BMT-73316 2019-01 Nanomedicine and Advanced Drug Delivery Systems

Examination 10.05.2019
Time: 3 h
Points: 70

Objective questions. Find one correct answer

1. The peptide ideally made of how many amino acids? (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

2. 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

3. Which of the following is **NOT** a parenteral drug delivery? (2 points)
   a) Administration of drugs to skin
   b) Intramuscular drug delivery
   c) Oral drug delivery
   d) Intravenous drug delivery

4. Which of the following enzyme is involved in drug metabolism in liver? (2 points)
   a) cyclooxygenase-2
   b) Cytochrome P450
   c) Cytochrome b
   d) Streptokinase

5. For designing plasmids for gene transfection, an antibiotic resistant gene is used
   (a) For efficient isolation and purification of plasmid
   (b) To enhance the stability of plasmids in-vivo
   (c) To prevent infections after in-vivo gene delivery
   (d) To prevent immune activation during gene delivery

6. Which of the following is **NOT** used for cancer vaccine applications?
   (a) Poly I : C (Polyinosinic-polycytidlylic acid)
   (b) Ovalbumin
(c) Dextran
(d) Cytosine-phosphate-guanine (CpG)

7. Which of the following statement is **false**?
(a) Prodrugs are drug precursors used to construct a bioactive drug molecule
(b) Prodrugs are biologically inert molecules
(c) Bipartite prodrug construct involves conjugation of drug to the carrier
(d) Tripartite product construct possesses a linker between the carrier and the drug

8. Which of the following statement is **false**? Very limited nanoparticle drugs are successful for osteo and rheumatoid arthritis because
(a) There are limited ways of reaching the inflamed joints
(b) Poor vascularity for the cartilage tissue limits the delivery
(c) High turnover rate of joint cavity limits the bioavailability of the drug
(d) Osteoarthritis and rheumatoid arthritis are autoimmune disease and difficult to treat

9. Buccal delivery refers to the delivery of drugs as
(a) Aerosols based drug delivery to lungs
(b) Delivery under the tongue
(c) skin patch
(d) intranasal delivery

10. The image presented in this question represents intestinal mucosa. Which of the statement is **true**?
(a) Drugs going through pathway A is paracellular pathway
(b) Drugs passing through pathway B is receptor mediated transcytosis
(c) Drugs passing through pathway B is paracellular pathway
(d) Drugs passing through pathway B represents absorption mediated transcytosis

**Answer any 10 out of the remaining 12 questions**

11. Can living cells be used as a drug carrier? suggest two examples (5 points)

12. Why a controlled drug delivery system is important? Explain using a dose response curve. (3 points)
Give an example of two devices that can promote a controlled drug delivery (NOT nanoparticles). (2 points)

13. What are the key differences between pharmacokinetics and pharmacodynamics? Suggest two ways to improve the pharmacokinetics of the drug. (3+2 points)
14. Coating of nanoparticles with polyethylene glycols (PEGs) are the most common strategy to improve the blood circulation time of the nanoparticles. What is the major drawback with this strategy? (5 points)

15. What is the difference between retro-virus based gene delivery vector over adeno-virus based vectors. Which is safer to use? Why? (3+2 points)

16. Peptides are prone to enzymatic degradation. Give any three strategies for peptide stabilization that could improve its stability and function (do not write encapsulating peptides in nanoparticles). (5 points)

17. Write any three main challenges of cell-based therapy that are different from nanoparticle-based therapy? (5 points)

18. Among gold nanorods and nanospheres, which is better for cancer photothermal therapy? Why? (5 points)

19. Explain the first pass effect and suggest ways to escape it. (3 points) What is Volume of Distribution? (2 points)

20. What are the key differences between liposomes and micelles? (2 points) How can we load hydrophilic and hydrophobic drugs in liposomes? (3 points)

21. What is DNA recombinant technology? (3 points) Give examples of two well-known drugs made using this Nobel prize winning technology. (2 points)

22. What is antisense technology? (3 points) How is it used for treating Muscular Dystrophy? (2 points)