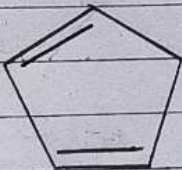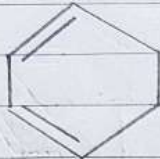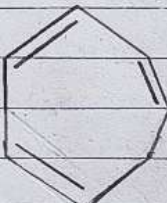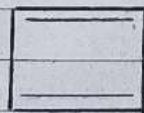Aromaticity, Anti-aromaticity,
Non-Aromaticity

Assignment - 1a. | Debarghya Barik
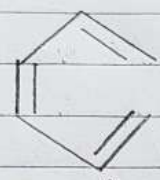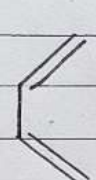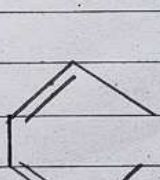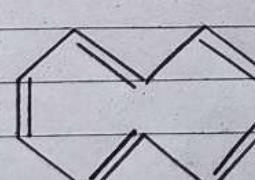 | RA2011026010022

S.NO	Type/Nature	Compound	Reason (s)
a.			
1.	Anti-aromatic	1,3,5,7-cycloocta--tetraene	a. A cyclic compound. b. sp^2 hybridised. Planar compound. c. By Huckel's rule, i) $\quad 4n+2 = 8 \quad$ ($\because$ 8 π e^- are there) $\Rightarrow 4n = 8-2 = 6$ $\Rightarrow 4n = 6$ $\Rightarrow n = 6/4 = 3/2 = 1.5$ $\therefore n$ is not integral, $\therefore$ compound not aromatic. ii) $\quad 4n = 8 \quad$ ($\because$ 8π e^- are there) $\Rightarrow n = 8/4 = 2$ $\therefore n$ is integral number, $\therefore$ compound is anti-aromatic (Ans)
2.	Non-aromatic	1,3-cyclopenta diene	a. A cyclic compound. b. One C centre is sp^3 hybridized. Thus overall molecule is non-planar. c. Huckel's rule not applicable. So compound is non aromatic (Ans)
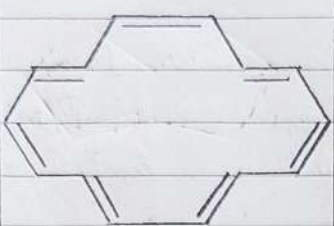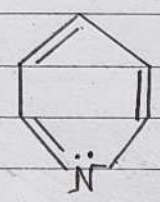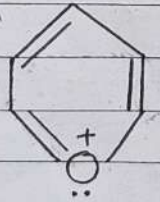
SN	Nature	Compound	Reasons
3.	Non-aromatic	1,3-cyclohexa-diene.	a. A cyclic compound. b. 2-C centres are sp^3 hybridized. So overall compound is non-planar. e. c. Huckel's rule not applicable. So compound is non-aromatic (Ans)
4.	Non-aromatic	1,3,6-cyclohepta-triene	a. A cyclic compound. b. 1 C centre is sp^3 hybridized c. Huckel's rule not applicable. So compound is non aromatic. (Ans)
5.	Anti-aromatic	cyclobutadiene	a. A cyclic compound. b. sp^2 hybridized. Planar compound. c. By Huckel's rule: i) $\quad 4n+2 = 4 \quad (2\ \pi\ bonds)$ $\Rightarrow 4n = 4-2 = 2$ $\Rightarrow n = 2/4 = 0.5$ ∴ n is fraction, so compound is not aromatic.

SN	Nature	Compound	Reasons
			ii) $4n = 4$ (2π bonds)
			$\Rightarrow n = 4/4 = 1$
			∴ n is integral number, so compound is anti-aromatic in nature.
6.	Non-aromatic	1,3,5-hexatriene	a. Not a cyclic compound. b. Sp^2 hybridized. Planar molecule. c. Huckel's rule not applicable. ∴ it is not a cyclic compound, ∴ it is not aromatic in nature.
7.	Non-aromatic	1,3-butadiene.	a. Not a cyclic compound. b. sp^2 hybridized. Planar molecule. c. Huckel's rule not applicable ∴ it is not a cyclic compound, ∴ it is not aromatic in nature.
8.	Non-aromatic	2,4-hexadiene.	a. Not a cyclic compound. b. sp^2 hybridized. Planar molecule. c. Huckel's rule not applicable. ∴ it is not a cyclic compound, ∴ it is non aromatic in nature
9.	Aromatic	[10]-annulene	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. By Huckel's rule: $4n+2 = 10$ [5π bonds] $\Rightarrow 4n = 10-2 = 8 \Rightarrow 4n = 8 \Rightarrow n = 2$ ∴ n is integral number, ∴ the compound is aromatic in nature.

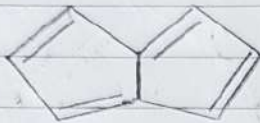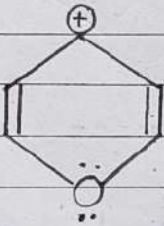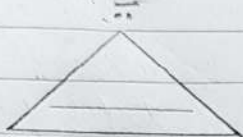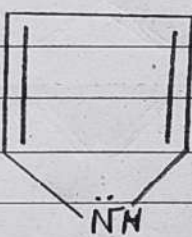| S.N	Nature	Compound	Reasons
10.	Aromatic.	[14]-annulene	a. A cyclic compound. b. Sp^2 hybridized. Planar molecule. c. By Huckel's rule; $\quad 4n+2 = 14 \quad [\because 7\pi \text{ bonds}]$ $\Rightarrow 4n = 14-2 = 12$ $\Rightarrow n = 12/4 = 3$ $\therefore n$ is integral number $\therefore$ the compound is aromatic in nature (Ans)
11.	Aromatic	pyridine.	a. A cyclic compound. b. Sp^2 hybridized. Planar molecule c. By Huckel's rule; $\quad 4n+2 = 6 \quad [\because 3\pi \text{ bonds}]$ $\Rightarrow 4n = 4$ $\Rightarrow n = 4/4 = 1$ $\therefore n$ is integral. So the compound is aromatic in nature. (Ans)
12.	Aromatic	pyranosium cation	a. A cyclic compound. b. Sp^2 hybridized. Planar molecule. c. By Huckel's rule, $\quad 4n+2 = 6 \quad [\because 3\pi \text{ bonds}]$ $\Rightarrow 4n = 4$ $\Rightarrow n = 4/4 = 1$ $\therefore n$ is integral, so the compound is aromatic in nature. (Ans)

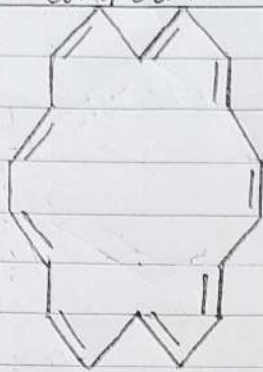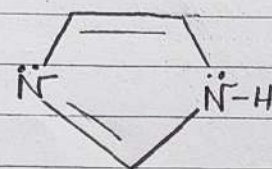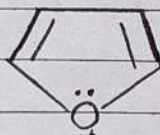| SN	Nature	Compound	Reasons.
13.	Anti-aromatic		a. It is a cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $\qquad 4n+2 = 4$ [∵ 2 π bonds] $\qquad \rightarrow 4n = 2$ $\qquad " \ n = 2/4 = 0.5$ ∵ n is not an integral number, so compound is non-aromatic. ii) $4n = 4$ [∵ 2π bonds] $\qquad \rightarrow n = 4/4 = 1$ ∵ n is integral. ∴ the compound is anti-aromatic in nature (Ans)
14.	Aromatic		a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $\qquad 4n+2 = 6$ [∵ 3π bonds] $\qquad \rightarrow 4n = 6-2 = 4$ $\qquad \rightarrow n = 4/4 = 1$ ∵ n is integral, ∴ the compound is aromatic in nature. (Ans)
15.	Non-aromatic		a. Not a cyclic compound b. 2 sp^3 hybridized C centres. ∴ Not a planar molecule. c. Huckel's rule not applicable. ∴ The compound is non aromatic in nature. (Ans)

S.N	Nature	Compound	Reasons
16.	Anti-aromatic		a. A cyclic compound.

a. A cyclic compound.
b. Sp^2 hybridized. Planar molecule.
c. i) By Huckel's rule;
$$4n+2 = 8 \quad [\because 4\pi \text{ bonds}]$$
$$\Rightarrow 4n = 6$$
$$\Rightarrow n = 6/4 = 3/2 = 1.5$$
$\therefore$ n is not an integral number, so the compound is not aromatic.
ii) $4n = 8 \quad [\because 4\pi \text{ bonds}]$
$$\Rightarrow n = 8/4 = 2$$
$\therefore$ n is integral, so the compound is Anti-aromatic in nature (Ans)

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17. Anti-aromatic

a. A cyclic compound.
b. Sp^2 hybridized. Planar molecule
c. i) By Huckel's rule,
$$4n+2 = 4 \quad (\because 2\pi \text{ bonds})$$
$$\Rightarrow 4n = 2$$
$$\Rightarrow n = 2/4 = 0.5$$
$\therefore$ n is not integral, $\therefore$ the compound is not aromatic.

ii) $4n = 4 \quad (\because 2\pi \text{ bonds})$
$$\Rightarrow n = 4/4 = 1$$

$\therefore$ n is integral, $\therefore$ the compound is anti-aromatic in nature.
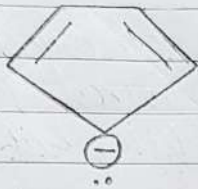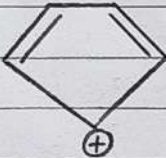
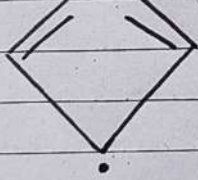| S.N	Nature	Compound	Reasons
18.	Anti - Aromatic	cyclopropene anion.	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $\qquad 4n+2 = 4 \quad (1\pi + 1 \text{lone pair})$ $\qquad \Rightarrow 4n = 2$ $\qquad \Rightarrow n = 2/4 = 0.5$ $\therefore$ n is fraction, the molecule is non-aromatic. $\qquad$ ii) $4n = 4 \quad (1\pi + 1 lp)$ $\qquad \Rightarrow n = 4/4 = 1$ $\therefore$ n is integral, the molecule is antiaromatic in nature.
19.	Anti-aromatic	$\overset{..}{N}H$	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $\qquad 4n+2 = 4 \quad [\because 2\pi \text{ bonds}]$ $\qquad \Rightarrow 4n = 4-2 = 2$ $\qquad \Rightarrow n = 2/4 = 0.5$ $\because$ n is not an integral number, so compound is not aromatic. $\qquad$ ii) $4n = 4 \quad [\because 2\pi \text{ bonds}]$ $\qquad \Rightarrow n = 4/4 = 1$ $\therefore$ n is integral, so the compound is anti aromatic in nature.

SN	Nature	Compound	Reasons
20.	Aromatic.	[18]-annulene	a. A cyclic compound b. sp^2 hybridized. Planar molecule. c. By Huckel's rule; $\quad 4n+2 = 18 \quad [\because 9\pi \text{ bonds}]$ $\Rightarrow 4n = 16$ $\Rightarrow n = 16/4 = 4$ $\because n$ is an integral number, so the given compound is aromatic in nature.
21.	Anti-aromatic	Histidin	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $\quad 4n+2 = 6 \quad [\because 2\pi \text{ bonds}]$ $\quad \Rightarrow 4n = 4 \qquad +1\text{lp}.$ $\quad \Rightarrow n = 2/4 = 0.51$ [$\because n$ is a fraction, the compound is non-aromatic ii) $\quad 4n = 4 \quad [\because 2\pi \text{ bonds}]$ $\quad \Rightarrow n = 4/4 = 1$] $\because n$ is integral, the compound is anti-aromatic in nature
22.	Aromatic	furan	a. A cyclic compound. b) sp^2 hybridized. Planar molecule. c. By Huckel's rule; $\quad 4n + 2 = 6 \quad (2\pi + 1\text{lp})$ $\quad \Rightarrow 4n = 4$ $\quad \Rightarrow n = 1$ $\because n$ is integral, so the compound is aromatic in nature.

S.N	Nature	Compound	Reasons.
23.	Aromatic	cyclopent-1,3-diene anion.	a: A cyclic compound. b. sp^2 hybridised. Planar molecule. c. By Huckel's rule; $4n+2 = 4+2 \ (2\pi + 2\,lp)$ $= 6$ $\Rightarrow 4n = 6-2 = 4$ $\Rightarrow n = 4/4 = 1$ ∴ n is integral, so the compound is aromatic in nature.
24.	Anti aromatic	cyclopent-1,3-diene cation.	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $4n+2 = 4 \quad (2\pi \ bonds)$ $\Rightarrow 4n = 2$ $\Rightarrow n = 2/4 = 0.5$ ∴ n is fraction, so compound is non aromatic. ii) $4n = 4 \quad (2\pi \ bonds)$ $\Rightarrow n = 4/4 = 1$ ∴ n is integral, So compound is anti-aromatic.
25.	Non-aromatic	cyclopent-1,3-diene radical.	a. A cyclic compound. b. sp^2 hybridized. Planar molecule. c. i) By Huckel's rule; $4n+2 = 4+1 \ (2\pi + 1 \ lone \ e^-)$ $\Rightarrow n = 3/4$ ∴ n is fraction, compound non aromatic. ii) $4n = 4+1 \ (2\pi + 1 \ lone \ e^-)$ $\Rightarrow n = 5/4$ ∴ n is fraction, compound not anti-aromatic so the compound is non-aromatic (AN)
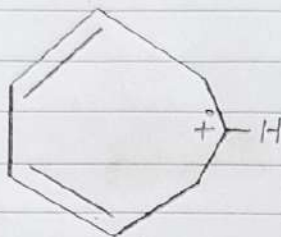
26.	Non aromatic		a. A cyclic compound. b. sp^4 hybridized. Planar molecule. c. By Huckel's rule: $4n+2 = 4+1$ (2π bonds + 1 $\Rightarrow 4n = 3$ lone e^-) $\Rightarrow n = 3/4$ $\therefore$ n is fraction, $\therefore$ compound is not aromatic. ii) $4n = 4+1$ (2π bonds + 1 lone $\Rightarrow n = 5/4$ e^-) $\therefore$ n is fraction, $\therefore$ compound is not anti aromatic. $\therefore$ The compound is non aromatic in nature. (Ans)

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RA2011026010022