ONLINE TEST PAPER
JEE MAIN - 2016

DATE : 10-04-2016

ANSWER KEY WITH SOLUTION

MATHEMATICS

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

PHYSICS

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

CHEMISTRY

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

1. **C**

$$xy + \int_1^x y(t)\,dt = (x+1)\,xy + \int_1^x y(t)\,dt$$

$$x^2y = \int_1^x (1-t)\,y(t)dt$$

$$2xy + x^2\frac{dy}{dx} = (1-x)y$$

$$\int\frac{dy}{dx} = \int\frac{(1-3x)}{x^2}dx$$

$$x^2\frac{dy}{dx} = y(1-x-2x)$$

$$\log y = -\frac{1}{x} - 3\log x + \log C$$

$$\log y + \log x^3 = \log C = -\frac{1}{x}$$

$$\log\left(\frac{yx^3}{C}\right) = -\frac{1}{x}$$

$$\frac{yx^3}{C} = e^{-\frac{1}{x}}$$

$$y = \frac{Ce^{-\frac{1}{x}}}{x^3}$$

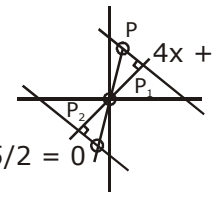
2. **A**

Coplanar

$$\begin{vmatrix} 2 & 0 & 4 \\ 1 & 2 & \lambda^2 \\ 1 & \lambda^2 & 2 \end{vmatrix} = 0$$

$2(4-\lambda^4) + 4(\lambda^2-2) = 0$
$4 - \lambda^2 + 2\lambda^2 - 4 = 0$
$\lambda = 0, \lambda = \pm\lambda^4 - 2\lambda^2 = 0$

3. **A**

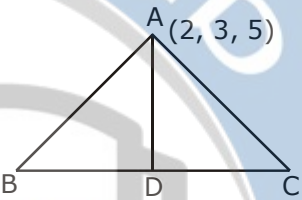


$4x + 3y - 10 = 0$

$4x + 3y + 5/2 = 0$

$$\frac{OA}{OB} = \frac{P_1}{P_2} = \frac{\frac{|-10|}{5}}{\frac{\left|\frac{5}{2}\right|}{2}} = \frac{4}{1}$$

4. **A**



$-1, 3, 2 \quad \left(\frac{\lambda-1}{2}, 4, \frac{4+2}{2}\right) \quad (\lambda, 5, 4)$

$\lambda - 5 = 2, \mu = 10$
$\lambda = 7, \mu = 10$

$$\overrightarrow{AD} = \left(\frac{\lambda-1}{2} - 2\right)\hat{i} + (4-3)\hat{j} + \left(\frac{\mu+2}{2} - 5\right)\hat{k}$$

$$\overrightarrow{AD} = \left(\frac{\lambda-5}{2}\right)\hat{i} + \hat{j} + \left(\frac{\mu-8}{2}\right)\hat{k}$$

5. **D**

$$2y\frac{dy}{dx} + y^2\sec x = \tan x$$

$y^2 = v$

$$2y\frac{dy}{dx} = \frac{dv}{dx}$$

$$\frac{dv}{dx} + v\sec x = \tan x$$

$$\text{I.F.} = e^{\int \sec x dx}$$

$\text{I.F.} = (\sec + \tan x)$

$$y^2 = 1 - \frac{x}{\sec x + \tan x}$$

6. **A**

$$\frac{\Sigma x_i}{5} = 5 \quad \Rightarrow \quad \bar{Z}x_i = 5$$

$$\frac{\Sigma x_i^2}{5} - \left(\frac{\Sigma x_i}{5}\right)^2 = 12.4$$

$$\frac{\Sigma x_i^2}{5} = 12.4 + 25$$

$$= \frac{|5-1| + 5-2| + |5-6| + |5-5| + |5-11|}{5}$$

$$= 4 + 3 + 1 + 6 = \frac{14}{5} = 2.8$$

7. **D**

$A - \lambda I = 0$
$A^{2014}.(A^2 - 2A - I)$

8. **A**

$$\sum_{r=1}^{10}(r^2+r)\underline{|r}-r\underline{|r}$$

$$\sum_{r=1}^{10} r\underline{|r+1}-(r-1)\underline{|r}$$

$$1\underline{|2}-0+2\underline{|3}-\underline{|2}+\ldots\ldots+10\underline{|11}-9\underline{|10}$$

$$=10\underline{|11}$$

9. **C**

$\frac{\vec{a}+\vec{b}+\vec{c}}{4}$ $\frac{\vec{a}+\vec{b}+\vec{c}}{3}$ $\vec{r}$

$$\frac{\vec{a}+\vec{b}+\vec{c}}{3}=\frac{\vec{r}+2(\vec{a}+\vec{b}+c/a)}{3}$$

$$\vec{r}=+\frac{(\vec{a}+\vec{b}+\vec{c})}{2}$$

10. **D**

$${}^6c_5\left(\frac{2}{3}\right)^5\left(\frac{1}{3}\right)+{}^6c_5\left(\frac{2}{3}\right)^6$$

$$\frac{6\times 2^5+2^6}{729}=\frac{256}{729}$$

11. **D**

$f(x)=\sin^4x+\cos^4x$

$$\frac{\pi}{2}\le 4x\le\frac{3\pi}{2}$$

$$\frac{\pi}{8}\le x\le\frac{3\pi}{2}$$

$f(x)=1-2\sin^2x\cos^2x$

$$f(x)=1-\frac{1}{2}(\sin^2 2x)$$

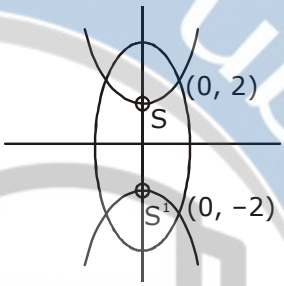
$$f^1(x)=0-\frac{1}{2}\times 2\sin 2x\cos 2x-2$$

$$=-\sin 4x$$

$\lambda\le 4x\le 2\lambda$

$$\frac{\pi}{4}\le x\le\frac{\pi}{2}$$

12. **A**



Eqⁿ to hyperbola

$$\frac{-x^2}{5}+\frac{y^2}{4}=1$$

$$a^2=4\left(\frac{9}{4}-1\right)$$

$$a^2=5$$

13. **C**

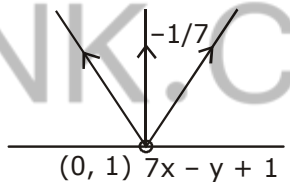
14. **C**

$$\lim_{x\to 0}\frac{(1-1+2\sin^2 x)^2}{x(2\tan x-\tan 2x)}$$

$$\lim_{x\to 0}4\frac{\sin^3 x}{x^3}\cdot\frac{x^3}{\left(2x+\frac{2x^3}{3}-2x-\frac{x^3}{3}\right)}$$

$$\frac{4}{\frac{2}{3}-\frac{8}{3}}=\frac{4}{-\frac{6}{3}}=-2$$

15. **D**



$$\frac{m+1/7}{1-\frac{m}{7}}=\frac{-\frac{1}{7}+2}{1+(-2)(-7)}$$

$$\frac{7m+1}{7-m}=\frac{13/7}{9/7}\qquad\lambda(\hat{a}+\hat{b})$$

Equation ot incident ray

$$y-1=\frac{41}{38}(x-0)$$

$38y-38=41x$

$\Rightarrow \quad 41x-38y+38=0$

$63m+9=91-13m$

$76m=82$

$m=41/38$

16. **D**

$a_1 + 2d + a_1 + 6d + a_1 + 10d + a_1 + 14d = 72$

$4(a_1 + 8d) = 72$

$a_1 + 8d = 18$

$S_{17} = \frac{17}{2}(2a_1 + 16d)$

$S_{17} = 17 \times 18 = 306.$

17. **A**

$A - 5I + 7A^{-1} = 0$

$7A^{-1} = 5I - A$

$A^3 - 2A^2 - 3A + I$

$A^3 - 5A^2 + 7A$

$3A^2 - 10A + I$

$3A^2 - 15A + 2I$

$+ 5A - 20I$

$5(A - 4I)$

18. **A**

$\frac{2}{a} = 9 \qquad a = \pm\sqrt{2}$

$a = \frac{26^2 - 46}{2\sqrt{2}}$

$\sqrt{2}\,a = b^2 - 2b$

$a = \sqrt{2}$

$b^2 - 26 - 2 = 0$

$b = \frac{2 \pm \sqrt{4 - 4}(1)(-2)}{2}$

$b = 1 \pm \sqrt{3}$

19. **A**

$\int \frac{dx}{(1+\sqrt{x})\sqrt{x}} \sqrt{1-x}$

$\int \frac{dx}{(1+\sqrt{x})} \sqrt{1-x} \sqrt{1+x}$

$\int \frac{dx}{(1+\sqrt{x})^2\sqrt{x}} \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}$

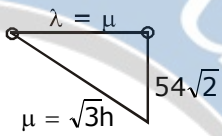
$\frac{1-\sqrt{x}}{1+\sqrt{x}} = +2$

$-2\int \frac{tdt}{t}$

$-2t + C$

$-2\sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}$

20. **D**



$3h^2 - h^2 = 954)^2 \times 2$

$2h^2 = (54)^2 \times 2$

$h = 54$

21. **B**

$\sqrt{2x+1} = 1 + \sqrt{2x-1}$

$2x + 1 = 1 + 2x - 1 + 2\sqrt{2x-1}$

$1 = 4(2x - 1)$

$1 = 8x - 4$

$x = 5/8$

$\sqrt{4 \times \frac{25}{64}} - 1$

$\sqrt{\frac{9}{16}} = \frac{3}{4}$

22. **A**

$I = \int_4^{10} \frac{[(14-x)^2]dx}{[x^2]+[14-x]^2}$

$2I = \int_4^{10} dx$

$2I = 6$

$I = 3$

23. **D**

$z^3 = l - i\,a^3 - 3a^2 + 3ai$

$z^3 = (1 - 3a^2) + i(3a - a^3)$

pure real no

$3a - a^3 = 0$

$z = 1 + i\sqrt{3} \qquad a = \sqrt{3}$

$z = 2(\cos\pi/3 + i\sin\pi/3)$

$S = \frac{1(1-z^{12})}{1-z}$

$S = \frac{1-2^{12}}{1-1-i\sqrt{3}} = \frac{4095}{3} \times \frac{\sqrt{3}}{i}$

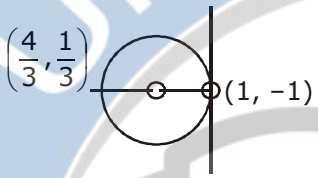
24. **A**

$x - y = 1$

$2x + y = 3$

$3x = 4$

$x = 4/3$



$\frac{4}{3} - 1 = y$

$y = \frac{1}{3}$

Eqⁿ to tangent

$y + 1 = \frac{-1}{\frac{-1-1/3}{1-4/3}} (x - 1)$

$y + 1 = \frac{-1}{\frac{-4/3}{-1/3}} = (x - 1)$

$4y + 4 = -x + 1$

$x + 4y + 3 = 0$

25. **B**

$\text{Sin}\,\theta = (\sqrt{2} + 1)\cos\theta$

$\tan\theta = \sqrt{2} + 1$

$(\sqrt{2} - 1)\sin\theta = \cos\theta$

$\tan\theta = \sqrt{2} - 1$

26. **B**

(1) Coeff. of x^{-2}

$18\left(\frac{1}{3}\right) - r\left(\frac{1}{3} + \frac{1}{3}\right) = -2$

$6 - \frac{2r}{3} = -2$

$8 = \frac{2r}{3} \quad \Rightarrow \quad r = 12$

(2) Coeff. of x^{-4}

$18\left(\frac{1}{3}\right) - r\left(\frac{1}{3} + \frac{1}{3}\right) = -4$

$6 - \frac{2r}{3} = -4 \qquad r = 15$

$n = {}^{18}C_{15}\left(\frac{1}{2}\right)^{15}$

$\frac{m}{n} = \frac{{}^{18}C_{12}}{{}^{18}C_{15}} \frac{(1/2)^{12}}{(1/2)^{15}} = 182$

27. **C**

$\frac{\frac{\lfloor n+2}{\lfloor n-4 \rfloor 6}}{\frac{\lfloor n-2}{\lfloor n-4}} = 11$

$(n + 2)(n + 1)(n)(n - 1) = 11.6.5.4.3.2.1$

$(n + 2)(n + 1)(n)(n - 1) = 11.10.9.8$

$n = 9$

28. **D**

for min A = B

$A = B = \pi/12$

$\tan A + \tan A = 2\tan \pi/12$

$2\tan\frac{\pi}{12} = 2\frac{\left(\tan\frac{\pi}{3} - \tan\frac{\pi}{4}\right)}{1 + \tan\frac{\pi}{3}\tan\frac{\pi}{4}}$

$2\left(\frac{\sqrt{3}-1}{1+\sqrt{3}}\right) = 2\frac{(\sqrt{3}-1)^2}{2} = 4 - 2\sqrt{3}$

29. **D**

$t_1 = t - \frac{2}{t}$

$t_1^2 = t^2 + \frac{4}{t^2} + 4$

$Am \geq 4m$

$\frac{t^2 + \frac{4}{t^2}}{2} \geq \sqrt{t^2 \times \frac{4}{t^2}}$

$t^2 + \frac{4}{t^2} \geq 4.$

30. **B**

$\frac{dy}{dx} = \frac{1}{2\sqrt{4x-3}} = \frac{2}{3}$

$4x - 3 = 9$

$4x = 12$

$x = 3$

$y = 1 + 3 = 4$

P(3, 4)

Eqⁿ ot Normal

$y - 4 = -\frac{3}{2}(x - 3)$

$2y - 8 = -3x + 9$

$3x + 2y - 17 = 0$

Normal passes through Pt (1, 7).

PHYSICS

1. **Wrong question**

2. **1**

$Q_{remain} = 5 \times 336 \times 10^3$
$= 1680 \times 10^3$ J

$B = \frac{Q_{remain}}{w} = \frac{T_2}{T_1 - T_2}$

$= \frac{1680 \times 10^3}{w} = \frac{273}{27}$

$w = 1680 \times 10^2$
$= 1.68 \times 10^5$

3. **1**

frequency received directly from toy $= n\left(\frac{v}{v-5}\right)$

frequency received after reflection from wall

$= n\left(\frac{v}{v-5}\right)$

between $= n\frac{v}{v-5} = n\left(\frac{v}{v-5}\right) = 5$

$= n\frac{340}{335} - n\frac{335}{340} = 5$

$n = 170$

4. **4**

$K_1 = \frac{hc}{\lambda} - \phi$ ....(1)

$K_2 = \frac{2hc}{\lambda} - \phi$ ....(2)

$K_2 = 3K_1$

$\frac{2hc}{\lambda} - \phi = \frac{3hc}{\lambda} - 3\phi$

$2\phi = \frac{hc}{\lambda}$

$f = \frac{hc}{2\lambda}$

5. **A**

$2\pi n = \sqrt{\frac{g}{a}}$

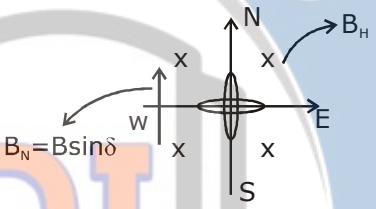
$n = \frac{1}{2\sqrt{a}} = \frac{1}{2\sqrt{7}} = 0.18$

$n = 0.19$

6. **2**

At least three reading are required

7. **4**



$B_N = B\sin\delta$

$B_H = B \sin \delta$

$= 5 \times 10^{-5} \times \sqrt{1 - \sin^2 \delta}$

$= 5 \times 10^{-5} \times \sqrt{1 - \frac{4}{9}}$

$= 5 \times 10^{-5} \times \frac{\sqrt{5}}{3}$

$= \frac{5\sqrt{5}}{3} \times 10^{-5}$ T

$\therefore$ P.D across wings = B × v × l

$= \frac{10}{3} \times 10^{-5} \times 240 \times 15$

$= 12000 = 120$ mV

with left side at high voltage

P.D between top & bottom

$= B_H \times v \times l$

$= \frac{5\sqrt{10}}{3} \times 10^{-5} \times 240 \times 5$

$= 4472 \times 10^{-5} = 45$ mv

8. **3**

Energy $= 13.6\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ ev

$= 13.6\left(1 - \frac{1}{4}\right)$

$= 13.6\left(\frac{3}{4}\right)$

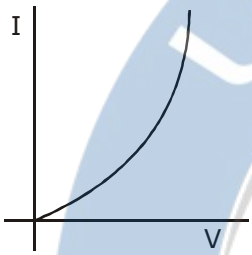
$= 3.4 \times 3$
$= 10.2$ eV

9. **3**

$y = (a + b) . c$
For y to be 1
(a + b) should be 1
& c should be 1

10. **4**

The V-I graph of i/p characterstic is



This means that increasing the voltage decreases the resistance almost to zero. This means that increases 1/r to ∞
Hence. correct graph is

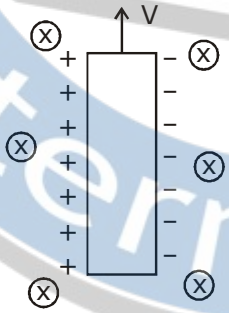
11. **3**

Redistribution will stop when
qvB = qE
E = vB

$$E = \frac{\delta}{2\varepsilon_0} + \frac{\delta}{2\varepsilon_0} = \frac{\delta}{\varepsilon_0}$$

$$vB + \frac{\delta}{\varepsilon_0}$$

$6 = \varepsilon_0 vB$
$\therefore \delta_1 = + \varepsilon_0 vB$
$\delta_2 = -\varepsilon_0 vB$



12. $B = \frac{FV}{A\Delta V}$

$$F = \frac{BA\Delta V}{V}$$

$$F = \frac{B(2\pi\Delta b)\pi(a+\Delta G)^2 - a^2)b}{\pi a^2 b}$$

$$F = \frac{2\pi abB(a^2 + \Delta a^2 + 2a\Delta a - a^2)}{a^2}$$

$$= \frac{2\pi abB.2a\Delta a}{a^2}$$

$F = (4\pi bB\Delta a)$
$F_{req.} = \mu R$
$= \mu F$
$= (4\pi bB\Delta a)\ \mu$
$= (4\pi\ \mu bB)\ \Delta G$

13. **1**

$$\left(\frac{2}{2400 + Rg}\right) = G \times 40 \quad ....(1)$$

$$\frac{2}{4900 + Rg} = G \times 20 \quad ....(2)$$

$$\frac{4900 + Rg}{2400 + Rg} = \frac{40}{20} = 2$$

$4900 + Rg = 4800 + 2Rg$
$100 = Rg$
from eqn. (1)

$$\frac{2}{2500} = G \times 40$$

$$G = \frac{2}{2500 \times 40} = \frac{1}{50 \times 10}$$

$G = 0.02 \times 10^{-3}$
$G = 2 \times 10^{-5} = 20$ uA/div
$\therefore$ ful scape deflection current is
$\Rightarrow 20\ \mu A/div \times 50$
$= 1000\ \mu AP$
$= 1mA$
Hence, 2 is incorrect

$$\frac{2}{9800 + 100} = 2 \times 10^{-5} \times \theta$$

$$\theta = \frac{2 \times 10}{9900 \times 2} = \frac{100 \times 1000}{9900} = 10.1$$

Hence, correct option is only 1 is correct

14. **2**

Image due to reflection

$$\frac{Uf}{U - f} = \frac{-4 \times 0.5}{-4 + 5} = \frac{20}{1}$$

V = 20 cm
Image due to refraction

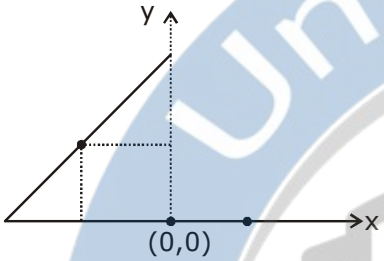
$$d_{app} = \frac{d_{Real} \times n_R}{n_I}$$

$$= \frac{300}{1.5} \times 1 = 20\ cm$$

15. **2**

The ratio of r_0 to r_i is very high for transistors almost in the range of 100 to 1000

16. **4**



x co-ordinal of AB = $-x/4$

X co-ordinal of BC = $\frac{l}{2}-\frac{x}{2}=\frac{l-x}{2}$

Centre of mass should below A 80

$x_{cm} = 0$

let lines mass density ρ

so $m_{AB} = \rho x$

$$x_m = \frac{\rho x\left(-\frac{x}{4}\right)+\rho l\left(\frac{l-x}{2}\right)}{\rho x+\rho t} = 0$$

$$\frac{-x^2}{4}+\frac{l^2-lx}{2}=0$$

$2l^2 - 2xl - x^2 = 0$

$$2\left(\frac{l}{x}\right)^2 - 2\frac{l}{x} - 1 = 0$$

$2n^2 - 2n - 1 = 0$

$$n = \frac{2\pm\sqrt{4-4(2)(-1)}}{2\times 2} = \frac{2\pm\sqrt{12}}{4}$$

$$= \frac{2+3.5}{4} = \frac{3.5}{5} = 1.37$$

17. **4**

Amplitude modulated O/P is given by

$$C(m) = V_C \cos(W_e t) + \frac{mv_c}{2}\cos(w_c + w_\omega)t$$

$$+ \frac{mv_c}{2}\cos(w_C - W_\omega)t$$

comparing with the given equation

$$\frac{mv_c}{2} = 10$$

$$m = \frac{10\times 2}{30} = \frac{2}{3}$$

$w_c = 300\,\pi$

$2\pi f_c = 300\,\pi$

$f_c = 150$ Hz

$w_c + w_\omega = 400\,\pi$

$w_\omega = 400\,\pi - 300\,\pi = 100\,\pi$

$2\pi fm = 100\,\pi$

$fm = 50$ Hz

18. **1**

19. **1,2**

Dimensionally $B \propto \frac{1}{D}$

& AD = C

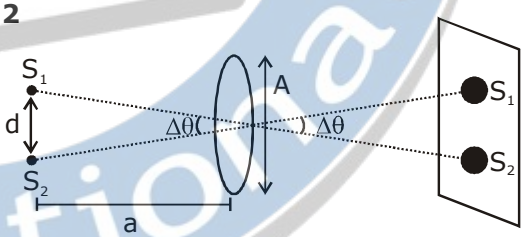
(i) $\frac{A}{D}-\frac{C}{D} \Rightarrow \frac{A}{D}-\frac{AD}{D} \Rightarrow \frac{A}{D}$ – A (meaningful)

(ii) $\frac{C}{BD}-\frac{AD^2}{C} \Rightarrow \frac{C}{BD}-\frac{AD^2}{AD} \Rightarrow \frac{C}{BD}$ – D (meaningful)

(iii) $A^2 - (BC)^2 \Rightarrow \left(\frac{C}{D}\right)^2 - \left(\frac{C}{D}\right)^2$ (meaningful)

(iv) $\frac{A}{B} - C \Rightarrow \frac{C}{BD}$ – C (meaningful)

20. **2**



$d = a\Delta\theta$ ....(1)

$A\sin\Delta\theta = 1.22\lambda$ ....(2)

$A\,\Delta\theta \simeq 1.22\,\lambda$

$$\Delta\theta = \frac{1.22\lambda}{A} = \frac{1.22\times 600\times 10^{-9}}{30\times 10^{-2}}$$

$= 24.4 \times 10^{-7} = 2.44 \times 10^{-6}$

$\therefore d = 10 \times 9.46 \times 10^{15} \times 2.44 \times 10^{-6}$

$= 23.08 \times 10^{10}$

2.308×10^{11} m

$\simeq 10^8$ km

21. **4**

In case of EM wave, the direction of oscillation of electric field and magnetic field is perpendicular to the direction of propagation.

$\therefore$ Options A and B are incorrect.

Also $\vec{E}\times\vec{B}$ gives the direction of propogation

$$(\hat{j}-\hat{k})\times(\hat{j}+\hat{k}) = \hat{i}+\hat{i} = 2\hat{i}$$

$$(\hat{j}+\hat{k})\times(\hat{j}\times\hat{k}) = \hat{i}-i = 0$$

Hence correct option is 4

22. **4**

$\frac{v^2}{r} = n^2 Rt^2$

$v = nRt$

$\frac{dv}{dt} = nR$

$F_t = mnR$

$P = FV$

$= (MnR)\, nRt = mn^2R^2\, t$

23. **4**

$v = \sqrt{rg}$

$rw = \sqrt{rg}$

$w = \sqrt{\frac{g}{r}}$

$2\pi n = \sqrt{\frac{g}{r}}$

24. **Wrong question**

25. **2**

Induced current $\Rightarrow \frac{A}{R}\frac{dB}{dt} = \frac{\pi r^2}{r}\frac{d}{dE}$

$\Rightarrow \frac{\pi r^2 B_0 e^{-t/T}}{R} \times \frac{1}{T} \Rightarrow \frac{\pi r^2 B_0}{TR}\, e^{-t/T}$

$\therefore$ Heat generated $= \int_0^\infty I^2 R dt$

$= \int_0^\infty \left(\frac{\pi r^2 B_0}{TR}\right)^2 e^{-2t/T} \times R dt$

$= \frac{\pi^2 r^4 B_0^2 \left[e^{-\frac{2t}{T}}\right]_0^\infty}{2TR} = \frac{2\pi^2 r^4 B_0^2}{2TR}\, [-e^{-\infty} + e^{-0}]$

$= \frac{\pi^2 r^4 B_0^2}{2TR}$

26. **3**

The given situation tells that $\frac{\Delta v}{\Delta r}$ is constant which means that electric field inside the sphere is constant. This is possible only when ρ is function of $\frac{1}{r}$

27. **1**

$a = -\frac{dv}{dt} = \frac{-50}{10} = -5 m/s^2$

$F = ma = 10 \times 5 = 50$ Newton

distance travelled in two seconds is

$s = Ut - \frac{1}{2} at^2$

$s = 50 \times 2 - \frac{1}{2} \times 5 \times 4^2$

$= 100 - 10 = 90 \quad \therefore w = F.d$

$= Ma.d = 10 \times 5 \times 90 = -4500$ J

28. **3**

$\rho = \frac{\delta RT}{M_w}$

$\rho \propto f$

29. **4**

$C_{eq.} = \frac{\left(\frac{8}{9} + \frac{8}{3}\right) \times C}{\left(\frac{8}{9} + \frac{8}{3}\right) + C} = 1$

$\frac{32C}{32 + 9C} = 1$

$32\, C = 32 + 9C$

$23\, C = 32$

$C = \frac{32}{23}$

30. **4**

$F = \frac{R}{t^2} v$

$\frac{mdv}{dt} = \frac{R}{t^2} v$

$m \frac{dv}{v} = \frac{R}{f^2} dt$

$m \ln v = -\frac{R}{t}$

$\ln v \propto \frac{1}{f}$

CHEMISTRY

1. **(3)**

2. **(3)**
Rate constant does not depned on concentration of reactans

3. **(1)**

4. **(1)**
Rhumann's purple is a confirmatory test of protein. Its also know as ninhydrin test

5. **(4)**

6. **(4)**

7. **(2)**

MX_2 eq. $\longrightarrow M^{+2}_{aq} + 2x^{-}_{aq}$

$n = \frac{3}{1} = 3$

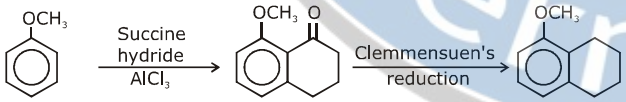
$2 = 1 + (n - 1)\alpha$
$2 = 1 + (3 - 1)\alpha \Rightarrow y = 1/2 = 0.5$ Ans.

8. **(4)**

9. **(1)**

10. **(3)**

11. **(4)**



12. **(4)**

13. **(1)**

14. **(3)**

15. **(4)**
lone pair of nitrogen at ninth position's involved in resonance i.e. not available for donation

16. **(3)**

$XY_{(s)} \longrightarrow \underset{(a)}{x}(5 \text{ bar}) + \underset{q}{y}(5 \text{ bar})$

$k_p = 25$ Ans

17. **(4)**

18. **(4)**

Work $= -P_{ekt}(V_2 - V_1)$

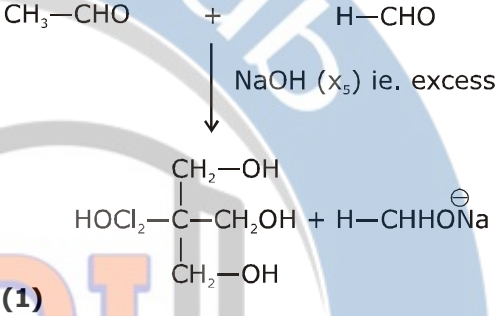
$= -P_{ext.}\left(V_{o_2}\right)$

$= -1 \text{ bar}\left(\frac{no_2RT}{1bar}\right)$

$= -50 \times 8.3 \times 300$

$= -124.5$ **Ans.**

19. **(1)**



20. **(1)**

21. **(3)**

22. **(4)**

23. **(3)**
$LiH + B_2H_6$
$2\,Li[BH_4]$

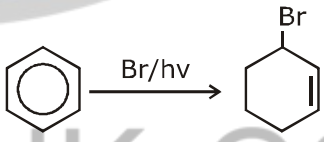
24. **(4)**

$N_2 \longrightarrow 2N$
Taken

$4_{rms} = 4 = \sqrt{\frac{3RT}{28}}$

$4_{rms}\,(New) = \sqrt{\frac{3R(2T_1)\times 2}{14\times 2}} = 2$ Cl

25. **(4)**



it is a free radical
r × 4

26. **(4)**

$H_2A + OH^{(-)} \longrightarrow$
0.1N 0.04

$\frac{0.1\times v}{1000} = 0.04$

V = 400 ml

27. **(2)**

28. **(1)**

29. **(3)**
$(CH_2)_2(CO_2H_2)$
$^{(-)}OOC—CH_2—CH_2 = 100^{(-)}$
↓
$CH_2 = CH_2\,(g)$
$+ 2\,CO_2(q) + 2e^{(-)}$
0.3 mol × 22.4
= 6.72 lit.

30. **(3)**