Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 29/04/2024

Time: 3 hours **Max. Marks:** 300

PRATHAM-1_MCT-1 (24-25)

Physics

Single Choice Question

Q1 $\int \frac{dx}{(3x+5)}$ is:

a) $\ell n\ (3x+5) + C$ **b)** $\frac{-3}{(3x+5)^2} + C$ **c)** $\ell n\ (3x+5)^3 + C$ **d)** $\frac{\ell n(3x+5)}{3} + C$

Q2 The displacement and the increase in the velocity of a moving particle in the time interval of t to $(t+1)s$ are $125 m$ and $50 m/s$, respectively. The distance travelled by the particle in $(t+\ 2)^{th}_{m}$ s is m.

a) 170 m **b)** 173 m **c)** 175 m **d)** 165 m

Q3 If $y = \frac{1}{x^4}$ then, $\frac{dy}{dx}$ will be :

a) $\frac{4}{x^3}$ **b)** $4x^3$ **c)** $-\frac{4}{x^5}$ **d)** $\frac{4}{x^5}$

Q4 The position of a particle as a function of time t, is given by
$x(t) = at + bt^2 - ct^3$
where a, b and c are constants. When the particle attains zero acceleration, then its velocity will be :

a) $a+\frac{b^2}{4c}$ **b)** $a+\frac{b^2}{3c}$ **c)** $a+\frac{b^2}{2c}$ **d)** $a+\frac{b^2}{c}$

Q5 A particle of mass m projected with a velocity 'u' making an angle of 30° with the horizontal. The magnitude of angular momentum of the projectile about the point of projection when the particle is at its maximum height h is :

a) $\frac{\sqrt{3}}{16}\frac{mu^3}{g}$ **b)** $\frac{\sqrt{3}}{2}\frac{mu^2}{g}$ **c)** $\frac{mu^3}{\sqrt{2}g}$ **d)** zero

Q6 If $y = 3t^2 - 4t$; then minima of y will be at :

a) 3/2 **b)** 3/4 **c)** 2/3 **d)** 4/3

Q7 If $y = \sin(x) + \ln(x^2) + e^{2x}$ then $\frac{dy}{dx}$ will be :

a) $\cos x + \frac{2}{x} + e^{2x}$
b) $\cos x + \frac{2}{x} + 2e^{2x}$
c) $-\cos x + \frac{2}{x^2} + e^{2x}$
d) $-\cos x - \frac{2}{x^2} + 2e^{2x}$

Q8 If $y = \frac{\ell nx}{x}$ then $\frac{dy}{dx}$ will be :

a) $\frac{1-\ell nx}{x}$
b) $\frac{1+\ell nx}{x^2}$
c) $\frac{1-\ell nx}{x^2}$
d) $\frac{\ell nx-1}{x^2}$

Q9 $\cos^2 37^\circ + \sin^2 53^\circ$ is

a) 0
b) 1
c) $\frac{18}{25}$
d) $\frac{32}{25}$

Q10 If $y = \sin(x) + \ell n(x^2) + e^x$ then $\frac{dy}{dx}$ will be :

a) $\cos x - \frac{2}{x} + e^x$
b) $\cos x + \frac{2}{x} + e^x$
c) $-\cos x + \frac{2}{x} + e^x$
d) $-\cos x - \frac{2}{x} + e^x$

Q11 $y = (x + 1)(3x + 1)$, find $\frac{dy}{dx}$

a) 3
b) $3x + 3$
c) $6x$
d) $6x + 4$

Q12 Slope of graph $y = \tan x$ drawn between y and x, at $x = \frac{\pi}{4}$ is :

a) 2
b) 0
c) 1
d) $\frac{1}{\sqrt{2}}$

Q13 A particle moving in a circle of radius R with uniform speed takes time T to complete one revolution. If this particle is projected with the same speed at an angle θ to the horizontal, the maximum height attained by it is equal to 4R. The angle of projection θ is then given by :

a) $\sin^{-1}\left[\frac{2gT^2}{\pi^2 R}\right]^{\frac{1}{2}}$
b) $\sin^{-1}\left[\frac{\pi^2 R}{2gT^2}\right]^{\frac{1}{2}}$
c) $\cos^{-1}\left[\frac{2gT^2}{\pi^2 R}\right]^{\frac{1}{2}}$
d) $\cos^{-1}\left[\frac{\pi R}{2gT^2}\right]^{\frac{1}{2}}$

Q14 The maximum value of function :
$f(x) = 3\sin x + 4\cos x$ is :

a) 7
b) $\frac{7}{\sqrt{2}}$
c) 5
d) 3

Q15 $|\vec{A}| = 10, |\vec{B}| = 20$ and angle between two vectors A and B. $\theta = 60^\circ$ then $\vec{A} \cdot \vec{B}$ will be.

a) 100
b) 200
c) 500
d) 250

Q16 If $\vec{A}$ is $2\hat{i} + 4\hat{j}$ and $\vec{B}$ is $3\hat{i} + 2\hat{k}$ then $(\vec{A} + \vec{B})$ is :

a) $5\hat{i} + 4\hat{j} + 2\hat{k}$
b) $5\hat{i} + 6\hat{j}$
c) $5\hat{i} + 6\hat{k}$
d) $5\hat{i} + 4\hat{k} + 2\hat{j}$

Q17 Ship A is sailing towards north-east with velocity $\vec{v} = 30\hat{i} + 50\hat{j}$ km/hr where $\hat{i}$ points east and $\hat{j}$, north. Ship B is at a distance of 80 km east and 150 km north of Ship A and is sailing towards west at 10 km/hr. A will be at minimum distance from B in:

a) 2.2 hrs. **b)** 4.2 hrs. **c)** 3.2 hrs. **d)** 2.6 hrs.

Q18 Train A and train B are running on parallel tracks in the opposite directions with speeds of 36 km/hour and 72 km/hour, respectively. A person is walking in train A in the direction opposite to its motion with a speed of 1.8 km/ hour. Speed (in ms^{-1}) of this person as observed from train B will be close to : (take the distance between the tracks as negligible)

a) 30.5 ms^{-1} **b)** 29.5 ms^{-1} **c)** 31.5 ms^{-1} **d)** 28.5 ms^{-1}

Q19 Three vectors of equal magnitude A are inclined at an angle of 60° with each other. The magnitude of the resultant will be :

a) zero **b)** A **c)** $A\sqrt{6}$ **d)** 2A

Q20 If $|\vec{A} \times \vec{B}| = \sqrt{3}\,\vec{A}\,.\,\vec{B}$, then the value of $|\vec{A} - \vec{B}|$ is :

a) $(A^2 + B^2 - AB)^{1/2}$ **b)** $\left(A^2 + B^2 - \frac{AB}{\sqrt{3}}\right)^{1/2}$ **c)** $(A - B)$ **d)** $(A^2 + B^2 - AB)^{1/2}$

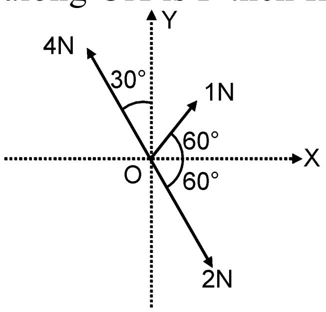
Numerical

Q21 Maximum value of f(x) = sin x + cos x is $\sqrt{n}$ then find the value of n :

Q22 The angle that the vector $\vec{A} = (3\hat{i} + 4\hat{j})$ makes with y-axis is θ (in degree) then find the value of θ :

Q23 The resultant of two vectors of magnitudes 3A and A acting at angle θ (in degree) is $\sqrt{13}$ A . The value of angle 'θ' is :

Q24 Three forces acting on a body are shown in the figure. To have the resultant force only along the y-direction, the magnitude of the minimum additional force (in N) needed along OX is F then find value of 10 F. (Round off to the Nearest Integer)



Q25 The component of vector $A = 2\hat{i} + 3\hat{j}$ along the vector $\hat{i} + \hat{j}$ is $\frac{x}{\sqrt{2}}$ then find the value of x :

Q26 The angle (in degree) made by vector $\hat{i} + \hat{j}$ with x-axis is -

Q27 If velocity of particle is given by v = $2t^4$ then its acceleration (dv/dt) at any time t will be given by xt^3 then find the value of x :

Q28 The position of a particle moving along the y-axis is given as y = $3t^2 - t^3$ where y is in metres and t is in sec. The time (in sec.) when the particle attains maximum positive position will be

Q29 Slope of graph y = tanx drawn between y and x, at x = $\frac{\pi}{4}$ is :

Q30 If y = $(1 + x^{1/8})(1 + x^{1/4})(1 - x^{1/8})$ then $\frac{dy}{dx} = -\frac{1}{n\sqrt{x}}$ then find the value of n :

Chemistry

Single Choice Question

Q31 In Bohr's stationary orbits:

a) electron do not move
b) electron move emitting radiation
c) energy of the electron remains constant
d) angular momentum of the electron is $\frac{n}{2\pi}$

Q32 For any H like system, the ratio of velocities of I, II and III orbit $v_1 : v_2 : v_3$ is :

a) 1 : 2 : 3
b) $1 : \frac{1}{2} : \frac{1}{3}$
c) 3 : 2 : 1
d) 1 : 1 : 11

Q33 What is the molecular weight of a substance, each molecule of which contains 9 carbon atoms, 13 hydrogen atoms and 2.23×10^{-23} g of other component?

a) 134.42 amu
b) 170 amu
c) 270.08 amu
d) 200 amu

Q34 In Rutherford's scattering experiment an α-particle is projected with K.E. = 4 MeV, minimum distance upto which this α-particle can reach to the nucleus of Cu nucleus-(atomic number of Cu = 29)

a) 2.08×10^{-14} m
b) 2.08×10^{-15} m
c) 1.04×10^{-14} m
d) 1.04×10^{-15} m

Q35 An electron in an atom jumps in such a way that its kinetic energy changes from x to $\frac{x}{9}$. The change in its potential energy will be-

a) $\frac{x}{9}$
b) $\frac{16x}{9}$
c) 9x
d) $\frac{9}{16}x$

Q36 The potential energy of an electron in He^+ ion is – 12.09 eV. In which excited state, the electron is present?

a) First
b) Second
c) Third
d) Fourth

Q37 The threshold wavelength for ejection of electrons from a metal is 330 nm. The work function for the photoelectric emission from the metal is ($h = 6.6 \times 10^{-34}$ J-s)

a) 1.2×10^{-18}J
b) 6.0×10^{-19} J
c) 1.2×10^{-20}J
d) 6.0×10^{-12} J

Q38 Photoelectric emission is observed from a surface for frequencies v_1 and v_2 of incident radiations ($v_1 > v_2$). If the maximum K.E. of photoelectrons in two cases are in the ratio of 2 : 1, then threshold frequency v_0 is given by

a) $\frac{v_2 - v_1}{2}$
b) $\frac{2v_1 - v_2}{(2-1)}$
c) $\frac{2v_2 - v_1}{(2-1)}$
d) $v_2 - v_1$

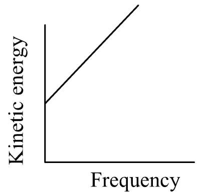
Q39 An isotope of $_{32}Ge^{76}$ is :
(i) $_{32}Ge^{77}$ (ii) $_{33}As^{77}$ (iii) $_{34}Se^{77}$ (iv) $_{34}Se^{78}$

a) (ii) & (iii)
b) (i) & (ii)
c) (ii) & (iv)
d) (ii) & (iii) & (iv)

Q40 Which excited state of Be^{3+} has the same orbit radius as that of the ground state of hydrogen atom ?

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

Q41 According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiations is –

a)


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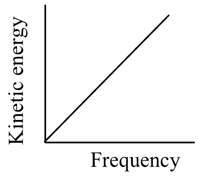

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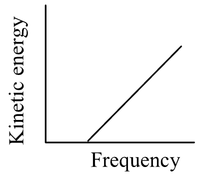

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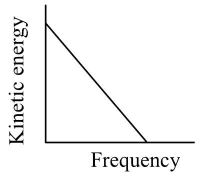


Q42 The IUPAC name of compound $CH_3 - C(CH_3)_2 - CH_2 - CH = CH_2$ is

a) 2, 2-Dimethylpent-4-ene **b)** 2, 2-Dimethyl-2-pentene

c) 1, 1, 1-Trimethylbut-3-ene **d)** 4, 4-Dimethylpent-1-ene

Q43 IUPAC name of $CH_3CH_2C(Br) = CH - Cl$ is :

a) 2-Bromo-1-chlorobut-1-ene **b)** 1-Chloro-2-bromobut-1-ene

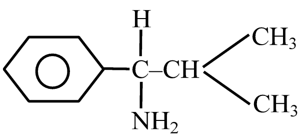
c) 3-Chloro-2-bromobut-1-ene **d)** 3-Bromo-4-chlorobut-3-ene

Q44 The correct IUPAC name of 2-ethyl-3-pentyne is :

a) 3-methyl hexyne-4 **b)** 4-ethyl pentyne-2 **c)** 4-methyl hexyne-2

d) None of these

Q45 The IUPAC name of the compound is :



a) 1-amino-1-phenyl-2-methyl propane **b)** 2-methyl-1-phenyl-propane amine

c) 2-methyl-1-amino-1-phenyl propane **d)** 1-isopropyl-1-phenyl methyl amine

Q46 Number of 3° carbon and 1° hydrogen respectively in the following structure are :

```
     Me  Me  Me  H
     |   |   |   |
H – C – C – C – C – Me
     |   |   |   |
     Me  H   Me  Me
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a) 3, 21 **b)** 3, 23 **c)** 2, 18 **d)** 3,18

Q47 The general molecular formula of nitroalkanes is :

a) $C_n H_{2n} NO_2$ **b)** $C_{n+1} H_{2n+3} NO_2$ **c)** $C_{n+1} H_{2n} NO_2$ **d)** $C_{n+1} H_{2n+2} NO_2$

Q48 IUPAC name of the following compound will be

```
CH3 – CH = C – CH2 – CH3
           |
           CH2 – CH2 – CH3
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a) 3-Ethyl-2-hexene **b)** 3-Propyl-2-hexene **c)** 3-Propyl-3-hexene

d) 4-Ethyl-4-hexene

Q49 Total number of neutrons present in 4 g of heavy water (D_2O) is :
(Where N_A represents Avogadro's number)

a) 2.4 N_A **b)** 4 N_A **c)** 1.2 N_A **d)** 2 N_A

Q50 An element is found in nature in two isotopic forms with mass numbers (A–1) and (A+3). If the average atomic mass of the element is found to be A, then the relative abundance of the heavier isotope in the nature will be :

a) 66.6% **b)** 75% **c)** 25% **d)** 33.3%

Numerical

Q51 Ratio of energies to two photons of 3000 Å to 2400 nm is x : 1. Give value of x

Q52 The energy of second Bohr orbit of the hydrogen atom is –328 kJ mol^{-1}. Hence, the energy of fourth Bohr orbit would be (report magnitude in kJ mol^{-1})

Q53 An electron in nth orbit of Li^{2+} moves to the I^{st} orbit of ion. In this process it emits two photons of energy 22.95 eV and 91.8 eV. Find value of n (orbit in which electron was present initially).

Q54 A gaseous mixture contains SO_3(g) and CH_4(g) in 25 : 1 ratio by mass. What is ratio of total number of atoms present in SO_3(g) to total number of atoms present in CH_4(g) in the mixture

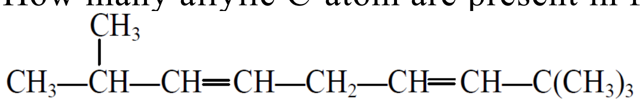
Q55 A gaseous mixture is composed of equal number of moles of CH_4, C_2H_6 and C_2H_2. Determine the average molecular mass of mixture (in amu).

Q56 What volume (in mL) of liquid H_2O_2 has same number of molecules as there are number of molecules in 22.4 ml H_2O(g) at 2 atm and 546 K. [Given : Density of liquid H_2O_2 = 6.8 × 10^{-3} gm/ml]

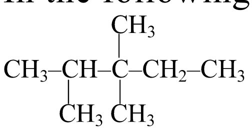
Q57 A certain dye absorbs 4000 Å and fluoresces at 8000 Å. These being wavelengths of maximum absorption that under given conditions 50% of the absorbed energy is emitted. Calculate the ratio of the no. of quanta emitted to the number absorbed.

Q58 For a wave, frequency is 10 Hz and wavelength is 2.5 m. How much linear distance (in km) will it travel in 40 seconds

Q59 How many allylic C-atom are present in following compound



Q60 In the following compound, the number of primary (1°) carbon is:



Mathematics

Single Choice Question

Q61 The sum of all the real values of x satisfying the equation $2^{(x-1)(x^2+5x-50)} = 1$

a) –5 b) 14 c) –4 d) 16

Q62 The set of all real values of x for which $\frac{(x+1)^2(x-3)^4(x-5)^5(x-4)^8(x-2)}{x(x^2-4)(x-6)^2} \le 0$

a) $(-\infty, -1) \cup (0, 5]$ b) $(-\infty, -2) \cup (0, 5] \cup \{1\}$
c) $(-\infty, -2) \cup (0, 2) \cup (2, 5]$ d) $(-\infty, -2) \cup (0, 2) \cup (2, 5] \cup \{-1\}$

Q63 If 2576a456b is divisible by 15 then
a) a = 6 and b = 5 b) a = 4 and b = 0 c) a = 4 and b = 5 d) a = 3 and b = 0

Q64 If a, b > 0 such that $a^{3-x}.b^{5x} = a^{x+5}\, b^{3x}$, then $x \log\left(\frac{b}{a}\right) =$

a) log a b) a c) b d) log b

Q65 If $\frac{\log_5(x^2-5x+7)}{\log_5(0.001)} > 0$, then

a) $x \in (2, 3)$ b) $x \in (-\infty, \infty)$ c) $x \in (-\infty, 2) \cup (3, \infty)$ d) $x \in (3, 4)$

Q66 If $\log_{1/3}\left(\frac{3x-1}{x+2}\right) < 1$ then x must lie in the interval

a) $(-\infty, -2) \cup \left(\frac{5}{8}, \infty\right)$ b) $\left(-2, \frac{5}{8}\right)$ c) $(-\infty, -2) \cup \left(\frac{1}{3}, \frac{5}{8}\right)$ d) $\left(-2, \frac{1}{3}\right)$

Q67 The inequality $\left(\frac{1}{2}\right)^{x^6-2x^4} < 2x^2$ is valid for x belongs to :

a) R b) $(0, \infty)$ c) $(-\infty, -1) \cup (-1, \infty)$
d) $(-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup (1, \infty)$

Q68 Let S = {x ∈ R : x ≥ 0 and $2\left|\sqrt{x}-3\right| + \sqrt{x}\left(\sqrt{x}-6\right) + 6 = 0$}. Then S :

a) contains exactly two elements b) contains exactly four elements.
c) is an empty set. d) contains exactly one element

Q69 The number of positive integers satisfying the equation $x + \log_{10}(2^x + 1) = x \log_{10}5 + \log_{10}6$ is

a) 0 b) 1 c) 2 d) infinite

Q70 The value of x satisfying | x – 4 | + | x – 9| = 5, is

a) x = 4, 9 b) $4 \le x \le 9$ c) $x \le 4$ or $x \ge 9$ d) None of these

Q71 Let A = {x ∈ R : |x +1 | < 2} and B = {x ∈ R : | x – 1 | ≥ 2}. Then which one of the following statements is **NOT** true?

a) $A - B = (-1,1)$ **b)** $B - A = R - (-3,1)$ **c)** $A \cap B = (-3,-1]$ **d)** $A \cup B = R - [1,3)$

Q72 In a class of 140 students numbered 1 to 140, all even numbered students opted Mathematics course, those whose number is divisible by 3 opted Physics course and those whose number is divisible by 5 opted Chemistry course. Then the number of students who did not opt for any of the three courses is :

a) 1 **b)** 38 **c)** 102 **d)** 42

Q73 If $\log_{0.3}(x-1) < \log_{0.09}(x-1)$, then x lies in the interval

a) $(2, \infty)$ **b)** $(1, 2)$ **c)** $(-2, -1)$ **d)** None of these

Q74 If x = 1998! then value of the expression $\frac{1}{log_2 x} + \frac{1}{log_3 x} + ...+ \frac{1}{log_{1998} x}$ equals:

a) –1 **b)** 0 **c)** 1 **d)** 198

Q75 If A is any set, then

a) $A \cup A' = \phi$ **b)** $A \cup A' = U$ **c)** $A \cap A' = U$ **d)** None of these

Q76 If A and B be any two sets, then $(A \cap B)'$ is equal to

a) $A' \cap B'$ **b)** $A' \cup B'$ **c)** $A \cap B$ **d)** $A \cup B$

Q77 If A and B are two sets, then $A \cup B = A \cap B$ if-

a) $A \subseteq B$ **b)** $B \subseteq A$ **c)** A = B **d)** none of these

Q78 If $x = \sqrt{1+\sqrt{1+\sqrt{1+.........\infty}}}$ then x is equal to :

a) $\frac{1+\sqrt{5}}{2}$ **b)** $\frac{1-\sqrt{5}}{2}$ **c)** $\frac{1\pm\sqrt{5}}{2}$ **d)** None of these

Q79 A survey shows that 73% of the persons working in an office like coffee, whereas 65% like tea. If x denotes the percentage of them, who like both coffee and tea, then x cannot be :

a) 63 **b)** 36 **c)** 38 **d)** 54

Q80 The number of integral solutions x of $\log_{\left(x+\frac{7}{2}\right)}\left(\frac{x-7}{2x-3}\right)^2 \geq 0$ is

a) 6 **b)** 8 **c)** 5 **d)** 7

Numerical

Q81 The number $N = \frac{\log_5 250}{\log_{50} 5} - \frac{\log_5 10}{\log_{1250} 5}$ when simplified reduces to a natural number N. find N

Q82 The number N = $6\log_{10}2 + \log_{10}31$ lies between two successive integers whose sum equals ––

Q83 The number of solutions of the equation $\log_4(x-1) = \log_2(x-3)$ is

Q84 The number of real roots of the equation $\sqrt{x^2-4x+3} + \sqrt{x^2-9} = \sqrt{4x^2-14x+6}$ is :

Q85 If sum of all solutions of the equation $\left(x^{\log_{10}3}\right)^2 - \left(3^{\log_{10}x}\right) - 2 = 0$ is $a^{\log_b c}$ where a,b,c∈N & a, b are prime numbers then $a^2 \times b$ equals

Q86 The number of real solutions of equation $x^{\log_x 2} + x^2 = 3x$ is

Q87 If $f(x) = x^4 - 2x^3 + 3x^2 - ax + b$ is a polynomial such that when it is divided by (x – 1) and (x + 1) the remainders are 5 and 19 respectively. If f(x) is divided by (x – 2), then remainder is-

Q88 Number of values of x for which $\frac{8^x + 27^x}{12^x + 18^x} = \frac{7}{6}$

Q89 Let N = $\frac{4^5+4^5+4^5+4^5}{3^5+3^5+3^5} \cdot \frac{6^5+6^5+6^5+6^5+6^5+6^5}{2^5+2^5}$ then the value of $\log_2 N$ =

Q90 If $x = \sqrt{7+4\sqrt{3}}$, then $x + \frac{1}{x}$ is equal to

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**D**	**C**	**C**	**B**	**A**	**C**	**B**	**C**	**D**	**B**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**D**	**A**	**A**	**C**	**A**	**A**	**D**	**B**	**C**	**A**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**37**	**60**	**0**	**5**	**45**	**8**	**2**	**2**	**2**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**C**	**B**	**A**	**A**	**B**	**B**	**B**	**C**	**C**	**B**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**C**	**D**	**A**	**C**	**B**	**A**	**B**	**A**	**D**	**C**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**8**	**82**	**4**	**4**	**24**	**5**	**1**	**1**	**3**	**5**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**C**	**D**	**B**	**A**	**A**	**A**	**D**	**A**	**B**	**B**
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	**B**	**B**	**A**	**C**	**B**	**B**	**C**	**A**	**B**	**A**
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	**2**	**7**	**1**	**1**	**12**	**1**	**10**	**2**	**12**	**4**