FRCA primary onexamination 5

1) Percutaneous translumimal coronary angioplasty (PTCA):

True / False		
●	○	has proven benefit in symptom relief. ✓Correct
○	●	the treatment of choice for significant left main stenosis ✓Correct
○	●	is contraindicated in unstable angina. ✓Correct
●	○	produces endothelial disruption in the treated vessel. ✓Correct
○	●	general anaesthesia should be used. ✓Correct

Percutaneous translumimal coronary angioplasty (PTCA) produces endothelial disruption in the treated vessel. It is mainly for symptom relief rather than for its prognostic benefits since coronary artery bypass grafting (CABG) is the treatment of choice for left main stem stenosis (not PTCA). It is not contraindicated in unstable angina. The procedure is almost always done under local anaesthesia rather than under general anaesthesia.

2) Regarding respiratory surfactant:

True / False		
●	○	It is produced by alveolar type 2 epithelial cells. ✓Correct
●	○	It is composed primarily of phospolipids such as dipalmitoyl lecithin. ✓Correct
○	●	It reduces lung compliance by changing surface tension. ✓Correct
●	○	Production may be enhanced by the administration of antenatal steroids to mother. ✓Correct
○	●	At 24 weeks gestation, production is 75% of that at term. ✓Correct

Surfactant is produced by type 2 (Clara) cells, and consists principally of phospholipids such as dipalmitoyl lecithin, which is synthesised from fatty acids. Surfactant is formed relatively late in fetal life, and deficiency leads to respiratory distress syndrome. By reducing surface tension, the compliance of the lung is increased (not reduced), and the work of breathing is reduced with each breath. Each alveoli is inherently unstable and liable to atelectasis (collapse). The production of foetal surfactant may be enhanced by the administration of steroids to the mother.

3) Regarding heat loss during anaesthesia:

True / False		
●	○	blankets made from aluminium foil reduce radiation heat losses ✓Correct
●	○	conduction accounts for about 5% of the heat lost ✓Correct
○	●	convection is the most significant factor ✓Correct
●	○	respiration accounts for only 10% of the total heat loss ✓Correct
○	●	when the relative humidity is high the cooling effect of sweating is increased ✓Correct

Body temperature falls during general anaesthesia and efforts to limit heat loss and prevent the development of hypothermia are essential. Heat can be lost from the body by five recognised methods: Conduction (5%); Respiration (10%); Convection (15%); Evaporation (20%); and Radiation (50%).

Heat lost through radiation is the most important source (not convection). Radiation losses are greater when the amount of exposed surface is high and it increases when there is a large temperature differential. The vasodilation associated with anaesthesia increases radiation heat loss. Reflective blankets made from aluminium foil reduce radiant heat losses. The cooling effect from sweating is decreased (not increased) when the relative humidity is high.

4) The following affect the value of MAC (minimal alveolar concentration):

True / False

○	◉	gender ✓Correct
○	◉	mild hypercapnia ✓Correct
◉	○	hypoxaemia ✓Correct
○	◉	acidaemia ✓Correct
○	◉	alkalaemia ✓Correct

The minimal alveolar concentration (MAC) of an inhalational anaesthetic agent is unaffected by the following: gender, acidaemia, alkalaemia, body weight, serum potassium variations and the duration of the anaesthetic.

MAC is increased in: infants/children; hyperthermia; hypermetabolic states and sympathetic increase and chronic alcoholism. MAC is reduced in: hypothermia; hypoxaemia; old age; the presence of other depressant drugs, e.g. opioids; and when the central nervous system has low levels of catecholamines, e.g. alpha methyl dopa.

Carbon Dioxide (levels > 120 mmHg) has been used an anaesthetic - Hickman, which by an additive effect can be considered as decreasing MAC. On the other hand a markedly elevated CO2 (and even severe acidaemia) can stimulate the sympathetic system / release catecholamines and result in MAC increasing. The issue is which is the dominant effect. Thus the subject of MAC and CO2 is confusing and in an MCQ it may be wise to leave the stem unanswered.

5) In thrombolyitc therapy:

True / False

◉	○	plasminogen activation can be antagonised by epsilon-aminocaproic acid ✓Correct
◉	○	activation of plasmin results in the lysis of a fibrin thrombus ✓Correct
○	◉	streptokinase is produced by Lancefield group A beta-haemolytic *streptococci* ✓Correct
○	◉	urokinase is associated with allergic and anaphylactic reactions ✓Correct
○	◉	streptokinase has a plasma half-life of approximately 120 minutes ✓Correct

Plasminogen is an inactive precursor and it is converted into the active plasmin through the action of endogenous tissue plasminogen activator and thrombin. It lyses fibrin and fibrinogen resulting in the formation of fibrin degredation products (FDP) that inhibit thrombin. Epsilon-aminocaproic acid inhibits thrombolysis by antagonising plasminogen activation.

Streptokinase is produced by Lancefield group C (not A) beta-haemolytic *streptococci*. It binds to plasminogen forming a streptokinase-plasminogen complex which converts additional circulating plasminogen and fibrin-bound plasminogen into plasmin. It is associated with allergic and anaphylactic reactions and has a plasma half-life of approximately 20 minutes. However, studies with radioactive streptokinase indicate 2 disappearance rates: a fast half-life of approximately 18 minutes due to the action of antibodies, and a slow half-life, operative in the absence of antibodies, of approximately 83 minutes. Urokinase activates plasminogen directly and is not antigenic.

6) Cyanosis may be apparent with:

True / False

●	○	oxygen saturations below 85% ✓Correct
○	●	beta-thalassaemia major ✓Correct
●	○	sickle cell disease ✓Correct
●	○	methaemoglobinaemia ✓Correct
○	●	carbon monoxide poisoning ✓Correct

Cyanosis may be apparent in the presence of more than 5g/dl of reduced haemoglobin, and when the arterial saturation is below 85%. It is associated with the following: congenital heart disease, respiratory disease and as a side effect of drug therapy causing methaemoglobinaemia. In carbon monoxide poisoning the patients appear cherry red in colour rather than cyanosed, and in beta-thalassaemia major there is severe anaemia and cyanosis is unlikely. In sickle cell disease despite the diagnostic difficulty caused by skin pigmentation cyanosis may be apparent.

7) Features of mitral stenosis include:

True / False

●	○	right axis deviation on the ECG ✓Correct
●	○	increased pulmonary artery occlusion pressure ✓Correct
●	○	a left parasternal heave ✓Correct
●	○	a palpable first heart sound ✓Correct
●	○	a palpable second heart sound ✓Correct

Mitral stenosis is in 99% of cases due to rheumatic heart disease, although a clear history is obtained in only 50% of patients. 25% of patients with rheumatic heart disease have pure mitral stenosis, and two-thirds are female. In parallel with the incidence of rheumatic fever, mitral stenosis is more common and generally more severe in developing countries. It causes elevated right sided pressures (including pulmonary artery occlusion pressure)with a left parasternal heave reflecting right ventricular hypertrophy (RVH). The RVH may cause right axis deviation on the ECG. A tapping apex beat signifies a palpable first heart sound. With pulmonary hypertension, a palpable second heart sound may be felt.

8) The following are usual in respiratory failure due to chronic bronchitis:

True / False

○	●	hyperventilation ✓Correct
●	○	respiratory acidosis ✓Correct

○	●	diminished lung compliance ✓Correct
●	○	muscle twitching ✓Correct
●	○	pulmonary hypertension ✓Correct

This question is testing your knowledge of 'blue bloaters' (chronic bronchitis and type 2 respiratory failure) and 'pink puffers' (emphysema and type 1 respiratory failure). Hyperventilation is seen in emphysema. Hypoventilation is more usual in respiratory failure due to advanced chronic bronchitis, and a respiratory acidosis occurs due to retention of carbon dioxide (hypoventilation). Muscle twitching is a feature of hypercapnoea (retained carbon dioxide). Pulmonary hypertension causes right heart failure and hence 'Cor Pulmonale'.

9) Regarding central cyanosis:

True / False

●	○	It can be reliably diagnosed when > 5g/dl of desaturated haemoglobin are present. ✓Correct
●	○	If the haemoglobin is 6g/dl, the child will be pre-terminal before cyanosis appears. ✓Correct
○	●	Central cyanosis is indicated by circum-oral blueness ✓Correct
●	○	It can be associated with a normal arterial PO2 in methaemoglobinaemia. ✓Correct
●	○	May be caused by right to left shunts. ✓Correct

Cyanosis is a bluish or purplish tinge of the skin or mucous membranes resulting from the presence of >5g/dl of reduced haemoglobin. It is, therefore, not detectable in patients with severe anaemia, even if they are gravely hypoxaemic. Central cyanosis is usually detectable once the oxygen saturation drops below about 80-85%. It may be respiratory or cardiac in origin. Occasionally, cyanosis can be because of abnormal pigments such as sulphaemoglobin or methaemoglobin. In this cases, arterial oxygen tension is often normal. Methaemoglobin is Fe3+ instead of normal Fe2+ in haemoglobin in some of the haemoglobin molecules. Two types occur, Genetic (asymptomatic) or Acquired (due to ingestion of oxidant drugs, e.g. analine dyes, GTN, dapsone, which give symptoms of anaemia with or without haemolysis). Sulphaemoglobin is usually acquired by ingestion of sulphonamides or phenaciten. central cyanosis may be caused by right to left shunts.

10) Regarding the haematocrit:

True / False

●	○	the haematocrit is higher in venous blood than in arterial blood ✓Correct
●	○	tissue oxygen delivery is increased when the haematocrit is lower than normal ✓Correct
○	●	the optimal haematocrit following haemorrhage is about 40% ✓Correct
○	●	the viscosity of blood is reduced when the haematocrit is high ✓Correct
○	●	the haematocrit should be expressed as a percentage ✓Correct

The haematocrit is the total red blood cell volume as a proportion of blood volume and it is expressed as a fraction not as a percentage. Normal values are 0.4 – 0.54 (male) and 0.37 – 0.47 (female). Venous blood has a higher haematocrit than arterial blood because of the entry of chloride ions into red cells (chloride shift) which is followed by water entry by osmosis. A fall in haematocrit decreases the viscosity and thus increases the flow. Therefore, a haematocrit of about 0.3 is thought to be optimal and does increase the tissue oxygen delivery. The hazards of blood transfusion and deep vein thrombosis are reduced. However, a haematocrit below 0.3 is undesirable because of reduced oxygen carrying capacity.

11) The following drugs cross the placenta in significant amounts:

True / False

◉	○	isoflurane ✓Correct
○	◉	rocuronium ✓Correct
○	◉	glycopyrrolate ✓Correct
◉	○	nitrous oxide ✓Correct
◉	○	pethidine ✓Correct

All inhalational agents readily cross the placenta in significant amounts, which is why the induction to delivery time should be as short as possible. They are all rapidly excreted from the lungs of the neonate and so any sedation effects are transient.

Rocuronium and glycopyrrolate both contain a quaternary amine and so do not cross the placenta. Other muscle relaxants, except gallamine, similarly do not cross the placenta, but other antimuscarinic agents do. Pethidine does cross the placenta and may decrease the Apgar score in the neonate.

Question: 1 of 70

Time taken: 1 mins 14 secs

8610

The development of post-dural puncture headache is reduced by:

True / False

◉	○	the Huber point of the Tuohy needle ✓Correct
○	◉	bed rest ✓Correct
○	◉	over-hydration ✓Correct
○	◉	rotating the Tuohy needle prior to threading the catheter ✓Correct
○	◉	a Quinke spinal needle compared with a pencil point ✓Correct

The Huber point of the Tuohy needle is designed so that the rounded point is less likely to cut the dural fibres in comparison with a standard beveled needle. Consequently it is associated with a reduced incidence of post-dural puncture headache (PDPH). Bed rest and over-hydration have no effect on whether a PDPH develops. Rotating the Tuohy needle increases the risk of dural trauma and a Quinke needle has a higher risk of headache than the less traumatic, pencil point needles.

Question: 2 of 70

8609

Local anaesthetic toxicity:

True / False

○	◉	Light-headedness is usually due to hypotension ✓Correct
○	◉	May be caused by epidural fentanyl ✓Correct
◉	○	L-bupivacaine is safer than bupivacaine ✓Correct

●	○	Ventricular fibrillation due bupivacaine toxicity is usually refractory ✓Correct
●	○	Intermittent boluses of 0.1% bupivacaine, do not usually cause cardiac side effects in healthy mothers ✓Correct

Light-headedness is usually due to the direct effect of local anaesthetic toxicity on the central nervous system. Fentanyl is not a local anaesthetic and therefore cannot cause local anaesthetic toxicity. L-bupivacaine and ropivacaine have better side effect profiles than bupivacaine and are considered safer in the event of toxicity. Intermittent boluses of 0.1% bupivacaine are not usually associated with cardiac side effects in healthy patients.

Ventricular fibrillation due to bupivacaine is resistant to treatment (refractory) and resuscitative efforts are usually prolonged.

Question: 3 of 70

Time taken: 6 mins 18 secs

8600

Regarding renal physiology in the pregnant patient:

True / False

○	●	proteinuria is abnormal ✓Correct
●	○	glomerular filtration rate is increased ✓Correct
●	○	the maximal tubular resorption threshold of glucose is reduced ✓Correct
●	○	bladder muscle is relaxed ✓Correct
●	○	urinary frequency is more common than urine retention ✓Correct

Proteinuria is present in 20% of normal pregnancies. The glomerular filtration rate increases by 50% during the first trimester. The maximal tubular resorption threshold for glucose is reduced and intermittent glycosuria is common. Progesterone relaxes the bladder and urinary frequency is common, due to mechanical compression of the bladder by the uterus.

Question: 4 of 70

Time taken: 7 mins 53 secs

8598

The following haematological changes occur in pregnancy:

True / False

●	○	red cell mass increases ✓Correct
○	●	platelet count increases ✓Correct
●	○	plasma cholinesterase concentration is reduced ✓Correct
○	●	prothrombin time is reduced ✓Correct
●	○	factor VII levels are increased ✓Correct

The increase in red cell mass is less than the increase in plasma volume, resulting in the physiological anaemia of pregnancy. The platelet count is normal or slightly reduced due to dilution and there is a 30% reduction in plasma cholinesterase concentration at term. There are significant increases in concentrations of factors VII, VIII, IX, X and fibrinogen but bleeding, clotting (prothrombin time) and clot retraction time remain unchanged in the healthy pregnant patient.

Question: 5 of 70

Time taken: 10 mins 37 secs

8597

The following respiratory changes occur in pregnancy:

True / False

○	●	lung compliance is reduced ✓Correct
○	●	functional residual capacity is increased ✓Correct
●	○	tidal volume increases ✓Correct
●	○	respiratory rate increases ✓Correct
●	○	plasma bicarbonate is reduced ✓Correct

There is a reduction in total respiratory compliance due to a decrease in chest wall compliance, but lung compliance is not altered. The functional residual capacity (FRC) is reduced by 20% (not increased), which is mainly due to elevation of the diaphragm. Progesterone stimulates the respiratory centre producing an increase in tidal volume and respiratory rate, this leads to a respiratory alkalosis, which is compensated for by a reduction in plasma bicarbonate levels.

Question: 6 of 70

Time taken: 13 mins 7 secs

8551

Regarding the insertion of a spinal (subarachnoid) block in a pregnant patient:

True / False

○	●	the height of the spinal block directly correlates with the body weight of the patient ✓Correct
○	●	higher APGAR scores are associated with prolonged uterine incision to delivery times ✓Correct
○	●	plain bupivacaine has a shorter duration of action than hyperbaric bupivacaine ✓Correct
●	○	the Sprotte and Whitacre are examples of pencil-point spinal needles ✓Correct
●	○	the bevel of the spinal needle should be inserted parallel to the longitudinal dural fibres ✓Correct

Examples of pencil-point spinal needles include the Sprotte and Whitacre needles. They are thought to separate rather than cut the dural fibres, which may explain why they are associated with a lower incidence of postspinal headache. The orientation of the spinal needle bevel should always be inserted parallel to the longitudinal dural fibres.

Prolonged ‘uterine incision to delivery’ times are associated with lower APGAR scores (not higher) and deranged neonatal acid-base values.

Plain bupivacaine has a longer duration of action (not shorter) than hyperbaric bupivacaine and has an unpredictable spread in obstetric patients. The height of a spinal block in pregnant patients is unrelated to body weight, height, body mass index, age or the height of the vertebral column.

Question: 7 of 70

Time taken: 17 mins 3 secs

8549

When using epidural anaesthesia for a lower segment caesarean section (LSCS):

True / False

●	○	warming the local anaesthetic will speed the onset of the block ✓Correct
○	●	the addition of adrenaline to bupivacaine speeds the onset of the block ✓Correct
○	●	the addition of 1mg/kg of fentanyl to the local anaesthetic prolongs the duration of the block ✓Correct
○	●	a pain free operation can be ensured with a sensory block from S5 to T6 ✓Correct
○	●	respiratory depression is increased with the more lipid soluble opioids ✓Correct

A sensory block from S5 to T4 (not T6) is required for lower segment caesarean section (LSCS). The limitations of this technique are due to the innervation of the diaphragm, which is supplied by the phrenic nerves (C3,4,5) and vagally innervated structures, which are not blocked. Therefore, a gentle surgical technique is essential to limit intraoperative pain and discomfort.

Alkalinization (increases the concentration of free base), carbonation and warming the local anaesthetic agents, have all been shown to speed the onset of action of local anaesthetics. The addition of adrenaline increases the duration and quality of an epidural block (not the speed of onset). Decreased absorption of the local anaesthetic from the epidural space or a direct action on the spinal cord alpha receptors have been proposed.

Epidural opioids have no effect on sympathetic or motor function, but they do have an additive effect when combined with local anaesthetic agents. The combination results in a faster onset of action and a longer duration of more effective analgesia. The risk of delayed respiratory depression is reduced (not increased) with the more lipid soluble agents like fentanyl and diamorphine. The addition of 1 microgram per kilogram (not 1mg/kg) is an appropriate dose of fentanyl to augment and prolong the epidural block.

Question: 8 of 70

Time taken: 21 mins 50 secs

8547

Regarding the prevention of aspiration pneumonitis:

True / False

○	●	sodium citrate is a viscous particulate mixture ✓Correct
●	○	anticholinergic drugs reduce lower oesophageal sphincter tone ✓Correct
○	●	omeprazole reversibly inhibits the hydrogen-potassium adenosine triphosphatase (ATPase) ✓Correct
○	●	ranitidine does not bind to cytochrome P_{450} and is therefore preferable to cimetidine ✓Correct
○	●	the purpose of aspiration prophylaxis is to reduce the volume and lower the pH of gastric contents ✓Correct

Aspiration of acidic gastric contents is associated with the development of a chemical pneumonitis. The purpose of pharmacological prophylaxis against aspiration is to reduce the volume and raise the pH (lowering the pH makes it more acidic) of the gastric contents.

Lower oesophageal sphincter tone is reduced during pregnancy and is further reduced by intravenous induction agents, opiates and anticholinergic drugs.

Sodium citrate is a non particulate antacid and is currently the drug of choice. Particulate viscous antacids (magnesium trisilicate) do not mix well with the gastric contents and can cause a severe pulmonary reaction if inhaled.

Omeprazole is a proton pump inhibitor that irreversibly binds (reversibly is false) to the hydrogen-potassium adenosine triphosphatase (ATPase) enzyme.

Cimetidine binds to the haem portion of cytochrome P_{450} and inhibits the metabolism of many drugs and is associated with a number of drug interactions. Ranitidine also binds to P_{450} but it is preferable because it is associated with fewer drug interactions.

Question: 9 of 70

Time taken: 21 mins 50 secs

Regarding accidental dural puncture with a Tuohy needle:

True / False		
○	◉	further attempts at inserting the epidural catheter should be abandoned ✓Correct
◉	○	an epidural blood patch is contraindicated in the presence of a pyrexia ✓Correct
◉	○	the incidence of post dural puncture headache is 70% ✓Correct
○	◉	an epidural blood patch should be inserted at the time of the dural puncture ✓Correct
○	◉	an epidural blood patch is performed using 15 to 20 ml of homologous blood ✓Correct

Accidental dural puncture is associated with the development of a postural headache (any part of the head or neck) and may be accompanied by nausea, vomiting, dizziness, and diplopia (due to stretching of the sixth cranial nerve). The headache, which is described as a postural headache, may occur immediately or develop up to four days later and has an incidence of 70 - 80%. If an accidental dural puncture occurs, further attempts at siting an epidural catheter are not contraindicated, as the advantages of having a working epidural in situ may outweigh the risks associated with inserting another epidural catheter. The interspace above should be used and consequently, the risk of the patient developing a postural headache is reduced to 50%. However, great care is required in order to avoid a second accidental dural puncture. An epidural blood patch is the most effective treatment for a post dural puncture headache, but it should be delayed until at least 24 hours after the dural puncture. If it is performed immediately it is associated with a high failure rate, compared with a rate of >90% if the procedure is delayed by 24 hours. Between 15 - 20 ml of autologous blood (not homologous) should be withdrawn using an aseptic technique, then slowly injected into the epidural space. Contraindications to an epidural blood patch include fever or any signs of systemic infection.

Question: 10 of 70

Time taken: 29 mins 26 secs

8217

The following congenital heart lesions have characteristic ECG patterns:

True / False		
○	◉	Ventricular septal defect (VSD) ✓Correct
○	◉	Patent ductus arteriosus (PDA) ✓Correct
◉	○	Endocardial cushion defect ✓Correct
◉	○	Tricuspid atresia ✓Correct
○	◉	Mild pulmonary stenosis ✓Correct

Endocardial cushion defect involves fusion of the tricuspid and mitral valve with an atrial septal defect. The ECG will show right atrial enlargement, rightward axis, right ventricular hypertrophy and rSR1- v1. Tricuspid atresia is associated with small right ventricular complexes and may show left ventricular hypertrophy. Ventricular septal defect (VSD) and patent ductus arteriosus (PDA) have similar ECG patterns which may be normal. They can also show left ventricular hypertrophy , biventricular hypertrophy, or right ventricular hypertrophy if the shunt reverses. In mild pulmonary stenosis the ECG will also usually be normal.

Question: 11 of 70

Time taken: 34 mins 12 secs

8216

Left ventricular hypertrophy can occur in:

True / False

○	◉	Tetralogy of Fallot ✓Correct
◉	○	Ventricular septal defect ✓Correct
○	◉	Atrial septal defect. ✓Correct
◉	○	Patent ductus arteriosus ✓Correct
◉	○	Coarctation of aorta. ✓Correct

Right ventricular hypertrophy occurs with tetralogy of Fallot and left ventricular hypertrophy occurs with a moderately sized ventricular septal defect (VSD), patent ductus arteriosus (PDA) and coarctation of the aorta. Right atrial enlargement occurs with an atrial septal defect (ASD).

Question: 12 of 70

Time taken: 42 mins 43 secs

8190

Type I respiratory failure:

True / False

○	◉	Can be caused by respiratory muscle weakness and fatigue. ✓Correct
◉	○	Is found in mountain sickness. ✓Correct
◉	○	Can lead to pulmonary hypertension. ✓Correct
○	◉	Can lead to CO2 retention if patients are given 100% oxygen. ✓Correct
◉	○	Can lead to ventricular failure. ✓Correct

In type I respiratory failure there is hypoxaemia accompanied by a normal or low arterial PCO2. Type II failure is hypoxaemia accompanied by an increased PCO2 (>6.5 kPa). Hypoxaemia can occur because of 3 mechanisms: Hypoventilation; Diffusion impairment; and VQ mismatch. Acute respiratory distress syndrome (ARDS) and hyaline membrane disease in addition to lung infections may cause both diffusion impairments and VQ mismatch. In the case of VQ mismatch and hypoventilation, the CO2 usually rises (type II respiratory failure). In these cases, the patient relies more and more on hypoxia to maintain respiratory drive, and an excess of oxygen can be counterproductive. Hypoxia is a potent pulmonary vasoconstrictor, and can lead to pulmonary hypertension and ventricular failure. Mountain sickness may cause type I respiratory failure because at high altitudes the PO2 is reduced, despite the oxygen content in the air remaining unchanged.

Question: 13 of 70

Time taken: 43 mins 6 secs

8182

The treatment of thyrotoxic crisis includes:

True / False

◉	○	high dose dexamethasone ✓Correct
○	◉	keeping the patient warm ✓Correct
◉	○	administration of beta blocking agents ✓Correct

●	○	immediate administration of propyl thiouracil ✓Correct
●	○	administration of iodide ✓Correct

The mainstay of treatment of thyrotoxic crisis includes: steroids, with Lugol's iodine (given with carbimazole/PTU although this takes days to begin working) and beta-blockers. Generally hyperthermia is a feature and patients require cooling.

Question: 14 of 70

Time taken: 45 mins

8181

In trigeminal neuralgia:

True / False

○	●	pain is associated with sensory loss in the trigeminal distribution ✓Correct
○	●	the maxillary division is most commonly affected ✓Correct
●	○	it rarely affects the first division of the nerve ✓Correct
●	○	is nearly always unilateral ✓Correct
○	●	is commoner in males than females ✓Correct

Trigeminal neuralgia is a chronic pain condition characterised by brief severe lancinating pain involving the trigeminal nerve distribution. The pain tends to be unilateral during acute attacks and there is minimal or no sensory loss. The mandibular division is most commonly affected (not maxillary), and rarely affects the first division of the nerve. Females are more commonly affected than males. Trigeminal neuralgia is associated with multiple sclerosis in the young and tumours in the elderly.

Question: 15 of 70

Time taken: 48 mins 16 secs

8177

Which of the following may occur in the respiratory tract in rheumatoid arthritis:

True / False

○	●	tracheomalacia ✓Correct
●	○	bronchiolitis obliterans ✓Correct
●	○	cavitating mass lesions ✓Correct
●	○	bronchial hyper-reactivity ✓Correct
●	○	hilar lymphadenopathy ✓Correct

Pleuropulmonary complications in rheumatoid arthritis (RA), are more often seen in men than women. In RA there may be laryngeal nodules or cricoarytenoid arthritis which could cause upper airways obstruction. Tracheomalacia is a congenital abnormality. Bronchiolitis obliterans is a rare complication that leads to pulmonary hypertension. Pulmonary nodules may cavitate and cause a pneumothorax or broncho-pleural fistulae. Bronchial hyper-reactivity and hilar lymphadenopathy are not complications of RA. Other pulmonary complications that are recognised include pleural disease, pulmonary fibrosis, pulmonary nodules, pneumonitis and arteritis.

Question: 16 of 70

Time taken: 51 mins 18 secs

8174

The following is associated with finger clubbing:

True / False

○	●	Chronic obstructive airways disease ✓Correct
○	●	Aspergillosis ✓Correct
●	○	Pigeon fancier's lung ✓Correct
○	●	Isocyanate induced (occupational) asthma ✓Correct
●	○	Left atrial myxoma ✓Correct

Causes of clubbing include: pulmonary fibrosis (pigeon fancier's lung), Cystic fibrosis/bronchiectasis, Carcinoma of the lung and mesothelioma. Cardiac causes include Congenital cyanotic heart disease, atrial myxoma and infective endocarditis. GI causes include inflammatory bowel disease, lymphoma and cirrhosis.

Question: 17 of 70

Time taken: 1 hrs 48 mins 45 secs

8173

In a patient with left sided tension pneumothorax:

True / False

○	●	The trachea is pushed towards the left ✓Correct
○	●	Neck veins are usually collapsed ✓Correct
○	●	An urgent chest X-ray is mandatory ✓Correct
○	●	Needle thoraco-centesis should not be performed if the 2nd intercostal space in the mid-clavicular line cannot be accurately identified ✓Correct
○	●	The insertion of a chest drain is only indicated if there is an associated rib fracture ✓Correct

Tension pneumothorax is a clinical diagnosis and a life-threatening emergency. The chest is hyperexpanded, hyperresonant, neck veins are distended (due to obstruction of venous return to the superior vena cava), the trachea is pushed towards the opposite side, and breath sounds are reduced. Though the 2nd intercostal space in the mid-clavicular line is the preferred site, a needle (cannula) could be inserted through any intercostal space on the affected side, since it is essential to relieve the pressure as soon as possible. This should be followed by formal chest drain insertion and connected to an underwater seal (in all patients) and forms an integral part of the resuscitation.

Question: 18 of 70

Time taken: 1 hrs 49 mins 56 secs

8166

Features of a prolactinoma include:

True / False

●	○	Amenorrhoea ✓Correct
●	○	Bitemporal hemianopia ✓Correct
○	●	Hirsutism ✓Correct
●	○	Reduced bone mineral density ✓Correct
●	○	Thyroid stimulating hormone (TSH) deficiency ✓Correct

A prolactinoma may present with amenorrhoea, bitemporal hemianopia due to chiasmal compression, reduced bone mineral density (BMD) associated with long standing hypo-oestrogenism and hypopituitarism. Hirsutism is not a feature.

Question: 19 of 70

Time taken: 1 hrs 51 mins 53 secs

8114

Psychiatric symptoms are associated with:

True / False

●	○	Hypothyroidism ✓Correct
●	○	Vitamin B12 deficiency ✓Correct
●	○	Bronchial carcinoma ✓Correct
●	○	Cushing's disease ✓Correct
●	○	Acute intermittent porphyria ✓Correct

Hypothyroidism is associated with depression and so called myxoedema madness. Hyperthyroidism is itself associated with agitation and psychosis in the extreme. Vitamin B12 deficiency may be associated with a dementia. Cushing's disease is associated with depression and psychosis. Acute intermittent porphyria may present with neuro-psychiatric symptoms together with acute abdominal pain. Bronchial carcinoma may be associated with depression which may be reactive, but it is also associated with cerebral atrophy and reduced cognition.

Question: 20 of 70

Time taken: 1 hrs 52 mins 54 secs

8098

Features of primary hyperaldosteronism or Conn's syndrome include:

True / False

●	○	muscle weakness ✓Correct
●	○	hypertension ✓Correct
○	●	high blood renin levels ✓Correct
○	●	acidosis ✓Correct
○	●	hyperkalaemia ✓Correct

In primary hyperaldosteronism or Conn's syndrome there is a hypokalaemic alkalosis, low renin hypertension. It is most commonly due to an adrenal adenoma but bilateral adrenal hyperplasia may also be a cause. Muscle weakness and tetany (associated with the alkalosis) may be a feature. The condition is diagnosed on the basis of an elevated renin:aldosterone ratio.

Question: 21 of 70

Time taken: 1 hrs 54 mins 31 secs

8079

The diagnosis of Fallot's tetralogy is supported by:

True / False

○	◉	Cyanosis present at birth. ✓Correct
○	◉	Left ventricular hypertrophy on the electrocardiogram. ✓Correct
◉	○	Episodes of squatting. ✓Correct
○	◉	Pulmonary plethora on the chest x-ray. ←This is the correct answer
○	◉	A murmur loudest at the lower left sternal edge. ✓Correct

Cyanosis usually presents at 3-6 months of age. The ECG should show right ventricular hypertrophy in this condition. Squatting increases the systemic vascular resistance and reduces the shunting of blood to the systemic side, and is a characteristic clinical sign in Fallot's tetralogy. The lung fields are typically oligaemic (not plethoric) and the systolic ejection murmur of pulmonary stenosis would be at the upper rather than lower left sternal edge.

Question: 22 of 70

Time taken: 1 hrs 57 mins 50 secs

8061

Recognised features of pulmonary embolism (PE) include:

True / False

○	◉	long PR interval on the electrocardiogram ✓Correct
◉	○	decreased left atrial pressure ✓Correct
◉	○	pulmonary hypertension ✓Correct
◉	○	collapse of the affected lung segments ✓Correct
◉	○	necrosis of lung tissue ✓Correct

The electrocardiogram features of pulmonary embolism include: a change in electrical axis characterised by an S wave in lead I and a Q wave and T wave inversion in lead III (S1 Q3 T3), sinus tachycardia, T wave inversion in leads V1 - V3, and small QRS complexes. Left atrial pressure may decrease if the PE is massive. Pulmonary hypertension and right heart failure may be the presenting features of multiple pulmonary emboli. There may be collapse of the affected lung segments and necrosis of the infarcted lung parenchyma.

Question: 23 of 70

Time taken: 2 hrs 2 mins 20 secs

8056

Crackles in the lung bases are characteristic of:

True / False

●	○	rheumatoid fibrosing alveolitis ✓Correct
●	○	sarcoidosis ✓Correct
●	○	coal workers' pneumoconiosis ✓Correct
●	○	asbestosis ✓Correct
○	●	pneumocystis pneumonia ✓Correct

Crackles are caused by the snapping open of small airways. Early inspiratory crackles come from larger airways and may be due to COPD, airway secretions (that clear with coughing) and bronchiectasis. Late inspiratory crackles are caused by smaller airways and may be due to any cause of pulmonary fibrosis (organic and inorganic dusts, connective tissue disease, sarcoidosis, etc.) and pulmonary oedema. Pneumocystis pneumonia usually has very few signs clinically (except cyanosis and breathlessness). Lobar pneumonia on the other hand does cause crackles, bronchial breathing, reduced breath sounds and percussion note with increased vocal resonance.

Question: 24 of 70

Time taken: 2 hrs 3 mins 45 secs

8047

Bronchiectasis may be associated with:

True / False

●	○	Cystic fibrosis. ✓Correct
○	●	Aortic coarctation. ✓Correct
●	○	Tuberculosis. ✓Correct
●	○	Whooping cough. ✓Correct
●	○	Achalasia of cardia. ✓Correct

Bronchiectasis is a permanent abnormal bronchial suppurative dilatation. It may follow pneumonia, bronchial obstruction and chronic chest infections, e.g. cystic fibrosis. Aspiration of gastric contents may cause inflammatory pneumonitis with intrabronchial damage which impairs clearance. Coarctation of the aorta is not usually associated with bronchiectasis.

Question: 25 of 70

Time taken: 2 hrs 6 mins 49 secs

8033

Giant 'a' waves are seen in the jugular venous pressure in:

True / False

●	○	pulmonary hypertension ✓Correct
○	●	aortic regurgitation ✓Correct
○	●	thyrotoxicosis ✓Correct
○	●	constrictive pericarditis ✓Correct
●	○	tricuspid stenosis ✓Correct

Giant 'a' waves occur in the jugular venous pressure (JVP) in pulmonary hypertension and tricuspid stenosis, when there is a poorly compliant right ventricle, which increases the impedence against which the right atrium

has to eject blood. In constrictive pericarditis the JVP is high with an abrupt fall in systole (x descent) and may rise with inspiration (Kussmaul's sign). Giant 'a' waves are not seen in aortic regurgitation or thyrotoxicosis.

Question: 26 of 70

Time taken: 2 hrs 7 mins 6 secs

8030

The following nerves may be damaged by incorrect intra-operative positioning of the patient:

True / False

●	○	optic nerve ✓Correct
●	○	ulnar nerve ✓Correct
●	○	radial nerve ✓Correct
●	○	saphenous nerve ✓Correct
●	○	common peroneal nerve ✓Correct

All of the above nerves and many more can be damaged during the peri-operative period. The length of time spent in an abnormal position will increase the likelihood of problems and possible litigation. The eyes and optic nerves are at risk from direct pressure from surgical instruments, elbows resting over the face and when in the prone position. The brachial plexus and its terminal braches are at risk from stretching or external pressure particularly in the lateral position. The lithotomy position can damage not only the saphenous and common peroneal nerves (pressure from the poles) but also the femoral and obturator nerves. Neuronal injury is usually temporary and function is returns with time, but occasionally damage is permanent.

Question: 27 of 70

Time taken: 2 hrs 9 mins 4 secs

8027

In the management of acute pain:

True / False

●	○	the dose of intravenous morphine is 10mg ✗Incorrect answer selected
●	○	the half life of naloxone is shorter than the half life of morphine ✓Correct
○	●	entonox contains 50% oxygen and 50% nitric oxide ✓Correct
○	●	codeine should not be given intravenously ✗Incorrect answer selected
○	●	ketamine causes a dry mouth ✓Correct

Intravenous morphine is the gold standard opiate analgesic, against which the potency of other drugs is compared. The dose of intravenous morphine is 0.1 – 0.2 mg/Kg. It is an agonist at the various opioids receptors and its actions are antagonised by naloxone (especially pain and respiratory depression). However, the half-life of naloxone is shorter than the half-life of the metabolites of morphine and this should be remembered when treating an opioids overdose. Entonox is a gaseous mixture of oxygen and nitrous oxide (not nitric) in equal proportions (50:50). It provides moderate analgesia but the effects are short lived and its use is contraindicated in patients with pulmonary disease. Codeine is unlicensed for intravenous use and

should only be given intramuscularly, orally or rectally. Ketamine increases salivation and pre-treatment with an anti-sialogogue such as glycopyrrolate is useful.

Question: 28 of 70

Time taken: 2 hrs 10 mins 34 secs

8014

Local Anaesthetics:

True / False

○	●	The metabolism of amides is independent of liver function and blood flow ✓Correct
●	○	Have a membrane stabilizing effect ✓Correct
○	●	Are weak acids ✓Correct
●	○	Metabolism of ester local anaesthetics is reduced in pregnancy ✓Correct
○	●	Have an increased effect in infected tissues ✓Correct

Local anaesthetics are poorly water soluble weak bases (not acids), that have pH values somewhat above physiologic pH and produce a reversible block of conduction along nerves. They enter the nerve in lipid soluble form and once in the nerve the ionized form binds to and blocks the sodium channels from within. Thus sodium entry during depolarization is prevented, which results in failure to reach the threshold potential and failure of propagation of the action potential (membrane stabilizing effect). Esters are metabolised by plasma and liver cholinersterases, and the level of these enzymes is low in pregnancy and liver disease. Amides are metabolised by liver microsomal enzymes, which is dependent on liver function and blood flow (not independent). The pH in infected tissues is lower than normal, so the effects of local anaesthetics is reduced (not increased).

Question: 29 of 70

Time taken: 2 hrs 13 mins

7989

Hyponatraemia may occur in:

True / False

●	○	acute renal failure ✓Correct
●	○	hypothyroidism ✓Correct
○	●	primary hyperaldosteronism ✓Correct
○	●	squamous cell carcinoma of the bronchus ✓Correct
●	○	prolonged oxytocin infusions ✓Correct

Hyponatraemia is a plasma sodium under 135 mmol/l and usually but not always, results in a hypo-osmolar plasma. It occurs in: acute renal failure due to volume overload; hypothyroidism; and following prolonged infusions with oxytocin, which has mild antidiuretic hormone (ADH) activity. Water intoxication and hyponatraemia may cause problems during labour especially if prolonged infusion has been given in addition to intravenous fluids. In primary hyperaldosteronism there is a normal or increased sodium concentration. Squamous cell carcinoma of the bronchus is not associated with hyponatraemia.

Question: 30 of 70

Time taken: 2 hrs 15 mins 35 secs

7980

Glucocorticoid therapy causes:

True / False

●	○	hypokalaemia ✓Correct
●	○	lymphopenia ✓Correct
●	○	hypertrichosis ✓Correct
●	○	amenorrhoea ✓Correct
●	○	aseptic necrosis of the femoral head ✓Correct

Glucocorticoids and steroids, may cause iatrogenic cushing's, with thin skin, easy bruising, glucose intolerance and diabetes, hypertension, hypokalaemia, hirsutism, osteoporosis and it may result in hypogonadotrophic hypogonadism (hence amenorrhoea). Glucocorticoid therapy may also be associated with aseptic necrosis of the femoral head.

Question: 31 of 70

Time taken: 2 hrs 19 mins 16 secs

7979

Coarctation of the aorta is:

True / False

●	○	usually congenital but may be aquired ✓Correct
●	○	recognised by absent or delayed femoral pulses ✓Correct
●	○	is a common cause of heart failure in infancy but is an uncommon cause of hypertension in adults ✓Correct
●	○	associated with an increased incidence of an aortic bicuspid valve ✓Correct
○	●	a cause of left to right shunting of blood ✓Correct

Coarctation of the aorta is usually congenital (bicuspid aortic valve) but may be aquired. It is a common cause of heart failure in infancy but is not a common cause of hypertension in adults. Clinical presentations may vary but delayed or absent femoral pulses are a useful feature. Coarctation of the aorta is a cause of left to right shunting of blood with a patent ductus arteriosus, but not otherwise.

Question: 32 of 70

Time taken: 2 hrs 23 mins 10 secs

7971

Regarding patent ductus arteriosus:

True / False

●	○	Functional closure occurs within the first 24 hours in the normal term infant. ✓Correct
●	○	Pulmonary atresia is a duct-dependent malformation. ✓Correct
○	●	It is possible to keep the ductus open using indomethacin. ✓Correct
○	●	Its incidence is lower in preterm babies. ✓Correct

○	●	Its incidence is lower in children living at high altitude. ✓Correct

The physiological function of the ductus arteriosus in the foetus is to divert blood away from lungs to the placenta. Constriction and functional closure occurs in the first 24 hours of life in response to increased environmental oxygen. In order to maintain life some cardiac malformations, e.g. pulmonary atresia, hypoplastic left ventricle and interrupted aortic arch, these patients require patency of the duct after birth. Indomethacin causes duct closure (not patency) through an anti-prostaglandin effect. An infusion of alprostadil is used to maintain duct patency. Incidence of PDA is greater in preterm infants and births at high altitude is associated with a greater risk.

Question: 33 of 70

Time taken: 2 hrs 24 mins 27 secs

7969

In bullous emphysema:

True / False

●	○	whole body plethysmography is superior for lung volume analysis than helium diffusion ✓Correct
○	●	compliance is reduced ✓Correct
○	●	FEV1/FVC is increased ✓Correct
●	○	TLCO is decreased ✓Correct
●	○	KCO is decreased ✓Correct

In bullous emphysema the air spaces are > 1 cm in diameter. If the bullae are not significantly ventilated then lung mechanics and carbon monoxide transfer reflect properties of non-bullous lung. The characteristic abnormality in bullous emphysema is a large difference between lung volumes measured by body plethysmography / radionucleotide techniques and helium equilibrium. Static lung compliance is increased (not reduced), and the ratio of FEV1/FVC is increased in restrictive defects but is decreased in obstructive defects. TLCO is decreased and KCO (which is TLCO / alveolar volume) is also reduced.

Question: 34 of 70

Time taken: 2 hrs 26 mins 7 secs

7964

Pulmonary hypertension is a recognised complication of

True / False

●	○	thromboembolic disease ✓Correct
○	●	polycythaemia rubra vera ✓Correct
●	○	life at high altitude ✓Correct
●	○	chronic alveolar hypoventilation ✓Correct
●	○	patent ductus arteriosus ✓Correct

Pulmonary hypertension is a recognised complication of: thromboembolic disease; life at high altitude; chronic alveolar hypoventilation; and patent ductus arteriosus. Polycythaemia rubra vera causes systemic hypertension not pulmonary hypertension.

Question: 35 of 70

Time taken: 2 hrs 27 mins 30 secs

7963

Ventilatory failure with elevated arterial PCO2 is a recognised feature of:

True / False

●	○	extreme obesity ✓Correct
●	○	progressive systemic sclerosis ✓Correct
○	●	asbestosis ✓Correct
●	○	severe kyphoscoliosis ✓Correct
○	●	sarcoidosis ✓Correct

Type 2 respiratory failure occurs with COPD, chest wall deformities (kyphoscoliosis), respiratory muscle weakness (Gullain-Barre syndrome), morbid obesity, and respiratory depression. It can be a late feature of systemic sclerosis though this is initially type 1. Type 1 respiratory failure is caused by oxygenation failure, e.g. in pulmonary fibrosis.

Question: 36 of 70

Time taken: 2 hrs 29 mins 22 secs

7962

In acute pulmonary embolism:

True / False

○	●	heparin is an effective thrombolytic therapy ✓Correct
○	●	a normal ECG excludes the diagnosis ✓Correct
●	○	thrombolysis administered through a peripheral vein is as effective as through a pulmonary artery catheter ✓Correct
○	●	the presence of hypoxaemia is an indication for thrombolysis ✓Correct
○	●	embolectomy is more effective than thrombolysis in improving survival ✓Correct

Embolectomies are rarely done nowadays due to the excellent results with thrombolysis. Thrombolytic therapy is reserved for those with severely compromised circulation rather than hypoxaemia. It is equally effective when administered through either a peripheral vein or a pulmonary artery catheter. Heparin reduces risk of further embolism (anticoagulant not a thrombolytic) and reduces pulmonary vasoconstriction. A normal ECG does not exclude the diagnosis.

Question: 37 of 70

Time taken: 2 hrs 30 mins 42 secs

7960

Features of carcinoma of the lung include:

True / False

●	○	Facial swelling ✓Correct
●	○	Raynaud's syndrome ✓Correct
●	○	Hoarseness ✓Correct
●	○	Pericardial effusion ✓Correct
●	○	Horner's syndrome ✓Correct

Lung cancer may be associated with facial swelling through superior vena cava (SVC) obstruction or ectopic Cushing's syndrome. Hoarseness with involvement of the recurrent laryngeal may occur with tumour infiltration or lymph metastases. Horner's syndrome is well recognised though less well appreciated is the development of Raynaud's phenomenon due to a paraneoplastic phenomenon. A pericardial effusion may occur due to infiltration.

Question: 38 of 70

Time taken: 2 hrs 31 mins 50 secs

7956

Total lung capacity:

True / False

●	○	is a specific measure of lung size. ✓Correct
○	●	depends on the thickness of the alveolar wall. ✓Correct
●	○	is reduced in severe cerebral palsy. ✓Correct
○	●	is increased in infants with cystic fibrosis. ✓Correct
●	○	can be measured by the helium dilution technique. ✓Correct

Total lung capacity equals the vital capacity plus the residual volume and is a specific measure of lung size. It is, therefore decreased in most lung abnormalities but does not depend on the thickness of the alveolar wall. In cystic fibrosis there are areas of overinflation, but also areas of atelectasis, so the overall lung volume is reduced (not increased). It is reduced in severe cerebral palsy. In the helium dilution technique, the change in concentration of a known volume of helium is used to estimate the total lung capacity following equilibration.

Question: 39 of 70

Time taken: 2 hrs 32 mins 44 secs

7950

Causes of alkalosis include:

True / False

○	●	Cardiogenic shock ✓Correct
●	○	Acute anxiety ✓Correct
●	○	Pyloric stenosis ✓Correct
●	○	Loop diuretic treatment ✓Correct
●	○	Primary hyperaldosteronism ✓Correct

Anxiety is associated with hyperventilation and a respiratory alkalosis. Pyloric stenosis is associated with vomiting and acid losses thus a metabolic alkalosis. Diuretics and primary hyperaldosteronism are also associated with metabolic alkalosis. Cardiogenic shock would be associated with a metabolic and respiratory acidosis (not alkalosis).

Question: 40 of 70

Time taken: 2 hrs 33 mins 57 secs

7949

Regarding the sweat test:

True / False

○	◉	Sweating is enhanced by application of atropine. ✓Correct
○	◉	The filter paper is left on for a total of about 4 hours. ✓Correct
○	◉	At least 25 mg of sweat is necessary for a reliable result. ✓Correct
◉	○	More than 60 mmol per litre of chloride in sweat is diagnostic of cystic fibrosis. ✓Correct
○	◉	False/positive results may be encountered in nephrotic syndrome. ✓Correct

The sweat test is conducted using pilocarpine iontophoresis (not atropine). A 3 mA current carries pilocarpine into the skin of the forearm stimulating local sweating. The arm is washed with distilled water and sweat collected on filter paper or gauze. The duration of collection is usually 30-60 minutes (not 4 hours). The filter paper is removed, weighed and eluted in distilled water. At least 50mg and preferably 100mg of sweat should be collected for reliable results (not 25 mg). It may not be possible to collect this amount in young infants. More than 60 mmol/l of chloride is diagnostic of cystic fibrosis (CF) when one or more other criteria are present. In healthy adults, the sweat chloride values increase slightly, but 60 mmol/l still differentiates CF from other conditions. False/negative results may be encountered in nephrotic syndromes (not False/Positives).

Question: 41 of 70

Time taken: 2 hrs 36 mins 57 secs

7945

The following lung function tests results are compatible with severe scoliosis:

True / False

◉	○	An FEV1 of 65% of normal ✓Correct
○	◉	An FEV1/2 of 65% of normal. ✓Correct
○	◉	A total lung capacity of 95% of normal. ✓Correct
◉	○	Tidal volume of 105% of normal ✓Correct
◉	○	Peak flow of 50% of normal. ✓Correct

Restrictive lung disease occurs when the lungs or the structures that surround them (pleura, rib cage or abdomen) limit the expansion of the lungs in a volume dependent fashion. These include: interstitial abnormalities (pulmonary oedema, inflammation), collapse or consolidation of alveoli, or external compression of the lungs (ascites, pneumothorax). As a consequences there is: increased muscular effort to maintain tidal volume; alveolar volume decreases, so there is decreased functional residual capacity; arterial PO2 decreases, and there is arterial hypoxaemia causing increased respiratory drive. Because there is no obstructive defect, the slope of the forced expiratory curve is initially normal, until limited by the restrictive nature of the defect. The FEV1 may, therefore, be reduced, but the FEV1/2 is unlikely to be significantly down (not 65% of normal). Total lung capacity is usually severely reduced (not 95% of normal). Tidal volume may be normal, but there will be decreased respiratory reserve. Peak flow is usually reduced.

Question: 42 of 70

Time taken: 2 hrs 38 mins 47 secs

7940

Which of the following is associated with pulmonary hypertension:

True / False

○	◉	coarctation of the aorta ✓Correct
○	◉	pulmonary stenosis ✓Correct

●	○	patent ductus arteriosus ✓Correct
●	○	kyphoscoliosis ✓Correct
●	○	schistosomiasis ✓Correct

Coarctation does not typically cause pulmonary hypertension however, by causing systemic hypertension pulmonary hypertension may occur as a late feature. Pulmonary stenosis causes a low pulmonary pressure not pulmonary hypertension. Patent ductus arteriosus (PDA) is typically associated with excess pulmonary volume overload and hypertension if not corrected. Kyphoscoliosis and schistosomiasis are rare causes of pulmonary hypertension. Other causes include congenital heart disease (VSD, ASD), COPD, recurrent pulmonary emboli and collagen diseases.

Question: 43 of 70

7935

The following are associated with sleep apnoea:

True / False

○	●	Anorexia nervosa ✓Correct
●	○	Large uninflammed tonsils ✓Correct
●	○	Guillain-Barre Syndrome ✓Correct
●	○	Ondine's Curse ✓Correct
○	●	Diencephalic Syndrome ✓Correct

Several medical conditions are major risk factors for the more common form of sleep apnoea, obstructive sleep apnoea (OSA). Anatomical factors include: Adenotonsillar hypertrophy, micrognathia, retrognathia, macroglossia, morbid obesity, congenitally narrow nasopharynx, swollen nasal turbulence, co-nasal stenosis. Diminished ventilatory responses to hypoxaemia and hypercapnia are seen in association with diminished arousal responses. Ondine's curse is due to reduced respiratory drive and is an example of central sleep apnoea. Guillain-Barre Syndrome can occasionally cause bulbar palsy, which is associated with upper airway obstruction. Diencephalic syndrome and anorexia nervosa are not associated with OSA.

Question: 44 of 70

Time taken: 2 hrs 41 mins 46 secs

7907

The shape of a frequency distribution can be described by using:

True / False

●	○	a stem and leaf plot ✓Correct
○	●	a correlation coefficient ✓Correct
●	○	a table of frequencies ✓Correct
●	○	a histogram ✓Correct
○	●	a median ✓Correct

This is a typical statistics question. The frequency of distribution can be described by: stem and leaf plots; histograms; table of frequencies; and positive and negative skews (not medians and correlation coefficients).

Question: 46 of 70

Time taken: 2 hrs 43 mins 57 secs

7905

In statistics:

True / False

◉	○	A type I error is to reject the null hypothesis when it should be accepted ✓Correct
○	◉	a type II error is to reject the null hypothesis when it should be accepted ✓Correct
◉	○	the null hypothesis is rejected if a significant difference is found ✓Correct
○	◉	a type I error is to accept the null hypothesis when it should be rejected ✓Correct
◉	○	the power of a study is the probability of rejecting the null hypothesis when it is false ✓Correct

A type I error is to reject the null hypothesis when it should be accepted. A type II error is to accept the null hypothesis when it should be rejected (when a genuine difference exists). The null hypothesis is rejected if a significant difference is found. The power of a study is the probability of rejecting the null hypothesis when it is false, i.e. the probability of concluding a result is statistically significant.

Question: 47 of 70

Time taken: 2 hrs 44 mins 43 secs

7898

In chronic renal failure:

True / False

◉	○	a correlation exists between falling glomerular filtration rate and rising parathyroid activity ✓Correct
○	◉	there are low levels of 25-hydroxycholecalciferol ✓Correct
○	◉	blood urea levels are low ✓Correct
◉	○	red cell survival is reduced ✓Correct
○	◉	the incidence of gout is increased ✓Correct

In chronic renal failure (CRF) secondary and tertiary hyperparathyroidism occur, thus there is a correlation between falling glomerular filtration rate and rising parathyroid activity. In CRF there is failure to hydroxylate 25-hydroxycholecalciferol to 1,25-dihydroxycholecalciferol. The 25-hydroxylation of Vitamin D occurs in the liver and 1,25-hydroxylation occurs in the kidney. Chronic renal failure has a high urea level and ureamia may cause coma, convulsions, flapping tremor, myoclonus, and pericarditis, etc. Red cell survival is reduced, and red cell production is low due to reduced erythropoietin production in the kidney. Gout is suprisingly rare despite the presence of hyperuricaemia.

Question: 48 of 70

Time taken: 2 hrs 46 mins 9 secs

7897

Pulsus paradoxus may occur with:

True / False

◉	○	a severe asthmatic attack ✓Correct
○	◉	severe left ventricular failure ✓Correct

●	○	myocardial disease ✓Correct
●	○	constrictive pericarditis ✓Correct
●	○	cardiac amyloidosis ✓Correct

Pulsus paradoxus is the exaggerated fall of pressure associated with inspiration due to disease process like asthma, constrictive pericarditis, cardiac tamponade and left ventricular disease (cardiomyopathy or amyloidosis). It is not a feature of left ventricular failure.

Question: 49 of 70

Time taken: 2 hrs 47 mins 19 secs

7889

In immunology:

True / False

●	○	All of the IgG subclasses can cross the placenta ✓Correct
○	●	Leukotrienes are products of the cyclo-oxygenase pathway ✓Correct
○	●	Degranulation of mast cells is caused by crosslinking of IgM by antigen ✓Correct
●	○	Mast cells are found in the respiratory mucosa ✓Correct
●	○	Hereditary angio-oedema is due to deficiency of C1 esterase inhibitor ✓Correct

All four sub-classes of IgG are able to cross the normal placenta. Leukotrienes are products of the 5-lipoxygenase pathway. Prostaglandins are the products of the cyclo-oxygenase pathway, which is the other arm of arachadonic acid metabolism. Degranulation of mast cells is caused by crosslinking of IgE (not IgM). Mast cells are the tissue equivalent of basophils and are found in the lungs, skin and gastrointestinal tract. They are the principal mediators of immediate hypersensitivity reactions. Hereditary angio-oedema is an autosomal dominant condition associated with a quantitative or qualitative deficiency of C1 esterase inhibitor.

Question: 50 of 70

Time taken: 2 hrs 49 mins 5 secs

7887

Diabetes insipidus:

True / False

○	●	is associated with hyponatraemia ✓Correct
●	○	deteriorates in pregnancy ✓Correct
○	●	is characterised by a high urine osmolality and low plasma osmolality ✓Correct
○	●	in most cases is due to renal disease ✓Correct
○	●	can be excluded by normal ADH levels ✓Correct

In diabetes insipidus there is polyuria and polydipsia associated with reduced vasopressin activity, either cranial because pituitary secretion is reduced (most common cause) or nephrogenic because the kidneys are unresponsive. Patients are frequently dehydrated and hypernatraemic (not hyponatraemic). In a normal pregnancy the placenta produces vasopressinase, which inactivates vasopressin, and increases the polyuria and polydipsia. It is characterised by a low urine osmolality and high plasma osmolality. Normal ADH levels suggest nephrogenic diabetes insipidus.

Question: 51 of 70

Time taken: 2 hrs 50 mins 9 secs

7881

Dissecting aortic aneurysms are associated with:

True / False

○	●	Syphilitic aortitis ✓Correct
●	○	Coarctation of the aorta ✓Correct
●	○	Hypertension ✓Correct
●	○	Marfan's syndrome ✓Correct
○	●	Homocystinuria ✓Correct

Dissecting thoracic aortic aneurysms are associated with: aortic coarctation, hypertension, marfan's syndrome, and atherosclerosis. Syphilitic aortitis and homocystinuria are not associated with aortic dissection.

Question: 52 of 70

Time taken: 2 hrs 51 mins 58 secs

7872

In paediatric shock:

True / False

○	●	hypotension is an early sign of hypovolaemia ✓Correct
●	○	the initial crystalloid bolus is 20 ml/kg ✓Correct
○	●	a normal capillary refill time is less than one second ✓Correct
○	●	the colloid of choice is 4.5% albumin ✓Correct
○	●	hyperglycaemia is a common finding ✓Correct

Children’s cardiovascular systems compensate well initially in shock. Hypotension is a late and often sudden sign of decompensation and if not reversed will be rapidly followed by death. A formula for calculating normal systolic blood pressure is 80 + (2 X Age in years). Capillary refill time is a more useful test of perfusion in children than blood pressure measurement. The skin on the sternum or a digit held at the level of the heart should be pressed for 5 seconds. After blanching pressure has been released the time for the colour to return to normal is measured. A normal capillary refill time is less than two seconds. Hypoglycaemia and shock may coexist as the sick child or infant has poor glucose producing reserves. Urgent blood glucose estimation must always be performed to exclude this common condition. Fluid resuscitation in paediatric shock is based on crystalloid blouses of 20 ml / kg, which can be repeated up to three times. Blood is the colloid of choice although 4.5% albumin may have a role in seticaemia.

Question: 53 of 70

Time taken: 2 hrs 52 mins 36 secs

7871

Lactic acidosis occurs in:

True / False

●	○	myocardial infarction ✓Correct

●	○	acute ethanol poisoning ✓Correct
○	●	chlorpropamide treatment ✓Correct
●	○	type I glycogenosis (von Gierke's disease) ✓Correct
●	○	chronic renal failure ✓Correct

Lactic acidosis is a metabolic acidosis with a raised plasma lactate above 5 - 7 mmol/l, and may be either type A or type B. Type A occurs in association with overt tissue hypoxia such as severe anaemia, shock, haemorrhage, hypotension, infections, cardiac/hepatic/renal failure. Type B occurs in those without apparent initial hypoxia and may be drug induced, e.g. biguanide therapy, ethanol/methanol, salycilates, and TPN. Metformin rather than chlorpropamide is associated with lactic acidosis.

Question: 54 of 70

Time taken: 2 hrs 53 mins 6 secs

7870

Tetany are associated with:

True / False

○	●	osteoporosis ✓Correct
●	○	thyroid surgery ✓Correct
○	●	respiratory acidosis ✓Correct
●	○	hyperventilation ✓Correct
○	●	untreated hyperparathyroidism ✓Correct

Tetany occurs in association with low plasma calcium or magnesium concentrations. Thyroid surgery may produce iatrogenic hypoparathyroidism due to the removal of parathyroid tissue. A respiratory alkalosis (not acidosis) would cause a low ionised calcium, and may occur following hyperventilation. Patients with untreated hyperparathyroidism become hypercalcaemic (not hypocalcaemic). Osetomalacia is associated with tetany (not osteoporosis).

Question: 55 of 70

Time taken: 2 hrs 53 mins 58 secs

7866

In severe bullous emphysema:

True / False

○	●	Helium dilution is more accurate than body plethysmography in measuring residual volume. ✓Correct
○	●	Hypoxaemia at rest improves with exercise. ✓Correct
○	●	Pulmonary compliance is reduced. ✓Correct
○	●	Reduced elastic recoil opposes airway collapse in expiration. ✓Correct
○	●	The carbon monoxide transfer factor is likely to be normal. ✓Correct

Whole body plethysmography also measures trapped gas, i.e. intrathoracic gas within bullae and other poorly ventilated areas, which barely communicates with the airway. Standard gas-dilution (e.g. helium) only measures gas that communicates with the airway, and mixing during helium dilution is more difficult in airway obstruction requiring multibreath methods that last 5 minutes rather than a single breath test. Exertion will

exacerbate breathlessness and hypoxia (not improves). The characteristic changes of severe emphysema are an increase in static compliance and a reduction in lung recoil pressure. Loss of lung recoil causes a reduction of alveolar pressure (elastic recoil pressure of lung and pleural pressure) leading to collapse of peripheral airways on exhalation. Emphysematous patients purse their lips in expiration to increase airway pressure to prevent this collapse. Carbon monoxide transfer factor is reduced (not normal).

Question: 65 of 70

Time taken: 3 hrs 15 mins 56 secs

7807

A 65-year-old male had an uncomplicated elective repair of an abdominal aortic aneurysm 2 days previously. He has a low dose epidural infusion for analgesia, but complains that he feels paralysed below his waist. The following statements is/are true:

True / False

○	●	the epidural needle probably caused direct spinal cord damage ✓Correct
○	●	his symptoms can be explained by the presence of local anaesthetic in the epidural space ✓Correct
●	○	an epidural haematoma rarely occurs with normal coagulation ✓Correct
○	●	he has anterior spinal artery syndrome ✓Correct
●	○	ischaemic damage to the spinal cord occurred during aortic cross clamping ✓Correct

The main differential diagnosis here is whether his symptoms are: related to the epidural or are a consequence of surgical cross clamping of the aorta. Low dose epidural infusions are weak concentrations of local anaesthetic agents delivered by a syringe pump. They are popular because they block sensory fibres but spare motor function, thus may not be totally responsible for his symptoms. Direct spinal cord injury from the epidural tuohy needle is rare. The risk can theoretically be further reduced, if the epidural technique is performed on awake patients using local anaesthesia. Epidural haematoma formation with spinal cord compression is extremely rare with normal coagulation. The presence of such a haematoma is unlikely to be masked by low dose local anaesthetic infusions in the epidural space. Permanent neurological damage may occur if surgical decompression is delayed. Epidurals can also be safely inserted into patients scheduled for anticoagulation, but are contraindicated in patients who are already anticoagulated. The spinal cord is supplied by an anterior spinal artery, two posterior spinal arteries and several radicular branches that feed the spinal arteries. The most important radicular branches are located at T1 and at the lower thoracic/upper lumbar levels. The latter is called the artery of Adamkiewicz. Cord ischaemia can occur, but anterior spinal artery syndrome usually only occurs with severe hypotension, and since surgery was uncomplicated this option is unlikely. The actual location where the artery of Adamkiewicz supplies the spinal arteries is not known. Therefore, aortic cross clamping exposes patients to the potential risk of distal spinal cord ischaemia even when the cross clamp time is short. Secondary damage to the cord can also occur during reperfusion.

Question: 66 of 70

Time taken: 3 hrs 16 mins 42 secs

7805

In significance testing:

True / False

○	●	A Type I error is to reject the alternative hypothesis when it should be accepted ✓Correct

○	◉	A Type II error is to accept the alternative hypothesis when it should be rejected ✓Correct
◉	○	the probability associated with a Type I error is the significance level ✓Correct
○	◉	the significance level is determined at the end of a significance test ✓Correct
○	◉	the significance level (p) is always set to 5% ✓Correct

The null hypothesis is that there is no differences between two groups. The alternative hypothesis is that there is a difference. Rejecting the null hypothesis when there really is no difference between the two groups is a Type 1 error. Accepting the null hypothesis (rejecting the alternative hypothesis) when there is a difference is a type 2 error. Rejection of the null hypothesis depends on the probability. The significance level is usually set at p <0.05.

Question: 67 of 70

Time taken: 3 hrs 19 mins 56 secs

7803

In a new drug trial the following results were obtained:- treatment group - 44 improved 16 not improved; placebo group - 36 improved 26 not improved.

True / False

○	◉	the results show a significant benefit of treatment that statistical analysis is unnecessary ✓Correct
◉	○	the data could be evaluated using the chi-squared test ✓Correct
○	◉	Pearson's coefficient of linear regression would be an appropriate significance test ✓Correct
○	◉	the numbers are too small to draw any conclusions ✓Correct
○	◉	a Student t-test could be used ✓Correct

No clinical drug trial is ever that obvious and statistical testing should be performed. The data would be ideal for evaluation using the chi-squared test. Pearson's coefficient of linear regression is inappropriate as there is no linear regression to plot. The Student t-test is aslo inappropriate as we are comparing proportions not means, and the numbers are not too small to draw any statistical conclusions.

Question: 68 of 70

Time taken: 3 hrs 25 mins 55 secs

7796

The phrenic nerve:

True / False

○	◉	receives nerve fibres from the second cervical nerve ✓Correct
○	◉	is purely a motor nerve ✓Correct
◉	○	desends vertically on the scalenus anterior muscles ✓Correct
○	◉	can be located at the lateral border of sternocleidomastoid ✓Correct
◉	○	may complicate a brachial plexus block ✓Correct

The phrenic nerve originates from the anterior primary rami of C3-5 (not C2) on each side and supplies motor innervation to the diaphragm. It also coveys sensory fibres from the diaphragm, pleura and pericardium (hence referred shoulder tip pain from diaphragmatic irritation). It descends vertically on the scalenus anterior muscles, and passes the root of the neck beneath the sternocleidomastoid muscle (not at its lateral border). The right phrenic nerve enters the thorax behind the subclavian / internal jugular venous junction, whereas the

left nerve enters the thorax between the subclavian artery and vein. Phrenic paralysis may complicate a brachial plexus block, which is indicated by a raised hemidiaphragm on the chest x-ray.

Question: 69 of 70

Time taken: 3 hrs 31 mins 47 secs

7791

Diabetic nephropathy:

True / False

●	○	is responsible for 25% of deaths in diabetic patients before the age of 30 years ✓Correct
●	○	end stage renal failure may follow 7 - 10 years after the appearence of proteinuria ✓Correct
○	●	microalbuminurea implies the excretion of low molecular weight albumin ✓Correct
○	●	can be reversed by tight control of blood sugar level ✓Correct
●	○	progression may be slowed or prevented by early agressive treatment of blood pressure ✓Correct

Death in young diabetics is commonly contributed to by end stage diabetic nephropathy. If proteinuria has developed then end stage renal failure (ESRF) may be expected within approximately 10 years, unless interventions are applied. Microalbuminuria is one of the earliest events in diabetic nephropathy and is defined as an albumin excretion of 30 -300 micrograms per day. It doesn't mean that the albumin is smaller! Diabetic nephropathy can be slowed (not reversed)with tight glycaemic control and hypertensive control in particular using angiotensin converting enzyme inhibitors (ACEi).

Question: 70 of 70

Time taken: 3 hrs 33 mins 25 secs

7788

Which of the following may cause pulmonary hypertension:

True / False

●	○	pulmonary emboli ✓Correct
○	●	pulmonary stenosis ✓Correct
●	○	patent ductus arteriosus (PDA) ✓Correct
●	○	kyphoscoliosis ✓Correct
●	○	schistosomiasis ✓Correct

Pulmonary hypertension may occur as a primary disorder or secondary to cardiac diseases such as PDA, VSD, ASD etc. It is also recognised with intrinsic lung diseases such as fibrosis and with structural abnormalities - kyphoscoliosis and schistosomiasis. Multiple pulmonary emboli may cause widespread pulmonary vascular obstruction and lead to pulmonary hypertension.

Review Question

20650

The following drugs when given intravenously decrease the intra-ocular pressure:

True / False

◉	○	Etomidate ✓Correct
○	◉	Ketamine ✓Correct
○	◉	Metoclopramide ✓Correct
◉	○	Thiopental ✓Correct
○	◉	Midazolam ✓Correct

Intro-ocular pressure (IOP) is normally 16 +/- 5 mm Hg and is determined by the equilibrium between the production and drainage of aqueous humour, intraocular blood volume (which is affected by central venous pressure) and scleral rigidity and capacity. Only thiopental and etomidate decrease IOP. Metoclopramide causes a transient increase in IOP lasting approximately 30 minutes. Ketamine increases the systemic blood pressure, choroidal blood volume and may cause contraction of the extra-ocular muscles. Midazolam has no effect on IOP.

Review Question

20644

Neostigmine:

True / False

◉	○	Causes bronchospasm ✓Correct
◉	○	Decreases cardiac output ✓Correct
○	◉	Easily crosses the blood brain barrier ✓Correct
○	◉	Causes mydriasis ✓Correct
◉	○	Causes skeletal muscle contraction ✓Correct

Neostigmine is a quaternary ammonium anticholinesterase compound, which via a direct action causes skeletal muscle contraction. It has no effect on Phase I block caused by suxamethonium, but it does transiently antagonise Phase II block. Bradycardia is the predominant effect on heart rate leading to a decrease in cardiac output. It causes bronchospasm and constriction of the pupillary sphincter muscle leading to miosis (not mydriasis). Neostigmine does not cross the blood brain barrier due to the quaternary ammonium group rendering it lipid insoluble.

Review Question

20643

Does the acute phase response include the following?

True / False

○	◉	Hepatic sequestration of copper ✓Correct
◉	○	Hyperthermia ✓Correct
◉	○	Increased C-reactive protein ✓Correct
○	◉	Increased plasma albumin ✓Correct
◉	○	Neutrophil leucocytosis ✓Correct

The acute phase response involves a complex series of reactions with changes in metabolic, immunological and haematological functions.
There is an alteration in the set point temperature of the hypothalamus which results in a febrile response.
Plasma albumin levels decrease, C-reactive protein increases and there is a neutrophil leucocytosis.
Copper is not sequestered by the liver and its levels actually increase, whereas iron and zinc concentrations decrease.

Review Question

20641

In acute spinal cord injury, are the following beneficial?

True / False

○	◉	Hyperglycaemia ✓Correct
○	◉	Induced hyperthermia ✓Correct
○	◉	Intraoperative hypercarbia ✓Correct
○	◉	Intraoperative hypotension ✓Correct
◉	○	Intravenous methylprednisolone ✓Correct

In acute spinal cord injury preserving perfusion and preventing ischaemic and secondary injury to the cord is of paramount importance.
In an attempt to achieve these aims the following should be ensured

- Avoid hypotension, which does reduce intraoperative bleeding but can exacerbate ischaemic damage
- Mild hypocarbia may help decompress the cord, which exhibits carbon dioxide reactivity
- Avoid hyperglycaemia as this can cause further damage to ischaemic cells
- Avoid hyperthermia as the damaged tissue has impaired thermoregulation and this may exacerbate secondary injury.

These factors are equally relevant during surgical procedures.

NASCIS trials (National Acute Spinal Cord Injury Study) showed improved long-term neurological recovery following high dose methylprednisolone.

Review Question

42942

May tourniquets be used in the following?

True / False

○	◉	Deep vein thrombosis ✓Correct
◉	○	Diabetes ✓Correct
◉	○	Elderly patients ✓Correct
○	◉	Limb infections ✓Correct
○	◉	Sickle cell disease ✓Correct

Tourniquets may be used in the elderly and in diabetics who do not have peripheral neuropathy.
They are contraindicated in patients with

- sickle cell disease
- any peripheral vascular disease (including deep vein thrombosis)
- limb infections.

Review Question

20654

In neonatal temperature regulation:

True / False

◉	○	An uncovered head can account for 60% of total heat loss ✓Correct
◉	○	Brown fat is a major source of thermogenesis ✓Correct
○	◉	The anterior hypothalamus responds to cold ✓Correct
○	◉	The posterior hypothalamus responds to heat ✓Correct
○	◉	Temperature receptors are more sensitive to gradual changes ✓Correct

Neonates have a large surface area in relation to body mass, low heat production and low tissue insulation all of which predispose to rapid heat loss. They are unable to shiver and produce heat by non-shivering thermogenesis, which involves the oxidation of triglycerides located in brown fat. Brown fat is located at the base of the neck, axillae, inter scapular region and in the mediastinum. An uncovered head can account for

60% of total heat loss. Temperature receptors are located in the skin, CNS and gastrointestinal system and they are more sensitive to rapid changes than to gradual ones. In both neonates and adults the anterior hypothalamus responds to heat and the posterior hypothalamus responds to cold.

Review Question

20652

In elderly patients:

True / False

●	○	Atrial fibrillation is the default rhythm ✓Correct
●	○	Postoperative convalescence is significantly longer than in a younger population ✓Correct
○	●	Preoxygenation is improved in the supine position ✓Correct
○	●	Shivering restores normothermia ✓Correct
○	●	Silent aspiration is an unusual event ✓Correct

Loss of pacemaker cells to approximately 10% of adolescent levels makes AF the default rhythm.
Postoperative convalescence may take as long as 12 months.
Preoxygenation is improved in the sitting position as closing capacity encroaches on tidal volume as the age increases.
A decreased muscle mass and metabolic capacity means that shivering is unable to restore normothermia.
Silent aspiration is common due to reduced cough reflexes and increased oesophageal reflux.

Review Question

20649

May intraoperative blood transfusions be reduced by the following?

True / False

○	●	A high proportion of hypochromatic erythrocytes ✓Correct
●	○	A high starting packed cell volume ✓Correct
●	○	A low central venous pressure ✓Correct
●	○	A low mean arterial pressure ✓Correct
●	○	An epidural block ✓Correct

Intraoperative blood transfusions may be reduced by maintaining a low mean arterial pressure and a low central venous pressure and through the use of an epidural.
A high packed cell volume has been shown to reduce transfusion requirements in orthopaedic surgery.

A high percentage of hypochromatic erythrocytes indicates functional iron deficiency with an increased likelihood of transfusion requirement.

Review Question

20646

The alveolar gas equation includes the following:

True / False

●	○	PI O_2 ✓Correct
○	●	PI CO_2 ✓Correct
○	●	Pa O_2 ✓Correct
○	●	Pa CO_2 ✓Correct
●	○	PA CO_2 ✓Correct

The shortened alveolar gas equation (AGE): PA O_2 = PI O_2 - PA CO_2 / R

It is derived using the assumption of steady state conditions. Consequently the AGE is only valid as long as the assumptions that were used to create it remain true.

Review Question

20642

Protein catabolism is reduced by:

True / False

●	○	Glutamine ✓Correct
●	○	Growth hormone ✓Correct
○	●	Cortisol ✓Correct
●	○	Insulin ✓Correct
●	○	Insulin-like growth factor-1 ✓Correct

Growth Hormone (GH) promotes protein synthesis and inhibits protein catabolism. GH also stimulates hepatic production of Insulin-like growth factor-1 which has the same effect on protein synthesis and catabolism. Insulin inhibits protein catabolism and lipolysis. The amino acid Glutamine is used to reduce catabolism in critically ill patients. Cortisol stimulates protein catabolism

Review Question

20639

Regarding acetylcholine receptors, which of the following is/are true?

True / False

○	◉	Are located in the pits of postjunctional folds ✓Correct
○	◉	Consist of 7 subunits ✓Correct
○	◉	In the fetus, an ε-subunit replaces the γ-subunit ✓Correct
○	◉	The diameter of the ion channel is 20 nm (at its entrance) ✓Correct
○	◉	Two of the subunits are known as sigma and beta ✓Correct

Acetylcholine receptors consist of five subunits (not seven) and are arranged in a pentameric structure around a central ion channel or ionophore.

The subunits are known as α, β, δ and ε (alpha, beta, delta and epsilon) and all receptors contain two α-subunits and one δ, β andε unit. There is no Ω subunit. In the fetus, γ (gamma) replacesε.

They are found in high concentrations on the crests of the postjunctional folds (not pits).

The entrance of ionophore is 4 nm in diameter (not 20 nm).

Review Question

20636

Triple-H therapy includes:

True / False

○	◉	Hypothermia ✓Correct
◉	○	Hypertension ✓Correct
◉	○	Hypervolaemia ✓Correct

●	○	Haemodilution ✓Correct
○	●	Hypocapnia ✓Correct

Triple-H therapy provides an effective regimen to limit and treat ischaemic neurological deficits caused by cerebral vasospasm following subarachnoid haemorrhage. It includes hypertension, hypervolaemia and haemodilution, which increase cerebral blood flow and improves perfusion in ischaemic regions of the brain. Hypocapnia is associated with cerebral vasoconstriction and whilst this helps limit increases in intracranial pressure it similarly reduces perfusion and may worsen cerebral ischaemia. Hypothermia is associated with improved neurological outcome following cardiac arrest and periods of profound cerebral hypoperfusion.

Review Question

20648

In paracetamol poisoning, N-acetyl cysteine:

True / False

●	○	Improves the microcirculation ✓Correct
○	●	Should be discontinued after 48 hours ✓Correct
●	○	Is effective when given 36 hours after the overdose ✓Correct
○	●	Should only be withheld until plasma paracetamol levels are known ✓Correct
●	○	Has antioxidant properties ✓Correct

There is evidence that N-acetyl cysteine (NAC) is effective when administered more than 24 to 36 hours after paracetamol overdose and is also clinically beneficial in non-paracetamol acute liver failure. It should be administered at the earliest opportunity, regardless of blood results and paracetamol concentrations, as early treatment has a great impact on outcome. NAC maintenance should be continued until the INR improves to less than 2.0. The microcirculation has been shown to improve. Non-toxic sulphation of paracetamol is increased by NAC and it has additional antioxidant properties.

Review Question

20651

Cytochrome(s) P450:

True / False

●	○	Have a haem component to the molecule ✓Correct

●	○	Are identified by amino acid homology ✓Correct
●	○	Is inhibited by propofol ✓Correct
○	●	Are single substrate enzymes ✓Correct
○	●	Are located predominantly in the cytoplasm of cells ✓Correct

Cytochrome(s) P450 (or CYP) are responsible amongst other enzymes for phase I metabolism and are located mostly in the endoplasmic reticulum (not cytoplasm). They have a haem component to the molecule. In humans there are about 20 CYP enzymes and they are identified by their amino acid homology. CYP 3A4 metabolises almost 60% of commonly used drugs, thus they are not single substrate enzymes as each enzyme metabolises many different drugs. However CYP is enhanced and inhibited by various drugs, e.g. barbiturates induce the enzymes and propofol is an inhibitor.

Review Question

20653

The spread of local anaesthetics is increased by:

True / False

○	●	Slow injection speed ✓Correct
○	●	Isobaric solutions ✓Correct
●	○	Barbotage ✓Correct
○	●	Obesity ✓Correct
○	●	Small syringes ✓Correct

The spread of local anaesthetic solution is determined by many factors including: Injection speed as the faster the solution is injected the wider the spread; Baricity of solutions as hyperbaric solutions spread more quickly than isobaric ones. Barbotage causes turbulent flow and increases the spread of solutions in an unpredictable manner and is thus not advised; Obesity may result in incomplete or patchy blocks due to adipose deposition within the epidural space and around nerve plexuses, which restricts the spread of solutions; Syringe size is unlikely to make any appreciable difference in spread.

Review Question

20655

The P50 of the oxygen dissociation curve for haemoglobin:

True / False

○	●	Changes with different haemoglobin concentrations ✓Correct
○	●	Decreases in acidosis ✓Correct
○	●	Is unaffected by carbon monoxide ✓Correct
●	○	Is decreased for myoglobin ✓Correct
●	○	Hypothermia increases the affinity of haemoglobin for oxygen ✓Correct

Acidosis, a rise in temperature and 2,3-DPG, shifts the oxygen dissociation curve (ODC) to the right which has a net effect on the P50. The subsequent affinity of haemoglobin for oxygen is decreased and oxygen is released to the tissues. Opposite factors (alkalosis, a fall in temperature and 2,3-DPG) shift the ODC to the left and the affinity of haemoglobin for oxygen is increased so less oxygen is available to the tissues. The P50 is decreased in the presence of carbon monoxide. 2,3-DPG is produced with erythrocytes during their normal glycolysis and is present in high concentrations. Myoglobin is structurally similar to a single subunit of haemoglobin. It combines with a single oxygen molecule and the resultant hyperbolic dissociation curve is far to the left of adult haemoglobin and the P50 is less. The ODC is unaffected by changes in haemoglobin concentration.

Review Question

20647

Low molecular weight heparin:

True / False

○	●	Must be given preoperatively to provide effective thromboprophylaxis ✓Correct
●	○	Can be given 2 hours after an uneventful neuraxial block ✓Correct
○	●	Has a shorter half-life than unfractionated heparin ✓Correct
○	●	Is contraindicated if an epidural catheter is in situ ✓Correct
○	●	At 8 hours after dosing, the Anti-Xa activity is at 20% of its peak ✓Correct

Pre and postoperative thromboprophylaxis dosing regimens have been shown to be equally effective and low molecular weight heparins can be given 2 hours after an uneventful spinal or epidural block. However, at least 12 hours should have elapsed after dosing before attempting a central neuraxial block. The half-life of most low molecular weight heparins is 2 to 3 times longer than unfractionated heparins (not shorter) and the anti-Xa activity is about 50% of its peak 12 hours after dosing.

Review Question

20645

Non-depolarising neuromuscular blocking drugs are prolonged by:

True / False

●	○	Lidocaine ✓Correct
○	●	Hyperthermia ✓Correct
●	○	Verapamil ✓Correct
●	○	Amitriptyline ✓Correct
○	●	Hypocarbia ✓Correct

Tricyclic antidepressants, e.g. amitriptyline, potentiate the action of non-depolarising neuromuscular blocking drugs by closed channel block. Verapamil and lidocaine potentiate the effect of these muscle relaxants by an open channel block mechanism. During hypothermia, enzyme activity is decreased, which reduces clearance of prolongs the duration of action of non-depolarising muscle relaxants. Acidosis and hypercarbia prolongs their effect (not hypocarbia).

Review Question

20640

At the neuromuscular junction, acetylcholinesterase:

True / False

○	●	Is mainly located in the junctional cleft ✓Correct
○	●	Is synthesised by choline acetyltransferase ✓Correct
○	●	Hydrolyses acetylcholine within 100 milliseconds of its release ✓Correct
○	●	Is attached to muscle ✓Correct
●	○	Hydrolyses most of the acetylcholine before it reaches the muscarinic receptors ✓Correct

Acetylcholinesterase (AChE) is made in and secreted by muscle cells and it lies mainly in the junctional clefts, but remains attached to the muscle by thin stalks of collagen. Choline acetyltransferase catalyses the synthesis of acetylcholine (not AChE). Once released into the synaptic cleft, most of the acetylcholine reaches the postjunctional receptors, which at the neuromuscular junction are nicotinic not muscarinic receptors. Once

released from the nicotinic receptors acetylcholine is hydrolysed by AChE, which occurs within 1 millisecond of its release (not 100 milliseconds)

Review Question

20637

Nitrous oxide:

True / False

○	◉	Is an NMDA agonist ✓Correct
○	◉	Decreases the cerebral metabolic rate of oxygen consumption (CMRO2) ✓Correct
○	◉	Decreases cerebral blood flow ✓Correct
○	◉	Maintains cerebral autoregulation ✓Correct
◉	○	Maintains carbon dioxide reactivity ✓Correct

Nitrous oxide causes direct cerebral stimulation which subsequently increases cerebral blood flow. Increased metabolism specifically in the frontal lobes and limbic system is seen which increases the cerebral metabolic rate of oxygen consumption (CMRO2). Cerebral autoregulation is impaired, but when used with propofol it is maintained. Nitrous oxide antagonises NMDA receptors (it is not an NMDA agonist), which may result in neurological damage, but this effect may be limited by the concurrent use of GABA agonists or inhalational anaesthetics. Carbon dioxide reactivity remains unaffected.

Review Question

21457

The following may be safely used in a patient susceptible to malignant hyperthermia:

True / False

◉	○	Glycopyrrolate ✓Correct
◉	○	Atropine ✓Correct
◉	○	Neostigmine ✓Correct
◉	○	Droperidol ✓Correct

●	○	Metoclopramide ✓Correct

Known triggering agents for malignant hyperthermia (MH) include all of the volatile agents and suxamethonium. ‘Safe drugs’ have been evaluated in the laboratory and safely used in MH susceptible patients. These include all intravenous induction agents, all benzodiazepines, all non-depolarising muscle relaxants, all local anaesthetic agents (including those with vasoconstrictors), all analgesics and opioids. However, not all drugs used during anaesthesia have been thoroughly tested, but expert advice is available from the Leeds MH Investigation Unit.

Review Question

21455

Ephedrine:

True / False

●	○	May increase fetal acidosis ✓Correct
○	●	Is the preferred vasoconstrictor in obstetric anaesthesia ✓Correct
●	○	Is positively inotropic and chronotropic ✓Correct
●	○	Is used to maintain uteroplacental blood flow ✓Correct
○	●	Is used to reduce intervillous blood flow ✓Correct

Ephedrine is used in obstetric anaesthesia because it has vasoconstrictor, chronotropic and inotropic properties. It normally maintains uteroplacental and intervillous blood flow, which preserves the foetal blood supply and prevents deterioration of the fetal acid base status. However, new work suggests this may not always be the case. Therefore, alpha agonists such as phenylepherine are now the first choice in obstetric anaesthesia.

Review Question

21382

When analysing data derived from pain assessment scales which of the following is/are true?

True / False

●	○	A pain relief score may give more useful information than a change in pain score ✓Correct
○	●	A time series of numerical rating scores are best analysed using the Mann-Whitney test ✓Correct
●	○	A time series of visual analogue scores are best analysed using an 'area under the curve' approach with *t*-tests ✓Correct
●	○	The data from a three-level verbal rating scale may be compared with the χ2 test ✓Correct
●	○	Two groups of visual analogue scores may be compared using the*t*-test ✓Correct

Verbal rating scales (VRS) and numerical rating scales (NRS) generate discontinuous data that are unsuitable for parametric tests of statistical significance and thus non-parametric techniques must be used.

When the VRS is confined to only three levels, data can be summarised in contingency tables and either the χ2 test or exact tests used. Where VRS is divided into several levels or NRS used, the Mann-Whitney test or Wilcoxon rank sum test is appropriate.

Visual analogue scales (VAS) yield continuous data and*t*-tests can be used as long as less than 25% of the data are at extreme ends of the range. If there are doubts about the validity of a *t*-test, non-parametric tests can be used. VAS data may be analysed using standard deviation and standard error.

A time series of numerical rating scores are best analysed using some form of analysis of variance for repeated measures or even area under the curve. Measuring the area under the curve gives a summary measure for each patient that can be analysed by a single test.

The Mann-Whitney test only compares two sets of data and cannot be used for multiple testing.

Review Question

21380

Carbon Monoxide (CO):

True / False

○	●	Induces cytochrome oxidase ✓Correct
●	○	Causes a left shift in the oxygen-haemoglobin dissociation curve ✓Correct
●	○	Clearance is greater in females ✓Correct
●	○	Is negatively inotropic ✓Correct
●	○	May exacerbate myocardial ischaemia ✓Correct

Haemoglobin (Hb) has 250 times more affinity for carbon monoxide than for oxygen, which reduces the total amount of Hb available for oxygen transport. CO shifts the oxygen-haemoglobin dissociation curve to the left

and down, reducing the ability of Hb to release oxygen. CO inhibits cytochrome oxidase, which reduces mitochondrial ATP formation and worsens tissue hypoxia. Clearance is decreased in men and during sleep. CO is negatively inotropic. Carboxyhaemoglobin (COHb) levels of 4.5 to 6% reduce the onset time of exercise induced angina and increase the incidence of ventricular dysfunction and dysrhythmias. Myocardial ischaemia itself promotes the formation of carboxyhaemoglobin, which further reduces oxygen delivery to the ischaemic myocardium.