IIT JEE -07 (Paper -II) Solution (for all codes)

PHYSICS

Q. is A student performs an experiment .....

Ans.(B) $Y = \dfrac{Fl}{Ax}$ $\quad [\ x \to extension\ ]$

$$= \frac{4Fl}{\pi d^2 x} = 2\times10^{11}\, N/m^2$$

$$\frac{\Delta Y}{Y} = \frac{2\Delta d}{d} + \frac{\Delta x}{x} = \frac{2\times0.01}{0.4} + \frac{0.05}{0.8}$$

$$= \frac{0.2}{4} + \frac{0.5}{8} = 0.05 + 0.06 = 0.11 = 0.1$$

$$\therefore\ \ \Delta y = y\times0.1 = 0.2\times10^{11}$$

Q. is In the experiment to detemine the speed of sound ...

Ans.(A)

Q. is a small object of uniform density rolls up a curved....

Ans.(D) $mg\left(\dfrac{3v^2}{4g}\right) = \dfrac{1}{2}mv^2 + \dfrac{1}{2}I\left(\dfrac{v^2}{R^2}\right) \Rightarrow I = \dfrac{1}{2}mR^2$

Q. is a particle moves in the X-Y plane under the .....

Ans.(D) $\vec{F} = \dfrac{d\vec{p}}{dt} = -Ak\sin kt\hat{i} + Ak\cos kt\hat{j}$

$$\vec{F}\ \vec{p} = -A^2k\sin kt\cosh t + A^2k\cos kt\cosh t = 0$$

$$\therefore\ \ \vec{F} \perp \vec{p}$$

Q. is a spherical portion has been removed from a .....

Ans.(B)

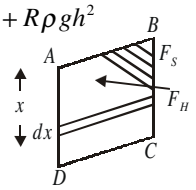
Q. is Water is filled up to a height h in a beaker of .....

Ans.(B) Hydrostatic Force

$$F_H = \int_0^h (P_0 + pgx)2Rdx = 2RP_0h + R\rho gh^2$$

Surface tension force

$F_S = 2RT$



$$\therefore\ \ F = \left|2RP_0h + R\rho gh^2 - 2RT\right|$$

Q. is A magnetic field $\vec{B} = B_0\hat{j}$ exists in the region .....

Ans.(A)

Q. is Positive and negative point charges of equal magnitude are kept at $\left(0,0,\dfrac{a}{2}\right)$.....

Ans.(C) Both the charges are equidistant from the two given points
Potential at both points = 0

Q. is Electrons with de-Broglie wavelength λ fall on .....

Ans.(A) $p = \dfrac{h}{\lambda}$

$$KE = \frac{hc}{\lambda_0} \Rightarrow \frac{p^2}{2m} = \frac{hc}{\lambda_0} \Rightarrow \lambda_0 = \frac{2hcm}{p^2} = \frac{2mc\lambda^2}{h}$$

STATEMENT

Q. is a cloth covers a table. Some dishes are kept on it....

Ans.(D)

Ans. is If there is no external torque o a body about its .....

Ans.(D)

Q. is The total translational kinetic energy of all the.....

Ans.(B)

Q. is a vertical iron rod has a coil of wire wound over it.....

Ans.(C)

PASSAGE

Q. is light travels as a

Ans.(A)

Q. is the phase of the light wave at c,d,e and f are .....

Ans.(C)

Q. is speed of light is

Ans.(B)

Q. is the speed of sound of the whistle is

Ans.(B)

Q. is the distribution of the sound intensity of the .....

Ans.(A)

Q. is The spread of frequency as observed by the.....

Ans.(A) $f_1' = 800\left[\dfrac{310}{320}\right] = 775\,Hz$,

$$f_2' = 1120\left[\frac{310}{320}\right] = 1085\,Hz$$

$$\Delta f' = 085 - 775 = 310\,Hz$$

Q. is Two wires each carrying a steady current I are .....

Ans. $A \to q,r;\ B \to p;\ C \to q,r;\ D \to q$

Q. is Column-I describes some situations in which a ....

Ans. $A \to p;\ B \to q,r;\ C \to p;\ D \to q,r$

Q. is Column-I gives some devices and Column-II gives ....

Ans. $A \to s;\ B \to q;\ C \to p;\ D \to r$

CHEMISTRY

Q. is **Consider a reaction** $aG+bH \rightarrow$ .....

Ans.(D) $r_1 = K[G]^a[H]^b$

$= K[2G]^a[2H]^b$

$r_2 = 2^a 2^b K[G]^a[H]^b$ .... (1)

$\frac{8r_2}{r_1} = 8 = 2^{(a+b)} \rightarrow 2^3 = 2^{(a+b)}\ a+b=3$

$\frac{r_2}{r_1} = 2^1 = 2^a K \Rightarrow a = 1$

Q is **For the process** $H_2O(l)$ .....

Ans.(D) $\Delta G = (-)ive; \Delta s = (+)ive.$

Q. is **A positron is emitted from** $^{23}_{11}Na$ .....

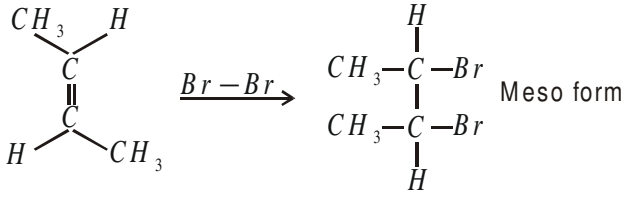
Ans.(C) $^{23}_{11}Na - \text{Positron} \rightarrow ^{23}_{10}Na$

Q. is **The least stable resonance strcuture is ....**

Ans.(A) Because two positive charge present on two adjacent atoms

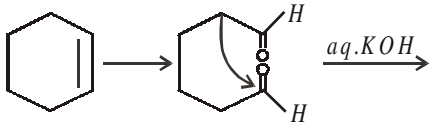
Q. is **The number of stereoisomers .....**

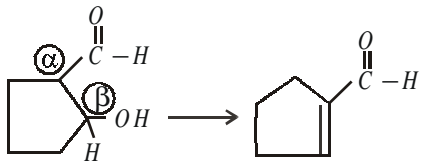
Ans.(D)



Q. is **Cyclohexene on ozonolysis .....**

Ans.(A)

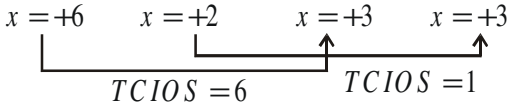




Q. is **Consider the titration of potassium.....**

$Cr_2O_7^{2-} + Fe^{2+} \longrightarrow Cr^{3+} + Fe^{3+}$

Ans.(D)



$\frac{\text{Moles of Mohr's salt}}{\text{Moles of } Cr_2O_7^{2-}} = \frac{J-\text{factor of } Cr_2O_7^{2-}}{J-\text{factor of } Fe^{2+}}$

$\frac{x}{1} = \frac{6}{1} \Rightarrow x = 6$

Q.is **Alkali metals dissolve...**

Ans **(b)** Metalion $+KI \rightarrow$ Red ppt

Dissolves in excess KI to give colourless sol.

Metalion + Cobalt (II) thiocyanate $\rightarrow$ Deep blue crystalline ppt.

$HgCl_2 + 2KI \rightarrow HgI_2 \xrightarrow{Excess\ KI} K_2HGI_4$

Red ppt. Colourless Sol.

$HgCl_2 + CO(SCN)_3 \rightarrow Hg(SCN)_2$

Deep blue crystalline ppt.

ASSERTION -REASON TYPE

Q. is **Glucose gives a reddish-brown .....**

Ans.(C) Glucose contain aldehyde functional group

Q.is **Alkali metals dissolve in liquid .....**

Ans.(B) $Na + NH_3 \underset{liq}{\rightarrow} [Na(NH_3)_n]^+ + Ne^{\ominus}$ soluated $e^{\ominus}$

Q.is **Molecules that are not superimposable**

Ans.(C)

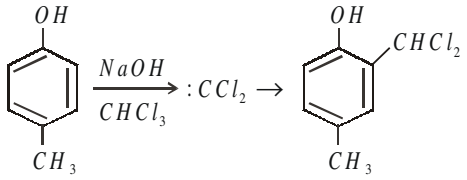
Q.is **Band gap in germanium is small**

Ans.()

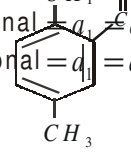
PASSAGE :1

Q. is **Which one of the following reagents....**

Ans.(c)



- Monoclinic $= a_1 \neq a_2 \neq a_3 \mid \alpha = \gamma = 90° \neq \beta$
- Tetragonal $= a_1 = a_2 \neq a_3 \mid \alpha = \beta = \gamma = 90°$
- Hexagonal $= a_1 = a_2 \neq a_3$



Q. is **The electrophile in this reaction is .....**

Ans.(C) $:CCl_2$ Dichloro carbene is intermediate.

Q.is **The structure of the intermediate I is .....**

Ans.is(b)

PASSAGE :2
Redox reaction play a

Ans..(C)Because Reduction potential of Cl_2 is greater than

Ans..(D)Because Reduction potential I_2 of Mn^{3+} is greater than O_2.

Ans. (A)

Q. is **Match the crystal system .....**

Ans.
A - p,s
B - p,q
C - q
D - q,r

Q. is **Match the compounds/ion in Column in .....**

Ans. A - p,s B - q,r
C - r,s D - q,r

Q. is **Match the reaction in Column in .....**

Ans. A - p,s B - r
C - q,p D - p

MATHEMATICS

Q. is **Let $\vec{a},\vec{b},\vec{c}$ be unit vectors.....**

Ans. $\bar{a}+\bar{b}+\bar{c}=0\Rightarrow \bar{a},\bar{b},\bar{c}$ form a triangle

Then, double the area of ΔABC equals

$\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}\neq 0$
(not necessarily zero) **Ans. (B)**

Q. is $\frac{d^2x}{dy^2}$ **equals .....**

Ans. $\frac{d^2x}{dy^2}=$

$$\frac{dx}{dy}=\frac{1}{\left(\frac{dy}{dx}\right)}$$ then differentiating w.r.t. y

$$\frac{d^2x}{dy^2}=\frac{-1}{\left(\frac{dy}{dx}\right)^2}\times\frac{d}{dy}\left(\frac{dy}{dx}\right)$$

$$=-\left(\frac{dy}{dx}\right)^{-2}\times\frac{d\left(\frac{dy}{dx}\right)}{dx}\times\frac{dx}{dy}$$

$$=-\left(\frac{dy}{dx}\right)^{-3}\times\left(\frac{d^2y}{dx^2}\right)$$ **Ans. (D)**

Q. is **If $|z|=1$ and $z\neq\pm1$, then all the values ...**

Ans. $|Z|=1\Rightarrow Z=\cos\theta+i\sin\theta$

$$\frac{Z}{1-Z^2}=\frac{\cos\theta+i\sin\theta}{1-(\cos\theta+i\sin\theta)^2}=\frac{\cos\theta+i\sin\theta}{1-\cos2\theta-i\sin2\theta}$$

$$=\frac{\cos\theta+i\sin\theta}{2\sin\theta(\sin\theta-i\cos\theta)}\times\frac{\sin\theta+i\cos\theta}{\sin\theta+i\cos\theta}$$

$$=\frac{i}{2\sin\theta}\qquad\therefore\qquad$$ **Ans (D)**

Q. is **Let $O(0,0),P(3,4),Q(6,0)$ .....**

Ans. Centroid of a triangle divides in parts of elqual area.

$$\therefore\qquad R=\left(\frac{0+3+6}{3},\frac{0+4+0}{3}\right)=\left(3,\frac{4}{3}\right)$$

Ans. (C)

Q. is **Let E^c denote the complement of an event E.**

Ans.(C) $$P\left(\frac{E^c\cap F^c}{G}\right)=\frac{P(E^C\cap F^C\cap G)}{P(G)}$$

$$=\frac{P(G)-P(E\cap G)-P(F\cap G)}{P(G)}$$

$$=\frac{P(G)-P(E)P(G)-P(F)P(G)}{P(G)}$$

$$=1-P(F)-P(F)$$

$$=P(E^C)-P(F)$$

Q. is **The differential elquation** $\frac{dy}{dx}=\frac{\sqrt{1-y^2}}{y}$

Ans.(C) $$\int\frac{ydy}{\sqrt{1-y^2}}=\int dx$$

$$\Rightarrow\ -\sqrt{1-y^2}=x+c$$

$$\Rightarrow\ x^2+y^2+2x+(c^2-1)=0$$

Centre $\Rightarrow$ $(-C,0)$, radus = 1

Q.is **Let $f(x)=\frac{x}{(1+x^n)^{1/n}}$ for $n\geq 2$**

Ans. fof $(x)=\dfrac{x}{(1+2\times n)^{1/n}}$

$\Rightarrow\ g(x)=\dfrac{x}{(1+n\times n)^{1/n}}$

$\Rightarrow\ \int x^{n-2}g(x)\ dx$

$=\int\dfrac{x^{n-1}}{(1+nx^n)^{1/n}}\ dx$

Put $1+nx^n=t\Rightarrow n^2x^{n-1}\ dx=dt$

$=\dfrac{1}{n^2}\int\dfrac{dt}{t^{1/n}}=\dfrac{1}{n(n-1)}t^{1-1/n}+C$

$=\dfrac{1}{n(n-1)}(1+n\times n)^{1-\frac{1}{n}}+C$

Q. is **The letters of the word COCHIN are**

Ans.(C) Words starting with $CC=4!=24$

Words starting with $CH=4!=24$

Words starting with $CI=4!=24$

Words starting with $CN=4!=24$

Now $COCHIN$ is the first word after series of words starting with (CN)

Q. is **Let ABCD be q quadrilateral.....**

Ans.(B)

ASSERTION REASON TYPE

Q.is **Lines** $L_1: y-x=0$ and $L_2: 2x+y=0$

Ans. Statement 2 is definitely false **Ans. (C)**

Q. is **The curve** $y=\dfrac{-x^2}{2}+x+1$ **is symmetric**

Ans.(A) $y=\dfrac{-x^2}{2}+x+1\Rightarrow 2y=-x^2+2x+2$

$\Rightarrow\ 2y-3=-(x^2-2x+1)$

$2y-3=-(x-1)^2$ is symmetric about its axis i.e. x

Q. is **Consider the planes** $3x-6y-2z=15$ **...**

Ans. Planes $3x-6y-2z=15$

$2x+y-2z=5$

Given line $\dfrac{x-3}{14}=\dfrac{y-1}{2}=\dfrac{z-0}{15}=t$

But (3,1,0) does not satisfy given planes
D.R. of common line

$$\frac{a}{\begin{vmatrix}-6 & -2\\ 1 & -2\end{vmatrix}}=\frac{b}{\begin{vmatrix}-2 & 3\\ -2 & 2\end{vmatrix}}=\frac{c}{\begin{vmatrix}3 & -6\\ 2 & 1\end{vmatrix}}$$

$\Rightarrow\ \dfrac{a}{14}=\dfrac{b}{2}=\dfrac{c}{15}$

Statement 2 is true but statement 1 is false
Ans. (D)

Q. is **Let** $f(x)=2+\cos x$ **for all real** x**.**

Ans.(B)

PASSAGE

Q. is **The line** $y=x$ **meets** $y=ke^x$ **for** $k\le 0$ **at**

Ans. (B) **one point**

$y=x,\ y=Ke^x$

Let $f(x)=Ke^x-x;\ f'(x)=Ke^x-1$

for $K\le 0,\ f'(x)<0$

$f(0)=K-o\ \ <0$

So, $f(x)$ will cut x-axis only one time.

Q. is **The positive value of** k **for which** $ke^x-x=0$ **has two distinct roots is**

Ans. (A) $\dfrac{1}{e}$

Q. is **For** $k>0$**, the set of all values of** k **for which** $ke^x-x=0$ **has two distinct roots is**

Ans. (A) $\left(0,\dfrac{1}{e}\right)$

PASSAGE

Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respetively, of two distinct positive numbers. For n > 2, let A_{n-1} and H_{n-1} have arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

Q. is . Which one of the following statement is correct?

(A) $G_1 > G_2 > G_3 > \ldots\ldots$

(B) $G_1 < G_2 < G_3 < \ldots\ldots$

(C) $G_1 = G_2 = G_3 = \ldots\ldots$

(D) $G_1 < G_3 < G_5 < \ldots\ldots$ and $G_2 > G_4 > G_6 > \ldots\ldots$

Sol. (C)

Q. Which one of the following statement is correct?

(A) $A_1 > A_2 > A_3 > ....$

(B) $A_1 < A_2 < A_3 < ....$

(C) $A_1 > A_3 > A_5 > ....$ and $A_2 < A_4 < A_6 < ....$

(D) $A_1 < A_3 < A_5 < ....$ and $A_2 > A_4 > A_6 > ....$

Sol. (A)

$A_1 > A_2$

Q. Which one of the following statement is correct?

(A) $H_1 > H_2 > H_3 > ....$

(B) $H_1 < H_2 < H_3 < ....$

(C) $H_1 > H_3 > H_5 > ....$ and $H_2 < H_4 < H_6 < ....$

(D) $H_1 < H_3 < H_5 < ....$ and $H_2 > H_4 > H_6 > ....$

Sol. (B)

Since $A_1 > A_2 > A_3$

$\therefore H_1 < H_2 < H_3$.

MATCH THE COLUMN

Q. **(A) If $a=1$ and $b=0$, then (x, y)**

Ans. (p) liest on the circle $x^2 + y^2 = 1$

(B) If $a=1$ and $b=1$, then (x, y)

Ans. (q) liest on $\left(x^2-1\right)\left(y^2-1\right)=0$

(C) If $a=1$ and $b=2$, then (x, y)

Ans. (p) liest on the circle $x^2 + y^2 = 1$

(D) If $a=2$ and $b=2$, then (x, y)

Ans. (p) liest on $\left(4x^2-1\right)\left(y^2-1\right)=0$

Q. **(A) Two intersecting circles**
Ans. (q,r) have a common normal, do not have a common tangent
(B) Two mutually external circles
Ans. (p,q) have a common tangent & normal
(C) Two circles, one strictly inside
Ans. (q,r) have a common normal, do not have a common tangent
(D) Two branches of a hyperbola
Ans. (p,q) have a common tangent & normal

Q. **Let $f(x)=\dfrac{x^2-6x+5}{x^2-5x+6}$**

(A) If $-1<x<1$, then $f(x)$ satisfies

Ans. (r,p,s) $f(x)>0\ ,\ 0<f(x)<1$

(B) If $1<x<2$, then $f(x)$ satisfies

Ans. (q,s) $f(x)<0\ ,\ f(x)>0$

(C) If $3<x<5$, then $f(x)$ satisfies

Ans. (q,s) $f(x)<0\ ,\ f(x)>0$

(D) If $x>5$, then $f(x)$ satisfies

Ans. (r,p,s) $f(x)>0\ ,\ 0<f(x)<1$