



FCA(SA) Part II

THE COLLEGES OF MEDICINE OF SOUTH AFRICA

Incorporated Association not for gain
Reg No 1955/000003/08

Final Examination for the Fellowship of the
College of Anaesthetists of South Africa

25 February 2020



Paper 2

(3 hours)

All questions are to be answered in the space provided.

CANDIDATE NUMBER.....

Questions 1 - 2

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 1

A 20-year-old healthy male is involved in a motor vehicle collision. He sustains facial injuries including maxillary fractures. With regard to intubation choices, fill in the table below. [10]

AIRWAY MANAGEMENT TECHNIQUE	ADVANTAGES	DISADVANTAGES
Oral Endotracheal Intubation		
Fibreoptic guided Nasal endotracheal Intubation		
Retromolar Endotracheal Intubation		
Submental Intubation		
Tracheostomy		

Question 2

- a) List 5 personal attributes required of a medical professional and specialist anaesthesiologist in the clinical context. (5)

- b) As senior consultant, you welcome a new colleague into your department. He asks your advice in terms of self-organisation and self-management. How would you advise him about the requirements for practising full time in a public institution? (5)

[10]

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CANDIDATE NUMBER.....

Questions 3 - 4

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Question 3

- a) List the ideal anaesthetic conditions for corneal transplant surgery. (4)

- b) What are your concerns with regards to the use of suxamethonium in corneal transplant surgery? (2)

- c) Name two regional anaesthetic blocks that may be used for corneal transplant surgery. (1)

- d) Which component of regional anaesthetic blocks for ocular surgery may affect intraocular pressure? (1)

- e) What are the limitations of using regional anaesthesia for corneal transplant surgery? (2)

Question 4

- a) Briefly outline the preoperative and intraoperative factors and pathophysiological processes that may contribute to the acute coagulopathy that develops during major vascular surgery.

(7)

- b) List three point of care tests that may help to elucidate the cause of the acute coagulopathy during major vascular surgery.

(3)

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CANDIDATE NUMBER.....

Questions 5 - 6

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Question 5

An unbooked 24-year-old patient presents to your tertiary hospital in active labour and foetal distress. She has differential cyanosis with clubbing of the toes. The diagnosis of a longstanding Patent Ductus Arteriosus (PDA) is made clinically by the cardiologist.

- a) Name 4 cardiovascular changes during normal pregnancy at term relevant to this patient. (4)

- b) What monitoring is needed above the standard monitoring? (2)

- c) Briefly explain the main reasoning behind your chosen anaesthesia technique. (4)

[10]

Question 6

A term infant born 6 hours ago presents with respiratory distress and a saturation of 82% on nasal prongs. He is diagnosed with congenital diaphragmatic hernia.

- a) When would be the ideal time to correct the hernia surgically? (1)

- b) List all the factors likely to contribute to the hypoxia. (4)

- c) Briefly discuss how the anaesthetist should avoid worsening of the hypoxia in the peri-operative period. (5)

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Questions 7 - 8

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Questions 9 - 10

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Question 9

During a pre-operative visit for a patient presenting for a laparotomy, the patient tells you he was diagnosed with porphyria at a young age. He mentions that tests were done and he was told he has an acute type of porphyria.

- a) The acute types of porphyria can complicate into acute neurovisceral crisis. (2)
- i) List 4 triggers for acute neurovisceral crisis in the perioperative period. (2)

- ii) List 2 cardiovascular symptoms that manifests during an acute crisis. (1)

- b) List the 3 mechanisms of drug porphyrinogenicity. (3)

- c) How will you manage an acute porphyria crisis? (4)

Question 10

A 59-year-old male is booked for the resection of the upper right lung lobe. The surgeon requests that you provide lung isolation to facilitate the surgery.

- a) Name and briefly describe three lung isolation techniques applicable to this scenario. (6)

- b) The patient develops hypoxaemia and the airway pressures increase significantly 15 minutes after the start of one lung ventilation. Name two possible causes of the hypoxaemia in this context and what action you will take to address each cause. (4)

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CANDIDATE NUMBER.....

Questions 11 - 12

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 11

a) In consenting a patient for a labour epidural how would you quantify the risks for the following complications:

i) Temporary nerve damage. (1)

ii) Permanent nerve damage. (1)

iii) Dural puncture. (1)

iv) Failure. (1)

b) List three precautions that you would take to mitigate the risk of the catheter migrating. (3)

- c) A patient experiences pain during the second stage of labour despite a well-functioning epidural in the first stage that is still correctly positioned and running at an adequate infusion rate? Give two reasons for this (3)

[10]

Question 12

a) A 2-day-old term neonate with a weight of 2.4kg presents for a repair of a myelomeningocele (MMC). There are no other congenital abnormalities.

i) Compare (give values) in the cerebral metabolic rate of O₂ consumption (CMRO₂) and cerebral blood flow (CBF) in this patient and an adult. (4)

ii) What protection does the neonatal CMRO₂ confer? (2)

iii) List two precautions during induction that you could take to avoid compression or rupture of the MMC. (2)

b) With regards to the positioning of the patient for the surgery, what precaution would you take to avoid venous congestion of the surgical site? (2)

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CANDIDATE NUMBER.....

Questions 13 - 14

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 14

Answer the following questions on Ventilator Associated Pneumonia (VAP)

- a) Define VAP. (1)

- b) How is VAP diagnosed? (4)

- c) Briefly outline strategies for the prevention of VAP. (5)

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CANDIDATE NUMBER.....

Questions 15 - 16

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 15

An 80-year-old male patient presents for endovascular repair of his 5,8cm infrarenal abdominal aortic aneurysm. He is known with hypertension that was complicated by a transient ischaemic attack which left no neurological fallout. He also has a 30-pack year history of smoking.

- a) What is his annual risk of rupture and why is this important? (1)

- b) List your anaesthetic considerations for an EVAR. (7)

- c) Name two risk factors for spinal cord ischaemia and how would you try to prevent it? (2) (½ a mark for any one of these risk factors and 1 mark for preventative measure). (2)

Question 16

A vascular surgery registrar has requested a pre-operative consultation for a 66-year-old male patient scheduled for an aorto-bifemoral bypass procedure. He is known with:

- Insulin dependent diabetes mellitus – well controlled with an HbA1c of 6%
- A history of a myocardial infarction 1 year ago after which he had an angioplasty done and is currently asymptomatic
- Atrial fibrillation that is rate controlled.

His current METS is > 4

Current medications include:

- Aspirin 150mg dly po
- Protaphane 30u mane and 20u nocte sc
- Dabigatran 150mg b.d po
- Diltiazem SR 90mg b.d po
- Digoxin 0.25mg dly po

a) What is his risk for developing an adverse event post-operatively and why? (2)

b) The registrar wants to know what to do with the following drugs pre-operatively and why?
i) Dabigatran. (2)

ii) Digoxin. (2)

iii) Diltiazem.

(2)

c) Would you start this patient on a beta blocker preoperatively? Motivate your answer.

(2)

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CANDIDATE NUMBER.....

Questions 17 - 18

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 17

- a) You are required to anaesthetise a 22-year-old male for debridement of a small necrotic area of skin and superficial tissue related to a subclavian central line. The patient is recovering in a normal medical ward following an ICU stay for severe Guillian-Barre polyneuropathy complicated by need for respiratory support, ventilator acquired pneumonia and severe sepsis. He was ventilator dependent for 19 days. What would be your concerns regarding neuromuscular blocker (muscle relaxants) in this patient. (6)

- b) What would be your choice of airway management in this patient, for a 30 minute procedure? Give reasons explaining your choice. (4)

[10]

Question18

You are tasked with decreasing the risk of surgical site infection in your hospital.

a) Name a quality improvement method, whose steps you would use. (1)

b) Briefly describe your approach using one of the accepted quality improvement tools available, explaining the steps (9)

[10]

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CANDIDATE NUMBER.....

Questions 19 - 20

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Question 19

You are required to anaesthetise a patient for electroconvulsive therapy (ECT) in the psychiatric ward procedure room.

- a) What are the challenges of anaesthetising this patient in the designated area? (3)

- b) What other issues do you need to bear in mind when anaesthetising this patient? (7)

[10]



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Paper 3

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(3 hours)

CANDIDATE NUMBER.....

Questions 1 - 2

There are 10 books for this examination, please ensure that the 10 books are handed over to the invigilator for marking.

Question 1

Figure 1 shows an intra-aortic pressure curve (PC) with corresponding EKG. Bullets 1, 2, and 3 on the PC represent the aortic end-diastolic pressure, the aorta end-diastolic pressure, and the aorta peak-systolic pressure, respectively. A decision is taken to provide mechanical circulatory support utilizing an intra-aortic balloon pump (IABP). Following proper set-up, a ratio of 1:3 is selected, i.e. the IABP is triggered by the R-wave of every 3rd QRS complex. The IABP is switched on at the point indicated by the asterisk (*) corresponding to the R-wave of the 4th QRS complex from the left, as shown in Figure 1.



- a) In the lined space in Figure 1, draw the remainder of the PC **to clearly demonstrate the changes effected by the IABP** when correctly positioned and timed, and set at a 1:3 ratio. Use numbered bullets on your drawing to name all the components of the PC that you regard as being of importance towards effective circulatory support (7)

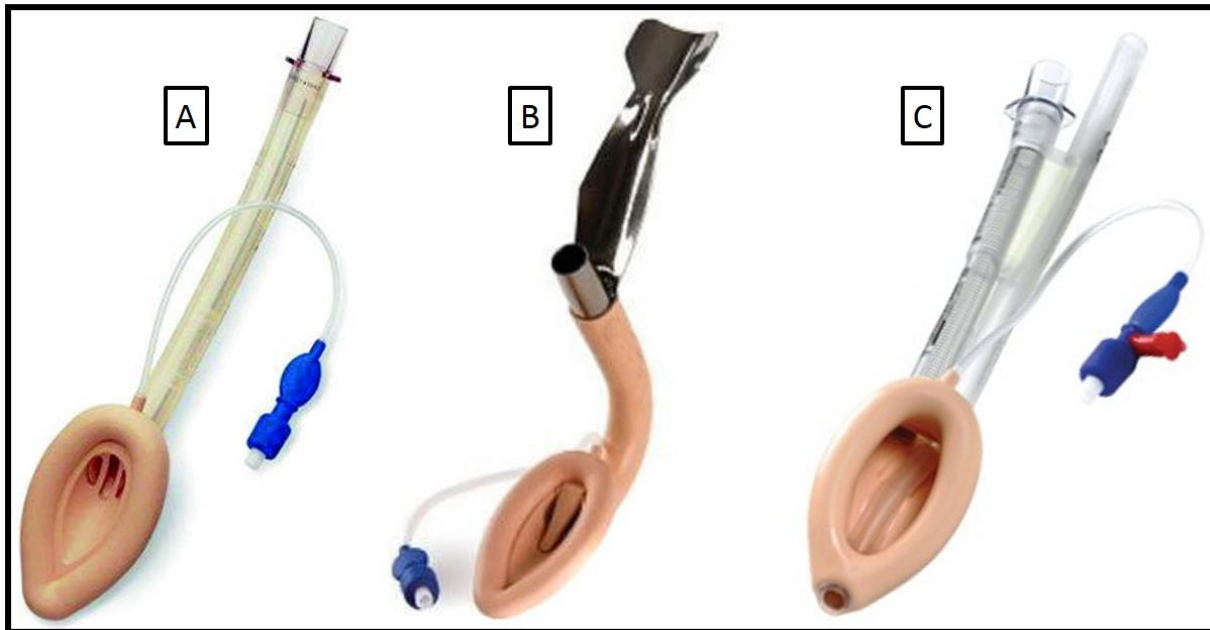
- b) List two absolute contra-indications to the use of an IABP. Only the first two conditions listed will be considered. (2)

- c) What does the term 'counter-pulsation' imply? (1)

[10]

Question 2

Consider supraglottic airway devices A, B, and C shown below.



- a) Identify the device specifically designed to reduce the risk of aspiration and of gastric inflation during general anaesthesia (1)

A

B

C

- b) Regarding your choice in Question 1, **list design features in the device specifically aimed at** reducing the risk of aspiration and of gastric inflation during general anaesthesia (4)

- c) Identify the device specifically designed to act as a conduit to facilitate blind endotracheal intubation. (1)

A

B

C

- d) Regarding your choice in Question 3, **list design features in the device specifically aimed at** facilitating blind endotracheal intubation. (4)

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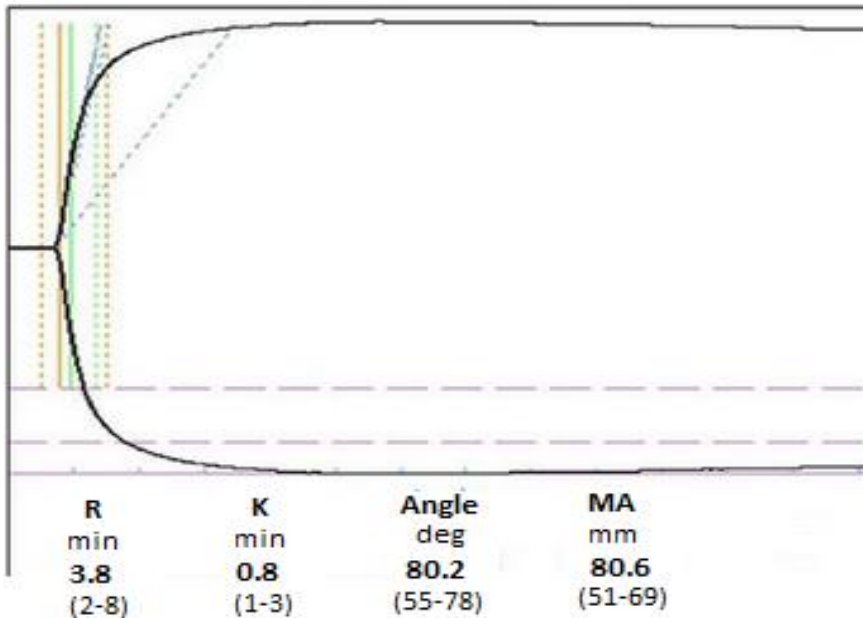
CANDIDATE NUMBER.....

Questions 3 - 4

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Question 3

A 36-year-old female patient post hysterectomy has been diagnosed with pulmonary embolus following total abdominal hysterectomy. She is currently being anticoagulated with heparin. A TEG was performed a week post initiation of heparin as shown.



- a) Describe the TEG (5)

- b) What does this imply? (1)

c) What is the most likely aetiology in this patient? (1)

d) List three other conditions that may result in the same pattern (3)

[10]

Question 4

This is the blood gas of a patient who presented for a Caesarean Section. Ventilator settings include a FiO_2 of 0.4 and cardiac output is 3.3l/min

PH: 7.401

PCO_2 : 50.3mmHg

PO_2 : 52.7mmHg

Hb: 12.9 g/L

SO_2 : 85.4%

Base Excess: 6.4mmol/L

Using the above results calculate the following

a) A-a gradient. (4)

b) DO_2 (Oxygen delivery). (3)

c) What is the possible aetiology for this A-a gradient? (3)

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Question 5

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Question 5

A 24-year-old female is a front seat passenger in a high velocity head on collision. She has sustained a fracture of the left distal radius and ulnar. A lateral neck X-ray was performed.



- a) Describe the abnormality seen. (2)

- b) What is your immediate management? (3)

- c) List 2 sets of clinical criteria which may be used prior to imaging to reduce the number of unnecessary x-rays. (2)

- d) List 3 symptoms the patient may present with. (3)

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CANDIDATE NUMBER.....

Questions 6 - 7

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Question 6

Please read the following abstract which contains certain errors then answer the questions which follow

Background.

Meta-analyses of the implementation of a surgical safety checklist (SSC) in observational studies have shown a significant decrease in mortality and surgical complications.

Objective.

To determine the efficacy of the SSC using data from randomised controlled trials (RCTs) and large case-control studies (CCS).

Methods.

This meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and was registered with PROSPERO (CRD123456). A comprehensive search of Medline and Google Scholar was conducted.

Results.

All trials had allocation concealment bias and a lack of blinding of participants and personnel, but had minimal or no detection, attrition or reporting biases. The SSC was associated with significantly decreased mortality (risk ratio (RR) 0.59, 95% confidence interval (CI) 0.42 - 0.85; $p=0.0004$; $I^2=0\%$) and surgical complications (RR 0.64, 95% CI 0.57 - 0.71; $p<0.06$; $I^2=0\%$).

The efficacy of the SSC on specific surgical complications was as follows: significant reduction in respiratory complications RR 0.59, 95% CI 0.21 - 1.70, and perioperative bleeding RR 0.36, 95% CI 0.23 - 0.56; $p<0.00001$; there was a trend toward reduction in cardiac complications RR 0.74, 95% CI 0.28 - 1.95; $p=0.54$, but no decrease in infectious complications RR 0.61, 95% CI 0.29 - 1.27; $p=0.18$

Conclusions. There is sufficient evidence to suggest that SSCs decrease hospital mortality and surgical outcomes in tertiary and community hospitals.

(Extract from SAMJ 2017)

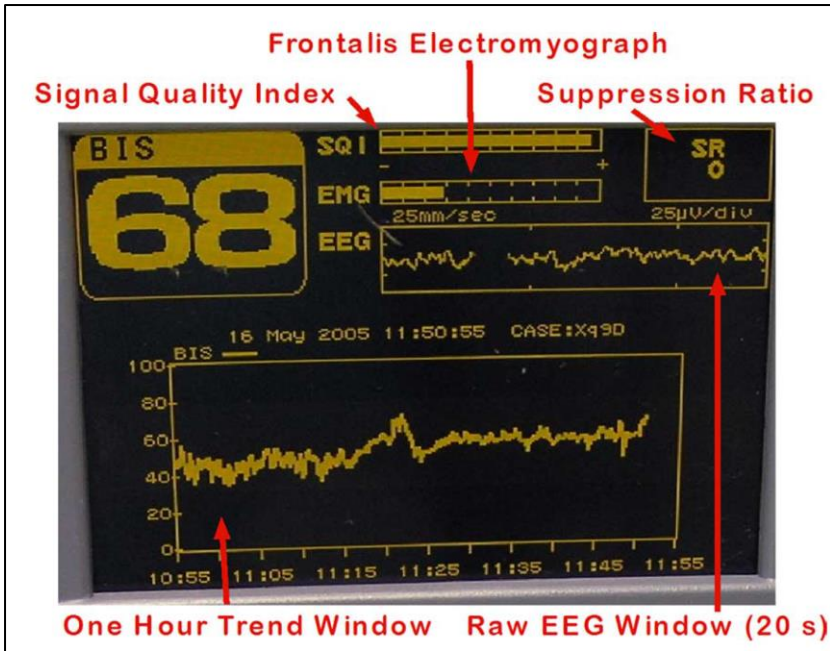
- a) Name at least 5 errors and briefly explain the error. (8)

b) What is I^2 and comment on the value in this study? (2)

[10]

Question 7

The image below depicts a Bispectral Index (BIS) monitor screen.



- a) List 4 causes of an elevated “EMG” number. (2)

- b) How may an elevated EMG number affect BIS monitoring? (2)

- c) The above patient is undergoing general anaesthesia. How would you use the BIS number (68) to guide your next management steps in this patient? (6)



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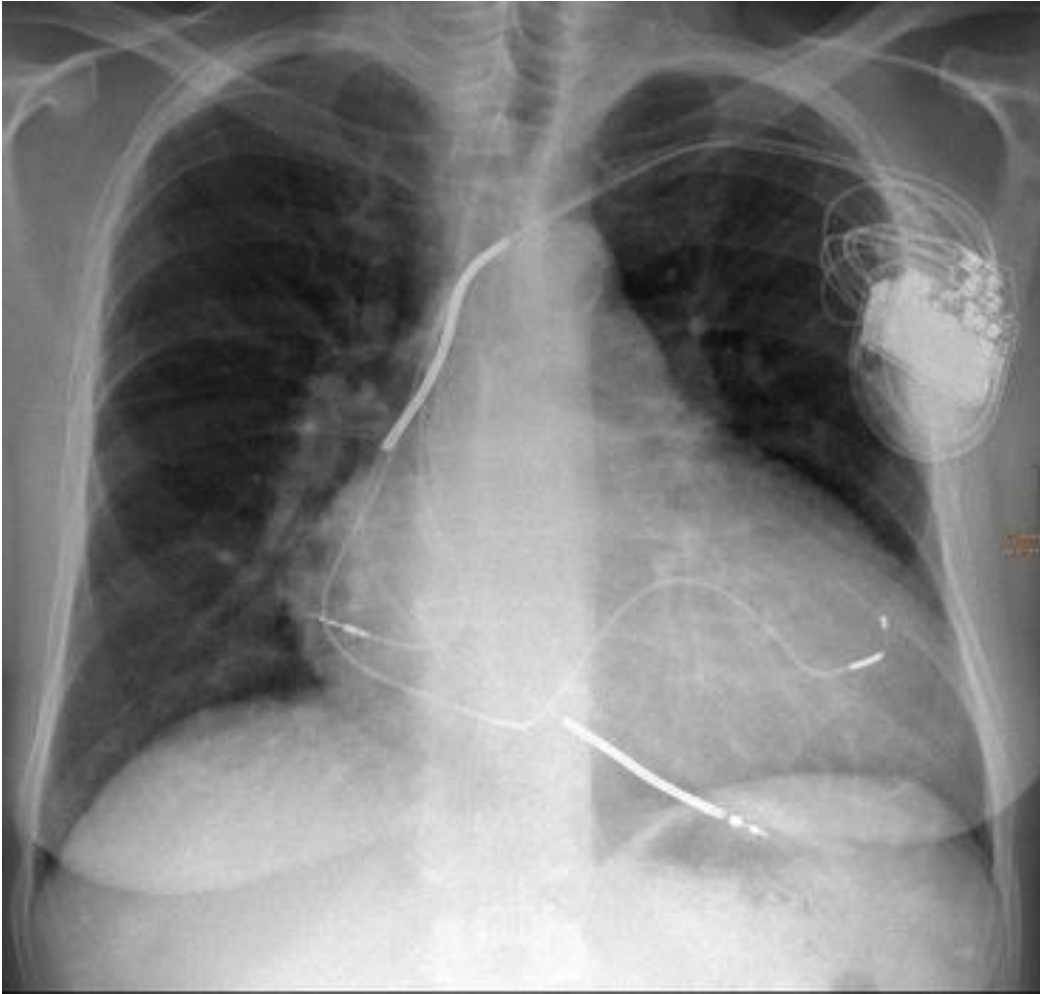
CANDIDATE NUMBER.....

Questions 8 - 10

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Question 8

The patient is scheduled for a hip replacement. Study the CXR and answer the questions below.



a) Describe the salient features of the CXR

(4)

Question 9

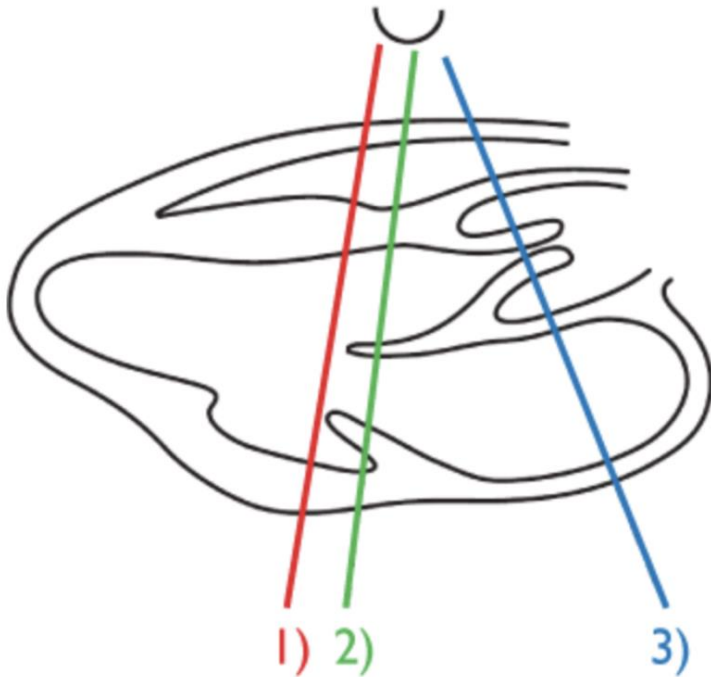
A 56-year-old female with chronic hypertension treated with Diovan HCT (valsartan/hydrochlorothiazide 160/12.5mg) presents for total hip replacement. Pre-operative cardiac echo reveals normal left ventricular ejection fraction, moderate diastolic dysfunction and a normal stress ECG. Coronary angiography shows a single LAD (left anterior descending) coronary artery occlusion of 60% and a fractional flow ratio of 0.9. The cardiologist recommends that the anaesthetic can proceed but recommends that the patient should omit the dose of the anti-hypertensive the night before surgery.

A central venous catheter and a Vigileo Flow Trac arterial pressure based cardiac output sensor is placed prior to induction. A set of readings is taken prior to induction of anaesthesia. After induction of anaesthesia with 150 mg Propofol, 200mcg fentanyl and 60 mg Rocuronium, her blood pressure decreased from 136/94 mmHg to 65/45 mmHg. Complete the following table of Flow Trac readings for the two pathophysiological scenarios by indicating the changes of each parameter by means of arrows - ↓, ↑, or → [10]

	Pre-induction	ACE/ARB related Vasoplegia	Left ventricular Ischaemia
CI (Cardiac Index) Normal Value (2.5-4.0 l/min/m ²)	3.7 l/min/m ²		
SVRI (Systemic Vascular Resistance Index) Normal Value: (1970 – 2390 dynes/sec/cm ⁵ /m ²)	1975 dynes/sec/cm ⁵ /m ²		
SVV (Stroke Volume Variation) Normal Value (<13%)	8%		
SVI (Stroke Volume Index) Normal Value (33-47 ml/m ² /beat)	45 ml/m ² /beat		
Management of hypotension			

Question 10

This is a representation of a parasternal long axis view of the heart. The numbered lines represent the Doppler m-mode directions.



- a) Which of these numbered lines can be used to assess left ventricular function and how is this done? (4)

- b) Calculate the Left Ventricular fractional shortening and estimated ejection fraction using the following measurements: (2)

RV wall 6mm	LVIDd 5.2cm	EDV (Teich) 138ml
RV 2.8cm	LVIDs 3.6cm	ESV (Teich) 54ml
IVSd 1.2cm	LVPWd 1.2cm	LA Dimension 5.5cm
IVSs 2.2cm	LVPWs 2.2cm	MSS 1.5cm

- c) How can the ejection fraction be corroborated using the figures supplied? (2)

- d) If this patient presents in heart failure, what is the most likely diagnosis? (1)

- e) Which is the most appropriate vasoactive agent that can be used to manage hypotension during induction of anaesthesia in this patient? (1)

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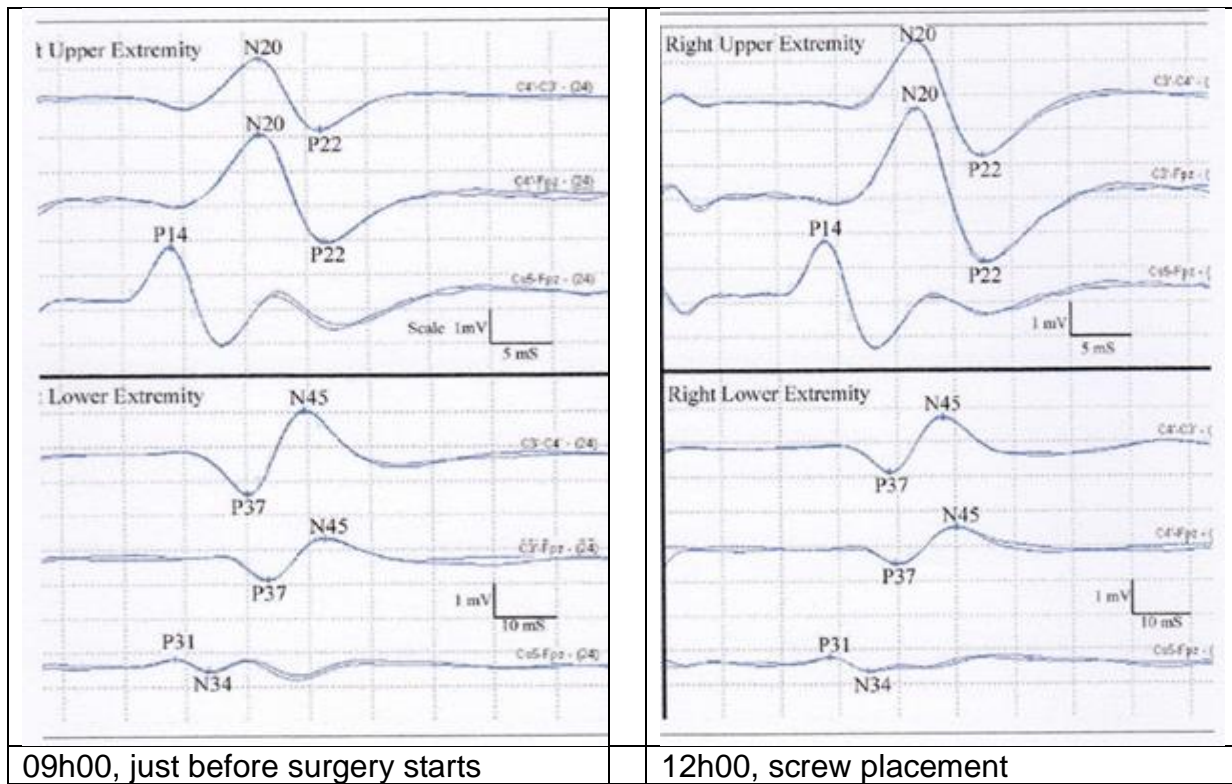
CANDIDATE NUMBER.....

Questions 11 - 13

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Question 11

A 14-year-old patient is undergoing surgical correction of a thoraco-lumbar scoliosis. Below is the tracing of a specific neurological function being monitored.

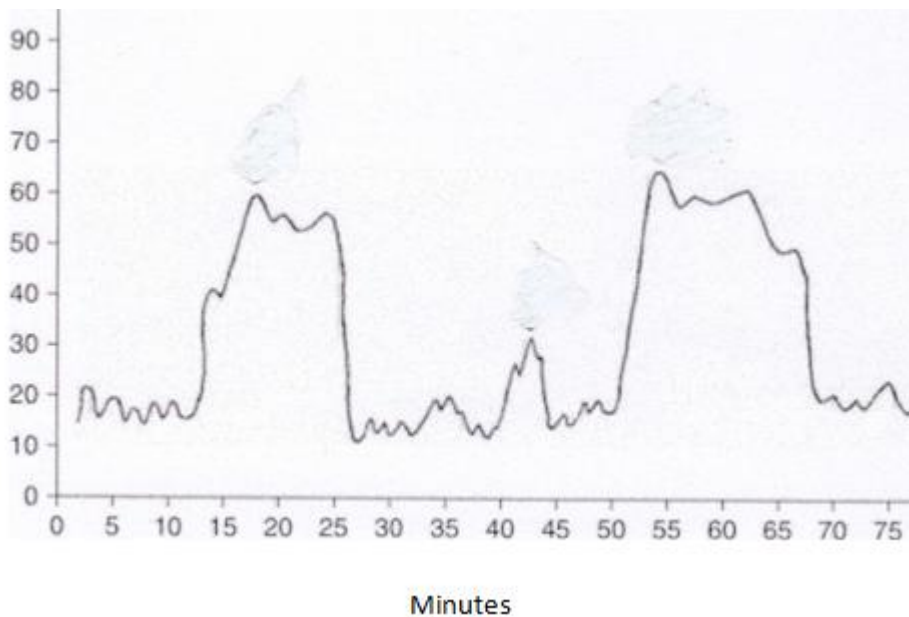


a) What form of monitoring is shown here? (1)

b) What other two modalities of this type of monitoring can be used in this surgery? (2)

Question 12

A patient is transferred from the neuro intensive care to theatre for an evacuation of a temporal lobe haematoma. The tracing below is recorded from an intracranial pressure monitor



- a) Describe the findings present on the trace from the intra-ventricular pressure monitor. (2)

- b) This patient presents with a Glasgow Coma scale rating of 9/15, a fixed, dilated pupil and a hemi-paresis. What is the imminent danger to the patient? (1)

- c) List the anaesthetic measures you can take to mitigate this condition before surgical evacuation of the haematoma. (7)

[10]

Question 13

A 26-year-old man presents for an open reduction and internal fixation of a femoral fracture following a motor vehicle accident. He has an associated head injury and appears lethargic. His investigations reveal the following:

Parameter	Value	Normal values
Serum Na ⁺	112mmol/L	136 – 149mmol/L
Serum K ⁺	4.7mmol/L	3.5 – 5mmol/L
Serum creatinine	96µmol/l	60 – 95µmol/L
Serum urea	7.1mmol/L	3.6 – 6.7mmol/L

a) What are the two most likely causes of hyponatraemia in this patient? (2)

b) What investigations would help in differentiating between these two causes? (3)

c) Why would it be important to differentiate between these two causes? (2)

d) Name two treatment modalities in general that could be used to treat hyponatraemia? (2)

e) What is the danger of correcting hyponatraemia too quickly? (1)

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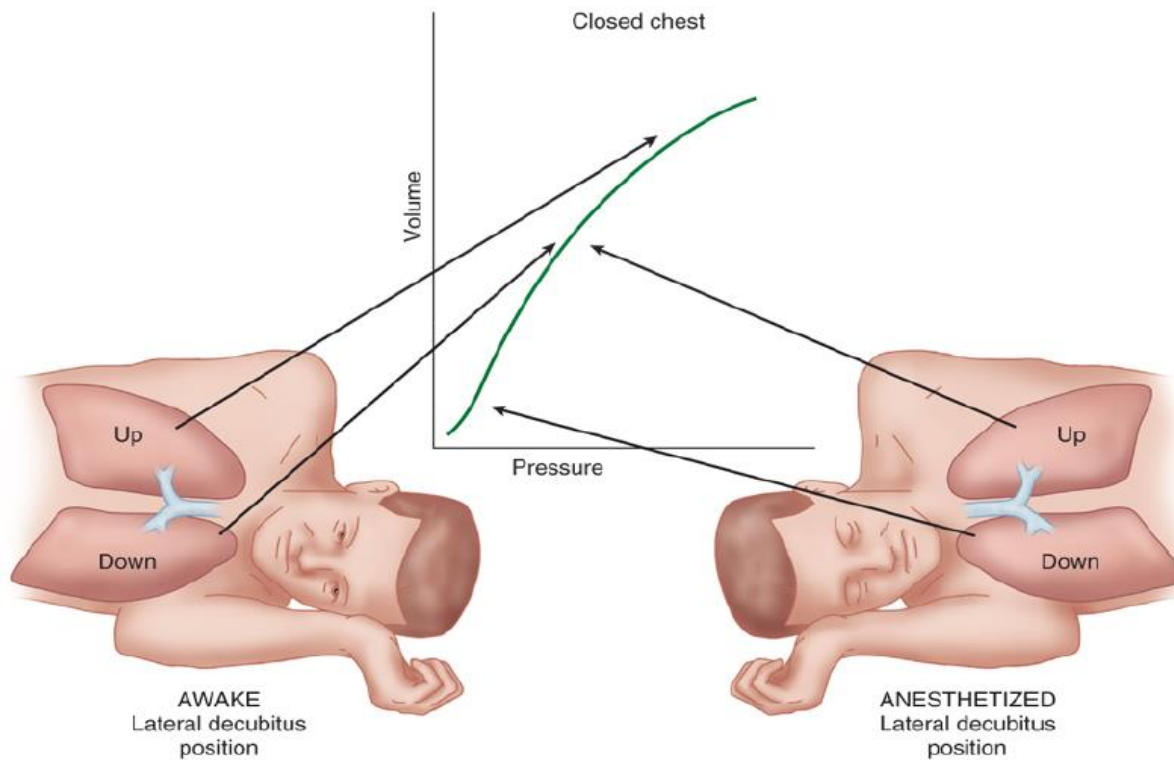
CANDIDATE NUMBER.....

Questions 14 - 15

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Question 14

The figure indicates the expected physiological changes in a patient in the lateral decubitus position for thoracotomy from the awake to the anesthetised state.



- a) Describe the changes illustrated in this diagram. (1)

- b) What is the reason for the illustrated change noted in the dependant lung in the anaesthetised patient? (1)

c) Specific to the dependant lung, how are the following parameters affected in the anaesthetised ventilated patient, **after the chest is opened**?

i) Ventilation. (2)

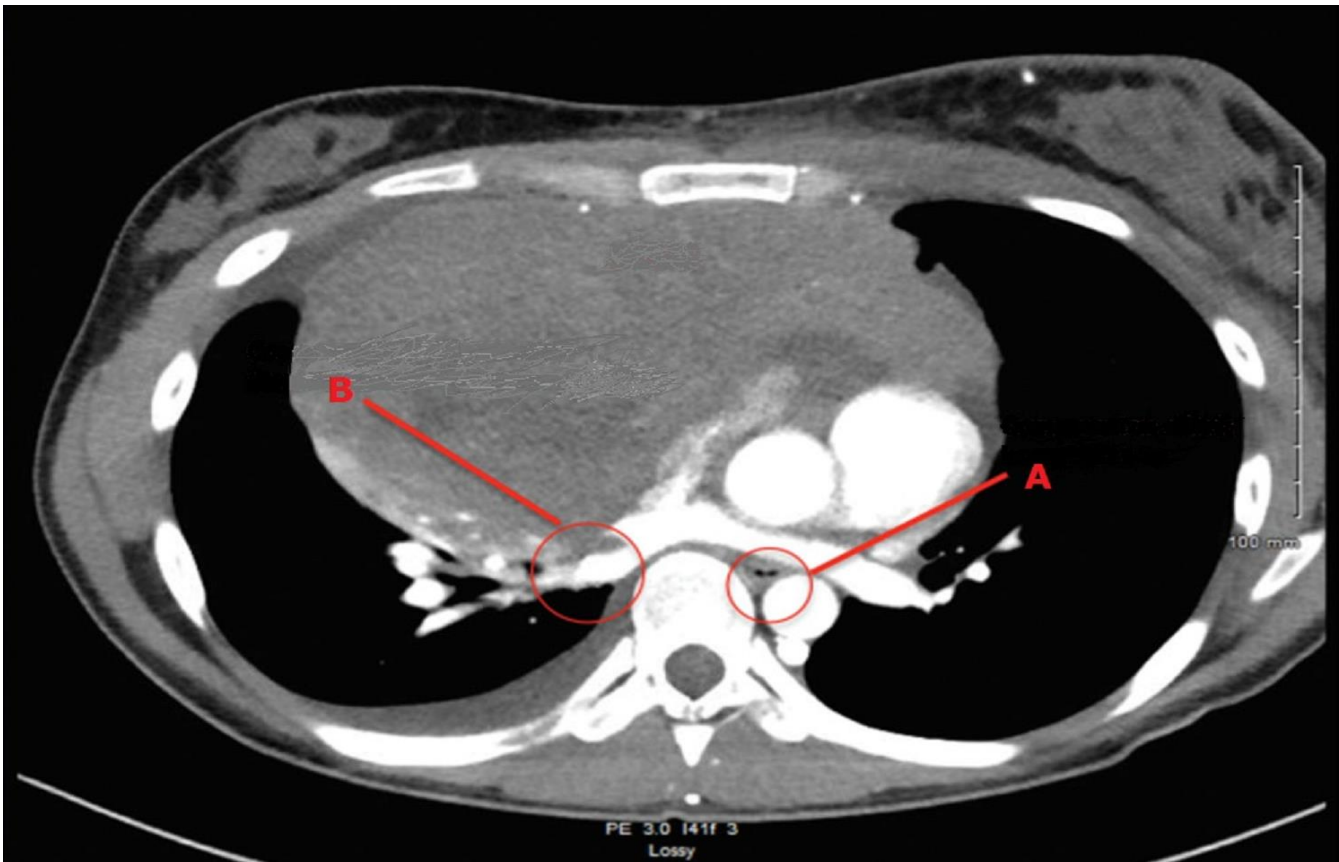
ii) Perfusion. (2)

iii) Functional Residual capacity. (2)

iv) Shunt Fraction. (2)

Question15

You are required to anaesthetise a patient for a mediastinoscopy. The image below is a thoracic CT scan **with contrast**.



- a) What is the diagnosis in this picture? (1)

- b) Comment on the structures marked A and B (2)

c) What anaesthetic risks will be associated with this mass? (3)

d) List the anaesthetic precautions to be observed when providing anaesthesia for this patient. (4)

[10]

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Questions 16 - 17

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b) List the differential diagnosis.

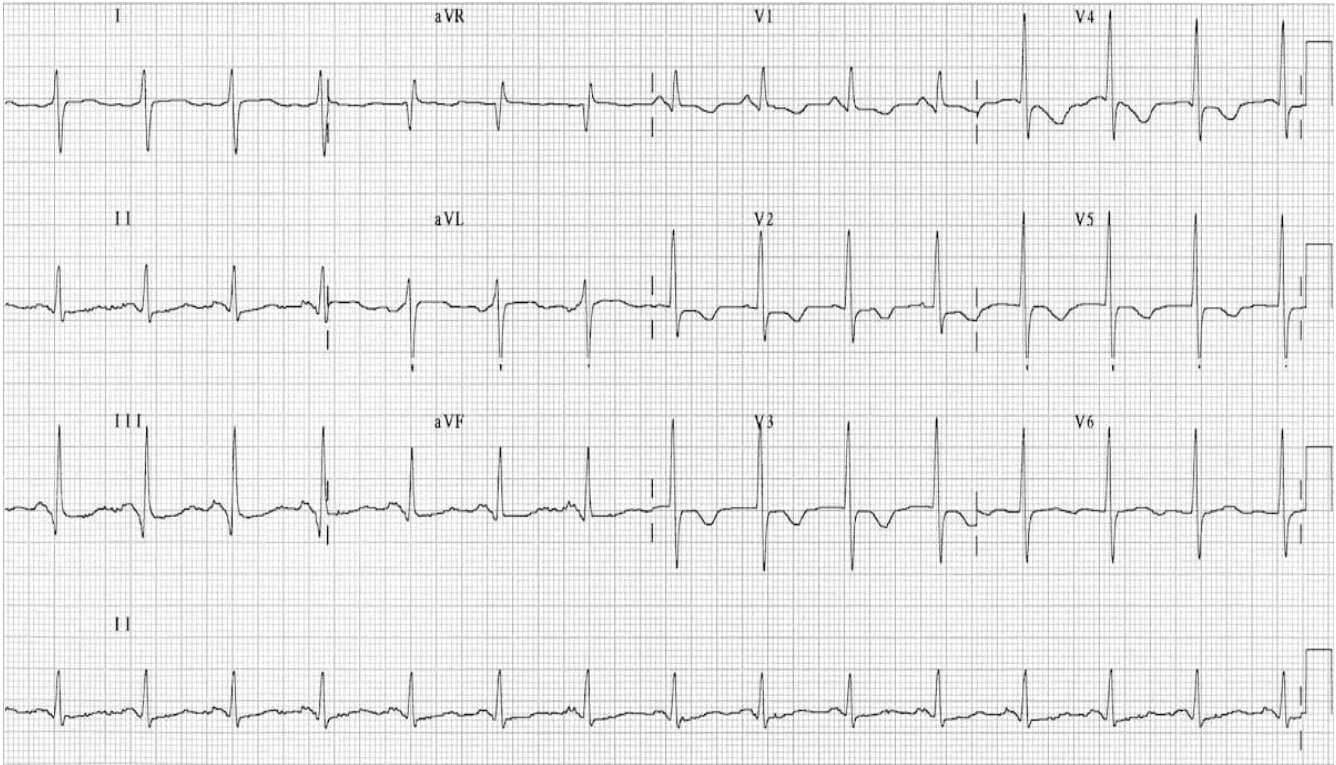
(4)

[10]

Question 17

A 58-year-old man with COPD and hypertension on treatment hydrochlorothiazide and amlodipine. He is scheduled for right knee arthroscopy. On examination his GCS is 15/15, BP134/78, Saturation is 90%.

ECG is ordered and displayed below:



a) Identify the abnormalities on the ECG.

(4)



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Paper 3

All questions are to be answered in the space provided.

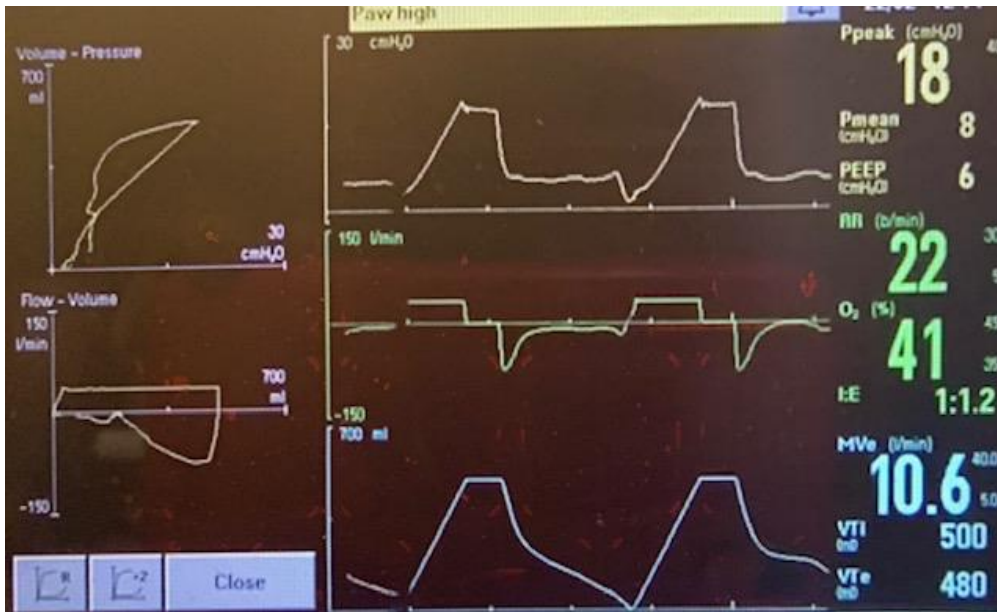
CANDIDATE NUMBER.....

Questions 18 - 19

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Question 18

A 70-year-old COPD patient is ventilated post exploratory laparotomy in ICU. An image of his ventilatory graphics is shown.



- a) What mode of ventilation is being used? (1)

- b) What information regarding the patient/ventilator interaction is indicated? Give reasons to support your answer. (4)

c) Name 3 clinical complications that can occur if (2) above is left uncorrected. (3)

d) What ventilatory adjustments can be made to correct the problem? (2)

[10]

Question 19

A 50-year-old female has undergone laparoscopic cholecystectomy procedure and the surgeon has completed the procedure. Complete the table below. For each of the scenarios listed, give the most appropriate neuromuscular transmission monitoring (NMT) modality to be used, and list the value you would consider indicative of adequate response.

Scenario	NMT Modality	Value
Example: 1) Adequacy of neuromuscular reversal.	Train of four ratio	>0.9
2) When the intubation dose of the muscle relaxant should be reduced to < 10% in patient in patient with Myasthenia gravis.		
3) Patient can be safely intubated.		
4) Neostigmine will reverse neuromuscular blockade.		
5) The awake patient may now be safely extubated, in the absence of quantitative monitoring modalities.		
6) Immediate reversal of deep neuromuscular blockade with sugammadex.		

[10]

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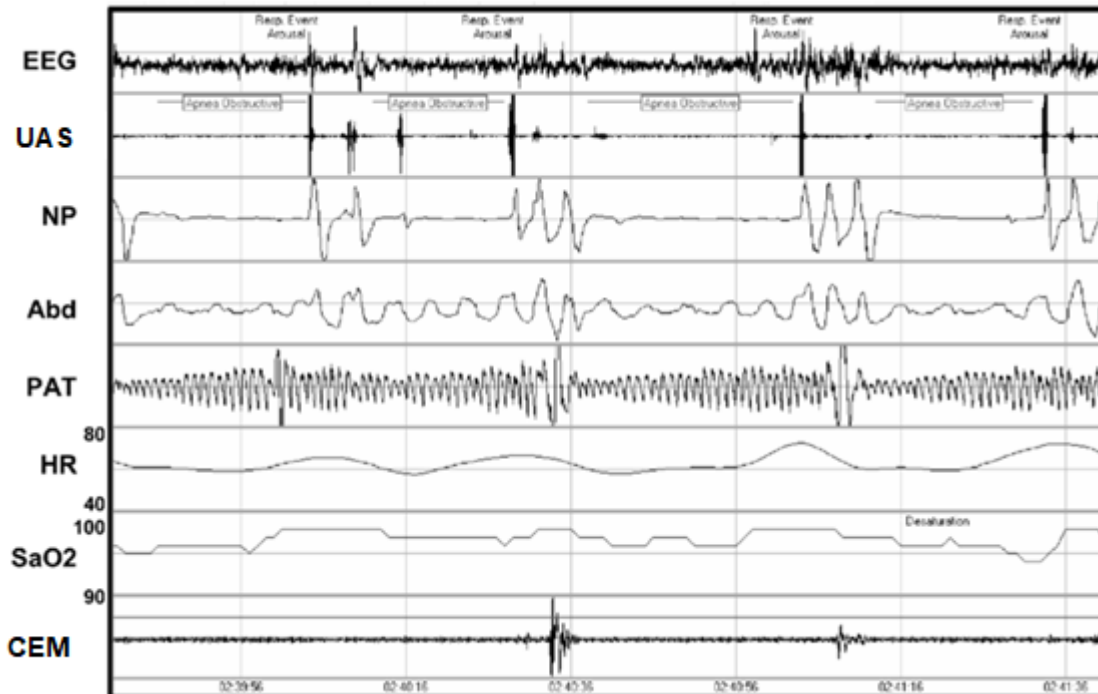
CANDIDATE NUMBER.....

Questions 20

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Question 20

During your pre-operative assessment rounds you see an obese 54-year-old man for an elective laparotomy the next day. He hands you this special investigation and disclose that he had sleep studies done two weeks before. With reference to the image below, answer the questions.



a) What is the purpose of the following measurements during the above assessment?

i) Electroencephalogram (EEG).

(1)

ii) Chin electromyogram (CEM).

(1)

iii) Upper airway sound recording (UAS).

(1)

iv) Thoraco-abdominal inductance plethysmography (Abd). (1)

b) Define the following terms:

i) Obstructive sleep apnea. (1)

ii) Central sleep apnea. (1)

iii) Hypopnea. (1)

iv) Apnea-Hypopnea Index (AHI). (1)

c) The above patient is prescribed a positive airway pressure mask to sleep with. Define the "Respiratory Disturbance Index" and briefly explain how it may be used to assess effectiveness of the positive pressure mask. (2)

[10]

Candidate number: _____