Exam A: Questions

A1. A trauma patient is brought into the resuscitation room with an obviously unstable pelvis. Despite ongoing fluid resuscitation with blood products the patient remains haemodynamically unstable, has a profound metabolic acidosis and continues to deteriorate. Focused assessment with sonography in trauma (FAST) scan is positive.

Which of the following is MOST important in the management of this patient's bleeding?

A. Administration of tranexamic acid
B. 1:1:1 rather than 1:1:2 transfusion ratio for plasma:platelets:blood
C. Treatment with interventional radiology
D. Urgent damage control surgery
E. Maintaining normothermia and ionized calcium levels >0.9 mmol/l

A2. A patient has been admitted to the intensive care unit (ICU) with severe sepsis and urgently requires a central venous catheter (CVC). You decide to insert the CVC into the right internal jugular vein (IJV).

Which of the following approaches to central line insertion is the best?

A. Landmark approach; lateral to the carotid artery pulsation
B. Audio-guided Doppler ultrasound guidance in the head-up position
C. Landmark approach; medial to the carotid artery pulsation
D. Audio-guided Doppler ultrasound guidance in the head-down position
E. Two-dimensional (2D) ultrasound guidance

A3. Of the following pathologies, which is the commonest cause for end-stage renal failure in the United Kingdom?

A. Hypertension
B. Polycystic kidney disease
C. Vasculitis
D. Renal artery stenosis
E. Immunoglobulin A (IgA) nephropathy

A4. Which of the following methods of humidification is able to generate the highest relative humidity in an ICU ventilator circuit?

A. Heat and moisture exchange filter (HME)
B. Cascade humidifier
C. Cold-water bath
D. Hot-water bath
E. Ultrasonic nebulizer

A5. Which of the following gas patterns seen on plain erect abdominal X-ray is most suggestive of significant bowel pathology requiring surgery?

A. Large gas bubble in the stomach
B. Gas in the small bowel
C. Gas in the small bowel and fluid levels at the same height within loops
D. Gas in the large bowel
E. Gas in the small bowel and rectum only

A6. You are about to intubate a patient with a life-threatening exacerbation of asthma.

Which of the following agents is MOST likely to improve lung mechanics and bronchospasm?

A. Atracurium
B. Ketamine
C. Propofol
D. Thiopentone
E. Fentanyl

A7. In a normal adult patient, a red blood cell travelling from the aorta to the portal vein is most likely to pass through which structures?

A. Inferior mesenteric artery, superior rectal artery, rectal veins
B. Coeliac trunk, left gastro-omental artery, splenic vein
C. Right gastric artery, short gastric vein, splenic vein
D. Superior mesenteric artery, right colic vein, inferior mesenteric vein
E. Coeliac trunk, gastroduodenal artery, epigastric vein

A8. A patient is undergoing chemotherapy for acute leukaemia, is neutropenic and has a persistent temperature and cough despite treatment with broad-spectrum antibiotics. A computed tomography scan of the thorax reveals pulmonary nodules with surrounding halos of ground-glass opacity ('halo sign'). Antigen testing on bronchoalveolar lavage samples suggests a diagnosis of *Aspergillus*.

Which of the following would be the BEST treatment for this patient?

A. Voriconazole
B. Amphotericin B deoxycholate
C. Fluconazole
D. Flucytosine
E. Posaconazole

A9. A male patient with jaundice has the following blood results:

Bilirubin	200 µmol/l	(3–17 µmol/l)	60% conjugated
Reticulocytes	<1%	(<1%)	
Aspartate transaminase (AST)	450 IU	(<35 IU)	
Alkaline phosphatase (ALP)	300 IU	(<250 IU)	
International normalized ratio	1.4	(0.8–1.2)	
Ceruloplasmin	33 mg/dl	(20–35 mg/dl)	

Which of the following is the MOST likely cause of the patient's jaundice?

A. Alcoholic cirrhosis
B. Primary sclerosing cholangitis
C. Wilson disease
D. Pancreatic cancer
E. Haemolysis

A10. A patient returns from an aortic valve replacement (AVR) operation to the cardiac intensive care unit (CICU). He has atrial and ventricular epicardial pacing wires in situ, connected to a temporary pacing box. The post-operative electrocardiogram (ECG) demonstrates a rate of 80 bpm with a pacing spike immediately followed by a P wave then 220 ms pause before a narrow QRS complex.

Which of the following is most likely to describe this situation?

A. VVI pacing
B. AOO pacing with first-degree heart block
C. DDD pacing with the AV delay set at 200 ms
D. VOO pacing with retrograde atrial contraction
E. AAI pacing with underlying fast atrial fibrillation

A11. Which of the following is the LEAST invasive method of calculating cardiac output?

A. Lithium dilution, e.g. LiDCO
B. Thermodilution, e.g. PiCCO
C. Indirect Fick method
D. Oesophageal Doppler
E. Volume clamp (Penaz method), e.g. Finapress

A12. A 54-year-old man with no previous medical history is admitted with shortness of breath and pleuritic chest pain 4 days after a 16-hour flight. A computed tomography (CT) scan has demonstrated bilateral pulmonary emboli, and echocardiography has revealed right heart dysfunction. His heart rate is 112 bpm, blood pressure is 104/52 and oxygen saturations are 94% on 50% inspired O_2.

Which would be the MOST appropriate treatment?

A. Anticoagulate with low molecular weight heparin (LMWH)
B. Anticoagulate with vitamin K antagonists
C. Thrombolyze using alteplase
D. Anticoagulate with unfractionated heparin infusion (UFH)
E. Anticoagulate with dabigatran

A13. A 74-year-old female patient presents with sudden onset, spontaneous, right-sided weakness. There is no history of trauma, and she reports no history of pain. Two days later, she remains alert and oriented. Neurological examination still reveals decreased tone and power in the right arm and leg with diminished reflexes and right-sided neglect due to homonymous hemianopia.

Which of the following is the most likely diagnosis?

A. Transient ischaemic attack (TIA)
B. Partial anterior circulation syndrome (PACS)
C. Carotid artery dissection
D. Total anterior circulation syndrome (TACS)
E. Malignant middle cerebral artery infarct

A14. A 54-year-old patient is ventilated with pneumonia. He has plateau and peak end expiratory pressures of 28 and 12 cmH_2O respectively. His O_2 saturation are 92% with an FiO_2 of 0.4 and arterial blood gas findings are as follows: pH 7.26, PaO_2 8.2 kPa, $PaCO_2$ 7.6 kPa. An echocardiography reveals an ejection fraction of 44% and pulmonary arterial pressure of 55 mmHg.

What is the MOST likely cause of this patient's pulmonary hypertension (PH)?

A. Hypoxia and hypercapnia
B. Chronic pulmonary hypertension
C. Acute left ventricular dysfunction
D. An acute pulmonary embolism
E. Pulmonary atelectasis

A15. Which of the following indications has the LEAST strong evidence base for initiating a blood transfusion?

A. Haemoglobin (Hb) <70 g/l in a previously well patient admitted to the intensive care unit
B. A shocked trauma patient with massive blood loss unresponsive to crystalloids
C. Hb <70 g/l in a stable patient admitted with an acute upper gastrointestinal bleed
D. Hb <70 g/l in a patient with septic shock on vasopressin and noradrenaline
E. Hb <100 g/l in a patient in the intensive care unit with a history of cardiovascular disease

A16. A 54-year-old male patient is admitted to the intensive care unit with electrolyte derangement and acute renal failure following initiation of treatment for his Burkitt lymphoma. Blood test results include the following:

	Result	Reference Range
K^+	7.2 mmol/l	3.5–5.0
PO_4^{3-}	1.8 mmol/l	0.8–1.2
Corrected Ca^{2+}	1.6 mmol/l	2.12–2.65
Uric acid	598 µmol/l	210–480

Which of the following is LEAST true regarding this condition?

A. Complete correction of electrolyte derangements with fluids, filtration and electrolyte replacement should occur
B. It occurs with increased frequency in those patients with bulky, rapidly proliferating tumours
C. It occurs spontaneously but is often precipitated by initiation of chemotherapy treatment
D. Electrolyte derangements result from release of intracellular contents as tumour cells lyse
E. Treatment with rasburicase is more effective at reducing uric acid levels than allopurinol

A17. A 74-year-old patient with *Clostridium difficile* diarrhoea, has a white cell count (WCC) of 18×10^9/l, a temperature of 39°C and evidence of ileus.

Which of the following is the BEST treatment regimen?

A. Intravenous metronidazole
B. Oral vancomycin and oral metronidazole
C. Oral fidaxomicin
D. Oral vancomycin and intravenous metronidazole
E. Oral vancomycin

A18. A 38-year-old patient has developed acute respiratory distress syndrome following a viral pneumonia. He is intubated and ventilated but showing little sign of improvement. A decision is made to refer him to the local extracorporeal membrane oxygenation (ECMO) centre.

Which of the following criteria contribute most to his Murray score for ECMO referral?

A. PaO_2/FiO_2 ratio of 25 kPa
B. PEEP of 8 cmH_2O
C. Compliance of 38 ml/cmH_2O
D. Half of the chest X-ray showing infiltrates
E. Uncompensated hypercapnia with a pH <7.2

A19. A 60-year-old, 160-kg man with a history of obstructive sleep apnoea has been referred to intensive care. He is in type 2 respiratory failure after an intentional overdose of benzodiazepines. He is haemodynamically stable but has a Glasgow Coma Score (GCS) of 5 and is making snoring noises. You decide to intubate and transfer to intensive care for supportive management.

Which of the following is most appropriate statement?

A. Intubation is likely to be difficult; therefore, non-invasive ventilation should be trialled first
B. Senior help should be called if there is difficulty in intubating after four attempts
C. The patient should be transferred to the operating theatre in anticipation of a difficult airway
D. Given his background of obstructive sleep apnoea, he is likely to require ventilation for some time; therefore you should proceed immediately to a percutaneous tracheostomy
E. Cricoid pressure may be reduced if there is difficulty intubating

A20. A 73-year-old man is admitted to hospital with shortness of breath and cough. He has a medical history of hypertension and asthma, for which he takes ramipril and a salbutamol inhaler, respectively. He has smoked 20 cigarettes per day since adolescence and drinks 15 to 20 units of alcohol per week. He has moderate respiratory distress with a respiratory rate of 28, oxygen saturations of 91% in air, a heart rate of 105 bpm and blood pressure of 155/95. An arterial blood gas (ABG) is performed with the following results:

pH 7.28
pO_2 7.1 kPa
pCO_2 8.9 kPa
HCO_3^- 38.1 mmol/l

What is the most likely cause of his shortness of breath and cough?

A. Pulmonary embolus
B. Asthma
C. Pneumonia
D. Chronic obstructive pulmonary disease
E. Side effect of ramipril

A21. Which of the following complications is most frequently seen after pulmonary artery catheter (PAC) insertion via the internal jugular vein?

A. Carotid artery puncture
B. An arrhythmia requiring treatment
C. Bacterial colonization
D. Pulmonary infarction
E. Pulmonary artery rupture

A22. You have a patient requiring an urgent fresh frozen plasma (FFP) transfusion. Which of the following combinations is MOST appropriate?

A. A patient with blood group AB receiving FFP grouped A
B. A patient with blood group A receiving FFP grouped B
C. A patient with blood group B receiving FFP grouped O
D. A patient with blood group A receiving FFP grouped AB
E. A patient with blood group AB receiving FFP grouped O

A23. Which of the following anticoagulants is most likely to be affected by a sudden fall in a patient's glomerular filtration rate (GFR)?

A. Warfarin
B. Dabigatran
C. Rivaroxaban
D. Apixaban
E. Heparin

A24. You are about to perform a rapid sequence induction (RSI) on a patient in convulsive status epilepticus (CSE). Which of the following agents is most likely to terminate the seizures?

A. Atracurium
B. Ketamine
C. Propofol
D. Rocuronium
E. Thiopentone

A25. You are explaining to a medical student how to diagnose acute respiratory distress syndrome (ARDS). In relation to the Berlin criteria, which of the following descriptions would best fit with a diagnosis of ARDS?

A. Hypoxaemia 3 days after a large myocardial infarction. Transthoracic echocardiogram shows moderate left ventricular impairment with akinesis of the apex. PaO_2/FiO_2 ratio is 35 kPa.
B. Hypoxaemia 5 days after a severe bronchopneumonia. Chest X-ray shows collapse of the left lower lobe. PaO_2/FiO_2 ratio is 30 kPa.
C. Hypoxaemia 2 days after a gastrointestinal (GI) bleed requiring transfusion of one circulating volume. Chest X-ray shows diffuse patchy infiltrates. PaO_2/FiO_2 ratio is 45 kPa.
D. Hypoxaemia 4 days after an episode of pancreatitis with a Glasgow score of 4. Chest X-Ray shows diffuse patchy infiltrates. PaO_2/FiO_2 ratio is 30 kPa.
E. Hypoxaemia 5 days after coronary artery bypass graft surgery. A pulmonary artery catheter shows a pulmonary capillary wedge pressure of 25 mmHg. Computed tomography scan shows pulmonary infiltrates. PaO_2/FiO_2 ratio is 25 kPa.

A26. You are asked to review a patient with known pancreatic cancer in the emergency department. He has hypotension and dehydration as a result of prolonged vomiting. You are concerned that he has gastric outflow obstruction.

Which of the following sets of biochemical results would best fit with gastric outflow obstruction?

	pH	PaO_2	$PaCO_2$	HCO_3^-	Na^+	K^+	Cl^-
A.	7.55	11.1 kPa	6.3 kPa	53 mmol/l	132 mmol/l	3.0 mmol/l	93 mmol/l
B.	7.37	12.0 kPa	4.1 kPa	22 mmol/l	166 mmol/l	3.7 mmol/l	131 mmol/l
C.	7.29	12.8 kPa	3.3 kPa	16 mmol/l	134 mmol/l	2.1 mmol/l	113 mmol/l
D.	7.26	14.5 kPa	1.6 kPa	8 mmol/l	136 mmol/l	4.7 mmol/l	102 mmol/l
E.	7.54	10.4 kPa	6.1 kPa	46 mmol/l	127 mmol/l	2.7 mmol/l	128 mmol/l

A27. A 47-year-old man with alcoholic liver cirrhosis and ascites is admitted to hospital. He is febrile with abdominal pain and delirium. Routine blood tests show increased white blood cells (WBC) and C-reactive protein (CRP) with normal electrolytes and renal function. An ascitic tap shows 500 WBCs/μl and organisms visible on microscopy.

What is the most likely organism?

A. *Klebsiella pneumoniae*
B. *Escherichia coli*
C. Enterobacteriaceae
D. *Streptococcus pneumoniae*
E. *Staphylococcus aureus*

A28. A 61-year-old man has been admitted to the emergency department. He has a diagnosis of acute myeloid leukaemia and is receiving chemotherapy. He has been unwell for 24 hours and has a temperature of 38.5°C. His neutrophil count is 0.4×10^9/l.

What antibiotic regimen is the most appropriate?

A. Tazobactam/piperacillin
B. Ceftriaxone
C. Tazobactam/piperacillin and gentamicin
D. Ceftriaxone and gentamicin
E. Ceftriaxone, vancomycin and gentamicin

A29. A 64-year-old man was admitted 6 hours ago to hospital with severe chest pain and shortness of breath. You are called to see him as his blood pressure has fallen over the past hour. He is drowsy, diaphoretic, cold to the touch and has widespread crackles on auscultation of his lung fields. His 12-lead electrocardiogram (ECG) shows a large ST-elevation myocardial infarction (STEMI). His vital signs are as follows: heart rate 95/min; blood pressure 80/48; respiratory rate 32/min; SpO_2 92% on 10 l oxygen. He has a venous lactate level of 6.3 mmol/l.

You diagnose cardiogenic shock. Which intervention has the strongest evidence of benefit?

A. Intra-aortic balloon pump (IABP)
B. Dobutamine
C. Left ventricular assist device (LVAD)
D. Revascularization therapy
E. Levosimendan

A30. You are asked to review a patient suffering an acute exacerbation of asthma in the emergency department, with all of the following signs present. Which of the signs gives the greatest cause for concern?

A. Respiratory rate: 32
B. $PaCO_2$: 4.9 kPa
C. Peak expiratory flow (PEF): 38% of predicted
D. Inability to complete sentences in one breath
E. Chest X-ray showing bibasal consolidation

Exam A: Answers

A1. A trauma patient is brought into the resuscitation room with an obviously unstable pelvis. Despite ongoing fluid resuscitation with blood products the patient remains haemodynamically unstable, has profound metabolic acidosis and continues to deteriorate. Focused assessment with sonography in trauma (FAST) scan is positive.

Which of the following is MOST important in the management of this patient's bleeding?

A. Administration of tranexamic acid
B. 1:1:1 rather than 1:1:2 transfusion ratio for plasma:platelets:blood
C. Treatment with interventional radiology
D. Urgent damage control surgery
E. Maintaining normothermia and ionized calcium levels >0.9 mmol/l

Answer: D

Short explanation

Tranexamic acid administration, maintaining normothermia and ionized calcium levels are important; however, they will not stop this patient's massive ongoing bleeding. The patient is deteriorating despite ongoing resuscitation with blood products, so control of bleeding is imperative. This patient is haemodynamically unstable and acidotic, and his or her FAST scan is positive; immediate damage control surgery is recommended in preference to interventional radiology.

Long explanation

Patients presenting with haemorrhagic shock should be treated with rapid identification of the cause and source control in conjunction with fluid resuscitation with blood products. Initial fluid resuscitation should be commenced with crystalloids and early use of blood products to target a systolic blood pressure of 80 to 90 mmHg until the bleeding has been controlled. The blood pressure should be higher in the context of a traumatic brain injury.

The Pragmatic, Randomized Optimal Platelet and Plasma Ratios (PROPPR) trial demonstrated a significant decrease in the rate of exsanguination for those who received blood products in a 1:1:1 rather than a 1:1:2 plasma:platelet:red blood cell ratio. Despite a trend to lower mortality seen in the 1:1:1 treatment arm, there was no significant decrease in mortality at 24 hours or 30 days. Fibrinogen replacement with

fibrinogen concentrate or cryoprecipitate should occur with fibrinogen levels below 1.5 to 2 g/l.

Measures to maintain normothermia and ionized calcium levels >0.9 mmol/l are required to minimize the coagulopathy that can occur with massive blood transfusions and the coagulopathy of trauma. Trauma patients who are bleeding or who are at risk of significant haemorrhage should receive tranexamic acid as soon as possible, either in the pre-hospital environment or starting in the emergency department.

Rapid control of the source of the haemorrhage is crucial. Tourniquets can be used preoperatively as an interim measure to stop arterial bleeding in life-threatening extremity injuries. Interventional radiology or surgical intervention can be used to manage patients with pelvic or intra-abdominal bleeding. Patients with suspected pelvic fractures should have a pelvic binder applied immediately to reduce any ongoing bleeding. Treatment for pelvic fractures in patients who are haemodynamically unstable includes external fixation, preperitoneal pelvic packing and interventional radiology. Patients should have an initial FAST scan in the resuscitation room. If this is positive, surgical treatment with laparotomy and packing is recommended in preference to angiography. Resuscitative endovascular balloon occlusion of the aorta (REBOA) has been used as an emergency interim measure for unstable patients.

Damage control in preference to definitive surgery is recommended for those patients with severe haemorrhage shock and ongoing bleeding. This is particularly the case in those who are hypothermic (≤34°C), acidotic (pH ≤7.2) or coagulopathic or patients who have inaccessible major venous injury or require time-consuming procedures.

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A2. A patient has been admitted to the intensive care unit (ICU) with severe sepsis and urgently requires a central venous catheter (CVC). You decide to insert the CVC into the right internal jugular vein (IJV).

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B. Audio-guided Doppler ultrasound guidance in the head-up position
C. Landmark approach; medial to the carotid artery pulsation
D. Audio-guided Doppler ultrasound guidance in the head-down position
E. Two-dimensional (2D) ultrasound guidance

Answer: E

Short explanation

The National Institute for Health and Care Excellence (NICE) guidance recommends the use of 2D ultrasound imaging for CVC insertion into the IJV in all elective situations, and it should be considered in all clinical scenarios including emergency situations. Audio-guided Doppler ultrasound is not recommended for CVC insertion.