--Question Starting--
Match the following groups with their corresponding properties related to algebraic structures:
1. Groups 2. Rings 3. Fields
A. Every non-zero element has a multiplicative inverse
B. The set is closed under two operations, addition and multiplication, satisfying distributivity
C. The additive structure is an abelian group
D. The multiplicative structure (excluding zero) is an abelian group
Choose the correct answer from the options given below:
(1) 1-C, 2-B, 3-A
(2) 1-D, 2-C, 3-B
(3) 1-A, 2-D, 3-C
(4) 1-B, 2-A, 3-D
Answer Key: 3
Solution:
? Groups: A set with a single operation, where each element has an inverse, and the operation is associative. For an abelian group, the operation is commutative.
? Rings: An algebraic structure with two operations; addition forms an abelian group, multiplication is associative, and distributivity holds.
? Fields: A ring where every non-zero element has a multiplicative inverse, and multiplication is commutative, making the non-zero elements form an abelian group under multiplication.
Matching these, the properties correspond as follows:
? Group: The inverse property (A) and abelian nature (D) for the additive group.
? Ring: Closure with addition and multiplication, with distributivity (B).
? Field: The multiplicative inverse for non-zero elements, (A), and multiplicative commutativity (D).
Hence, Option (3) is the right answer.

--Question Starting--
3. Match the following graph types with their defining characteristics:
1. Tree 2. Bipartite Graph 3. Eulerian Path
A. Contains a path traversing each edge exactly once, with all vertices of even degree
B. Vertices can be split into two disjoint sets such that every edge connects a vertex from each set
C. A connected acyclic graph with n vertices and n-1 edges
Choose the correct answer from the options given below:
(1) 1-C, 2-B, 3-A
(2) 1-B, 2-C, 3-A
(3) 1-C, 2-A, 3-B
(4) 1-A, 2-B, 3-C
Answer Key: 3
Solution:
? Tree: An acyclic connected graph with n vertices and n?1 edges, which is minimal and contains no cycles.
? Bipartite Graph: Vertices can be partitioned into two disjoint sets such that edges are only between these sets.
? Eulerian Path: A path that uses each edge exactly once; such a path exists if and only if the graph is connected and has exactly 0 or 2 vertices of odd degree.
In particular, an Eulerian circuit (a special case) occurs when all vertices are of even degree, which is a subset of Eulerian paths.
Matching these, the characteristics are:
? Tree: (C)
? Bipartite Graph: (B)
? Eulerian Path: (A)
Hence, Option (3) is the right answer.