



DA(SA)

## THE COLLEGES OF MEDICINE OF SOUTH AFRICA

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

Examination for the Diploma in Anaesthetics  
of the College of Anaesthetists of South Africa



11 July 2018

Paper 1

(3 hours)

*All questions to be answered.*

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### Please answer questions 1, 2 and 3 in ONE booklet

- 1 You have to anaesthetise a 48-year-old male patient with a history of Chronic Obstructive Pulmonary Disease (COPD) scheduled for an elective lower abdominal surgical procedure
- a) What criteria will you use to diagnose the severity of COPD? (2)
  - b) What will be your pre-operative considerations? (5)
  - c) What are the mechanisms of oxygen-induced hypercapnia in patients with COPD? (3)
  - d) What will be the best peri-operative pain management strategy? (5)
- [15]
- 2 What are the mechanisms of action for the following drugs
- a) Losartan? (1)
  - b) Enalapril? (1)
  - c) Prazocin? (1)
  - d) Atenolol? (1)
  - e) Nifedipine? (1)
  - f) Which anti-hypertensives would you prescribe or omit for the morning of surgery? (2)
- [7]
- 3 A pulse oximeter is one of the standard monitors in the practice of anaesthesia
- a) What physical laws are the basis of the function of the pulse oximeter? (1)
  - b) Describe what those laws state. (2)
  - c) What range of the electromagnetic spectrum does the pulse oximeter use? (2)
  - d) List three sources of inaccuracy, when reading the saturation on a pulse oximeter. (3)
- [8]

### Please answer questions 4, 5 and 6 in ONE booklet

- 4 Maintaining intra-operative normothermia is important
- a) Why is hypothermia detrimental to the patient? (1)
  - b) List the four physical principles of heat transfer. (4)
  - c) i) Which method of heat transfer is used in a forced air warming device? (1)
  - ii) Explain how a forced air warming device works. (3)
  - iii) What is the potential complication of using the device incorrectly? (1)
- [10]

- 5 A 20-year-old man presents to the emergency department 6 hours after sustaining 30% TBSA burns (including facial burns) in a house fire
- Describe the assessment and immediate management of this patient's airway. (4)
  - Briefly describe the mechanism of suxamethonium induced hyperkalaemia in the burns patient. (2)
  - Subsequently this patient requires surgical debridement and grafting of his burn wounds. List 4 factors to evaluate during the pre-anaesthesia assessment. (4)
- [10]
- 6 A 20-year-old male patient presents with a stab to the left precordial area. On examination he is found to be hypotensive, with muffled heart sounds and jugular venous distention. He is haemodynamically unstable and is rushed to theatre
- What is the likely cause of shock in this scenario? (1)
  - What special investigation would confirm the diagnosis? (1)
  - Using the equation below to motivate your answers, complete the following table. (8)

**Blood pressure (BP) = stroke volume (SV) x heart rate (HR) x systemic vascular resistance (SVR)**

	Intervention / drug of choice	Motivation for choice
<b>Induction agent</b>		
<b>Analgesia</b>		
<b>Fluids</b>		
<b>Inotropy</b>		

[10]

**Please answer questions 7, 8, 9, 10 and 11 in ONE booklet**

- 7 A 31-year-old male patient known with paraplegia at T6, sustained 4 months ago, is on your elective list for a percutaneous nephron-lithotomy in the prone position
- Describe spinal shock and explain whether this condition is an issue for this patient. (3)
  - Discuss the intra-operative management of this patient with special reference to
    - The type and device used for airway management. (2)
    - What is the risk if suxamethonium is used? (1)
    - Explain the mechanism of 7bii). (2)
  - If the surgeon suggested operating without anaesthesia citing that the surgical incision falls within the asensate area.
    - What condition is the patient at risk of? (1)
    - Explain the pathophysiology of your answer to 7c)i). (3)
    - What would be your management of the above? (2)
- [14]
- 8 A 47-year-old male patient had a motorcycle injury sustaining a head injury with coup/contracoup injury. The patient is booked for emergency decompressive craniotomy
- Write down the equation for cerebral perfusion pressure. (2)
  - State two treatment modalities that can be implemented intra-operatively to protect the brain until the skull and dura is opened? (2)
  - Name any two conditions that can disrupt the blood brain barrier. (2)
- [6]

- 9 With respect to anaesthesia in a patient with epilepsy
- Name two anaesthetic drugs that should be avoided due to their epileptogenic potential. (2)
  - What drug interaction will manifest with the combination of chronic phenytoin therapy and the use of steroidal type non-depolarising muscle relaxants? (1)
  - What is the solution to the above drug interaction? (1)
- [4]
- 10 With respect to anaesthesia for a patient with Parkinson's disease
- Name two anaesthetic drugs that can exacerbate the symptoms of Parkinsons disease. (2)
  - Explain why they would have this effect. (1)
- [3]
- 11 Regarding anaesthesia for electroconvulsive therapy
- Name the physiological effects of the electroconvulsive seizures. (2)
  - What is the most appropriate muscle relaxant for providing the mandatory muscle relaxation during the seizure? (1)
- [3]

**Please answer question 12 in a separate booklet**

- 12 A 76-year-old female patient is scheduled for the insertion of a right dynamic hip screw (DHS) after a recent fall. Upon examination you discover that she has a right parasternal ejection systolic murmur. She is allergic to penicillin
- What is the classic triad of symptoms associated with aortic stenosis? (3)
  - How would you differentiate clinically between aortic stenosis and aortic sclerosis? (3)
  - What is the significance of this distinction? (2)
  - Name the three most likely causes of aortic stenosis in an elderly patient. (3)
  - Briefly describe the pathophysiological changes that occur in the heart with mild to moderate aortic stenosis. (4)
  - List four special investigations, other than echocardiography, that you would request as part of your pre-operative evaluation. Provide a reason for each investigation requested. (4x2=8)
  - What important information could a transthoracic echo provide? (5)
  - What antibiotic prophylaxis would you prescribe pre-operatively for this patient? (2)
- [30]

**Please answer question 13, 14, 15 and 16 in ONE booklet**

- 13 Regarding general anaesthesia for a caesarean section of any indication, mention any 2 worrying concerns during each of the stages listed below
- Induction. (2)
  - Maintenance. (2)
  - Emergence. (2)
- [6]
- 14 Explain the modifications you will apply for a successful "CPR" (Cardio- Pulmonary Resuscitation) on a 38-weeks pregnant woman who suddenly collapses in the ward. [4]

- 15 Regarding massive obstetrics haemorrhage
- a) What is the definition? (2)
  - b) List 2 common antepartum causes. (2)
  - c) List 4 common postpartum causes. (4)
  - d) Which pro-coagulant drug is indicated for obstetric haemorrhage and what is its mechanism of action? (2)
- [10]
- 16 Regarding Magnesium sulphate use in obstetrics
- a) Name 2 common indications. (2)
  - b) What are the clinical signs of toxicity that you should exclude prior to deciding on type of anaesthesia? (5)
  - c) What single medication will you make available prior to anaesthesia if you suspect toxicity? (1)
  - d) Explain how you will safely utilise non-depolarising muscle relaxants if you have to administer general anaesthesia for a pre-eclamptic patient who has been receiving an infusion of magnesium sulphate. (2)
- [10]

**Please answer question 17 and 18 in ONE booklet**

- 17 A 32-year-old ventilated male patient, that developed acute respiratory distress syndrome (ARDS) in the intensive care unit (ICU), is brought to theatre from ICU for a tracheostomy
- a) Which radiological findings must be present on the CXR as part of the diagnosis of ARDS? (2)
  - b) On arrival in theatre, describe your ventilator settings for this patient with regards to tidal volume (TV), positive end expiratory pressure (PEEP), plateau inspiratory pressure and FiO<sub>2</sub>. (4)
  - c) Intra-operatively, after the surgeon inserts the tracheostomy tube and you commence ventilation through the tracheostomy, your patient suddenly developed hypoxaemia. How do you manage this? (6)
  - d) Name 6 possible adverse effects or complications when applying an excessive amount of PEEP to a ventilated patient. (5)
  - e) List 4 drugs that can be used for sedation in the ICU setting. (2)
  - f) Name 3 advantages of a tracheostomy for a patient needing prolonged ventilation in ICU. (3)
- [22]
- 18 A patient on acute renal dialysis is taken to theatre for washout and cleaning of a scalp wound
- a) What is disequilibrium syndrome and its possible effects on your anaesthesia? (3)
  - b) How will you manage the fluid requirements for this patient? (3)
  - c) Which drugs will you avoid in this patient, considering that you must take her back to high care extubated? (2)
- [8]

**Please answer question 19, 20 and 21 in ONE booklet**

- 19 A 40-year-old moderately obese diabetic patient on insulin therapy has been booked for below knee amputation.
- a) List 4 physiological effects of insulin. (4)
  - b) What clinical signs of diabetic autonomic neuropathy would you look for? (4)
  - c) Describe pathophysiologic changes of obesity on the cardiovascular system that you might expect in this patient. (4)
- [12]

- 20 Regarding open eye surgery
- What is the nerve for the afferent and the nerve for the efferent pathway of the oculocardiac reflex? (2)
  - Describe your management of the oculocardiac reflex. (3)
  - List 3 drugs to be avoided in this surgical procedure. (3)
- [8]
- 21 A 3-year-old male child is booked for adenoidectomy at 8:00 am the following day. His mother gives a history of severe snoring and no history of a pharmacogenetic disorder
- What would you look for in your clinical examination? (5)
  - What premedication would you prescribe for this patient? (2)
  - What is your post-operative airway concern and how would you manage it? (3)
- [10]

**Please answer question 22, 23 and 24 in ONE booklet**

- 22 An anxious 4-year-old male ASA 1 patient presents for elective umbilical hernia repair
- Describe your pre-operative plan to manage his anxiety. (3)
  - List 4 airway characteristics of children that differ from adult patients. (4)
  - What are the fasting guidelines for paediatric patients? (2)
  - Using equations for the above patient calculate the following (show calculations)
    - Estimated body weight. (2)
    - Endotracheal tube size. (2)
    - Intra-operative fluid maintenance. (3)
  - In the recovery room, post-extubation, you hear an inspiratory high-pitched wheezing sound. You make a diagnosis of post-operative stridor.
    - Give 2 possible risk factors for post-extubation stridor in this patient. (2)
    - Describe your management. (4)
- [22]
- 23 In terms of EMLA
- What drugs are contained in EMLA cream? (2)
  - Describe how EMLA is used? (2)
- [4]
- 24 Regarding the Propofol Infusion Syndrome (PRIS)
- What dosing of propofol is associated with PRIS? (1)
  - What are the features of PRIS? (3)
- [4]

**Please answer question 25 in ONE booklet**

- 25 You are asked to provide general anaesthesia for a list of dental cases in a day clinic which only has one theatre. All the patients will be under 6-years-old
- What will you consider when deciding on your analgesia plan? (3)
  - Give three examples of analgesia you will use. Include the agent, dose and route of administration. (9)
  - Which circuit will you use and what fresh gas flows will you set for spontaneous ventilation and manual ventilation? (3)
  - When will you allow the patients to be discharged? (8)

- e) The dentist has a 4-year-old patient without a medical aid who cannot afford the day clinic. She asks you to please provide sedation in her rooms the following day for 2 extractions.
- i) What are your 2 main concerns? (2)
  - ii) What minimum equipment must she have available for you to consider being involved? (5)
- [30]

**Please answer question 26, 27, 28, 29 and 30 in ONE booklet**

- 26 You step on a thorn. Draw and label the pathway followed to cause the sharp pain sensation. [8]
- 27 You review a patient post operatively in the recovery room. He verbalises his pain to be severe. List three effects of his pain on each of the following
- a) Cardiovascular system. (3)
  - b) Endocrine system. (3)
- [6]
- 28 Draw and broadly describe your interpretation of a universal pain scale. [4]
- 29 Complete the following table

Drug	Mechanism of action	Route of administration	Duration of action	Contra indication
Morphine				
Tramadol				
Parecoxib				
Ketamine				

[8]

- 30 Choose a suitable opioid in each of the following scenarios
- a) Blunting of intubation response in a patient with HELLP syndrome. (1)
  - b) Intubating a 2-year-old child, without using muscle relaxant. (1)
  - c) Renal failure patient coming for peritoneal dialysis catheter placement. (1)
  - d) Target-controlled infusion (TCI) for a 30-minutes day hospital procedure. (1)
- [4]



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12 July 2018



Paper 3

Data Interpretation

(2 hours)

**Candidate number:** \_\_\_\_\_

**Instructions****There is one booklet for this examination**

Answer all questions in the booklet and hand in the whole booklet at the end of the examination. Do not tear off or remove any pages.

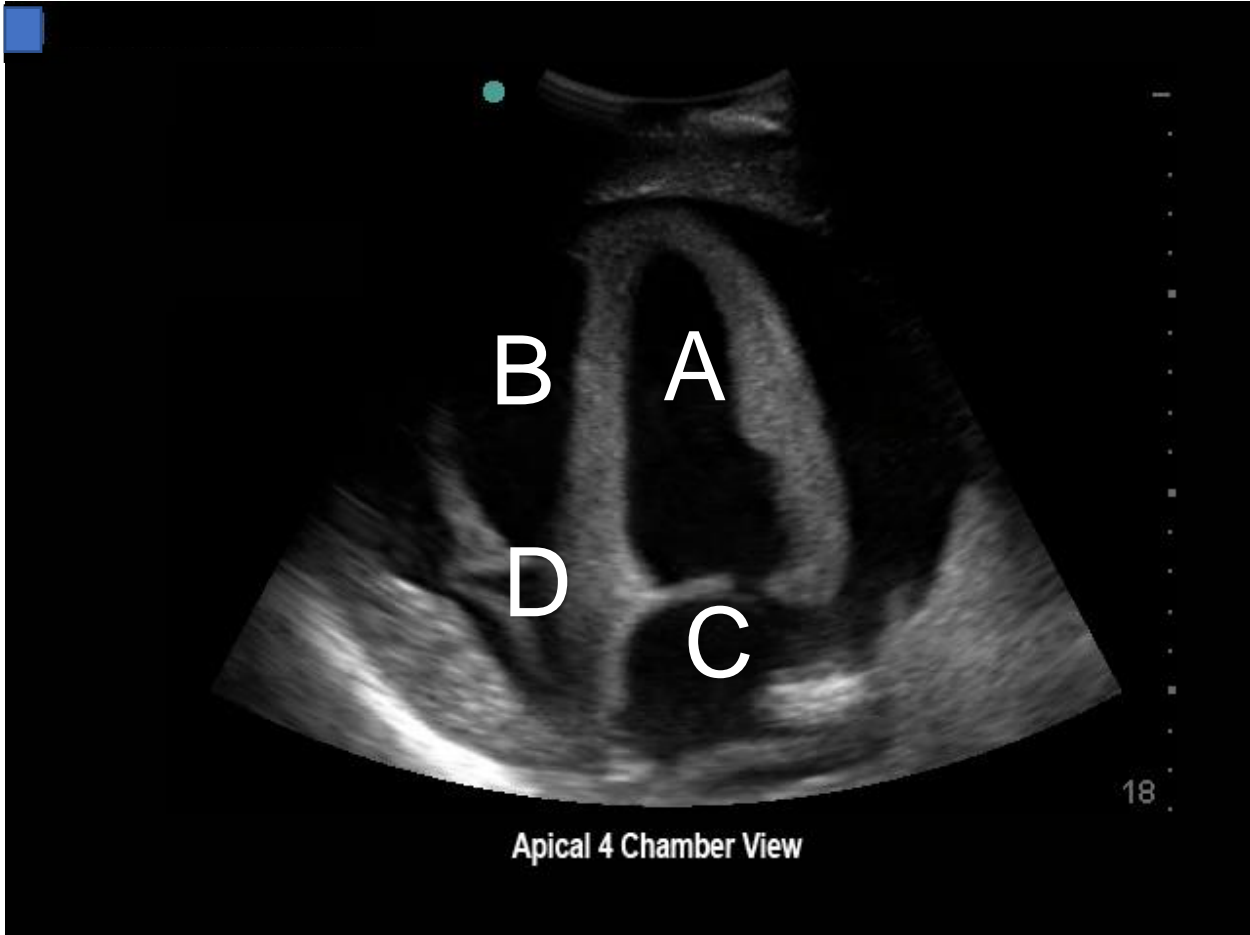
Not all questions have an accompanying picture.

Note the number of responses required for each question, and do not provide more responses than are required (as these will be ignored).

**NB. Fill in your candidate number above.**

**Question 1**

The below transthoracic echo view is an apical 4 chamber view



- a) Label the anatomical parts marked A to D. (4)

A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

- b) What is the pathology shown on this view? (1)

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c) Give five possible causes of the above pathology. (5)

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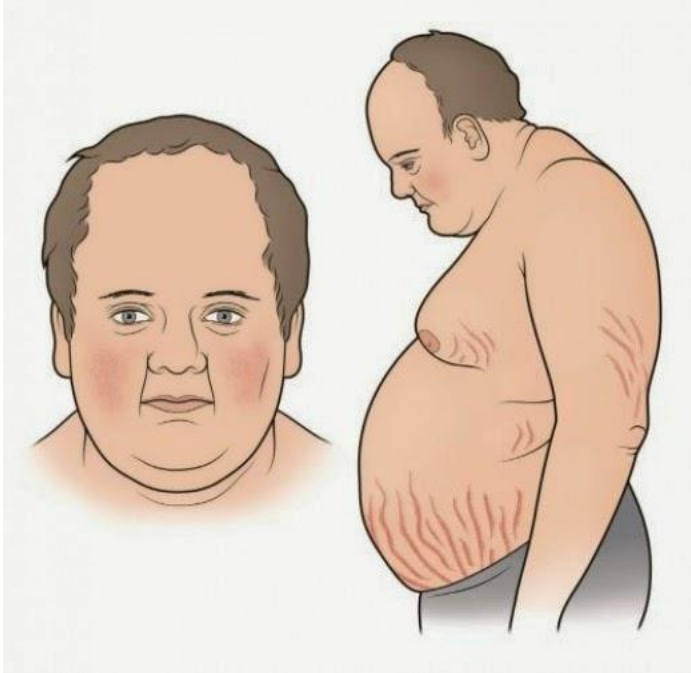
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[10]

The below patient is a patient booked for a laparoscopic cholecystectomy

His urea and electrolytes are as follows

Na+ 156 mmol/l  
K+ 3.0 mmol/l  
Ur 8  $\mu$ mol/l  
Cr 70 mmol/l



a) From the above morphology and blood results what condition do you think the patient has and explain your answer? (3)

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b) Which drugs are used as chronic medication for this condition and how are you going to administer them peri-operatively? (3)

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c) List your concerns with positioning for this patient. (4)

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[10]

**Question 3**

You have performed spinal anaesthesia on a 70-year-old male, with no co-morbidities except for prostatic hyperplasia, for a transurethral resection of the prostate. Intra-operatively, he becomes restless and dyspnoeic, and you notice his vital readings are as listed below

BP: 178/110  
PR: 33 beats/min  
SPO2: 88%

You take an arterial blood gas and the results are as below  
ABG:

pH:7.25  
HCO<sub>3</sub>: 16 mmol/l  
BE: -10  
PaO<sub>2</sub> : 60mmHg  
PaCO<sub>2</sub>: 30mmHg  
Na<sup>2+</sup>: 118 mmol/l  
Glucose: 14mmol/l  
Hb: 8.0 g/dl

- a) List your differential diagnosis. (3)

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- b) How would you treat the hyponatraemia? (4)

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c) What strategies can be used to prevent this situation from happening? (3)

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[10]

**Question 4**

A 40-year-old male who sustained a head injury, presents with the following CT (**computed tomography**) scan, for a craniotomy



- a) What pathology do you see on the CT Scan? (2)

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- b) Which induction agent, ketamine or propofol, would you use on the above patient and why? (5)

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c) Which inhalational agent would you avoid and why? (3)

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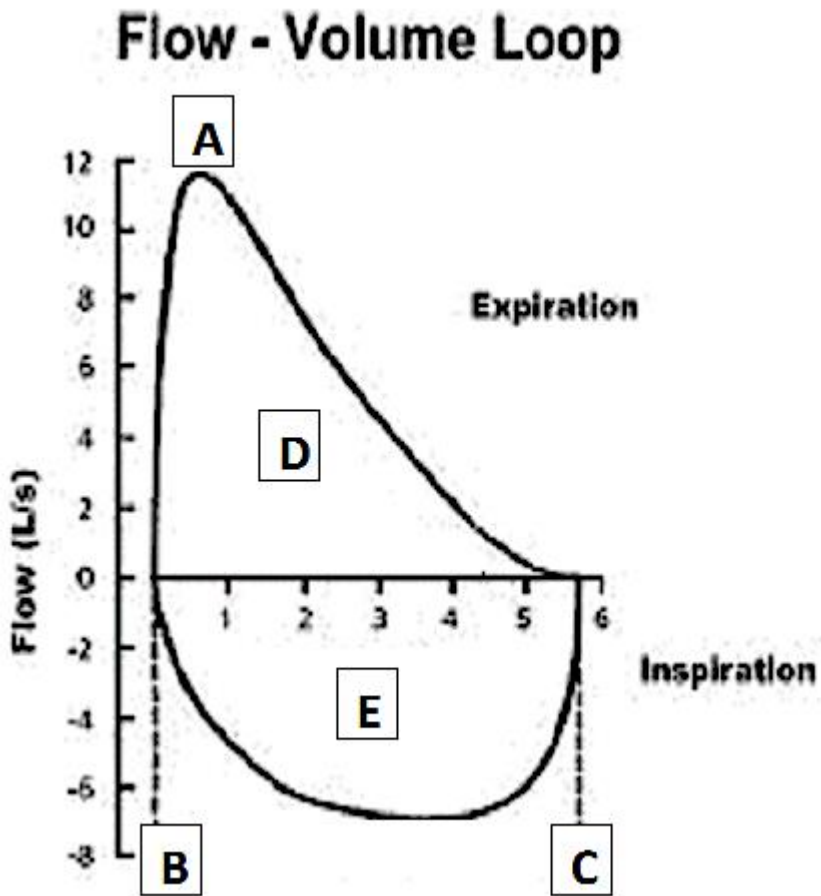
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[10]

**Question 5**

The below figure shows a flow/volume loop taken with the patient breathing from a maximum expiration to a maximum inspiration



a) Label the above diagram A – E. (5)

A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

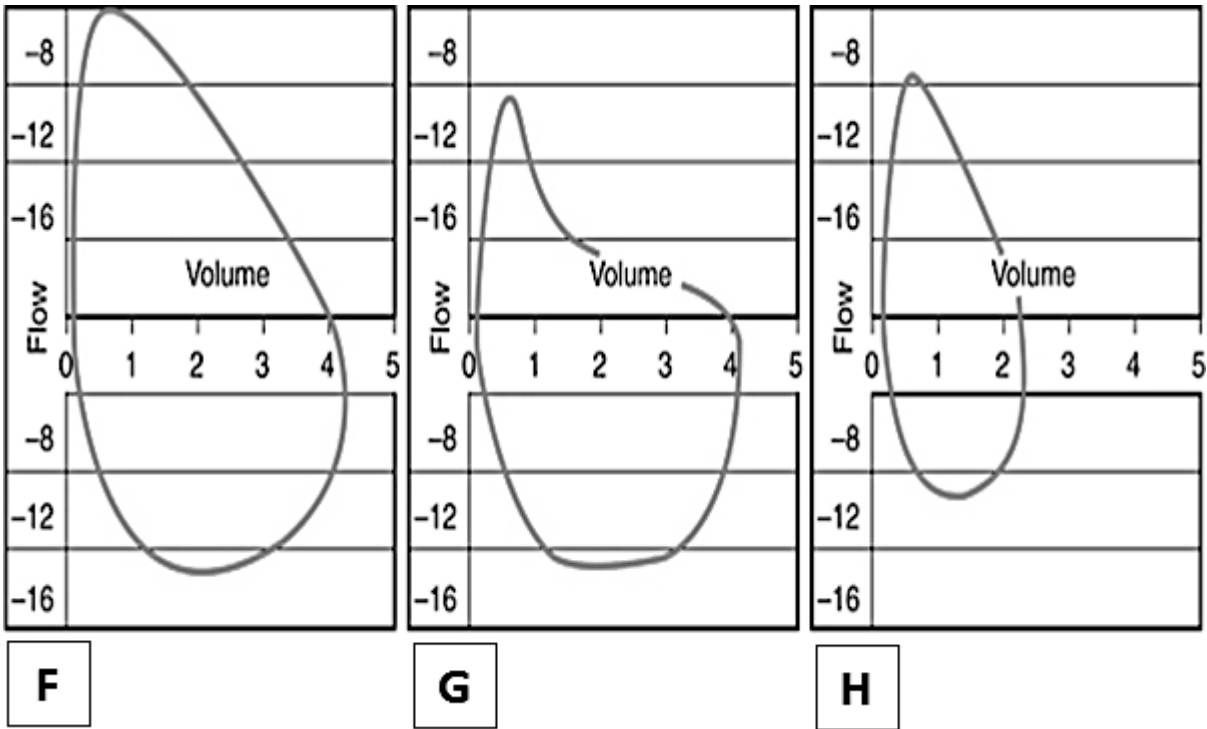
E: \_\_\_\_\_



- b) Draw a flow/volume loop showing obstruction to inspiration and obstruction to expiration. (2)  
[7]

**Question 6**

F, G and H are three Flow/volume loops



Indicate which is compatible with normal, emphysema and restrictive lung disease. [3]

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**Question 7**

What laboratory or other tests can be done to measure the activity of

- a) Heparin. (1)

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- b) Low Molecular Heparin. (1)

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- c) Warfarin. (1)

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- d) Aspirin. (1)

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- e) Clopidogrel. (1)

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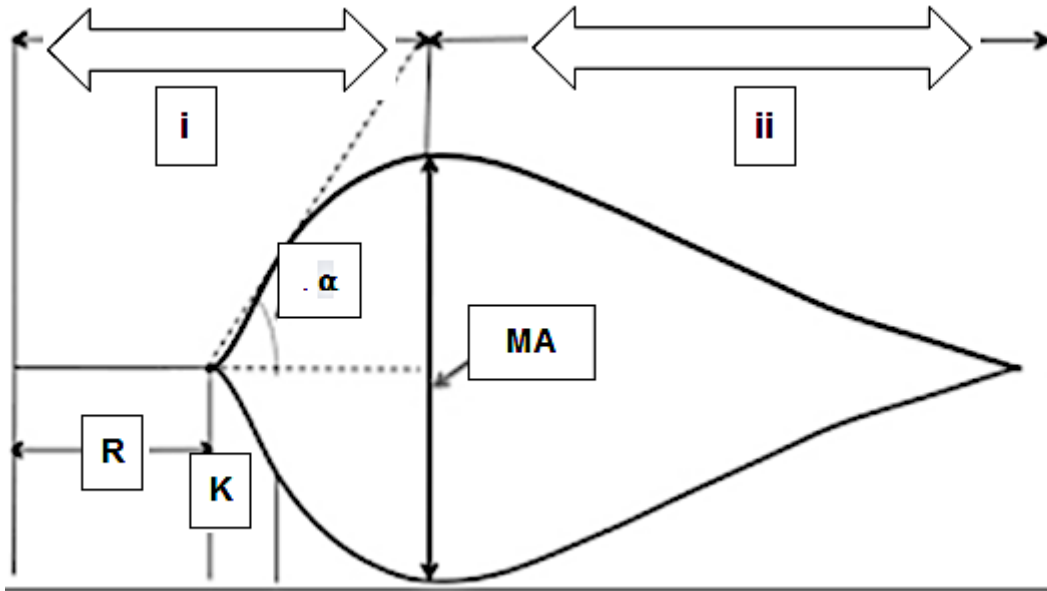
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[5]

**Question 8**

Thromboelastogram (TEG) may allow for a more goal-directed transfusion of blood and blood products. The interactions between the coagulation cascades, platelets, and the fibrinolytic system in the formation and stability of a clot are demonstrated within a TEG



- a) With reference to the example above, please label what the periods i and ii represent. (2)

i: \_\_\_\_\_

ii: \_\_\_\_\_

- b) Which blood constituents may influence

i) R. (1)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

ii)  $\alpha$  and K. (1)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

iii) MA. (1)

\_\_\_\_\_

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[5]

**Question 9**

Give the accepted time period before a neuraxial block can be performed in a patient given the following drugs

- a) Unfractionated heparin. (1)

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- b) Low molecular weight heparin–prophylaxis dose. (1)

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- c) Warfarin. (1)

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- d) Aspirin. (1)

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- e) Clopidogrel. (1)

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[5]

**Question 10**

A 38-year-old female is scheduled for an elective subtotal thyroidectomy. She gives a history of intolerance to heat, palpitations, lethargy and weight loss and finds it difficult to breathe comfortably when lying flat. She has an enlarged left thyroid lobe. She failed radio-iodine therapy 3 years ago. Her current medication is carbimazole and eye drops

**CLINICAL EXAMINATION**

Weight – 56kg  
 Height – 170cm  
 HR – 120 bpm  
 BP – 110/75  
 Temp – 36.7

**Thyroid Function Tests**

T4	30.7pmol/L	(10-22pmol/L)
Free T3	10.5pmol/L	(2-7pmol/L)
TSH	0.1 mU/L	(0.3-4.6mU/L)

- a) What is the patient's current thyroid state? (1)

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- b) What could be the cause of this state? (1)

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- c) If the thyroid state is uncontrolled what other drugs can be used to achieve a euthyroid state? (2)

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- d) What peri-operative anaesthetic concerns would you have regarding this patient? (3)

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e) What special investigations would you order to further evaluate the airway. (2)

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f) Where would you consider placing the patient post operatively. (1)

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[10]

**Question 11**

a) Name three indications for capnography. (3)

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b) Name three causes for raised ETCO<sub>2</sub>. (3)

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c) Name two causes for decreased ETCO<sub>2</sub>. (2)

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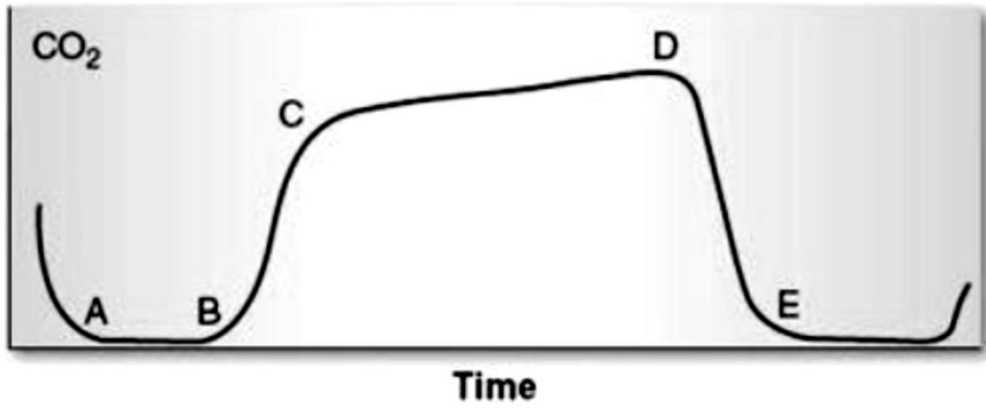
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d) Label the image below and indicate where you would read the ETCO<sub>2</sub>? (5)



A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

E: \_\_\_\_\_

[13]

**Question 12**

Give a differential diagnosis for the image below?

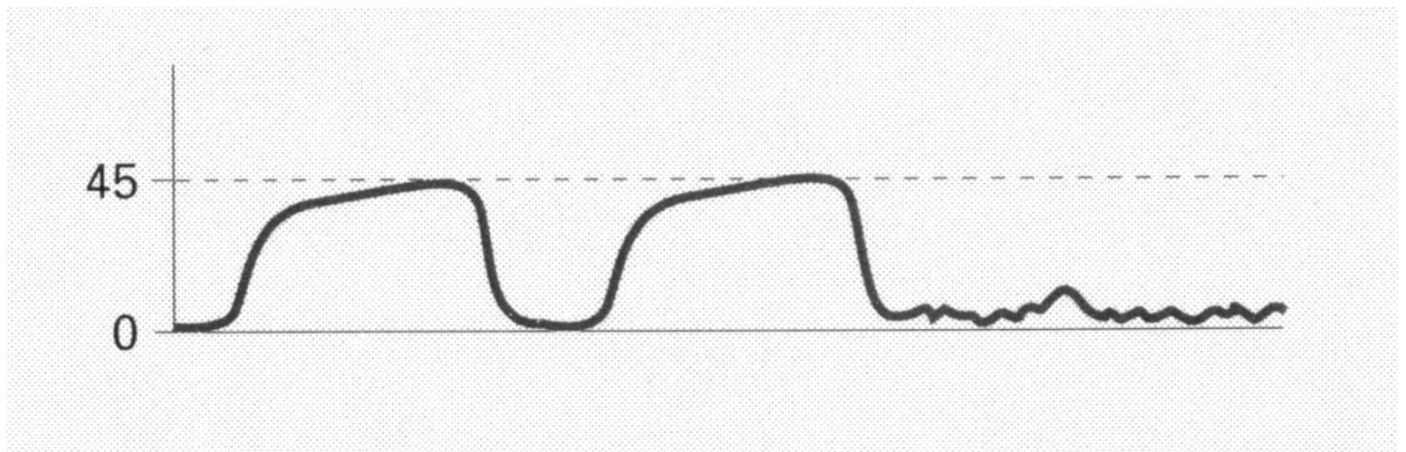
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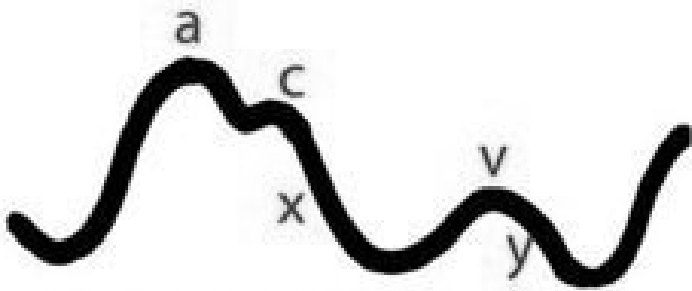
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**Question 13**

a) Below is a labelled Central Venous Pressure tracing. Indicate what each letter stands for (5)



Central Venous Trace

- A: \_\_\_\_\_
- C: \_\_\_\_\_
- V: \_\_\_\_\_
- X: \_\_\_\_\_
- Y: \_\_\_\_\_

b) How will this tracing change in a patient with constrictive pericarditis? (2)

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c) Name the sites and their possible benefits where one can place a central venous catheter. (3)

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d) Name 5 complications of a Central Venous Catheter. (5)

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[15]

**Question 14**



a) Name the disorder depicted above. (1)

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b) Name the relevant airway and respiratory difficulties that may be present. (5)

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c) What difficulties with regards to your anaesthesia plan might be expected? (4)

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[10]

**Question 15**

You are called to see a 54-year-old lady on the ward, she is 3 days post cholecystectomy and is complaining of shortness of breath. Her arterial blood gas (ABG) is as follows

pH: 7.49  
pO<sub>2</sub>: 7.5kPa/ 56,25mmHg  
pCO<sub>2</sub>: 3.9kPa/ 29,25mmHg  
HCO<sub>3</sub>: 22mmol/l  
BE: -1

Everything else is within normal range

- a) What does her ABG Show? (2)

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- b) What is the differential diagnosis? (3)

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- c) How would you manage this patient? (5)

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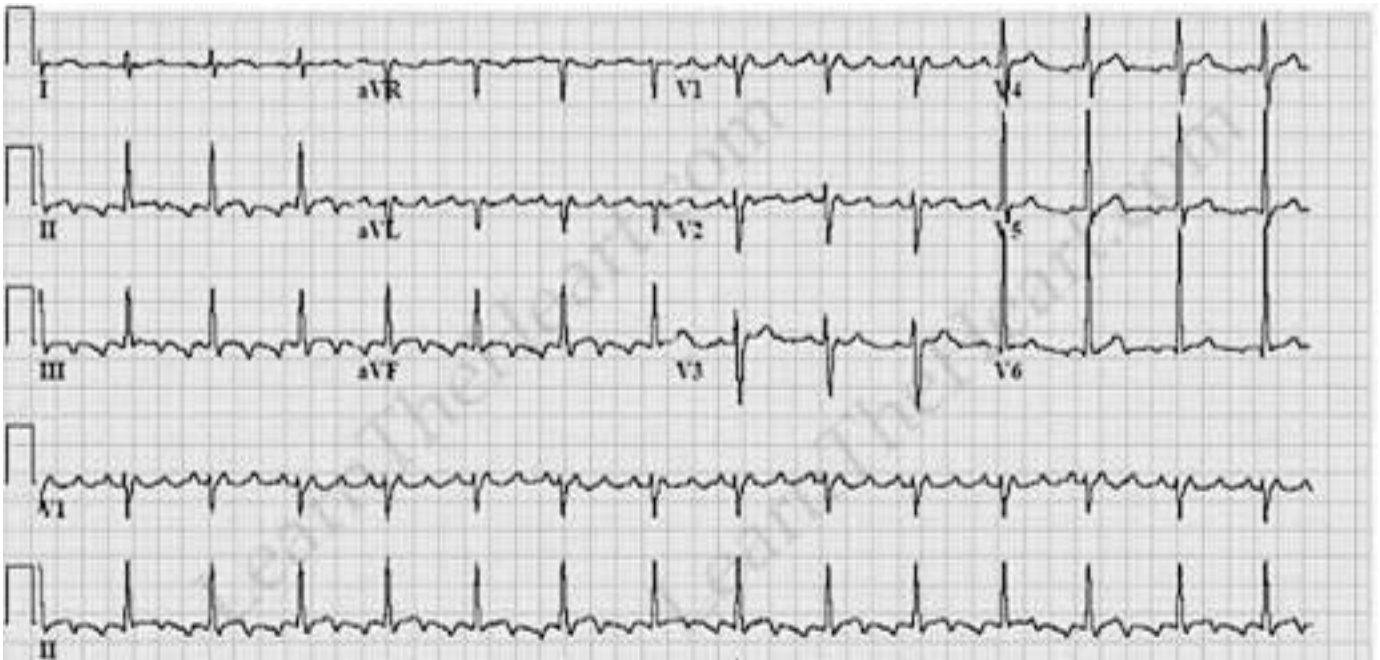
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[10]

**Question 16**

a) What does an ECG actually measure? (1)

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b) What is the heart rate in the above ECG? (1)

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c) What is the rhythm? (1)

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d) What is the axis? (1)

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e) What is a normal PR interval value? (1)

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f) How would you treat this arrhythmia? (3)

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g) What are causes of interference or difficulties in performing a 12 lead ECG? (2)

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[10]

**Question 17**

- a) Interpret the above reading displayed on the nerve stimulator. (2)

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- b) When assessing the train of 4, where can you place the electrodes? (1)

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- c) How is train of four used to assess depth of neuromuscular block? (1)

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d) At what percentage of receptor block would you lose the 4th(T4) and 2nd(T2) twitch? (2)

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e) Using train of four, when would you consider a patient ready to receive neuromuscular block reversing agents and to be extubated? (2)

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f) What is post tetanic count and when would you use it? (2)

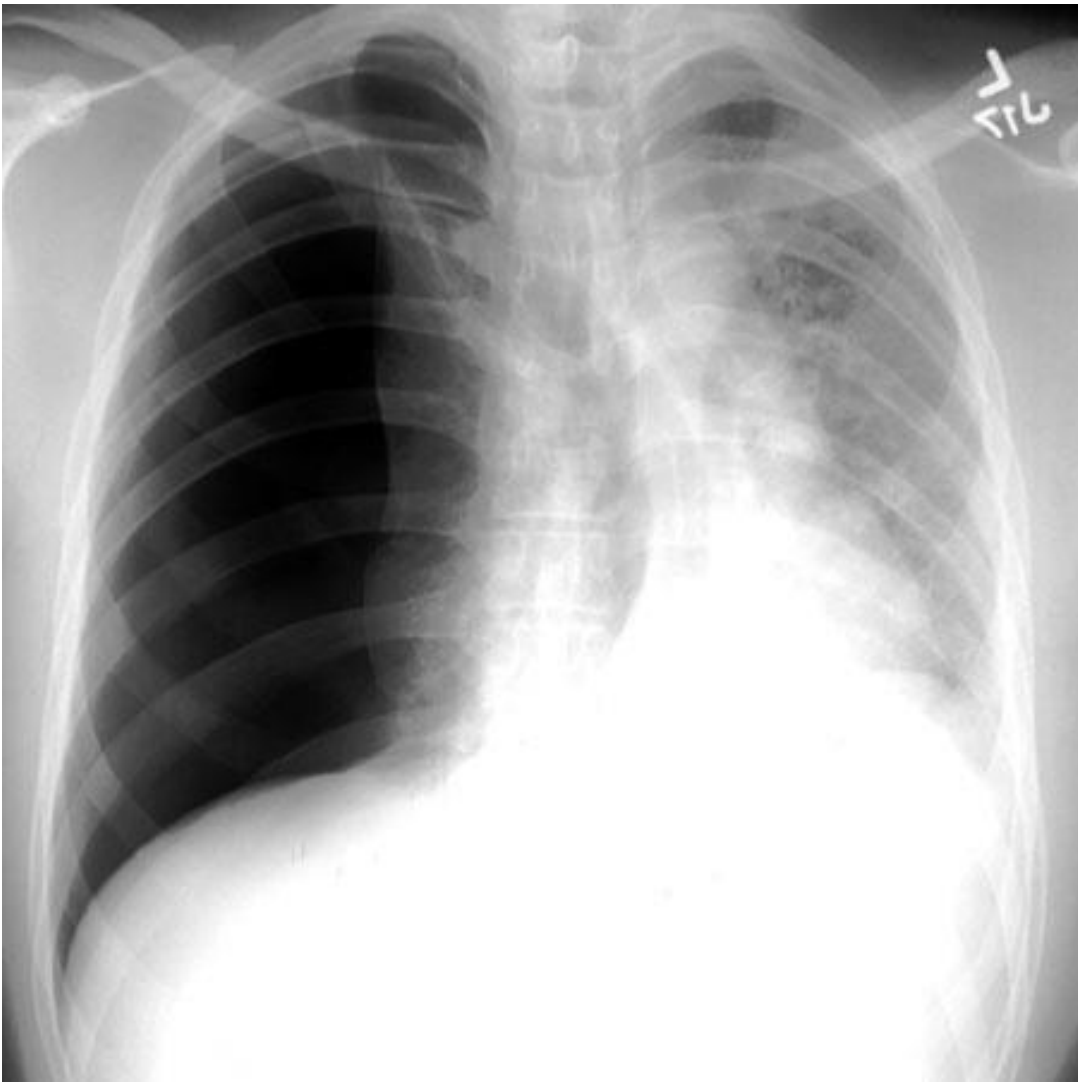
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[10]

**Question 18**

- a) What pathology do you see on the chest x-ray? (2)

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b) How would it present in a patient undergoing intermittent positive pressure, under general anaesthesia? (5)

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c) How would you safely anaesthetise this patient? (3)

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[10]

**Question 19**

The below patient was examined and found to have yellow sclera



- a) State the most likely diagnosis for the following scenarios (3)
- i) Raised aspartate transaminase (AST) and raised alanine aminotransferase (ALT) and prolonged prothrombin time.

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- ii) Raised alkaline phosphatase.

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- iii) Elevated alpha-fetoprotein.

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- b) Complete the following table with regard to safe and unsafe drugs in a patient with the above condition (4)

	Safe	Unsafe/avoid
Inhalational Agents		
Muscle Relaxants		

c) List 3 anaesthetic related concerns in this patient with regard to the following (3)

a) Neuraxial anaesthesia.

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b) Cardiovascular.

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c) Metabolic.

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[10]

**Question 20**



a) State the diagnosis illustrated in the x-ray above. (2)

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b) List 2 features in the x-ray above in keeping with your diagnosis. (2)

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- c) List the respiratory complications that may occur in the patient with the above x-ray, under general anaesthesia. (3)

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- d) List 2 objective measures of respiratory failure in this patient. (2)

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- e) What type of ventilation/perfusion (V/Q) mismatch would this patient have? (1)

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[10]

**Question 21**



a) What type of vapouriser is depicted in Figure A and B above? (2)

Figure A:

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Figure B:

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b) How does the desflurane vapouriser differ from other vapourisers? (2)

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c) State 2 ways in which a vapouriser compensates for temperature changes of the volatile liquid. (2)

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d) Complete the following table

(4)

	Isoflurane	Desflurane
Volatile colour code		
MAC (%)		
Can the volatile be used for gas inductions?		
Blood gas partition coefficient		

[10]

**Question 22**



a) What is the most likely cause of the above? (1)

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b) Name 2 other clinical features of the above condition. (2)

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c) Name 2 drugs commonly used in theatre that may precipitate this condition. (2)

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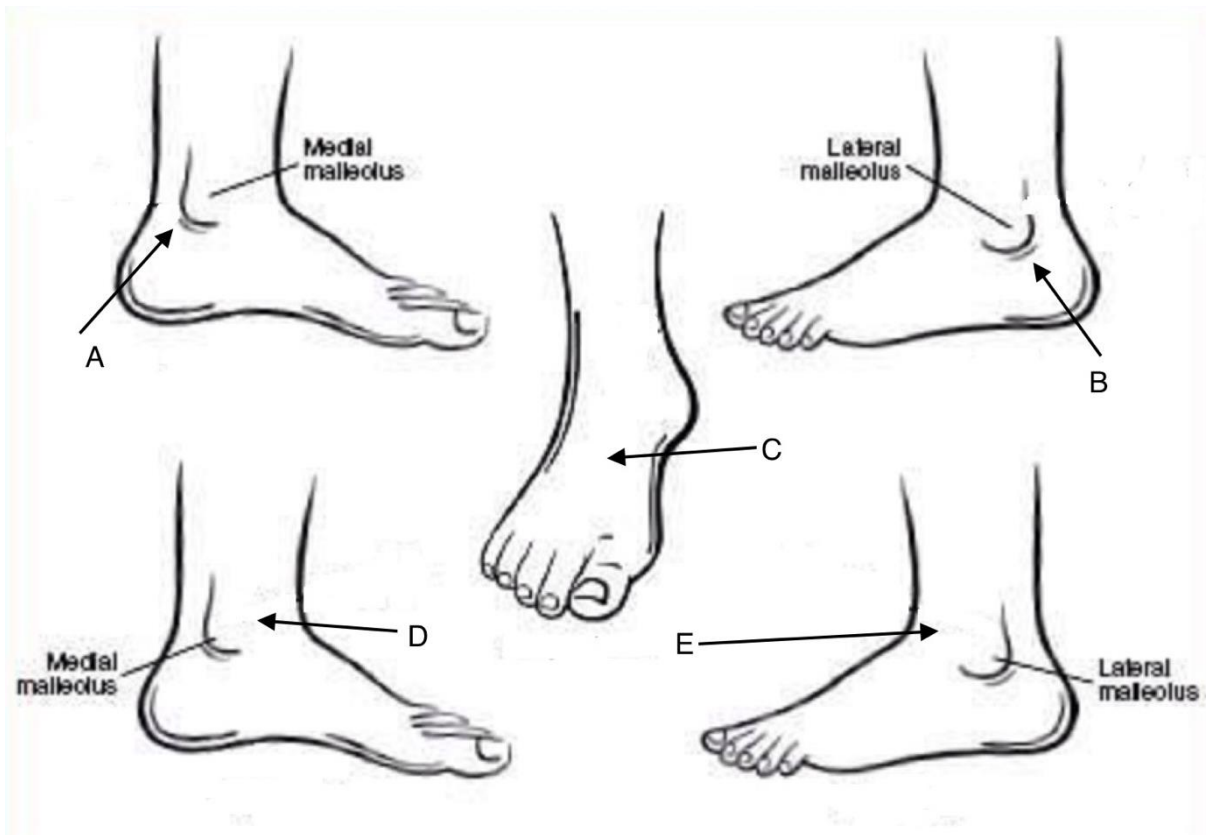
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**Question 23**

Ankle block



a) Which 5 nerves marked A -E, supply the ankle? (5)

A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

E: \_\_\_\_\_

[5]