

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										

## MATHEMATICS

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

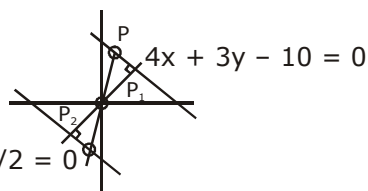
$$\begin{vmatrix} 2 & 0 & 4 \\ 1 & 2 & \lambda^2 \\ 1 & \lambda^2 & 2 \end{vmatrix} = 0$$

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

$$4 - \lambda^2 + 2\lambda^2 - 4 = 0$$

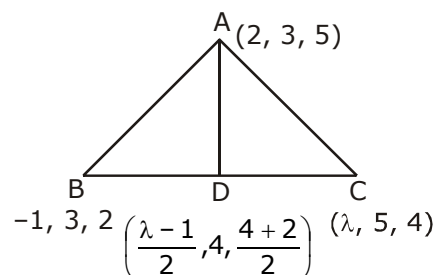
$$\lambda = 0, \lambda = \pm\lambda^4 - 2\lambda^2 = 0$$

3. A



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

4. A



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

$$\lambda = 7, \mu = 10$$

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

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

5. D

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

$$y^2 = v$$

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

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

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

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

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

6. A

$$\frac{\sum x_i}{5} = 5 \Rightarrow \bar{x} = 5$$

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

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

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

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

7. D

$$A - \lambda I = 0$$

$$A^{2014} \cdot (A^2 - 2A - I)$$

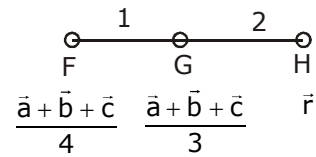
8. A

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

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

$$1|2 - 0 + 2|3 - |2 + \dots + 10|11 - 9|10 \\ = 10|11$$

9. C



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

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

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

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

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

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

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

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

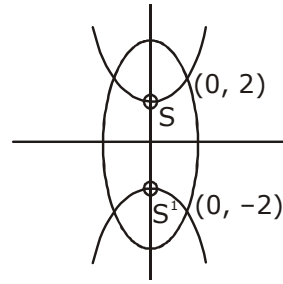
$$f'(x) = 0 - \frac{1}{2} \times 2\sin 2x \cos 2x - 2$$

$$= -\sin 4x$$

$$\lambda \leq 4x \leq 2\lambda$$

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

12. A



Eq<sup>n</sup> 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

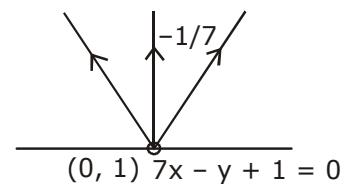
14. C

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

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

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

15. D



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

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

Equation of incident ray

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

$$38y - 38 = 41x$$

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

$$63m + 9 = 91 - 13m$$

$$76m = 82$$

$$m = 41/38$$

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

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

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

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

$$a = \sqrt{2}$$

$$b^2 - 2b - 2 = 0$$

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

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

19. A

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

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

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

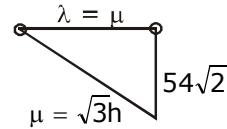
$$\frac{1-\sqrt{x}}{1+\sqrt{x}} = +2$$

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

$$-2t + C$$

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

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

$$z^3 = 1 - i a^3 - 3a^2 + 3ai$$

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

pure real no

$$3a - a^3 = 0$$

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

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

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

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

24. A

$$\begin{aligned}x - y &= 1 \\2x + y &= 3 \\3x &= 4 \\x &= 4/3\end{aligned}$$

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

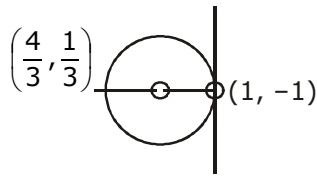
$$y = \frac{1}{3}$$

Eq<sup>n</sup> to tangent

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

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

$$\begin{aligned}4y + 4 &= -x + 1 \\x + 4y + 3 &= 0\end{aligned}$$



25. B

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

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

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

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

26. B

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

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

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

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

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

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

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

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

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

27. C

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

$$\begin{aligned}(n+2)(n+1)(n)(n-1) &= 11.6.5.4.3.2.1 \\(n+2)(n+1)(n)(n-1) &= 11.10.9.8 \\n &= 9\end{aligned}$$

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

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

$$4x - 3 = 9$$

$$4x = 12$$

$$x = 3$$

$$y = 1 + 3 = 4$$

$$P(3, 4)$$

Eq<sup>n</sup> of 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**

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

$$= 1680 \times 10^3 \text{ J}$$

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

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

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

$$= 1.68 \times 10^5$$

**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**

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

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

$$K_2 = 3K_1$$

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

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

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

**5. A**

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

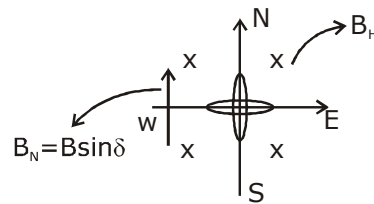
$$n = \frac{1}{2\sqrt{a}} = \frac{1}{2\sqrt{7}} = 0.18$$

$$n = 0.19$$

**6. 2**

At least three reading are required

**7. 4**



$$B_H = B \sin \delta$$

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

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

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

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

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

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

$$= 12000 = 120 \text{ mV}$$

with left side at high voltage

P.D between top & bottom

$$= B_H \times v \times l$$

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

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

**8. 3**

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

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

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

$$= 3.4 \times 3$$

$$= 10.2 \text{ eV}$$

**9. 3**

$$y = (a + b) \cdot c$$

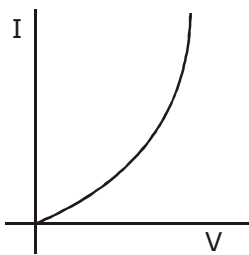
For y to be 1

(a + b) should be 1

& c should be 1

10. 4

The V-I graph of i/p characteristic is



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

11. 3

Redistribution will stop when

$$qvB = qE$$

$$E = vB$$

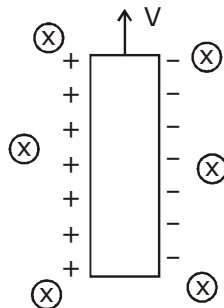
$$E = \frac{\delta}{2\epsilon_0} + \frac{\delta}{2\epsilon_0} = \frac{\delta}{\epsilon_0}$$

$$vB + \frac{\delta}{\epsilon_0}$$

$$6 = \epsilon_0 vB$$

$$\therefore \delta_1 = + \epsilon_0 vB$$

$$\delta_2 = -\epsilon_0 vB$$



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

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

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

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

$$4900 + Rg = 4800 + 2Rg$$

$$100 = Rg$$

from eqn. (1)

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

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

$$G = 0.02 \times 10^{-3}$$

$$G = 2 \times 10^{-5} = 20 \mu A/div$$

$\therefore$  full scale deflection current is

$$\Rightarrow 20 \mu A/div \times 50$$

$$= 1000 \mu A$$

$$= 1mA$$

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

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

$$V = 20 \text{ cm}$$

Image due to refraction

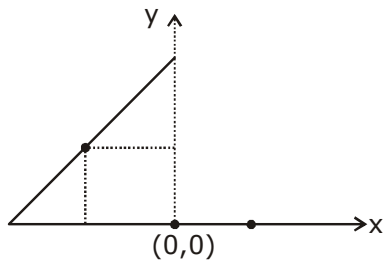
$$d_{app} = \frac{d_{Real} \times n_R}{n_I}$$

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

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 =  $-x/4$

$$X \text{ co-ordinal of BC} = \frac{1}{2} - \frac{x}{2} = \frac{1-x}{2}$$

Centre of mass should below A 80

$$x_{cm} = 0$$

let lines mass density  $\rho$

$$\text{so } m_{AB} = \rho x$$

$$x_m = \frac{\rho x \left(-\frac{x}{4}\right) + \rho l \left(\frac{1-x}{2}\right)}{\rho x + \rho l} = 0$$

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

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

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

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

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

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

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

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

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

$$w_c = 300 \pi$$

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

$$f_c = 150 \text{ Hz}$$

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

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

$$2\pi f_m = 100 \pi$$

$$f_m = 50 \text{ Hz}$$

18. 1

19. 1,2

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

&  $AD = C$

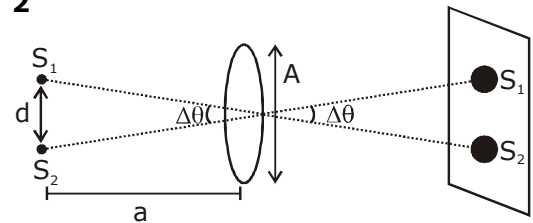
$$(i) \frac{A}{D} - \frac{C}{D} \Rightarrow \frac{A}{D} - \frac{AD}{D} \Rightarrow \frac{A}{D} - A \text{ (meaningful)}$$

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

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

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

20. 2



$$d = a\Delta\theta \quad \dots(1)$$

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

$$A \Delta\theta \approx 1.22 \lambda$$

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

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

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

$$= 23.08 \times 10^{10}$$

$$2.308 \times 10^{11} \text{ m}$$

$$\approx 10^8 \text{ km}$$

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 propagation

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

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

Hence correct option is 4



22. 4

$$\frac{v^2}{r} = n^2 R t^2$$

$$v = nRt$$

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

$$F_t = mnR$$

$$P = Fv$$

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

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

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

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

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

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

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

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

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

$\rho$  is function of  $\frac{1}{r}$

27. 1

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

$$F = ma = 10 \times 5 = 50 \text{ Newton}$$

distance travelled in two seconds is

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

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

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

$$= Ma \cdot d = 10 \times 5 \times 90 = -4500 \text{ J}$$

28. 3

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

$$\rho \propto f$$

29. 4

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

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

$$32C = 32 + 9C$$

$$23C = 32$$

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

30. 4

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

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

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

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

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

## CHEMISTRY

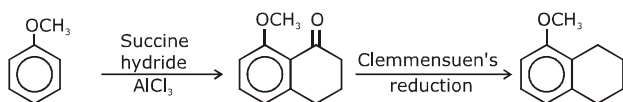
1. (3)  
 2. (3)  
 Rate constant does not depend on concentration of reactants  
 3. (1)  
 4. (1)  
 Rhumann's purple is a confirmatory test of protein. It is also known as ninhydrin test  
 5. (4)  
 6. (4)  
 7. (2)  

$$MX_2 \text{ eq.} \longrightarrow M_{\text{aq}}^{+2} + 2X_{\text{aq}}^{-}$$

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

$$2 = 1 + (n - 1)\alpha$$

$$2 = 1 + (3 - 1)\alpha \Rightarrow \alpha = 1/2 = 0.5 \text{ Ans.}$$
 8. (4)  
 9. (1)  
 10. (3)  
 11. (4)



12. (4)  
 13. (1)  
 14. (3)  
 15. (4)  
 lone pair of nitrogen at ninth position is involved in resonance i.e. not available for donation  
 16. (3)  

$$XY_{(s)} \longrightarrow X_{(a)} + Y_{(q)}$$

$$k_p = 25 \text{ Ans}$$
 17. (4)  
 18. (4)  

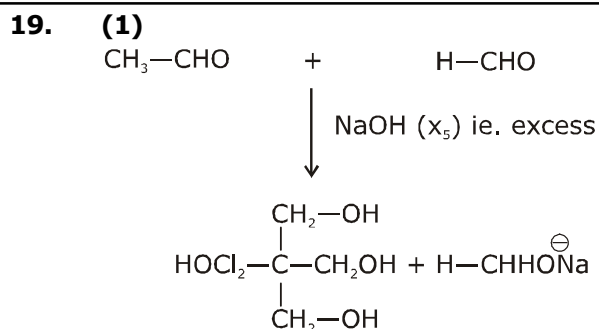
$$\text{Work} = -P_{\text{ekt}} (V_2 - V_1)$$

$$= -P_{\text{ext.}} (V_{O_2})$$

$$= -1 \text{ bar} \left( \frac{nO_2 RT}{1 \text{ bar}} \right)$$

$$= -50 \times 8.3 \times 300$$

$$= -124.5 \text{ Ans.}$$



20. (1)  
 21. (3)  
 22. (4)  
 23. (3)  

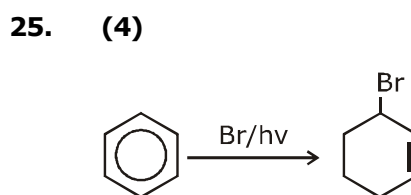
$$LiH + B_2H_6$$

$$2 Li[BH_4]$$
 24. (4)  

$$N_2 \longrightarrow 2N$$
 Taken  

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

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



- it is a free radical  
 $r \times 4$   
 26. (4)  

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

$$0.1N \quad 0.04$$

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

$$V = 400 \text{ ml}$$
 27. (2)  
 28. (1)  
 29. (3)  

$$(CH_2)_2 (CO_2H)_2$$

$$^{(-)}OOC-CH_2-CH_2 = 100^{(-)}$$

$$\downarrow$$

$$CH_2 = CH_2 (g)$$

$$+ 2 CO_2 (g) + 2e^{(-)}$$

$$0.3 \text{ mol} \times 22.4$$

$$= 6.72 \text{ lit.}$$
 30. (3)