IIT – JEE: 2019 **TW TEST (ADV)** **DATE: 03/03/18**

ANSWER KEY

PHYSICS : SIMPLE HARMONIC MOTION

1.	**(B)**	**2.**	**(C)**	**3.**	**(B)**	**4.**	**(B)**	**5.**	**(D)**
6.	**(ABC)**	**7.**	**(AB)**	**8.**	**(ABCD)**	**9.**	**(BC)**	**10.**	**(ABC)**
11.	**(ABCD)**	**12.**	**(ACD)**	**13.**	**(BC)**	**14.**	**(ACD)**	**15.**	**(ABD)**
16.	**(4)**	**17.**	**(2)**	**18.**	**(1)**	**19.**	**(8)**	**20.**	**(5)**

CHEMISTRY : REACTION MECHANISM

21.	**(C)**	**22.**	**(D)**	**23.**	**(D)**	**24.**	**(D)**	**25.**	**(C)**
26.	**(D)**	**27.**	**(BCD)**	**28.**	**(AB)**	**29.**	**(ABCD)**	**30.**	**(BD)**
31.	**(AB)**	**32.**	**(AD)**	**33.**	**(AD)**	**34.**	**(AC)**	**35.**	**(AB)**
36.	**(1)**	**37.**	**(4)**	**38.**	**(3)**	**39.**	**(5)**	**40.**	**(7)**

MATHEMATICS : COMPLEX NUMBERS

41.	**(D)**	**42.**	**(C)**	**43.**	**(C)**	**44.**	**(A)**	**45.**	**(B)**
46.	**(ABD)**	**47.**	**(ACD)**	**48.**	**(AB)**	**49.**	**(BCD)**	**50.**	**(ABCD)**
51.	**(AC)**	**52.**	**(CD)**	**53.**	**(ABCD)**	**54.**	**(AB)**	**55.**	**(AC)**
56.	**(2)**	**57.**	**(2)**	**58.**	**(6)**	**59.**	**(2)**	**60.**	**(2)**

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TOPIC: REACTION MECHANISM

SOLUTION

21. **(C)**

22. **(D)**
Due to steric hinderance

23. **(D)**

24. **(D)**

25. **(C)**

26. **(D)**

27. **(BCD)**

28. **(AB)**

29. **(ABCD)**

30. **(BD)**

31. **(AB)**

32. **(AD)**

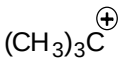
33. **(AD)**

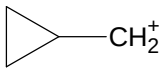
34. **(AC)**

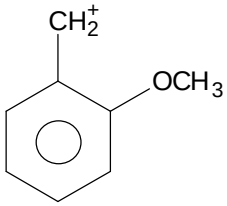
35. **(AB)**

36. **(1)**
Only $\bar{S}H$ is a stronger nuclephile than EtO^-.

37. (4)







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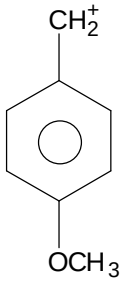
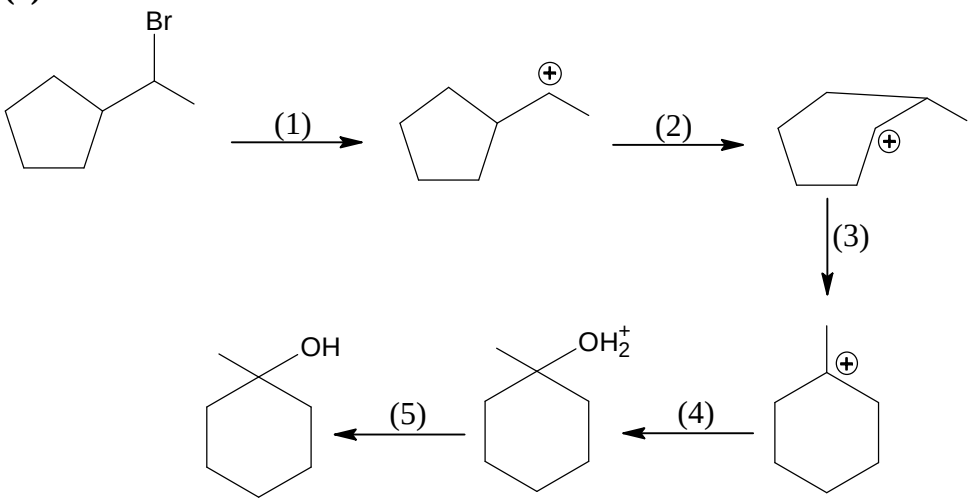


are more stable.

38. (3)

1-Butene, cis-2-Butene, trans-2-Butene.

39. (5)



40. (7)

Cl^-, Br^-, I^-, F^-, $CH_3–SO_3^-$, $Ph–O^-$ and H_2O

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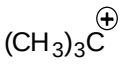

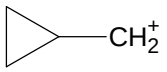

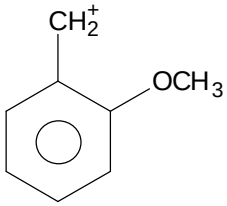

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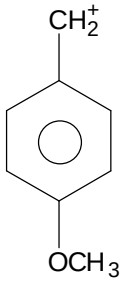

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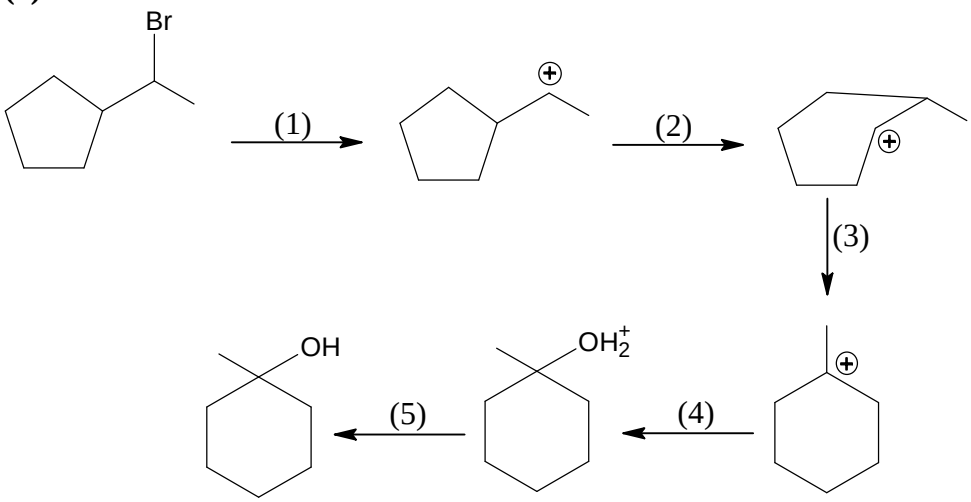

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SOLUTION

41. (D)

$$f(x) = (x-1) + (x-3)^3 + \cdots + (x-99)^{99}$$

$$\Rightarrow f'(x) = 1 + 3(x-3)^2 + 5(x-5)^4 + \cdots + 99(x-99)^{98}$$

clearly $f'(x) > 0 \quad \forall\ x \in R$

Hence $f(x)$ is increasing

That means $f(x)$ has exactly 1 Real root & rest Imaginary

42. (C)

let $f(z) = (z^2+z+1)\,p(z) + 2\omega z + \omega$

$\Rightarrow$ Remainder $\dfrac{f(z)}{z-\omega} = \boxed{f(\omega) = 2\omega^2 + \omega}$ — (i)

& $\dfrac{f(z)}{z-\omega^2} = \boxed{f(\omega^2) = 2 + \omega}$ — (ii)

Consider $f(z) = (z^3-1)\,\phi(z) + az^2+bz+c$

Remainder $\frac{f(z)}{z-1} = f(1) = \boxed{a+b+c = 5-\omega}$ — (A)

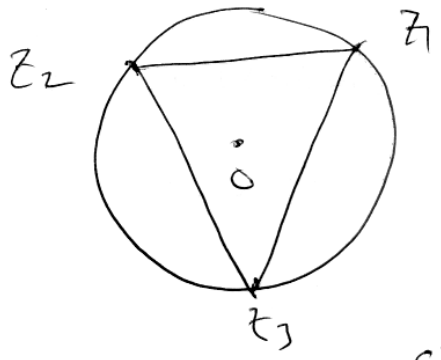
$\frac{f(z)}{z-\omega} = f(\omega) = \boxed{a\omega^2+b\omega+c = 2\omega^2+\omega}$ — (B)

$\frac{f(z)}{z-\omega^2} = f(\omega^2) = \boxed{a\omega+b\omega^2+c = 2+\omega}$ — (C)

Soln for a, b & c to get Ans as C

43. (C)

i) $|z_1| = |z_2| = |z_3| = 1$



clearly S|O)

& $G\left(\frac{z_1+z_2+z_3}{3}\right)$

Since $\sum z_i = 0$

$\Rightarrow G(0)$

Hence i) S & G coincide $\Rightarrow$ Eq. Δ

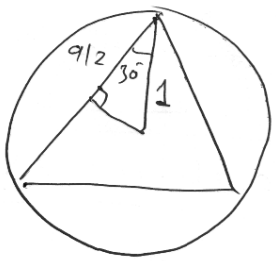
We know $3z_G = z_1^2 + z_2^2 + z_3^2$

$z_G = 0$

$\Rightarrow 0$

44. (A)

clearly z_1 & z_2 & z_3 form an Equilateral $\triangle$



$\Rightarrow \frac{a}{2} = \cos 30^\circ \Rightarrow \boxed{a = \sqrt{3}}$

Hence $A = \frac{\sqrt{3}}{4}(3)$

$= \frac{3\sqrt{3}}{4}$.

45. (B)

$\frac{1+z+z^2}{1-z+z^2} \in$ Real

By componendo / dividendo

$\frac{1+z^2}{z} \in$ Real

$\Rightarrow \frac{1+z^2}{z} = \frac{1+\bar{z}^2}{\bar{z}}$

$\bar{z} + |z|^2 z = z + |z|^2 \bar{z}$

$\Rightarrow (1-|z|^2)(z-\bar{z}) = 0$

$\Rightarrow |z| = 1$

46. (ABD)

put $x=0$ Expression $=0$

$y=0$ Expression $=0$

$\Rightarrow xy$ is a factor

put $x = -y$
Expression $=0$
$\Rightarrow x+y$ factor

put $x = y\omega$

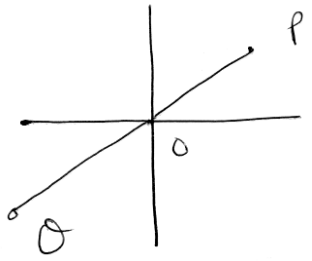
$y^n(1+\omega)^n - \omega^n y^n - y^n$

$y^n(-\omega^{2n} - \omega^n - 1)$

$\Rightarrow x = y\omega$ & $x = y\omega^2$ also factor

47. (ACD)

48. (AB)

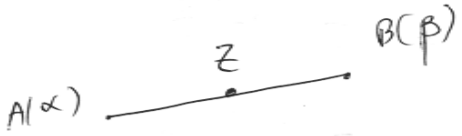


clearly $a = -c$

& $b = -d$

49. (BCD)

50. (ABCD)



clearly option (A) correct

We can say z divides A & B in Ratio

$t : (1-t)$

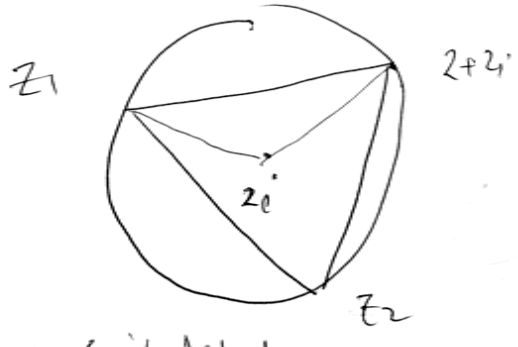
$\therefore z = \dfrac{t\beta + (1-t)\alpha}{1}$ (B) ✓

(C) ABC

$$\begin{vmatrix} z & \bar{z} & 1 \\ \alpha & \bar{\alpha} & 1 \\ \beta & \bar{\beta} & 1 \end{vmatrix} = 0 \Rightarrow \begin{vmatrix} z-\alpha & \bar{z}-\bar{\alpha} \\ \alpha-\beta & \bar{\alpha}-\bar{\beta} \end{vmatrix} = 0$$

ABC ✓

51. (AC)



Δ is Equilateral

Coni's Rule $\frac{z_1 - 2i}{2} = \omega \frac{2\pi}{3}$ or $\omega\left(-\frac{2\pi}{3}\right)$

$z_1 = (-1+\sqrt{3}i) + 2$ or $(-1-\sqrt{3}i) + 2$

$\Rightarrow$ AC option

52. (CD)

$\left|\frac{z-12}{z-8i}\right| = \frac{5}{3}$ & $|z-4| = |z-8|$

1

$x = 6$

~~Circle~~ Put $z = x+yi$ or $z + \bar{z} = 12$

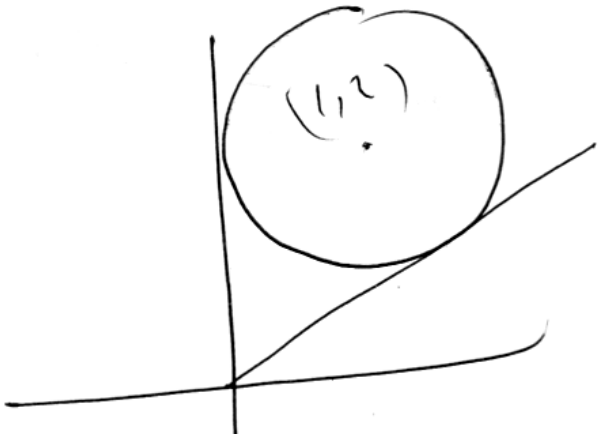
$9((x-12)^2 + y^2) = 25(x^2 + (y-6)^2)$

Solve with $x = 6$

$9(y^2 + 36) = 25(36 + (y-8)^2)$

$\Rightarrow$ $y = 17,\ y = 8$

53. (ABCD)



1

let tangent to circle $(x-1)^2+(y-2)^2=1$

be $y-2=m(x-1)\pm\sqrt{1+m^2}$

put (x,y) $(0,0)$

$-2=-m\pm\sqrt{1+m^2}$

$(m-2)^2=m^2+1$

$m^2-4m+4=m^2+1$

$\frac{3}{4}=m$

54. (AB)

$\cot^{-1}$ is a decreasing function

$\cot^{-1}(\log_3(2z+1))>\cot^{-1}(\log_3|2z-1|)$

$\Rightarrow \log_3|2z+1|<\log_3|2z-1|$

$\Rightarrow |2z+1|<|2z-1|$

or $\left|z+\frac{1}{2}\right|<\left|z-1/2\right|$

$\Rightarrow$ $x<0$

55. (AC)

56. (2)

Let $1+z+z^2+\dots+z^{99} = (z-\alpha)(z-\alpha^2)\dots(z-\alpha^{99})$

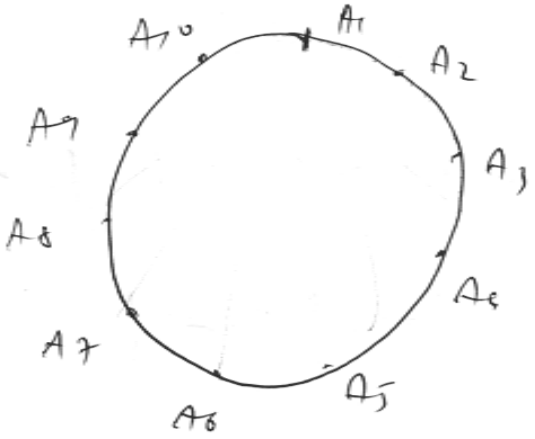
take log & differentiate $\left(\alpha = \text{cis}\left(\frac{2\pi}{100}\right)\right)$

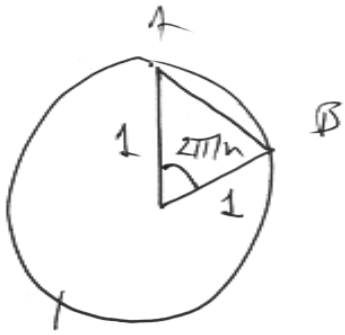
$$\frac{99z^{98}+98z^{97}+\dots+2z+1}{1+z+z^2+\dots+z^{99}} = \frac{1}{z-\alpha}+\frac{1}{z-\alpha^2}+\dots+\frac{1}{z-\alpha^{99}}$$

put $z=1$

$$\frac{99}{2} = \frac{1+2+3+\dots+99}{100} = \frac{1}{1-\alpha}+\frac{1}{1-\alpha^2}+\dots+\frac{1}{1-\alpha^{99}}$$

57. (2)





$$AB = \sqrt{2-2\cos\frac{2\pi}{n}} = 2\sin\frac{\pi}{n}$$

clearly $A_1A_2 = AA_{10}$

$A_1A_3 = AA_9$

$\vdots$

$A_1A_5 = AA_6$

$\therefore$ ~~AA~~ Expression $= 2\left(|AA_2|^2+\dots+|AA_5|^2\right)+9$

$$= 2\left(4\sin^2\frac{\pi}{10}+4\sin^2\frac{2\pi}{10}+\dots+4\sin^2\frac{9\pi}{10}\right)+4$$

$$= 8\left(4 - \left(\cos\frac{2\pi}{10} + \cos\frac{4\pi}{10} + \cos\frac{6\pi}{10} + \cos\frac{8\pi}{10}\right)\right)$$

$$+4$$

$$= 20$$

58. (6)

59. (2)

$$\cos z = \frac{e^{iz} + e^{-iz}}{2}$$

$$= \frac{e^{-\ln(2-\sqrt{3})} + e^{\ln(2-\sqrt{3})}}{2}$$

$$= \frac{\frac{1}{2-\sqrt{3}} + 2-\sqrt{3}}{2} = 2$$

60. (2)

$$|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$$

$$\Rightarrow |9\bar{z}_1\bar{z}_2 + 4\bar{z}_1\bar{z}_3 + \bar{z}_2\bar{z}_3| = 12$$

$$\Rightarrow \left|\frac{9\times 9}{z_1z_2} + \frac{4\times 9}{z_1z_3} + \frac{36}{z_2z_3}\right| = 12$$

$$3|z_1 + z_2 + z_3| = |z_1||z_2||z_3|$$

$$\Rightarrow |\Sigma z_1| = 2$$