JEPAS(PG)-2020

Subject: M. Sc. in Perfusion Science (M. Sc PS)-2020

Duration: 90 minutes **Full Marks: 100**

Instructions

1. All questions are of objective type having four answer options for each. Only one option is correct. Correct answer will carry full marks 1. In case of incorrect answer or any combination of more than one answer, ¼ mark will be deducted.
2. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
3. Use only **Black/Blue ball point pen** to mark the answer by complete filling up of the respective bubbles.
4. Mark the answers only in the space provided. Do not make any stray mark on the OMR.
5. Write your roll number carefully in the specified locations of the **OMR**. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination centre and put your full signature in appropriate boxes in the OMR.
7. The OMR is liable to become invalid if there is any mistake in filling the correct bubbles for roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination centre. The OMR 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, docu-pen, log table, wristwatch, any communication device like mobile phones etc. inside the examination hall. Any candidate found with such items will be **reported against** & his/her candidature will be summarily cancelled.
9. Rough work must be done on the question paper itself. Additional blank pages are given in the question paper for rough work.
10. Hand over the OMR to the invigilator before leaving the Examination Hall.

1) **What is the reasonable systemic flow recommendation for CPB to maintain adequate cerebral blood flow?**
   a) In normothermic adult it is @ 50 mL/kg/min.
   b) In pediatric patient 30- 35 mL/kg/min during deep hypothermic circulatory arrest.
   c) In an adult flow rate is @2.2 L/ min/m2 at 28 ^{0} C or warmer.
   d) A patient 's BSA more than or equal to 2 m2, a systemic flow of 0.8 to 1.8 L/min/m2 is recommended.

2) **Most of the ventricular filling occurs in:**
   a) Early rapid filling phase.
   b) Diastasis.
   c) Atrial systole.
   d) None of the above.

3) **Commonest neurological disorder after CPB is:**
   a) Delirium.
   b) Stroke.
   c) Post operative cognitive deficit.
   d) None of the above.

4) **Milrinone acts by inhibiting:**
   a) Phosphodiesterase III enzyme.
   b) Na+ channel.
   c) Na+ K+ 2Cl- channel.
   d) Alpha 1 receptor.

5) **Hybrid procedure can be performed for all except:**
   a) Aortic aneurysm surgery.
   b) Coronary artery disease.
   c) Aortic dissection surgery.
   d) Mitral valve surgery.

6) **All of the following are indications for ECMO except:**
   a) Dilated cardiomyopathy.
   b) Congenital diaphragmatic hernia.
   c) ARDS.
   d) Chemical pneumonitis..

7) **Ideal Activated cloGng time to induce CPB in an adult posted for aortic valve replacement is:**
   a) 480 ms.
   b) 300 ms.
   c) 500 ms.
   d) 600 ms.

8) **All of the following hormones are increased asc a result of CPB except:**
   a) Growth hormone.
   b) ACTH.
   c) Catecholamines.
   d) Thyroid hormones.

9) **All of the following are contraindications of IABP except:**
   a) Low output syndrome following CABG.
   b) Ischemic MR with cardiogenic shock.
   c) AR with heart failure.
   d) None of the above.

10) **Characteristics of a Roller pump include all except:**
   a) Composed of twin rollers.
   b) Blood flow is calculated using tubing stroke volume & pump revolutions per minute.
   c) Operate on the constrained vortex principle.
   d) Deliver flow using positive displacement of the fluid in the tubing.

11) Diagonal arteries are branches of:

a) Left anterior descending artery.
b) Right coronary artery.
c) Circumflex coronary artery.
d) Obtuse marginal artery.

12) Maximum pressure in vacuum assisted drainage is:

a) -50 mmHg.
b) -100 mmHg.
c) -150 mmHg.
d) -200 mmHg.

13) Common position of heat exchanger in the CPB circuit is:

a) Always integrated with the hollow-fibre membrane oxygenator(MO).
b) Usually situated just proximal to the gas exchanging section of MO.
c) Usually situated just distal to the gas exchanging section of MO.
d) It is integrated within the venous reservoir.

14) In case of suspected aortic cannula malposition (within the arterial wall) what immediate measure you will take?

a) Reposition of cannula with maintenance of CPB.
b) Repair aortic dissection.
c) If CPB has commenced, Stop CPB.
d) If CPB has commenced, Stop CPB& repositioned the aortic cannula.

15) Right ventricle has:

a) 2 papillary muscles.
b) 3 papillary muscles.
c) Multiple papillary muscles.
d) All may be true.

16) Commonest type of coronary circulation is:

a) Left dominance.
b) Right dominance.
c) Codominance.
d) None of the above.

17) IABP acts by all of the following principles except:

a) Preload reduction.
b) Afterload reduction.
c) Improved myocardial perfusion.
d) Improved renal perfusion.

18) In septic shock the inotrope of choice is:

a) Adrenaline.
b) Dopamine.
c) Noradrenaline.
d) Dobutamine.

19) Role of systemic hypothermia during cardiac surgery under CPB is:

a) Reduction in the metabolic rate & O2 consumption of the vital organs of the body.
b) Allows higher pump flows.
c) Allows organ protection but less than does normothermic perfusion.
d) Helps to increase excitatory neurotransmitter release to protect central nervous system.

20) Hypomagnesemia causes all of the following except:

a) Arrhythmia.
b) Persistent hypokalemia.
c) Muscle weakness.
d) Convulsion.

21) In anaphylactic shock the inotrope of choice is:
a) Adrenaline.
b) Dopamine.
c) Noradrenaline.
d) Dobutamine.

22) Causes of systemic hypotension immediately with the onset of CPB:
a) Acute decrease in blood viscosity produced by asanguineous prime.
b) Seen both asanguineous solution as well as blood prime.
c) General anaesthesia.
d) Hypothermia.

23) During maintenance phase of CPB, arterial PaO2 is maintained by adjusting the %O2 in the sweep gas delivered to the oxygenator. PaO2 should be within:
a) 300 -350 mm Hg.
b) 350 -400 mm Hg.
c) 150 -300 mm Hg.
d) 400 -450 mm Hg.

24) Pre-CPB calculation of hematocrite(Hct) during CPB is:
a) Patient's RBC volume before CPB/pt's estimated blood volume

+ CPB prime volume + pre-CPB IV fluid volume.
b) Patient's RBC volume during CPB/pt's estimated blood volume

+ CPB prime volume + pre-CPB IV fluid volume.
c) Patient's RBC volume before CPB/pt's estimated blood volume

+ CPB prime volume.
d) Patient's RBC volume before CPB/pt's estimated blood volume

+ CPB prime volume + pt's body weight.

25) In TOF cyanosis usually appears:
a) Immediately after birth.
b) 5-6 months after birth.
c) In adulthood.
d) All may be possible.

26) Factors that affect the haematocrit during CPB include all except:
a) Preoperative hypovolemia.
b) General anaesthesia.
c) CPB prime volume.
d) Pre CPB blood loss.

27) Venous return may be augmented by all except:
a) Use of a centrifugal pump in series.
b) Vacuum assisted venous drainage.
c) Increasing the temperature.
d) Raising the height of the table.

28) Regarding retrograde cardioplegia (RCP) which one is correct?
a) RCP cannula is in the coronary sinus.
b) Balloon of the specialized RCP cannula measure coronary sinus pressure.
c) RCP is needed in old age patient with comorbidities.
d) It is used to produce myocardial protection in CABG surgery with normal valve function.

29) Anticoagulant management of a patient with history of Heparin-induced thrombocytopenia & absent heparin antibody who require open heart surgery include:
a) Use short-term heparin.
b) Use non-heparin anticoagulant.
c) Delay surgery.
d) Use Bivalirudin over heparin & other non- heparin anticoagulant.

30) In DHCA the best ABG management strategy is:
a) pH stat.
b) alpha stat.
c) beta stat.
d) delta stat.

31) Maximum safe temperature gradient between the water temperature in the heat exchanger & the blood ti limit the rate of rewarming from the CPB is:

a) < 5 °C.
b) < 6 °C.
c) < 10 °C.
d) < 15 °C.

32) Regarding cardioplegic (CP) delivery catheters all are true except:

a) Retrograde escape of cardioplegic across the aortic valve is possible if patient has AR.
b) Cardioplegia delivery system pressure may be high due to presence of AR.
c) CP administered through aortic root, termed antegradecardioplegia.
d) Most common flow rates in an adult achieved during cardiac surgery are 200- 300 mL/min.

33) The priming fluid used for extracorporeal circuit usually contain heparin at a rate of:

a) 10,000 to 20,000 units of heparin.
b) 5,000 to 10,000 units of heparin.
c) 20,000 to 30,000 units of heparin.
d) 4,000 to 6,000 units of heparin.

34) All of the following are mechanical complications of AMI except:

a) Acute Mitral regurgitation.
b) Ventricular septal rupture.
c) Ventricular free wall rupture.
d) Acute Tricuspid regurgitation.

35) All of the following are to be monitored when a patient is on IABP except:

a) ACT.
b) Carotid pulses.
c) ADP pulses.
d) Radial pulses.

36) Most membrane oxygenator used for clinical CPB for cardiac surgery are made of:

a) Microporous polypropylene (PPL) membrane.
b) Non-porous polymethyl pentene(PMP).
c) Non-porous PPL.
d) Microporous PMP.

37) For multivessel coronary artery disease with diabetes the procedure of choice is:

a) PTCA.
b) Hybrid procedure.
c) CABG.
d) Drug eluting stents.

38) Clinical condition that influences ACT (activated cloGng time) include:

a) Surgical incision decreases ACT.
b) Hypothermia decreases ACT.
c) Protamine increases ACT.
d) lysed platelets increases ACT.

39) Adverse reaction of protamine include:

a) Systemic hypotension resulting from the high dose of protamine.
b) Catastropic pulmonary vasoconstriction occur independent of protamine dose.
c) Catastropicpulmonary vasoconstriction is protamine dose dependent.
d) Systemic hypertension resulting from rapid infusion of protamine.

40) Diffusion of gases at the blood – membrane interface can be predicted by:

a) Fick's law.
b) Frank Starling law.
c) Barnouli's principle.
d) Doppler principle.

41) One unit of RBCs or whole blood equals to approximately:

a) 100 mL of RBC volume.
b) 150 mL of RBC volume.
c) 250 mL of RBC volume.
d) 350 mL of RBC volume.

42) Results of ABG abnormalities in patient with hypotensive shock-

pH < 7.4, PCO2 35 mm Hg, HCO3<20 mm Hg Mention the diagnosis:

a) Respiratory acidosis.
b) Metabolic acidosis.
c) Metabolic alkalosis.
d) Respiratory alkalosis.

43) All of the following arteries may be used for cannulation in ECMO except:

a) Femoral artery.
b) Brachial artery.
c) Axillary artery.
d) Aorta.

44) Which one is correct about arterial blood Oxygen content(CaO2)?

a) Normal range is 15.5 to 17.5 mL/dL.
b) Normal range is 16.5 to 17.5 mL/dL.
c) Formula for CaO2 =

[0.003(O2 mL/dL)xPaO2] +[1.39x Hgb(g/dL)
x % of Hgb saturated with O2] or

d) Formula for CaO2 =

[0.003(O2 mL/dL)xPvO2] +[1.39x Hgb(g/dL)
x % of Hgb saturated with O2]

45) Mention the heparin reversal agent in patient who have allergic reaction to fish:

a) Protamine.
b) Platelet Factor 4.
c) Bivalirudin.
d) Epsilon Amino Caproic acid.

46) Vitamin K dependent coagulation factor is:

a) Factor IV.
b) Factor V.
c) Factor VI.
d) Factor VII.

47) Why during de-airing lungs are inflated:

a) To help flush bubbles out of pulmonary artery.
b) To help flush bubbles out of pulmonary vein.
c) To help flush bubbles out of pulmonary vein& heart chambers.
d) To help flush bubbles out of aorta.

48) Posterior descending coronary artery is branch of:

a) Circumflex coronary artery.
b) Right coronary artery.
c) Diagonal artery.
d) Obtuse marginal artery.

49) Biggest advantage of mechanical prosthetic valve is:

a) Less incidence of valve degeneration.
b) Low thrombogenicity.
c) Smaller size.
d) Compatible in pregnancy.

50) Norwood procedure is performed for:

a) Tricuspid atresia.
b) Hypoplastic left heart.
c) TGA.
d) Ebstein anomaly.

51) Which one is correct regarding cerebral oxygen demand(CMRO2) during CPB under steady state anaesthesia:

a) A 10 degree temperature reduction increases CMRO2 by 50%.
b) Q10 or CNS respiratory quotient describe the increase in CMRO2/10 degree Celsius decrease of temperature.
c) Varies primarily in inverse proportion to brain temperature.
d) 'Cerebral blood flow-metabolism coupling' is independent of CMRO2.

52) Effect of severe hypokalaemia on ECG:

a) Prominent U waves best seen in precordial lead.
b) Peaked T waves.
c) Wide & flattened P wave.
d) Sinus bradycardia.

53) One of the indication of Off-pump CABG surgery include:

a) Tripple vessel disease with ejection fraction (EF%)>50%.
b) Age > 50 years.
c) Having associated diabetes mellitus.
d) Porcelain aorta.

54) Decreased pulmonary blood flow is seen in:

a) ASD.
b) VSD.
c) TOF.
d) PDA.

55) HITT syndrome is mediated by:

a) Ig A.
b) Ig D.
c) Ig G.
d) Ig M.

56) Biggest advantage of heparin coated circuit is:

a) Less dose of heparin is needed.
b) Less activation of complement and inflammatory mediators.
c) Less cost.
d) All of the above.

57) Cause of cyanosis in TOF are all except:

a) Shunt through VSD.
b) Pulmonary stenosis.
c) Overriding of aorta.
d) All of the above.

58) Low output syndrome includes:

a) Low peripheral temperature.
b) Low systemic blood pressure.
c) Low urine output.
d) All of the above.

59) All of the following may occur with Protamine administration except:

a) Hypotension.
b) Heparin rebound.
c) Hypothermia.
d) Anaphylaxis.

60) For pediatric patients the better blood gas management strategy is:

a) pH stat.
b) alpha stat.
c) beta stat.
d) None of the above.

61) Heparin selectively inhibits:
a) Factor I and II.
b) Factor II and VII.
c) Factor VII and X.
d) Factor II and X.

62) Monitors used during CPB with cardioplegia to monitor vital organs function:
a) Trans EsophagealEchocardiography used as a cardiovascular function monitoring.
b) Transcranial Doppler ultrasonography used to measure blood flow velocity of major artery of brain.
c) Pulmonary artery catheterization (PAC) gives an accurate measurement of leG atrial pressure.
d) Central Venous Pressure monitoring is a gold standard for assessing leG atrial pressure.

63) All of the following are cyanotic heart disease except:
a) TOF.
b) TGA.
c) Tricuspid atresia.
d) TAPVC- non obstructive type.

64) Extrinsic pathway in monitored by:
a) BT.
b) APTT.
c) PT.
d) ACT.

65) Sources of blood returning to the le† ventricle include all except:
a) Bronchial vein.
b) Thebesian vein.
c) PDA.
d) SVC (superior vena cave).

66) The degree of hemodilution on CPB circuit can be predicted by:
a) Patient's body weight &Hct %.
b) Calculated amount of IV fluid administered aGer CPB.
c) Patient's blood volume , determined by BW in kg multiplied by 5% for women.
d) Patient's blood volume , determined by BW in kg multiplied by 5.5% for men.

67) The clamp used in minimally invasive cardiac surgery is:
a) Debeky clamp.
b) Cooley clamp.
c) Chitwood clamp.
d) Satinsky clamp.

68) What will happen if there is sudden reduction of venous drainage during CPB:
a) Increasing the risk of air embolism.
b) Venous cannula may be disrupted.
c) Patient's Venous pressure will be low.
d) Decreasing organ perfusion as a result of systemic low venous pressure.

69) Which of the following medicines is used for neuroprotection in aortic surgery:
a) Phenobarbitone.
b) Benzodiazepine.
c) Valproate.
d) Carbamazepine.

70) Effects of hypothermia on drugs during Cardiopulmonary bypass:
a) induces cerebral protection by increasing the release of glutamate and glycin into the CNS.
b) Vecuronium requirement decreases.
c) Renal excretion of drug increases.
d) Anaesthetic requirements are reduced.

71) **Problem of aortic root venting during CABG surgery under cardiopulmonary bypass(CPB) include:**
a) Presence of clot in leG atrium.
b) Excessive blood return to the leG heart.
c) If associated with aortic insufficiency.
d) It does not function during the time cardioplegic solution is being administered.

72) **PaO2 reduces with increasing age. Identify correct guideline for calculating PaO2 above age 40 at room air:**
a) PaO2 = 105 – age in years /3.
b) PaO2 = 105 – age in years /2.
c) PaO2 = 90 – age in years /3.
d) PaO2 =90– age in years /2.

73) **All of the following may be used as conduit for CABG except:**
a) LIMA.
b) Radial artery.
c) Ulnar artery.
d) Gastro-epiploic artery.

74) **One of the function of venous reservoir in the CPB circuit system:**
a) Act as a high pressure receiving chamber of venous return.
b) Help gravity drainage of arterial flow.
c) Maintain oxygenation of blood.
d) Act as a buffer for fluctuation & imbalance between venous return and arterial flow.

75) **Write the correct answer about temperature conversion- Degree Fahrenheit to Celsius:**
a) (Degree F -32) x 5/9.
b) (Degree F x 9/5) +32.
c) (Degree C -9/5) + 32.
d) (Degree F -32) + 32.

76) **The Sieving Coefficient (SC) is:**
a) SC ranges from 1.0 to 1.5.
b) A SC zero indicates that the solute passes freely across the membrane.
c) A SC 1.0 indicates that none of the solute passes through the membrane.
d) The ratio of ultrafiltrate solute concentration to plasma solute concentration.

77) **The gas used to insufflate the balloon of IABP is:**
a) Hydrogen.
b) Carbon dioxide.
c) Oxygen.
d) Helium.

78) **All of the following routes may be used for venting except:**
a) Ascending aorta.
b) Inferior pulmonary vein.
c) Left ventricle.
d) Pulmonary artery.

79) **About pulmonary vascular resistance(PVR) which one is true:**
a) Formula for PVR =[80 x(pulmonary artery mean BP – pulmonary capillary wedge pressure)]/ CO (L/min).
b) Formula for PVR =[80 x(pulmonary artery systolic BP – pulmonary capillary wedge pressure)]/ CO (L/min).
c) Normal range of PVR is 20 – 120 dynes-sec-cm^{-4}.
d) Normal range of PVR is 5 – 100 dynes-sec-cm^{-4}.

80) **All of the following veins may be used for cannulation in ECMO except:**
a) Right internal jugular vein.
b) Femoral vein.
c) Left internal jugular vein.
d) Subclavian vein.

81) When do the anaesthesiologist stop ventilation of lung during cardiac surgery under CPB:

a) When aortic ejection of blood by the heart has ceased.
b) On onset of CPB.
c) Immediately aGer venous cannulation.
d) Before aortic cross- clamp.

82) Activities that are believed to decrease the risk of perfusion accidents include all except:

a) Discussion with colleagues.
b) Written protocols.
c) "Hands on" workshops.
d) Patients associated body weight.

83) Which one is mandatory prior to arterial cannulation:

a) Venous cannula should be in the right atrium if two stage venous cannula is used.
b) Adequate anticoagulation must be confirmed.
c) Confirm adequate venous drainage.
d) Confirm arterial cannula in the root of the aorta.

84) Factors that affects the ACT management include all except:

a) Kaolin.
b) Aprotinin.
c) Heparin.
d) Tranexamic acid.

85) Which one is correct about mean arterial pressure (MAP)?

a) Formula for MAP=[Systolic blood pressure +(2x diastolic blood pressure)]/ 3 or.
b) Diastolic blood pressure+ ½ of pulse pressure.
c) Normal range for MAP is 40 mmHg to 60 mmHg.
d) With increasing age MAP decreases.

86) Which one is correct about venous reservoir(VR):

a) Place immediately before the systemic pump to act as atrium.
b) VR is placed beyond the oxygenating and de- foaming chamber of membrane oxygenator.
c) Reduce the risk of massive air embolism.
d) Closed system VR difficult to prime.

87) Del Nido cardioplegia acts on action membrane potential by blocking Na+ channel in:

a) Phase I.
b) Phase II.
c) Phase III.
d) Phase IV.

88) Flow in a centrifugal pump depends on:

a) Afterload.
b) Preload.
c) Both.
d) None of the above.

89) Size of the solute that will be ultrafiltrated through the hollow-fibre semipermeable membrane is:

a) <65,000 Da.
b) <75,000 Da.
c) >65,000 Da.
d) >75,000 Da.

90) The traditional method for seGng occlusion before bypass is necessary:

a) To ensure accurate delivery of systemic blood flow when a roller pump is used.
b) To ensure accurate delivery of systemic blood flow when a centrifugal pump is used.
c) To measure occlusion ,set by moving the pump away from the backing plate a over occlusion may result.
d) To set proper occlusion a 30- 60 inch vertical column of fluid in the outlet side of the tubing to drop @ > 1 inch/ minis mandatory.

91) Wilkin's score used to assess:
a) Mitral valve.
b) Aortic valve.
c) Tricuspid valve.
d) Pulmonary valve.

92) Treatment of CPB induced ionized hypocalcemia (<0.8 mg/dL):
a) It should be treated as and when detected.
b) It should not be treated during CPB.
c) Usually it is corrected on CPB to prevent myocardial depression.
d) It should be corrected with calcium chloride @2mg/kg aGer rewarming.

93) Bidirectional Glenn shunt is performed for:
a) TOF.
b) Coarctation of aorta.
c) Tricuspid atresia.
d) DORV.

94) Difference between adult and pediatric CPB which one is correct?
a) Perfusion pressure in an adult is 50 -80 mmHg & in pediatric patient is 20 -50 mmHg.
b) Hypoglycemia frequently occur in adult than pediatric patient.
c) Pump prime & dilution of blood volume 50 -150% in an adult & 20 -30 % in pediatric patient.
d) Use of retrograde cerebral refusion rarely needed in pediatric patient than adult patient.

95) Anticoagulant effects of heparin is reversed by protamine. Calculation of protamine dose to get accurate result:
a) Fixed dose ratio of protamine to heparin.
b) Heparin/ protamine titration.
c) Body weight of patient to protamine.
d) Heparin activated clotting time dose response curves.

96) At what Haemoglobin level usually allogenicblood should be transfused to the CPB circuit:
a) Hb level <6.5 g/ dL.
b) Hb level <8.5 g/ dL.
c) Hb level <7.5 g/ dL.
d) Hb level <8.0 g/ dL.

97) Which one is contraindication of intraarterial blood pressure monitoring on the right sided radial artery:
a) Patient with right heart failure.
b) Massive trauma.
c) Patient with dyselectrolytaemia.
d) Coagulopathy.

98) Potassium arrests the heart in:
a) Systole.
b) Diastole.
c) Both can happen.
d) None of the above.

99) Commonest arrhythmia after cardiac surgery is:
a) Atrial flutter.
b) Atrial fibrillation.
c) Ventricular tachycardia.
d) Ventricular fibrillation.

100) Priming volume in case of valve replacement surgery depends on all of the following except:
a) Height of the patient.
b) Weight of the patient.
c) Hemoglobin of the patient.
d) Age of the patient.