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NEET FRESH 2023-24

Mark	Group		
720	PCB	**PCB EXAM - 63**	Date : 05/01/2024 Time : 3:20 Hours

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PHYSICS

SECTION - A (35 Questions)

01. **(2)** From the given equation amplitude A = 0.04 m

Frequency $=\dfrac{\text{Co-efficient of } t}{2\pi}=\dfrac{\pi/5}{2\pi}=\dfrac{1}{10}Hz$

Wavelength $\lambda=\dfrac{2\pi}{\text{Co-efficient of } x}=\dfrac{2\pi}{\pi/9}=18m$

Wave speed

$v=\dfrac{\text{Co-efficient of } t}{\text{Co-efficient of } x}=\dfrac{\pi/5}{\pi/9}=1.8\text{m/s}$.

02. **(1)** Maximum acceleration $=a\omega^2=a\times4\pi^2n^2$

$=0.01\times4\times(\pi)^2\times(60)^2=144\pi^2\text{m/sec}$.

03. **(1)** $F=-KX\Rightarrow dW=Fdx=-KXdx$

So, $\int_0^W dW=\int_0^W -KXdW\Rightarrow W=U=-\frac{1}{2}KX^2$.

04. **(3)** Suppose at displacement y from mean position potential energy = kinetic energy

$\Rightarrow\frac{1}{2}m(A^2-y^2)\omega^2=\frac{1}{2}m\omega^2y^2$

$\Rightarrow A^2=2y^2\Rightarrow y=\frac{A}{\sqrt{2}}$.

05. **(1)** In first overtone of organ pipe open at one end,

$n_c=\frac{3v}{4l_c}$ ....(i)

Third harmonic or second overtone of organ pipe open at both ends, $n_0=\frac{3v}{2l_0}$ ....(ii)

Under resonance $n_c=n_0\Rightarrow\frac{3v}{4l_c}=\frac{3v}{2l_0}\Rightarrow\frac{l_c}{l_0}=\frac{1}{2}$.

06. **(3)** The effective acceleration in a lift descending with acceleration $\frac{g}{3}$ is $g_{eff}=g-\frac{g}{3}=\frac{2g}{3}$.

$\therefore T=2\pi\sqrt{\frac{L}{g_{eff}}}=2\pi\sqrt{\frac{L}{2g/3}}=2\pi\sqrt{\frac{3L}{2g}}$.

07. **(1)** $f=\frac{1}{T}=\frac{1}{0.04}=25Hz$.

08. **(3)** The given equation representing a wave travelling along –y direction (because '+' sign is given between t term and x term).

On comparing it with $x=A\sin(\omega t+ky)$, we get

$k=\frac{2\pi}{\lambda}=12.58\Rightarrow\lambda=\frac{2\times3.14}{12.56}=0.5$ m.

09. **(3)** $E=\frac{1}{2}m\omega^2A^2$

$E'=\frac{1}{2}m\omega^2\left(\frac{A}{2}\right)^2$

$E'=\frac{E}{4}$.

10. **(2)** i. $v=\omega\sqrt{A^2-x^2}\Rightarrow\frac{v^2}{\omega^2A^2}=1-\frac{x^2}{A^2}$

$\Rightarrow\frac{v^2}{\omega^2A^2}+\frac{x^2}{A^2}=1$

v v/s x is ellipse.

ii. $a=-\omega^2x$, a v/s x is straight line.

iii. $U=\frac{1}{2}m\omega^2x^2$, U v/s x is parabola.

iv. $x=A\sin\omega t$, x v/s t is sinusoidal.

11. **(3)** First overtone of closed organ pipe $n_1=\frac{3v}{4l_1}$

Third overtone of open organ pipe $n_2=\frac{4v}{2l_2}$

$n_1=n_2\ (Given)\Rightarrow\frac{3v}{4l_1}=\frac{4v}{2l_2}\Rightarrow\frac{l_1}{l_2}=\frac{3}{8}$.

12. **(4)** Points B and F are in same phase.

13. **(4)** $y=5\sin(\pi t+4\pi)$, comparing it with standard equation $y=a\sin(\omega t+\phi)=a\sin\left(\frac{2\pi t}{T}+\phi\right)$

$a=5m$ and $\frac{2\pi t}{T}=\pi t\Rightarrow T=2\text{sec}$.

14. **(1)** At point 2, the acceleration of the particle is maximum, which is at the extreme position. At extreme position, the velocity of the particle will be zero.

15. **(4)** The given equation can be written as

$y = 4\sin\left(4\pi t - \frac{\pi x}{16}\right) \Rightarrow (v) = \frac{\text{Co-efficient of } t(\omega)}{\text{Co-efficient of } x(K)}$

$\Rightarrow v = \frac{4\pi}{\pi/16} = 64$ cm/s along +x direction.

16. **(3)** Given, $x = 10\sin\left(2t - \frac{\pi}{6}\right)$

$A = 10$ and $\omega = 2\,\text{Hz}$

$\therefore \upsilon = \omega\sqrt{A^2 - x^2} = 2\sqrt{(10)^2 - (6)^2}$

$= 2\sqrt{100 - 36} = 2 \times 8 = 16\,\text{ms}^{-1}$

17. **(1)** K.E. and P.E. completes two vibration in a time during which S.H.M. completes one vibration. Thus frequency of P.E. or K.E. is double than that of S.H.M.

18. **(4)** The second pendulum placed in a space laboratory orbiting around the earth is in a weightlessness state.

Hence, $g = 0$ so $T = \infty$

19. **(3)** As, we know, in SHM

Maximum acceleration of the particle,

$\alpha = A\omega^2$

Maximum velocity, $\beta = A\omega \Rightarrow \omega = \frac{\alpha}{\beta}$

$\Rightarrow T = \frac{2\pi}{\omega} = \frac{2\pi\beta}{\alpha} \qquad \left[\because \omega = \frac{2\pi}{T}\right]$

20. **(4)** $y = \frac{1}{\sqrt{a}}\sin\omega t \pm \frac{1}{\sqrt{b}}\sin\left(\omega t + \frac{\pi}{2}\right)$

Here phase difference $= \frac{\pi}{2}$

$\therefore$ The resultant amplitude

$= \sqrt{\left(\frac{1}{\sqrt{a}}\right)^2 + \left(\frac{1}{\sqrt{b}}\right)^2} = \sqrt{\frac{1}{a} + \frac{1}{b}} = \sqrt{\frac{a+b}{ab}}.$

21. **(4)** $y = A\sin(\omega t + \phi) = A\sin\left(\frac{2\pi}{T}t + \phi\right)$

$\Rightarrow y = 0.5\sin\left(\frac{2\pi}{0.4}t + \frac{\pi}{2}\right)$

$\Rightarrow y = 0.5\sin\left(5\pi t + \frac{\pi}{2}\right) = 0.5\cos 5\pi t.$

22. **(4)** $V_P = -V_W \times slope.$

23. **(4)** Acceleration $= -\omega^2 y$. So $F = -m\omega^2 y$.

y is sinusoidal function.

So F will be also sinusoidal function with phase difference π.

24. **(1)** Spring constant

$k = \frac{F}{x} = \frac{10}{5 \times 10^{-2}} = 200\,\text{N/m}$

And for spring-mass system undergoing SHM

$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{2}{200}} = \frac{2\pi}{10} = 0.628\,\text{s}$

$(\because m = 2\,\text{kg given})$

25. **(4)** At time $\frac{T}{2}; v = 0$ $\therefore$ Total energy Potential energy.

26. **(2)** From the equation $y(x,t) = 2a\sin kx\cos\omega t$ the position of nodes (where amplitude is zero) are given by sin $kx = 0$ or $kx = n\pi$

where $n = 0, 1, 2, 3$ .....

27. **(2)** The two springs on left side having spring constant of $2k$ each are in series, equivalent constant is k. The two springs on right hand side of mass M are in parallel. Their effective spring constant is $(k + 2k) = 3k$.

Equivalent spring constants of value k and $3k$ are in parallel and their net value of spring constant of all the four springs is $(k + 3k) = 4k$.

$\therefore$ Frequency of mass is $n = \frac{1}{2\pi}\sqrt{\frac{4k}{M}}$.

28. **(4)** After reflection from a rigid surface we know crest is reflected as trough. So final wave equation will be $y = -A\sin(kx + \omega t)$

29. **(4)** $T = 2\pi\sqrt{\frac{l}{g}} \Rightarrow T \propto \frac{l}{\sqrt{g}}$

$\Rightarrow \frac{\Delta T}{T}\times 100 = -\frac{1}{2}\left(\frac{\Delta g}{g}\right)\times 100 = -\frac{1}{2}(-2\%) = 1\%.$

30. **(3)** From given equation

$\omega = \frac{2\pi}{T}0.5\pi \Rightarrow T = 4\sec$

Time taken from mean position to the maximum displacement $= \frac{1}{4}T = 1\sec$.

31. **(4)** Particle velocity $(v_p) = -v \times$ slope of the graph at that point

At point 1 : Slope of the curve is positive, hence particle velocity is negative or downward ($\downarrow$).

32. **(1)** It is required to calculate the time from extreme position.

Hence, in this case equation for displacement of particle can be written as

$x = A\sin\left(\omega t + \frac{\pi}{2}\right) = A\cos\omega t.$

So $\frac{A}{2} = A\cos\omega t \Rightarrow t = \frac{T}{6}.$

33. **(2)** No of loops $\propto \frac{1}{\text{frequency}}$

$\frac{f_1}{f_2} = \sqrt{\frac{T_1}{T_2}} = \sqrt{\frac{m_1}{m_2}}$

$2 = \sqrt{\frac{M}{M^1}} \Rightarrow M^1 = \frac{M}{4}.$

34. **(1)**

$x = A\cos\left(\omega t + \frac{\pi}{4}\right)$ & $v = \frac{dx}{dt} = -A\omega\sin\left(\omega t + \frac{\pi}{4}\right)$

For maximum speed,

$\sin\left(\omega t + \frac{\pi}{4}\right) = 1 \Rightarrow \omega t + \frac{\pi}{4} = \frac{\pi}{2}$ or $\omega t = \frac{\pi}{2} - \frac{\pi}{4}$

$\Rightarrow t = \frac{\pi}{4\omega}.$

35. **(3)** The stone executes SHM about centre of earth with time period $T = 2\pi\sqrt{\frac{R}{g}}$; where R = Radius of earth.

Section - B (Attempt Any 10 Questions)

36. **(4)** For nodes $\sin(0.314x) = 0 = n$

$\Rightarrow 0.314x = K_2\pi = K \times 3.14$

$x = 10\,n\ [n = 0, 1, 2, 3, ...]$

$\therefore$ nodes are at 0, 10, 20, 30 cm

$2\pi f = 600\pi \Rightarrow f = 300\ Hz$

length $l = \frac{3\lambda}{2} = 3(10) = 30\ cm$

37. **(2)** Amplitude of a damped oscillator $A = A_0 e^{-bt/2m}$

Case 1 : When $t = 2$s, $A = \frac{A_0}{3}$

$\therefore \frac{A_0}{3} = A_0 e^{-2t/2m} \Rightarrow \frac{1}{3} = e^{-b/m}$ ....(i)

When $t = 6$s, $A = \frac{A_0}{n}$

$\therefore \frac{A_0}{n} = A_0 e^{-6b/2m} \Rightarrow \frac{1}{n} = (e^{-b/m})^3$ ....(ii)

From eqs. (i) and (ii), we get

$\Rightarrow \frac{1}{n} = \left(\frac{1}{3}\right)^3 \Rightarrow \therefore n = 3^3.$

38. **(4)** Suppose n_P = frequency of piano = ? $(n_P \propto \sqrt{T})$

n_f = frequency of tuning fork = 256 Hz

x = beat frequency = 5 bps, which is decreasing $(5 \rightarrow 2)$ after clanging the tension of piano wire

Also, tension of piano wire is increasing, so $n_P \downarrow$.

Hence $n_P\uparrow - n_f = x\downarrow \longrightarrow$ Wrong

$n_f - n_P\uparrow = x\downarrow \longrightarrow$ Correct.

$\Rightarrow n_P = n_f - x = 256 - 5$ Hz.

39. **(2)** As mg produces extension x, hence $k \Rightarrow \frac{mg}{x}$

$\therefore\ T = 2\pi\sqrt{\frac{M+m}{k}} = 2\pi\sqrt{\frac{(M+m)x}{mg}}.$

40. **(2)** $n = \frac{1}{2l}\sqrt{\frac{T}{m}} \Rightarrow n_1 l_1 = n_2 l_2 = n_3 l_3 = k$

$l_1 + l_2 + l_3 = l \Rightarrow \frac{k}{n_1} + \frac{k}{n_2} + \frac{k}{n_3} = \frac{k}{n}$

$\Rightarrow \frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3} + ...$

41. **(1)** K.E. of a body undergoing SHM is given by,

$K.E. = \frac{1}{2} ma^2\omega^2 \cos^2 \omega t$ and $T.E. = \frac{1}{2} ma^2\omega^2$

Given K.E. = 0.75 T.E.

$\Rightarrow 0.75 = \cos^2 \omega t \Rightarrow \omega t = \frac{\pi}{6}$

$\Rightarrow t = \frac{\pi}{6 \times \omega} \Rightarrow t = \frac{\pi \times 2}{6 \times 2\pi} \Rightarrow t = \frac{1}{6} s$

42. **(2)** n_A = Known frequency = 288 cps, n_B = ?

x = 4 bps, which is decreasing (from 4 to 2) after loading i.e. $x\downarrow$

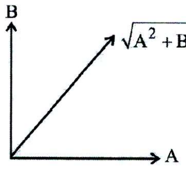
Unknown fork is loaded, so $n_B\downarrow$

Hence $n_A - n_B\downarrow = x\downarrow \longrightarrow$ Wrong

$n_B\downarrow - n_A\downarrow = x\downarrow \longrightarrow$ Correct.

$\Rightarrow n_B = n_A + x = 288 + 4 = 292$ Hz.

43. **(2)**



Given equations

$y = A_0 + A\sin\omega t + B\sin\omega t$

Now assume $(y - A_0) = \gamma$

$y - A_0 = A\sin\omega t + B\sin\omega t$

$\gamma = A\sin\omega t + B\cos\omega t$

$= \sqrt{A^2 + B^2}\sin(\omega t + \phi)$

which is S.H.M.

where $\cos\phi = \frac{A}{\sqrt{A^2 + B^2}}$

and $\sin\phi = \frac{B}{\sqrt{A^2 + B^2}}$

44. **(4)**

45. **(2)** $y = e^{-(ax^2 + bt^2 + 2\sqrt{ab}xt)}$

$= e^{-(\sqrt{a}x + \sqrt{b}t)^2}$

$\sqrt{a}x + \sqrt{b}t = kx + \omega t$

$k = \sqrt{a}, \omega = \sqrt{b}$

Wave velocity, $v = \frac{\omega}{k} = \sqrt{\frac{b}{a}}$.

46. **(2)** We use equation $T = 2\pi\sqrt{\frac{I}{mgh}}$ and the parallel-axis theorem $I = I_{cm} + mh^2$ where $h = d$.

For a solid disk of mass m, the rotational inertia about its centre is $I_{cm} = mR^2/2$.

Therefore, $T = 2\pi\sqrt{\frac{\frac{mR^2}{2} + \frac{mR^2}{4}}{mg\frac{R}{2}}} = 2\pi\sqrt{\frac{3R}{2g}}$.

47. **(4)**

$v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{T}{\frac{\pi d^2}{4}\rho}} \Rightarrow v = 2\sqrt{\frac{T}{\mu d^2 \rho}} \Rightarrow v \propto \frac{\sqrt{T}}{d}$

$\frac{v_A}{v_B} = \sqrt{\frac{T_A}{T_B}} \times \frac{d_B}{d_A} = \frac{1}{\sqrt{2}} \times \frac{d_B}{d_B/2}$

$\Rightarrow \frac{v_A}{v_B} = \frac{2}{\sqrt{2}} \quad \therefore v_A : v_B = \sqrt{2} : 1.$

48. **(4)**

$T = \mu v^2 = \mu\frac{\omega^2}{k^2} = 0.04\frac{(2\pi/0.004)^2}{(2\pi/0.50)^2} = 6.25\,N$

49. **(2)** After 2s, the each wave travels a distance $= 2 \times 2 = 4$ m.

The wave shape is shown in figure.

Thus energy is purely kinetic.

50. **(3)** $y = A\sin(\omega t - kx)$

Particle velocity,

$v_p = \frac{dy}{dt} = A\omega\cos(\omega t - kx)$

$\therefore \; v_{p\max} = A\omega$

wave velocity $= \frac{\omega}{k}$

As per question $A\omega = \frac{\omega}{k}$

i. e., $A = \frac{1}{k}$ But $k = \frac{2\pi}{\lambda}$

$\therefore \; \lambda = 2\pi A$.

CHEMISTRY

SECTION - A (35 Questions)

51. **(3)**

$$t = \frac{2.303}{k}\log\frac{100}{1}$$

$$= \frac{2.303}{2.303\log 2} \times 2 \times 30$$

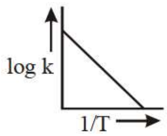
199 min

52. **(1)**

(A) only

53. **(2)**

A graph plotted between log k vs $\frac{1}{T}$ for calculating activation energy is shown as



from Arrhenius equation

$$\log k = \log A - \frac{E_a}{2.303RT}$$

54. **(1)**

$\Delta n_g = 0$

$K_P = K_C(RT)^{\Delta n_g}$

$K_P = K_C$

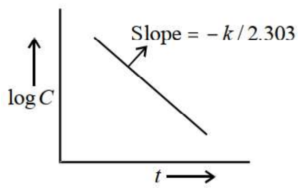
$\frac{K_P}{K_C} = 1$

55. **(1)**

Unit of $K_C = (mol/L)^{\Delta n_g}$

$mol\,L^{-1}$

56. **(2)**



57. **(2)**

The curve Y shows the increase in concentration of products with time.

58. **(2)**

Products predominate over reactant

59. **(3)**

$N_2O_4 \rightarrow 2NO_2$
$4 - x \qquad 2x$

$4 - x + 2x = 6$

$x = 2$

$K_P = \frac{16}{2} = 8$

60. **(4)**

A – (s), B – (r), C – (p), D – (q)

61. **(1)**

A – (q), B – (r) ,C – (p)

62. **(4)**

Factual

63. **(1)**

$\Delta G = \Delta G^0 + RT \ In\ Q$

64. **(4)**

In the given options $-\frac{d[C]}{3.dt}$ will not represent the reaction rate. It should not have –ve sign as it is product. Since $\frac{1}{3}\frac{dC}{dt}$ show the rate of formation of product C which will be positive.

65. **(4)**

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

66. **(3)**

$t_{1/2} \propto \frac{1}{a^{n-1}}$; where, a : initial concentration,

n : order of reaction

67. **(3)**

$\frac{\ln 2}{k}$

68. **(1)**

	A	$\longrightarrow$	2B	+	C
t = 0	P_i		0		0
t = t	$p_i - y$		2y		y

Total pressure $P_t = P_i - y + 2y + y = P_i + 2y$

$$\frac{P_t - P_i}{2} = y$$

$$K = \frac{2.303}{t}\log\frac{2P_i}{3P_i - P_t}$$

69. **(2)**

Rate $r_1 = k[A]^m[B]^n$ ...(1)

$r_2 = 8 = k[2A]^m[2B]^n$ ...(2)

$r_3 = 2 = k[A]^m[2B]^n$ ...(3)

By eqs. (1) and (3),

$$\frac{r_1}{r_3} = \frac{1}{2} = \left(\frac{1}{2}\right)^n$$

$n = 1$

By eqs. (2) and (3),

$$\frac{r_3}{r_2} = \frac{2}{8} = \left(\frac{1}{2}\right)^m$$

$m = 2$

$\therefore$ $r = k[A]^2[B]^1$

70. **(3)**

Bimolecular reactions

71. **(4)**

$$K_c = \frac{K_p}{(RT)^{\Delta n}}$$

$$= \frac{1.44\times10^{-5}}{(0.082\times773)^{-2}} (\text{R in L. atm. K}^{-1}\ \text{mole}^{-1})$$

72. **(2)**

$$\frac{1}{64}$$

73. **(2)**

$r = k[O_3]^2[O_2]^{-1}$

74. **(2)**

The order w.r.t. I_2 is zero because the rate is not dependent on the concentration of I_2.

75. **(3)**

Reaction (3) can be obtained by adding reactions (1) and (2) therefore $K_3 = K_1.K_2$

Hence (3) is the correct answer.

76. **(2)**

$$K_1 = \frac{1}{K_2} = \frac{1}{(K_3)^2}$$

77. **(3)**

$k = (\text{mol lit}^{-1})^{1-n}\ \text{time}^{-1}$. For given reaction n = 2.

$\therefore$ $k = \text{mol}^{-1}\ \text{lit sec}^{-1}$.

78. **(2)**

$$k = \frac{A_0}{2t_{1/2}}$$

$$K_P = \frac{16}{2} = 8$$

79. **(1)**

$K_p = K_c(RT)^{\Delta n}$

80. **(4)**

A – (q), B – (p), C – (r)

81. **(1)**

Factual

82. **(4)**

Factual

83. **(3)**

Effect of increase of temperature on equilibrium constant depends on the fact that whether the reaction is exothermic, or endothermic. If the reaction is exothermic, it is favoured by low temperature and ifthe reaction is endothermic, it is favoured by hightemperature.

84. **(1)**

Melting of ice involve absorption of heat i.e Endothermic hence high temperature favour the process. Further for a given mass volume of water is less than ice thus high pressure favour the process. High pressure and high temperature convert ice into liquid.

85. **(3)**

$r_1 = k[A]^2$

$$r_2 = \frac{k[A]^2}{4}$$

$$\frac{r_1}{r_2} = 4$$

$$r_2 = \frac{r_1}{4}$$

SECTION - B (Attempt Any 10 Questions)

86. **(2)**

5.82×10^{-2} atm

87. **(2)**

$$\underset{a(1-x)}{PCl_5} \rightleftharpoons \underset{ax}{PCl_3} + \underset{ax}{Cl_2}$$

$a = 2,\ x = 0.4,\ V = 2L$

$$\therefore [PCl_5] = \frac{2(1-0.4)}{2} = 0.6 \text{ mol } L^{-1}$$

$$[PCl_3] = [Cl_2] = \frac{2 \times 0.4}{2} = 0.4 \text{ mol } L^{-1}$$

$$\therefore\ K_c = \frac{0.4 \times 0.4}{0.6} = 0.267$$

88. **(1)**

For given reaction x and y may or may not be equal to p and q respectively.

89. **(3)**

$$t_{1/4} = \frac{2.303}{k}\log\frac{1}{3/4} = \frac{2.303}{k}\log\frac{4}{3}$$

$$= \frac{2.303}{k}(\log 4 - \log 3) = \frac{2.303}{k}(2\log 2 - \log 3)$$

$$= \frac{2.303}{k}(2 \times 0.301 - 0.4771) = \frac{0.29}{k}$$

90. **(4)**

Given

$$AB \underset{}{\overset{K_1}{\rightleftharpoons}} A^+ + B^{-1}$$

$$K_1 = \frac{[A^+][B^-]}{[AB]}$$

$$AB + B^- \overset{K_2}{\rightleftharpoons} AB_2^-$$

$$K_2 = \frac{[AB_2^-]}{[AB][B^-]}$$

Dividing K_1 and K_2, we get

$$K = \frac{K_1}{K_2} = \frac{[A^+][B^-]^2}{[AB_2^-]}$$

$$\therefore \frac{[A^+]}{[AB_2^-]} = \frac{K}{[B^-]^2}$$

91. **(2)**

An equilibrium constant does not give any information about the rate at which the equilibrium is reached.

92. **(1)**

$$t = \frac{2.303}{k}\log\frac{[R]_0}{[R]}$$

$$\log\frac{[R_0]}{[R]} = t \times \frac{k}{2.303}$$

$y = mx$

$$\frac{k}{2.303} = 0.02$$

$$k = 4.6 \times 10^{-2}\ sec^{-1}$$

93. **(2)**

$$\frac{50}{t} = \frac{\ln 100/20}{\ln 100/10} \quad \Rightarrow\ t = 50\frac{\ln 10}{\ln 5}$$

94. **(3)**

Equilibrium constant is temperature dependent having one unique value for a particular reaction represented by a balanced equation at a given temperature.

95. **(4)**

The equilibrium will remain unaffected in all the three cases

96. **(4)**

$$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$$

$$\log\frac{0.06}{0.03} = \frac{E_a}{2.303R}\left[\frac{500-400}{400 \times 500}\right]$$

$E_a = 11.53$ kJ

97. **(1)**

Factual

98. **(4)**

For a zero order reaction,

$t_{1/2} \propto a_0$ (initial concentration or initial pressure)

$(t_{1/2})_1 \propto P_1$

$(t_{1/2})_2 \propto P_2$

$$\frac{(t_{1/2})_2}{(t_{1/2})_1} = \frac{P_2}{P_1}, \frac{(t_{1/2})_2}{45} = \frac{16}{4}$$

$$(t_{1/2})_2 = \frac{16}{4} \times 45 = 180 \text{ min}$$

99. **(3)**

(ii) and (iii)

100. **(1)**

A – (r), B – (p), C – (s), D – (q)