Answer 1:
   The size of the phenotypic search space is:-
   the number of possible sets of vertices are 2^n.
   Excluding the empty set, $2^n - 1$.

Answer 2:

 We can represent each vertex in the graph with a binary digit in the genotype.
 1 to indicate the presence of the corresponding vertex in the phenotype, and
 0 to indicate the absence of the vertex in the phenotype.

Answer 3:

In the given graph we have 8 vertices.
Binary genotype is "01101010" = {2, 3, 5, 7 }.
Vertex Absent represented by 0.
Vertex present represented by 1.

Answer 4:

Fitness function for the given phenotype:
F(p) = (The number of edges covered by p)-(Number of vertices covered by p).

Answer 5:

Number of edges covered by p=8
Number of vertices covered by p=4
F(p)=8-4=4

Answer 6:

Number of edges covered by p=11
Number of vertices covered by p=5
F(p)=11-5=6

Answer 7:

The swap mutation might be a bad idea when it comes to solving the minimum vertex cover problem because it might swap vertices that do not provide edge coverage and could lead to invalid solutions. Moreover, it can cause the algorithm to get stuck in local optima

Answer 8:

(i)   Algorithm may get stuck in local optima.
(ii)   It may take a very long time to find an optimal solution to the minimum vertex cover problem because the search space is exponential.

Answer 9:

Additional termination criterion could be to set a maximum number of generations or evaluations, to make sure that Algorithm will stop after certain time.