COLLEGE OF INTENSIVE CARE MEDICINE
OF AUSTRALIA AND NEW ZEALAND

EXAM REPORT AUGUST / OCTOBER 2012

This report is prepared to provide candidates, tutors and Supervisors of Training with information regarding the assessment of candidates' performance in the General Fellowship Examination. Answers provided are not necessarily model answers but guides as to what was expected. Candidates should discuss the report with their tutors so that they may prepare appropriately for future examinations.

The exam comprises a written section and an oral section. The written exam consists of two 2.5 hour papers of 15 ten-minute short answer questions each. Candidates are required to score at least 50% in the written section to be eligible to sit the oral section. The oral exam consists of eight interactive vivas and two separate clinical "hot cases".

The tables below provide an overall statistical analysis as well as information regarding performance in the individual sections. A comparison with data from the three previous exams is provided.

Candidates	Oct-12	May-12	Oct-11	May-11
Presenting for written (including OTS)	43	41	55	35
Carrying a pass from a previous attempt	13	11	11	7
OTS Exempt	0	0	0	0
Total number presenting (written + carry + OTS)	56	52	66	42

Pathway to oral section	Oct-12	May-12	Oct-11	May-11
Invited to orals (50% in written section)	29	26	45	22
Total sitting oral section	42	37	56	29

Analysis of performance in individual sections	Oct-12	May-12	Oct-11	May-11
Successful in the written section	29	26	45	22
	67%	63%	82%	63%
Successful in the Hot Case section	21	15	39	15
	50%	41%	70%	52%
Successful in both Hot Cases	10	7	22	5
	24%	19%	39%	17%
Successful in the Viva section	36	22	44	20
	86%	59%	79%	69%

Sectional pass rate - Hot Cases	Oct-12		May-12	
	Pass rate	Highest Individual Mark	Pass rate	Highest Individual Mark
Hot Case 1	40%	100%	32%	80%
Hot Case 2	50%	93%	43%	77%

Sectional pass rate - Vivas	Oct-12		May-12	
	Pass rate	Highest Individual Mark	Pass rate	Highest Individual Mark
Viva 1	90%	90%	57%	97%
Viva 2	88%	75%	57%	75%
Viva 3	40%	80%	81%	91%
Viva 4	81%	93%	30%	60%
Viva 5	98%	95%	43%	80%
Viva 6 (Radiology)	48%	90%	49%	90%
Viva 7 (Communication)	67%	100%	84%	100%
Viva 8 (Procedure)	71%	100%	68%	85%

Oral section pass rate	Oct-12	May-12	Oct-11	May-11
Candidates who scored >50% in the written and passed the overall exam	24	19	36	17
	83%	73%	80%	77%
All candidates invited to the oral section and passed the overall exam (written + carry + OTS)	31	20	43	18
	74%	54%	77%	62%
Overall Pass Rate	55%	38%	65%	43%

EXAMINERS' COMMENTS

Written Paper

Nine of the thirty questions had a pass rate of less than 50%. Topics covered by questions with a pass rate of less than 40% were non-convulsive status epilepticus and the management of the patient post liver transplantation. There was an apparent lack of understanding of basic principles relating to commonly used tests, interpretation of the literature and assessment of the circulation.

As in previous exams, candidates who failed did not answer the questions as asked; did not attempt to answer certain questions or parts of questions; and/or were too narrow in their answer. It appears that candidates do not always read the questions carefully and thoroughly.

Candidates who failed the written section passed an average of 12/30 questions compared with candidates scoring > 50% and gaining an invitation to the oral section, passing an average of 21/30 questions. Candidates are reminded that it is mathematically possible to pass 29/30 questions and still fail the written paper overall.

Hot Cases

The overall pass rate was comparable to previous exams. Concerns expressed by the examiners included:

- A tendency for candidates to have a formulaic approach to examination of the patient rather than a flexible approach that is appropriately adapted to the given situation.

- Taking too long assessing the monitors and equipment before actually starting to examine the patient.

Candidates are reminded that they should not sit the General Fellowship Examination until they can confidently examine patients, present the relevant clinical findings and discuss management issues at the appropriate level, i.e. experienced senior registrar/junior consultant. Candidates are also encouraged to practice examination of individual systems.

Candidates who performed well in the Hot Cases demonstrated the following:

- Respect and consideration for the patient;
- Competent and efficient examination technique;
- The seeking of information that was relevant to the case;
- Ability to interpret and synthesise their findings appropriately;
- Presentation of their conclusions in a systematic fashion, addressing the issue in question
- Discussion of management issues in a mature fashion, displaying confident and competent decision-making.

Vivas

The Vivas tend to be the section in which candidates perform well and the pass rate in the Vivas for this exam was higher than in recent past exams. Only two vivas - Viva 3 (nutrition in the critically ill) and Viva 6 (radiology) - had a pass rate less than 50%.

GENERAL FELLOWSHIP WRITTEN EXAMINATION

(A) Write your answers in the blue book provided.
(B) Start each answer on a **new page** and indicate the **question number**. It is not necessary to rewrite the question in your answer book.
(C) You should aim to answer each question in **ten** minutes.
(D) The questions are worth **equal** marks.
(E) Record your **candidate number** and each **question number** on the cover of each book and hand in all books.

GLOSSARY OF TERMS

Critically evaluate:	Evaluate the evidence available to support the hypothesis.
Outline:	Provide a summary of the important points.
List:	Provide a list.
Compare and contrast:	Provide a description of similarities and differences (Eg. Table form).
Management:	Generic term that implies overall plan. Where appropriate, may include diagnosis as well as treatment.

NOTE

Where laboratory values are provided, abnormal values are marked with an asterisk (*****).

Please note that in this report images from the SAQs have been removed.

Question 1

A 43-year-old woman is transferred to your Intensive Care Unit from a regional hospital following a motor vehicle crash. She is in haemorrhagic shock secondary to abdominal and pelvic trauma and received 3L crystalloid and 8 units O Rh(D) negative blood prior to arrival in your hospital.

a) What are the risks of giving O negative uncrossmatched blood to this patient?

b) Indicate whether crossmatch is needed or not for each of the following blood products:

Packed red blood cells
Platelets
Fresh frozen plasma
Cryoprecipitate
Prothrombin concentrate
Granulocyte concentration
Intravenous immunoglobulin

Answer

a)
Risks common to all blood transfusions
(infection, allergy, haemolysis, TRALI, fluid overload, dilutional coagulopathy, etc)

Risks specific to O-ve uncrossmatched
Mixed field group and screen (unclear blood group)

Prolong group and cross match if specimen not taken before.
Non-ABO, non Rh (D) antigens/antibodies leading to allo-immunisation (sensitization) and delayed haemolytic reactions

b)

Blood Product	Need for Crossmatch
Packed red blood cells	Yes
Platelets	No
Fresh Frozen Plasma	No
Cryoprecipitate	No
Prothrombin concentrate	No
Granulocyte concentrate	Yes
Intravenous immunoglobulin	No

Pass rate	77%
Highest mark	8.5

Question 2

Outline the predisposing factors, consequences and management of the critically ill patient with Vancomycin Resistant Enterococcus (VRE).

Answer

Predisposing factors
Previous treatment with anti-microbials (especially vancomycin, cephalosporins and broad-spectrum antibiotics)
Increased length of stay
Renal impairment
Long-term IV access
Enteral tube feeding
Prevalence of VRE colonized patients in the ICU
Resident of long-term care facility
Decreased staff : patient ratios

Consequences
Potential transmission of resistance to Staph aureus
Determined by site of infection if present (eg UTI, bloodstream including endocarditis and rarely respiratory infection)
Need for isolation

Management
Specific antibiotics if infected rather than colonized depending on sensitivities (Van A resistant to vancomycin and teicoplanin; Van B sensitive to teicoplanin) – options include linezolid, daptomycin, quinupristin-dalfopristin, tigecycline.
Probiotics may have a role.
Infection control including isolation, contact precautions and PPE, and general infection control measures including surface and environmental cleaning, antibiotic stewardship, screening of contacts and patient surveillance until swabs are negative. Precautions should continue on discharge from ICU

Pass rate	46%
Highest mark	7.0

Question 3

Q1.

A 49-year-old female, with a history of pulmonary vasculitis is found collapsed in the ward with shallow breathing and a GCS of 6.

An initial arterial blood gas on room air (FiO2 0.21) reveals:

Parameter	Result	Normal Range
Barometric pressure	760 mmHg (100 kPa)	
pH	7.13*	
PCO_2	80 mmHg (10.5 kPa)*	35 – 45 (4.6 – 6.0)
PO_2	38 mmHg (5.0 kPa)	
Bicarbonate	26 mmol/L	22 – 27
Base Excess	+2 mmol/L	-2 – +2

What is the cause of the hypoxia?
Give the reason for your answer

Answer

Hypoventilation.
No reason to believe there is parenchymal disease / vasculitis as the A-a gradient is 13 mmHg. This fits with the clinical picture of coma, shallow breathing and hypercapnia

Q2.

A 64-year-old man with a background of heavy alcohol consumption has been admitted to your ICU for several days with a sensitive staphylococcus aureus (MSSA) epidural abscess which has been surgically drained.

The following results were obtained.

Parameter	Value	Normal Range
Sodium	143 mmol/L	134 – 146
Potassium	4.0 mmol/L	3.4 – 5.0
Chloride	114 mmol/L*	100 – 110
Urea	10.1 mmol/L*	3.0 – 8.0
Creatinine	104 mmol/L	50 – 120
Glucose	6.9 mmol/L	3.0 – 7.0
Urinary ketones	Negative	
Measured osmolality	300 mOsm/Kg	280 – 300

On 30% oxygen arterial blood gas analysis as follows:

Parameter	Value	Normal Range
pH	7.22*	7.35 – 7.45
PO_2	84 mmHg (11kPa)	
PCO_2	25 mmHg (3.2 kPa)*	35 – 45 (4.6 – 6.0)
Bicarbonate	10 mmol/L*	22 – 27
Lactate	1.8 mmol/L*	<2.0

What is the likely cause of the acid base disturbance?

How would you investigate and manage it?

Answer

High anion gap metabolic acidosis secondary to pyroglutamic acidaemia.

Can be detected by requesting an organic acid screen, or by plasma or urine pyroglutamate levels.
Management – cessation of precipitating drugs likely paracetamol and flucloxacillin in this case.
N-Acetyl cysteine infusion has been advocated.

Q3.

The following is a CSF sample from a 56-year-old woman with severe rheumatoid arthritis who has presented with fever, malaise and altered mental state.

Parameter	Value	Normal Range
Cell count	75 cells / mm^3* (90% lymphocytes)	0 – 5
Protein	890 mg/L*	170 – 550
Glucose	2.0 mmol/L*	2.8 – 4.5
Gram stain	Negative	

Describe 4 further tests you would perform upon the CSF to establish an infective cause.

Answer

Herpes Simplex PCR
Mycobacterium Tuberculosis PCR
Mycobacterial Stain and Cultures
India Ink Stain, Cryptococcal Ag
Fungal cultures
Bacterial PCR

Pass rate	60%
Highest mark	9.3

Question 4

A 65-year-old man had an out of hospital cardiac arrest secondary to a large anterior ST elevation myocardial infarction. His ICU stay has been complicated by aspiration pneumonia. He is now day 14 from admission, with a tracheostomy in situ, and has started weaning from ventilation.

You have been asked to review him as he is communicating that he 'can't get enough air' despite ongoing mechanical ventilatory support.

How would you manage this patient who reports being breathless on a ventilator?

Answer

Urgent attention to A, B, C – Give 100% oxygen and exclude/treat immediate threats to life

Focused history and examination considering differential diagnoses:

Patient factors
Airway / trache – blocked, displaced or too small diameter
Respiratory eg pneumonia, PE, PTX
Cardiac – ongoing ischaemia, cardiac failure, fluid overload
Neuromuscular – weakness, fatigue
Sepsis
Metabolic
Central – increased respiratory drive, pain, agitation

Ventilator factors
Unsuitable mode
Triggering threshold too high
Inadequate flow
Prolonged inspiratory time
Inappropriate cycling
Inadequate pressure support
Ventilator malfunction

Treatment:

100% O2, suction trachy, exclude obstruction/malposition, end tidal CO2 etc

Assess ventilation
Mode, respiratory rate and pattern
Spontaneous and delivered TV / MV / airway pressures
Expiratory flow-time curve, PEEPi (if possible)

Titrated pain relief
May need to carefully sedate to gain control of the situation if he is very distressed and agitated. Rarely need to paralyse after sedation

Investigations
Basic Investigations – eg ABG, ECG, CXR, cultures
Further investigations as indicated – eg Echo, CTPA, BNP, Troponin etc

Management of underlying cause

Change trache if indicated
Consider change ventilator settings or mode
Increase pressure support etc
ACV Vs SIMV Vs BiLevel

Pass rate	48%
Highest mark	8.5

Question 5

Critically evaluate the role of thrombolytic therapy in massive pulmonary embolism

Answer

1. Define the rationale for thrombolysis

Standard therapy for pulmonary embolism is anticoagulation, which prevents additional thrombus from forming, but does not directly dissolve the clot that already exists. Thrombolysis theoretically gives primary treatment as it dissolves fibrin

2. Define massive PE

Massive PE has traditionally been used to describe clot burden on radiology, but this was of little use clinically. Massive PE is more conventionally defined as a cardiogenic shock or SBP <90mmHg due to PE, either confirmed or strongly suspected on clinical grounds.

3. Discuss the evidence in massive PE

The evidence for thrombolysis to improve mortality in massive PE is not strong, but there is a trend towards improved mortality and resolution of shock with thrombolysis. Most guidelines advocate the use of thrombolysis unless absolutely contraindicated i.e. intracranial haemorrhage

4. Discuss the other options if thrombolysis can't be done in massive PE

If thrombolysis is not possible or contraindicated then the other options for massive PE are surgical embolectomy or catheter embolectomy and fragmentation.

5. Statement of candidate's approach to thrombolysis in massive PE

Pass rate	56%
Highest mark	9.0

Question 6

1.
The following blood gases, electrolytes and full blood count relate to a 32-year-old woman post-extubation, following an emergency lower segment Caesarian section at 38 weeks gestation for foetal distress during labour:

Parameter	Result	Normal Values
Barometric pressure	760 mmHg	
FiO_2	0.5	
pH	7.31*	7.35 – 7.45
PO_2	150 mmHg (19.7 kPa)	
PCO_2	42 mmHg (5.5 kPa)	35 – 45 (4.6 – 6.0)
HCO_3	20.3 mmol/L*	22 – 27
Standard BXS	-5.0 mmol/L*	-2 – +2
Sodium	137 mmol/L	135 – 145
Potassium	4.3 mmol/L	3.2 – 4.5
Chloride	106 mmol/L	100 – 110
Haemoglobin	110 G/L*	125 – 165
White cell count	19.8×10^9/L*	4.0 – 11.0
Neutrophils	17.3×10^9/L*	1.8 – 7.5
Lymphocytes	1.8×10^9/L	1.5 – 4.0

a) Comment on and interpret the arterial blood gases and the acid-base status.

b) What is the significance of the haemoglobin concentration and white cell count?

Answer

a)
Raised A-a gradient of 154 mmHg suggestion shunt and/or V/Q mismatch. Potential explanations are loss of FRC post abdominal surgery, segmental collapse/consolidation or aspiration.

Acute respiratory acidosis – normal PCO_2 for 38 weeks gestation is 30 mmHg with compensatory reduction in HCO_3. CO_2 retention is possibly due to pain, narcotics and/or sedation from anaesthetic agents

Normal anion gap

b)
Anaemia and leukocytosis – mild anaemia is physiological in pregnancy. Neutrophil leukocytosis is a normal feature during labour and early post-partum.

2. The following biochemical profile is that of a 68-year-old man who has undergone endovascular repair of an abdominal aortic aneurysm that was technically difficult:

Parameter	Result	Normal Range
Sodium	137 mmol/L	135 – 145
Potassium	6.3 mmol/L*	3.2 – 4.5
Chloride	106 mmol/L	100 – 110
Bicarbonate	18 mmol/L*	22 – 27
Urea	15.0 mmol/L*	3.0 – 8.0
Creatinine	0.34 mmol/L*	0.07 – 0.12
Total Calcium	1.75 mmol/L*	2.15 – 2.6
Phosphate	2.75 mmol/L*	0.7 – 1.4
Albumin	26 G/L*	33 – 47
Globulins	35 G/L	25 – 45
Total Bilirubin	20 micromol/L	4 – 20
Conjugated Bilirubin	4 micromol/L	1 – 4
GGT	6 U/L	0 – 50
ALP	100 U/L	40 – 110
LDH	3800 U/L*	110 – 250
AST	2100 U/L*	<40
ALT	100 U/L*	<40

What is the likely cause of this biochemical profile?

Rhabdomyolysis from lower limb ischaemia

3.

Parameter	Result	Normal Range
Sodium	149 mmol/L*	135 – 145
Potassium	4.5 mmol/L	3.2 – 4.5
Chloride	109 mmol/L	100 – 110
Bicarbonate	24 mmol/L	22 – 33
Urea	22.0 mmol/L*	3.0 – 8.0
Creatinine	0.14 mmol/L*	0.07 – 0.12
Total Calcium	2.3 mmol/L	2.15 – 2.6
Phosphate	1.4 mmol/L	0.7 – 1.4
Albumin	34 G/L	33 – 47
Glucose	6.5 mmol/L	3.0 – 7.8

List four possible underlying reasons for the above biochemical profile

Answer

Dehydration
Steroid therapy or Cushings
GI bleed
Protein catabolism
Decreased muscle mass
Ruptured bladder

Pass rate	84%
Highest mark	9.3

Question 7

A 67 year old male, having presented with a presumptive diagnosis of Community Acquired Pneumonia (CAP) remains intubated and in need of mechanical ventilation at Day 5 of his admission to hospital.

a) Outline the factors that may affect the expected rate of resolution of their CAP

b) Outline your approach, and indication for, the diagnostic evaluation of non-resolving pneumonia

Answer

a) Host factors
Alcoholism, older age, and the presence of comorbid diseases such as diabetes and chronic obstructive lung disease. In addition, disorders of immune function, particularly AIDS and syndromes associated with deficient humoral immunity, can be associated with delayed resolution of pneumonia.

Severity of CAP
Pathogen:
In general, resolution is more rapid with Mycoplasma pneumoniae, non-bacteremic Streptococcus pneumoniae, Chlamydophila (formerly Chlamydia) species, and Moraxella catarrhalis than with other organisms
(note to Examiners – don't need to list all of these, just indicate that some organisms associated with rapid resolution, and which some of those organism are)

Unusual pathogen:
Such as: Mycobacterium tuberculosis, Nocardia, Actinomyces israelii, Aspergillus, Coxiella burnetii (Q fever), Chlamydia psittaci (psittacosis), Leptospira interrogans (leptospirosis), Pseudomonas pseudomallei (melioidosis)

Antibiotic Resistance

Development of complications from initial CAP
The two main forms of sequestered focus preventing adequate resolution of pneumonia are empyema and lung abscess.

Non-infectious aetiology to initial CAP and/or underlying lung disease
Respiratory Malignancy, lymphoma, Granulomatosis with polyangiitis (Wegener's), Diffuse alveolar hemorrhage, Bronchiolitis obliterans-organizing pneumonia (BOOP), Acute or Chronic eosinophilic pneumonia, Acute interstitial pneumonia, Pulmonary alveolar proteinosis, Sarcoidosis, Systemic lupus erythematosus, Heart failure, Pulmonary embolism

b)
Chest CT to look for sequestered areas of infection or for findings that suggest an alternative diagnosis.
Fiberoptic bronchoscopy patients – lesions, mechanicals respiratory lesion, unusual pathogen
Thoracoscopic or open lung biopsy

Pass rate	72%
Highest mark	7.0

Question 8

A colleague directs your attention to a recently published randomised trial on a therapeutic intervention.

Outline the features of the trial that you would lead you to change your practice.

Answer

Points to consider in the answer would be:
1. Does the population studied correspond with the population the candidate expects to treat?
2. Were the inclusion/exclusion criteria appropriate?
3. Was the trial methodology appropriate – was there adequate blinding and randomisation?
4. Was the primary outcome a clinically relevant or a surrogate endpoint?
5. Was the length of follow up adequate?
6. Was the trial sufficiently powered to detect a clinically relevant effect?
7. Were the groups studied equivalent at baseline?
8. Is the statistical analysis appropriate – was there an intention to treat analysis, have differences between groups at baseline been adjusted for? Are there multiple sub group analyses, and if so were they specified *a priori?*
9 Is this a single centre study or multi centre?
10. Were the results *clinically* significant rather than just statistically significant?
11. Is the primary hypothesis biologically plausible with pre existing supporting evidence?
12 Are the findings supported by other evidence – have these results been replicated?
13. Would there be logistical and/or financial implications in practice change?
14. Are there important adverse effects of the treatment?

Pass rate	44%
Highest mark	8.3

Question 9

A 56-year-old woman with a spontaneous subarachnoid haemorrhage, presenting with a Glasgow Coma Scale of 12, requires transfer to a neurosurgical centre from a regional hospital. Outline the clinical and organisational issues involved pre-transfer.

Answer

Mode of transfer – road or air (fixed or rotary wing) – should be determined by resources, distance to be covered and weather conditions. The mode of transfer should provide the shortest time from the referring hospital to the receiving centre and the standard of care should be maintained throughout the transfer. Staff safety during transfer is an essential consideration. College guidelines for minimum standards for transport of critically ill patients should be followed.

Co-ordination and communication
Ensure bed available at receiving centre
Establish key individual(s) at receiving centre for liaison to receive updates on transfer status and to provide expert advice re patient management

Ensure all necessary documentation prepared to accompany patient including clinical records and radiology
Ensure transport team know destination (town, hospital, ICU location)
Ensure patient's next of kin are aware of need for transfer

Preparation of patient
Consider intubation and mechanical ventilation (with ongoing sedation and paralysis) depending on stability of patient and distance/mode of transport
Stabilise on transport ventilator
Vascular access including arterial line
Urinary catheterization and passage of NG tube
TEDs
All lines and tubes secured and correct position confirmed
Resuscitation and physiological stabilization of patient as indicated
Final repeat clinical assessment immediately prior to departure

Monitoring
Full monitoring of patient including intra-arterial pressure, end-tidal CO_2, oxygen saturation and ECG and TO4 if paralysing agents used
Ensure optimum MAP to maintain cerebral perfusion but target SBP < 150 mmHg to avoid re-bleed

Equipment and drugs
Transport ventilator
Monitor
Bag-valve-mask and re-intubation equipment
Oxygen cylinders
Defibrillator
Infusion pumps as needed
Needles and syringes etc
Sedative drugs and muscle relaxants
Resuscitation drugs
IV fluids
Prescribed drugs as indicated eg antibiotics

Personnel
Ensure adequately trained personnel for retrieval team, including appropriately experienced medical practitioner
Ensure adequate staffing remains on site at base hospital

Pass rate	56%
Highest mark	8.9

Question 10

A 45-year-old man is admitted to the Emergency Department after ingesting an unknown quantity of “headache tablets”. His initial complaints are nausea, vomiting, shortness of breath and tinnitus. Fluid resuscitation has been commenced. You are asked to assess him as he is getting more dyspnoeic.

His serum biochemistry and arterial blood gas profile are as follows:

Parameter	Result	Normal Range
Sodium	138 mmol/L	135 – 145
Potassium	3.2 mmol/L*	3.4 – 5.0
Chloride	108 mmol/L	100 – 110
Bicarbonate	10 mmol/L*	22 – 27
FiO_2	0.3	
pH	7.32*	7.35 – 7.45
PO_2	125 mmHg (16.4 kPa)	
PCO_2	20 mmHg (2.6 kPa)*	35 – 45 (4.6 – 6.0)
Base Excess	-10 mmol/L*	-2 – +2
Salicylate level	105 mg/dL*	3 – 10 mg/dL
Paracetamol level	<20 mg/L (<130 µmol/L)	<20 (<130 µmol/L)

a) Describe the acid-base status
b) What are 4 severe complications of this toxidrome?
c) What coagulopathy may be present in this toxidrome and what is the treatment?
d) What are the treatment options for severe toxicity, and what is their rationale?

Answer

a)
Acid-base status:
Increased anion gap metabolic acidosis
Concomitant normal anion gap metabolic acidosis
Respiratory alkalosis
Decreased delta ratio

b)
Hypoglycaemia
Pulmonary oedema
Cerebral oedema
Arrhythmias
Hyperpyrexia

c)
Hypoprothrombinaemia

Vitamin K

d)
Forced alkaline diuresis. Renal excretion of salicylates becomes important when the metabolic pathways become saturated. There is a 10-20 fold increase in elimination when the urine pH increased from 5 to 8

Haemodialysis. Most of the drug is protein-bound, and is concentration dependant. The volume of distribution is small, and binding site saturation leads to large levels of free drug, which is easily dialysable

Multiple-dose charcoal. Many aspirin forms are slow release and after ingestion they clump together in the GI tract, forming a large slow release preparation. It is also poorly soluble in the stomach leading to delayed absorption.

Pass rate	49%
Highest mark	7.3

Question 11

A 42-year-old male is admitted to ICU following a cadaveric orthotopic liver transplant for end-stage liver disease secondary to alcohol-induced cirrhosis.

a) List the important management principles for the first 24 hours specific to this patient.
b) Despite weaning sedation he remains unresponsive 12 hours after ICU admission. What are the possible causes?

Answer

a)
Haemodynamic stabilization – optimize cardiac output and tissue perfusion and avoid fluid overload as ventricular function may be impaired. Close haemodynamic monitoring. Vaso-active agents as indicated.

Correction of anaemia and coagulopathy – maintain haemocrit 0.25 – 0.3 to keep blood viscosity low. INR $\leq$2, APTT $\leq$50 secs, Fibrinogen above 0.5 g/L and Platelets above 30 x 10^9/L.

Fluid and electrolyte management – appropriate negative fluid balance day 1 decreases risk of pulmonary complications. Fluid overload may aggravate graft congestion and oedema caused by ischaemic-reperfusion. Electrolyte imbalances are common and need to be corrected.

Correction of metabolic abnormalities – hypoglycaemia is an ominous sign of compromised liver recovery, hyperglycaemia also may occur, acid-base abnormalities also occur

Early weaning from mechanical ventilation – associated with better outcome but not feasible in patients with respiratory failure, haemodynamic instability, pulmonary oedema, primary graft dysfunction, encephalopathy etc. Unsucessful early extubation may result in impaired oxygen delivery to transplanted liver

Monitoring of graft function LFTs, lactate, BSL, coagulation, hepatic artery doppler

Early detection of surgical complications - bleeding

Immunosuppressants

Infection prophylaxis

Housekeeping including analgesia (PCA) and appropriate nutrition plan
Other – ICP monitoring if decompensated CLD pre-op

b)

Delayed metabolism of sedative / anaesthetic drugs
Metabolic derangements – hypoglycaemia, hyponatraemia, hyperosmolar syndrome
Hepatic encephalopathy
Hypoxic-ischaemic cerebral injury
Seizures
Intracerebral haemorrhage

Pass rate	39%
Highest mark	7.0

Question 12

1.

The following is the haemtological profile of a 22-year-old previously healthy female admitted to ICU with community acquired pneumonia:

Parameter	Result	Normal Range
INR	1.1	0.8 – 1.2
Prothrombin time	11 seconds	10 – 15
APTT	73 seconds*	35 – 45
APTT after protamine	69 seconds*	35 – 45
APTT with 50% normal plasma	53 seconds*	35 – 45
Fibrinogen	3.4 G/L	2.5 – 5

a) What is the likely explanation for the APTT result? Give the reasons for your response.
b) What further test would you order to confirm the underlying disorder?
c) Give two potential complications of which this patient is at risk

Answer

a) Antiphospholipid antibody syndrome

b) Lupus anticoagulant / Antiphopholipid antibody

c) Recurrent DVT / PE
Arterial thrombosis
Recurrent miscarriage

2. A 72-year-old man is admitted to ICU post-operatively for multi-trauma following a motor vehicle crash. 10 days post admission he develops a new fever. Septic screen results are pending and the full blood count is as follows:

Parameter	Result	Normal Range
Haemoglobin	76 G/L*	130 – 175
White Cell Count	15.8 x 10^9/L*	4.0 – 11.0
Platelets	1211 x 10^9/L*	150 – 450
Reticulocytes	220 x 10^9/L*	10 – 80
Neutrophils	10.4 x 10^9/L*	1.8 – 7.5
Lymphocytes	2.06 x 10^9/L	1.5 – 4.0
Monocytes	2.54 x 10^9/L*	0.2 – 0.8
Eosinophils	0.48 x 10^9/L*	0.0 – 0.4
Haematocrit	0.26*	0.4 – 0.52
MCV	92 fl	82 – 98
MCH	29.9 pg	27.0 – 34.0
MCHC	326 g/L	310 – 360

Comment on blood film: Moderate anisocytosis. Moderate polychromasia. Moderate number of target cells. Occasional Howell-Jolly bodies. Increased rouleaux formation. Marked thrombocytosis.

a) What is the explanation for this blood picture?

b) What treatment will you consider to prevent complications of this condition when this man is discharged from hospital?

Answer

a) Post splenectomy

b) Antibiotic prophylaxis with Penicillin or equivalent
Immunisation prior to hospital discharge for Haemophilus, Meningococcus and Pneumococcus

3. The following is the full blood count of a 66-year-old man admitted to the High Dependency Unit following a gastro-intestinal haemorrhage:

Parameter	Result	Normal Range
Haemoglobin	84 G/L*	130 – 175
White Cell Count	8.3 x 10^9/L	4.0 – 11.0
Platelets	240 x 10^9/L	150 – 450
Reticulocytes	220 x 10^9/L*	10 – 80
Neutrophils	5.8 x 10^9/L	1.8 – 7.5
Lymphocytes	1.5 x 10^9/L	1.5 – 4.0
Monocytes	0.4 x 10^9/L	0.2 – 0.8
Eosinophils	0.6 x 10^9/L*	0.0 – 0.4
Haematocrit	0.25*	0.4 – 0.52
MCV	88.4 fl	82 – 98
MCH	30.2 pg	27.0 – 34.0
MCHC	341 g/L	310 – 360

What is the most likely cause of this haematological profile?

Answer

Acute blood loss

4. List five likely causes for the following coagulation profile:

Parameter	Result	Normal Range
PT	35.4 secs*	12.0 – 15.0
INR	3.5*	0.8 – 1.1
APTT	>170.0 secs*	25.0 – 37.0
Fibrinogen	0.9 G/L*	2.20 – 4.30

Answer

DIC
Primary fibrinolysis
Dilutional coagulopathy from massive transfusion
Post thrombolysis
Snake bite

Pass rate	91%
Highest mark	9.4

Question 13

1. List the techniques / measurements that are available to assess the circulation status of a patient in the intensive care unit.

Answer

Physical examination [warm hands, urine output, mentation]
Vital signs – heart rate, blood pressure, oxygenation
Lactate
Urine output
Blood pressure response to passive leg raise or fluid challenge
Invasive arterial monitoring [Vigileo/LiDCO (cardiac output, stroke volume variation, stroke volume)]
Central venous pressure measurement, central venous oxygen saturation
Invasive cardiac monitoring
- PiCCO measurements [Intra thoracic blood volume, global end diastolic volume, cardiac output, stroke volume variation]
- Pulmonary Artery Flotation Catheter [pulmonary artery occlusion pressure, cardiac output, mixed venous oxygenation]

Echocardiogram [cardiac output, left ventricular ejection fraction, IVC collapsibility]
Transcutaneous Doppler [cardiac output/stroke volume variation]
Research tools
- Techniques for measuring microvascular perfusion eg contrast US, SDF
- Techniques for measuring tissue oxygenation eg, gastric tonometry [Δ pCO_2], sublingual tonometry, microdialysis
- Impedance cardiography [cardiac output, stroke volume variation, stroke volume]

2.

a) How do you calculate the oxygen extraction ratio (O_2ER)?

b) In a patient with septic shock, how would you interpret the following values for the oxygen extraction ratio (O_2ER):

(i) $O_2ER = 0.5$
(ii) $O_2ER = 0.2$

Answer

a) $O_2ER = VO_2 / DO_2$

b)
(i) The normal value is around 0.2 – 0.3 and if the value is higher this suggests that the tissues are extracting excessive amounts because oxygen delivery is inadequate due to inadequate cardiac output from either inadequate contractility or inadequate preload and may respond to inotropes and/or fluid resuscitation.

(ii) A low normal OER in this patient suggests failure of the microcirculation with inadequate oxygen uptake due to shunting and microvascular occlusion and resultant tissue ischaemia. This would be confirmed by rising lactate levels.

Pass rate	44%
Highest mark	8.3

Question 14

Critically evaluate the role of the following investigations in the critically ill patient:

1. Serum ammonia
2. B-type natriuretic peptide (BNP)

Answer

Serum Ammonia

Used as an indicator of hepatic encephalopathy
Normal values do not rule out encephalopathy – therefore of limited utility in patients with known chronic liver disease
Not useful as a monitor during therapy
Very high levels may indicate cerebral herniation
May be useful to indicate undiagnosed cirrhosis in patients presenting with altered mental status
May also be elevated in: TPN, GI Bleed and steroid use, portosytemic shunts and inborn errors of metabolism.

B-type natriuretic peptide (BNP)

Released from cardiac cells in response to ventricular wall distension
Elevated in heart failure
Can be used as a diagnostic marker in patients presenting with dyspnoea to emergency department, and can be useful prognostically and to guide therapy in heart failure
May be elevated in many other conditions in critical care, including sepsis, acute lung injury, PE and intracranial bleed
Interpretation of BNP in ICU patients is therefore complex and while it may have a role in prognosis and response to therapy in future its current place is unclear.

Pass rate	42%
Highest mark	9.0

Question 15

Q1

A 64-year-old man with a past history of CLL presents with fever and malaise after an 8-day illness for which he was originally prescribed celecoxib.

The photographs below are of his forehead (figure 1) and back (figure 2).

a) What is your differential diagnosis?
b) Give two investigations that would aid diagnosis.

Answer

a)

Severe drug hypersensitivity reaction
- Erythema multiforme
- Stevens Johnson/TENS

Viral infection
- Herpes simplex
- Varicella
- EBV/CMV

Bacterial infection – staphylococcal scalded skin syndrome
Autoimmune bullous disease
Urticarial vasculitis

b)

Skin biopsy
HSV and varicella PCR
Viral serology
Mycoplasma serology

Q2

The image below is of a 76-year-old lady who presents with dyspnoea

a) List three abnormalities on observation.

b) What are two likely causes of her dyspnoea?

Answer

a)
Previous Right mastectomy
Marked erythema left breast and anterior chest wall on right
2 Ulcerated lesions on the anterior chest wall near the axilla
Ectatic vessels of chest wall

b)
Radiation induced tissue injury with radiation induced pulmonary fibrosis
Superimposed Infection
Tumour recurrence / lymphangitis carcinomatosis

Q3
List the main feature(s) of these fundoscopy images a), b) and c) and name the conditions associated with them.
a)
b)
c)

Answer
a) Retinal Haemorrhage (Coagulopathy, thrombocytopenia)
b) Papilloedema (Raised intracranial pressure)
c) Optic disc swelling, retinal haemorrhages and infarcts or cotton wool spots. (Malignant Hypertension)

Q4
The following is an image from an abdominal CT scan taken of a 24 year old man who presented with a carbamazepine overdose.
What complication has occurred?
Answer
Gastrointestinal obstruction secondary to multi dose charcoal administration.

Pass rate	79%
Highest mark	8.0

Question 16

A 42-year-old primigravida, 30 weeks gestation, is admitted with abdominal trauma and hypotension, following a motor vehicle crash, to the Emergency Department of a hospital without an obstetric service.

Outline the management issues specific to the care of this patient.

Answer

In addition to management by a trauma team following EMST principles, this case requires additional early obstetric, neonatal and anaesthetic input. The operating theatre needs to be alerted to the possibility of the need for emergency Caesarian section. In an elderly primigravida this is likely to be a 'precious' pregnancy.

Other specific management issues include:
High flow oxygen to avoid maternal and fetal distress.
Reduced respiratory reserve with decreased FRC.
Potential for relative difficulty in intubation
Maternal compensation for blood loss is at the expense of utero-placental blood flow.
Left lateral tilt to avoid aorto-caval compression.
Transfusion should be Rhesus compatible and immunoglobulin should be given if she is Rhesus negative because of the immunological effects of minor feto-maternal haemorrhage.
Physiological anaemia of pregnancy
Minimise exposure to radiation – ultra-sound alternatives may be preferable. (DPL contra-indicated).
Retroperitoneal haemorrhage, placental abruption or fetal distress may occur and premature labour may be precipitated.
If pelvic fractures present, pelvic binders may not be suitable.
Regular fetal monitoring is required.
Bereavement issues in the event of an adverse fetal outcome

Pass rate	65%
Highest mark	8.3

Question 17

With regards to the determination of brain death:

1. Apart from identifying evidence of sufficient intracranial pathology, list the preconditions that must be met prior to the determination of brain death by clinical criteria:

a. Minimum period of 4 hours in which the patient is observed to have unresponsive coma, unreactive pupils, absent cough/tracheal reflex and no spontaneous respiratory effort
b. Normothermia (temp >35^{o}C)
c. Normotension (SBP >90 mmHg, MAP >60 mmHg in adult)
d. Exclusion of sedative drugs
e. Absence of severe electrolyte, metabolic or endocrine disturbance
f. Intact neuromuscular function
g. Ability to examine the brainstem reflexes including at least one ear and one eye
h. Ability to perform apnoea testing

2. What is the recommended minimum time for observation in cases of hypoxic-ischaemic brain injury, prior to performing clinical testing of brain-stem function?

    a. 24 hours

3. For each of the following brainstem reflexes, list the cranial nerves that are tested:

    a. Cough reflex — cranial nerve X
    b. Vestibulo-ocular reflex — cranial nerve III,IV,VI,VIII
    c. Pupilary light reflex — cranial nerve II & III
    d. Corneal reflex — cranial nerve V & VII
    e. Gag reflex — cranial nerve IX & X

    (for each part of this question ALL cranial nerves are required in order to receive the 5 marks, no marks should be given for an incomplete response)

4. List three contraindications to performing apnoea testing:

    a. Concomitant high cervical cord injury
    b. Severe hypoxaemia
    c. Haemodynamic instability

5. List the acceptable imaging techniques that may be used to demonstrate brain death as an alternative to clinical testing as recommended by the ANZICS Statement on Death and Organ Donation.

a. Four vessel intra-arterial catheter angiography with digital subtraction (preferred)
b. Radionuclide imaging with Tc-99m HMPAO and single photon emission computerised tomography (SPECT) (preferred)
c. CT angiography (limited experience to date) (acceptable)

Pass rate	84%
Highest mark	9.1

Question 18

A 28-year-old man has been referred to the intensive care unit for management after being pulled from a house fire.

a) Briefly describe the injury shown below in figure 1
b) List 4 possible complications.
c) What are other important features on the initial clinical assessment of this patient?

a) There is an extensive burn injury of the left lower leg consisting of areas of:
1st degree burn - erythematous areas of skin without blistering
2nd degree superficial partial thickness and likely deep partial thickness with blistering
3rd Degree - Full thickness - white and mottled area although 4th degree cannot be excluded.

b) 4 possible complications:
Infection

Ischaemia
Scarring
Contracture
Pain
Amputation
DVT

c) Important clinical features

Other areas of burn – extent and type
Basic resuscitation status, adequacy of resuscitation status to date and vital signs including urine output
Associated trauma
Evidence of airway burn or inhalational injury
Evidence of inhalation of toxic gases
Evidence of facial, corneal or perineal burns
Circumferential burns or evidence of compartment syndrome
Temperature
Analgesia requirements
Vascular access issues
Co-existing conditions such as epilepsy or drug intoxication

Pass rate	70%
Highest mark	8.8

Question 19

Discuss the potential mechanical strategies for supporting myocardial function in a 45-year-old man presenting with cardiogenic shock post-revascularisation for an acute anterior myocardial infarction. In your answer include the physiological rationale for each strategy.

Answer

Positive End Expiratory Pressure
This can either be delivered invasively or non-invasively. By increasing the positive pressure within the thoracic cavity, venous return to the heart is reduced thereby reducing cardiac pre load to facilitate movement back to the optimal point on the Starling Curve. Also reduces afterload by reducing pressure gradient across the myocardial (left ventricular) wall. Also reduces work of breathing (reduces cardiac work) and improves PaO_2 (O_2 delivery to coronary blood flow).

Intra Aortic Balloon Pump
The inflation of the intra aortic balloon pump at the time of diastole increases coronary perfusion to increase cardiac contractility and reduces the after load at the commencement of systole as the balloon deflates.

Pacing
Emergency transcutaneous, temporary transvenous and permanent multi-chamber pacing. Improves cardiac output by optimising the heart rate and/or synchronising A-V conduction optimising “atrial kick”. Increasing the heart rate to normal in profound bradycardia as CO = SV x HR. Overdrive pacing in tachyarrhythmias to re-establish normal conduction and then slow the heart improves cardiac output by increased ventricular filling and improved coronary artery perfusion in diastole.

Ventricular Assist Devices
This provides either a continuous or pulsatile pumping of blood from the left ventricle directly into the aorta (LVAD) or from right atrium or right ventricle directly to pulmonary artery (RVAD) or functions as both (BIVAD).
Decreases workload of the heart whilst maintaining adequate flow and blood pressure. Indicated if potentially reversible myocardial stunning or as a bridge to transplantation or for support during high-risk revascularisation procedures. In this patient as a bridge to transplantation may allow management as outpatient. Requires cardiac surgical expertise for insertion and so not available in all centres.

Veno-Arterial Extra Corporeal Membrane Oxygenation
Venous blood is extracted, oygenated externally and then pumped and returned to the arterial system providing both oxygenation and circulation. Decreases workload of heart and lungs whilst maintaining flow, blood pressure and oxygenation.
Requires expertise for insertion and maintenance and not available in all ICUs.

Pass rate	77%
Highest mark	8.5

Question 20

With respect to non-convulsive status epilepticus (NCSE) in the critically ill:
a) Give a definition for NCSE
b) Outline the difficulties in making the diagnosis
c) List the risk factors for NCSE
d) Outline your approach to the management of a patient with suspected NCSE

Answer

Definition:
Change in behaviour and or mental processes from baseline associated with continuous epileptiform EEG changes but without major motor signs. NCSE comprises a group of syndromes with a wide range of response to anti-convulsants from virtually self-limiting forms to refractory forms. No universally accepted definition yet exists

Difficulties in Diagnosis:
Little agreement on diagnostic criteria, clinical forms, consequences and treatment
Difficulty telling when coma is due to ictal symptomatology and differentiating it from non ictal symptoms associated with underlying pathology such as posthypoxic, metabolic or septic encephalopathies and effects of sedative drugs.
On EEG there are cross over features between epilepsy and encephalopathies which are being still standardized and the diagnosis of NCSE should not be on EEG changes alone.

Early recognition and treatment are essential to optimize response to treatment and to prevent neurological and systemic sequelae. However overdiagnosis and aggressive use of anticonvulsants may also contribute to morbidity and mortality.

Risk factors:
Systemic infection in patient with pre-existing epilepsy
Stroke including intracerebral & subarachnoid haemorrhages
Dementia
Neoplasia
Previous neurosurgery
Patients with pre-existing epilepsy have a lower mortality (3%) than where NCSE is due to acute medical disorders (27%).

Management:
Difficulties in diagnosis as outlined above
Index of suspicion in patients with risk factors and suggestive clinical features

Investigations
Blood tests to exclude electrolyte abnormalities (low Ca, low Mg), liver and renal dysfunction, haematological causes (e.g TTP)
Lumbar puncture: looking for CNS infection
EEG and response on EEG and clinically to Benzodiazepines
MRI to exclude structural cause not evident on CT

Treatment
Treatment of underlying cause
Benzodiazepines: Diazepam or Lorazepam
Valproate: if failure to respond to benzodiazepines
Keppra increasingly used
Reversal of factors that lower seizure threshold eg drugs such as cefepime, fever, hypoxia, hypoglycaemia, hyponatraemia

Pass rate	0%
Highest mark	4.75

Question 21

1. A 28-year-old 35-week pregnant woman presents to the Emergency Department with acute onset epigastric pain. The biochemical profile and haematology report are as follows:

Parameter	Result	Normal Range
Sodium	138 mmol/L	135 – 145
Potassium	4.4 mmol/L	3.2 – 4.5
Chloride	102 mmol/L	100 – 110
Bicarbonate	27 mmol/L	22 – 27
Urea	4.3 mmol/L	3.0 – 8.0
Creatinine	0.07 mmol/L	0.07 – 0.12
Calcium	2.35 mmol/L	2.15 – 2.6
Corrected Calcium	2.53 mmol/L	2.15 – 2.8
Phosphate	2.75 mmol/L*	0.7 – 1.4
Magnesium	0.8 mmol/L	0.7 – 1.0
Glucose	4.7 mmol/L	3.6 – 7.7
Albumin	36 G/L	33 – 47
CK	71 U/L	<160
Total Bilirubin	40 micromol/L*	4 – 20
GGT	45 U/L	0 – 50
ALP	185 U/L*	40 – 110
LDH	748 U/L*	110 – 250
AST	241 U/L*	<40
ALT	189 U/L*	<40
Haemoglobin	88 G/L*	110 – 160
White Cell Count	12.4 x 10^9/L	4.0 – 15.0
Platelets	64 x 10^9/L*	150 – 400

a) What is the most likely diagnosis?
b) Give two additional tests that would support your diagnosis

Answer

a) HELLP syndrome

b) Haptoglobins – low
Blood film showing evidence of haemolysis

2. A 52-year-old man with a history of alcohol abuse and Type 2 diabetes is admitted with the abdominal pain. His arterial blood gases and biochemical profile are as follows:

Parameter	Result	Normal Range
Barometric pressure	760 mmHg (100 kPa)	
FiO_2	0.5	
pH	7.14*	7.35 – 7.45
PCO_2	12 mmHg (1.1 kPa)*	35 – 45 (4.7 – 6.0)
PO_2	149 mmHg (20 kPa)	
Bicarbonate	4 mmol/L*	22 – 26
Lactate	16 mmol/L*	<2.0
Sodium	142 mmol/L	135 – 145
Potassium	4.7 mmol/L*	3.2 – 4.5
Urea	14 mmol/L*	3.0 – 8.0
Creatinine	0.17 mmol/L*	0.07 – 0.12
Glucose	6.5 mmol/L	3.6 – 7.7
Total Bilirubin	20 micromol/L	4 – 25
LDH	1400 U/L*	50 – 150
AST	60 U/L*	<40
ALT	70 U/L*	<40
Serum Osmolality	314 mOsm/Kg*	275 – 295

a) Give three likely underlying diagnoses
b) Give two additional investigations that would assist the diagnosis

Answer

a)
Ischaemic bowel
Metformin induced lactic acidosis
Septic shock
Thiamine deficiency
Pancreatitis

b)
CT abdomen
Blood cultures / septic screen
Lipase
Red cell transketolase
Diagnostic laparoscopy / laparotomy

3. A 79-year-old woman with a history of Type 2 diabetes presents with confusion and a decreased conscious state. The following are her blood results on admission:

Parameter	Result	Normal Range
Barometric pressure	760 mmHg (100 kPa)	
FiO_2	0.4	
pH	7.32	7.35 – 7.45
PCO_2	36 mmHg (4.0 kPa)	35 – 45 (4.7 – 6.0)
PO_2	90 mmHg (12.0 kPa)	
Bicarbonate	18 mmol/L*	22 – 26
Lactate	4.8 mmol/L*	<2.0
Sodium	140 mmol/L	135 – 145
Potassium	3.9 mmol/L	3.2 – 4.5
Chloride	105 mmol/L	100 – 110
Urea	21.8 mmol/L*	3.0 – 8.0
Creatinine	0.22 mmol/L*	0.07 – 0.12
Glucose	40 mmol/L*	3.6 – 7.7

a) What is the most likely condition consistent with these results? Give the rationale for your answer.

b) List four potential complications of this condition.

Answer

a)

Non-ketotic hyperosmolar state:
Marked hyperglycaemia – higher than usually seen in DKA
Hyperosmolar – approx. 342 mOsm/Kg
Relatively mild anion gap acidosis accounted for by raised lactate

b)

Cerebral oedema
Vascular thrombosis
Electrolyte derangement
Intercurrent events such as sepsis, AMI
Hypotension and shock if inadequate resuscitation
Death

Pass rate	93%
Highest mark	10

Question 22

You are called urgently to the Emergency Department to review a 63-year-old male with chronic airflow limitation who is rapidly deteriorating. He is spontaneously breathing and a known difficult intubation.

Outline the priorities in this man's management.

Answer

This is an emergency situation with the following key issues:
Rapid deterioration in a patient with airflow limitation
Preparation for a difficult intubation

Management comprises simultaneous resuscitation and assessment to diagnose the cause(s) of the rapid deterioration in this patient and initiation of supportive and definitive management and at the same time calling for help and preparing for a difficult intubation.

Prompt diagnosis and appropriate focussed management of the underlying cause(s) may obviate the need for intubation in this patient but should not delay intubation if this needs to be done.

Help should be sought from the most appropriate resources available (senior ED or anaesthetic colleague, ENT, skilled anaesthetic technician)

Diagnosis of underlying cause depends on history, examination and specific investigations. Possible causes of rapid deterioration in this patient include tension pneumothorax, worsening bronchospasm, pneumonia and septic shock, pulmonary embolus, myocardial ischaemia. Treatment measures may include thoracocentesis / insertion ICC, bronchodilators, fluid and vasopressor resuscitation and antibiotics, thrombolysis, reversal coronary ischaemia.

Consideration should be given to a trial of NIV but again this should not delay necessary intubation.

If the underlying problem is not readily reversible, proceed to securing the airway with preparation for difficult intubation.

Preparation for difficult intubation involves the following:

Location
Patient unsuitable for transfer to OT so use well-equipped resus bay in ED

Equipment
Standard intubation equipment plus difficult airway trolley including equipment for emergency surgical airway, resuscitation equipment and full monitoring and $ETCO_2$

Drugs
Sedatives, muscle relaxants, resuscitation drugs and local anaesthetics

Personnel
Experienced assistants for airway equipment, drugs, cricoid pressure and general help
Experienced colleague (ICU, anaesthesia, ED, ENT)

Technique
Assess patient's airway and information regarding previous intubations and nature of difficulty and ease of bag-mask ventilation. It may be appropriate to perform immediate tracheostomy or cricothyroidotomy under local anaesthesia. Difficult to intubate BUT easy to ventilate increases options.

Plan A: attempted intubation under direct laryngosopy optimizing position and using adjuncts and if fails:
Plan B: Intubating LMA and if fails:
Plan C: able to ventilate via LMA, controlled surgical airway OR if unable to ventilate via LMA emergency surgical airway (cricioidotomy or cricoidostomy)

Pass rate	53%
Highest mark	8.5

Question 23

a) List the differential diagnoses of a low platelet count in the critically ill.

b) A 68-year-old man commenced on continuous renal replacement therapy for Acute Kidney Injury (AKI) following repair of a ruptured abdominal aortic aneurysm is noted to have a platelet count of 40 x 10^9/L.

What is your management of this problem?

Answer

a)
Cause of thrombocytopenia in most ICU patients is multi-factorial, due to some combination of following four mechanisms:

Increased destruction or consumption
Decreased production
Dilution
Sequestration

Increased destruction
Non-immune mediated – DIC, TTP, HELLP
Immune-mediated (drug) – eg Type 2 HITS, Glycoprotein IIb/IIIa inhibitors, NSAIDS, anti-epileptic drugs
Immune-mediated (non-drug) – ITP
Mechanical – extracorporeal circuits

Decreased production
Bone marrow suppression – drugs (eg linezolid), toxins, infections, nutritional deficiencies, metastases

Dilutional
After massive transfusion and fluid resuscitation

Sequestration
Splenomegaly
Portal hypertension

May also be spurious due to clumping of platelets in collection tubes

b)
Management consists of establishing the diagnosis and specific and supportive treatment.

The most likely causes in this patient are:

DIC
HITS
Other anti-platelet agents
Dilutional from massive transfusion

Other causes to be considered if indicated from history or examination

Investigations
FBC and Blood film
Coagulation screen including DIC screen
HITS screen
LFTs
Sepsis screen
Consider ADAMTS-13 (for TTP)

Treatment
Stop heparin and any other possible causative agents
Stop ongoing bleeding
Alternative agent for heparin in CRRT and alternative strategy for thromboprophylaxis
Platelet transfusion if bleeding, high risk or interventions scheduled
Look for and treat sepsis

Pass rate	58%
Highest mark	9.2

Question 24

1. The item of equipment depicted above is an endobronchial blocker.

a) List 3 situations where it might be used.
b) Give 2 advantages and 2 limitations of its use.

Answer

a) Indications- (any 3 of these)

To avoid contamination of a non-diseased lung
- Infection (e.g. unilateral pulmonary abscess)
- Massive pulmonary haemorrhage
- Unilateral pulmonary lavage (pulmonary alveolar proteinosis)

Control of distribution of ventilation
- Bronchopleural fistula
- Giant unilateral lung cyst or bulla
- Tracheobronchial tree disruption /Major airway trauma
- Severe hypoxaemia due to unilateral lung disease

During surgical procedures
- Pneumonectomy, lobectomy
- Oesophageal resection
- Lung transplant
- Thoracic aneurysm surgery
- Thoracic spine surgery

b) Advantages - (any 2)
- Can be used in patients through existing endotracheal tube (oral or nasal) without requirement to change to a double-lumen tube or back to a single lumen tube after. Therefore useful in patients with difficult airway, cervical spine injury, etc.
- Can be used in patients with major airway trauma or distorted trachoebronchial anatomy more safely than DLT
- Can provide selective lobar blockade of a specific lobe- in cases of haemorrhage, air leak, infection in one lobe, thereby allowing ventilation of more lung units.

Limitations - (any 2)

- Do not allow suctioning of deflated lung due to small lumen
- Requires ETT >7.5mm diameter.
- Collapse of desired lung may be slow
- Easily dislodged
- Risk of perforation of bronchus or lung parenchyma
- Difficult to block R upper lobe bronchus due to variable take-off.

2. Identify A, B, C, D & E in the figure below and explain the principles of a three-bottle drainage system compared with a one-bottle drainage system.

Answer

A = Trap or Collection Bottle

B = Underwater Seal Bottle

C = Manometer Bottle

D = Distance below water is equal to the negative pressure generated when suction is applied

E = Adjustable Vent tube

In the 1-bottle system the chest drain is connected by collecting tubing to a tube approximately 3 cm under water (the seal) in the underwater-seal bottle while another vent tube is open to atmosphere. In this system pleural pressure greater than + 3 cm water will force air or fluid from the pleural space into the bottle while negative pressure in the pleural space will suck fluid up the tube. As long as the underwater-seal bottle is well below the patient (e.g., on the floor beside the patient), the hydrostatic pressure of the fluid column in the tube will counterbalance the negative pleural pressure and prevent water from being sucked into the pleural space. The hydrostatic pressure is proportional to the height of the fluid column. Therefore a disadvantage of this single bottle system is that, as liquid contents (blood, pus, effusion fluid) is expelled from the pleural space and collects in the underwater-seal bottle, the seal tube becomes immersed deeper under water and the pressure required to force more contents into the bottle increases thus impeding the clearance of the pleural collection.

In a 3-bottle system, a trap or collection bottle is interposed between the drain tube and the underwater-seal bottle and a third bottle, called the manometer bottle, is added after the underwater-seal bottle. This manometer bottle has a vent tube under water to regulate the negative pressure generated by suction. The maximum negative pressure (in cm H_2O) generated by suction equals to the distance (in cm) this vent tube is below the water line (represented by D in the figure above).

The negative pressure generated by the vent tube (D) is independent of the amount of pleural drainage that is collected in the trap bottle (A).

Pass rate	56%
Highest mark	8.5

Question 25

You are called to assist with a 12-year-old child, brought in to the Emergency Department unconscious, following near drowning at a local beach.

Outline your immediate management.

Answer

Assess for signs of life and if absent commence CPR, check underlying rhythm and treat appropriately following APLS guidelines

Airway and breathing
Administer 100% oxygen
Intubation for airway protection and suction with ETT cuffed size 7 (ILCOR guidelines – cuffed ETT's acceptable in children) (age/4 +4) (half size bigger and smaller available) with C spine precautions
Ventilate with appropriate settings (Vt 6-8ml/kg, RR 15-20, PEEP > 5cm H2O)
SpO_2 and $ETCO_2$ monitoring, ABG and CXR
May get some discussion re management of ARDS

Circulation
Assess pulse rate and volume, blood pressure and capillary return, Doppler may be helpful if hypothermic
Secure IV access
If inadequate circulation fluid bolus of 20 ml/kg 0.9% Saline – avoid hypotonic intravenous fluids
Consider inotrope support early
Blood glucose, FBE, U & E

Cerebral support
Avoid any further episodes of hypoxia and hypercarbia
Optimise circulation

Temperature
Actively rewarm to core temperature of 34^oC
Passively rewarm over 34^oC
If post cardiac arrest – maintain hypothermia 32.5 – 33.5^oC for > 24 hours

Other
Primary and secondary survey for associated trauma
Look for precipitating cause (hypoglycaemia, epilepsy, drug/alcohol ingestion, marine envenomation)
Antibiotics not indicated routinely
Collateral history – immersion time, resuscitation at scene, medical history
Admit to ICU with appropriate paediatric expertise

Counsel family regarding likely outcomes

Pass rate	60%
Highest mark	7.3

Question 26

Discuss the role of interventional radiology in the management of the critically ill.

Answer

Therapeutic or diagnostic

Therapeutic:
CT or US guided drainage of abscess or fluid collections
Coiling of aneurysm
Embolisation of bleeding vessel
Regional thrombolysis or clot removal
TIPS procedure
Angioplasty for vasospasm
Coronary intervention
IVC filter insertion
Angioseal of cannulated vessel eg inadvertent arterial insertion of vascath
Vascular access eg Hickman
Insertion PEG, nasojejunal tubes

Diagnostic:
Angiography to diagnose vasculitis, cerebral thrombosis, region of haemorrhage (especially intestinal), brain death

Efficacy
May be as effective as surgery (good evidence in aneurysmal SAH) with lower morbidity and mortality
Offers treatment option for patients unsuitable for surgery due to age or co-morbidities
Good option in critically ill where surgical risks high eg laparotomy to drain abscess
Preferred strategy in management pelvic trauma
May avoid hysterectomy in post-partum haemorrhage

Limitations
Specific expertise needed but increasingly widespread
Needs to be performed in radiology suite with the risks and difficulties of managing a critically ill patient in a 'hostile' environment
Surgical back-up needed if intervention fails
Risk of contrast use (allergy, CIN)
Complications specific for each procedure

Pass rate	44%
Highest mark	7.1

Question 27

A 20-year-old, 80 kg man presents to the ED with acute severe asthma. In ED he has a respiratory arrest and is intubated. He is then transferred to your ICU with the following ventilator settings:

Mode	SIMV
FiO_2	1.0
Vt	500 ml
Respiratory rate	16 breaths/min
Inspiratory flow	20 litres per min
PEEP	5 cmH_2O

He has a tachycardia 130 bpm and a BP of 80/60. Arterial blood gas analysis shows pH 7.1, PCO_2 93 mmHg (12.3 kPa), PO_2 69 mmHg (9.0 kPa), HCO_3 28 mmol/L SaO2 90%.

a) What additional measurements would you take to assist ventilator management?

b) Comment on the ventilator settings, and describe what change (if any) you would make in each case.

c) List the <u>likely</u> causes of this patient's hypotension

<u>Answer</u>

a)
Peak pressure, plateau pressure and total PEEP *(auto PEEP and intrinsic PEEP acceptable terms)*

b)
SIMV
Leave unchanged. No benefit for PCV, and risks of hyperinflation with rapid changes in resistance. Will need sedation and probably paralysis to tolerate. *(If candidates change to PCV must explain risks)*

FiO_2
Obviously, leave.

Vt
Probably satisfactory; may be able to increase Vt if necessary to help control pCO_2 (allowing for adequate expiratory time); "lung protective" strategy not strictly necessary for this situation. High PCO_2 most probably relates to gas trapping and is best controlled by changes in flow rate and respiratory rate.

Rate
16 b/min is too high. The hypotension suggests significant dynamic hyperinflation. Rate should be immediately reduced to 10 or fewer. This rate with Inspiratory flow rate of 20 L/min and Vt 500 ml gives I:E of 1:1.5. I:E should be 1:3. Optimal respiratory rate to limit hypercapnia is balance between that which limits gas trapping (lower rate) and that which limits hypoventilation (higher rate)

Inspiratory flow
20 L/min is too low, causing prolonged inspiratory time (1.5 sec for Vt 500 ml). Flow should be adjusted up to minimise inspiratory time. Peak pressure will rise, but this should be tolerated so long as plateau pressure is safe.

PEEP
Extrinsic PEEP in this situation is controversial.

b)
Dynamic hyperinflation
Tension pneumothorax
Hypovolaemia – unlikely as sole cause but may be a contributing factor
Myocardial depression from intubating / sedating drugs
R ventricular dysfunction secondary to lung pathology with septal shift compromising L ventricular function
Sepsis possible

Pass rate	63%
Highest mark	8.5

Question 28

A 76-year-old man is admitted to ICU following a Medical Emergency Team call for hypotension and tachypnea. He is three days post-laparoscopic anterior resection for sigmoid cancer.

Information from his arterial blood gas is as follows:

Parameter	Result	Normal Range
Sodium	138 mmol/L	135 – 145
Potassium	5.4 mmol/L*	3.5 – 4.5
Chloride	104 mmol/L	95 – 105
Barometric pressure	760 mmHg (100 kPa)	
FiO_2	0.4	
pH	7.01*	7.35 – 7.45
PCO_2	45 mmHg (6 kPa)	35 – 45 (4.6 – 6)
PO_2	84 mmHg (11 kPa)	
Bicarbonate	11 mmol/L*	22 – 27
Base Excess	-19 mmol/L*	-2.0 – +2.0
Haemoglobin	88 G/L*	135 - 180
Glucose	7.5 mmol/L*	3.5 – 7.0
Lactate	13 mmol/L*	<2.0

a) Comment on the above results
b) What are the likely underlying causes of the raised lactate?
c) What are your immediate management priorities for this man?

Answer

a)
High anion gap metabolic acidosis
AG 23 not accounted for by just rise in lactate
Marked lactic acidosis
Respiratory acidosis
Hypoxaemia with A-a DO_2 145
Anaemia

b)
Septic shock (intra-abdo, lung, other)
Hypovolaemic shock with intra-abdominal bleeding
Ischaemic gut
Cardiogenic shock (myocardial ischaemia or septic cardiomyopathy)
PE less likely with PO_2 84 on FiO_2 0.4 but cannot be excluded

c)
Resuscitation with simultaneous focussed assessment (history, examination, investigations) to ascertain diagnosis and institution of treatment (supportive and definitive)

Resuscitation – ensure adequate airway and ongoing adequate oxygenation and ventilation. Intubation and IPPV if needed. IV access and fluid resus plus/minus vasopressors.
Focussed assessment – differential diagnosis as above. Look for signs of bleeding, sepsis, intra-abdominal catastrophe, assess myocardial function
Investigations – FBC, U&E, coags, Troponin, septic screen, ECG, CXR, CT abdo (if stable) ± CTPA, bedside echo
Broad-spectrum antibiotics if sepsis suspected
Surgical review, consider proctoscopy, with urgent return to theatre if indicated (anastamotic leak, ischaemic gut)
Other urgent specific treatment as indicated eg stop bleeding, treat myocardial ischaemia
Monitoring and transfer to ICU/HDU

Pass rate	84%
Highest mark	8.0

Question 29

You are called to the Emergency Department to assist in the management of a 45-year-old man with respiratory distress. He is a known HIV patient with Pneumocystis jiroveci pneumonia and an allergy to sulphonamides.

On examination:
Temperature 38.8^{o}C
Mucous membranes appear cyanotic
Respiratory rate 35/min
Heart rate 125/min
Blood pressure 90/50 mmHg
SpO_2 82% on 8L/min oxygen via Hudson mask

Initial arterial blood gas analysis (ABG) is as follows:

Parameter	Result	Normal Range
pH	7.32	7.35 – 7.45
PCO_2	27.6 mmHg (3.6 kPa)	35 – 45 (4.6 – 6.0)
PO_2	84.6 mmHg (11 kPa)	
HCO_3	13.9 mmol/L	22 – 27
Standard Base Excess	11.0	-2 – +2
Hb	62 G/L	110 – 165
SpO_2	93.4%	
*F*COHb	0.5%	
*F*HHb	5.4%	
*F*MetHb	18.4%	
FO_2Hb	75.7%	

a) Interpret the ABG report.
b) What is the likely diagnosis?
c) Outline your management of this patient

Answer

a)
ABG:

Metabolic acidosis
Respiratory compensation
Anaemia
Marked MetHb

b)
What is the likely diagnosis?

Drug related (dapsone as known sensitivity to sulphonamides) methaemoglobinaemia.
Haemolytic anaemia likely in this setting

c)
Outline your management of this patient

ABCs.

Empirical antimicrobial therapy until sepsis is excluded
Cease Dapsone
Use ABG with co-oximetry rather than pulse oximetry in the initial period to monitor response. Oximeter will not be reliable due to MetHb so there will be a reliance on clinical signs and gases.
Optimize tissue oxygen delivery – evidence on ABG that tissue Oxygen delivery is inadequate with lactataemia.
Transfuse - Hb 62 and functionally ~50- transfusion reasonable option
Ensure Hb maximally oxygenated – target high FHbO2 pending resolution of MetHbaemia so pO2 target high (eg >80mmHg)
Methylene Blue infusion 1-2 mg/kg (ideally do a rapid G6PD screen prior)
Exogenous glucose
Exchange transfusion if other measures fail or unavailable
N- acetylcysteine, cimetidine, ketoconazole - experimental

Pass rate	53%
Highest mark	8.3

Question 30

1.
This is the ECG of a 62-year-old man undergoing treatment for acute lymphoblastic leukaemia who presented with shortness of breath.

a) What are the abnormalities on this ECG?
b) What is the likely cause of his symptoms?

Answer

a)
Atrial fibrillation
Low voltage complexes
Electrical alternans

b)
Pericardial effusion

2.
The following information was obtained during the insertion of a right heart catheter

RA	14 mmHg
RV	105/14 mmHg
PA	33/18 mmHg
PAOP	14 mmHg
CI	2.4 L/min/m^2

a) What dominant abnormality is indicated by the right heart catheter data?
b) List two likely causes

Answer

a)
Pressure gradient between RV and PA

Pulmonary valve stenosis
Supravalvular or RVOT stenosis

3.

Report on the abnormalities on the following ECG:

Answer

Right bundle branch block
Q waves in leads II III and AVF and T wave inversion in III and AVF indicative of old inferior infarct
>2 mm ST segment elevation in leads V2 and V3 and ST elevation in leads V4 and V5 indicating STEMI

4.
The following is the ECG of a 61-year-old man in ICU following aortic valve replacement for endocarditis.

What does this ECG show?

Complete heart block

Pass rate	53%
Highest mark	9.3

HOT CASES

Royal Melbourne Hospital

- 47-year-old man, day 4 in ICU following an out of hospital cardiac arrest. Clinical findings included GCS E3M6VT, dysconjugate gaze, hyporeflexia and ankle clonus, systolic murmur and renal replacement therapy. Candidates were asked to assess him from a neurological point of view. Discussion points included the neurological prognosis and the possible causes of the renal failure.

- 42-year-old man with bilateral community-acquired pneumonia. Clinical signs included subcutaneous emphysema of his upper trunk. Candidates were told that he had been ventilated for one week in ICU for severe hypoxaemic respiratory failure and were asked to assess his prognosis overall. Discussion points included the management plan, causes of the subcutaneous emphysema, deranged liver function and thrombocytopaenia.

- 20-year-old male post motor vehicle crash with polytrauma including facial, chest and lower limb injuries. Clinical findings included facial fractures and eye injury, surgical above knee amputation right leg, fever and agitation. Candidates were asked to identify the injuries and discuss a management plan.

- 50-year-old female post motor vehicle crash with polytrauma including cervical spinal injuries, traumatic aortic dissection, chest trauma, liver and renal injuries and skeletal injuries. Candidates were asked to assess for suitability for weaning. Discussion included management issues in this patient and general criteria for extubation.

- 48-year-old male post high speed motor vehicle crash with traumatic brain injury, chest, abdominal and skeletal injuries. Clinical signs included poor neurological recovery off sedation. Candidates were asked to identify his injuries and assess his neurological prognosis.

- 69-year-old female post complicated coronary artery graft surgery who failed extubation. Clinical signs included vasoplegic shock state, oliguria and raised lactate. Candidates were asked to address the key issues and formulate a management plan.

- 53-year-old female with severe sepsis, acute kidney injury and a new temporal lobe infarct. Candidates were asked to determine the source of sepsis.

- 39-year-old male with chest, abdominal, pelvic and spinal trauma following high-speed motor vehicle crash. Candidates were asked to assess him for extubation. Discussion included criteria for extubation and management of delirium.

Monash Medical Centre

- 61-year-old woman with Guillain Barre syndrome. Clinical findings included bilateral VII and XII nerve palsies, generalized hypotonia, quadraparesis, areflexia and intact sensation. Candidates were asked to provide a differential diagnosis for her weakness.

- 45-year-old man with Guillain Barre syndrome. Clinical findings included motor weakness, areflexia and intact sensation. Candidates were asked to perform a neurological examination. The discussion related to the distinction between a myopathy and neuropathy and issues related to prolonged ICU admission.

- 35-year-old woman with intracranial haematoma and fever. Clinical findings included a head wound, withdrawal to painful stimulus, bilateral upgoing plantar reflex responses and thrombophlebitis of the right arm. Candidates were asked to perform a neurological exam and suggest a cause for the fever. Discussion included interpretation of the CXR findings and management of fever.

- 70-year-old man with inflammatory response post coronary artery graft surgery. Clinical findings included bilateral lung crepitations, pericardial rub, groin haematoma, saphenous vein harvest site and milrinone infusion. Discussion related to the management of heart failure.

- 63-year-old man with embolic stroke post vascular and cardiac surgery. Clinical findings included carotid surgical wound, median sternotomy wound, cardiac murmur, confusional state and unequal pupils. Candidates were asked to determine if the patient was suitable for a trial of extubation. Discussion related to the causes of neurological deterioration and interpretation of the MRI findings.

St Vincent's Hospital

- 37-year-old man with chronic liver failure and Gram negative sepsis who had an acute gastrointestinal haemorrhage. Clinical signs included stigmata of chronic liver disease, blood-stained airway and oliguria. Candidates were asked to examine him from the aspect of his acute GI bleed. Discussion related to the underlying causes and management of the GI bleed, coagulopathy in liver failure and hepato-renal syndrome.

- 78-year-old man with CLL who presented with fever, neck pain and confusion secondary to a cervical epidural abscess. Clinical findings included decreased conscious state, cervical laminectomy wound, decreased spontaneous movement and decreased reflexes in the left upper limb. Candidates were asked to examine him with a view to forming a differential diagnosis.

- 59-year-old man with hypotension, hypothermia and collapse secondary to a stroke and subsequent septic shock. Clinical findings included multi-organ failure, limb ischaemia, purpura fulminans, GCS 3, signs consistent with previous pneumonectomy and gas trapping. Candidates were asked to examine him with regard to the likely diagnosis and management issues.

VIVAS

Viva 1

You are the consultant rostered on at the start of a week in ICU and you are taking handover from another consultant.

The patient being discussed is a 40 year diabetic female admitted to ICU with urosepsis and septic shock 12 hours ago. She is critically ill and still deteriorating despite “aggressive” intensive care.

What are the major actions you would expect to have already been taken for this patient?

Viva 2

A 76-year-old male presents following a fall down stairs. He is found to have multiple (>5) fractured ribs on the right side of his chest. Otherwise he has no other injuries.

His past history includes depression, he requires a hearing aid and has a 30 pack-year smoking history. His daughter says he has recently become quite "forgetful" since his wife passed away.

He is admitted to your intensive care unit for respiratory and analgesic management.

When you meet this man he is in considerable discomfort with a pain score of 9/10.

What medications would you use to provide analgesia for this man and give the pros and cons of each?

Viva 3

A 60-year-old man has been transferred to your ICU from another hospital ICU, where he had been admitted with severe pancreatitis complicated by respiratory failure requiring mechanical ventilation.

His oral intake was reported to be poor during the week leading up to that hospital admission.

How would you assess his current nutritional state?

Viva 4

A 25-year-old man was involved in a high speed motor vehicle accident. His GCS was M4 E2 V2.

The patient was intubated and ventilated in the Emergency Department. Vital parameters post-intubation, SpO_2 98% on 50% oxygen, BP 130/80, reactive pupils.

A CT head was reported as diffuse axonal injury (DAI). Other imaging confirmed rib fractures and lung contusions and excluded any other injury.

What is your understanding of DAI?

Viva 5

You are the intensivist on duty. A 50 year old woman has just been transferred from the surgical ward with worsening shortness of breath day 5 post-oesophagectomy and a presumed anastomotic leak. On arrival in ICU she is tachypneic and extremely agitated.

Arterial blood gas analysis on 80% Oxygen via Venturi mask shows:

pH	7.12
PaO_2	50 mm Hg
$PaCO_2$	50 mm Hg
HCO_3	16 mmol/L

A CXR shows bilateral pulmonary opacification.

What are the possible causes for her respiratory failure and outline your initial approach to her respiratory management?

Viva 6 (Radiology viva)

Consisted of 3 X-ray images and 4 CT scans for interpretation

Viva 7 (Communication viva)

John is 64, and is a committed Jehovah's Witness admitted to ICU following surgery for colonic bleeding, with an admission Hb of 42g/L.

He has atrial fibrillation, stable on warfarin. Ten days prior, John had an uneventful colonoscopic snare excision of a colonic polyp. Warfarin had been ceased for the procedure, and was re-commenced day 3 post-op.

John presented to the hospital Emergency Department today with massive PR bleeding and hypotension. He has had an emergency R hemicolectomy, with formation of a colostomy. Vitamin K was given for warfarin reversal; the presentation INR was 3.2.

John was transferred to ICU one hour ago, intubated and ventilated with FiO2 of 0.6. His mean arterial pressure is 75 mmHg on 15 mcg/min nor-adrenaline with cool peripheries and urine output 10-20 ml/hr. Haemoglobin = 42 g/L, platelets = 32, INR = 2.6, pH = 7.28, lactate = 2.3 mmol/L. There is fresh blood in the surgical drains and the colostomy.

So far John has not received any blood products, the anaesthetist reports that he re-affirmed his wishes not to receive blood prior to induction of anaesthesia. John's next-of-kin has been waiting to see him since he went to theatre.

Viva 8

A 30-year-old man has presented to the Emergency Department with a single stab wound to the Left anterior upper chest. You have been called to see him to review him for an HDU admission, and arrive just as the Emergency department registrar has intubated him for agitation. As you enter, you hear the call for assistance from the only other doctor in the department, the emergency department registrar, who is bagging the unconscious patient.

Please assess and manage the immediate priorities.