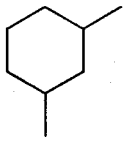
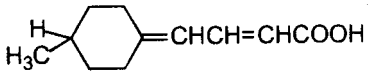
NUMBER OF STEREOISOMERS

Q.1 How many stereoisomers are possible for the following molecule ?



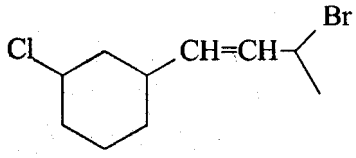
(A) 1 (B) 2 (C) 3 (D) 4

Q.2 How many stereoisomers are possible for the following molecule ?



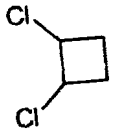
(A) 1 (B) 2 (C) 3 (D) 4

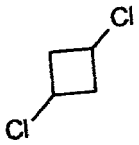
Q.3 How many stereoisomers are possible for the following molecule :

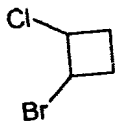


(A) 4 (B) 8 (C) 10 (D) 16

Q.4 What is the correct order of compounds for increasing number of stereoisomers

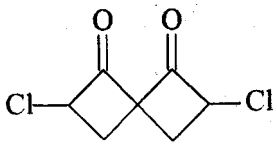
(I) 

(II) 

(III) 

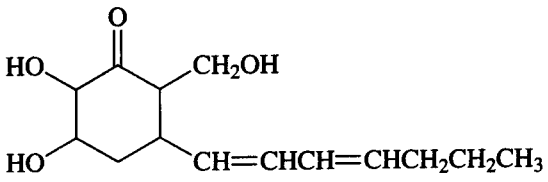
(A) II < I < III (B) I < II < III
(C) II < III < I (D) All have same no. of isomers.

Q.5 How many stereoisomers are possible for the following molecule ?



(A) 2 (B) 3 (C) 4 (D) 8

Q.6 A naturally occurring substance has the constitution shown. How many stereoisomers may have this constitution ?



(A) 2 (B) 8 (C) 16 (D) 64

Q.7 If a compound has n asymmetric carbon atoms, then maximum number of optical isomer are given by the formula

(A) $\left(\frac{1}{2}\right)^n$ (B) 2^n (C) $2\sqrt{n}$ (D) $\sqrt{2n}$

Q.8 The number of possible racemic forms in Glucose are -

(A) 4 (B) 8 (C) 12 (D) 16

Q.9 How many stereoisomeric aldohexoses are possible ? (All are known).

(A) 4 (B) 8 (C) 12 (D) 16

Q.10 The number of meso forms in the compound given below is

$HOOCCH(CH_3)CH(OH)CH(Cl)CH(OH)CH(CH_3)COOH$

(A) 4 (B) 3 (C) 16 (D) 8

ANSWER KEY

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.	C	D	D	A	D	D	B	B	D	A

SOLUTIONS (NUMBER OF STEREOISOMERS)

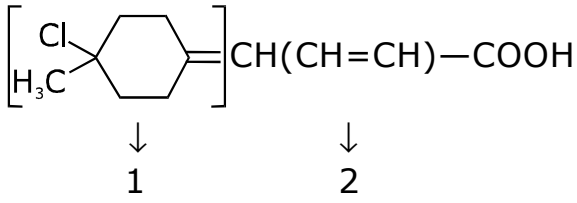
Ans.1 Molecule has an even no. of chiral carbon atoms and has an plane of symmetry optically active forms $= 2^{n-1}$

n = no. of chiral carbons = 2

$= 2^{2-1} = 2$

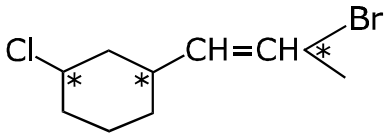
Meso form $= 2^{n/2-1} = 2^{2/2-1} = 1$

Total no. of stereoisomers = 2 + 1 = 3

Ans.2 

There are two stereogenic centre in above molecule

$2^2 \Rightarrow 4$

Ans.3 

Total number of chiral centers are 4 (one due to one double bond)

No. of stereoisomers = 2^2

n = No. of stereogenic centre

$= 2^4 \Rightarrow 16$

Ans.4 II has no chiral carbon.

III has even no. of chiral carbons (i.e. 2) and has no plane of symmetry.

Optically active forms $= 2^2 = 4$

Meso $= 0$

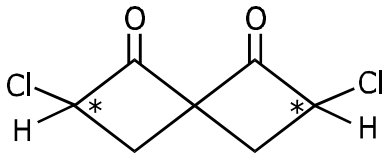
Total no. of stereoisomers = 4

I has 2 chiral carbon & has plane of symmetry

optically active forms $= 2^{2-1} = 2$

Meso $= 2^{2/2-1} = 1$

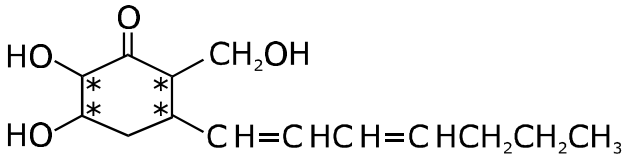
Total no. of stereoisomers = 2 + 1 = 3

Ans.5 

Molecule has 3 stereogenic centre i.e. 2 are chiral carbon atoms (marked with asterisk) and one stereogenic centre is due to spiro component.

Total no. of stereoisomers = $2^3 = 8$

Ans.6



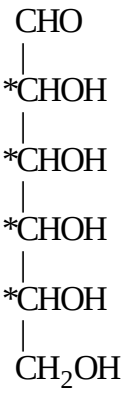
$2^6 \Rightarrow 64$

There are 6 stereogenic centres.
(4 due to four chiral centres and 2 due to two double bonds)

Ans.7 2^n

Ans.8 Glucose has 4 chiral carbons and it is unsymmetrical molecule so number of racemic forms are $\frac{2^n}{2} = \frac{2^4}{2} = 8$

Ans.9



Aldohexose

There are 4 chiral carbon atoms in aldohexose
No. of stereoisomers = 2^4
= 16

Ans.10 The number of chiral carbons = 5 (odd number). It is symmetrical molecule so no. of meso forms

$= 2^{\left(\frac{n}{2}-\frac{1}{2}\right)} = 2^{\left(\frac{5}{2}-\frac{1}{2}\right)} = 2^2 = 4.$