JEMAS(PG)-2024 **QB No: 4102000001**

Subject: M.Sc in Perfusion Science(M. Sc PS)

Duration: 90 minutes **No of MCQ: 100** **Full Marks: 100**

INSTRUCTIONS

1. All questions are of objective type having four answer options for each.
2. **Category-1**: Carries **1** mark each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ¼ mark will be deducted.
3. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
4. Use only **Black/Blue ink ball point pen** to mark the answer by filling up of the respective bubbles completely.
5. Write Question Booklet number and your roll number carefully in the specified locations of the **OMR** sheet. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination center and put your signature (as is appeared in Admit Card) in appropriate boxes in the **OMR sheet**.
7. The OMR sheet is liable to become invalid if there is any mistake in filling the correct bubbles for Question Booklet number/roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination center. The OMR sheet may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, pen, log-table, wristwatch, any communication device like mobile phones, bluetooth devices etc. inside the examination hall. Any candidate found with such prohibited items will be **reported against** and his/her candidature will be summarily cancelled.
9. Rough work must be done on the Question Booklet itself. Additional blank pages are given in the Question Booklet for rough work.
10. Hand over the OMR sheet to the invigilator before leaving the Examination Hall.
11. Candidates are allowed to take the Question Booklet after examination is over.

Signature of the Candidate: ____________________________

(As in Admit Card)

Signature of the Invigilator: ______________________________

ROUGH WORK ONLY

M.Sc. – PERFUSION SCIENCE

1. Moderator band is present in-
   (A) RA
   (B) LA
   (C) RV
   (D) LV

2. Crux of heart refers to-
   (A) Joining of LV and aorta
   (B) External landmark of joining between RA and LA at anterior surface
   (C) External landmark of joining between RV and LV at posterior surface
   (D) Meeting point of Atrioventricular, interventricular and interarial groove meets at posterior surface

3. No of intercostal arteries are-
   (A) 6pairs
   (B) 12pairs
   (C) 8pairs
   (D) 12 only

4. In maximum cases of type A aortic dissection intimal tear occurs at-
   (A) Ascending aorta
   (B) Arch of aorta
   (C) Descending thoracic aorta
   (D) None of the above

5. Frozen elephant trunk graft is associated with
   (A) Renal artery aneurysm
   (B) RSOV
   (C) Aortic aneurysm
   (D) Aortic dissection

6. Debakey type B dissection involves-
   (A) Ascending aorta
   (B) Descending aorta distal to left common carotid artery
   (C) Descending aorta distal to left subclavian artery
   (D) Arch of aorta

7. Sand Blasting effect is associated with
   (A) Rupture of aortic aneurysm
   (B) Venous cannulation in femoral vein
   (C) Aortic cannulation in atherosclerotic aorta
   (D) Partial clamping of aorta during OPCABG

8. Upper limit of max flow at which oxygenator can oxygenate mixed venous blood ensuring $SpO_2 \geq 95\%$ is called
   (A) Max. flow
   (B) Min. flow
   (C) Mean flow
   (D) Rated flow

9. Lactate level monitoring during CPB gives an insight to-
   (A) Depth of anaesthesia
   (B) Adequacy of perfusion
   (C) Coagulation factor loss in CPB
   (D) Metabolic acidosis

10. Long saphenous vein runs through which surface of leg?
   (A) Anterior
   (B) Posterior
   (C) Medial
   (D) Lateral

11. $ECCO_2R$ is used in-
   (A) Metabolic alkalosis
   (B) Respiratory acidosis
   (C) Respiratory alkalosis
   (D) None of the above

12. Rate of CSF drainage for optimum spinal protection is
   (A) <50ml/hr
   (B) >30ml/hr
   (C) 20ml/hr
   (D) 50ml/hr

13. For Adult patient for delivery of flow around 4 LPM maintaining acceptable line pressure, minimum size of aortic cannula required is-
   (A) 5.3mm
   (B) 6.5mm
   (C) 7.3mm
   (D) 6mm

14. Percentage of cardiac output delivered by ECMO-
   (A) 90-95%
   (B) 100%
   (C) 75-80%
   (D) 80-90%

15. For ECPR choice of cannulation site is-
   (A) fem-jugular
   (B) fem-femoral
   (C) Central
   (D) Bi femoro jugular

16. Del Nido cardioplegia was invented in the year of-
   (A) 1990s
   (B) 1980s
   (C) 1890s
   (D) 2000s

17. Best strategy to maintain patient with cold agglutinins under CPB is
   (A) Hypothermic CPB with cold cardioplegia
   (B) Normothermic CPB with warm cardioplegia
   (C) Hypothermic CPB with warm cardioplegia
   (D) Normothermic CPB with cold cardioplegia

18. Cerebral Perfusion pressure is equal to
    (A) MAP - Intracranial Pressure
    (B) DBP - Intracranial tension
    (C) MAP - DBP
    (D) SBP - Intracranial pressure

19. In DHCA, the area of brain which is most prone to injury due to rapid severe hypothermia and hypoperfusion is known as-
    (A) Drinkwater zone
    (B) Waterstone zone
    (C) Watershed zone
    (D) None of the above

20. In 12 lead ECG which leads represent inferior wall of heart?
    (A) II, III, avF
    (B) I, avL
    (C) $V_2 – V_6$
    (D) I, avF

21. Resting time =
    (A) ½ cross clamp time
    (B) $1/3^{rd}$ pump time
    (C) ½ pump time
    (D) $1/3^{rd}$ cross clamp time

22. During removal of cross clamp B/L carotid pressure is applied to-
    (A) Manually create cerebral hypoperfusion
    (B) To prevent sudden reperfusion if brain
    (C) To prevent air embolism to brain
    (D) None of the above

23. During weaning from CPB gradual cutting down of venous return and arterial flow results in increasing ejection of heart. This phenomenon is described by-
    (A) Fick's law
    (B) Frank-Sterling Law
    (C) Kirkllin's Law
    (D) None of the above

24. A perfusionist in his day's first and second case gives perfusion in two paediatric open heart surgery with same heart lung machine. Now he is going to give perfusion to the third case which is an adult MVR with the same HLM which he had used in the first two cases. During the case while he is priming his circuit suddenly he notices his main pump's LPM is too low with respect to RPM. What can be the cause?
    (A) He forgot to change the inserts of main pump head
    (B) He forgot to change the tubing size in settings of main pump
    (C) He forgot to clean the Pump so it is malfunctioning
    (D) None of the above

25. In TOF patients, most commonly RVOT obstruction is seen at which part?
    (A) Valvular
    (B) Supravalvular
    (C) Subaortic
    (D) Subvalvular

26. Advantage of softshell venous reservoir over hardshell reservoir is-
    (A) No chance of air embolism
    (B) Low priming volume
    (C) Low cost
    (D) Easy to assemble

27. Modified Carpentier's procedure is related to-
    (A) DTGA
    (B) TOF
    (C) Ebstein anomaly
    (D) Aortic dissection

28. Stroke volume of 3/8" tubing is almost
    (A) 50ml
    (B) 20ml
    (C) 40ml
    (D) 10ml

29. During open heart surgery best way to monitor optimum cerebral perfusion is-
    (A) Urine output
    (B) Pulse oximeter on ear lobes
    (C) NIRS
    (D) ABG

30. What will happen if patient's temperature is reduced below 30°C before cross clamping aorta and achieving cardioplegic arrest?
    (A) No significant event will occur
    (B) VT
    (C) VF
    (D) Cardiac arrest

31. Priming volume of adult patient is calculated by-
    (A) {Body wt*75*(Patient's HCT-Desired HCT)}/Desired HCT
    (B) {Body wt*85*(Patient's HCT-Desired HCT)}/Desired HCT
    (C) {(Pt's HCT-Desired HCT)*(Pt's blood volume-priming volume)}/priming volume
    (D) None of the above

32. During priming, perfusionist is observing unexpected amount of bubble continuously circulating in the postoxygenator arterial limb of circuit which she is unable to remove from circulation. But she observes there is no air bubble in the limb connecting reservoir and oxygenator through pump head. After thorough checking no loose joint or leaks or any other fault in circuit detected by her. What can be the possible cause?
    (A) Leak in tubing
    (B) High gas flow was given to oxygenator during priming
    (C) High pressure in central oxygen line
    (D) None of the above

33. What will happen if during delivery of retrograde cardioplegia flow is given at too high pressure?
    (A) Heart will not arrest
    (B) RV will not be protected
    (C) Field will be flooded through coronary sinus
    (D) Coronary sinus rupture

34. What is the maximum time that a regular CPB oxygenator can oxygenate blood without any complications?
(A) 24hr
(B) 9hr
(C) 6hr
(D) 12hr

35. Na^+ concentration in ringer lactate solution is-
(A) 111meq/L
(B) 131meq/L
(C) 154meq/L
(D) 126meq/L

36. Pump flow is cut down during cross clamping aorta-
(A) To prevent rupture of aorta
(B) To prevent microemboli formation inside aorta
(C) All of the above
(D) None of the above

37. In MVR venous return can be taken through-
(A) Cavoatrial cannulation
(B) Single caval cannulation
(C) Bi-caval cannulation
(D) All of the above

38. At time of doing CABG+MVR, which major catastrophe will occure if MVR is done prior to grafting
(A) Proper distribution of cardioplegia will be hampered due to CAD
(B) Sondergaard's groove may rupture
(C) Difficult weaning
(D) None of the above

39. Centrifugal blood pump was first described by-
(A) Rafferty et al.
(B) Gibbon et al.
(C) Lillehei et al.
(D) Kay cross et al.

40. At the middle of operation, a perfusionist faces abnormally low MAP even with supra systemic pump flow though initially all parameters were within normal limit. All technical aspects were cross checked but nothing found. What can be the scenario-
(A) Inadequate depth of anesthesia was maintained
(B) Patient is developing paraplegia
(C) Patient is developing hemiplegia
(D) Patient is developing vasoplegia

41. Drug of choice in cardiogenic shock-
(A) Adrenaline
(B) Noradrenaline
(C) Dopamine
(D) Dobutamine

42. Patients allergic to fin fish like salmon are most likely to develop which type of protamine reaction?
    (A) Horrow Type II
    (B) Horrow Type IV
    (C) All of the above
    (D) Horrow type III

43. Ideal myocardial temp should be maintained at
    (A) $<12°C$
    (B) $>12°C$
    (C) $>4°C$
    (D) $<4°C$

44. Acceptable blood velocity through aortic cannula is-
    (A) 300-400cm/s
    (B) 200-300cm/s
    (C) 100-200cm/s
    (D) 50-100cm/s

45. Cold cardioplegia is administered at-
    (A) 12°C
    (B) 29°C
    (C) 4°C
    (D) 37°C

46. During first 2-3 minutes of delivery of hotshot, perfusate should be-
    (A) Hypothermic hypokalemic
    (B) Hypothermic hyperkalemic
    (C) Normoothermic normokalemic
    (D) Hyperthermic hyperkalemic

47. Main causative agent for reperfusion injury to heart is-
    (A) Na^+
    (B) K^+
    (C) Ca^+
    (D) Mg^{2+}

48. Which stage of myocardial injury is irreversible?
    (A) Hibernation
    (B) Stunned
    (C) Necrosis
    (D) All of the above

49. After drop refers to-.
    (A) Drop of ACT after full heparinization
    (B) Drop of Temp after full rewarming
    (C) Drop of Hb after taking pt into CPB
    (D) All of the above

50. During circuit priming a perfusionist has given 1.5L of RL in reservoir and starts priming. During priming he has also connected hemotherm to heat exchanger and running it at a temp of 34°C. Now suddenly he observes fluid level in his reservoir is gradually increasing although he has not given any extra fluid. What can be the cause?
    (A) Internal sucker is sucking volume from field
    (B) Leak in oxygenator
    (C) Leak in heat exchanger
    (D) Both a & c

51. Most common activation agent used in ACT sartridge is-
    (A) Celite
    (B) Iron
    (C) Clay
    (D) Kaolin

52. Average blood volume of an pediatric patient is-
    (A) 2.4*BSA
    (B) 75*BSA
    (C) 2.8*BSA
    (D) 1.6*BSA

53. By definition hematocrit value is-
    (A) 3*Hb
    (B) Concentration of Hb in blood in percentage
    (C) Volume of RBC in whole blood in percentage
    (D) All of the above

54. During venting Pump head rotate in which direction?
    (A) Clockwise
    (B) Anticlockwise
    (C) All of the above
    (D) None of the above

55. During IABP support 'W' pattern at the level of dicrotic knotch in assisted curve denotes-
    (A) Accurate timing of inflation
    (B) Early inflation
    (C) Late deflation
    (D) Late inflation

56. During ongoing IABP support if baseline of balloon pressure waveform goes downward in every curve from its preceding then it denotes-
    (A) Catheter kink
    (B) Leak in balloon catheter
    (C) Over inflation of balloon
    (D) None of the above

57. First successful VAD implantation was done in-
    (A) 1966
    (B) 1954
    (C) 1950
    (D) 1979

58. First successful cardiac transplant in India was done by-
   (A) Dr. Devi Shetty
   (B) Dr. P.K.Sen
   (C) Dr. K.M. Cherian
   (D) None of the above

59. Chemical nature of protamine is –
   (A) Alkaline
   (B) Acidic
   (C) Neutral salt
   (D) None of the above

60. Type of murmur heard in patients with PDA
   (A) End systolic
   (B) Early systolic
   (C) End diastolic
   (D) Continuous

61. In ECMO, CRRT is connected-
   (A) Pre pump to post oxygenator
   (B) Post pump to post oxygenator
   (C) Post pump proximal to oxygenator
   (D) Post oxygenator to pre pump

62. If during surgery under CPB surgeon complains about bloody field, then what perfusionist can do?
   (A) Reduce pump flow
   (B) Reduce temperature
   (C) None of the above
   (D) Both of the above

63. After line is divided while checking occlusion if fluid column is falling too fast, what can be the cause?
   (A) Occlusion set too low
   (B) Bypass line from oxygenator to reservoir left open
   (C) Hemofilter left open
   (D) All of the above

64. Glenn shunt is placed between –
   (A) SVC & RPA
   (B) SVC& LPA
   (C) IVC & PA
   (D) All of the above

65. At 28ºC maximum TCA time allowed without complicationis-
   (A) 15min
   (B) 30min
   (C) 45min
   (D) 60min

66. Tranexamic acid is used by many perfusionist in CPB as-
(A) Platelet protector
(B) Fibrin protector
(C) FVI protector
(D) All of the above

67. During CPB after achieving proper cardioplegic arrest some time ECG waveform shows some deviation from straight line. Causes can be
(A) Artifacts
(B) Movement of heart due to pressure of venous drainage and arterial flow
(C) Diathermy
(D) All of the above

68. Oxygenator oedema refers to
(A) Oxygen leak
(B) Pulmonary oedema due to CPB
(C) Generalized oedema due to CPB
(D) All of the above

69. In St Thomas II cardioplegia, role of magnesium is –
(A) Arresting agent
(B) Membrane stabilizer
(C) Antiarrhythmic agent
(D) Preservative

70. During retrograde cerebral perfusion upper extremities are nor perfused because-
(A) Major veins of upper extremities are clamped by surgeon
(B) Pressure of perfusion kept too low
(C) Veins draining upper extremities are too small
(D) Veins of upper extremities have valves

71. How many pigs are required to make one commercial bioprosthetic aortic valve?
(A) 1
(B) 2
(C) 3
(D) 4

72. At what point of surgery anaesthesiologists starts ventilating the lung after stopping it when complete CPB is established?
(A) During removal of crossclamp
(B) After complete stoppage of heart
(C) When gradually preload is applied on heart
(D) After total completion of procedure

73. Historically which oxygenation strategy for cPB was associated with 200% mortality?
(A) Bubble oxygenator
(B) Disc oxygenator
(C) Membrane oxygenator
(D) Cross circulation

74. Most common arrhythmia that occurs after removal of crossclamp is-
   (A) AF
   (B) VF
   (C) VT
   (D) PSVT

75. Performance index of aortic cannula is –
   (A) Pressure gradient/External diameter
   (B) Pressure gradient/Internal diameter
   (C) Internal diameter/External diameter
   (D) External diameter/flow

76. For CPB most prominent alternative of heparin is-
   (A) Hirudin
   (B) LMWH
   (C) Bivalirudin
   (D) PF4

77. Filtration capacity of screen filter depends upon-
   (A) Material of membrane
   (B) Pore size
   (C) Thickness
   (D) No. of filters in series

78. Late IABP deflation results in –
   (A) Increase in myocardial oxygen demand
   (B) Increased prload
   (C) Decresed afterload
   (D) All of the above

79. What would cause sickeling during CPB
   (A) Increase temp
   (B) Decrease temp
   (C) Increased flow
   (D) None of the above

80. If you are giving cardioplegia through a coronary ostium and you notice high line pressure at low flow and a myocardial temp not doping, which is the most likely cause?
   (A) Malfunctioning of the roller pump
   (B) Increased non coronary collateral flow
   (C) Ostial stenosis
   (D) Sluddging due to cold blood

81. What is not a cause of decreased LVAD flow?
   (A) Obstructed inflow cannula
   (B) Obstructd outflow cannula
   (C) Increased SVR
   (D) Hypervolemia

82. A case with TOF, surgeon will ask to reduce the flow
   (A) So as to insert the RSPV vent
   (B) While delivering cardioplegia
   (C) During VSD closure
   (D) During RVOT muscle bundle removal

83. The technique of cross circulation is attributed to
(A) Gibbon
(B) Lillehei
(C) Debakey
(D) Buckberg

84. Blood cardioplegia was reintroduced and popularized by
(A) Gibbon
(B) Buckberg
(C) Debakey
(D) Lillehei

85. Roller pump was invented by
(A) Gibbon
(B) Buckberg
(C) Debakey
(D) Lillehei

86. In case with multiple left to right shunt PDA is closed
(A) Before commencing CPB
(B) Only after on full CPB, before cooling
(C) After aortic cross clamping,just before cardiotomy
(D) On achieving hemodynamics off CPB

87. Suitable balanced electrolytes for priming for diabetic patient-
(A) RL
(B) Plasmalyte A
(C) RI
(D) NS

88. After going on full CPB, a perfusionist faces continuous low PO_2 & PCO_2. His gas flow and FiO_2 was set accurately at air oxygen blender and gas line was also connected properly. Then what can be the probable reason?
(A) Pump flow too low
(B) Pump flow too high
(C) Gas out port was not opened
(D) All of the above

89. Ringer chase technique refers to-
(A) Primimg
(B) Transfusion of circuit residual volume
(C) Both of the above
(D) All of the above

90. If manifold is kept on after offbypass and before decannulation without clamping aortic line what will happen-
(A) Air entry into circuit
(B) Patient will be drained and pressure will drop
(C) No problem will occur at all
(D) None of the above

91. Halden effect is related to-
   (A) Blood transfusion
   (B) Gaseous exchange
   (C) Cardiac cycle
   (D) CPB

92. Dicrotic knotch refers to-
   (A) Closure of mitral valve
   (B) Closure of pulmonary valve
   (C) Closure of tricuspid valve
   (D) Closure of aortic valve

93. Jone's criteria is for diagnosis of-
   (A) IHD
   (B) CHD
   (C) RHD
   (D) All of the above

94. Cardiac specific troponin is-
   (A) Trop T
   (B) Trop I
   (C) CPKMB
   (D) All of the above

95. During Redo sternotomy, femorofemoral bypass is established to
   (A) Uplift sternum
   (B) Increase BP
   (C) Decompress heart
   (D) Decompress SVC

96. Dose of mannitol in CPB-
   (A) 20ml/kg
   (B) 20mg/kg
   (C) 10ml/kg
   (D) 10mg/kg

97. In VSD repair of a 20 kg child whose baseline Hb is 14g/dl, How many PRBC have to be added to priming to maintain a HCT value of 30 during CPB?
   (A) 1
   (B) 2
   (C) 4
   (D) 0

98. A 54 kg adult patient undergoing MVR. Dring CPB at a certain period his ABG shows pH of 7.32,PCO_2 is 40, HCO_3^- is 19 and BE is -3.8. To fully correct the acid base imbalance what will you do?
   (A) Lower the sweep gas flow
   (B) 32 ml $NaHCO_3$ in reservoir
   (C) 65ml $NaHCO_3$ in reservoir
   (D) higher the sweep gas flow

99. What will you do, if electrolyte report before crossclamp shows higher potassium level what will you do?
(A) Give Lasix
(B) Start hemofiltration
(C) Give magnesium
(D) You will do nothing

100. Product of intraoperative cell salvage by cell saver is -
(A) PRBC
(B) Whole blood
(C) Washed RBC
(D) Salvaged blood