

1. Activated carrier molecules are essential for biosynthesis. ATP is the most widely used activated carrier molecule in cells, which carries the phosphate group and can transfer the phosphate group to another molecule. Please identify the group carried in high energy linkage that are listed in the right column for the activated carrier molecules that are listed in the left column (15%).

Activated carrier	Group carried in high-energy linkage
NADH, NADPH, FADH ₂	glucose
Carboxylated biotin	Electrons and hydrogens
S-Adenosylmethionine	Methyl group
Uridine diphosphate glucaose	Acetyl group
Acetyl CoA	Carboxyl group

2. If a protein contains 100 amino acids, how many nucleotides will be present in the gene that codes for this protein (20%)?
3. In one type of diabetes, the plasma concentration of the hormone insulin is normal, but the response of the cells to which insulin usually binds is markedly decreased. Suggest as many possible reasons as you can for this in terms of the properties of protein binding sites (15%).
4. What will happen to cell volume if a cell is placed in each of the following solutions (20%)?

Solution	Concentration, mM	
	NaCl (nonpenetrating)	Urea (penetrating)
A	150	100
B	100	150
C	200	100
D	100	50

5. Please explain the following terms or techniques (30%).
- Dominant negative mutant
 - Reporter gene
 - Gel eletrophoresis mobility shift assay
 - Transcriptome
 - SNP
 - siRNA