UNIVERSAL ACADEMY

Icon of Success and Excellence

MOCK CET – 1

PHYSICS, CHEMISTRY, MATHEMATICS & BIOLOGY

ANSWER KEYS

ANSWERS												
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
3	1	1	1	4	2	3	1	2	1	4	4	3
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2	2	2	2	4	1	2	2	2	4	3	1	2
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**					
2	4	2	1	4	3	4	3					

HINTS & SOLUTIONS

1. R$\propto \frac{l}{d^2}$ $R_1 \propto \frac{l_1}{d_1^2}$

   $R_2 \propto \frac{2l_1}{(2d_1)^2}\frac{l_1}{d_1^2}$

   $\therefore\ R_2 \propto \frac{R_1}{2}$

2. $R = \frac{V}{I}$ from graph $R \propto \frac{1}{slope} \propto t$

   $\therefore t_1 > t_2 > t_3$

3. Since (α) is same for semiconductors, balancing length (l) is same.

4. Self explanatory

5. $R = \frac{\rho l}{A} = 5\Omega$. Since volume remains constant there is a change in either lengthy or area.

   After stretching, change in length $= 200\%$

   $\therefore\ l^1 = 3l, A^1 = \frac{A}{3}$

   New resistance after stretching

   $R_1 = \frac{\rho \times 3l}{A/3}; R_1 = \left(\frac{\rho l}{A}\right) \times 9\,; R_1 = 5 \times 9 = 45\Omega$

6. $I = 0.2A,\ A = 10^{-6}m^2, n = 8.4 \times 10^{28}m^{-3}$

   $e = 1.6 \times 10^{-19}C, V_d = ?$

   $V_d = \frac{I}{nAe} = \frac{0.2}{8.4 \times 10^{28} \times 10^{-6} \times 1.6 \times 10^{-19}}$

   $\therefore\ V_d = 1.5 \times 10^{-5}ms^{-1}$

7. $X_L = 2\pi fL$

   $= 2\pi \times 50 \times 20 \times 10^{-3}$

   $= 6.28 \times 10^6 ohm$

   $X_C = \frac{1}{2\pi fC} = \frac{1}{2 \times \pi \times 50 \times 500 \times 10^{-6}}$

   $X_C = 6.37$ohm

   $I_L = \frac{V}{X_L}\ and\ I_C = \frac{V}{X_C}$

$I_C > I_L$ Bulb B_1 glows more brightly

8. To have large selectively, quality factor should be more

$Q = \frac{\omega_0 L}{R}$ L should be more and R should be less.

10. $.G_A = 0.1\ ohm, I = 5A, V = 100V, R = ?$

$R = \frac{V}{I} - G_A = \frac{100}{5} - 0.1$

$= 20 - 0.1 = 19.9$ ohm in series.

11. Magnetic field due to conductor is towards west. To neutralize the field external field must be towards east.

12. $F = BqV\sin\theta$

a) If charge is at rest $V = 0\ \therefore F = 0$

b) If charge is moving in the direction of magnetic field θ = 0. $\therefore \sin(0) = 0\ and\ hence\ F = 0$

13. For hydrogen atom $E_2 = -\frac{13.6}{4} = -3.4\ eV$

$E_2 = -\frac{13.6}{4} = -0.85eV$

$h\gamma = 0.85 + 3.4 = 2.55eV$

$h\gamma = W + K.E$

$\therefore K.E = h\gamma - W = 2.55 = 1.9 = 0.65eV$

14. As aperture decreases intensity of light decreases

$I \propto D^2$

$I^1 \propto \frac{D^2}{4}\ \therefore\ I^1 \propto \frac{I}{4}$

15. S.P = K.E

$\left(\frac{hC}{\lambda}\right)\frac{1}{e} = W + (SP)\ \ \therefore W = 3.10 - 1.5 = 1.6eV$

All the given answers are wrong.

16. $R \propto \frac{1}{\sqrt{V}}\ \frac{R_1}{R_2} = \frac{\sqrt{V_2}}{\sqrt{V_1}} = \frac{4}{1}\ \ \therefore R_2 = \frac{R_1}{4} = \frac{R}{4}$

17. Power factor of an A.C circuit having resistance ® and inductance (L) connected in series is given by:

$cos\emptyset = \frac{R}{(R^2+\omega^2L^2)^{1/2}}$

18. Impedance $Z = (10^2 + 10^2)^{1/2} = 10\sqrt{2}$

Peak emf= $\sqrt{2} \times 220\ .Hence\ peak\ current$

$= \frac{220\sqrt{2}}{10} \times 2 = 22\ A$

19. $\frac{1}{f} = (n_1 - n_2)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ Here $R_2 = \infty$, n_1 = 1.5, n_2 = 1, f = 16 cm. Hence R_1 = 8 cm

20. Knowledge based

21. For $n = 3$, two elliptical orbits for $n_\emptyset = 1, 2$ and one circular orbit for $n_\emptyset = 3$

22. $r \propto n^2, F \propto \frac{1}{r^2}\ \therefore F \propto \frac{1}{n^2}$

Force is inversely proportional to square of principal quantum number.

23. $E \propto \frac{1}{n^2}\ \ \therefore E_1 : E_2 = 1 : 4$

(Note: As negativity decrease energy increases)

24. Cathode rays travel with a very high speed, that is 10% of c (velocity of light in vacuum)

25. $R = R_0(Al)^{1/3}$

$= 1.2(27)^{\frac{1}{3}} = 1.2 \times 3 = 3.6$ Fermi.

26. If initial activity is (A)

$$A \xrightarrow{6days} \left(\frac{A}{2}\right) \xrightarrow{6days} \frac{(A)}{4} \xrightarrow{6days} \left(\frac{A}{8}\right) \xrightarrow{6days} \left(\frac{A}{16}\right)$$

In first 12 days activity is reduced to A/4

In next 12 days activity is reduced to A/16

27. Frequencies greater than incident light are called Antistrokes ($\gamma > \gamma_0$)

Frequencies lesser than incident light are called Strokes ($\gamma < \gamma_0$)

28. Thickness and intensity proportional.

29. Self explanatory

30. Self explanatory

31. From Newton's II law

$$a_1 = \frac{F}{m_1}\ ;\ a_2 = \frac{F}{m_2}$$

For total mass $a = \frac{F}{m_1+m_2}\ \therefore \frac{1}{a} = \frac{m_1+m_2}{F}$

32. Horizontal component of velocity (u_x) does not change. Vertical component u_y changes along its trajectory due to gravity.

33. $T = \frac{2u\sin\theta}{10}\ \ u = \frac{100m}{s};\ \theta = 30^0 = \sin 30 = \frac{1}{2}\ ; g = 10ms^{-2}$

$T = \frac{2\times100\times1/2}{10} = 10$Second

35. Application of Beronoulli's theorem.

Air between two suspended balls is less but outside is more

36. Due to capillary action oil rises in the wick of a lamp

37. $y = 0.5\ \sin 2\pi\left(\frac{.01x}{2} - \frac{3t}{2}\right) \rightarrow (1)$

$y = 0.5\sin 2\pi(kx - \omega t) \rightarrow (2)$

Comparing equation (1) and equation (2)

$$k = \frac{0.01}{2} = \frac{1}{200}\omega = \frac{3}{2} = 1.5$$

$$v = \frac{\omega}{k} = \frac{1.5}{1} = 300ms^{-1}$$

38. $f_1 f_2 = Beats$

Number of beats/second = $\frac{34}{10} = 3.4$ Hz

Number of beats/second = $f_1 - f_2$

$$= \frac{\upsilon}{\lambda_1} - \frac{\upsilon}{\lambda_2}$$

$$3.4 = \upsilon\left(\frac{1}{1} - \frac{1}{1.01}\right)$$

$$3.4 = \upsilon\left(\frac{0.01}{1\times1.01}\right)$$

$\therefore$ v = 343 Hz

39. For open pipe For closed pipe

$$n_0 = \frac{\upsilon}{2l} \rightarrow (1) \qquad n_c = \frac{\upsilon}{4l}; n_c = \frac{1}{2}\left(\frac{\upsilon}{2l}\right) \rightarrow (2)$$

Comparing (1) and (2) $\quad \therefore\ n_c = \frac{n_0}{2}$

43. L.S. decreases with R.I.

Reason: As n ↓ r ↑ and hence d = (iur). ↓ So L.S. decreases

44. Total internal reflection phenomena takes place when light travels from denser medium to rarer medium. Hence it is possible for A to C only.

45. When two lenses are separated by a distance – x

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$$ $f_1 = f_2 = 0.5m$; $x = 0.5m$

$$\frac{1}{F} = \frac{2}{f} - \frac{x}{f^2}$$

$$\frac{1}{F} = \frac{2}{0.5} - \frac{0.5}{0.25}$$

$$\therefore\ \frac{1}{F} = 4 - 2 = 2. \frac{1}{F} = 2 \ \therefore F = \frac{1}{2} = 0.5m$$

46. $$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$$

$$\sqrt{2} = \frac{\sin\left(\frac{60+D}{2}\right)}{\sin 30} \qquad \therefore \sin 30 = \frac{1}{2}$$

$$\frac{1}{2} \times \sqrt{2} = \sin\left(\frac{60+D}{2}\right)$$

$$\frac{1}{\sqrt{2}} = \sin\left(\frac{60+D}{2}\right)$$

$$\sin\sqrt{-1}\left(\frac{1}{\sqrt{2}}\right) = \frac{60+D}{2}$$

$$45 = \frac{60+D}{2} \qquad \therefore D = 30^{O}$$

$$i = \left(\frac{A+D}{2}\right) = \left(\frac{60+30}{2}\right) = 45^o$$

48. When a transparent plate is introduced, number of fringes displaced (n – 1)t

$20 \propto (1.5 - 1)\ t$ …….. (1)

$N \propto (1.6 - 1)\ t/2$ …….. (2)

$$\frac{20}{N} = \frac{0.5 \times t}{0.6 \times \frac{t}{2}}$$

$$\frac{20}{N} = \frac{1}{0.6} \qquad \therefore N = 12 \text{ fringes}$$

49. According to Einstein's photoelectric equation,

$$E = \left(\frac{hc}{\lambda} - \omega\right)$$

$= \left[\frac{6.62\times10^{-34}\times3\times10^{8}}{4000\times10^{-10}}\right]J$

$= 2.965eV = 3eV$

50. d sin $\theta = n\lambda$

$$\sin\theta = \frac{n\lambda}{d} = \frac{3\times5\times10^{-7}}{1\times10^{-4}} = 15\times10^{-3}$$

$$\sin\theta = \theta = 15mm = 15\times10^{-3}$$

$$\tan\theta = \theta = \frac{x}{D} \qquad \therefore x = D\theta = 1\times15\times10^{-3} = 15mm$$

52. Using the formula r = $90-\theta_p$

$d = -\theta p - r = 22^o$ …….. (1)

$\theta p + r = 90^o$ …….. (2)

Angle of polarization for glass is about 56^{O}.

Simplify Eq. (1) and Eq. (2); r = 34^{O}

54. Photoelectric effect is the experimental proof for quantum nature of light

55. For dipole electric intensity E ∝ $\frac{1}{r^3}$ or E ∝ r^3

$\therefore n = -3$

56. $E = \frac{V}{R}$ or V = ER

$$E = \frac{\sigma}{60} \qquad \therefore \qquad V = \frac{\sigma}{\varepsilon_0}R$$

60. $C_{eq} = \frac{6\times4}{6+4} = \frac{24}{10} = 2.4\mu F$

V = V_1 + V_2 = 100 + 100 = 200V

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CHEMISTRY

ANSWER KEYS

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HINTS & SOLUTIONS

2. No. of atoms present per unit cell in fcc arrangement = 4

   Total volume of atoms present

   $$= 4 \times \frac{4}{3}\pi r^3 = \frac{16}{3}\pi r^3$$

4. $$\frac{p^o - p}{p^o} = x\,(solute)$$

   p^O, vapour pressure of pure water at 100^OC = 760 torr

   $$x = \frac{\frac{18}{180}}{\frac{18}{180} + \frac{178\cdot 2}{18}} = \frac{0\cdot 1}{0\cdot 1 + 9\cdot 9} = \frac{0\cdot 1}{10}$$

   $$\therefore \frac{0.1}{10} = \frac{760 - p}{76}$$

5. t ½ is 15 min

   ∴ Conc. reduces from 0.1 to 0.025 M in $2t_{1/2}$

   i.e., 30min

6. $$-\frac{dx}{dt} \propto [CO]^2$$

   Doubling the conc. of CO, rate will become four times

7. Lyophilic sols are self stabilizing because they are reversible and highly hydrated in the solution

15. The diborane structure contains four

    2e – 2e (B – H) bounds and two 3c – 2e (B – H – B) bounds

16. Ammonium sulphate is a salt of strong acid and weak base. Its aqueous solution is acidic due to hydrolysis of ammonium ion. Therefore, it will increase the acidity of soil

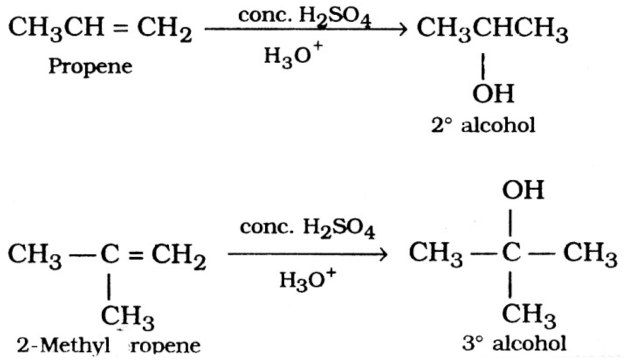
20. Since the saturated solution gives white ppt. with $AgNO_3$, so the solution must contain Cl^- ions. Thus, the gas X is Cl_2.

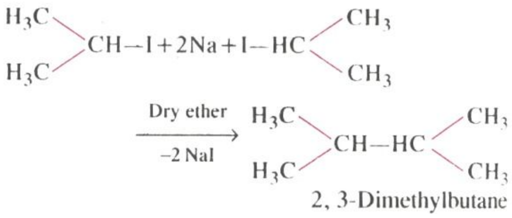
    Saturated solution + Mg $\rightarrow MgCl_2 + H_2$

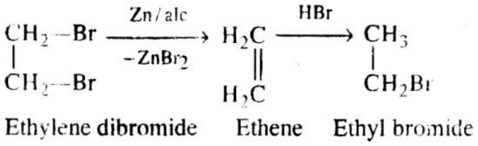
    (Colourless gas)

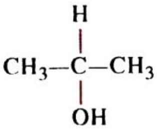
    Thus, Y is H_2.

24. Propene gives 2° alcohol and 2-methyl propene gives 3° alcohol.

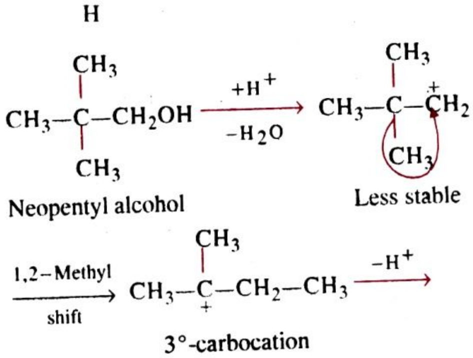


25. 

26. 

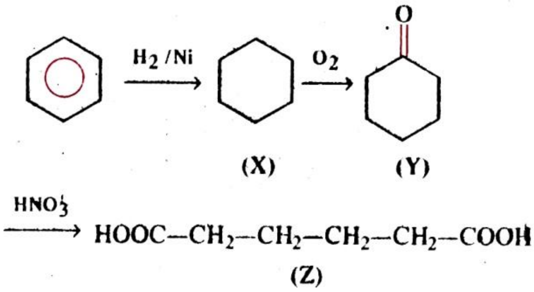
27.  gives iodoform on reaction with

$I_2 + Na_2CO_3$.

28. 

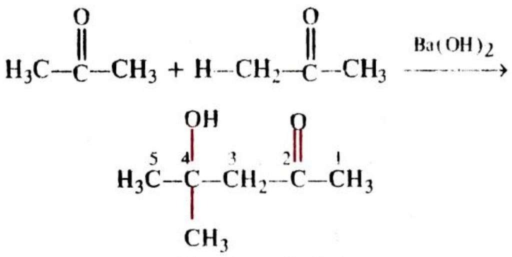
29. With $Br_2 - CHCl_3$ phenol gives a mixture of o-andp-bromophenol

33. Acidity decreases with the decreases in electronegativity of halogen i.e.,
$FCH_2COOH > ClCH_2COOH > BrCH_2COOH$

35. 

37. Only achiral amino acid is glycine (NH_2CH_2COOH)

38. Starch is a mixture of two polymers. It is not a single polymer, amylose is not a component of cellulose.
It is acomponent of starch.
There are nearly 20 different types of amino acids present in proteins.
The furanose structure of fructose has four carbon atoms and one oxygen atom in the ring

39. Metal present in B_{12} is Co
40. Teflon is a thermally stable polymer of tetrafluoreethylene ($CF_2 = CF_2$)
41. The catalyst used in the polymerisation of olefins is Zieglar-Natta catalyst
46. Ease of adsorption of the hydrated alkali metal ions on an ion exchange resins decreases as the size of the alkali metal ions increases.
    Since, the order of size of alkali metal ions
    $$Li^+ < Na^+ < K^+ < Rb^+$$
    the ease of adsorption follows the order
    $$Rb^+ < K^+ < Na^+ < Li^+$$
47. Photochemical smog is formed in warm and sunny climate during day time by the action of sunlight on primary pollutants. It contains nitrogen oxides, ozone, PAN etc. which are oxidising in nature. Hence photochemical smog behaves as an oxidising agent. It causes irritation in eyes and throat
51. $\frac{17}{22400} \times 112 = 0.085g$
    $\because\ 22400\, cc\, at\, STP = 17g$
54. N_2 has no unpaired electron. So it is dia-magnetic
57. F–H ……. F is the strongest hydrogen bond because of largest electronegativity difference between H and F.
58. For N2 + 3H2 $\rightarrow$ NH3
    $\Delta n_g = 2 - (1 + 3) = -2$
    $\Delta H = \Delta U + \Delta n_g RT$
    $= \Delta U - 2RT$
    $\therefore\ \Delta H < \Delta U$
59. Conjugate base of $H_2PO_4^-$ is HPO_4^{2-}
60. 

Diacetone alcohol

4-Hydroxy-4-methyl pentan-2-one

MATHEMATICS

ANSWER KEYS

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3	1	2	3	2	3	1	2					

HINTS & SOLUTIONS

1. (a) is not symmetric because if 'a' is a brother of 'b', 'b' may be 'a' sister of 'a'
   (b) is symmetric ; if a is perpendicular to 'b', nodoubt, 'b' is perpendicular to 'a'
   (c) is not symmetric because if 'a' is the father of 'b', 'b' cannot be the father to 'a'
   (d) is not symmetric because (3, 1)$\in$R and (1, 3)$\notin$R
2. $f(x)$ is a polynomial of degree 90. $f'(x)$ reduces the degree of $f(x)$ by one. Thus, in order to get a polynomial of degree 20, we must reduce the degree of $f(x)$ by 70. Hence $f(x)$ should be differentiated 70 times to get a polynomial of degree 20.
   $\therefore$ n = 70
3. $y=(\sin^{-1}x)^2 \quad \Rightarrow \frac{dy}{dx}=\frac{2\sin^{-1}x}{\sqrt{1-x^2}}$

$$\sqrt{1-x^2}\frac{dy}{dx}=2\sin^{-1}x$$

$$\sqrt{1-x^2}\frac{d^2y}{dx^2}+\frac{dy}{dx}=\frac{2}{\sqrt{1-x^2}}$$

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

$$(1-x^2)\frac{d^2y}{dx^2}-\frac{xdy}{dx}+2$$

5. 'There exists' an existential quantifier. It is denoted by $\exists$. Let P(x) be an even prime number
6. $\underset{x\to 5}{lt}\frac{xf(5)-5f(x)}{x-5}=\left(\frac{0}{0}\right)$ form

= $\underset{x\to 5}{lt}\frac{x(0)+f(5)-5f'(x)}{1-0}$ (using L' Hospital rule)

= 7 – 5 x 7 = – 28

7. Here $\frac{dx}{dt}=\frac{d}{dt}(e^t\cot t)=e^t(\cot-\sin t)$

and $\frac{dy}{dt}=\frac{d}{dt}(e^t\sin t)=e^t(\cos t+\sin t)$

when $t=\frac{\pi}{4}, \frac{dy}{dx}=\frac{\sin\frac{\pi}{4}+\cos\frac{\pi}{4}}{\cos\frac{\pi}{4}-\sin\frac{\pi}{4}}$

which does not exist at

$\Rightarrow$ tangent to the given curve at $t=\frac{\pi}{4}$ is vertical and makes an angle of $\frac{\pi}{2}$ with the x-axis

8. We have,

$f(x)=x^n \Rightarrow f(1)=1={}^nC_0$

$\frac{f'(1)}{1!}=\frac{2}{1!}={}^nC_1$

$\frac{f''(1)}{2!}=\frac{n(n-1)}{2!}={}^nC_2$

$\frac{f^{1n}(1)}{3!}=\frac{n(n-1)(n-2)}{3!}={}^nC_3$

$\frac{f^{n}(1)}{n!}=\frac{n!}{n!}={}^nC_n$

$\therefore\quad f(1)-\frac{f'(1)}{1!}+\frac{f''(1)}{2!}+\frac{f^{n!}(1)}{3!}+.....+\frac{(-1)^n f^n(1)}{n!}$

$= {}^nC_0 - {}^nC_1 + {}^nC_2 - {}^nC_3 + \ldots + (-1)^n\, {}^nC_n$

$= (1-1)^n = 0$

9. $I=\int_a^b xf(x)dx$

$=\int_a^b (a+b-x)f(a+b-x)dx$

$=\int_a^b (a+b-x)f(x)dx$

[since f (a + b – x) = f(x)]

$=(a+b)\int_a^b f(x)dx-\int_a^b x\,f(x)dx$

$=(a+b)\int_a^b f(x)dx-I$

$\therefore\quad =2I=(a+b)\int_a^b f(x)dx$

$\therefore\quad I=\left[\frac{a+b}{2}\right]\int_a^b f(x)dx$

11. $\underset{x\to 1}{Lt}\int_4^{f(x)}\frac{2t}{x-1}dt=\underset{x\to 1}{Lt}\left\{\frac{1}{x-1}\int_4^{f(x)}2t\,dt\right\}$

$=\underset{x\to 1}{Lt}\left\{\frac{1}{x-1}[t^2]_4^{f(x)}\right\}=\underset{x\to 1}{Lt}\frac{(f(x)^2-4^2}{x-1}$

$= \underset{x\to 1}{Lt} \frac{f(x)+4)(f(x)-4)}{x-1}$

$= \underset{x\to 1}{Lt}\{f(x)+4\} \underset{x\to 1}{Lt} \frac{f(x)-4}{x-1}$

$= \{f(1)+4\} \underset{x\to 1}{Lt} \frac{f(x)-f(1)}{x-1}$

$= (4+4) \underset{h\to 0}{Lt} \frac{f(1+h)-f(1)}{h} = 8f'(x)$

12. If x is any real number, then $x-x+\sqrt{2}=\sqrt{2}$ is surely irrational

$\Rightarrow$ xRx for all $x \in R$ $\Rightarrow$ R is reflexive

13. We have, $\int \frac{2a\sin x + b\sin 2x}{(b+a\cos x)^3}dx$

$= 2\int \frac{\sin x(a+b\cos x)}{(b+a\cos x)^3}dx$

$= \frac{-2}{a}\int \frac{a+b\left[\frac{t-b}{a}\right]}{t^3}dt$

[On putting $b+a\cos x = t$ and $-a\sin x dx = dt$]

$= \frac{1}{a^2}\frac{(a^2-b^2)}{t^2} + \frac{2b}{a^2 t} + c$, where t = b + a cos x

14. Here, b∗a = |b – a| – 1 = |(–1) (a – b)| –1 = |(–1) |a – | – 1

= 1 |a – b| – 1

= |a – b| – 1 = a∗b

∴ ‘∗’ is commutative

15. For $x_1, x_2 \in R, f(x_1) = f(x_2) \Rightarrow ax_1 + b = ax_2 + b$

$\Rightarrow$ $ax_1 = a\,x_2$ $\Rightarrow$ $x_1 = x_2$

∴ f is one – one and hence invertible when considered as a function from D_f to R_f. In this case $D_f = R_f = R$.

To find f^{-1}, let y = f(x) = ax + b

$\Rightarrow$ $x = \frac{y-b}{a}$ $\Rightarrow$ $f^{-1}(y) = \frac{y-b}{a}$

17. $Df = \{x \in R : f(x) \in R\} = \left\{x \in R : \frac{1}{3x+2} \in R\right\}$

$= \{x \in R : 3x+2 \neq 0\} = \left\{x \in R : x \neq \frac{-2}{3}\right\} = R - \left\{-\frac{2}{3}\right\}$

18. For $|x| \leq |, \sin^{-1}\left[\frac{2x}{1+x^2}\right] = 2\tan^{-1} x$

20. $\sin(2\tan^{-1} .75) = \sin(2\theta)$, where $\theta = \tan^{-1} .75$

$= \frac{2\tan\theta}{1+\tan^2\theta}$ $\tan\theta = .75 = \frac{3}{4}$

$$= \frac{2 \times \frac{3}{4}}{1 + \left[\frac{3}{4}\right]^2} = \frac{\frac{3}{2}}{1 + \frac{9}{16}}$$

21. 5A is of order 3 x m and 2 B is of order 3 x n. Hence, 5 A – 2 B will be defined only when both 5 A and 2 B are of same order, i.e., if m = n. When m = n, then 5A – 2 B will be of order 3 x m or 3 x n

23. adj (adj A) = $|A|^{n-2}$ A,
whenever A is a non-singular matrix of order n(>1)

25. Since $A^{-1} = A \Rightarrow AA^{-1} = A^2 \Rightarrow I = A^2$
i.e., $A^2 = I$
Hence (c) is correct answer

26. $$\begin{vmatrix} x & a & a & a \\ a & x & a & a \\ a & a & x & a \\ a & a & a & x \end{vmatrix} = (x+3a) \begin{vmatrix} 1 & a & a & a \\ 1 & x & a & a \\ 1 & a & x & a \\ 1 & a & a & x \end{vmatrix}$$

Applying $C_1 \to C_1 + C_2 + C_3 + C_4$ and taking (x + 3a) common from C_1
Applying $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$ and $R_4 \to R_4 - R_1$
Expanding along C_1

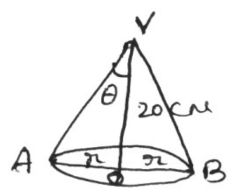
27. For $y = \frac{x^2-2}{x^2-4} \Rightarrow \frac{dy}{dx} = \frac{-4x}{(x^2-4)^2}$

$\Rightarrow \frac{dy}{dx} > 0$ for x < 0 and $\frac{dy}{dx} < 0$ for x > 0. Thus x = 0 is the point of local maxima for y. Now $y|_{x=0} = \frac{1}{2}$ (positive). Thus x = 0 is also the point of local maximum for $y = \left|\frac{x^2-2}{x^2-4}\right|$.

28. Let θ be the semi-vertical angel and r be the radius of the cone at time t. Then,

r = 20 tanθ

$$\Rightarrow \frac{dr}{dt} = 20\sec^2\theta \frac{d\theta}{dt}$$



$$\Rightarrow \frac{dr}{dt} = 20\sec^2 30^o \times 2 \quad \left[\because \theta = 30^o \; and \; \frac{d\theta}{dt} = 2\right]$$

$$\Rightarrow \frac{dr}{dt} = 20 \times \frac{4}{3} \times 2 cm/\sec = \frac{160}{3} cm/\sec$$

29. Given $R(x) = 3x^2 + 36x + 5 \Rightarrow \frac{dr}{dx} = 6x + 36$

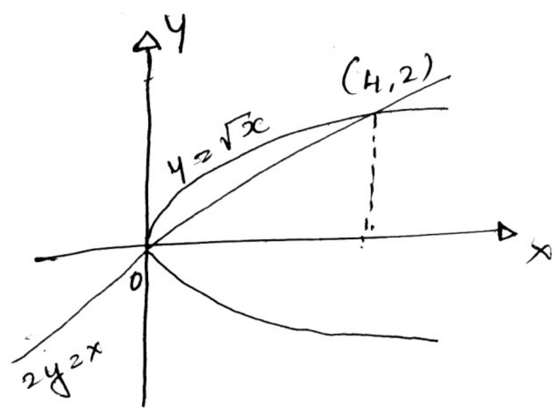
$\therefore$ M.R. (when x = 5) = (6 x 5 + 36) Rs = Rs.66

30. Required area

$$= \int_0^4 \left[\sqrt{x} - \frac{x}{2}\right] dx$$

Note that the two curves (the line and the parabola)

meet where $\left[\frac{x}{2}\right]^2 = x$



$\Leftrightarrow\ x^2-4x=0$

$\Leftrightarrow\quad x=0,4$

33. We have, $\frac{dy}{dx}=y\tan x-y^2\sec x$

$\Rightarrow \frac{1}{y^2}\frac{dy}{dx}-\frac{1}{y}\tan x=-\sec x$

Putting $\frac{1}{y}=v\Rightarrow \frac{-1}{y^2}\qquad \frac{dy}{dx}=\frac{dv}{dx}$

we obtain $\frac{dv}{dx}+\tan x.v=\sec x$ which is linear,

I.F. = $e\int \tan x\,dx \qquad = e^{\log}\sec x=\sec x$

$\therefore$ The solution is

$v\sec x=\int \sec^2 x\,dx+c \qquad \Rightarrow \frac{1}{y}\sec x=\tan x+c$

$\Rightarrow \sec x=y(c+\tan x)$

47. Given, $\sec x\cos 5x+1=0$

$\Rightarrow \frac{1}{\cos x}x\cos 5x+\frac{1}{1}=0$

$\Rightarrow \frac{\cos 5x+x\cos x}{\cos x}=0$

$\Rightarrow \cos 5x+\cos x=0$

$\Rightarrow 2\cos\frac{5x+x}{2}\cos\frac{5x+x}{2}=0$

$\left[\because \cos C+\cos D=2\cos\frac{C+D}{2}\cos\frac{C-D}{2}\right]$

$\Rightarrow 2\cos 3x\cos 2x=0$

$\Rightarrow \cos 3x=0\, or \cos 2x=0$

$\Rightarrow 3x=(2n+1)\frac{\pi}{2}\, or\, x=(2n+1)\frac{\pi}{2}$

$\Rightarrow x=(2n+1)\frac{\pi}{6}\, or\, x=(2n+1)\frac{\pi}{4}$

If n = 0,then $x=\frac{\pi}{6}\, or\, x=\frac{\pi}{4}$

If n = 1, then $x3\times\frac{\pi}{6}=\frac{\pi}{2}\ or\ x=\frac{3\pi}{4}>\frac{\pi}{2}$

$\therefore$ the value of x are $\frac{\pi}{6},\frac{\pi}{2}\&\frac{\pi}{2}$.

48. Given that $\sin\theta=-\frac{4}{5}$ and θ lies is the III[rd] quadrant

$\Rightarrow \cos\theta=-\sqrt{1-\frac{16}{25}}=-\frac{3}{5}$

Now, $\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}} = \pm\sqrt{\frac{1-\frac{3}{5}}{2}} = \pm\sqrt{\frac{1}{5}}$

But we take since, is lies is IIIrd quadrant, then $\frac{\theta}{2}$ will be in IInd quadrant

Hence, $\cos\frac{\theta}{2} = -\frac{1}{\sqrt{5}}$

49. Given, $a\cos 2\theta + b\sin 2\theta = c$

$\therefore \quad a\left[\frac{1-\tan^2\theta}{1+\tan^2\theta}\right] + b\left[\frac{2\tan\theta}{1+\tan^2\theta}\right] = c$

$\Rightarrow \; a = a\tan^2\theta + 2b\tan\theta = c(1+\tan^2\theta)$

$\Rightarrow \; a\tan^2\theta(a+c) - 2b\tan\theta + c - a = 0$

since, α and β are the roots of the above equation

$\therefore \quad \tan\alpha + \tan\beta = \frac{2x}{a+c}$

50. Let $z = \frac{1-i\sin a}{1+\sin a} \times \frac{(1-2i\sin a)}{(1-2i\sin a)}$

$= \frac{1-i\sin a - i\sin a + (-1)2\sin^2 a}{1^2 - (2i\sin a)^2}$

$\frac{1-2\sin^2 a - 3i\sin a}{1^2 - (2i\sin a)^2}$

$\frac{1-2\sin^2 a - 3i\sin a}{1+4-\sin^2 a)}$

Since, Z is purely real, therefore

Im (z) = 0

$\frac{-3\sin a}{1+4\sin^2 a}$

$\Rightarrow \; \sin a = 0 \Rightarrow a = n\pi$

51. Given, {x : x is a positive multiple of 3 and less than 100}

= {3, 6, 9, 12, …. 99}

$\Rightarrow$ n(s) = 33

and p = {x : x is prime number less than 20}

= {2, 3, 5, 7, 11, 13, 17, 19}

$\Rightarrow$ n(p) = 8

$\therefore$ n(s) + n(p) = 33 + 8 = 41

52. Given, $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!} \Rightarrow \frac{1}{6!} + \frac{1}{7\times 6!} = \frac{x}{8\times 7\times 6!}$

$\frac{1}{6!}\left[1+\frac{1}{7!}\right] = \frac{x}{8\times 7\times 6!} \Rightarrow \frac{1}{1} + \frac{1}{7} = \frac{x}{8\times 7}$

$\Rightarrow \; \frac{7+1}{7} = \frac{x}{8\times 7}$

$\Rightarrow \; x = 8\times 8 = 64$

53. Total number of available courses = 9

Out of there 5 courses have to be chosen. But it is given that 2 courses are compulsory for every student. i.e., you have to choose only 3 courses instead of 5, out of 7 instead of 9.

It can done in $^7C_3$ ways = $\frac{7\times6\times5}{6}$ = 35ways

54. Let $S=1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+.....$

$\Rightarrow S=1=\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+.....$ .... (1)

$\Rightarrow \frac{S-1}{3}=\frac{2}{3^2}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^5}+.....$ .... (2)

On subtracting Eq (2) from Eq (1), we get

$$\Rightarrow S-2=\frac{\pm\frac{2}{3}}{1-\frac{1}{3}}=2+1=3$$

55. Let price and litre be denoted in ordered pair (x, y), where x denotes the ₹ per litre and y denotes the quantity of milk in litre. Given, (14, 980) and (16, 1220) are two points
let linear relations i.e., linear equation points
let linear relations i.e., linear equation is

$$y-y^1=\frac{y_2-y_1}{x_2-x_1}(x-x_1)$$

$\Rightarrow y-980=\frac{1220-980}{16-14}(x-14)$

$\Rightarrow y-980=\frac{240}{2}(x-14)$

$(\because x_1=14, y_1=980, x_2=16, y_1=1220)$

$\Rightarrow$ y-980=120(x – 14)

$\Rightarrow$ y – 980 = 120 x – 120 x 14

$\Rightarrow$ 120 x –y = 1680 – 980

$\Rightarrow$ 120 x –y = 700

when price x = 17,

$\Rightarrow$ 120 x 17 – y = 700

$\Rightarrow$ y = 2040 – 700

y = 1340

He will sell weekly 1340L milk at the rate ₹17L

56. It is given, centre is (2, –3) and circumference of circle = 10π

$\Rightarrow 2\pi$ r = 10π

$\Rightarrow$ r = π

The equation of circle, if centre is (2, –3) and radius is 5, is

$$(x-2)^2+(y+3)^2=5^2$$

$\Rightarrow x^2+y^2-4x+6y+13=25$

$\Rightarrow x^2+y^2-4x+6y-12=0$

KEYS TO MOCK CET - 1

BIOLOGY

ANSWERS												
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
2	4	4	2	4	3	3	4	3	1	2	2	1
14	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
4	3	3	4	2	1	2	3	2	2	1	4	4
27	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**
4	4	4	1	4	1	3	4	3	1	1	3	3
40	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
3	4	4	2	1	3	2	4	2	2	1	4	1
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**					
4	2	3	2	4	3	2	4					