1. Adoptive cell transfer refers to (2 points)
   a) Stem cell transplantation from the same patient
   b) Transplantation of engineered T-cells from the same patient
   c) Stem cell transplantation from another donor
   d) Stem cell transplantation for tissue regeneration

2. Adjuvants are (2 points)
   a) Molecules secreted by the tumor cells
   b) Proteins/peptides expressed on the surface of pathogens (viruses, bacteria etc)
   c) Additional molecules added with vaccine to increase the efficacy
   d) Steroid molecules produced by the infected cell

3. Which of the statement is true? (2 points)
   a) T cells produce antibody
   b) Macrophages produce antibody
   c) Dendritic cells produce antibody
   d) B cells produce antibody

4. Proteins and peptides are made up of amino acids. The peptide ideally consists of (2 points)
   a) Less than 60 amino acids
   b) Less than 50 amino acids
   c) Less than 40 amino acids
   d) Less than 35 amino acids

5. Ostwald ripening refers to (2 points)
   a) Nanoparticle formation assisted by polymers
   b) Nanoparticle crystal growth by digestion of larger particles
   c) Crystal growth by the aggregation of smaller particles
   d) Maturation of self-assembled lipid bilayer in liposomes

   Answer any 10 out of the following 12 questions

6. What is the difference between the Phase I and Phase II drug metabolism? Give one examples of enzymes or molecules that drives phase I and phase II metabolism. (5 points)
7. siRNA can be employed for treating many diseases which could not be treated by drugs. However, even though we could deliver them using nanoparticles, their biological response is relatively low. What are the possible reasons for its failure? Suggest few solutions to overcome it. (5 points)

8. Explain the different mechanisms by which the monoclonal antibody could be used to treat different diseases. 5 points

9. Why is it beneficial to use a controlled drug delivery system? Write three ways we can engineer such a delivery system (2+3 points).

10. Peptides have enormous potential to function as a drug. Write three ways we can improve the in-vivo stability of sensitive peptides. (5 points)

11. Explain what is ‘First-pass effect’. How can we avoid first pass effect? (5 points)

12. What is a pro-drug? Why is it used in drug delivery? Give one example (5 points)

13. What is the therapeutic index of a drug? How is it estimated? (5 points)

14. What is the difference between the adenovirus and retrovirus-based gene delivery vectors? Which of them is safer to use? (5 points)

15. Explain the double emulsion polymerization method for nanoparticle synthesis. Why are they used? (5 points)

16. Write three key barriers for the delivery of nanoparticle in-vivo. (5 points)

17. Write key advantages and challenges of non-viral gene delivery methods (e.g. cationic lipids based gene delivery) (5 points)