ANSWER KEY- XII/XIII(ASEEM/ANANT) - (PST-3) DATE : 27-12-2015

CODE-1

PHYSICS															
QUS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ANS.	3	3	2	1	3	1	1	4	3	3	4	4	1	3	2
QUS.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ANS.	1	3	3	1	1	2	3	2	2	4	2	2	3	1	3
CHEMISTRY															
QUS.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
ANS.	4	1	1	3	3	3	4	2	4	1	1	2	1	3	3
QUS.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
ANS.	3	3	3	2	1	2	4	1	4	1	3	3	2	1	2
MATHEMATICS															
QUS.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
ANS.	3	1	2	3	3	3	2	1	4	4	2	2	2	3	3
QUS.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
ANS.	3	1	1	3	2	1	1	1	3	1	3	3	4	3	4

Note :-
Solutions can be *downloaded* from the website or will be displayed on the notice board !

ANSWER KEY- XII/XIII(ASEEM/ANANT) - (PST-3) DATE : 27-12-2015

CODE-2

PHYSICS															
QUS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ANS.	1	3	3	1	1	2	3	2	2	4	2	2	3	1	3
QUS.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ANS.	3	3	2	1	3	1	1	4	3	3	4	4	1	3	2
CHEMISTRY															
QUS.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
ANS.	3	3	3	2	1	2	4	1	4	1	3	3	2	1	2
QUS.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
ANS.	4	1	1	3	3	3	4	2	4	1	1	2	1	3	3
MATHEMATICS															
QUS.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
ANS.	3	1	1	3	2	1	1	1	3	1	3	3	4	3	4
QUS.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
ANS.	3	1	2	3	3	3	2	1	4	4	2	2	2	3	3

Note :-
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PART SYLLABUS TEST [PST–03]
TARGET-JEE MAIN TEST SERIES 2016

CLASS-XII/XIII- (ASEEM/ANANT) **DATE : 27-12-2015**

Hints & Solution

PART – I (PHYSICS)

1. A vessel contains oil (density = 0.8 ....

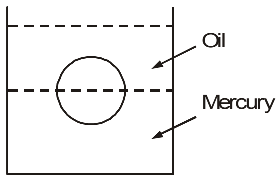
[Sol. Weight = Buoyant force

$V\rho_m g = \frac{V}{2}\rho_{Hg}g + \frac{V}{2}\rho_{oil}$

$\rho_m = \frac{\rho_{Hg}+\rho_{oil}}{2}$

$= \frac{13.6+0.8}{2}$

$= \frac{14.4}{2} = 7.2$]



2. A hollow conducting sphere of inner ....

[Sol. $E = \rho\frac{i}{A}$; $E = \frac{kr^2}{R}\frac{i}{4\pi r^2}$; $E = \frac{ki}{4\pi R}$]

3. In the circuit shown the variable ....

[Sol. $E - ix = 0$
$10 - 2x = 0$
$x = 5$]

4. Four wires A, B, C and D are made ....

[Sol. $E_C = 2E_A = 2E_B = 2E_D$ ...(1)

$d_D = 2d_A = 2d_B = 2d_C$ ...(2)

from (1) & (2), we get

$\frac{1}{4E_C d_C^2} = \frac{1}{8E_A d_A^2} = \frac{1}{8E_B d_B^2} = \frac{1}{2E_D d_D^2}$

$\therefore \quad \frac{\sigma_C}{4} = \frac{\sigma_A}{8} = \frac{\sigma_B}{8} = \frac{\sigma_D}{2}$

So, (A)]

5. A uniform wire of resistance R is ....

[Sol. $Al = nl \times A'$ $\Rightarrow$ $A' = \frac{A}{n}$

$R' = n^2R$ $\Rightarrow$ $R_1 = \frac{n^2R}{5}$

$R_{eq} = R_1$]

6. In the circuit shown in the given ....

[Sol. $V = 20 \times 1 = 0.5 \times R_2$

$\Rightarrow$ $R_2 = 40$
40 Ω, 10 Ω, 20 Ω in parallel

$\Rightarrow$ their $R_{eq} = \frac{40}{7}\Omega$

$\Rightarrow$ $i = \frac{20}{40}\times 7 = 3.5$ A

$\Rightarrow$ $V_{R_1} = 49 = 3.5\,R_1$

$\Rightarrow$ $R_1 = 14\ \Omega$]

7. Two cells of the same emf E have ....

[Sol. $E - ir_1 = 0$ $\Rightarrow$ $\frac{E}{r_1} = i = \frac{2E}{r_1+r_2+R}$

$\Rightarrow$ $R = r_1 - r_2$]

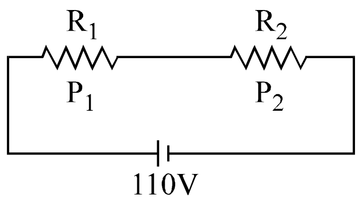
8. In the house of a person who ....

[Sol. Circuit should be in the manner so that on closing any switch, current will flow through both door ball and bulb

9. The wattage rating of a light bulb ....

[Sol. $R = \frac{V^2}{P}$

$\therefore$ $R_1 = \frac{110\times110}{50}$ $R_2 = \frac{110\times110}{100}$



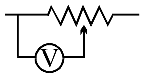
$I = \frac{110}{3R} = \frac{110\times100}{3\times110\times110} = \frac{10}{33}$ amp.

$P_1 = I^2 \times R_1 = \frac{10}{33}\times\frac{10}{33}\times\frac{110\times110}{50}$

$= \frac{200}{9} \approx 22$ W]

10. A potential difference ....

[Sol. R_{eq} till ac = $\frac{6000 \times 3000}{6000 + 3000}$ = 2000 Ω



R = 2000 + 9000 = 11000 Ω

⇒ i = $\frac{220}{11000}$ = 0.02 A

⇒ V = 2000 × 0.02 = 40 V]

11. A galvanometer of resistance ....

[Sol. $i_g = 100 \times 10^{-4} = 0.01$ A

10 = 0.01 (R + 100)

⇒ R = 900 Ω]

12. Two identical potentiometer wires...........

[Sol. For w_1, $\varepsilon = \frac{l}{2}\left[\left(\frac{\varepsilon_p}{1+2}\right)\frac{2}{l}\right]$ ...(1)

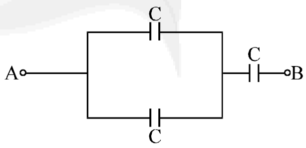
For w_2, $\varepsilon = \frac{2l}{3}\left[\left(\frac{\varepsilon_p}{1+R}\right)\frac{R}{l}\right]$ ...(2)

Dividing eq. (i) by (ii) and on solving, we get Resistance of wire w_2 = 1 Ω]

13. In the network shown we have ....

[Sol: When applied p.d. is V across A & B assuming $V_{AC} = V_1$ & $V_{CB} = V_2$

we have, $V_1 = \frac{V_2}{2}$ & hence

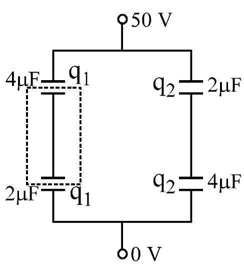


$V_1 = \frac{V}{3}$ & $V_2 = \frac{2V}{3}$

As V_1 & V_2 both must not exceed 100 V, the maximum value of applied p.d. across A & B would be 150 V.]

14. The circuit was in the shown state ....

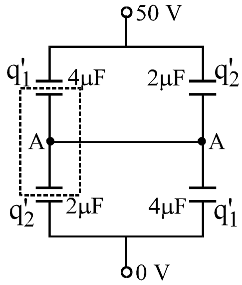
[Sol.



Net charge under dotted box shown = $-q_1 + q_1 = 0$

<u>Finally</u>

V_A = 25V



q_1' = 25(4) = 100 μC

q_2' = 25(2) = 50 μC

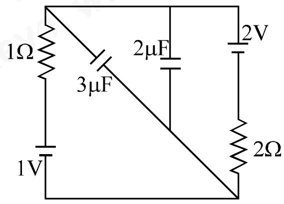
Net charge under the dotted box shown = $-q_1' + q_2'$ = –100 + 50 = –50 μC

∴ The charge which flows = 50 μC]

15. In the circuit shown, the charge on ....

[Sol. At steady state, there will be no current in the branches having capacitor only thus equivalent circuit diagram will be as shown in the figure.

$V_{AB} - 1 + \frac{V_{AB} - 2}{2} = 0$

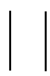


⇒ $V_{AB} = \frac{4}{3}$ V

thus q = CV_{AB} = 4 μC]

16. The potential across a 3 μF capacitor ......

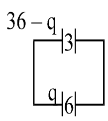
[Sol.



3μf

Q = CV = 3 × 10^{-6} × 12

Q = 36μC



$\frac{36 - q}{3} = \frac{q}{6}$

72 – 2q = q

q = $\frac{72}{3}$ = 24 μC

∴ Charge on 3μF ⇒ 36 – q = 12 μC

V = $\frac{36 - q}{C} = \frac{12}{3}$ = 4 volt]

17. A graph between current & time ....

[Sol. $I = \frac{V}{R}e^{-t/(RC)}$

$\therefore \quad \log_e I = \log_e\left(\frac{V}{R}\right) - \frac{t}{RC}$

when t = 0, $\log_e I = \log_e\left(\frac{V}{R}\right)$, which is same for both circuits. Hence, if one out of V and R is different, then another also has to be different.

$\therefore \quad C_1 = C_2$

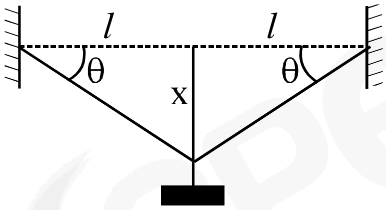
Now, |Slope| = $\frac{1}{RC}$ is greater for (1)

$\therefore \quad R_1 < R_2$

and hence $V_1 < V_2$]

18. A wire of cross-section A is ....

[Sol. New length = $2\sqrt{(l^2 + x^2)}$



Old length = $2l$

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

$= 1 + \frac{1}{2}\left(\frac{x}{l}\right)^2$ + higher terms of x^2/l^2 ..... – 1

Neglecting higher terms

Strain = $\frac{1}{2}\left(\frac{x}{l}\right)^2$]

19. The bar shown in the figure is made ....

[Sol. $F = \frac{YA}{L/2} \cdot \Delta L_1$

$\therefore \Delta L_1 + \Delta L_1 = \frac{3FL}{4YL}$

$F = \frac{Y \cdot 2A}{L/2} \cdot \Delta L_2$]

20. Water freezes inside a pipe and ....

[Sol. $\frac{\Delta P}{\frac{\Delta V}{V}} = \Delta P = \frac{B\Delta V}{V}$

$= 2 \times 10^9 \times \frac{9}{100} = 1.8 \times 10^8$ N/m^2]

21. A spherical hole of radius $R/2$ is ....

[Sol. $m' = \frac{m}{\frac{4\pi R^3}{3}} \times \frac{4\pi}{3}\frac{R^3}{8} = \frac{m}{8}$

$g = \frac{Gm}{R^2} - \frac{Gm^4}{8R^2} = \frac{Gm}{2R^2}$]

22. A particle is projected vertically ....

[Sol. $v_C = \sqrt{2gR}$

$v = \frac{\sqrt{2gR}}{4} = \frac{\sqrt{gR}}{2\sqrt{2}}$

$\frac{1}{2}mv^2 - \frac{GMm}{R} = 0 - \frac{GMm}{R+h}$

$\frac{1}{2}m\frac{gR}{8}$ a mg R = $\frac{gR^2m}{R+h}$

$\frac{1}{16} = 1 - \frac{R}{R+h}$

$\frac{1}{16} = \frac{h}{R+h}$

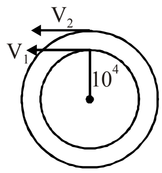
R + h = 16 h

R = 15 h

$h = \frac{R}{15}$]

23. Two satellites S_1 and S_2 revolve ....

[Sol.



$\omega_1 = \frac{2\pi}{1}$ rad/hr

$\omega_2 = \frac{2\pi}{8}$ rad/hr

$\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{R_1}{R_3}\right)^3 \quad \Rightarrow \quad \frac{R_2}{R_1} = 4$

$\Rightarrow \quad R_2 = 4 \times 10^4$ km

$V_1 = \dfrac{2\pi R_1}{1h} = 2\pi \times 10^4$ km/hr

$V_2 = \dfrac{2\pi R_2}{8h} = \pi \times 10^4$ km/hr

at closest separation ω

$= \dfrac{V_{rel} \perp \text{ to line joining}}{\text{length of line journing}}$

$= \dfrac{\pi \times 10^4 \text{km/hr}}{3 \times 10^4 \text{km}} = \dfrac{\pi}{3}$ rad/hr.]

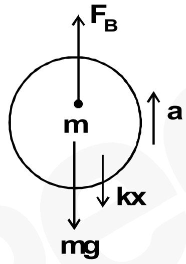
24. A ball of mass 10 kg and density ....

Sol. F.B.D of ball

Applying newton's law

$F_B - mg - kx = ma$

$\dfrac{10}{1} \times 1.1 \times 10 - 10 \times 10 - 200x = 10 \times 0.2$



$110 - 100 - 200x = 2$

$200x = 8$

$x = \dfrac{4}{100} m = 4cm$

25. Which one of the following curves ....

Sol. Velocity increases continuously but rate of change of velocity decreases and finally becomes constant.

26. Two drops of same radius are ....

Sol. Terminal velocity, $v \propto r^2$
when drops coalesce, volume remains constant

i.e. $\quad 2.\dfrac{4}{3}\pi r^3 = \dfrac{4}{3}\pi R^3$

where, R = Radius of final drop

So, $\quad R = 2^{\frac{1}{3}} r \quad$ or

$R^2 = 2^{\frac{2}{3}} r^2 = 4^{\frac{1}{3}} r^2$

New terminal velocity, $v' = 4^{\frac{1}{3}} v$.

27. A mosquito with 8 legs stands on ....

Sol. Weight = Net force due to surface tension
w = $8 \times T \times 2\pi a$

$= 16\pi Ta$.

28. A sample of a metal weights 210 g ....

Sol. Let volume of metal be V and density of metal, water and liquid be ρ_m, ρ_w & ρ_ℓ

$V\rho_m = 210 \qquad$ ....(1)

$V\rho_m - V\rho_w = 180$

$\Rightarrow \quad V(\rho_m - 1) = 180 \qquad$ ....(2)

$[\because \rho_w = 1 \text{ gm/cm}^3]$

$V(\rho_m - V\rho_\ell) = 120 \qquad$ ....(3)

dividing equation (1) by (2), we get

$\dfrac{\rho_m}{\rho_m - 1} = \dfrac{7}{6} \quad \Rightarrow \quad 6\rho_m = 7\rho_m - 7$

$\Rightarrow \quad \rho_m = 7$

dividing equation (1) by (3), we get

$\dfrac{\rho_m}{\rho_m - \rho_\ell} = \dfrac{7}{4}; \quad \dfrac{7}{7 - \rho_\ell} = \dfrac{7}{4}$

or $\quad 4 = 7 - \rho_\ell$

or $\quad \rho_\ell = 3$.

29. In a U-tube experiment, a column PQ ....

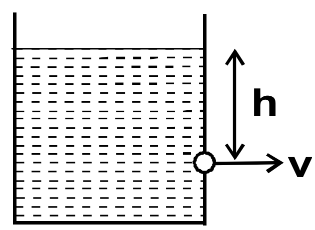
Sol. $\because$ Pressure at points R and Q will be same

$\therefore \quad \rho_\ell . gh_1 = \rho_w . gh_2 \quad$ or $\quad \dfrac{\rho_\ell}{\rho_w} = \dfrac{h_2}{h_1}$

So, Relative density $= \dfrac{h_2}{h_1}$.

30. Water is filled in a container upto ....

Sol. $v^2 = \dfrac{2gh}{1 - \left(\dfrac{a}{A}\right)^2}$



$= \dfrac{2 \times 10 \times 2.475}{1 - 0.01}$

$= \dfrac{20 \times 2.475}{0.99}$

$= \dfrac{2 \times 2475}{99} = \dfrac{2 \times 275}{11}$

$= 2 \times 25 = 50$.

PART SYLLABUS TEST- 03

TARGET- JEE MAIN 2015

CLASS-XII & DROPPERS **DATE : 27-12-2014**

Hints & Solution

PART- II (CHEMISTRY)

31. What is the molar …………..

Sol. pH = 13, pOH = 1 $\Rightarrow$ $[OH]^- = 0.1$ M

$Fe(OH)_2 \rightleftharpoons Fe^{2+} + 2OH^-$

x 0.1

$K_{sp} = [Fe^{2+}][OH^-]^2$

$\Rightarrow 8 \times 10^{-16} = [Fe^{2+}] \times (0.1)^2$

$\Rightarrow x = [Fe^{2+}] = 8 \times 10^{-14}$ M

32. The solubility of different …………..

Sol. **AB K_{sp}= s^2** $\Rightarrow S_1^2 = 4\times10^{-20}$

$S_1 = 2\times10^{-10}M$

A_2B, K_{sp} = $4s^3$ $\Rightarrow 4S_2^3$ **= 3.2 ×10^{-11}**

AB_3,K_{sp} = $27s^4$ $\Rightarrow 27S_3^4 = 2.7\times10^{-13}$

$\Rightarrow S_3^4 = 10^{-32}$

S_3 = 10^{-8} M

33. K_{sp} value of $Al(OH)_3$ ……

Sol. Solubility of $Al(OH)_3$ is lesser than $Zn(OH)_2$.

$Al(OH)_3$ $k_{sp} = 27s^4 = 8.5 \times 10^{-23}$

$Zn(OH)_2$ $K_{sp} = 4s^2 = 1.8 \times 10^{-14}$

34. Why pure $NaCl$ is ………………

Sol. (c) $NaCl_{(s)} \rightleftharpoons Na^+_{(aq)} + Cl^-_{(aq)}$

$HCl \rightleftharpoons H^+ + Cl^-$

The increase in $[Cl^-]$ brings in an increase in $[Na^+]$ $[Cl^-]$ which will lead for backward reaction because $K_{sp}\ NaCl = [Na^+]\,[Cl^-]$.

35. In thermodynamics which ……

Sol. Volume is not an intensive property.

Intensive – independent of size and mass of the system

36. At constant *T* and *P*, ……………

Sol. $\Delta n_g = 1 - \frac{3}{2} = \frac{-1}{2}$, As Δn_g is negative, thus $\Delta H < \Delta E$.

37. One mole of an ideal ………………

Sol. *W* = 0 is not true

In free expansion $P_{ext} = 0$

$\Rightarrow W = P_{ext}.dV = 0$

$\Delta U = 0 \Rightarrow \Delta H = q = 0$

$\Delta S \neq 0$

38. One mole of an ………………

Sol. Given number of moles =1

Initial temperature $= 27^o\ C = 300\ K$

Work done by the system $= 3\ KJ = 3000\ K$

It will be $(-)$ because work is done by the system.

Heat capacity at constant volume $(Cv) = 20\ J/k$

We know that work done

$W = -nC_V(T_2 - T_1)$; $3000 = -1 \times 20\ (T_2 - 300)$

$3000 = -20\,T_2 + 6000$

$20\,T_2 = 3000$; $T_2 = \frac{3000}{20} = 150\ K$

39. The work done during the ……….

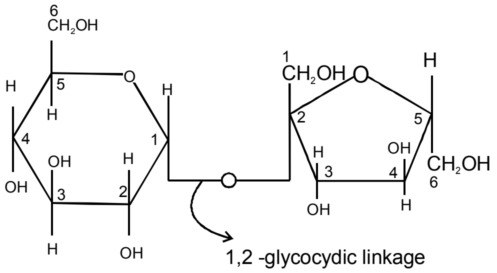
Sol. $W=-p\Delta V$; $W=-3\times(6-4)$

$W=-6\times 101.32$ $(\therefore 1\,L\,atm = 101.32\,J)$

$W=-608\ J$

40. The correct name ……………….

Sol

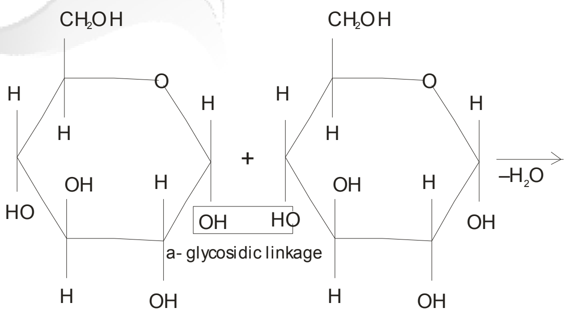


41. The substance that ……………………

Sol. Cellulose occurs exclusively in plants and it is the most abundant ogranic substance in plant kingdom. It is a predominant constituent of cell wall of plant cells. Cellulose is a straight chain polysaccharide composed only of β-D-glucose units which are joined by glycosidic linkage between C1 of one glucose unit of C_4 of the next glucose unit.

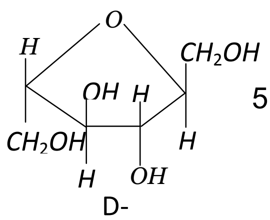
42. An example of a ………….

Sol Maltose $\xrightarrow[\text{Maltase}]{\text{Hydrolysis}}$ glucose + glucose



43. The number of atoms ………

Sol.



5 atoms in the ring

44. Proteins are hydrolysed …….

Sol. Protein is the condensation natural polymer of α amino acid

$$\text{Protein} \xrightarrow{\text{Enzyme}} \underset{\text{(Acidic medium in stomach)}}{\text{Amino acid}}$$

46. The order of ……………

Sol. **(a) Elastomers :**

Rubber like solid with elastic property. Chain is Held by weakest intermoleculer force.A few crosslinks are introduced in between the chain which helps the polymer to retract to it's original position.

ex. Buna-S, Buna-N, Neoprene.

(b) Fibres :

Strong intermoleculr forces like H-bonding.

ex. polyamides, Nylon-6, 6, Polysters (terylene)

(c) Thermoplastic polymer :

Linear or slightly branched long chain molecule capable of repeateadly softening on heating and hardening on cooling. It has intermolecular forces between elastomers & fibre.

ex. polythene, polystyrene, polyvinyl...

(d) Thermosetting polymers :

These are cross linked or heavily branced molecule, which on heating under go extensively cross linking in moulds and again becomes infusible. These can't be re-used.

ex. Bakelite, urea-formaldehyde resin

47. The base adenine ……………….

Sol. DNA contains four bases viz. adenine (A), guanine (G), cytosine (C) and thymine (T). RNA also contains four bases, the first three bases are same as in DNA but the fourth one is uracil (U).

Adenine is a purine base common in both RNA and DNA.

48. The deficiency of ………

Sol. Name of vitamins – Vitamin B_1(Thiamine)

Sources-Yeast, Milk, green vegetables and cereals Deficiency diseases- Beri beri (loss of appetite, retarded grown)

49. In DNA, the complementary ………

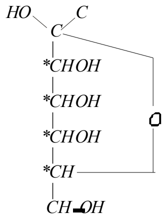
Sol. $\underset{\text{2 hydrogen bonds}}{\text{Adenine} = \text{Thymine}}, \underset{\text{3 hydrogen bonds}}{\text{Guanine} \equiv \text{Cytosine}}$

50. Vitamin B_6 is known as……………..

Sol. Vitamin B_6 is called pyridoxin. It is found in fruits, green-vegetables, milk, etc. Due to its deficiency, anaemia disease is caused.

51. Number of chiral ……………………..

Sol.



This structure of β-D glucose has four asymmetric carbon atom

52. The compound required …………

Sol. When phenol react with *HCHO* form bakelite which is a thermosetting polymer

54. Which of the following is …………..

Sol. Permanent hardness cannot be removed by boiling of water but temporary hardness can be removed.

55. 1 *ml* of H_2O_2 solution……………

Sol. 10 volume of H_2O_2 means 10 *ml* of O_2 is obtained from 1 *ml* of H_2O_2.

56. H_2O_2 is manufactured these days…………..

Sol. Electrolysis of 50% sulphuric acid gives per disulphuric acid $(H_2S_2O_8)$ which on distillation yields 30% solution of hydrogen peroxide

$$H_2SO_4 \rightleftharpoons H^{\oplus} + HSO_4^{\ominus}$$

at anode : $2HSO_4^{\ominus}$ $S_2O_8^{2-} + 2H^+ + 2e^-$; at

cathode : $H^+ + e^- \longrightarrow \frac{1}{2}H_2$

$$H_2S_2O_8 + H_2O \xrightarrow[\text{distillation}]{80-90°C} H_2SO_5 + H_2SO_4\ ;$$

$$H_2SO_5 + H_2O \longrightarrow H_2SO_4 + H_2O_2$$

57. Potassium permanganate …….

Sol.
$$\xrightarrow{H^+} Mn^{2+}$$
$$\xrightarrow{\text{Neutral}} MnO_2$$
$$\xrightarrow{OH^-} MnO_4^{2-}$$

58. The atomic number …………………

Sol. *Configuration of Valence shell*

V : $3s^3 4s^2$	*clearly for 2^{nd} ionization*
Cr : $3d^5 4s^1$	*energy e^- is removed from*
Mn:$3d^5 4s^2$	*the half filled orbital*
Fe:$3d^6 4s^2$	*of Cr($3d^5$) hence it should have*

highest first ionization energy

59. Four successive members …………….

Sol. The low value for Sc reflects the stability of Sc^{3+} which has a noble gas configuration. The highest value for Zn is due to the removal of an electron from the stable d^{10} configuration of Zn^{2+}. The comparatively high value for Mn shows that $Mn^{2+}(d^5)$ is particularly stable, whereas comparatively low value for Fe shows the extra stability of Fe^{3+} (d^5). The comparatively low value for V is related to the stability of V^{2+} (half-filled t_{2g} level,

$E^o_{M^{3+}/M^{2+}}$ order Cr < Fe < Mn < Co

60. In neutral of family ………

Sol. $8MnO_4^- + 3S_2O_3^{2-} + H_2O \rightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$

PART- III (MATHS)

61. The area bounded by y = $\cos^{-1}$ …………..

Sol. **(3)** $Y = \cos^{-1}(\cos x) = \begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x & \pi < x \le 2\pi \end{cases}$

The required area

$$= \int_0^{\pi} x\,dx + \int_{\pi}^{2\pi} (2\pi - x)\,dx = \pi^2$$

62. The number of positive integral solutions ……

Sol. **(1)** Here $x_1 x_2 x_3 = 2^2 \times 3 \times 5$

Let number of two's given to each of x_1, x_2, x_3 be a, b, c . Then a + b + c = 2, a, b, c ≥ 0

The number of integral solutions of this equations is equal to coefficient of x^2 in $(1 - x)^{-3}$ i.e. ${}^4C_2$

i.e. the available 2 two's can be distributed among x_1, x_2 and x_3 in ${}^4C_2 = 6$ ways.

Similarly, the available 1 three can be distributed among x_1, x_2, x_3 in ${}^3C_2 = 3$ ways. (= coefficient of x in $(1 - x)^{-3}$)

$\therefore$ Total number of ways $= {}^4C_2 \times {}^3C_2 \times {}^3C_2 = 6 \times 3 \times 3 = 54$ ways.

63. The solution of differential ……

Sol. Put $y = tx \Rightarrow \dfrac{dy}{dx} = t + x\dfrac{dt}{dx}$

$$t + x\frac{dt}{dx} = t + \frac{\phi(t)}{\phi'(t)}$$

$$\Rightarrow \quad \int \frac{\phi'(t)dt}{\phi(t)} = \int \frac{dx}{x}$$

$\Rightarrow \quad \ln \phi(t) = \ln x + \ln k$

$\Rightarrow \quad \phi(t) = kx \qquad \Rightarrow \qquad \phi(y/x) = kx$

64. A die is thrown n times (n being odd)……

Sol. **(3)**

The required probability is ${}^nC_1$

$$\frac{1}{2}\left(\frac{1}{2}\right)^{n-1} + {}^nC_3\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^{n-3} + \ldots + {}^nC_n\left(\frac{1}{2}\right)^n$$

$$= \left(\frac{1}{2}\right)^n \left({}^nC_1 + {}^nC_3 + \ldots + {}^nC_n\right) = \frac{1}{2}.$$

65. In the expansion of …..

Sol. **(3)** In the expression

$$\left(\frac{x+1}{x^{2/3} - x^{1/3} + 1} - \frac{x-1}{x - x^{1/2}}\right)^{10}$$

To simplify, for first term put $x = p^3$ and for second term put $x = q^2$, then it will become $(x^{1/3} - x^{-1/2})^{10}$

$T_{r+1} = {}^{10}C_r(x^{1/3})^{10-r}\,(x^{-1/2})^r$

For term independent of x;

$$\Rightarrow \left(x^{\frac{10-r}{3}}\right)\left(x^{\frac{-r}{2}}\right) = x^0 \Rightarrow \frac{10-r}{3} - \frac{r}{2} = 0$$

$\Rightarrow 5r = 20 \Rightarrow r = 4 \Rightarrow T_5 = {}^{10}C_4$

66. The area bounded by the ……

Sol. **(3)**

Area of square ABCD = 2 sq. units

Area of circle $= \pi$ Sq. units

$\Rightarrow$ Required area $= (\pi - 2)$ Sq. units

67. Nine hundred distinct N-digit numbers ………

Sol. **[2]**

$(3)^6 = 729 < 900$ and $(3)^7 = 2187 > 900$

68. Solution of differential equation of ……….

Sol. **[1]**

The given differential equation can be re written as

$$\frac{dx}{dy} - \frac{1}{y}.x = 2y^2 \qquad \text{I.F}= e^{-\int \frac{1}{y}dy} = \frac{1}{y}$$

So solution is $x.\dfrac{1}{y} = \displaystyle\int \frac{1}{y}\,2y^2.dy = y^2 + c$

So $x = y^3 + cy$

69. The distinct numbers are chosen from ………..

Sol. **(4)** The required probability $= \dfrac{1}{{}^6C_3} = \dfrac{1}{20}$.

70. The coefficient of x^{65} in the expansion of …….

Sol. **(4)** $(1+x)^{131}(x^2 - x + 1)^{130} = (1 + x)(1 + x^3)^{130}$

$= (1 + x^3)^{130} + x(1 + x^3)^{130}$

Hence coefficient of x^{65} is zero.

71. If A_n is the area bounded by $y = (1-x^2)^n$ …

Sol. **(2)**

$$A_n = \int_0^1 (1-x^2)^n\, dx < \int_0^1 (1-x^2)^{n-1} dx = A_{n-1},$$

as $0 < 1 - x^2 < 1$ for $x \in (0,1)$

72. A polygon has 44 diagonals …………

Sol. [2]

Let n be the number of sides hence number of diagonals = ${}^nC_2 - n = 44$

$\Rightarrow \dfrac{n(n-1)}{2} - n = 44 \quad \Rightarrow n^2 - n - 2n = 88$

$\Rightarrow n^2 - 3n - 88 = 0$

$\Rightarrow (n-11)(n+8) = 0 \Rightarrow n = 11$

73. The order of the differential equation ………..

Sol. **[2]**

Axis of the parabola will be of the form $x - y = K$. Hence focus will be $(k + t, t)$ for some t, Hence family will be of 2 parameters, and hence corresponding differential equation will be of order 2.

74. A and B are two events such that P(A) = 0.2 ……..

Sol. **(3)**

$0.7 = P(A \cup B) = P(A) + P(B) - P(A \cap B) = P(A) + P(B) - P(A).\, P(B) = 0.2 + P(B) - 0.2P(B)$

$\Rightarrow \quad P(B) = \dfrac{0.5}{0.8} = \dfrac{5}{8} \Rightarrow \quad P(B') = 3/8.$

75. If coefficient of $x^2\, y^3\, z^4$ in $(x + y + z)^n$ is ……

Sol. (3)

Since $x^2y^3z^4$ is occurring in the expansion of $(x + y + z)^n$, so n should be 9 only.

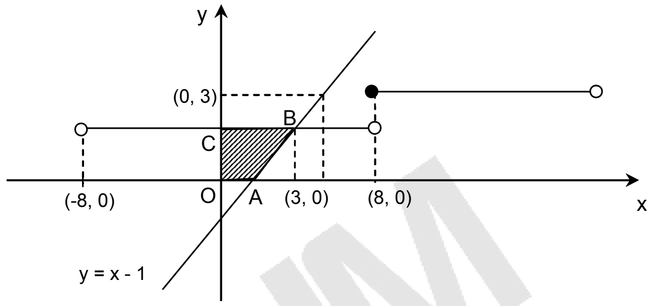
Now $A = \dfrac{9!}{2! \times 3! \times 4!} = 1260$

Coefficient of $x^4y^4\, z$ is $\dfrac{9!}{4! \times 4!} = 630 = A/2.$

76. Area bounded by the curves ……..

Sol. (3)

$y = [x^2/64 + 2]$, $y = x - 1$ and $x = 0$ above x-axis is



so required area of trapezium (OABCO)

$= \dfrac{1}{2}(1+3)(2) = 4.$

Alternate $-8 < x < 8 \Rightarrow y = 2$

$A = 2 \times 2 = 4$ sq. units.

77. Six identical coins are arranged in a row ……

Sol. **[1]**

Required number of ways $= \dfrac{6!}{3!3!} = \dfrac{720}{6 \times 6} = 20$

78. The degree of the differential equation ………..

Sol. **[1]**

$y = e^{dy/dx} \Rightarrow \dfrac{dy}{dx} = \ell n(y)$, so degree is 1

79. Entries of a 2 × 2 determinant are chosen ……….

Sol. **[3]**

$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc = 0 \Rightarrow$ whether $ad = 1, bc = 1$

or $ad = -1, bc = -1$

which occur in eight ways. Total number of 2 × 2 determinants from {–1, 1} is 16. Thus required probability is $\dfrac{8}{16} = \dfrac{1}{2}$.

80. Let n be an odd natural number and ……

Sol. **(2)** Let n= 2m +1

$$A = \frac{1}{C_1}+\frac{1}{C_2}+...+\frac{1}{C_m}=\frac{1}{C_{2m}}+\frac{1}{C_{2m-1}}+...+\frac{1}{C_{m+1}}$$

$$\Rightarrow 2A+2=\sum_{r=0}^{n}\frac{1}{C_r}$$

$$\text{Let } S=\sum_{r=1}^{n}\frac{r}{C_r}=\sum_{r=0}^{n}\frac{r}{C_r}=\sum_{r=0}^{n}\frac{n-r}{C_{n-r}}=\sum_{r=0}^{n}\frac{n-r}{C_r}.$$

$$\Rightarrow 2S = n\sum_{r=0}^{n}\frac{1}{C_r} \Rightarrow S = n(A+1).$$

81. If the area bounded by the curve y = f(x) ……

Sol. **[1]** $\int_0^a f(x)dx = \frac{6a-\sin 2a}{4}$

$\Rightarrow f(a)=\frac{3-\cos 2a}{2}=1+\sin^2 a$

82. A five digit number divisible by 3 …………

Sol. **[1]** Since the number to be formed are divisible by 3 hence we can use the digits either from the set {1, 2, 3, 4, 5} or from the set {0, 1, 2, 4, 5} so that the sum of digits to be used must be a multiple of 3. Now first set gives 5! Numbers and the second set give 5! – 4! Numbers Hence the total numbers = 2.5! – 4! = 240 – 24 = 216

83. The solution of the differential ……….

Sol. **[1]**

$\Rightarrow \quad 2y\frac{dy}{dx}x=-y^2-\sin 2x$

$\Rightarrow \quad y^2+2yx\frac{dy}{dx}=-\sin 2x$

$\Rightarrow \quad \frac{d}{dx}(xy^2)=\frac{d}{dx}(\cos^2 x)$

$\Rightarrow \quad xy^2 = \cos^2x+c$

84. If 'head' means one and 'tail' means ….

Sol. **[3]**

$b^2 - 4ac < 0$

For b = 1 any a and c which can be chosen in 4 ways

For b = 2 either a = 1, c = 2

or a = 2, c = 1

or a = 2, c = 2

$\Rightarrow$ Required probability = $\frac{7}{8}$

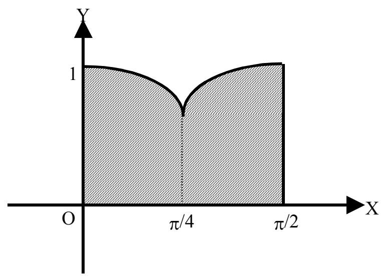
85. Area bounded by f(x) = max.(sinx, cosx) ……

Sol. [1]

$f(x) = \cos x$ for $0 \le x \le \pi/4$

$= \sin x$ for $\pi/4 < x \le \pi/2$

Required = $2\int_0^{\pi/4}\cos x\,dx = 2\sin x\Big|_0^{\pi/4}$



$= \sqrt{2}$ sq. units.

86. If x-intercept of any tangent is 3 times ……….

Sol. **[3]**

Equation of tangent is $Y - y = \frac{dy}{dx}(X-x)$

For Y = 0, X = 3x, we get $\frac{dy}{dx}=-\frac{y}{2x}$

$\Rightarrow \quad \frac{dy}{y}=-\frac{1}{2}\frac{dx}{x}$

$\Rightarrow \quad y=\frac{c}{\sqrt{x}}$

$\Rightarrow \quad y = \frac{1}{\sqrt{x}}$ (c =1, as the curve passes through (1,1))

87. In a bag there are 15 red and 5 white balls …….

Sol. **[3]**

Probability that out of remaining balls the one that is red is $= \frac{^{14}C_1}{^{19}C_1} = \frac{14}{19}$

88. Differential equation whose general solution ……..

Sol. **[4]**

$y = c_1x + \frac{c_2}{x}$

$\Rightarrow \quad \frac{dy}{dx} = c_1 - \frac{c_2}{x^2}$

$\Rightarrow \quad \frac{d^2y}{dx^2} = \frac{2c_2}{x^3}$

Eliminating c_1 & c_2 from the above three equations,

We get $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} - \frac{y}{x^2} = 0$

89. The number of solutions of the …………

Sol. **[3]**

$^{10}C_{x-1} > 3 \,.\, ^{10}C_x \Rightarrow \frac{1}{11-x} > \frac{3}{x} \Rightarrow 4x > 33 \Rightarrow$ $x \geq 9$, but $x \leq 10$.

So x = 9, 10. Hence there are two solutions

90. If $1+ 99^n$, n being an odd positive ……

Sol. **[4]**

$1 + 99^n = 1+ (100-1)^n$

$= 1+ [\,(100)^n - n\,(100)^{n-1} + \ldots + n.100 - 1]$

which is divisible by 10^2. Hence m = 2