JEE – Main

Chapter wise Model Paper - V

Time: 3 hrs   **Max. Marks: 360**

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IMPORTANT INSTRUCTIONS :

Physics :   Question No. 1 to 30 consists FOUR (4) marks.   Negative (-1)

Chemistry :   Question No. 31 to 60 consists FOUR (4) marks.   Negative (-1)

Maths :   Question No. 61 to 90 consists FOUR (4) marks.   Negative (-1)

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Syllabus:

Physics :   wave motion, sound and optics
Chemistry :   General organic chemistry, Alkanes, Alkenes, Alkyles and Arenes
Mathematics :   Calculus

PHYSICS

1   A light pointer is fixed to a tuning fork and it touches a vertical plate. The fork is set into vibration and the plate is allowed to fall freely. 8 complete oscillations are recorded as the plate falls through 10 cm. The frequency of the fork is (nearly)

    1. 112 Hz   **2.** 56 Hz   **3.** 28 Hz   **4.** 224 Hz

2   A string fixed at both ends is vibrating in the lowest mode of vibration for which a point at quarter of its length from one end is a point of maximum displacement. The frequency of vibration in this mode is 100 Hz. What will be the frequency emitted when it vibrates in the next mode such that this point is again a point of maximum displacement?

    1. 400 Hz   **2.** 200 Hz   **3.** 600 Hz   **4.** 300 Hz

3   A sound wave of wavelength λ travels towards the right horizontally with a velocity V. It strikes and reflects from a vertical plane surface, travelling at a speed v towards the left. The number of positive crests striking during a time interval of three seconds on the wall is

    1. $3(V - v) / \lambda$ **2.** $3(V + v) / \lambda$

    3. $(V + v) / 3\lambda$ **4.** $(V - v) / 3\lambda$

4   The frequency changes by 10% as a sound source approaches a stationary observer with constant speed V_s. What would be the percentage change in frequency as the source recedes the observer with the same speed. Given that $V_s < V.$ (v = speed of sound in air)

    1. 14.3%   **2.** 20%   **3.** 10.0%   **4.** 8.5%

5 A fish 40 cm beneath the surface of pond sees a bird directly over head. If the bird is actually 15 cm above the water surface, the same appears to be seen by the fish above the water surface at a height of $\left(\mu = \dfrac{4}{3} \right)$

1. 10 cm   **2.** 20 cm   **3.** 25 cm   **4.** 30 cm

6 Two sound waves have intensities of 10 and $500 \mu W / cm^2$. How many decibels is the louder sound than the other ?

1. 7 dB   **2.** 1.7 dB   **3.** 2.7 dB   **4.** 3.7 dB

7 A parallel beam of fast moving electrons is incident normally on a narrow slit. A screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statement is correct ?

1. Diffraction pattern is not observed on the screen in the case of electron

2. The angular width of the central maximum of the diffraction pattern will increase

3. The angular width of the central maximum will decrease

4. The angular width of the central maximum will remains the same

8 A double convex thin lens made of glass (refractive index 1.5) has both radii of curvature of magnitude 20 cm. Incident light rays parallel to the axis of the lens will converge at distance L such that

1. L = 20 cm.   **2.** L = 10 cm

3. L = 40 cm   **4.** L = 20/3 cm

9 In Young's double slit experiment, the interference pattern is found to have an intensity ratio between bright and dark fringes is 9. This implies that :

1. the intensities at the screen due to two slits are 5 units and 4 units respectively

2. the intensities at the screen due to two slits are 4 units and 1 units respectively

3. the amplitude ratio is 7

4. the amplitude ratio is 6

10 A ray of light enters a rectangular glass slab of refractive index $\sqrt{3}$ at an angle of incidence 60^0. It travels a distance of 5 cm inside the slab and emerges out of the slab. The

perpendicular distance between the incident and the emergent rays is

1. $5\sqrt{3}\,cm$ 2. $\dfrac{5}{2}\,cm$ 3. $5\sqrt{\dfrac{3}{2}}\,cm$ 4. $5\,cm$

11. Two light rays having the same wavelength λ in vacuum are in phase initially. Then the first ray travels a path L_1 through a medium of refractive index n_1 while the second ray travels a path of length L_2 through a medium of refractive index n_2. The two waves are then combined to produce interference. The phase difference between the two waves is :

1. $\dfrac{2\pi}{\lambda}(L_2 - L_1)$ 2. $\dfrac{2\pi}{\lambda}(n_1 L_1 - n_2 L_2)$

3. $\dfrac{2\pi}{\lambda}(n_2 L_1 - n_1 L_2)$ 4. $\dfrac{2\pi}{\lambda}\left(\dfrac{L_1}{n_1} - \dfrac{L_2}{n_2}\right)$

12. A Sonometer is set on the floor of a lift. When the lift is at rest, the Sonometer wire vibrates with fundamental frequency 256 Hz. When the lift goes up with acceleration $a = \dfrac{9g}{16}$. the frequency of vibration of the same wire changes to

1. 512 Hz.   2. 320 Hz.   3. 256 Hz.   4. 204 Hz.

13. In a young's double-slit experiment $\lambda = 500nm, d = 1mm$ and D = 1 m. The minimum distance from the central maximum for which the intensity is half of the maximum intensity is

1. $2 \times 10^{-4}\,m$ 2. $1.25 \times 10^{-4}\,m$ 3. $4 \times 10^{-4}\,m$ 4. $2.5 \times 10^{-4}\,m$

14. A beam of light is incident on a glass plate at an angle of incidence 60^0. The reflected ray is polarized. What is the angle of refraction when the angle of incidence is 45^0?

1. $\sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ 2. $\cos^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ 3. $\sin^{-1}\left(\dfrac{1}{\sqrt{6}}\right)$ 4. $\sin^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

15. The two coherent sources of equal intensity produce maximum intensity of 100 units at a point. If the intensity of one of the source is reduced by 36% by reducing its width then the intensity of light at the same point will be

1. 90   2. 89   3. 67   4. 81

16. A tuning fork of frequency 250Hz produces 4 beats per second with a wire of length 25 cm vibrating in its fundamental mode. The beat frequency decreases when the length is slightly shortened. What could be the minimum length by which the wire be shortened so that is produces no beats with the tuning fork?

1. 0.2 cm   **2.** 0.4 cm   **3.** 0.3 cm   **4.** 0.1 cm

17 The maximum intensity in young's double slit experiment is I_0. Distance between the slits is $d = 5\lambda$ where λ the wavelength of mono chromatic light is used in the experiment. What will be the intensity of light in front of one of the slits on a screen at distance b=10d

1. $\dfrac{I_0}{2}$ **2.** $\dfrac{3}{4}I_0$ **3.** I_0 **4.** $\dfrac{I_0}{4}$

18 A fish rising vertically up towards the surface of water with speed 3 ms^{-1} observes a bird diving vertically down towards it with speed 9 ms^{-1}. The actual velocity of bird is
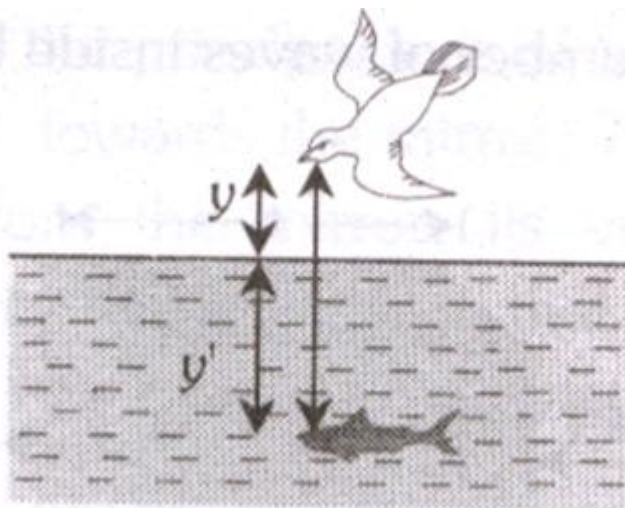
**1.** $4.5\,ms^{-1}$ **2.** $5\,ms^{-1}$ **3.** $3.0\,ms^{-1}$ **4.** $3.4\,ms^{-1}$

19 A line source of sound of length 10 m, emitting a pulse of sound that travels radially outward from the source. The power of the source is $P = 1.0 \times 10^4 W$. What is the intensity I of the sound when it reaches a distance of 10 m from the source

1. $12.2W / m^2$ **2.** $8.2W / m^2$

3. $586.25W / m^2$ **4.** $15.92W / m^2$

20 A spherical surface of radius of curvature 'R' separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in the glass. A point object 'P' placed in air is found to have a real image 'Q' in the glass. The line PQ cuts the surface at a point 'O', and PO = OQ. The distance PO is equal to

1. 5 R   **2.** 3 R   **3.** 2 R   **4.** 1.5 R

21 An optical fiber consists of core of μ_1 surrounded by a cladding of $\mu_2 < \mu_1$. A beam of light enters from air at an angle α with axis of fiber. The highest α for which ray can be travelled through fiber is
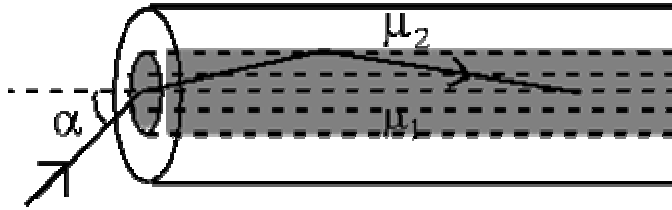
1. $\cos^{-1}\sqrt{\mu_2^2-\mu_1^2}$ **2.** $\sin^{-1}\sqrt{\mu_1^2-\mu_2^2}$

3. $\tan^{-1}\sqrt{\mu_1^2-\mu_2^2}$ **4.** $\sec^{-1}\sqrt{\mu_1^2-\mu_2^2}$

22 A point source of light is placed 4 m below the surface of water of refractive index $5/3$. The minimum diameter of a disc which should be placed over the source on the surface of water to cut-off all right coming out of water is

1. 2 m **2.** 6 m **3.** 4 m **4.** 3 m

23 The convex side of a thin Plano - convex lens with radius of curvature 60 cm is silvered to obtain a concave mirror. An object is located at a distance of 30 cm in front of this mirror. The distance of the image from the mirror is ($\mu_8=1.5$)

1. 12 cm **2.** –60 cm **3.** 60 cm **4.** 20 cm

24 A transverse wave along a string is given by $y=2\sin\left(2\pi(3t-x)+\dfrac{\pi}{4}\right)$, where, x and y are in cm and t in second. The acceleration of a particle located at x = 4cm at t = 1s is:

1. $36\sqrt{2}\pi^2 cm/s^2$ **2.** $36\pi^2 cm/s^2$

3. $36\sqrt{2}\pi^2 cm/s^2$ **4.** $-36\pi^2 cm/s^2$

25 An engine approaches a railway station and whistles at a frequency of 400Hz. A stationary observer on the platform observer a change of 40Hz as the engine passes across him. If the velocity of sound is $330\,ms^{-1}$ the speed of the engine is

1. $16.5\,ms^{-1}$ **2.** $66\,ms^{-1}$ **3.** $33\,ms^{-1}$ **4.** $44\,ms^{-1}$

26 The equation of a stationary wave in a metal rod is given by $y=0.002\sin\dfrac{\pi x}{3}\sin 1000t$, where x is in cm and t is in second. the maximum tensile stress at a point x = 2 cm: (Young's modulus Y of material of rod $=8\times10^{11}\,dyne/cm^2$) will be :

1. $\dfrac{\pi}{3}\times10^8 dyne/cm^2$ **2.** $\dfrac{4\pi}{3}\times10^8 dyne/cm^2$

3. $\dfrac{8\pi}{3}\times10^8 dyne/cm^2$ **4.** $\dfrac{2\pi}{3}\times10^8 dyne/cm^2$

27 Two plane mirrors are combined to each other as such one is in y-z plane and other is in x-z plane. A ray of light along vector $\hat{i} + \hat{j} + \hat{k}$ is incident on the first mirror. The unit vector in the direction of emergence ray after successive reflections through the mirror is :

1. $-\dfrac{1}{\sqrt{3}}\hat{i} - \dfrac{1}{\sqrt{3}}\hat{j} + \dfrac{1}{\sqrt{3}}\hat{k}$

2. $-\dfrac{1}{\sqrt{3}}\hat{i} - \dfrac{1}{\sqrt{3}}\hat{j} - \dfrac{1}{\sqrt{3}}\hat{k}$

3. $-\hat{i} - \hat{j} + \hat{k}$

4. none of the above

28 The reflective surface is given by y = 2 sin x. The reflective surface is facing positive axis. What are the least values of co-ordinate of the point where a ray parallel to positive x-axis becomes parallel to positive y-axis after reflection?

1. $\left(\dfrac{\pi}{3}, \sqrt{3}\right)$　　　　2. $\left(\dfrac{\pi}{2}, \sqrt{2}\right)$　　　　3. $\left(\dfrac{\pi}{3}, \sqrt{2}\right)$　　　　4. $\left(\dfrac{\pi}{4}, \sqrt{3}\right)$

29 A concave mirror with its optic axis vertical and mirror facing upward is placed at the bottom of the water tank. The radius of curvature of mirror is 40cm and refractive index for water $\mu = 4/3$. The tank is 20 cm deep and if a bird is flying over the tank at a height 60cm above the surface of water, the position of image of a bird is :

1. 3.75 cm　　　　2. 4.23 cm　　　　3. 5.2 cm　　　　4. 3.2 cm

30 If Fraunhoffer diffraction pattern due to a single slit, the slit of width 0.1 mm is illuminate by monochromatic light of wavelength 600 nm. What is the ratio of separation between the central maximum and first secondary minimum to the distance between screen and the slit?

1. $6 \times 10^{-3} m$　　　　2. $0.1 m$　　　　3. 6　　　　4. $100 m$

CHEMISTRY

31　Hybridization of middle carbon atoms in 1,3 – butadiene is

1. sp^3 and sp^3　　　　2. sp^3 and sp^2　　　　3. sp^3 and sp　　　　4. sp^2 and sp^2

32　The Lassaigne's extract is boiled with dil. HNO_3 before testing for halogens because

1. Silver halides are soluble in HNO_3　　　　2. Na_2S and NaCN are decomposed by HNO_3

3. Ag_2S is soluble in HNO_3　　　　4. $AgCN$ is soluble in HNO_3

33　In Lassaigne's test, the organic compound is fused with a piece of sodium metal in order to

1. Increase the ionization of the compound

2. Decrease the melting point of the compound

3. Increase the reactivity of the compound

4. Convert the covalent compound into a mixture of ionic compounds

34   Which of the following has the highest melting point?

1. $CH_2 = CHCH(CH_3)_2$ **2.** $CH_3CH = C(CH_3)_2$

3. $(CH_3)_2C = C(CH_3)_2$ **4.** $CH_2 = CH(CH_2)_2CH_3$

35   An organic compound de colourises Br_2 water and also gives red ppt. with $CuCl_2$ solution. The compound is

1. $CH_2 = CH_2$ **2.** $CH_3 - CH = CH_2$ **3.** $CH_3 - C \equiv CH$ **4.** $CH_3 - C \equiv C - CH_3$

36   For the detection of sulphur in an organic compound, sodium nitroprusside is added to the sodium extract. The violet colour obtained is due to the formation of
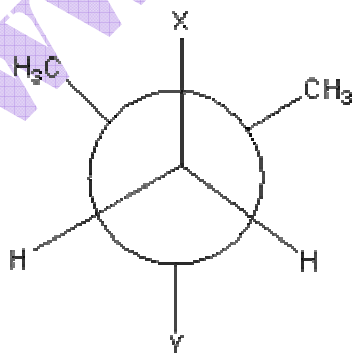
1. $Fe(CNS)_3$ **2.** $Na_4[Fe(CN)_5NOS]$ **3.** $Na_3[Fe(CN)_5NOS]$ **4.** $Na_3[Fe(CN)_6]$

37   The total number of contributing structures showing hyperconjugation (involving C – H bonds) for the following carbocation is
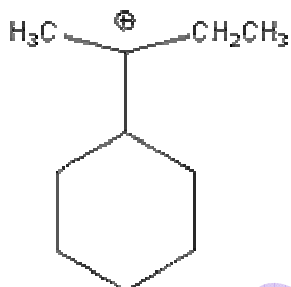
1. 3   **2.** 4   **3.** 5   **4.** 6

38   In the Newman projection for 2, 2 – dimethylbutane
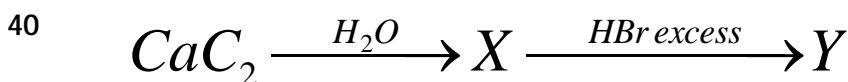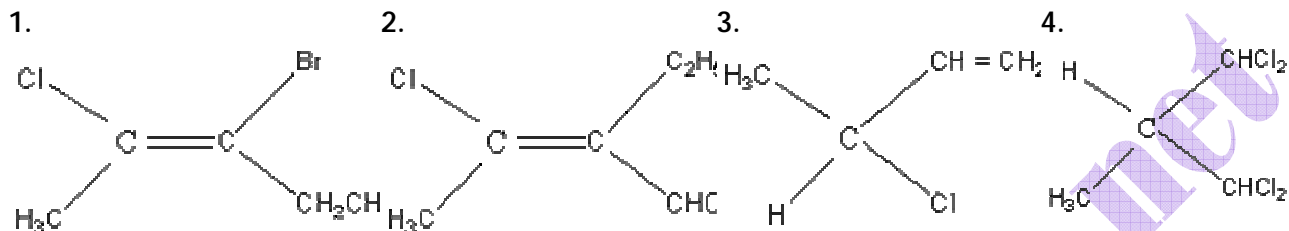
X and Y can respectively be

a) H and H   b) H and C_2H_5 c) C_2H_5 and H   d) CH_3 and CH_3

1. Only b   **2.** Only d   **3.** Only b, d   **4.** Only c

39   The E – isomer from amongst the following is

40

$$CaC_2 \xrightarrow{H_2O} X \xrightarrow{HBr\,excess} Y$$

The organic product 'Y' is

1. Ethylene bromide   **2.** Vinyl bromide   **3.** Ethylidene bromide   **4.** Ethyl bromide

41   Benzene reacts with chlorine in the presence $FeCl_3$ to given 'A' and the presence of UV light to give 'B'. Compounds A and B are respectively

    1. Chlorobenzene and hexachlorobenzene

    2. Benzene hexachloride and chlorobenzene

    3. Chlorobenzene and benzene hexachloride

    4. Hexachlorobenzene and benzene hexachloride

42 $X = NH_3, Y = C_2H_5NH_2$ and $Z = C_6H_5NH_2$. The correct order of basic strengths of the substances is

    1. X < Z < Y   **2.** Y < X < Z   **3.** Z < Y < X   **4.** Z < X < Y

43   The correct order of nucleophilicity among the following is

I) $CH_3 - \overset{\overset{\displaystyle O}{\|}}{C} - O^-$ II) CH_2O^- III) CN^- IV) $CH_3 - C_6H_4 - SO_3^-$
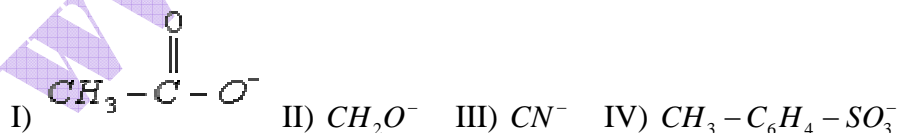
1. I>II>III>IV   **2.** IV>III>II>I   **3.** II>III>I>IV   **4.** III>II>I>IV

44

$$CH_3 - C = CH_2 + H_2O \xrightarrow{H^+} A$$
$$\qquad | $$
$$\qquad CH_3$$
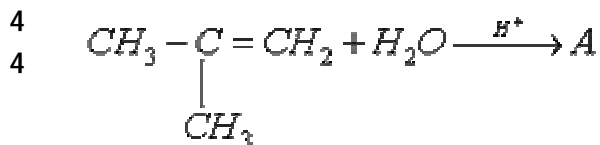
Number of primary hydrogen atoms present in the compound A is

1. 7   **2.** 8   **3.** 9   **4.** 10

45 The compounds 1 – butyne and 2 – butyne can be distinguished by using

1. Bromine water   **2.** Baeyer's reagent   **3.** Tollen's reagent   **4.** Chlorine gas

46 Formation of o – hydroxy benzophenone and p – hydroxyl benzophenone from phenyl benzoate is

1. A substitution reaction   **2.** An elimination reaction

3. A molecular rearrangement   **4.** An aromatization reaction

47 The enolic form of acetone contains

1. 9 sigma bonds, 1 pi bond and 2 lone pairs   **2.** 8 sigma bonds, 2 pi bond and 2 lone pairs

3. 10 sigma bonds, 1 pi bond and 1 lone pairs   **4.** 9 sigma bonds, 2 pi bond and 1 lone pairs

48 Match the following List – I (Compound / mixture) with
List – II (Purification method)

Column I	Column II
A. I_2 with non volatile impurity	**P.** Fraction distillation
B. $C_6H_6 + C_6H_5CH_3$	**Q.** Distillation under reduced pressure
C. H_2O_2	**R.** Steam distillation
D. o – nitrophenol + p – nitrophenol	**S.** Sublimation

1). A--> S B--> P C--> R D--> Q

2). A--> Q B--> P C--> S D--> R

3). A--> S B--> P C--> Q D--> R

4). A--> P B--> Q C--> R D--> S

49   The treatment of CH_3OH with CH_3MgI releases 1.04 ml of a gas as STP. The mass of CH_3OH added is

    1. 1.49mg   **2.** 2.98mg   **3.** 3.71mg   **4.** 4.47mg

50   In the complete combustion of ethane the number of oxygen molecules required is

    1. 2   **2.** 7   **3.** $\dfrac{5}{2}$ **4.** $\dfrac{7}{2}$

51   The hydrolysis of Mg_2C_3 produces

    1. Acetylene   **2.** Propyne   **3.** Butyne   **4.** Ethylene

52   The electrophile in sulphonation of benzene is

    1. SO_3^+ **2.** SO_3 **3.** $SO_3\overset{+}{H}$ **4.** SO_3H

53   0.3g of an organic compound on combustion liberates 0.18 g of water vapour and 0.44 g of carbon dioxide. Assuming that the compound contains only carbon, hydrogen and oxygen, weight percentage of oxygen present in that compound is

    1. 53.33   **2.** 40   **3.** 33.33   **4.** 6.67

54   In the presence of manganese acetate catalyst, when ethane is subjected to exhaustive oxidation, the functional isomer of the product formed is

    1. Ethanoic acid **2.** Methylmethanaoate **3.** Ethylmethylmethanoate **4.** Methylethanoate
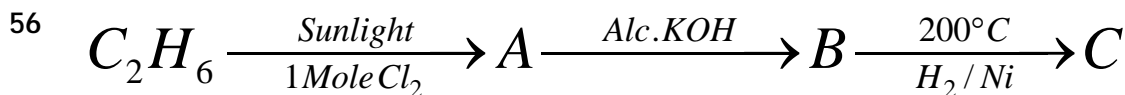
55   The alkene on treating with hot acidified permanganate gives propanoic acid and carbon dioxide is

    1. $CH_3 - CH = CH_2$ **2.** $CH_3CH_2CH = CH_2$ **3.** $CH_3CH = CHCH_3$ **4.** $(CH_3)_2C = CH_2$

56 $C_2H_6 \xrightarrow[1 Mole\, Cl_2]{Sunlight} A \xrightarrow{Alc.KOH} B \xrightarrow[H_2/Ni]{200°C} C$

Here 'C' is

1. C_2H_6 **2.** C_2H_5Cl **3.** C_2H_4 **4.** C_4H_{10}
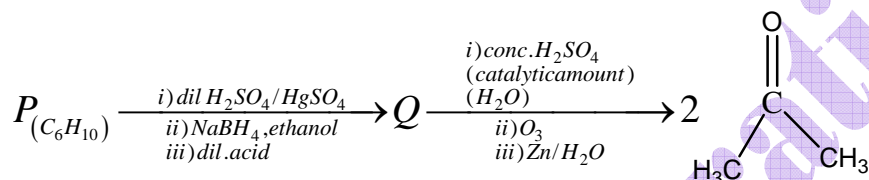
57 The main reaction product when toluene is treated with con HNO_3 in the presence of con H_2SO_4 is

1. 3 – nitrotoluene   **2.** 4 – nitrotoluene   **3.** 2, 4 – dinitrotoluene   **4.** 2,4,6 – trinitrotoluene

58. An organic compound of mass 0.156 g containing nitrogen in Kjeldahl's method liberated ammonia which was absorbed in 60.25 ml of 0.05 M H_2SO_4. The unreacted acid required 16.50 ml of 0.1 M NaOH solution for complete neutralization. Then percentage of nitrogen present in the compound is
1. 20   2. 40   3. 60   4.80

Passage:

$$P_{(C_6H_{10})} \xrightarrow[\substack{ii)NaBH_4,ethanol \\ iii)dil.acid}]{i)dil\,H_2SO_4/HgSO_4} Q \xrightarrow[\substack{ii)O_3 \\ iii)\dot{Z}n/H_2O}]{\substack{i)conc.H_2SO_4 \\ (catalyticamount) \\ (H_2O)}} 2\,\, \underset{H_3C \qquad CH_3}{\overset{O}{\overset{\|}{C}}}$$

An acyclic hydrocarbon P, having molecular formula C_6H_{10}, gave acetone as the only organic product through the following sequence of reactions, in which Q is an intermediate organic compound

59. The structure of compound P is

1. $CH_3CH_2CH_2CH_2 - C \equiv C - H$ 2. $H_3CH_2C - C \equiv C - CH_2CH_3$

3. $\underset{H_3C}{\overset{H_3C}{>}} H - C - C \equiv C - CH_3$

4. $\underset{H_3C}{\overset{H_3C}{>}} H_3C - C - C \equiv C - H$

60. The structure of the compound Q is

1. $\underset{H_3C}{\overset{H_3C \quad OH}{\underset{|}{|}}} H - \overset{|}{C} - \overset{|}{C} - CH_2CH_3$ (with H below second C)

2. $\underset{H_3C \quad H}{\overset{H_3C \quad OH}{\underset{|\quad|}{|\quad|}}} H_3C - \overset{|}{C} - \overset{|}{C} - CH_3$

3. $\underset{H_3C}{\overset{H_3C}{>}} H - \overset{OH}{\underset{}{C}} - CH_2CHCH_3$

4. $CH_3CH_2CH_2\overset{OH}{\underset{|}{CH}}CH_2CH_3$

MATHEMATICS

61

$\lim\limits_{x \to a-}\left(\dfrac{|x|^3}{a} - \left[\dfrac{x}{a}\right]^3\right)(a > 0),$ where $[x]$ denotes the greatest integer less than or equal to x is

1. $a^2 - 3$ 2. $a^2 - 1$ 3. a^2 **4.** None of these

62

If $f^{11}(x)$ is continuous at $x = 0$ and $f^{11}(0) = 4,$ then the value of $\lim\limits_{x \to 0}\dfrac{2f(x) - 3f(2x) + f(4x)}{x^2}$ is

1. 4   2. 8   3. 12   4. None of these

63

If $\displaystyle\int \dfrac{dx}{\sin x \cos x} = \log|f(x)| + C$ then

1. $f(x) = \sin x + \cos x$ 2. $f(x) = \tan x$
3. $f(x) = \sec^2 x$ 4. None of these

64

The equation of the tangent to the curve $y = \displaystyle\int_{x^2}^{x^3} \dfrac{dt}{\sqrt{1+t^2}}$ at $x = 1$ is

1. $\sqrt{2}\,y - 1 = x$ 2. $\sqrt{3}\,x - 1 = y$
3. $\sqrt{3}\,x + 1 = y$ 4. $\sqrt{2}\,y + 1 = x$

65

Solution of the differential equation $2y\,\sin x\,\dfrac{dy}{dx} = 2\sin x \cos x - y^2 \cos x$ satisfying $y(\pi/2) = 1$ is given by

1. $y^2 = \sin x$ 2. $y = \sin^2 x$
3. $y^2 = \cos x + 1$ 4. $y^2 \sin x = 4\cos^2 x$

66 Range of values of 'k' for which $f(x) = |x^2 + (k-1)|x| - k|$ is not differentiable at five points is

1. $(-\infty, 0) - \{-1\}$ 2. $(0, \infty)$
3. $(-\infty, \infty)$ 4. $R - \{0\}$

67 $\lim\limits_{x \to 0}\left[\dfrac{a\sin x}{x}\right] + \left[\dfrac{b\tan x}{x}\right],$ where a, b are integers and [.] denotes integral part, is equal to

1. $a + b$ 2. $a + b - 1$ 3. $a - b$ 4. $a - b - 1$

68 The minimum value of $f(x) = 2^{(\log_8^3)\cos^2 x} + 3^{(\log_8^2)\sin^2 x}$ is

1. $2^{1+\log_8^{\sqrt{3}}}$ 2. $2^{\log_8^{\sqrt{2}}}$ 3. $3^{\log_8^{\sqrt{2}}}$ 4. $2^{1-\log_8^{\sqrt{3}}}$

69 $\displaystyle \operatorname*{Lt}_{x\to a} \frac{x}{x-a} \int_{a}^{x} f(x)dx$ equal to

1. $2f(a)$ 2. $f(a)$ 3. $a\, f(a)$ 4. x

70 If $f(x) = \begin{cases} x-1, & x \geq 1 \\ [a+1]-x^3+1 & x < 1 \end{cases}$ has minimum at $x = 1$ then ([.] denotes greatest integer function)

1. $a \geq -1$ 2. $a \leq -1$ 3. $-1 \leq a \leq 1$ 4. $a \neq 0$

71 The solution of the differential equation $\dfrac{x\,dx + y\,dy}{x\,dy - y\,dx} = \sqrt{\dfrac{a^2 - x^2 - y^2}{x^2 + y^2}}$ is

1. $\sqrt{x^2 + y^2} = a\cos\left\{c + \tan^{-1}\dfrac{y}{x}\right\}$ 2. $\sqrt{x^2 + y^2} = a\sin\left\{c + \tan^{-1}\dfrac{y}{x}\right\}$

3. $\sqrt{x^2 + y^2} = a\sin\left\{c + \tan^{-1}\dfrac{x}{y}\right\}$ 4. $\sqrt{x^2 + y^2} = a\cos\left\{c + \tan^{-1}\dfrac{x}{y}\right\}$

72 If m is the slope of tangent to the curve $e^y = 1 + x^2$ then

1. $|m| > 1$ 2. $m > 1$ 3. $m > -1$ 4. $|m| \leq 1$

73 The least value of 'k' for which the function $x^2 + kx + 1$ is an increasing function in $1 < x < 2$ is

1. -2 2. 2 3. -4 4. 4

74 The value of $\dfrac{1}{\pi} \displaystyle\int_{2\pi}^{0} [\sqrt{2}\sin x]dx$ where [.] denotes greatest integer function is

1. 4 2. 3 3. 2 4. 1

75 Let $f(x) = x + \sin x$ and $g(x)$ be the inverse of $f(x)$. Then area bounded by $g(x)$ and the ordinates $x = 0$, $x = \pi$ is

1. $\dfrac{\pi^2}{2} + 2$ 2. $\pi^2 + 2$ 3. $\dfrac{\pi^2}{2} - 2$ 4. $\pi^2 - 2$

76 The range of the function $x = 0,\ y = \dfrac{x - [x]}{1 - [x] + x}$ is

1. $\left(0, \dfrac{1}{2}\right)$ 2. $\left[0, \dfrac{1}{2}\right]$ 3. $\left[0, \dfrac{1}{2}\right)$ 4. $\left(0, \dfrac{1}{2}\right]$

77. The area enclosed by the curves $y = |x+1|$ and $y = 2 - |x|$ is

1. $\dfrac{3}{2}$ 2. 1   3. $\dfrac{1}{2}$ 4. None of these

78. If a, b, c are three real numbers such that $\underset{x \to 0}{Lt} \dfrac{a \, xe^x - b \, \log(1+x) + c \, xe^{-x}}{x^2 \sin x} = 2$ then the value of $2a + c + b$ is

1. 1   2. 2   3. 3   4. 4

79. If $f(x) = \begin{cases} 1+x, & 0 \le x \le 2 \\ 3-x, & 2 < x \le 3 \end{cases}$ then the number of points of discontinuity of the function (fof) (x) in $[0, 3]$ is

1. 4   2. 2   3. 8   4. -4

80. The number of integral values of 'λ' for which $f(x) = \sin^3 x + \lambda \sin^2 x$ for $-\pi/2 < x < \pi/2$ has exactly one minimum and one maximum

1. 4   2. 8   3. 2   4. -4

81. Value of the definite integral $\displaystyle\int_{-1/2}^{1/2} (\sin^{-1}(3x - 4x^3) - \cos^{-1}(4x^3 - 3x))dx$

1. 0   2. $-\dfrac{\pi}{2}$ 3. $\dfrac{7\pi}{2}$ 4. $\dfrac{\pi}{2}$

82. If the area of the region bounded by $y = \big|[x-3]\big|$, the x-axis and lines $x = -2$, $x = 3$ is 'k' sq. units where [.] denotes greatest integer function then the value of k/3 is

1. 5   2. 10   3. 15   4. 20

83. The value of $2\displaystyle\int_{1/e}^{e^2} \left|\dfrac{\ln x}{x}\right| dx$ is

1. 20   2. 10   3. 5   4. 1

84. $\displaystyle\int \dfrac{\cot^{-1}(e^x)}{e^x} dx$ is equal to :

1. $\dfrac{1}{2}\ln\left(e^{2x}+1\right) - \dfrac{\cot^{-1}\left(e^x\right)}{e^x} + x + c$ 2. $\dfrac{1}{2}\ln\left(e^{2x}+1\right) + \dfrac{\cot^{-1}\left(e^x\right)}{e^x} + x + c$

3. $\frac{1}{2}\ln\left(e^{2x}+1\right)-\frac{\cot^{-1}\left(e^x\right)}{e^x}-x+c$ **4.** $\frac{1}{2}\ln\left(e^{2x}+1\right)+\frac{\cot^{-1}\left(e^x\right)}{e^x}-x+c$

85 The value of the definite integral, $\int\limits_{1}^{\infty}(e^{x+1}+e^{3-x})^{-1}dx$ is

1. $\frac{\pi}{4e^2}$ **2.** $\frac{\pi}{4e}$

3. $\frac{1}{e^2}\left(\frac{\pi}{2}-\tan^{-1}\frac{1}{e}\right)$ **4.** $\frac{\pi}{2e^2}$

86 For the equation $ydx+y^2dy = xdy, x\in R, y>0, y = y(x)$ and $y(1) = 1$. Then $y(-3)$ is given by

1. 4   **2.** 3   **3.** 2   **4.** 1

87 The orthogonal trajectories of the family of semi cubical parabola is given by

1. $x^2+3y^2 = c^2$ **2.** $3x^2+y^2 = c^2$

3. $x + 3y^2 = c^2$ **4.** $3y^2+2x^2 = c^2$

88 The value of $\underset{x\to 1}{Lt}\,\frac{x^{1/3}-x^{1/4}}{x^3-1}$ is _____

1. $\frac{1}{36}$ **2.** $-\frac{1}{36}$ **3.** $-\frac{1}{12}$ **4.** $\frac{1}{12}$

89 If $f(x) = e^{g(x)}$ and $g(x)=\int\limits_{2}^{x}\frac{t\;dt}{1+t^4}$ then $f^1(2)$ has the value equal to :

1. 2/17   **2.** 0

3. 1   **4.** cannot be determined

90 $\int e^{\tan\theta}(\sec\theta - \sin\theta)d\theta$ equals :

1. $-e^{\tan\theta}\sin\theta+c$ **2.** $e^{\tan\theta}\sin\theta+c$

3. $e^{\tan\theta}\sec\theta+c$ **4.** $e^{\tan\theta}\cos\theta+c$

KEY SHEET

PHYSICS :-

1) 2	2) 4	3) 2	4) 4	5) 2	6) 2	7) 3	8) 1	9) 2	10) 2
11) 2	12) 2	13) 2	14) 3	15) 4	16) 2	17) 1	18) 1	19) 2	20) 1
21) 2	22) 2	23) 3	24) 4	25) 1	26) 3	27) 1	28) 1	29) 1	30) 1

CHEMISTRY :-

31) 4	32) 2	33) 4	34) 3	35) 3	36) 2	37) 4	38) 3	39) 2	40) 3
41) 3	42) 4	43) 3	44) 3	45) 3	46) 3	47) 1	48) 3	49) 1	50) 4
51) 2	52) 2	53) 1	54) 2	55) 2	56) 1	57) 4	58) 2	59) 4	60) 2

MATHEMATICS :-

61) 3	62) 3	63) 2	64) 4	65) 1	66) 1	67) 2	68) 1	69) 3	70) 1
71) 2	72) 4	73) 1	74) 4	75) 3	76) 3	77) 1	78) 3	79) 2	80) 3
81) 2	82) 1	83) 3	84) 3	85) 1	86) 2	87) 4	88) 1	89) 1	90) 4

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