MOCK TEST PAPER | 9

General Instructions : *Same as Mock Test Paper 1.*

Physics

Section A

Q. 1. If x grams of steam at 100°C becomes water at 100°C which converts y grams of ice at 0°C into water at 100°C, then the ratio x/y will be :
$L_{ice} = 80$ cal/g
$L_{steam} = 540$ cal/g
$S_{water} = 1$ cal/g°C

(1) $\dfrac{1}{3}$ (2) $\dfrac{27}{4}$ (3) 3   (4) $\dfrac{4}{27}$

Q. 2. A vessel is filled with a gas at a pressure of 76 cm of mercury at a certain temperature. The mass of the gas is increased by 50 % by introducing more gas in the vessel at the same temperature. The resultant pressure, in cm of Hg, is :

(1) 76   (2) 152
(3) 114   (4) 1117

Q. 3. The temperature drop through a two layer furnace wall is 900°C. Each layer is of equal area of cross-section. Which of the following actions will result in lowering the temperature θ of the interface ?

| Inner layer	Outer layer
1000°C	100°C

θ
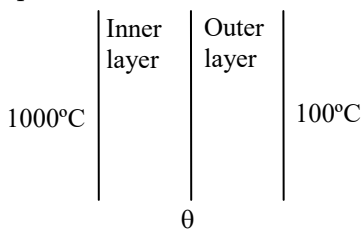
(1) By increasing the thermal conductivity of outer layer
(2) By increasing the thermal conductivity of inner layer
(3) By increasing thickness of outer layer
(4) By decreasing thickness of inner layer

Q. 4. In a resonance pipe the first and second resonance are obtained at lengths 22.7 cm and 70.2 cm, respectively. Which of the following is an appropriate estimate of the end correction of the pipe?

(1) 1.05 cm   (2) 115.5 mm
(3) 92.5 mm   (4) 2.135 cm

Q. 5. A swimmer is swimming with constant velocity $2\sqrt{2}$ m/s due North-East in a calm lake. He observes his image in a mirror fitted at the rear of a boat moving with constant velocity 1 m/s due East. Velocity of his image as observed by him in the mirror will be :

(1) 2 m/s   (2) $2\sqrt{2}$ m/s
(3) $2\sqrt{5}$ m/s   (4) 3 m/s

Q. 6. White light is incident normally on a glass surface ($n = 1.52$) that is coated with a film of MgF_2 ($n = 1.38$). For what minimum thickness of the film will yellow light of wavelength 550 nm (in air) be missing in the reflected light ?

MgF_2
glass
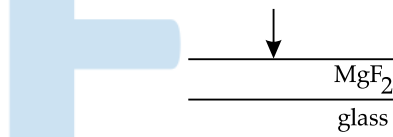
(1) 99.6 nm   (2) 49.8 nm
(3) 19.6 nm   (4) 10.6 nm

Q. 7. A prism has a refractive index of cot A/2. Then minimum angle of deviation is :

(1) 180° – A   (2) 180° – 2A
(3) 90° – A   (4) A/2

Q. 8. A mass m is revolving in a vertical circle at the end of a string of length 20 cm. By how much does the tension of the string at the lowest point exceed the tention at the top most point.

(1) 2 mg   (2) 4 mg
(3) 6 mg   (4) 8 mg

Q. 9. In Young's experiment, the ratio of maximum and minimum intensities in the fringe system is 9 : 1. The ratio of amplitudes of coherent sources is :

(1) 9 : 1   (2) 3 : 1
(3) 2 : 1   (4) 1 : 1

Q. 10. Water is flowing through a narrow tube. The velocity of water which the flow remains a streamline flow is known as:

(1) Relative Velocity   (2) Terminal Velocity
(3) Critical Velocity   (4) Particle Velocity

Q. 11. A material whose K absorption edge is 0.15 Å is irradiated with 0.1 Å X-rays. The maximum kinetic energy of photoelectrons that are emitted from K-shell is :

(1) 41 KeV   (2) 51 KeV

(3) 61 KeV   (4) 71 KeV

Q. 12. An electron is moving with a velocity of $\dfrac{c}{10}$.

The de-Broglie wavelength associated with it will be :

(1) 0.48×10^{-10} m   (2) 0.24×10^{-10} Å

(3) 0.24×10^{-10} m   (4) 1.24×10^{-10} m

Q. 13. Stopping potentials of 24, 100, 110, 115 kV are measured for photoelectrons emitted from a certain element when it is irradiated with monochromatic X-rays. If the element is used as a target in an X-ray tube. The energy of Kα line is :

(1) 54 KeV   (2) 76 KeV

(3) 88 KeV   (4) 32 KeV

Q. 14. A heavy nucleus having mass number 200 gets disintegrated into two small fragments of mass number 80 and 120. If binding energy per nucleon for parent atom is 6.5 MeV and for daughter nuclei is 7 MeV and 8 MeV, respectively, then the energy released in the decay will be :

(1) 200 MeV   (2) –220 MeV

(3) 220 MeV   (4) 180 MeV

Q. 15. A particle of mass 'm' is executing oscillations about the origin on the x-axis. Its potential energy is $U(x) = K|x|^3$ where K is a positive constant. If the amplitude of oscillation is 'a' then its time period T is :

(1) Proportional to $\dfrac{1}{\sqrt{a}}$

(2) Independent of a

(3) Proportional to $\sqrt{a}$

(4) Proportional to $a^{3/2}$

Q. 16. Two blocks are connected by a massless string through an ideal pulley as shown. A force of 22 N is applied on block B when initially the blocks are at rest. Then acceleration of centre of mass of block A and block B, 2 s, after the application of force is (masses of A and B are 4 kg and 6 kg, respectively and surfaces are smooth) :
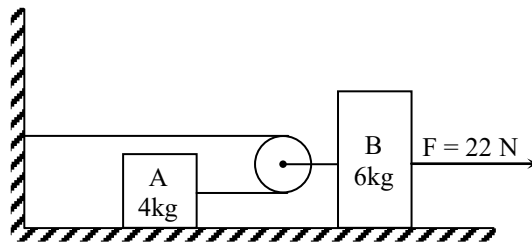
(1) 1.4 m/s^2 (2) 1 m/s^2

(3) 2 m/s^2 (4) None of these

Q. 17. Observe the following circuit.
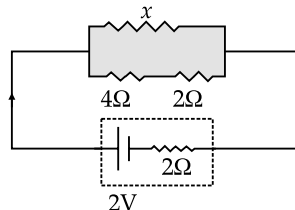
In order that the power dissipated in external circuit is maximum, the value of x should be (in ohm) ?

(1) 4Ω   (2) 3Ω   (3) 2Ω   (4) 1Ω

Q. 18. In series LCR circuit voltage drop across resistance is 8 volt; across inductor voltage drop = 6V and across capacitor is 12 volt. Then :

(1) Voltage of the source will be leading current in the circuit.

(2) Voltage drop across each element will be less than the applied voltage.

(3) Power factor of circuit will be $\dfrac{4}{3}$.

(4) None of these

Q. 19. If an electron revolves around a proton, then its time period (R = radius of orbit) :

(1) $T \propto R^2$ (2) $T \propto R^{3/2}$

(3) $T \propto R^3$ (4) $T \propto R$

Q. 20.
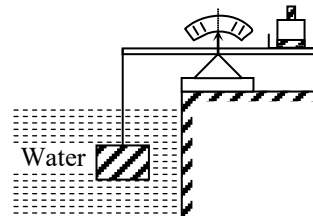
The volume of brick is 2.197 litres. The submerged brick is balanced by a 2.54 kg mass on the beam scale. The weight of the brick is : ($g = 9.8$ m/s^2)
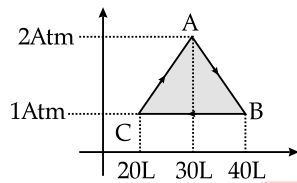
(1) 46 N   (2) 50 N

(3) 56 N   (4) 72 N

Section B

Q. 21. A cube of mass 3 kg is kept on a frictionless horizontal surface. The block is given an impulse so that point 'A' acquires velocity 4 m/s in the direction shown. If speed of point B is $4\sqrt{2}$ m/s, K.E. of block is .... J.
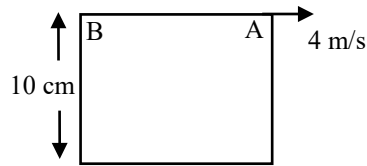

**Q. 22.** Consider a pv–cyclic process ABCA as per described by the graph below.

Heat of 1205. J is provided for the process to take place. The amount of heat rejected (in joule) in one cycle is ?

Q. 23. Each of the blocks shown in figure has mass 1 kg. The rear block moves with a speed of 2 m/s towards the front block kept at rest. The spring attached to the front block is light and has a spring constant 50 N/m. The maximum compression of the spring is given by $\dfrac{X}{10}$ m, then the value of X is .... m.
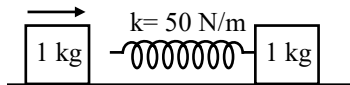
Q. 24. A rectangular plate of mass 20 kg is suspended from points A and B as shown. If the pin B is suddenly removed then the angular acceleration of the plate is .... rad/sec^2 ($g = 10$ m/s^2).
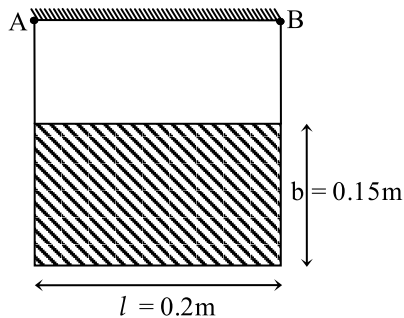

**Q. 25.** In a certain region of space, electric potential V is given by $V = ax^2 + ay^2 + 2az^2$ (where 'a' is a constant of proper dimensions). Work done by electric field in moving a 2μC charge from origin to (0, 0, 0.1 m) is (-5×10^{-8}) J.

The approximate value of 'a' is V/m^2 is ....

Q. 26. In figure $C_1 = 2$ μF $C_2 = 6$ μF and $C_3 = 3.5$ μF. If break down voltages of the individual capacitors are $V_1 = 100$ V, $V_2 = 50$ V and $V_3 = 400$ V. Maximum voltage can be placed across points a and b is ....$\times \dfrac{100}{3}$ volt.
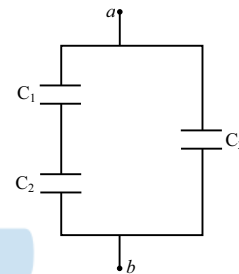
Q. 27. Consider the circuit shown in figure. What is the current through the battery just after the switch is closed is .... A.
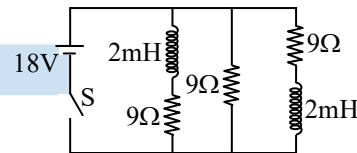
Q. 28. Position of a particle moving along a straight line is given by $x = 2t^2 + t$. Find the velocity at $t = 2$ sec is .... m/s.

Q. 29. A particle moving towards a concave mirror of focal length 20 cm has a speed of 9 m/s when it is 30 cm away from the focus. The speed of the image is _____ m/s.

Q. 30. A wire of length '2 m' is clamped horizontally between two fixed support. A mass $m = 5$ kg is hanged from middle of wire. The vertical and depression in wire in equilibrium is .... cm. (Young modulus of wire = 2.4×10^9 N/m^2, cross-sectional area = 1 cm^2)

Chemistry

Q. 31. For a molecule Br_2, total distance between two nuclei is 3.2 Å. What will be the co-valent radius of Br atom ?

(1) 1.6 Å   (2) 6.4 Å

(3) 2.4 Å   (4) 4.9 Å

Q. 32. Match the items under list (1) with items under list (2) select the correct answers from the sets (1), (2), (3) and (4) :

List (1) **Molecule**

(a) PCl_5 (b) F_2O

(c) BCl_3 (d) NH_3

List (2) **Shape**

(i) V-shaped

(ii) Triangular planar

(iii) Trigonal bipyramidal

(iv) Trigonal pyramidal

(v) Tetrahedral

(1) a - i, b - v, c - iv, d - iii

(2) a - ii, b -iii, c - i , d - ii

(3) a - iv, b - iii, c - ii, d - v

(4) a - iii, b - i, c - ii, d - iv

Q. 33. During the qualitative analysis of salt with cation y^{2+}, addition of a reagent (X) to alkaline solution of the salt gives a bright red precipitate. The reagent (X) and the cation (y^{2+}) present respectively are:

(1) Dimethylglyoxime and Ni^{2+}

(2) Dimethylglyoxime and Co^{2+}

(3) Nessler's reagent and Hg^{2+}

(4) Nessler's reagent and Ni^{2+}

Q. 34. Calculate the work done when 2 moles of hydrogen expand isothermally and reversibly at 27°C from 15 to 50 litres.

(1) 14.45 k cal   (2) 1445 J

(3) –1445 cal   (4) 14.45 kJ

Q. 35. The k_{sp} for bismuth sulphide (Bi_2S_3) is 1.08×10^{-73}. The solubility of Bi_2S_3 in mol/L at 198 K is
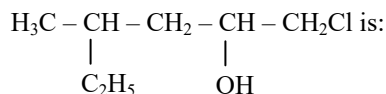
(1) 2.7×10^{-12} (2) 1.0×10^{-15}

(3) 4.2×10^{-8} (4) 3.2×10^{-10}

Q. 36. Calculate pH of 0.1 M CH_3COOH
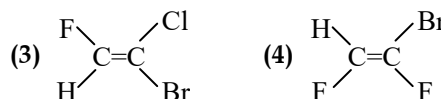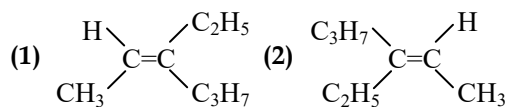
(Given $K_{a_{CH_3COOH}} = 2 \times 10^{-5}$)

(1) 2.5   (2) 2.2

(3) 2.85   (4) 3.15

Q. 37. IUPAC name of

$$H_3C - CH - CH_2 - CH - CH_2Cl \text{ is:}$$

with C_2H_5 below the first CH and OH below the second CH

(1) 1-chloro-4-methylhexan-2-ol

(2) 1-chloro-4-methylhexan-2-al

(3) 1-chloro-4-ethylpentan-2-ol

(4) 1-chloro-2-hydroxy-4-methylhexane

Q. 38. The Z-configuration in the following is :

(1)
$$
\begin{array}{c}
H \\
CH_3
\end{array}
C=C
\begin{array}{c}
C_2H_5 \\
C_3H_7
\end{array}
$$

(2)
$$
\begin{array}{c}
C_3H_7 \\
C_2H_5
\end{array}
C=C
\begin{array}{c}
H \\
CH_3
\end{array}
$$

(3)
$$
\begin{array}{c}
F \\
H
\end{array}
C=C
\begin{array}{c}
Cl \\
Br
\end{array}
$$

(4)
$$
\begin{array}{c}
H \\
F
\end{array}
C=C
\begin{array}{c}
Br \\
F
\end{array}
$$

Q. 39. Given below are two statements.

Statement I: The presence of weaker π–bonds make alkenes less stable than alkanes.

Statement II: The strength of the double bond is greater than that of carbon-carbon single bond.

In the light of the above statements, choose the *correct* answer from the options given below.

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

Q. 40. In the given reaction

$$2A \xrightarrow[\text{(iii) } H_2O/H^+]{\substack{\text{(i) 2 Mg, THF} \\ \text{(ii) Methyl benzoate}}} \text{(triphenylmethanol)}$$
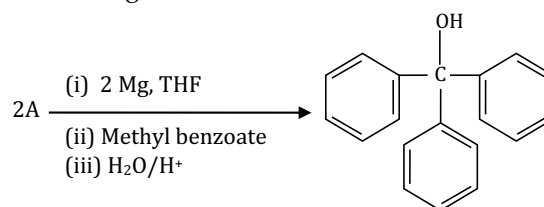
(1) Benzyl bromide

(2) bromobenzene

(3) cyclohexyl bromide

(4) methyl bromide

Q. 41. Cerium (IV) has a noble gas configuration. Which of the following is correct statement about it?

(1) It will not prefer to undergo redox reactions.

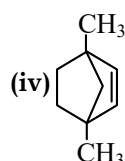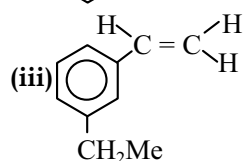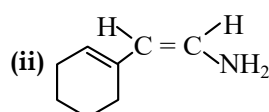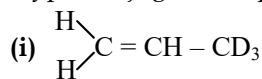(2) It will prefer to gain electron and act as an oxidizing agent.

(3) It will prefer to give away an electron and behave as reducing agent.

(4) It acts as both, oxidizing and reducing agent.

Q. 42. The depression in freezing point observed for a formic acid solution of concentration 0.5 mol L^{-1} is $0.0405°C$. The density of formic acid is 1.05 g mL^{-1}. The Van't Hoff factor of the formic acid solution is nearly: (Given for water $k_f = 1.86 \text{ K kg mol}^{-1}$)

(1) 0.8   (2) 1.1

(3) 1.9   (4) 2.4

Q. 43. Hyperconjugation is possible in :

(i) $\overset{H}{\underset{H}{}}C = CH - CD_3$

(ii) $C = C \overset{H}{\underset{NH_2}{}}$

(iii) $C = C \overset{H}{\underset{H}{}}$

CH$_2$Me

(iv)

(1) i and ii   (2) i, ii and iii

(3) only ii   (4) All of the above

Q. 44. When 1-alkyne is treated with Na + Liq. NH_3 and product is reacted with methyl chloride, the end product of the reaction will be :

(1) Lower alkyne having two carbon less than 1-alkyne

(2) Lower alkyne having one carbon less than 1-alkyne

(3) Higher alkyne having one carbon more than 1-alkyne

(4) Higher alkyne having two carbon more than 1-alkyne

Q. 45. $\xrightarrow[\text{ether}]{\text{1 equivalent Mg}} X \xrightarrow{D_2O} Y$ is

(1)   (2)

(3)   (4)
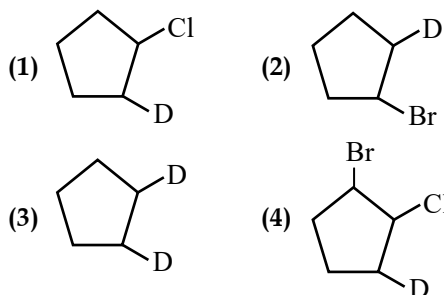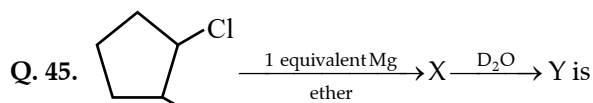
Q. 46. In 'nitration mixture' concentrated sulphuric acid is used :

(1) As sulphonating agent

(2) As dehydrating agent

(3) For the formation of nitronium ions

(4) As a solvent

Q. 47. Methanol and ethanol are distinguished by :

(1) Treating with victor mayer test

(2) Treating with Lucas reagent

(3) Heating with iodine and alkali

(4) Treating with CrO_3 in dil. H_2SO_4

Q. 48. In which of the following crossed aldol condensations, only one kind of cross aldol is formed?

(1) CH_3CHO and CH_3CH_2CHO

(2) CH_3CHO and $(CH_3)_2CO$

(3) $(CH_3)_2CO$ and $(C_2H_5)_2CO$

(4) C_6H_5CHO and CH_3CHO

Q. 49. —$COOH + NaHCO_3$

$\longrightarrow$ —$COONa + CO_2$
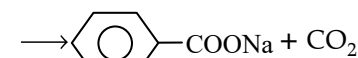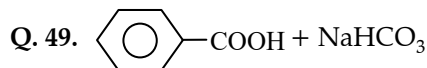
C^* is with in the product –

(1) CO_2

(2) —$COONa$

(3) Both (1) and (2)

(4) None of these

Q. 50. Name the products in the acid- base reaction:

(A) $CH_3CH_2NH_2 + HI$

(B) $(CH_3)_3N + HBr$

(1) (A) Trimethyl ammonium iodide

(B) Trimethyl ammonium bromide

(2) (A) Ethyl ammonium iodide

(B) Methyl ammonium bromide

(3) (A) Ethyl ammonium iodide

(B) Trimethyl ammonium bromide

(4) All of the above

Section B

Q. 51. Two substances A ($t_{1/2}$ = 5 min) and ($t_{1/2}$ = 15 min) are taken in such a way that initially [A] = 4[B]. The time after which both the concentration will be equal is .... (assuming reactions are of first order).

Q. 52. A radioactive element has atomic mass 90 amu and a half-life of 28 years. The number of disintegrations per second per g of the element is .... $\times 10^{12}$.

Q. 53. The standard free energy change for the reaction:

$H_2(g) + 2AgCl(s) \to 2Ag(s) + 2H^+(aq) + 2Cl^-$ (aq)

is –10.26 kcal mol^{-1} at 25°C. A cell using above reaction is operated at 25°C under P_{H_2} = 1 atm, [H$^+$] and [Cl$^-$] = 0.1. The e.m.f. of cell is .... V.

Q. 54. For the given first order reaction

A → B

The half life of the reaction is 0.3010 min. The ratio of the initial concentration of reactant to the concentration of reactant at time 2.0 min will be equal to _____. (Nearest integer)

Q. 55. The concentration of an aqueous solution of common salt must be .... g/l. If it is to be isotonic with a solution of this substance which freezes at –0.0186°C? (Assuming NaCl is fully ionised in the first solution).

Q. 56. For the reaction

$H_2F_2(g) \to H_2(g) + F_2(g)$

ΔU = –59.6 kJ mol^{-1} at 27 °C.

The enthalpy change for the above reaction is (–) _____ kJ mol^{-1} [nearest integer]

Given : R = 8.314 J K^{-1} mol^{-1}.

Q. 57. When 800 mL of 0.5 M nitric acid is heated in a beaker, its volume is reduced to half and 11.5 g of nitric acid is evaporated. The molarity of the remaining nitric acid solution is $x \times 10^{-2}$M. (Nearest Integer).

Q. 58. The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and B from the base line are 3.25 cm, 2.08 cm and 1.05 cm, respectively. The ratio of R_f values of A to B is_____.

Q. 59. At 500 kilobar pressure density of diamond and graphite are 3 g/cc and 2 g/cc respectively, at certain temperature 'T'. The value of $|\Delta H - \Delta U|$ is .... kJ/mol (kJ /mol) for the conversion of 1 mole of graphite to 1 mole of diamond at temperature 'T' .

Q. 60. The half life for the decomposition of gaseous compound A is 240 s when the gaseous pressure was 500 Torr initially. When the pressure was 250 Torr, the half life was found to be 4.0 min. The order of the reaction is _____. (Nearest integer)

Mathematics

Section A

Q. 61. $2\sin\left(\dfrac{\pi}{22}\right)\sin\left(\dfrac{3\pi}{22}\right)\sin\left(\dfrac{5\pi}{22}\right)\sin\left(\dfrac{7\pi}{22}\right)\sin\left(\dfrac{9\pi}{22}\right)$

is equal to

(1) $\dfrac{3}{16}$ **(2)** $\dfrac{1}{16}$ **(3)** $\dfrac{1}{32}$ **(4)** $\dfrac{9}{32}$

Q. 62. For $z \in C$, if the minimum value of $\left(|z-3\sqrt{2}|+|z-p\sqrt{2}i|\right)$ is $5\sqrt{2}$, then a value of p is

(1) 3 **(2)** $\dfrac{7}{2}$ **(3)** 4 **(4)** $\dfrac{9}{2}$

Q. 63. Sum $\dfrac{1}{5} + \dfrac{1}{7} + \dfrac{1}{5^2} + \dfrac{1}{7^2} + \dfrac{1}{5^3} + \dfrac{1}{7^3}$ +.... is equal to

(1) $\dfrac{5}{12}$ **(2)** $\dfrac{3}{4}$ **(3)** $\dfrac{7}{12}$ **(4)** $\dfrac{3}{49}$

Q. 64. If $x = 2 + 2^{1/3} + 2^{2/3}$, then the values of $x^3 - 6x^2 + 6x$ is

(1) –2 **(2)** 3 **(3)** 4 **(4)** 2

Q. 65. The remainder when $(11)^{1011} + (1011)^{11}$ is divided by 9 is

(1) 1 **(2)** 4 **(3)** 6 **(4)** 8

Q. 66. If the equation of the locus of a point equidistant from the point (a_1, b_1) and (a_2, b_2) is $(a_1 - b_2) x + (a_1 - b_2) y + c = 0$, then the value of '$c$' is

(1) $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$ (2) $\frac{1}{2}\left(a_2^2 + b_2^2 - a_1^2 - b_1^2\right)$

(3) $a_1^2 - a_2^2 + b_1^2 - b_2^2$ (4) $\frac{1}{2}\left(a_1^2 + a_2^2 + b_1^2 + b_2^2\right)$

Q. 67. The number of real values of λ, such that the system of linear equations
$2x - 3y + 5z = 9$
$x + 3z - z = -18$
$3x - y + (\lambda^2 - |\lambda|)z = 16$
has no solutions, is

(1) 0   (2) 1   (3) 2   (4) 4

Q. 68. The general solution of the differential equation $(x - y^2)dx + y(5x + y^2)dy = 0$ is

(1) $(y^2 + x)^4 = C|(y^2 + 2x)^3|$
(2) $(y^2 + 2x)^4 = C|(y^2 + x)^3|$
(3) $|(y^2 + x)^3| = C(2y^2 + x)^4$
(4) $|(y^2 + 2x)^3| = C(2y^2 + x)^4$

Q. 69. The number of bijective functions $f: \{1, 3, 5, 7, \dots 99) \to \{2, 4, 6, 8, \dots, 100\}$, that $f(3) \geq f(9) \geq f(15) \geq f(21) \geq \dots \geq f(99))$, is .....

(1) $^{50}P_{17}$ (2) $^{50}P_{33}$

(3) $33! \times 17!$ (4) $\frac{50!}{2}$

Q. 70. The position of the point $(2, 5)$ relative to the hyperbola $9x^2 - y^2 = 1$ is

(1) Inside   (2) Outside
(3) lie on   (4) Cannot decide

Q. 71 Let $f: R \to R$ be a function defined by $f(x) = \dfrac{x^2 + 2x + 5}{x^2 + x + 1}$ is

(1) one-one and into
(2) one-one and onto
(3) many-one and onto
(4) many-one and into

Q. 72. $\lim\limits_{\theta \to -\frac{\pi}{4}} \dfrac{\cos\theta + \sin\theta}{\theta + \dfrac{\pi}{4}} = $

(1) $\sqrt{2}$ (2) 1
(3) 2   (4) Does not exist

Q. 73. Let $f(x) = \left|\left(x + \dfrac{1}{2}\right)[x]\right|$ when $-2 \leq x \leq 2$, where [.] represents greatest integer function, then

(1) $f(x)$ is continuous at $x = 2$
(2) $f(x)$ is continuous at $x = 1$
(3) $f(x)$ is continuous at $x = -1$
(4) $f(x)$ is discontinuous at $x = 0$

Q. 74. If $x^2 e^y + 2xye^x = 0$, then the value of $\dfrac{dy}{dx}$ when $y = 0$, $x = 1$ is

(1) $\dfrac{-1}{1+e}$ (2) $\dfrac{2}{2+e}$

(3) $\dfrac{-2}{1+2e}$ (4) $\dfrac{-1}{2e+1}$

Q. 75. For any real number x, let $[x]$ denote the largest integer less than equal to x. Let f be a real valued function defined on the interval $[-10, 10]$ by $f(x) = \begin{cases} x - [x], & \text{if } [x]\text{ is odd} \\ 1 + [x] - x, & \text{if } [x]\text{ is even} \end{cases}$

Then the value of $\dfrac{\pi^2}{10} \int_{-10}^{10} f(x)\cos\pi x\, dx$ is

(1) 4   (2) 2   (3) 1   (4) 0

Q. 76. The length of largest continuous interval in which function $f(x) = 4x - \tan 2x$ is monotonic, is

(1) $\dfrac{\pi}{2}$ (2) $\dfrac{\pi}{4}$ (3) $\dfrac{\pi}{8}$ (4) $\dfrac{\pi}{16}$

Q. 77. The set of value(s) of 'a' for which the function $f(x) = \dfrac{ax^3}{3} + (a+2)x^2 + (a-1)x + 2$ possesses a negative point of inflection is

(1) $(-\infty, -2) \cup (0, \infty)$ (2) $\{-4/5\}$
(3) $\{-2, 0\}$ (4) empty set

Q. 78. The value of $\sin 10° \sin 30° \sin 50° \sin 70°$ is

(1) $\dfrac{1}{16}$ (2) $\dfrac{1}{32}$ (3) $\dfrac{1}{18}$ (4) $\dfrac{1}{36}$

Q. 79. If the absolute maximum value of the function $f(x) = (x^2 - 2x + 7) e^{(4x^3 - 12x^2 - 180x + 31)}$ in the interval $[-3, 0]$ is $f(x)$, then

(1) $\alpha = 0$ (2) $\alpha = -3$
(3) $\alpha \in (-1, 0)$ (4) $\alpha \in (-3, -1]$

Q. 80. If the lines $\dfrac{x-1}{-3} = \dfrac{y-2}{2k} = \dfrac{z-3}{2}$ and $\dfrac{x-1}{3k} = \dfrac{y-5}{1} = \dfrac{z-6}{-5}$ are at right angles, then the value of k will be

(1) $-\dfrac{10}{7}$ (2) $-\dfrac{7}{10}$ (3) -10 (4) -7

Section B

Q. 81. For $\triangle ABC$, let position vectors of A, B and C be respectively $6\hat{i}+\hat{j}+\hat{k}, 2\hat{i}+4\hat{j}+\hat{k}$ and $4\hat{i}+4\hat{j}+7\hat{k}$. If interior and exterior bisectors of angle A meets BC at D and E respectively and $\dfrac{1}{BD}-\dfrac{1}{BE}=\dfrac{1}{\sqrt{k}}$, then [k] is equal to ....

Q. 82. The letters of the word 'MANKIND' are written in all possible orders and arranged in serial order as in an English dictionary. Then the serial number of the word 'MANKIND' is _____.

Q. 83. Let a, b be two non-zero real numbers. If p and r are the roots of the equation $x^2-8ax+2a=0$ and q and s are the roots of the equation $x^2 + 12bx + 6b = 0$, such that $\dfrac{1}{p},\dfrac{1}{q},\dfrac{1}{r},\dfrac{1}{s}$ are in A.P., then $a^{-1}-b^{-1}$ equal to _____.

Q. 84. The value of $\displaystyle\int_0^{\infty}[x].2^{-[x]}dx$ is equal to ....
(where [.] denotes greatest integer function)

Q. 85. Let A be the set of all 3×3 symmetric matrices whose diagonal elements are 1, then the number of matrices A for which the system of linear equations $A\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ represents three perpendicular planes is ....

Q. 86. Let $A=\begin{bmatrix} 1 & a & a \\ 0 & 1 & b \\ 0 & 1 & 1 \end{bmatrix}, a, b \in R$. If for some $n \in N$,

$A^n =\begin{bmatrix} 1 & 48 & 2160 \\ 0 & 1 & 96 \\ 0 & 0 & 1 \end{bmatrix}$, then $n + a + b$ is equal to

Q. 87. The curve $y = f(x)$ passes through the origin and satisfies $\dfrac{dy}{dx}+\displaystyle\int_0^3 ydx = 11$. Let a and b are chosen randomly from the set $S = \{1, 2, 3,........ 10\}$ with replacement. If the probability that the curve $y = f(x)$ passes through (a, b) is $\dfrac{p}{q}$ (where p and q are coprime), then $(p + q)$ is ....

Q. 88. If the maximum value of the term independent of t in the expansion of $\left(t^2 x^{\frac{1}{5}} + \dfrac{(1-x)^{\frac{1}{10}}}{t}\right)^{15}$, $x \geq 0$, is K, then 8 K is equal to _____.

Q. 89. If the set of values of x satisfying the inequality $\tan x \cdot \tan 3x < -1$ in the interval $\left(0, \dfrac{\pi}{2}\right)$ is (a, b), then the value of $\left(\dfrac{36(b-a)}{\pi}\right)$ is ....

Q. 90. If $\sin^2 x \cos y = (a^2 - 1)^2 + 1$ and $\cos^2 x \sin y = a + 1$, where $x, y \in [0, \pi]$ and $a \in R$, then number of ordered pairs (x, y) is ....