Module 1.1 : HEART-LUNG MACHINE AND ARTIFICIAL HEART

1. The primary function of a Heart-Lung Machine (HLM) is to provide _____ and _____ to the patient's blood during cardiac surgery.
   a) Oxygenation, Circulation
   b) Cooling, Heating
   c) Compression, Relaxation
   d) Filtration, Absorption
   Answer: a) Oxygenation, Circulation

2. Oxygenators in heart-lung machines are classified into two types: _____ and _____.
   a) Hollow fiber, Bubble
   b) Pneumatic, Hydraulic
   c) Electrical, Magnetic
   d) Synthetic, Natural
   Answer: a) Hollow fiber, Bubble

3. The two main types of blood pumps used in heart-lung machines are _____ and _____.
   a) Roller, Centrifugal
   b) Axial, Rotary
   c) Hydraulic, Pneumatic
   d) Linear, Rotary
   Answer: a) Roller, Centrifugal

4. In a pulsatile pump, blood flow mimics the natural _____ of the heart.
   a) Contraction
   b) Relaxation
   c) Rhythmic beating
   d) Filtering
   Answer: c) Rhythmic beating

5. Continuous-flow pumps create a _____ flow of blood instead of pulsatile flow.
   a) Rhythmic
   b) Constant
   c) Irregular
   d) High-pressure
   Answer: b) Constant

6. The process of temporarily redirecting blood flow around a blocked artery is called _____.
   a) Shunting
   b) Hemodialysis
   c) Ventilation
   d) Coagulation
   Answer: a) Shunting

7. A primary indication for cardiac transplantation is _____ heart failure that is unresponsive to medical therapy.
   a) Acute
   b) Chronic
   c) Mild
   d) Secondary
   Answer: b) Chronic

8. The driving mechanism for an artificial heart can be _____ or _____.
   a) Pneumatic, Electric
   b) Thermal, Optical
   c) Magnetic, Hydraulic
   d) Chemical, Mechanical
   Answer: a) Pneumatic, Electric

9. Blood handling systems in artificial hearts must prevent _____ to avoid clot formation.
   a) Hemolysis
   b) Coagulation
   c) Cavitation
   d) Turbulence
   Answer: b) Coagulation

10. The schematic for a temporary bypass of the left ventricle involves connecting the left atrium to the _____ for blood circulation.
    a) Aorta
    b) Pulmonary vein
    c) Right atrium
    d) Vena cava
    Answer: a) Aorta

11. The Heart-Lung Machine takes over the function of the _____ and _____ during open-heart surgery.
    a) Liver, Kidney
    b) Heart, Lungs
    c) Stomach, Intestines
    d) Arteries, Veins
    Answer: b) Heart, Lungs
12. The oxygenation process in a heart-lung machine removes _____ from venous blood and adds _____.
    a) Oxygen, Carbon Dioxide
    b) Carbon Dioxide, Oxygen
    c) Nitrogen, Oxygen
    d) Oxygen, Nitrogen
    Answer: b) Carbon Dioxide, Oxygen
13. The bubble oxygenator allows blood to interact directly with _____.
    a) Nitrogen gas
    b) Oxygen gas
    c) Carbon monoxide
    d) Helium gas
    Answer: b) Oxygen gas
14. Hollow fiber oxygenators improve oxygenation by using a _____ membrane.
    a) Porous
    b) Non-porous
    c) Rigid
    d) Solid
    Answer: a) Porous
15. Centrifugal pumps in heart-lung machines work based on the principle of _____.
    a) Positive displacement
    b) Magnetic induction
    c) Rotational energy

d) Direct compression
Answer: c) Rotational energy

16. One of the major concerns in using an artificial heart is preventing _____ formation, which can lead to stroke.
    a) Blood clot
    b) Red blood cell
    c) Hemoglobin
    d) Electrolyte
    Answer: a) Blood clot
17. _____ is a key parameter monitored during heart-lung machine operation to ensure adequate tissue perfusion.
    a) Sodium concentration
    b) Blood pressure
    c) Lung capacity
    d) Liver function
    Answer: b) Blood pressure
18. The major disadvantage of a pulsatile pump in artificial hearts is its _____ size and complexity.
    a) Small
    b) Large
    c) Lightweight
    d) Transparent
    Answer: b) Large
19. The primary function of a left ventricular assist device (LVAD) is to pump blood from the _____ to the aorta.
    a) Right atrium
    b) Left ventricle
    c) Pulmonary vein
    d) Superior vena cava
    Answer: b) Left ventricle
20. A fully implantable artificial heart requires an external _____ to power it wirelessly.
    a) Battery
    b) Generator
    c) Pump
    d) Valve
    Answer: a) Battery
21. The primary function of the heart-lung machine is to temporarily replace the function of the _____ and _____ during cardiac surgery.
    a) Liver, Kidneys
    b) Brain, Spinal cord
    c) Heart, Lungs
    d) Intestines, Stomach
    Answer: c) Heart, Lungs
22. The main types of oxygenators used in heart-lung machines are _____ and _____.
    a) Bubble, Membrane
    b) Mechanical, Hydraulic
    c) Positive, Negative
    d) None of the above
    Answer: a) Bubble, Membrane
23. In a centrifugal pump, blood is propelled by _____ force instead of direct mechanical compression.
    a) Gravitational

b) Centrifugal
c) Magnetic
d) Static
Answer: b) Centrifugal

24. The artificial heart is primarily used as a _____ therapy before heart transplantation.
a) Temporary
b) Permanent
c) Minor
d) Preventive
Answer: a) Temporary

25. The artificial heart must prevent excessive _____ to avoid damaging blood cells.
a) Temperature rise
b) Shear stress
c) Oxygen saturation
d) Platelet count
Answer: b) Shear stress

26. The schematic for a temporary bypass of the left ventricle includes a connection between the _____ and the aorta.
a) Left atrium
b) Right ventricle
c) Pulmonary artery
d) Left ventricle
Answer: d) Left ventricle

27. The major limitation of pulsatile artificial hearts is their increased _____.
a) Efficiency
b) Size and complexity
c) Blood clot prevention
d) Durability
Answer: b) Size and complexity

28. A major risk in using a heart-lung machine is the formation of _____ in the bloodstream.
a) Plaque
b) Blood clots
c) Calcium deposits
d) Bacteria
Answer: b) Blood clots

29. The driving mechanism of an artificial heart is typically powered by _____ energy.
a) Chemical
b) Pneumatic or electrical
c) Hydraulic
d) Thermal
Answer: b) Pneumatic or electrical

30. During a cardiac transplant, the heart is preserved in a _____ solution before implantation.
a) Cold
b) Warm
c) Neutral
d) Saline
Answer: a) Cold

Module 1.1: CARDIAC ASSIST DEVICES

31. Cardiac assist devices are primarily used to support patients with _____.
    a) Liver disease
    b) Kidney failure
    c) Heart failure
    d) Lung infections
    Answer: c) Heart failure

32. Right and Left Ventricular Bypass Pumps are designed to assist the function of the _____ and _____.
    a) Lungs, Liver
    b) Right Ventricle, Left Ventricle
    c) Arteries, Veins
    d) Kidneys, Lungs
    Answer: b) Right Ventricle, Left Ventricle

33. The auxiliary ventricle functions as a _____ support system for the heart.
    a) Permanent
    b) Temporary
    c) Non-functional
    d) Reactive
    Answer: b) Temporary

34. Open chest cardiac assist devices require a _____ to be surgically opened.
    a) Small incision
    b) Large vein
    c) Thoracic cavity
    d) Arterial graft
    Answer: c) Thoracic cavity

35. Intra-aortic balloon pumping (IABP) helps improve myocardial oxygen supply by inflating during _____.
    a) Systole
    b) Diastole
    c) Contraction
    d) Resting phase
    Answer: b) Diastole

36. Prosthetic cardiac valves are used to replace damaged _____ valves.
    a) Heart
    b) Lung
    c) Kidney
    d) Liver
    Answer: a) Heart

37. The principle of external counterpulsation (ECP) is to enhance _____ blood flow during diastole.
    a) Coronary
    b) Pulmonary
    c) Venous
    d) Arterial
    Answer: a) Coronary

38. Intra-aortic balloon pumps work by inflating during _____ and deflating during _____.
    a) Inspiration, Expiration
    b) Diastole, Systole
    c) Contraction, Relaxation
    d) Venous return, Arterial flow
    Answer: b) Diastole, Systole

39. The function of an open-chest ventricular assist device is to provide mechanical support to the _____.
    a) Liver
    b) Kidneys
    c) Lungs
    d) Heart
    Answer: d) Heart

40. The primary goal of cardiac assist devices is to reduce the workload on the _____ and improve circulation.
    a) Lungs
    b) Kidneys
    c) Heart
    d) Liver
    Answer: c) Heart

41. The right ventricular assist device (RVAD) supports blood flow from the right ventricle to the _____.
    a) Lungs
    b) Aorta
    c) Kidneys
    d) Brain
    Answer: a) Lungs
42. Intra-aortic balloon pumping reduces the workload of the heart by _____ myocardial oxygen demand.
    a) Increasing
    b) Reducing
    c) Stabilizing
    d) Reversing
    Answer: b) Reducing
43. An auxiliary ventricle is used as a temporary support system in patients with _____ failure.
    a) Kidney
    b) Heart
    c) Liver
    d) Lung
    Answer: b) Heart
44. The main purpose of a prosthetic heart valve is to restore normal _____ function.
    a) Kidney
    b) Liver
    c) Cardiac
    d) Respiratory
    Answer: c) Cardiac
45. Open-chest cardiac assist devices require direct surgical access to the _____.
    a) Brain
    b) Heart

c) Lungs
d) Liver
Answer: b) Heart

46. In external counterpulsation therapy, inflatable cuffs are placed around the _____.
a) Chest
b) Arms
c) Legs
d) Head
Answer: c) Legs

47. The intra-aortic balloon pump inflates during _____ to improve coronary perfusion.
a) Systole
b) Diastole
c) Expiration
d) Contraction
Answer: b) Diastole

48. The closed-chest type of ventricular assist device is inserted through a _____.
a) Open-heart surgery
b) Catheter
c) Transplant
d) Mechanical valve
Answer: b) Catheter

49. External counterpulsation (ECP) helps to increase _____ flow to ischemic heart tissue.
a) Coronary
b) Venous
c) Pulmonary
d) Lymphatic
Answer: a) Coronary

50. A ventricular assist device (VAD) is often used as a _____ before heart transplantation.
a) Final treatment
b) Bridge therapy
c) Permanent solution
d) Minor intervention
Answer: b) Bridge therapy

51. The left ventricular assist device (LVAD) helps pump blood from the _____ to the rest of the body.
a) Right ventricle
b) Left ventricle
c) Pulmonary artery
d) Right atrium
Answer: b) Left ventricle

52. A ventricular assist device (VAD) is used as a _____ therapy in patients waiting for heart transplantation.
a) Curative
b) Palliative
c) Bridge
d) Non-essential
Answer: c) Bridge

53. The intra-aortic balloon pump (IABP) is inflated during _____ to increase coronary perfusion.
a) Systole
b) Diastole
c) Expiration

d) Contraction
Answer: b) Diastole

54. The right ventricular assist device (RVAD) assists in pumping blood to the _____.
    a) Liver
    b) Lungs
    c) Brain
    d) Kidneys
    Answer: b) Lungs
55. External counterpulsation therapy uses _____ cuffs to improve coronary circulation.
    a) Air-filled
    b) Water-filled
    c) Mechanical
    d) Magnetic
    Answer: a) Air-filled
56. The prosthetic cardiac valve replaces a malfunctioning heart valve to restore proper _____ function.
    a) Pulmonary
    b) Circulatory
    c) Digestive
    d) Nervous
    Answer: b) Circulatory
57. A major complication of cardiac assist devices is the risk of _____ due to foreign material in the bloodstream.
    a) Infection
    b) Hypertension
    c) Edema
    d) Diabetes
    Answer: a) Infection
58. Intra-aortic balloon pumps (IABPs) improve cardiac function by reducing _____ load.
    a) Left ventricular
    b) Right ventricular
    c) Pulmonary
    d) Atrial
    Answer: a) Left ventricular
59. Open-chest cardiac assist devices are typically used in _____ surgeries.
    a) Brain
    b) Liver
    c) Cardiac
    d) Orthopedic
    Answer: c) Cardiac
60. A fully implantable artificial heart must include a _____ power source to operate continuously.
    a) Wireless
    b) External
    c) Portable
    d) Limited
    Answer: a) Wireless