

$\text{where}, b_{max} = \omega v_{max}$

$so, \omega = \frac{b_{max}}{v_{max}}$

$$T = 2\pi\frac{v_{max}}{b_{max}} = 2\pi \times \frac{4}{2} = 4\pi\ sec$$

64. c

Let the radius of smaller radius be r and bigger be R.
Since volume remains constant, thus

$$\frac{4}{3}\pi R^3 = 1000\frac{4}{3}\pi r^3$$

We get $R = 10r$

$$\frac{W_f}{W_i} = \frac{T \times 4\pi R^2}{T \times 1000 \times 4\pi r^2} = \frac{1}{10}$$

65. b

$$\frac{\bar{C}_2}{\bar{C}_1} = \sqrt{\frac{T_2}{T_1}} = 1.8 \times \sqrt{\frac{1200}{300}} = 3.6km/s$$

66. c

$$\mu = \frac{c}{v}$$

$$v = \frac{c}{\mu} = \frac{3 \times 10^8}{1.33} = 225563909.7m/s$$

$$t = \frac{d}{v} = \frac{500}{225563909.774} = 2.21 \times 10^{-6}$$

67. a

Heat produced in wire = energy stored in capacitor

Heat produced in wire =$\frac{1}{2}\mathrm{CV}^2$

Heat produced in wire =$\frac{1}{2} \times 2 \times 10^{-6} \times (200)^2$

Heat produced in wire =$200 \times 200 \times 10^{-6}$

Heat produced in wire =$4 \times 10^{-4}$J

68. c

$$\frac{10}{E} = \frac{40}{20}$$

$$E = 5$$

69. c

Magnetic field intensity at $P$ due to segment $-I$

$$B_1 = \frac{\mu_o}{4\pi a}[\sin 45^\circ + \sin \alpha_2]$$

For infinitely long wire $\alpha_2$ = $180^\circ$

So, $B_1 = \frac{\mu_o}{4\pi a}\frac{1}{\sqrt{2}} + \sin 180^\circ](\sin 180^\circ = 0)$

Or, $B_1 = \frac{\mu_o}{4\pi a} \times \frac{1}{\sqrt{2}} = \frac{\mu_o}{4\sqrt{2}\pi a}$ (downward)

Since the field by the both arms are in the same direction,

Resultant $B = 2 \times \frac{\mu_o I}{4\pi a\sqrt{2}} = \frac{\mu_o I}{2\pi a\sqrt{2}}$

70. d

$E_{max} = BlV = (5 \times 10^{-4}) \times 15 \times 10 = 0.075$ V

71. b

Mass per length of the string

$$m = \frac{10^{-2}}{0.4} = 2.5 \times 10^{-2} kg/m$$

$$v = \sqrt{\frac{T}{M}} = \sqrt{\frac{1.6}{2.5 \times 10^{-2}}} = 8 \frac{m}{s}$$

Now, for constructive interference between successive pulses.

$$\Delta t_{min} = \frac{2l}{v} = 2 \times \frac{0.4}{8} = 0.10 sec$$

72. c

For source approaching the observer:

$$f' = \frac{v}{v - v_s} f$$

$$2f = \frac{340}{340 - v_s} f$$

$$680 - 2v_s = 340$$

$$2v_s = 340$$

$v_s = 170$ m/s

73. c

$hf = \varphi o + E_k$ .....(i)

$hf_{uv} = \varphi o + E_k$' .....(ii)

$h(f - f_{uv}) = E_k - E_k$'

$f_{uv} =$ .....Hz

Then

$$\lambda_{uv} = \frac{C}{f_{uv}}$$

74. d

Time between two decay as $\Delta t = \frac{\log(\frac{N_1}{N_2})}{\lambda}$

For 20% decay, $10 = \frac{\log(\frac{100}{80})}{\lambda}$

For 40% decay, $\Delta t = \log(\frac{100}{60})\lambda = \log(\frac{100}{60}) \times 0.02231 =$ $22.9$ days

75. b

76. b

$$A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

$$A^2 = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$$

$$A^3 = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$$

Hence,

If $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ $A^n = 2^{n-1}A$

Here, $A^{100} = (2^{100-1})A = 2^{99}A$

77. c

$$\left|\frac{1}{2}(z_1 + z_2) + \sqrt{z_1 z_2}\right| + \left|\frac{1}{2}(z_1 + z_2) - \sqrt{z_1 z_2}\right|$$

$$\left|\frac{1}{2}(\sqrt{z_1} + \sqrt{z_2})^2\right| + \left|\frac{1}{2}(\sqrt{z_1} - \sqrt{z_2})^2\right|$$

$$\frac{1}{2}[|(\sqrt{z_1} + \sqrt{z_2})|^2 + |(\sqrt{z_1} - \sqrt{z_2})|^2]$$

$$\frac{1}{2}2 \times [|(\sqrt{z_1})^2| + |(\sqrt{z_2}^2)|]$$

$$|z_1| + |z_2|$$

78. d

$a, b, c$ are in GP $b = ar, c = ar^2$

$$2b = \frac{a + 3c}{2}$$

$$2ar = \frac{a + 3ar^2}{2}$$

$$4r = 1 + 3r^2$$

$$3r^2 - 4r + 1 = 0$$

$$3r^2 - 3r - r + 1 = 0$$

$$3r(r - 1) - 1(r - 1) = 0$$

$$(3r - 1)(r - 1) - 0$$

since $r < 1$

$$r = \frac{1}{3}$$

79. d

$S = (1 + x)^{21} + (1 + x)^{22} + (1 + x)^{23} + ..... + (1 + x)^{31}$

$S(1 + x) = (1 + x)^{22} + (1 + x)^{23} + (1 + x)^{24} + ..... + (1 + x)^{32}$

Subtracting:

$$xS = -(1 + x)^{21} + (1 + x)^{32}$$

$$S = \frac{(1 + x)^{32} - (1 + x)^{21}}{x}$$

$$T_8 = \frac{^{32}C_7x^7 - ^{21}C_7x^7}{x} = [C(32,7) - C(21,7)]x^6$$

80. a

$$\sin^2 x - 2\cos x + \frac{1}{4} = 0$$

$$1 - \cos^2 x - 2\cos x + \frac{1}{4} = 0$$

$$\cos^2 x + 2\cos x = \frac{5}{4}$$

$$4\cos^2 x + 8\cos x - 5 = 0$$

$$4\cos^2 x + 10\cos x - 2\cos x - 5 = 0$$

$$(2\cos x + 5)(2\cos x - 1) = 0$$

$$(2\cos x + 5) \neq 0$$

$$(2\cos x - 1) = 0$$

$$\cos x = \frac{1}{2}$$

$$x = 2n\pi \pm \frac{\pi}{3}$$

81. c

$b^2 + c^2 = 4^2 + 3^2 = 25 = 5^2 = a^2$
$i.e. \angle A = 90^\circ$

If AD be perpendicular drawn from A to BC then,

$$\Delta = \frac{1}{2}AC \times AB$$

or, $\frac{1}{2} \times BC \times AD = \frac{1}{2}AC \times AB$

$$5 \times AD = 4 \times 3$$

$$AD = \frac{12}{5} \text{ cm}$$

82. b

$a = 20i + j, b = 5i + pj$ and $c = 10i - j$

Slope of (ab) =slope of (ac)

Or, $\frac{(p-1)}{(5-20)} = \frac{(-1-1)}{(10-20)}$

$$p = -2$$

83. a

$lx + my = n$

$$\frac{lx + my}{n} = 1$$

$$x^2 + y^2 = a^2$$

$$x^2 + y^2 = a^2\left(\frac{lx+my}{n}\right)^2$$

$$x^2 + y^2 - a^2\left(\frac{lx+my}{n}\right)^2 = 0$$

Coefficient of $x^2 = 1 - \frac{a^2l^2}{n^2}$

Coefficient of $y^2 = 1 - \frac{a^2m^2}{n^2}$

For perpendicular:

Coefficient of $x^2$ + Coefficient of $y^2 = 0$

$$1 - \frac{a^2l^2}{n^2} + 1 - \frac{a^2m^2}{n^2} = 0$$

$$\frac{a^2l^2}{n^2} + \frac{a^2m^2}{n^2} = 2$$

$$a^2(l^2 + m^2) = 2n^2$$

84. c

85. a

$y^2 = 5x$

$$2y\frac{dy}{dx} = 5$$

$$\frac{dy}{dx} = \frac{5}{2y}$$

Slope of the line x + 2y − 7 = 0 is $-\frac{1}{2}$

Slope of line perpendicular to this is $2$

$$\frac{5}{2y} = 2$$

$$y = \frac{5}{4}$$

when $y = \frac{5}{4}, x = \frac{5}{16}$

Then equation of tangent is

$$y - \frac{5}{4} = 2(x - \frac{5}{16})$$

$$\frac{4y-5}{4} = 2(\frac{16x-5}{16})$$

$$8y - 10 = 16x - 5$$

16x− 8y + 5 = 0

86. b

The equation of plane which meets axes at intercepts 3, 4 and 6 is

$$\frac{x}{3} + \frac{y}{4} + \frac{z}{6} = 1$$

i.e., $4x + 3y + 2z = 12$

so length of the perpendicular from origin to plane

$$= \left| \frac{4 \times 3 + 3 \times 4 + 2 \times 6 - 12}{\sqrt{4^2 + \ 3^2 + 2^2}} \right| = \frac{12}{\sqrt{29}}$$

87. b

$\lim_{x \to 0^-} f(x) = \lim_{x \to 0^+} f(x) = f(x)$

$\lim_{x \to 0} f(x) = f(0)$

$\lim_{x \to 0} \frac{2\sin(\pi x)}{5x} (0/0) = 2k$

Using L'Hospital Rule:

$\lim_{x \to 0} \frac{2\cos(\pi x)\pi}{5} = 2k$

$k = \frac{\pi}{5}$

88. a

$y = \ln(\ln x)$

$e^y = \log_e x$

now, $e^y \frac{dy}{dx} = \log_e x \frac{d}{dx} \log_e(log_e x)$

$= \log_e x \times \frac{1}{log_e x} \times \frac{1}{x}$

$= 1/x$

89. a

90. a

91. d

$8\,\mathrm{NH_3} + 3\,\mathrm{Cl_2} \longrightarrow \mathrm{N_2} + 6\,\mathrm{NH_4Cl}$

92. a

Heating pyrites to remove sulphur is called roasting. Pyrites are metal sulphide ores. Upon heating in presence of air, metal pyrites are converted to metal oxides and sulphur is removed as sulphur dioxide gas.

93. c

$\text{atomic weight} = \frac{6.4}{\text{specific wt.}} = \frac{6.4}{0.13} = 49.23$

$\text{Atomic Wt} \cdot \text{of } \mathrm{MCl_x} = 2 \times \text{Vapour density} = 192$

$49.23 + 35.5x = 192$

$x = 4$

$\text{Equivalent weight} = \frac{\text{Atomic Wt}}{\text{valency}} = 12$

94. a

$M = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$

$\mathrm{NaCl}$ n factor$=1$

$\mathrm{MgCl_2}$ n factor$=2$

$$0.3 = \frac{0.25 \times 2 \times V_1 + 320 \times 0.25 \times 1}{V_1 + 320}$$

$$0.3V_1 + 96 = 0.5V_1 + 80$$

$$16 = 0.2V_1$$

$$V_1 = 80 \text{ ml}$$

95. b

$\mathrm{AgCl} \rightleftharpoons [\mathrm{Ag^+}][\mathrm{Cl^-}]$

$$K_{sp} = S^2$$

$$S = \sqrt{K_{sp}} = \sqrt{1.44 \times 10^{-8}} = 1.20 \times 10^{-2} \text{ M}$$

96. b

$\mathrm{H_2O_2} \longrightarrow \mathrm{O_2} + 2\,\mathrm{H^+} + 2\,\mathrm{e^-}$

$1\,\text{mole of } \mathrm{H_2O_2} = 2\,\mathrm{F}$

$= 2 \times 96500 \text{ C}$

$= 193000 \text{ C}$

97. b

98. c

99. b

100. a