FIITJEE

ALL INDIA TEST SERIES

PART TEST – III

JEE (Advanced)-2019

PAPER –1

TEST DATE: 16-12-2018

ANSWERS, HINTS & SOLUTIONS

Physics

PART – I

SECTION – A

1. B, D

Sol. $v_{esc} = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{8}{3}G\rho\pi R^2}$

Given that, $4(4\pi R_P^2) = (4\pi R_Q^2)$ $\therefore$ $R_Q = 2R_P$

Mass of R is $M_R = M_P + M_Q$

$R_R^3 = R_P^3 + R_Q^3$

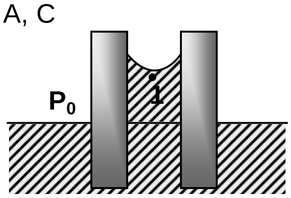
So, $R_R = 9^{1/3}R_P$

So, $R_R > R_Q > R_P \Rightarrow v_R > v_Q > v_P$

Also, $\frac{v_R}{v_P} = 9^{1/3}$ and $\frac{v_P}{v_Q} = \frac{1}{2}$

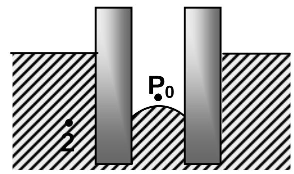
2. A, C

Sol.



$P_1 < P_0$

Case-I



$P_2 > P_0$

Case-II

3. C

Sol. Least count = $\frac{0.5}{100} = 0.005$ mm

Zero error = 0 + 0.005 × 2 = 0.01 mm

So, true diameter = 0.5 × 8 + 0.005 × 83 – 0.01 = 4.405 mm

4. B

Sol. Repulsive force between protons forbids heavy nucleus.

5. A, B, D

Sol. Δx at O = d(path difference is maximum at O)

So, for $d = \frac{5\lambda}{2}$ and $\frac{7\lambda}{2}$, O will be a minimum and for d = λ, O will be a maximum.

There would be total 5 minima for d = 4.8 λ.

6. A, D

Sol. $\frac{I_0}{2} = 4\frac{I_0}{4}\cos^2\left(\frac{\Delta\phi}{2}\right)$

and $\Delta\phi = \frac{2\pi}{\lambda}(2\Delta x)$

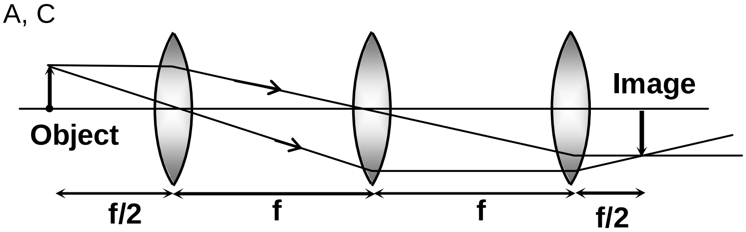
7. B, D

Sol. If two nuclei in the range 51 < A < 100 will fuse then they will produce an element with mass number above 100 and less than 200 which has more E_{bn} thus energy is released hence option (B) is correct.

Similarly a nucleus in the range 200 < A < 260 when broken into two equal fragments then the E_{bn} of these fragments will be more than that of the nucleus hence option (D) is correct.

8. A, C

Sol.



9. B

Sol. The second law is consequence of conservation of angular momentum, which is still true.

10. A

Sol. Accuracy describes how close to the correct or true value a measurement is, while precision in a measurement of how closely grouped or how well a result can be reproduced of the plots given (A) demonstrates the closest grouping at data points.

SECTION – B

11. (A) → (p, q); (B) → (p, r); (C) → (p, q); (D) → (s, t)

Sol. (A) $\Delta\phi_{P_1} = \frac{2\pi}{4\times10^{-7}}\frac{(10^{-3})(3\times10^{-4})}{1} = \frac{3\pi}{2}$

$\Delta\phi_{P_2} = \left(\frac{3\pi}{2}\right)(4) = 6\pi$

So, $I_C = I_{P_2} = 4I_0$ and $I_{P_1} = 2I_0$

(B) $\Delta\phi_{P_1} = \left(\frac{3\pi}{2}\right)\left(\frac{4}{3}\right) = 2\pi$

$\Delta\phi_{P_2} = (2\pi)(4) = 8\pi$

So, $I_C = I_{P_1} = I_{P_2} = 4I_0$

(C) $\Delta\phi_C = \frac{2\pi}{4\times10^{-7}}\left(\frac{3}{2}-1\right)\times 8\times10^{-7} = 2\pi$

$\Delta\phi_{P_1} = 2\pi - \frac{3\pi}{2} = \frac{\pi}{2}$

$\Delta\phi_{P_2} = |2\pi - 6\pi| = 4\pi$

So, $I_C = I_{P_2} = 4I_0$ and $I_{P_1} = 2I_0$

(D) $\Delta\phi_C = \frac{2\pi}{4\times10^{-7}}(10^{-3})(10^{-4}) = \frac{\pi}{2}$

$\Delta\phi_{P_1} = \left(\frac{3\pi}{2} - \frac{\pi}{2}\right) = \pi$

$\Delta\phi_{P_2} = \left(6\pi - \frac{\pi}{2}\right) = \frac{11\pi}{2}$

So, $I_C = I_{P_2} = 2I_0$ and $I_{P_1} = 0$

12. (A) $\rightarrow$ (p, q, r, s); (B) $\rightarrow$ (q, t); (C) $\rightarrow$ (r, s); (D) $\rightarrow$ (q)

Sol. (A) From free body diagram of the liquid above the sphere, $F_x = P_0\pi R^2 + \frac{1}{3}\pi R^3\rho g$

Force of buoyancy on the sphere = $\frac{4}{3}\pi R^3\rho g$

So, $F_y = P_0\pi R^2 + \frac{5}{3}\pi R^3\rho g$

(B) Force of buoyancy on the disc $F_x = \frac{1}{3}\pi R^3\rho g$

$F_y = P_0\pi R^2 + \frac{5}{3}\pi R^3\rho g$

(C) From the free body diagram of the liquid in the container F_x and F_y are different with option (p) and (q)

(D) $F_x = \left(P_0 + \rho g\frac{R}{3}\right)4\pi R^2 = 4\pi P_0 R^2 + \frac{4}{3}\rho g\pi R^3$

$F_y = \left(P_0 + \rho g\frac{5R}{3}\right)\pi R^2 = P_0\pi R^2 + \frac{5}{3}\rho g\pi R^3$

Force on the part open to atmosphere = $P_0 3\pi R^2$

So, $F_B = \frac{1}{3}\rho g\pi R^3 = 4\pi R^2\frac{4R}{3}\sigma g - N$ (N = normal reaction)

$\therefore\ \sigma \ge \frac{\rho}{16}$

SECTION – C

13. 9

Sol. $g_1 = g\left(1 - \frac{h_1}{R}\right)$ $\therefore\ \Delta g_1 = -\frac{g}{R}\Delta h_1$

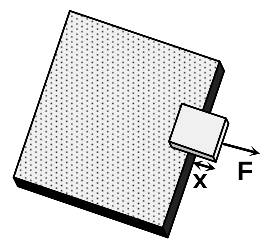
and $g_2 = g\frac{R^2}{(R+h_2)^2}$ $\therefore\ \Delta g_2 = -\frac{2gR^2}{(R+h_2)^3}\Delta h_2$

given that, $\Delta g_1 = \Delta g_2$

So, $h_2 = R\left[2^{1/3} - 1\right] = 900$ km

14. 5

Sol. In this case,



$F = \eta\frac{v}{h}\ell(\ell - x)$

$\therefore\ v = \frac{Fh}{\eta\ell(\ell - x)} = \frac{dx}{dt}$

So, $t = \frac{3\eta\ell^3}{8Fh} = 5$ sec

15. 2

Sol. Tension in the wire at t = 0 is, $T_0 = (0.1)^3(10^3)(1.5 - 1)(10) = 5N$

Wire breaks at tension, $T = 7 \times 10^6 \times 10^{-6} = 7N$

So volume of ejected water = 200 cm^3

So time taken = 100 sec.

16. 3

Sol. One star is approaching, while the other is receding.

So, $\lambda' - \lambda'' = \frac{c+v}{c}\lambda - \frac{c-v}{c}\lambda = \frac{2v}{c}\lambda$

So, $\Delta\lambda = \frac{2\omega R\lambda}{c}$

$\therefore\ 2R = \frac{\Delta\lambda c}{\omega\lambda} = \frac{\Delta\lambda c\tau}{\pi\lambda} = 3 \times 10^7$ km

17. 1

Sol. Possible frequencies which will satisfy condition of both ends rigid

$f_1 = \frac{m}{2\ell}\sqrt{\frac{T}{\mu}}$, where ℓ is length of the string

and all possible frequencies which will satisfy condition of string of length $\frac{3\ell}{8}$ with one end rigid and one end free

$f_2 = \frac{2n+1}{4\left(\frac{3\ell}{8}\right)}\sqrt{\frac{T}{\mu}}$

So, $f_1 = f_2 \Rightarrow 3m - 8n = 4$

So, $\lambda = \ell/6 = 1$ m

18. 8

Sol. Volume flow rate of ideal fluid = $v_0\pi R^2$

Volume flow rate of the viscous fluid = $\int_0^R v_0'\left(1-\frac{r^2}{R^2}\right)2\pi r dr$

$$= v_0' 2\pi\left[\frac{R^2}{2}-\frac{R^2}{4}\right] = \frac{v_0'\pi R^2}{2} = v_0\pi R^2$$

$\therefore\ v_0' = 2v_0 = 8$ m/s

19. 2

Sol. Speed of wave in the lighter string = (50)(1) = 50 cm/s = $\sqrt{\frac{T}{\mu}}$

Speed of wave in the heavier string $= \sqrt{\frac{T}{4\mu}} = 25$ cm/s

So wavelength in heavier string = 0.5 cm

$\therefore\ \Delta\phi = \frac{2\pi}{(1\,\text{cm})}(9.5\text{ cm}) = (9.5)(2\pi)$

A point that will oscillate in phase with S must be ahead in phase by $(0.5)(2\pi)$ with respect to Q. If x is the distance of this point from Q then,

$$\frac{2\pi}{0.5\text{ cm}}x = (0.5)(2\pi)$$

$\therefore$ x = 0.25 cm

So time required is $\frac{9.5}{50}+\frac{0.25}{25} = 0.2\,\text{sec}$

20. 4

Sol. The permitted wavelength are $\lambda = \frac{2L}{n}$

So, de-Broglie wavelength $\lambda_d = \frac{h}{p} = \frac{h}{\sqrt{2mk_n}}$

$\therefore\ \frac{2L}{n} = \frac{h}{\sqrt{2mk_n}}$

$\therefore\ k_n = \frac{n^2h^2}{8mL^2}$ (n = 1, 2, 3, ……….)

$\therefore\ E_3 - E_1 = (3^2 - 1^2)\frac{h^2}{8mL^2} = \frac{h^2}{mL^2} = 4\times10^{-65}$ J

Chemistry

PART – II

SECTION – A

21. A, B, C, D

Sol. $Fe^{3+} + (NH_4)_2S \longrightarrow FeS\downarrow + S\downarrow$

$Al^{3+} + (NH_4)_2S + H_2O \longrightarrow Al(OH)_3\downarrow + H_2S\uparrow$

$Cr^{3+} + (NH_4)_2S + H_2O \longrightarrow Cr(OH)_3\downarrow + H_2S\uparrow$

$Co^{2+} + (NH_4)_2S \longrightarrow CoS\downarrow$

22. A, B, C, D

Sol. In linear molecule $\rightarrow$ 3 translation + 2 Rotation = 5 motion

$\therefore$ Energy contribution $= 5 \times \frac{1}{2}KT = \frac{5}{2}KT$ by one molecule

$\frac{5}{2}N_{av}KT = \frac{5}{2}RT$ by one mole.

In bent triatomic $\Rightarrow$ 3 translation + 3 Rotation = 6 motion

$\therefore$ Energy contribution $= 6 \times \frac{1}{2}KT$ = 3 KT by one molecule

$\therefore$ By one mole = 3 KT × N_{av} = 3RT

In monoatomic $\Rightarrow$ 3 translation motion

$\therefore$ Energy contribution $= \frac{3}{2}RT$ by one molecule.

23. B, C, D

Sol. Facts.

24. A, B, C, D

Sol. W = 1.350 gm

Molar mass = 320

Moles = $\frac{1.35}{320}$

$\pi_{calc.} = CRT = \left(\frac{1.350}{320} \times \frac{1000}{200}\right) \times 0.0821 \times 300$

= 0.5195 atm

$\pi_{obs.} = 1.039$

$\frac{\pi_{obs.}}{\pi_{calc.}} = i = \frac{1.039}{0.5195} = 2$

$\alpha = \frac{i-1}{n-1} = 1$

n = 2

	$[Co(NH_3)_5Br]SO_4 \longrightarrow$	$[Co(NH_3)_5Br]^{2+}$	SO_4^{2-}
Initial	0.021		
at equ.	–	0.021	0.021

25. D

26. C

Sol.

	Oxidation number	Hybridization
$[Ni(CO)_4] \rightarrow$	0	sp^3
$\left[Au\left(CN\right)_2\right]^-$	+1	sp
$\left[PtCl_4\right]^{2-}$	+2	dsp^2
$\left[AuCl_4\right]^-$	+3	dsp^2

27. B

Sol. $PbBr_2$, AgI, AgBr and $FeCl_3$ solution is yellow.

$HgI_2 \rightarrow$ Red

$NI_3 \rightarrow$ Touch sensitive explosive

28. A, B, C, D

Sol. All are preparation methods of Cl_2.

29. A, B, C, D

Sol. Facts.

30. A, B, C, D

Sol. Facts.

SECTION – B

31. $A \rightarrow t;\ \ B \rightarrow r;\ \ C \rightarrow p;\ D \rightarrow q$

Sol.
$$K_a = \frac{C\alpha^2}{1-\alpha} = \frac{C\left(\lambda m/\lambda_m^o\right)^2}{\left(1-\lambda m/\lambda_m^o\right)}$$

$$= \frac{C\lambda_m^2/\lambda_m^{o\,2}}{\frac{\lambda_m^o - \lambda_m}{\lambda_m^o}} = \frac{C\lambda_m^2}{\lambda_m^o\left(\lambda_m^o - \lambda_m\right)}$$

32. $A \rightarrow t;\ \ B \rightarrow s;\ \ C \rightarrow p;\ D \rightarrow r$

Sol.
$$Co^{2+} + KNO_2 + CH_3COOH \longrightarrow \underset{\text{Yellow ppt.}}{K_3\left[Co\left(NO_2\right)_6\right]}\downarrow$$

$$Ni^{2+} + DMG \longrightarrow \text{Red ppt.}$$

$$Cu^{2+} + K_4\left[Fe\left(CN\right)_6\right] \longrightarrow \underset{\text{Brown ppt.}}{Cu_2\left[Fe\left(CN\right)_6\right]}\downarrow$$

$$Al^{3+} + \left(NH_4\right)_2S \xrightarrow{H_2O} \underset{\text{White ppt.}}{Al\left(OH\right)_3}\downarrow$$

SECTION – C

33. 3

Sol.
$$HA \rightleftharpoons H^+ + A^-$$

$$K_a = \frac{c\alpha^2}{1-\alpha}$$

$$1-\alpha \simeq 1$$
$$K_a = c\alpha^2, \alpha = \sqrt{\frac{10^{-6}}{10^{-3}}} = 0.0316$$
$$\frac{\lambda_m}{\lambda_m^o} = \alpha$$
$$\lambda_m = 0.0316 \times 450 = 14.22$$

34. 9

Sol. $\frac{r_{H_2}}{r_{C_nH_{2n-2}}} = \sqrt{\frac{M_{C_nH_{2n-2}}}{2}} = 5\sqrt{5}$

$\therefore M_{C_nH_{2n-2}} = 250$

$\therefore 12n + (2n-2) = 250$

$\therefore n = 18$ and $n/2 = 9$

35. 9

Sol. $X_3Y_6 \quad \therefore n + m = 9$

36. 3

Sol. $H_2 \longrightarrow 2H^+ + 2e^-$

$$E = E^o - \frac{0.059}{2}\log\frac{\left[H^+\right]^2}{P_{H_2}}$$
$$0.177 = 0 - \frac{0.059}{2}\log\frac{\left[H^+\right]^2}{1}$$
$$\therefore -\log\left[H^+\right] = \frac{0.177}{0.059} = 3$$

37. 5

Sol. $\Delta G = -nFE$

$$E = -\frac{1930000}{4 \times 96500} = -5.0 \text{ V}$$

V = 5

38. 6

Sol. $\left[Cr(H_2O)_4 Cl_2\right]Cl + AgNO_3 \longrightarrow AgCl$

$20 \times 0.03 = 0.1\,V$

$$V = \frac{20 \times 0.03}{0.1} = 6 \text{ ml}$$

39. 6

Sol. All are correct.

40. 3

Sol. Only HgS, PbS and Cu_2S gives self reduction.

Mathematics PART – III

SECTION – A

41. C, D

Sol. Fix first row as [1, 1, 1], and possibility are $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ -1 & 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

42. A, B, C

Sol. $\Rightarrow \left({}^{29}C_4 + {}^{29}C_5\right) - \left({}^{29}C_5 + {}^{29}C_6\right) + ... - \left({}^{29}C_{27} + {}^{29}C_{28}\right) = {}^{29}C_4 - 29$

$\Rightarrow 3P = {}^{29}C_4 \Rightarrow P = 3 \times 7 \times 13 \times 29$

${}^{Q}C_R = {}^{104}C_{94} \Rightarrow Q = 104, R = 94$ or 10

43. B, C

Sol. The equation can be written as $t_1 + t_2 + t_3 + t_4 = 16$, $0 \le t_1 \le 4$, $0 \le t_2 \le 6$, $0 \le t_3 \le 5$ and $0 \le t_4 \le 6$
Let P_1 is property that $t_1 \ge 5$, t_2 is property is $t_2 \ge 7$, p_3 is property $t_3 \ge 6$ and p_4 is property that $t_4 \ge 7$ and A_i is denote the subset of S satisfying condition p_i when S is total number of solutions $= {}^{19}C_{16} = 969$

So, $\bar{A}_1 \cap \bar{A}_2 \cap \bar{A}_3 \cap \bar{A}_4 = S - \sum A_i + \sum A_i \cap A_j - \sum A_i \cap A_j \cap A_k + ... \Rightarrow k = 55$

So, number of ordered pair satisfying condition abc = k^4, a, b, c $\in$ I $\Rightarrow 4 \times 225 = 900$

44. A, C, D

Sol. There are maximum 7 distinct planes which are at equidistance from all the vertices
The volume of tetrahedron is 1/3 unit^3

45. A, C, D

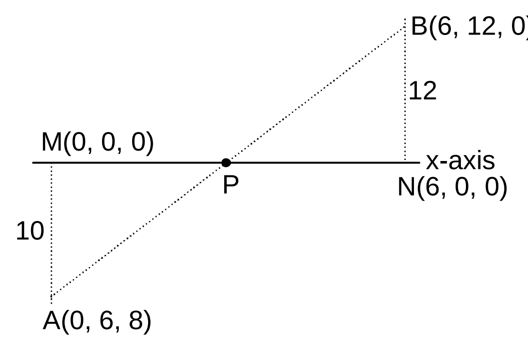
Sol. $\alpha = \frac{30}{11}$, $Q\left(0, \frac{66}{7}, 0\right)$

PA + PB is minimum, then

So, $\frac{MP}{PN} = \frac{AM}{BN} = \frac{5}{6}$

So, $P = \left(\frac{30}{11}, 0, 0\right)$

Similarly Q is $\left(0, \frac{66}{7}, 0\right)$



46. B, C, D

Sol. The possible value of k are –1, $-\frac{19}{8}$ and k = 7 is not possible, because all points will be collinear

47. A, B, D

Sol. $(2P + I)(4P^2 - 2P + I) = 8P^3 + I^3 = I$
Similarly, $(I - 2P)(I + 2P + 4P^2) = I$, if P has integer entries, then $|I - 2P|$ and $|I + 2P|$ will be equal to either 1 or –1

48. A, C

Sol. $\left|\vec{a}-\vec{b}\right|^2+\left|\vec{b}-\vec{c}\right|^2+\left|\vec{c}+\vec{a}\right|^2=3 \Rightarrow \left|\vec{a}+\vec{c}-\vec{b}\right|^2=0$, $\vec{a}+\vec{c}=\vec{b} \Rightarrow \vec{a}\cdot\vec{c}=-\frac{1}{2}$

So, $\left|\vec{a}+\vec{b}+\vec{c}\right|=2\left|\vec{b}\right|=2$, $\left|\vec{a}+2\vec{b}+3\vec{c}\right|=\left|3\vec{a}+5\vec{c}\right|=\sqrt{19}$

49. B, D

Sol. $1 = |z_1|^2 = |z_2 \cos\alpha + z_3 \sin\alpha|^2$

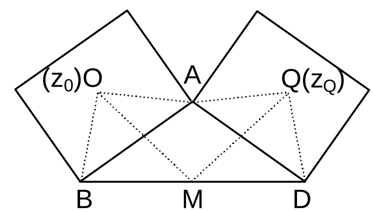
$1=1+\frac{z_2^2+z_3^2}{z_2 z_3}\cos\alpha\sin\alpha \Rightarrow z_2^2+z_3^2=0 \Rightarrow z_3=\pm iz_2$

Now take cases for z_1 as $z_1 = -z_2(\cos\alpha \pm i\sin\alpha) \Rightarrow z_1=-z_2e^{\pm i\alpha}$

α can not equal to zero or $\frac{\pi}{2}$ so option A and C are not possible

50. B, D

Sol. Let z_1, z_2, z_3 be complex number represents A, B, and D point



$\frac{z_1-z_0}{z_2-z_0}=\frac{z_3-z_Q}{z_1-z_Q}=i$

$\Rightarrow z_0=\frac{z_1+z_2+(z_1-z_2)i}{2}$; $z_Q=\frac{z_1+z_3+(z_3-z_1)i}{2}$

$z_M=\frac{z_2+z_3}{2}$

$\frac{z_0-z_m}{z_Q-z_m}=\frac{(z_1-z_3)+(z_1-z_2)i}{(z_1-z_2)+(z_3-z_1)i}=i \Rightarrow QM \perp OM$ and $OM = QM$

SECTION – B

51. (A) $\rightarrow$ (p, q), (B) $\rightarrow$ (q, s), (C) $\rightarrow$ (q), (D) $\rightarrow$ (r, s)

Sol. (A) ${}^{15}C_{2r}>\frac{1}{2}\,{}^{15}C_{2r-1}$

$r<\frac{16}{3} \Rightarrow r\le 5$ $(r\in N)$

(B) Let side of triangle is (x, x, y), y < 2x
For x = 1, 2, 3, 4, 5 number of possible value of y is 1, 3, 5, 7, 9 respectively
For x > 5, y has 9 possibilities so total number of the ordered pair of (x, x, y) is
$1 + 3 + 5 + 7 + 5 \times 9 = 61$
So, total possibility are $52 \times 3 + 9 = 165$

(C) $|az^2| = |-bz - c| \le |b|\,|z| + |c| \Rightarrow |z|^2 - |z| - 1 \le 0$, $|z|\le\frac{1+\sqrt{5}}{2}$

and $|c| \le |a|\,|z|^2 + |b|\,|z| \Rightarrow |z|^2 + |z| - 1 \ge 0$, $|z|\ge\frac{\sqrt{5}-1}{2}$

(D) z > x > y, z > y > x and z > y = x
So total number of cases = ${}^8C_3+{}^8C_3+{}^8C_2=140$

52. (A) $\rightarrow$ (p, r), (B) $\rightarrow$ (p, s), (C) $\rightarrow$ (p, r, s), (D) $\rightarrow$ (p, q, r, s, t)

Sol. (A) Let the form of divisor is $2^a 5^b$
So, $88 \le a, b \le 99$, 12 cases for each a and b
So, $p(E)=\frac{12\times12}{100\times100}=\frac{9}{625}$

(B) On each face there are 4 such triangles are possible, so total triangles are $4 \times 6 = 24$

Total number of triangle are = 56

$p(E) = \frac{24}{56} = \frac{a}{b}$

(C) Possible cases

$\underbrace{1\ 1\ 1.....1}_{10\text{ times}} \rightarrow 1$

$\underbrace{1\ 1\ 1.....1}_{7\text{ times}}\ 3 \rightarrow \frac{8!}{7!} = 8$

$1\ \ 1\ \ 1\ \ 1\ \ 3\ \ 3 \rightarrow \frac{6!}{4!\ 2!} = 15$

$1\ \ 3\ \ 3\ \ 3\ \rightarrow \frac{4!}{3!} = 4$

So total number of cases will be = 28

(D) No such equilateral triangle is possible, so N = 0

SECTION – C

53. 7

Sol. Choices for f(1), f(2), ..., f(2018), are 4, but f(2019) have two possibility

So, $a^b = 2 \times 4^{2018}$

54. 8

Sol. Volume of DFAB = $\frac{1}{3} \times \text{height} \times \text{base area} = \frac{1}{3} \times 6 \times 4 = 8$

Given line is perpendicular to edge AB and passing through point E

55. 3

Sol. $z^4 - 5z^3 + 18z^2 - 17z + 13 = (z - z_1)(z - z_2)(z - z_3)(z - z_4)$

$10 = (1 - z_1)(1 - z_2)(1 - z_3)(1 - z_4)$

$10 = (PA)^2(PC)^2 \Rightarrow (PA)(PC) = \sqrt{10}$

56. 2

Sol. det(A) = $(r\omega - 1)(p\omega - 1)$, total number of matrices are 8,

the number of matrices has |A| = 0, are 6

57. 5

Sol. Coefficient of x^6 in $(x^5 + x^4 + ... + 1)^3$

$\Rightarrow$ Coefficient x^6 in $(x^6 - 1)^3(x - 1)^{-3}$

$\Rightarrow 28 - 3 = 25$, R = 25

58. 8

Sol. $\vec{d} = \lambda\left(\vec{a} + \vec{b} + \vec{c}\right) \Rightarrow \lambda = \pm\frac{1}{\sqrt{3}}$

$\left|\vec{a} + \vec{b} + \vec{c} + \vec{d}\right| = |\lambda + 1|\left|\vec{a} + \vec{b} + \vec{c}\right| = \left|\sqrt{3} \pm 1\right|$

59. 2

Sol. $M = \left({}^{2019}C_1 \times {}^{1008}C_1\right) + \frac{2019}{3} = 2035825$

60. 3

Sol. Only equality holds in A.M. $\geq$ G.M. so x = y = z = 1