UNIT III: ARTIFICIAL KIDNEY

1. The primary indication for hemodialysis is _____ failure.
   a) Liver
   b) Kidney
   c) Lung
   d) Heart
   Answer: b) Kidney

2. Haemodialysis works on the principle of _____ and diffusion to remove waste products from the blood.
   a) Osmosis
   b) Ultrafiltration
   c) Absorption
   d) Filtration
   Answer: b) Ultrafiltration

3. The process of haemodialysis requires a semipermeable _____ to separate blood from the dialysate.
   a) Membrane
   b) Tube
   c) Gel
   d) Resin
   Answer: a) Membrane

4. The composition of _____ is carefully controlled to prevent imbalances in electrolytes and waste removal during dialysis.
   a) Plasma
   b) Dialysate
   c) Urine
   d) Serum
   Answer: b) Dialysate

5. The most commonly used membrane in modern hemodialysis machines is made of _____.
   a) Cellulose
   b) Polysulfone
   c) Polyvinyl chloride
   d) Rubber
   Answer: b) Polysulfone

6. The two major types of hemodialyzers are hollow fiber dialyzers and _____ dialyzers.
   a) Parallel plate
   b) Cylindrical
   c) Rotating
   d) Tubular
   Answer: a) Parallel plate

7. The efficiency of a hemodialyzer is determined by its surface area and _____ permeability.
   a) Temperature
   b) Pressure
   c) Membrane
   d) Electrical
   Answer: c) Membrane

8. _____ is an advanced dialysis system designed to be worn as a portable device for continuous treatment.
   a) Wearable artificial kidney
   b) Continuous renal replacement therapy
   c) Implantable hemodialyzer
   d) Extracorporeal circuit
   Answer: a) Wearable artificial kidney

9. The major advantage of a **wearable artificial kidney** is improved _____ compared to conventional dialysis machines.
   a) Size
   b) Portability
   c) Cost
   d) Noise
   Answer: b) Portability

10. In hemodialysis, **uremic toxins** are removed by diffusion across the _____ membrane.
    a) Impermeable
    b) Selectively permeable
    c) Metallic
    d) Non-porous
    Answer: b) Selectively permeable

11. The main purpose of ultrafiltration in haemodialysis is to remove excess _____ from the blood.
    a) Protein
    b) Glucose
    c) Fluid
    d) Hemoglobin
    Answer: c) Fluid

12. A major risk during haemodialysis is the loss of essential _____ such as sodium and potassium.
    a) Hormones
    b) Electrolytes
    c) Proteins
    d) Enzymes
    Answer: b) Electrolytes

13. The **blood flow rate** in a standard hemodialysis session typically ranges from _____ mL/min.
    a) 50–100
    b) 200–500
    c) 800–1000
    d) 1000–1500
    Answer: b) 200–500

14. The presence of a **dialysis fistula** helps provide adequate _____ access for haemodialysis.
    a) Arterial
    b) Venous
    c) Both arterial and venous
    d) Lymphatic
    Answer: c) Both arterial and venous

15. The effectiveness of dialysis is monitored by measuring _____ reduction ratio (URR).
    a) Urea

b) Creatinine
c) Glucose
d) Albumin
Answer: a) Urea

16. A significant complication of long-term dialysis is **dialysis-related _____ disease** affecting bones.
a) Cardiovascular
b) Hepatic
c) Mineral
d) Neurological
Answer: c) Mineral

17. The primary function of the dialysate is to maintain _____ balance while removing waste products.
a) Hormonal
b) Electrolyte
c) Oxygen
d) Lipid
Answer: b) Electrolyte

18. The removal of **middle molecules** in haemodialysis requires the use of _____ flux membranes.
a) Low
b) Medium
c) High
d) Non-porous
Answer: c) High

19. **Implantable artificial kidneys** are being developed as a permanent alternative to _____.
a) Blood transfusion
b) Traditional dialysis
c) Chemotherapy
d) Kidney biopsy
Answer: b) Traditional dialysis

20. The primary advantage of **implantable artificial kidneys** is their ability to provide continuous _____.
a) Blood flow
b) Filtration
c) Oxygenation
d) Nutrient supply
Answer: b) Filtration

21. One of the most common complications of hemodialysis is a sudden drop in _____.
a) Heart rate
b) Blood pressure
c) Oxygen levels
d) Blood glucose
Answer: b) Blood pressure

22. Long-term dialysis can lead to _____ due to reduced kidney function and calcium imbalance.
a) Anemia
b) Hyperkalemia
c) Bone disease

d) Hypertension
Answer: c) Bone disease

23. The most frequent cause of infection in hemodialysis patients is due to contamination of the _____.
    a) Dialysate
    b) Water supply
    c) Vascular access site
    d) Dialyzer
    Answer: c) Vascular access site

24. Excess removal of _____ during hemodialysis can lead to muscle cramps.
    a) Calcium
    b) Sodium
    c) Potassium
    d) Fluid
    Answer: d) Fluid

25. One of the metabolic complications of hemodialysis is _____ syndrome caused by rapid shifts in fluid and solute levels.
    a) Nephrotic
    b) Disequilibrium
    c) Dialysis-encephalopathy
    d) Uremic
    Answer: b) Disequilibrium

26. Hemodialysis patients are at high risk for _____ due to reduced erythropoietin production.
    a) Hypertension
    b) Anemia
    c) Hyperlipidemia
    d) Acidosis
    Answer: b) Anemia

27. _____ is a severe condition caused by aluminum accumulation in dialysis patients using non-purified dialysate water.
    a) Osteoporosis
    b) Dialysis dementia
    c) Hypercalcemia
    d) Nephritis
    Answer: b) Dialysis dementia

28. The biocompatibility of a hemodialysis membrane is measured by its ability to reduce _____ activation.
    a) White blood cell
    b) Platelet
    c) Red blood cell
    d) Enzyme
    Answer: a) White blood cell

29. A major concern in hemodialysis is _____ activation, which can lead to clotting issues.
    a) Hemoglobin
    b) Complement system
    c) Sodium pump

d) Phagocytosis
Answer: b) Complement system

30. Biocompatible dialysis membranes aim to minimize the release of inflammatory _____.
    a) Cytokines
    b) Hormones
    c) Enzymes
    d) Vitamins
    Answer: a) Cytokines

31. Synthetic dialysis membranes, such as polysulfone, have better _____ compared to cellulose-based membranes.
    a) Water permeability
    b) Toxicity
    c) Rigidity
    d) Heat resistance
    Answer: a) Water permeability

32. High-flux dialyzers use membranes with larger _____ to remove middle molecules more effectively.
    a) Thickness
    b) Surface area
    c) Pore size
    d) Charge density
    Answer: c) Pore size

33. The most promising alternative to conventional dialysis is the development of _____ kidneys.
    a) Wireless
    b) Bionic
    c) Optical
    d) External
    Answer: b) Bionic

34. A key advantage of **bioartificial kidneys** is their ability to use living _____ cells for filtration.
    a) Skin
    b) Endothelial
    c) Kidney
    d) Liver
    Answer: c) Kidney

35. **Nanotechnology-based dialysis** systems are being explored to improve _____ removal efficiency.
    a) Toxin
    b) Oxygen
    c) Blood flow
    d) Dialysate temperature
    Answer: a) Toxin

36. One of the major challenges in developing an implantable artificial kidney is preventing _____ formation.
    a) Scar
    b) Clot
    c) Biofilm

d) Cancerous
Answer: b) Clot

37. Wearable artificial kidneys aim to provide **continuous** dialysis, reducing dependence on _____ dialysis sessions.
    a) Weekly
    b) Intermittent
    c) Nocturnal
    d) Acute
    Answer: b) Intermittent

38. **CRRT (Continuous Renal Replacement Therapy)** is typically used for patients with _____ kidney injury.
    a) Acute
    b) Chronic
    c) Inherited
    d) Genetic
    Answer: a) Acute

39. Future artificial kidney designs are exploring the use of _____ energy sources to enhance portability.
    a) Solar
    b) Thermal
    c) Battery-powered
    d) Kinetic
    Answer: c) Battery-powered

40. A major advantage of implantable artificial kidneys over traditional dialysis is the elimination of _____ fluid exchange.
    a) Plasma
    b) Peritoneal
    c) Heparinized
    d) Saline
    Answer: b) Peritoneal

41. The efficiency of hemodialysis is measured by the clearance of _____.
    a) Sodium
    b) Creatinine
    c) Urea
    d) Albumin
    Answer: c) Urea

42. The standard measure of dialysis adequacy is the _____ ratio.
    a) Urea Reduction
    b) Hemoglobin
    c) Sodium-Potassium
    d) Calcium-Phosphate
    Answer: a) Urea Reduction

43. _____ is the most commonly used parameter to assess dialysis efficiency.
    a) KT/V
    b) Blood Pressure
    c) Urine Output

d) Blood Sugar Level
Answer: a) KT/V

44. High-flux dialyzers improve toxin removal by increasing the _____.
    a) Filtration speed
    b) Dialysate volume
    c) Membrane permeability
    d) Blood pressure
    Answer: c) Membrane permeability

45. Dialysis clearance depends on blood flow rate, dialysate flow rate, and _____ area.
    a) Dialyzer membrane
    b) Patient skin
    c) Stomach lining
    d) Liver tissue
    Answer: a) Dialyzer membrane

46. Dialysis disequilibrium syndrome occurs due to a rapid change in _____ concentration.
    a) Oxygen
    b) Sodium
    c) Urea
    d) Glucose
    Answer: c) Urea

47. An ideal dialyzer should have high permeability for toxins but low permeability for _____.
    a) Electrolytes
    b) Water
    c) Proteins
    d) Carbon dioxide
    Answer: c) Proteins

48. Patients on hemodialysis should restrict their intake of _____ to prevent hyperkalemia.
    a) Sodium
    b) Potassium
    c) Calcium
    d) Iron
    Answer: b) Potassium

49. **Dry weight** in dialysis patients refers to the weight after removing excess _____.
    a) Protein
    b) Fluid
    c) Glucose
    d) Urea
    Answer: b) Fluid

50. Hemodialysis patients are often prescribed erythropoietin to prevent _____.
    a) Dehydration
    b) Anemia
    c) High blood sugar
    d) Hypokalemia
    Answer: b) Anemia

51. The preferred vascular access for long-term hemodialysis is a/an _____.
    a) Central venous catheter
    b) Arteriovenous fistula
    c) Peripheral IV line
    d) Subclavian catheter
    Answer: b) Arteriovenous fistula

52. Patients undergoing **peritoneal dialysis** require regular monitoring for signs of _____.
    a) Dehydration
    b) Infection
    c) Anemia
    d) Hypercalcemia
    Answer: b) Infection

53. A major dietary recommendation for dialysis patients is to limit _____ to prevent fluid overload.
    a) Fiber
    b) Sugar
    c) Salt
    d) Fat
    Answer: c) Salt

54. Patients on hemodialysis should avoid excessive consumption of _____ due to phosphorus retention.
    a) Dairy products
    b) Green leafy vegetables
    c) Citrus fruits
    d) Lean meats
    Answer: a) Dairy products

55. Dialysis patients require regular monitoring of _____ levels to maintain bone health.
    a) Potassium
    b) Phosphorus
    c) Sodium
    d) Albumin
    Answer: b) Phosphorus

56. The main advantage of **wearable artificial kidneys** is the ability to provide _____ dialysis.
    a) Continuous
    b) Monthly
    c) Intermittent
    d) Emergency
    Answer: a) Continuous

57. Implantable artificial kidneys aim to eliminate the need for _____ access.
    a) Dialysis machine
    b) Catheter-based
    c) Blood pressure
    d) Insulin
    Answer: b) Catheter-based

58. The major challenge in wearable kidney technology is ensuring adequate _____ removal.
    a) Protein
    b) Oxygen

c) Water
d) Toxin
Answer: d) Toxin

59. **Bioartificial kidneys** incorporate living _____ cells to improve filtration.
a) Liver
b) Kidney
c) Bone marrow
d) Skin
Answer: b) Kidney

60. The wearable dialysis device operates by mimicking the function of a _____.
a) Dialyzer
b) Nephron
c) Heart pump
d) Ventilator
Answer: b) Nephron

61. A major benefit of an artificial kidney over traditional dialysis is a reduced risk of _____.
a) Infection
b) High blood pressure
c) Urinary retention
d) Low oxygen levels
Answer: a) Infection

62. Nanotechnology is being explored in artificial kidney research to develop ultra-thin _____ filters.
a) Polycarbonate
b) Silicon
c) Copper
d) Glass
Answer: b) Silicon

63. A key component in the future development of **implantable artificial kidneys** is the use of _____-powered systems.
a) Solar
b) Battery
c) Nuclear
d) Wireless
Answer: b) Battery

64. One of the major goals of artificial kidney research is to reduce patient dependence on _____.
a) Dialysis centers
b) Antibiotics
c) Blood transfusions
d) Insulin therapy
Answer: a) Dialysis centers

65. **Hemofiltration** in artificial kidney devices focuses on the removal of _____ instead of diffusion.
a) Proteins
b) Electrolytes
c) Solutes
d) Water
Answer: d) Water