



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

5 February 2020



Paper 1

Short answer questions

(3 hours)
(Total 300)

Candidate number: _____

Instructions

Questions 1 – 7 (30 marks)

There are ten booklets 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.

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Question 1

List 5 safety features incorporated into a vaporiser's design.

[5]

Question 2

Complete the following table for these five volatile agents

Desflurane

Enflurane

Halothane

Isoflurane

Sevoflurane

a) List them in order of washout time.

(5)

b) State the MAC for each agent.

(5)

[10]

	Shortest washout time \longrightarrow Longest washout time				
<u>a) Name of volatile</u>					
<u>b) MAC</u>					

Question 3

State 3 features of Desflurane which necessitate a special vaporiser design. [3]

Question 4

Describe the adaptations made to the Tec 6 vaporiser to deliver Desflurane [2]

Question 5

A liquid oxygen storage system is common in larger hospitals. Explain why oxygen is stored as a liquid. [3]

Question 6

A liquid oxygen storage system is common in larger hospitals, how is it stored? [1]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 8 – 11 (30 marks)

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A 70-year-old lady with adenocarcinoma (Stage 0) of her large intestine attends the pre-admission anaesthesia clinic. She is scheduled for a total colectomy in 2 months. She has hypertension (Baseline BP: 140/90) and Type 2 diabetes (HBa1c: 8 %) and is a (10 pack year) smoker. Her Hb is 8g/dL and she has normal renal function. She has lost 15kg over the last 2 months.

Question 8

Name 5 ways that this patient can be optimised before her operation.

[5]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 12 – 19 (30 marks)

There are ten booklets for this examination

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Question 12

What is the pathophysiology of molar pregnancy?

[3]

Question 13

Which abnormal endocrine condition is associated with molar pregnancy?

[1]

Question 14

A 25-year-old G₁P₀ primigravida at 18 weeks gestation is booked for an emergency evacuation of her uterus. She has been diagnosed with a molar pregnancy, her Hb=7g/dl and HR=120/min. List 6 potential peri-operative anaesthetic concerns in this patient. [6]

Question 15

Describe 3 physiological changes that predispose pregnant patients to pulmonary aspiration. [3]

Question 16

List strategies you would employ to reduce pulmonary aspiration risk and aspiration consequences in a pregnant patient coming for a general anaesthetic. [5]

Question 17

Describe the pathophysiology of aspiration pneumonia. [3]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 20 – 25 (30 marks)

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Question 21

Name the 2 possible contraindications for spinal anaesthesia in this patient and explain why a spinal would be contraindicated in each case. [4]

Question 22

Name 1 potential advantage of spinal anaesthesia in this patient. [1]

Question 23

List the factors influencing myocardial oxygen supply and demand. [7]

Question 24

List 2 drugs you would use for post-operative analgesia in this patient and indicate the dose of each. [4]

Question 25

Draw the ECG lead placement for a five lead ECG, indicate the colours as well. [2]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 26 – 31 (30 marks)

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Question 26

Draw and a label graph correlating partial pressure of carbon dioxide with cerebral blood flow. [4]

Question 27

Draw and label a graph correlating partial pressure of oxygen with cerebral blood flow. [4]

A 25-year-old previously healthy male presents for a right sided craniotomy- The MRI showed a right sided intracranial abscess pressing on the temporal lobe

Question 28

How would you calculate cerebral perfusion pressure?

[2]

Question 29

How will you manage his raised ICP?

[6]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 32 – 40 (30 marks)

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A 3-year-old boy is booked for strabismus surgery on the elective ophthalmology list. His pre-operative history and examination are normal

Question 32

Please state the pre-operative fasting guidelines for children. [3]

Question 33

List 3 risk factors present, for this child, to develop post-operative nausea and vomiting. [3]

Question 34

List 3 pharmacological agents for the prevention/management of post-operative nausea and vomiting in this child. Please give doses for each agent. [6]

The child had an uneventful induction of anaesthesia, +/- 10 minutes after surgery started, the child develops a sudden severe bradycardia despite normal saturation and blood pressure

Question 35

What is your most likely diagnosis?

[1]

Question 36

Describe the physiology of your diagnosis.

[2]

Question 37

Describe the management of the above mentioned diagnosis.

[4]

A 30-year-old male patient presents for sinus surgery. The ENT surgeon requests a total intravenous anaesthetic technique with propofol

Question 38

Name 2 advantages of this technique.

[2]

The surgery was uneventful, and the patient is extubated and transferred to recovery. In recovery, the patient is desaturating

Question 39

What is the differential diagnosis in this patient?

[5]

Question 40

How would you manage this complication?

[4]



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Paper 1

Short answer questions

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Instructions

Questions 41 – 47 (30 marks)

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Question 41

Respiratory anatomy and physiology are different between young children and adults. List 2 such differences. [2]

Question 42

Regarding paediatric cardiac physiology. Write down the equation for cardiac output and explain how each component influences cardiac output in young children. [5]

A 24kg child sustained hot water burns to both posterior aspect of his legs. He is booked for a sloughectomy 8 hours after the burn

Question 43

Calculate the % burns incurred. [1]

Question 44

What fluid management plan would you institute? Please include type of fluid and dose. [6]

Question 45

List 5 peri-operative anaesthetic concerns pertaining to this burn patient. [5]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 48 – 53 (30 marks)

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Question 48

List 4 clinical features that could indicate severe life-threatening asthma (status asthmaticus). [4]

Question 49

List 4 findings on special investigations that could indicate severe life-threatening asthma (status asthmaticus). [4]

Question 50

List the pathophysiological features of severe life-threatening asthma (status asthmaticus). [8]

Question 51

Describe the immediate management of a patient presenting with life-threatening asthma (status asthmaticus). [5]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 54 – 58 (30 marks)

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NB. Fill in your candidate number above.

Question 54

For the following analgesics, give the receptors on which they act in the table below.

[4]

Analgesic	Receptor Type
e.g. Morphine	Opioid (μ , δ , κ)
Ketamine	
Paracetamol	
Aspirin	
Cannabis	

Question 55

Define each of the following terms

a) Tolerance.

(2)

b) Physical dependence.

(2)

c) Addiction.

(2)

[6]

Question 56

Define the term: Withdrawal (include signs and symptoms).

[4]

Question 57

A 6-year-old patient known with obstructive sleep apnoea presents after a fall, with a closed femur fracture that requires surgery. With regards to opioid-sparing analgesia, tabulate 4 analgesic agents that belong to four different groups of analgesics that you can use in this patient, intra-operatively. Indicate the dosages and the route of administration of each agent. [12]

Drug	Dose	Route

Question 58

List 4 side effects of opioids.

[4]



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Paper 1

Short answer questions

(Total 300)

Candidate number: _____

Instructions

Questions 59 – 66 (30 marks)

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You are assigned to a list in the gastroenterology suite which is in a remote location

Question 59

List 5 concerns about providing procedural sedation in this environment. [5]

Question 60

List 1 **clinical** monitor you would use during procedural sedation. [1]

Question 61

List 4 electronic monitors you would use during procedural sedation. [4]

Question 62

When monitoring a patient's breathing pattern under sedation, what would be concerning signs? [3]

Question 63

You observe an alteration in breathing pattern and conclude it is secondary to opioid overdose

What drug would you use to reverse the effects, indicate the dosing regimen you would use, and the maximum dose permitted? [4]

Question 64

Which patient factors should be considered to assess whether a patient may be offered procedural sedation as a day case in a remote location? [6]

Question 65

What level of sedation would be appropriate for gastroscopy cases and how would you confirm you have reached the depth of sedation you have aimed for, using patient responsiveness?

[3]

Question 66

Would you proceed with the following 2 patients on your gastroscopy list in this remote location? Provide reasons for your answer.

[4]

<u>VIGNETTE</u>	<u>PROCEED:</u> <u>Yes / No</u>	<u>REASON</u>
<u>Patient A:</u> A 65-year-old female HPT, IHD with 2 x coronary stents placed 5 years ago and currently only on aspirin. She no longer has chest pain and manages to walk 5km 3 times a week.		
<u>Patient B:</u> A 50-year-old male HPT, morbidly obese patient (BMI 55). His wife describes that he snores and stops breathing. He also admits to frequently falling asleep at his desk at work.		



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Paper 3

Data Interpretation

(2 hours)
(Total 200)

Candidate number: _____

Instructions

Questions 1 – 4 (40 marks)

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NB. Fill in your candidate number above.

Question 1

A 67-year-old gentleman is scheduled for a right above knee amputation. He has longstanding insulin dependent diabetes mellitus and severe peripheral vascular disease

Blood results are the following

		Normal Values
HbA1c	10 %	4 -5.6 %
Random Glucose	11.3 mmol/L	4.4 -7.8 mmol/L
Haemoglobin	7.8 g/dl	12 – 15.5 g/dl
Platelets	320 X 10 ⁹ /L	150 – 450 X 10 ⁹
Sodium	138 mmol/L	135 - 145 mmol/L
Potassium	5.9 mmol/L	3.5 – 5 mmol/L
Urea	42 mmol/L	2.5 to 7.1 mmol/L
Creatinine	310 mmol/L	60 – 110 mmol/L

- a) Would you do a regional or a general anaesthetic for this patient and explain your choice? (2)

- b) Comment on this patient's glucose control. (2)

- c) List 2 potential reasons for the patient's haemoglobin level. (2)

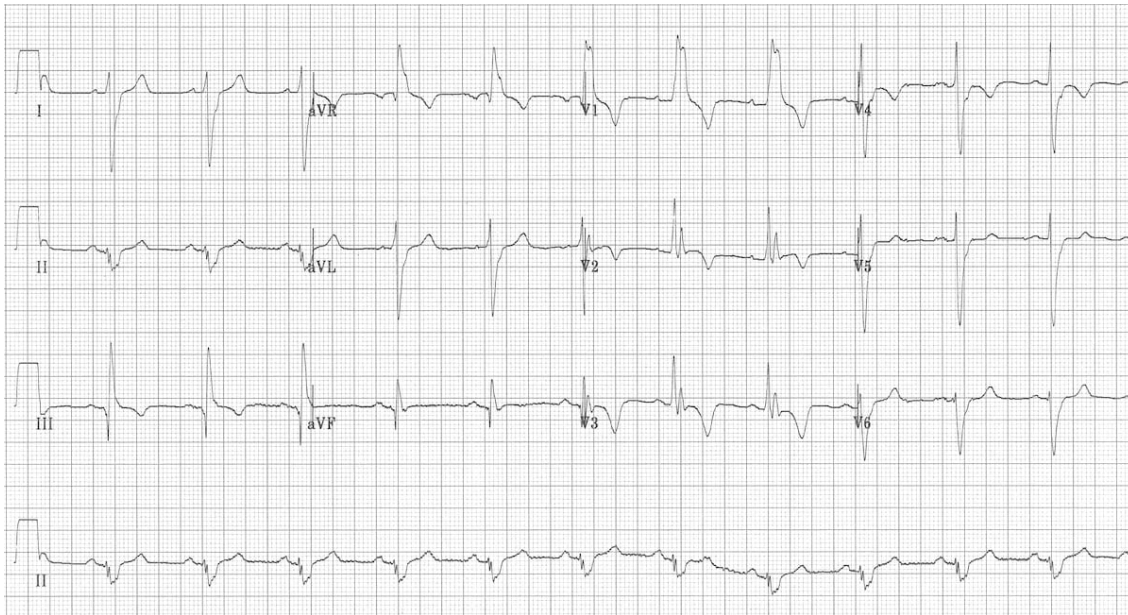
d) How would you manage the patient's haemoglobin peri-operatively? (4)

[10]

Question 2

A 62-year-old lady is day 3 post right total knee replacement. She has a 20-pack year history of smoking and has a high body mass index (BMI).

She now complains of dyspnoea and chest pain. On examination her pulse rate is 120 beats per minute, her blood pressure is 94/54 mmHg and her saturation on room air is 88%



a) Interpret the above ECG.

(4)

b) What is the most likely diagnosis?

(1)

c) What is the management of this patient?

(5)

[10]

Question 3

- a) Please tabulate the similarities and differences between Ringers lactate and Plasmalyte B (mmol values are not required). (7)

Fluids	Ringers lactate	Plasmalyte B
Similarities (3)		
Differences (4)		

- b) What is your preferred maintenance fluid for a patient with traumatic head injury and explain your choice? (3)

[10]

Question 4

A 37-year-old ASA 1 patient has been under general anaesthesia for an open cholecystectomy, after a laparoscopic procedure failed. You are called to review her in theatre recovery as she started to desaturate. On evaluation she has tachypnoea and a tachycardia and is extremely drowsy

		Normal values
pH	7.27	7.35-7.45
PaCO₂	7.0 kPa / 52 mmHg	4.6 – 6.1 kPa/35 – 45 mmHg
PaO₂	7.8 kPa / 58 mmHg	10.0 –13.3 kPa/ 75 – 100 mmHg
HCO₃	23.1 mmol/l	22 – 28 mmol/l
BE	-3 mmol/l	-2 - +2 mmol/l
SpO₂	87 %	
FiO₂	Room air	

- a) Analyse this arterial blood gas. (4)

- b) Calculate the PaO₂/FiO₂ (P/F) ratio and explain its relevance. (2)

- c) List 4 systemic effects of hypercarbia. (4)



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Paper 3

Data Interpretation

(Total 200)

Candidate number: _____

Instructions

Questions 5 – 8 (40 marks)

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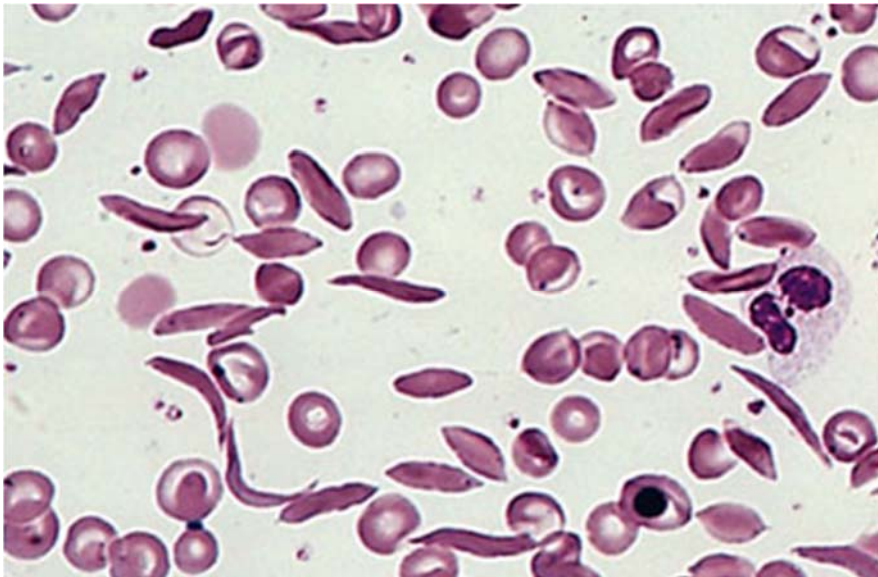
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Question 5

Below is a full blood count and a smear of a 14-year-old boy, of central African descent who presented with acute abdominal pain, jaundice and dehydration

		Normal Value
WCC	WCC 22 x 10 ⁹ /L	3.90-12.6 x 10 ⁹ /L
Hb	Hb 8.9 g/dL	11.6-16.4 g/dL
HCT	Hct 22 %	34 – 48 %
PLT	Plt 334 x 10 ⁹ /L	186 - 454 x 10 ⁹ /L
MCV	MCV 90 fL	78.9 – 98.5 fL
MCH	MCH 28.6 pg	26.1 – 33.5 pg



- a) What type of anaemia does he have? (2)

- b) What abnormality is demonstrated on the blood smear that has been exposed to an oxygen consuming reagent? (1)

c) List four things that can induce this abnormality demonstrated on the blood smear. (4)

d) The patient is booked for laparotomy for an appendix abscess, list 3 **pre-operative** measures specific to this haemoglobinopathy that you will take. (3)

[10]

Question 6

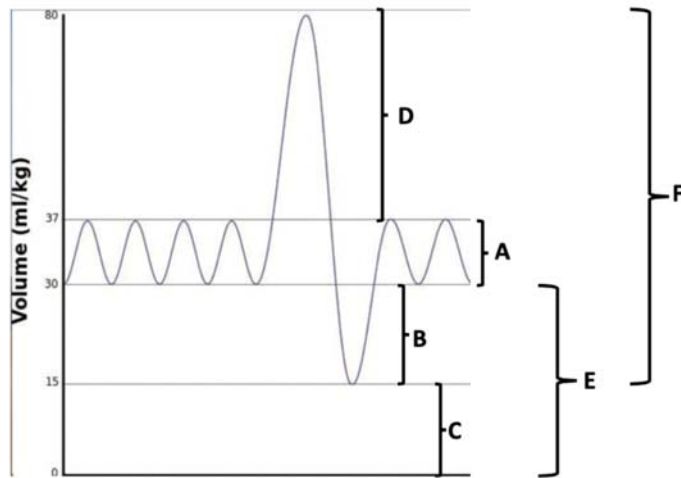
- a) Draw and label a flow volume loop representing fixed airway obstruction. (7)

b) Give three causes of fixed upper airway obstruction. (3)

[10]

Question 7

The following spirogram was obtained from a 46-year-old female presenting for a staging laparotomy for a large ovarian cancer



a) Label the graph from A – F.

(6)

A=

B=

C=

D=

E=

F=

b) During the apnoeic period, which area marked A - F does the body maintain oxygenation from? (1)

c) Name 2 factors that are known to affect the above area in question (7b). (2)

d) Name one complication from ovarian cancer that can affect the area in question (7b). (1)

[10]

Question 8

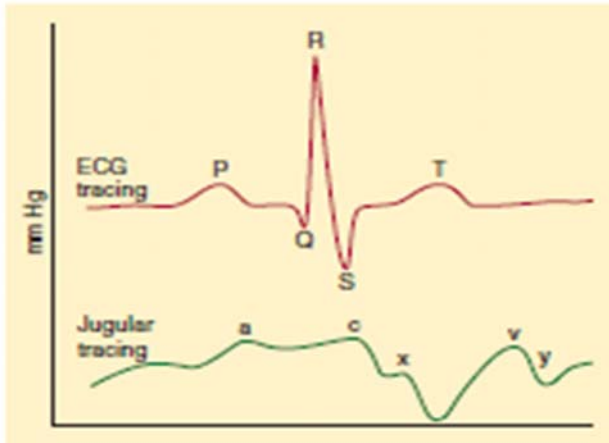
- a) You plan to insert a central venous catheter in the neck of a patient. Please label the structures in the ultrasound image below. (2)



A

B

- b) Below is the trace of the central venous catheter you have inserted, describe the waves and descents in relation to the cardiac cycle. (4)



a _____

c _____

x _____

y _____

- b) List 4 indications for a central venous catheterisation. (4)



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Paper 3

Data Interpretation

(Total 200)

Candidate number: _____

Instructions

Questions 9 – 12 (40 marks)

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Question 9

A 15-year-old male patient is booked for an umbilical hernia repair. On the pre-operative assessment, he reports a chronic cough associated with haemoptysis. His pre-operative chest x-ray is shown



- a) Describe the findings on the x-ray. (3)

- b) What is the diagnosis on the chest radiograph? (1)

Question 10

A 4-year-old child presents in the emergency department with one day history of inspiratory stridor, difficulty swallowing and drooling. Below is his preoperative radiograph

His vitals:

Temperature 39°C

Pulse: 145 beats /min

Respiratory rate: 48 breaths/min

Blood pressure: 95/52 mmHg



- a) What is the most likely diagnosis and what confirmation of this condition do you find on the x-ray? (2)

- b) You have brought this patient to theatre for emergency airway management. List the **additional** airway equipment you would request to supplement your normal airway trolley. (6)

- c) This patient is later brought back to theatre for a trial of extubation. List 2 airway examination findings that will indicate that it is safe to try and extubate the child. (2)

[10]

Question 11

A 9-year-old male patient is booked for a biopsy of a posterior cervical lymph node, the surgeon suspects lymphoma and requires a diagnosis to initiate treatment. Please see the patient's Chest X-ray (CXR) below







- a) What abnormality do you see on the CXR? (2)

- b) What are the important questions to ask this patient, as part of your history taking? (4)

Question 12

Please complete the following table.

[10]

Clinical sign		
<p><u>'The trousseau sign'</u></p> 	<p>Which electrolyte abnormality is associated with this clinical sign? (1)</p> <p>.....</p> <p>.....</p>	<p>List 2 hormones that are involved in the regulation of this electrolyte? (2)</p> <p>.....</p> <p>.....</p>
<p><u>'Sclerodactyly'</u></p> 	<p>State a disease process associated with this clinical sign. (1)</p> <p>.....</p> <p>.....</p>	<p>List 2 respiratory anaesthetic considerations associated with this condition. (2)</p> <p>.....</p> <p>.....</p>
<p><u>'Splinter haemorrhages'</u></p> 	<p>State the disease process associated with this clinical sign. (1)</p> <p>.....</p> <p>.....</p>	
<p>'Boutonniere and swan neck deformity'</p> 	<p>State a disease process associated with this clinical sign. (1)</p> <p>.....</p> <p>.....</p>	<p>List 2 musculoskeletal complications of this disease that may lead to difficult direct laryngoscopy. (2)</p> <p>.....</p> <p>.....</p>



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Paper 3

Data Interpretation

(Total 200)

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Instructions

Questions 13 – 16 (40 marks)

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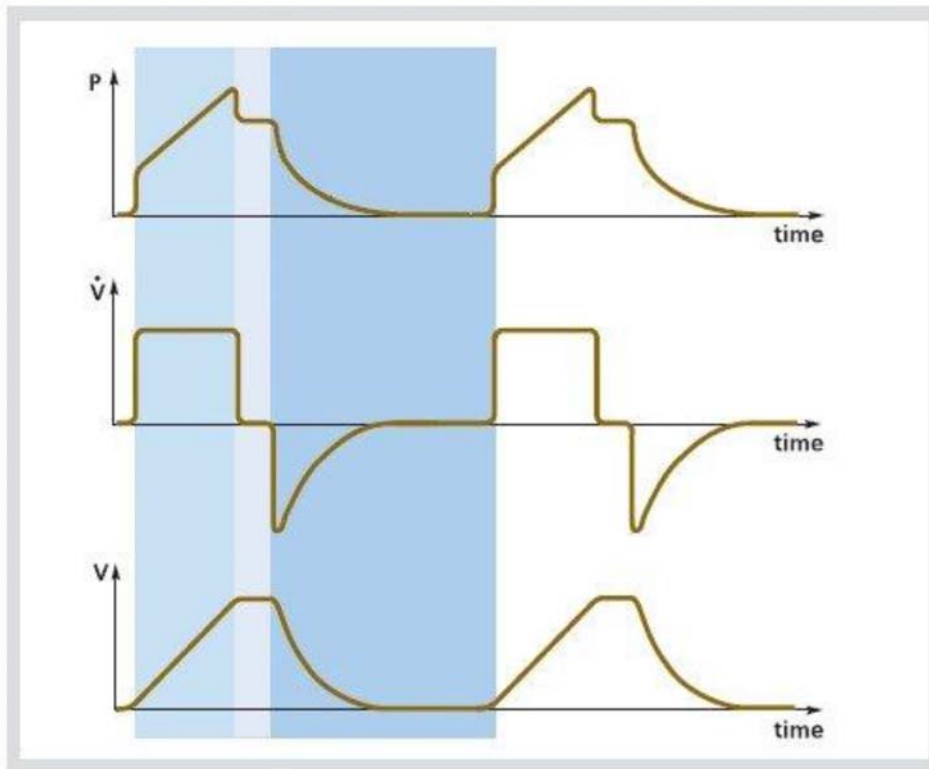
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Question 13

This G1P0 30-year-old patient with a previous mitral valve replacement for mitral stenosis secondary to rheumatic heart disease presents for a conus biopsy of cervix for possible cervix cancer. She has Grade II NYHA function and no other co-morbid disease



- a) List 4 pathological features caused by mitral stenosis that are still visible on this x-ray. (4)

Question 14

The diagram above shows graphs of pressure, flow and volume (top to bottom) plotted against time on the anaesthetic workstation screen of a patient undergoing a laparoscopic appendicectomy. This is immediately post induction and intubation

- a) Do these graphs represent volume or pressure control ventilation? (1)

- b) During abdominal insufflation, what changes will occur on the pressure -time graph? (1)

- c) Briefly describe what physiological changes will occur in the cardiac system after the pneumoperitoneum. (3)

- d) Briefly describe what physiological changes will occur in the respiratory system after the pneumoperitoneum. (3)

- e) How would you optimise the ventilation with the insufflation of the abdomen of this patient? (2)

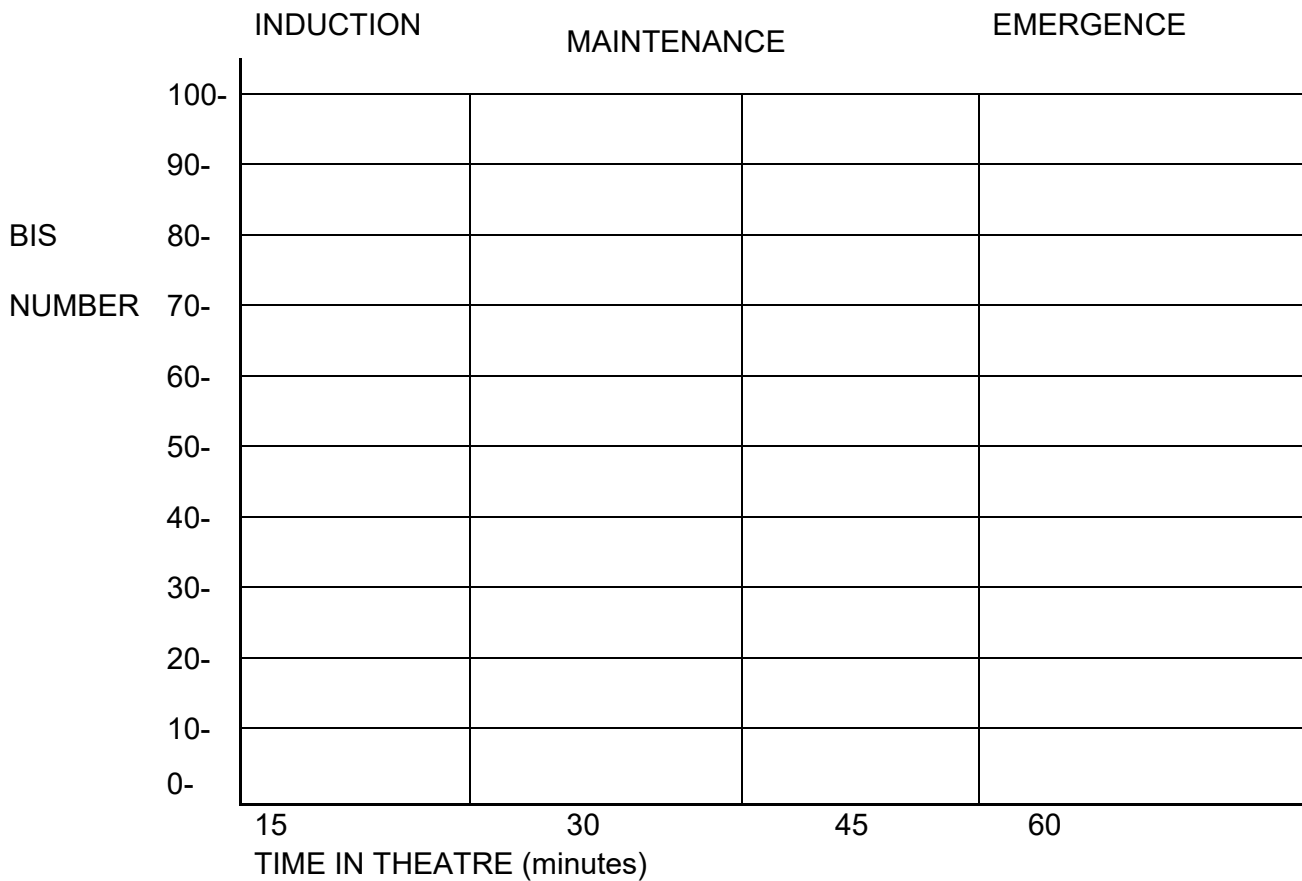
[10]

Question 16

- a) Using Bispectral index (BIS) depth of anaesthesia monitoring, what value range are you likely to see in an awake patient? (1)

- b) Complete the graph below. Plot the shape of the graph you are likely to see during induction, maintenance and emergence. (3)

Graph of BIS number versus time in theatre



- c) List 2 potential reasons why the monitor is not 100% effective in preventing awareness under anaesthesia. (2)

- d) List 4 clinical signs that could help to indicate that the patient's depth of anaesthesia may be inadequate. (4)

[10]



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Paper 3

Data Interpretation

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Instructions

Questions 17 – 20 (40 marks)

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NB. Fill in your candidate number above.

Question 17

A 65-year-old patient fell and fractured her hip. She is presented for total hip replacement on the emergency list within 24 hours of the initial fall. When you examine her, her BP is 90/40 mmHg pulse rate 38 beats/ min and she is confused with an ECG as follows



- a) Describe the ECG and what abnormality you detect. (3)

- b) List 2 possible causes of this abnormality. (2)

- c) Would you take this patient to theatre and give a reason why? (2)

- d) What precautions would you take before you take this patient to theatre? (3)

Question 18

You are given the following blood results for a patient booked for a laparotomy

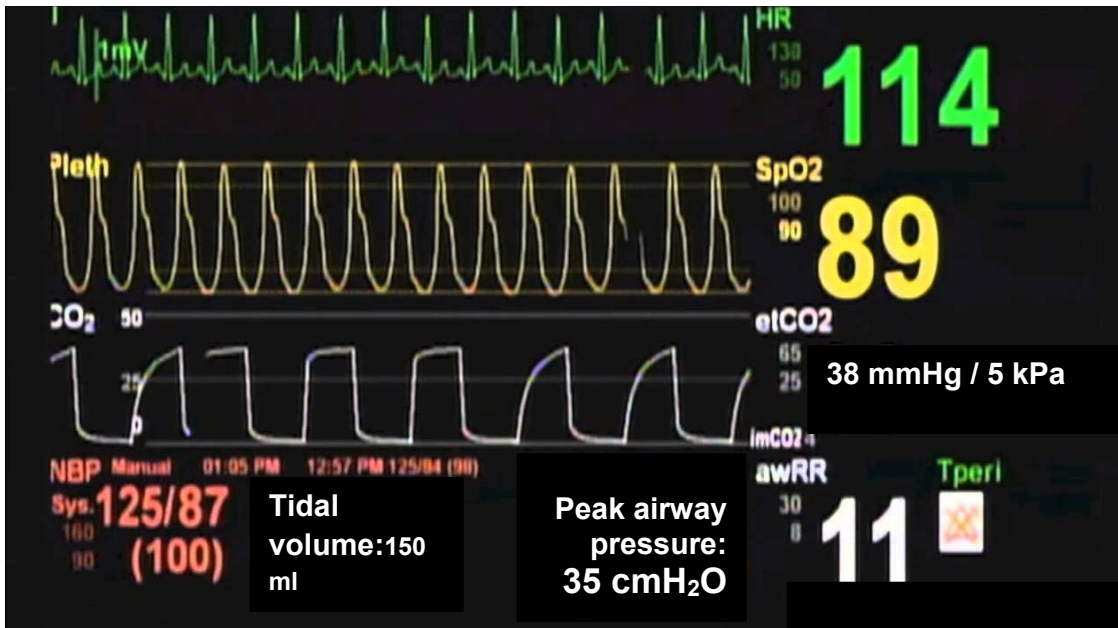
		Normal values
pH	7.33	7.35-7.45
PaCO₂	3 kPa / 22.5 mmHg	4.6 – 6.1 kPa/35 – 45 mmHg
PaO₂	13 kPa / 97.5 mmHg	10.0 –13.3 kPa/ 75 – 100 mmHg
HCO₃	17 mmol/L	22 – 28 mmol/L
Lactate	4 mmol/L	0.5 -1 mmol/L
Glucose	15 mmol/L	4.4 – 7.8 mmol/L
Sodium	135 mmol/L	135 - 145 mmol/L
Potassium	5 mmol/L	3.5 – 5 mmol/L
Chloride	95 mmol/L	96 – 106 mmol/L
Haemoglobin	13 g/dl	12.5 – 15.5 g/dl

- a) What acid-base disorder is present and give 3 reasons for your answer? (4)

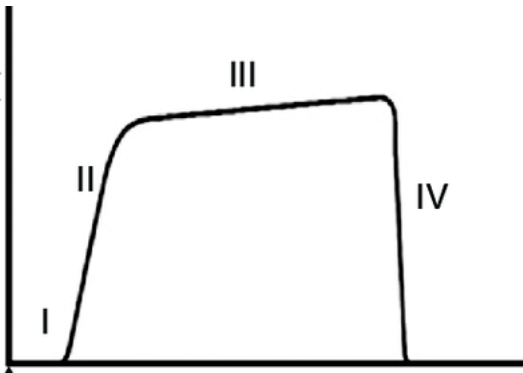
- b) Calculate the anion gap. (2)

c) What are 4 possible causes for this anion gap result above? (4)

[10]

Question 19

- a) During a general anaesthetic of a 70kg patient the above changes occur suddenly. List 3 potential causes for these changes. (3)

Question 20

a) Identify the different phases of the above capnograph.

I =

(1)

II =

(1)

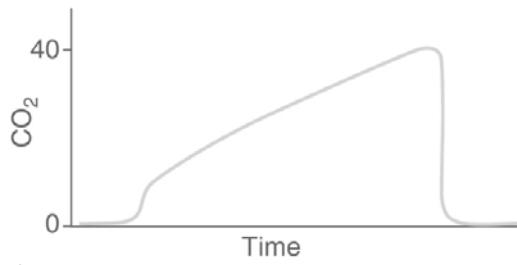
III =

(1)

IV =

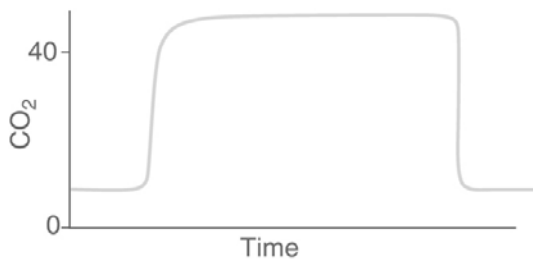
(1)

Identify the problem with the following capnographs and the possible solution for the problem.



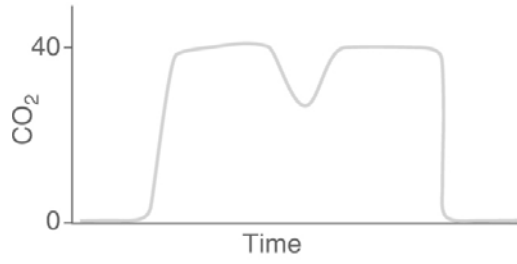
b) Problem (1)

Solution (1)



c) Problem (1)

Solution (1)



d) Problem (1)

Solution (1)

[10]