1. The beta-blocker with the greatest ORAL bioavailability is
   A. metoprolol
   B. labetalol
   C. sotalol
   D. atenolol
   E. carvedilol

2. Comparing esmolol and sotalol
   A. both are class III anti-arhythmic agents
   B. both prolong the QT interval with a potential for generating torsades de pointes
   C. both have an oral-availability of approximately 90%
   D. both prolong the effective refractory period by prolonging the action potential duration
   E. both decrease sino-atrial nodal rate and increase atrio-ventricular nodal refractory period

3. Central anticholinergic syndrome may be treated with
   A. atropine
   B. benztropine
   C. physostigmine
   D. pralidoxime
   E. pyridostigmine

4. Regarding anticholinesterase drugs,
   A. pyridostigmine has a tertiary amine structure
   B. quaternary ammonium anticholinesterase drugs have a larger volume of distribution compared with non-depolarising neuromuscular drugs
   C. edrophonium has a slower onset of action than neostigmine
   D. neostigmine has a longer duration of action than pyridostigmine
   E. edrophonium acts via the esteratic site of acetylcholinesterase by forming a carbamyl-ester complex

5. The following drugs have anti-emetic properties EXCEPT
   A. propofol
   B. dexamethasone
   C. scopolamine
   D. etomidate
   E. midazolam

6. Angiotension-converting enzyme inhibitors
   A. Have not been implicated as a cause of hypotension under general anaesthesia
   B. Are given as pro-drugs to reduce the risk of cough
   C. May be the treatment of choice in hypertensive diabetic patients
   D. Are contra-indicated in patients at risk of congestive cardiac failure
   E. Directly reduce sympathetic nervous system stimulation
7. The most common cause of hypotension during intravenous administration of vancomycin?
   A. bacterial lysis with endotoxaemia
   B. direct myocardial depression
   C. blockade of autonomic ganglia
   D. systemic histamine release
   E. direct relaxation of vascular smooth muscle

8. With respect to the effect of carbonic anhydrase inhibitors on the kidney, which of the following is CORRECT?
   A. the maximum increase in urinary pH will occur 8 hours after an oral dose
   B. at maximal safely administered dose, bicarbonate reabsorption from proximal tubule can be completely abolished
   C. at maximal safely administered dose, the overall renal effect is 45% inhibition of bicarbonate reabsorption
   D. the overall metabolic effect is hypochloremic metabolic acidosis
   E. they can be classified as K+ sparing diuretics

9. Warfarin
   A. has an onset of action determined by the speed of synthesis of coagulation factors
   B. is used clinically as a racemic mixture
   C. does not cross the placenta
   D. can safely be used in pregnancy
   E. enhances the carboxylation of prothrombin

10. Glucagon
    A. produces its cardiac inotropic effect via beta receptor stimulation
    B. can cause hyperkalaemia
    C. increases catecholamine release
    D. increases gastrointestinal motility
    E. is effective in chronic hypoglycaemia

11. Metoclopramide
    A. is a substituted benzamide
    B. inhibits prolactin release
    C. is a dopamine receptor agonist
    D. is structurally related to atropine
    E. increases the rate of gastric emptying via an H1 receptor blocking action

12. The action of tramadol on the serotonin receptor is best described as being a
    A. direct agonist
    B. indirect agonist
    C. partial agonist
    D. impartial agonist
    E. inverse agonist

13. Concerning desflurane, sevoflurane and isoflurane
    A. isoflurane has the highest saturated vapour pressure
    B. sevoflurane is metabolised least in the body
    C. isoflurane does not react with soda-lime CO2 absorbant
    D. all three may increase cerebral blood flow and intracranial pressure
    E. isoflurane and desflurane both contain chloride atoms in their molecular structure
14. Ketamine is
   A. chemically related to phencyclidine
   B. a competitive antagonist at the NMDA receptor
   C. usually associated with hypotension due to vasodilatation
   D. a cerebral vasoconstrictor
   E. a potent myocardial pre-conditioning agent

15. A side effect of therapy with intravenous 8.4% sodium bicarbonate solution is
   A. hypotonicity
   B. intracellular acidosis
   C. ionised hypercalcaemia
   D. right shift of the oxygen-haemoglobin dissociation curve
   E. rebound metabolic acidosis

16. 20mls of 0.5% bupivacaine is inadvertently injected into an epidural vein over 30 seconds. The patient is 30 years old, pregnant and weighs 60kg. The most likely outcome would be?
   A. tinnitus and sinus tachycardia
   B. confusion and atrial ectopics
   C. grand mal convulsions and hypotension
   D. focal seizures and torsades de pointes
   E. muscle twitching and heart block

17. Which of the following may interfere with antagonism of a competitive neuromuscular block by an anticholinesterase?
   A. respiratory acidosis
   B. metabolic acidosis
   C. hyperkalaemia
   D. respiratory alkalosis
   E. hypomagnesaemia

18. The benzodiazepine with longest elimination half-life is
   A. diazepam
   B. midazolam
   C. temazepam
   D. lorazepam
   E. flunitrazepam

   A. increase the risk of colorectal carcinoma
   B. produce a similar range of side effects
   C. reduce the incidence of gastrointestinal bleeding
   D. reduce the risk of myocardial infarction through selective inhibition of PGI2
   E. produce similar rates of surgical bleeding

20. Parenteral administration of magnesium sulphate
   A. reduces the effect of neuromuscular blocking agents
   B. potentiates the cardiovascular effects of volatile anaesthetic agents
   C. antagonises the effects of ketamine
   D. is safe when used with calcium channel blockers
   E. is associated with increased acetyl choline release
21. With regard to morphine
   A. in adults it is predominantly metabolised to morphine 6-glucuronide
   B. in infants metabolism is increased due to increased hepatic blood flow
   C. bioavailability of oral morphine exceeds 50% in normal subjects
   D. clinically significant metabolism occurs in the kidney
   E. the metabolite morphine 3-glucuronide is a potent mu-receptor agonist

22. Paracetamol
   A. has analgesic, antipyretic and strong anti-inflammatory actions
   B. is metabolised to the toxic product N-acetyl-p-benzoquinimine which is inactivated by conjugation with glutathione
   C. is a strong inhibitor of the COX-2 isoenzyme, but not the COX-1 isoenzyme
   D. has a toxic dose that is at least five times the maximum therapeutic dose
   E. is well absorbed by the stomach after oral administration because it is an acid and its pKa is 9.5

23. A propofol infusion once started must be used within
   A. 6 hrs
   B. 12 hrs
   C. 18 hrs
   D. 24 hrs
   E. 30 hrs

24. Which one of the following drugs acts via a ligand gated ion channel?
   A. ranitidine
   B. morphine
   C. phenylephrine
   D. vecuronium
   E. salbutamol

25. The pKa of bupivacaine is 8.16. If the ratio of ionised : unionised bupivacaine = 100 : 1, what is the pH of the solution?
   A. 5.16
   B. 6.16
   C. 7.96
   D. 8.36
   E. 10.16

26. The toxic effects of the nerve agent sarin
   A. can be modified by thiosulphate
   B. should not be treated with an anticholinergic drug if there is tachycardia
   C. are reversed by pralidoxime because it blocks the organophosphate binding sites
   D. can include muscle fasciculation and paralysis
   E. can be modified by glycopyrrolate better than atropine

27. Phenylephrine
   A. increases skin temperature
   B. is inactivated by catechol-o-methyl-transferase (COMT)
   C. increases gastric secretion and motility
   D. causes mydriasis
   E. has a duration of action similar to that of noradrenaline
28. Nitric oxide
   A. is a potent activator of platelet aggregation
   B. binds to guanylyl cyclase in the cytoplasm inhibiting the production of cGMP
   C. is rapidly inactivated by tissue esterases
   D. is a potent activator of neutrophil adhesion to the vascular endothelium
   E. production is increased by acetylcholine

29. In statistical theory, the Central Limit Theorem states that
   A. if the number of observations is large the distribution of sample means is approximately normally distributed
   B. the population mean is the best measure of central tendency
   C. a 95% confidence interval that includes zero is not statistically significant
   D. two groups with the same mean and variance must be derived from the same population
   E. random selection from a population will prevent confounding

30. The recommended defibrillation protocol in an adult with witnessed ventricular fibrillation and immediate availability of a defibrillator is
   A. monophasic defibrillation at 200/200/200 joules
   B. biphasic defibrillation at 200/360/360 joules
   C. monophasic defibrillation at 300/360/360 joules
   D. biphasic defibrillation at 200/200/200 joules
   E. biphasic defibrillation at 200/200/360 joules

31. Quantal dose-effect curves can be used to measure
   A. the relation between drug dose and clinical response
   B. the relative pharmacologic potency
   C. the maximal efficacy
   D. the therapeutic index
   E. the dose of a drug required to produce 50% of that drug's maximal effect

32. Which of the following constitutes the most significant contraindication to the use of a beta blocker?
   A. as an adjunctive treatment of stable congestive cardiac failure
   B. treatment of atrial fibrillation in a patient with an otherwise normal myocardium
   C. initial management of hypertension in phaeochromocytoma
   D. treatment of blood pressure in patients with chronic airway limitation
   E. treatment of ischaemic heart disease in patients with diabetes and peripheral vascular disease

33. Adenosine
   A. has a half life in blood of about 15 minutes
   B. increases potassium conductance resulting in hyperpolarisation of exitable tissues
   C. depresses sino-atrial node activity
   D. is potentiated by caffeine
   E. increases calcium flux

34. The chemoreceptor trigger zone
   A. is inaccessible to drugs that have not crossed the blood brain barrier
   B. is the site of action of copper sulphate when used to initiate vomiting
   C. is not involved in the mediation of motion sickness
   D. contains D2 and 5HT3 receptors
   E. receives significant synaptic inputs as well as from blood and CSF - borne substances
35. Clonidine
A. Is completely renally cleared
B. Decreases sympathetic outflow from the central nervous system
C. Is not useful to treat opioid withdrawal
D. Does not prolong sensory blockade when added to intra-thecal local anaesthetic solutions
E. Can be safely discontinued abruptly

36. Clopidogrel
A. Reduces platelet function by inhibition of IIb/IIIa glycoprotein receptors
B. Irreversibly modifies ADP receptors, thus inhibiting their function
C. Acts in a similar mechanism to aspirin
D. Is in a different therapeutic category to ticlopidine
E. Has inactive metabolites

37. The rate of induction with a volatile agent is independent of
A. arterial pCO₂
B. body mass
C. age
D. agent solubility
E. cardiac output

38. Sodium thiopentone
A. has a half-time for equilibration between blood and brain shorter than that for propofol
B. does not show synergism with benzodiazepines
C. decreases chloride conductance in the post-synaptic membrane
D. has only inactive metabolites
E. is associated with more rapid recovery than methohexitone

39. The cardiotoxicity of bupivacaine is
A. represented by its high cardiac to CNS toxicity ratio
B. possibly a result of its sodium channel binding
C. different from that seen with etidocaine
D. transient
E. restricted to the R enantiomer

40. Which of the following is characteristic of phase 1 neuromuscular blockade?
A. train of four ratio of less than 0.7
B. initial increased sodium permeability at the post-junctional membrane
C. antagonism by neostigmine
D. acetylcholine receptors are predominately in the desensitized state
E. potentiation by low serum magnesium

41. A typical characteristic of serotonin syndrome is
A. prolongation of the QT interval
B. muscle flaccidity
C. encephalopathy
D. hypothermia
E. hypocalcaemia
42. Prostaglandins I2 and E2
A. increase water and sodium excretion from the body
B. inhibit renin release
C. decrease glomerular filtration rate
D. are only synthesised in the renal medulla
E. reduce aldosterone activity

43. All of the following about pethidine are true EXCEPT
A. it inhibits the reuptake of serotonin
B. it can cause central nervous system excitability
C. it causes less nausea and vomiting than morphine
D. it has atropine like effects
E. it is a synthetic product

44. In the management of acute pain;
A. Analgesia given before an incision (pre-emptive analgesia) has a significant effect on postoperative pain
B. The addition of ketamine to patient controlled analgesia morphine improves analgesia and reduces the incidence of opioid-related side effects
C. The addition of a background infusion to intravenous opioid patient controlled analgesia improves pain relief
D. Provision of analgesia may interfere with the diagnostic process in acute abdominal pain
E. Intratricular local anaesthetics reduce postoperative pain only minimally

45. The addition of adrenaline at 1/200,000 to a local anaesthetic solution represents which of the following concentrations?
A. 0.05%
B. 0.5%
C. 5 mcg/ml
D. 50 mcg/ml
E. 500 mcg/ml

46. According to receptor theory, a partial agonist
A. produces a very similar response, at full receptor occupancy, to a full agonist
B. produces concentration - effect curves that resemble those observed with full agonist in the presence of an irreversible antagonist
C. never competitively inhibits the responses produced by full agonists
D. fails to produce a full maximal response due to decreased affinity to receptors
E. is never used as a competitive antagonist

47. Which of the following statements regarding codeine is correct?
A. as a partial agonist it is largely devoid of the serious opioid side effects of dependence and respiratory depression
B. O-demethylation of codeine by CYP-2D6 enzyme to the active metabolite morphine may occur.
C. there is marked racial homogeneity and minimal inter-individual variability in the response to codeine
D. the principal mechanism of action of codeine is N-demethylation in the liver by CYP-3A1 enzyme to nor-codeine
E. codeine is not a naturally occurring opiate

48. Metaraminol
A. has no inotropic effects on the myocardium
B. has minimal indirect effect on the α1 receptors
C. directly stimulates α1 and α2 receptors
D. causes peripheral release of noradrenaline
E. has no effect on coronary vessels
49. Power analysis depends upon all of the following EXCEPT

A. the number of patients
B. the alpha value
C. the confidence interval
D. the variability within the group
E. the expected difference

50. All of the following statements about milrinone are true EXCEPT

A. chronic oral therapy for heart failure is associated with an increase in mortality
B. its actions are primarily mediated by phosphodiesterase III inhibition
C. typically a loading dose of 50μg/kg is followed by an infusion of 0.5μg/kg/min
D. risk of thrombocytopenia with prolonged infusion is much less than that seen with amrinone
E. dose is limited by tachycardia and hypertension

51. Changes in body composition in the healthy elderly patient result in

A. increased volumes of distribution for water-soluble drugs
B. no change in the duration of action of renally excreted drugs
C. increased clearance of drugs with perfusion-dependent hepatic metabolism
D. increased lean body mass
E. increased volumes of distribution for lipid-soluble drugs

52. The minimum alveolar concentration of sevoflurane is decreased by

A. pregnancy
B. hypothyroidism
C. chronic alcohol abuse
D. a decrease in PaCO₂
E. female gender

53. Propofol is preferred for total intravenous anaesthesia over thiopentone because it has a

A. steep dose-response curve
B. faster t₁/₂ Ke₀
C. smaller volume of distribution
D. higher therapeutic index
E. higher clearance

54. Cocaine

A. is a direct acting sympathomimetic
B. has marked central dopaminergic effects
C. in large doses cause bradycardia through vagal stimulation
D. is primarily dependent on normal pseudocholinesterase for metabolism
E. overdose rarely causes convulsion

55. Comparing ropivacaine and levobupivacaine

A. levobupivacaine is the L isomer and ropivacaine is the R isomer of their respective racemic compounds
B. the hydrophobic (aromatic) end of levobupivacaine increases its potency in comparison to ropivacaine
C. the amide linkage of ropivacaine increases its potency in comparison to levobupivacaine
D. the hydrophilic end of levobupivacaine differs from ropivacaine by one CH₂ group
E. the lower molecular weight of ropivacaine enables it to more rapidly block sodium channels
56. Midazolam is
A. less lipophilic than lorazepam
B. buffered in the ampoule to alkaline pH
C. metabolised mainly by demethylation in the liver
D. subject to significant first-pass hepatic extraction
E. readily water soluble at physiologic pH

57. Chronic tolerance to opioid analgesics can be related to which of the following factors?
A. increased phosphorylation of μ- and δ- opioid receptors
B. increased sensitivity of κ-opioid receptors
C. internalisation of μ- and κ-opioid receptors
D. rapid internalisation and recycling of reactivated μ- opioid receptors
E. increased adenyly cyclase activity

58. With regard to dopamine receptors
A. they are divided into 3 groups
B. they are located only in the CNS
C. they are G protein coupled
D. bromocriptine is a D2 agonist
E. D2 receptor stimulation increases activity of adenyly cyclase

59. The kinetic rate constant 'K' has units of;
A. μmol.min⁻¹
B. min⁻¹
C. mg.kg⁻¹.min⁻¹
D. ml⁻¹
E. μmol.kg⁻¹.min⁻¹

60. Inhalation of 1MAC isoflurane in a spontaneously breathing patient
A. does not change ventilatory response to oxygen
B. increases airway resistance
C. increases responsiveness to a high PaCO₂
D. decreases respiratory rate
E. decreases tidal volume

61. The additive in propofol injection that acts as the emulsifying agent is
A. sodium metabisulphite
B. egg lecithin
C. sodium hydroxide
D. soya bean oil
E. glycerol

62. Concerning the fate of local anaesthetics in the body
A. lignocaine metabolism produces intermediate compounds with no local anaesthetic action
B. local anaesthetics are largely excreted unchanged in the urine
C. amide linked local anaesthetics undergo oxidative de-alkylation as a phase I reaction
D. phase I reactions produce more fat soluble compounds
E. concurrent general anaesthesia does not affect the elimination of amide local anaesthetics
63. Concerning suxamethonium
   A. it initially blocks the cholinergic receptor at the neuromuscular junction
   B. its short duration of action is due to a large volume of distribution
   C. a high dibucaine number suggests an individual will have a prolonged response to suxamethonium
   D. patients with renal failure are no more susceptible to an exaggerated hyperkalaemia response than patients with normal renal function
   E. because of an increase in intraocular pressure suxamethonium is contraindicated for all ocular procedures

64. An early sign of phenytoin overdose following intravenous loading is
   A. nystagmus
   B. dry mouth
   C. decreased seizure control
   D. respiratory depression
   E. tremor

65. The possible effects of high dose fentanyl (30mcg/kg) at induction of anaesthesia include all of the following EXCEPT
   A. muscle rigidity
   B. 80% MAC reduction
   C. hypotension
   D. low amplitude high frequency alpha waves on the EEG
   E. slowing of conduction of impulses through the A-V node

66. Therapeutic index
   A. is usually easy to establish accurately for most drugs in humans
   B. can usually be derived from simple analysis of a graded dose-response curve
   C. is usually very helpful as a measure of the clinical usefulness of a drug
   D. takes into account the idiosyncratic nature of toxic reactions
   E. is best expressed as the ratio of LD50 to ED50

67. With respect to a three-compartment open pharmacokinetic model used to describe propofol
   A. inter-compartmental distribution is a zero-order process
   B. at equilibrium removal of drug is dependent on distribution
   C. a large third compartment results in a long elimination half-life
   D. parameters are derived by measuring excreted metabolites
   E. the effect site is part of the central compartment volume

68. Prolonged exposure to high concentrations of nitrous oxide for extended periods results in
   A. a reduction in methionine synthetase
   B. a reduction in homocysteine levels
   C. an increase in s-adenosyl methionine
   D. both A and B
   E. both B and C

69. Propofol clearance is
   A. significantly reduced in hepatic disease
   B. significantly reduced in pregnancy
   C. significantly increased in children
   D. significantly reduced in renal failure
   E. unchanged in the elderly
70. A drug which influences the duration of action of suxamethonium but does NOT affect plasma cholinesterase is
A. procaine
B. cyclophosphamide
C. magnesium
D. neostigmine
E. metoclopramide

71. Which of the following is a good example of genetic influence on drug metabolism
A. prolonged half-life of diazepam in patients with hepatic dysfunction
B. suxamethonium apnoea
C. increased phase 1 metabolism related to induction of cytochrome P450 enzymes
D. inhibition of warfarin metabolism by cimetidine
E. interaction between statin drugs and a component of grapefruit juice

72. A drug has a hepatic extraction ratio of 0.7 and is 30% absorbed from the gut. The bioavailability is therefore
A. 0.70
B. 0.30
C. 0.21
D. 0.14
E. 0.09

73. Of the following, the LEAST effect on systemic vascular resistance is from
A. desflurane
B. sevoflurane
C. isoflurane
D. enflurane
E. halothane

74. Propofol
A. is contraindicated in patients with known epilepsy
B. increases seizure duration in electro-convulsive therapy
C. can be used to treat status epilepticus
D. does not alter EEG amplitude
E. does not alter EEG frequency

75. Following administration of two times the ED95 of a neuromuscular blocking agent in a healthy adult, the time to greater than 25% recovery of twitch height was 12 minutes. This agent is most likely to be
A. rocuronium
B. succinylcholine
C. atracurium
D. vecuronium
E. mivacurium