Australian and New Zealand College of Anaesthetists

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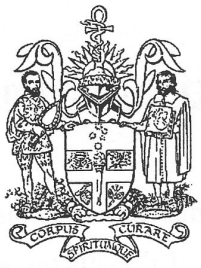

PRIMARY EXAMINATION

THURSDAY, 28 MAY 2009

3:15 pm – 4:35 pm

PHARMACOLOGY

MULTIPLE CHOICE QUESTIONS

NOTICE

- **ALL** questions must be answered
- Write the answer to each question on book provided.
- No queries regarding individual questions can be answered.
- There are 75 questions to answer in 75 minutes. You should answer each question in 1 minutes or less.
- All questions are worth equal marks.

1. Drug distribution and clearance:
A. Volume of distribution of a drug is independent of plasma-protein binding
B. Highly ionized drugs may have a renal clearance approximating to the glomerular filtration rate
C. Phenytoin undergoes zero-order kinetics at low plasma concentrations
D. A two compartment model can describe the profile of drug concentrations following intramuscular injection
E. The terminal half-life of a drug provides a useful guide to optimal bolus drug administration

2. Which of the following crosses the blood-brain barrier?
A. GABA
B. Propranolol
C. Suxamethonium
D. Edrophonium
E. Dopamine

3. The following drugs inhibit the cytochrome P450:
A. Omeprazole
B. Dexamethasone
C. Rifampicin
D. Phenytoin
E. Fluconazole

4. Which of the following statements is false:
A. The volume of distribution (Vd) for water-soluble drugs is smaller in neonates than adults
B. In pregnancy the clearance of drugs excreted by the biliary system may be attenuated
C. Plasma-protein binding is unchanged in obese patients
D. The clearance of drugs with low hepatic extraction ratios is not limited by hepatic blood flow
E. Oral propranolol has greater bioavailability in patients with chronic renal failure

5. With isoflurane anaesthesia, MAC awake is:
A. 0.1% vol
B. 0.3% vol
C. 0.5% vol
D. 0.8% vol
E. 1% vol

6. Which of the following statements are true:
A. The peripheral nerve stimulator generates a square wave electrical pulse
B. Double-burst stimulation consists of two bursts of three stimuli at 50 Hz with each triple burst separated by 50 ms
C. The ratio of twitches with train of four stimulation (T4:T1) in a depolarizing block is less than one
D. A depolarizing block produces detectable fade in muscle contraction with tetanic stimulation
E. Post-tetanic count reflects the reversal of neuromuscular blockade

7. Which is NOT correct regarding opioids administed via the epidural space

A. urinary retention is relatively common
B. low dose naloxone alleviates pruritis without significantly modifying analgesia
C. biphasic respiratory depression may occur
D. lipid solubility affects speed of onset
E. morphine is commonly used because it has the lowest side effect profile

8. Which of the following statements are true:
A. At a pH below their pKa, weak acids will be more un-ionized
B. Phagocytosis is an important mechanism in the transport of insulin
C. According to Graham's law the rate of diffusion is inversely proportional to the molecular size
D. Erythromycin decreases the bioavailability of warfarin
E. A volatile agent with high solubility in blood has rapid onset of effect

9. Uptake of N2O when breathing 70%:
A. More than one litre absorbed in the first minute
B. Equilibrium is achieved in 3mins
C. Absorb 10 litres in the first 3 mins
D. At steady state, uptake is 200mls/min
E. Produces surgical anaesthesia

10. What is NOT correct regarding rramadol:
A. Is only a weak agonist at the μ-receptor
B. Inhibits the reuptake of norepinephrine
C. Increases the levels of serotonin at descending inhibitory neurons
D. Is more effective for neuropathic pain than morphine
E. In equianalgesic doses causes greater respiratory depression than morphine

11. Propofol
A. is a weak organic acid with a pKa of 11
B. contains Cremophor EL as the commercial solvent
C. partially antagonises alfentanil
D. is an effective analgesic
E. requires a blood concentration of approximately 12-14μg/ml for induction of anaesthesia in unpremedicated patients

12. The following is true of opioids and their routes of administration EXCEPT:
A. Oral oxycodone has a higher bioavailability than oral morphine
B. Patient's age is a more reliable indicator of opioid dose via the intramuscular route than weight
C. Pethidine is irritating and painful when administered by subcutaneous injection
D. The analgesic efficacy of epidural opioids is less than that of parenteral opioids
E. Transdermal fentanyl patch uses the principle of passive diffusion

13. Phenylephrine:
A. Metabolised by COMT
B. used in glaucoma

C. Safely be used with a monoamine oxidase inhibitor
D. Effect lasts longer than noradrenaline
E. Acts by indirect method only

14. **Which of the following DO NOT decrease the lower oesophageal sphincter pressure:**
A.Thiopentone
B. Atropine
C. Progesterone
D. Isoflurane
E. Suxamethonium

15. Gelofusine
A. is derived from human plasma
B. contains molecules with an average weight of 30 000
C. contains calcium
D. contains preservative
E. interferes with cross matching

16. The following decreases the intraocular pressure:
A. Suxamethonium
B. Acetazolamide
C. Hypercarbia
D. Atropine
E. Elevated central venous pressure

17. In clinical doses, captopril
A. may cause hypokalaemia
B. may cause a moist cough
C. should be given with food
D. is given orally once a day
E. causes an increased level of angiotensin 1

18. Physostigmine
A. Causes excitatory activity on the EEG
B. Doesn't cross the blood brain barrier
C. Doesn't cause sedation
D. Only has its effects at nicotinic receptors
E. Causes retrograde amnesia

19. In a clinical trial, a patient either vomits or not. What type of data is this?
A. Ordinal
B. Nominal
C. Ratio
D. Interval
E. Continuous

20. The following are correct regarding pethidine EXCEPT:

A Readily crosses the placenta
B Is a phencyclidine derivative
C Norpethidine has proconvulsant properties
D Pethidine trapping occurs in the fetal compartment
E. has local anaesthetic properties

21. Low molecular weight heparins
A. contain unfractionated heparins
B. is usually given by infusion
C. should be monitored during use by the activated partial thromboplastin time (APTT)
D. should be discontinued at least 6 hours before major surgery
E. may cause thrombocytopenia

22. The following is correct regarding local anaesthetics EXCEPT:
A. Cocaine undergoes significant metabolism by ester hydrolysis
B. Potency of local anaesthetic agents is quantified as octanol partition coefficient
C. Acidic environment of an abscess decreases the non- ionized proportion of local anaesthetic
D. At lower concentrations, the block produced by ropivacaine may be motor sparing
E. Levobupivacaine is the s-enantiomer of racemic bupivacaine

23. Ketamine
A. increases cerebral blood flow
B. is an N-methyl-D-aspartate (NMDA) receptor agonist
C. causes a reduction in airway secretions
D. is a poor analgesic
E. causes premature labour contractions

24. Regarding sevoflurane:
A. The vapour pressure is less than enflurane
B. The vapour pressure is greater than isoflurane
C. Cardiovascular side effects are similar to isoflurane
D. Molecular weight less than isoflurane
E. Boiling point less than enflurane

25. The following are correct regarding halothane hepatitis EXCEPT:
A. The incidence of halothane hepatitis is lower in children compared with adults
B. Patients on liver-enzyme inducing drugs have a lower incidence of halothane hepatitis
C. The latency period before presentation with hepatitis is directly proportional to the time between multiple exposures to halothane
D. The oxidative metabolite of halothane is the trigger for hepatic injury
E. Enflurane has been reported to cause halothane hepatitis

26. Sulphonylureas:
A. High incidence of lactic acidosis
B. Good in patients with depleted insulin stores
C. Metformin & phenformin are examples

D. Increased glucose utilisation in the peripheries
E. Are related to sulphonamides

27. The following drugs cause uterine relaxation EXCEPT:
A. Nifedipine
B. Terbutaline
C. Magnesium sulphate
D. Atracurium
E. Atosiban

28. The benzodiazepine with the longest elimination half-life is:
A. Diazepam
B. Oxazepam
C. Temazepam
D. Midazolam
E. Lorazepam

29. The following are all amides except:
A. Bupivicaine
B. Prilocaine
C. Etidocaine
D. Tetracaine
E. Dibucaine

30. The following statements regarding the drugs used to treat nausea and vomiting are true EXCEPT:
A Prolonged QT interval is a potentially serious side effect of chronic administration of droperidol
B Opioid antagonists have ineffective anti-emetic properties
C Metoclopramide has some 5HT3 antagonism at higher doses
D Tropisetron is a 5-HT3 antagonist, which is metabolized by cytochrome P450 enzyme system
E Dexamethasone works as an anti-emetic by antagonizing the dopamine receptor

31. With regards to diffusion through a membrane:
A. Directly proportional to thickness
B. Inversely proportional to thickness
C. Inversely proportional to Surface area
D. Inversely proportional to concentration difference
E. Directly proportional to square root of the molecular weight

32. Desflurane
A. has a molecular weight of 185
B. has a minimum alveolar concentration (MAC) value of 2%
C. has a blood:gas solubility of 0.42
D. is flammable in a concentration of 6%
E. should not be used with soda lime

33. Regarding Neostigmine:
A. Binds covalently to esteric site on AChEsterase
B. Binds electrostatically to esteric site on AChEsterase
C. Binds to anionic site
D. Forms complex with AChEsterase with a shorter half life than acetylcholine
E. is the main antidote to Calabar bean poisoning

34. Which is FALSE regarding the mechanism of action of drugs used perioperatively:
A. Benzodiazepines act as agonists at GABAA receptors by increasing chloride entry to hyperpolarize the synaptic membrane
B. Ondansetron is a 5-HT3 antagonist that acts both centrally and peripherally
C. Clonidine is an agonist predominantly at α2- adrenoreceptors
D. Heparin acts by inhibition of antithrombin III
E. Paracetamol has no effect on the cyclo-oxygenase pathway

35. The statement INCORRECTLY describes how the inotropes increases cardiac contractility:
A. Adrenaline increases cardiac cAMP
B. Dobutamine stimulates predominantly β1-receptors
C. Dopexamine acts on β2-receptors
D. Milrinone increases cAMP by stimulating phosphodiesterase
E. Digoxin increases intracellular calcium by inhibiting the Na-K pump

36. Rocuronium administered in 2 times the ED95 dose:
A. Rapid onset, short duration
B. Rapid onset, Intermediate duration
C. Slow onset, intermediate duration
D. Slow onset, long duration
E. Slow onset, short duration

37. Regarding the power of a two-sample t test, all are true EXCEPT:
A. Increases if the sample sizes are increased
B. Depends on the difference between the population means which we wish to detect
C. Depends on the difference between the sample means
D. Is the probability that the test will detect a given population difference
E. Cannot be zero

38. The following drugs, in therapeutic dosage have the described approximate percentage plasma protein binding
A. morphine, 10%
B. thiopentone 99%
C. pancuronium 50%
D. diazepam, 75%
E. fentanyl, 85%

39. Anti-arrhythmic drugs that DO NOT block the sodium pump include:
A. Amiodarone

B. Flecainide
C. Lidocaine
D. Propafenone
E. Verapamil

40. Regarding digoxin toxicity:
A. Serum level > 2.1 ng/ml is toxic
B. Calcium acts as an antidote
C. Causes a long PR interval
D. Causes xanthopsia
E. Causes a long QT interval and torsades

41. Drugs WITHOUT α antagonist properties include:
A. Yohimbine
B. Doxazosin
C. Phenoxybenzamine
D. Phentolamine
E. Hydralazine

42. With regard to the ionisation of acids and bases
A. weak acids have a pKa>7.4
B. weak acids in solution cannot exist in alkaline pH
C. the concentration of the ionised form of weak bases increases with an incrase in pH
D. decreasing the H+ concentration decreases the ionised form of weak acids
E. strong acids are highly ionised at pH7.4

43. Adverse effects of epidural opioids include
A. Lower limb motor blockade
B. Respiratory depression
C. Surgical site bleeding
D. Pulmonary embolism
E. Interactions with local anaesthetics

44. Which of the following drugs are contraindicated in patients with acute intermittent porphyria
A. propofol
B. fentanyl
C. thiopentone
D. ketamine
E. halothane

45. NMDA antagonists include
A. Ketamine
B. Propofol
C. Adrenaline
D. Ketorolac

E. Dextrometorphane

46. The following drugs cross the placenta in clinically significant amounts when given in conventional dosages during labour
A. intravenous fentanyl
B. intravenous neostigmine
C. intravenous vecuronium
D. epidural bupivacaine
E. intravenous ketamine

47. Genetic variability for the clinical efficacy of morphine is suggested to be related to all EXCEPT:
A. Differences in mu-opioid receptors
B. Differences in the metabolism of morphine
C. Differences in renal clearance of morphine
D. Differences in transport of morphine across the bloodbrain barrier.
E. Differences in adrenergic modulation of opioid analgesia

48. Guanethidine:
A. Acts primarily within the CNS
B. Produces anti-hypertensive effect primarily by presynaptically inhibiting release of noradrenaline
C. Highly lipid soluble
D. Mental depression is a troublesome side effect
E. Orthostatic hypotension is not a prominent side effect

49. Remifentanil
A. is a pure μ opioid receptor agonist
B. is metabolised by plasma cholinesterase
C. has clinically active metabolites
D. is equipotent with alfentanil
E. does not cause nausea and vomiting

50. The blood gas coefficient for the agents are correct EXCEPT:
A. Isoflurane 1.4
B. Sevoflurane 0.69
C. Ether 12
D. Desflurane 0.42
E. Halothane 0.8

51. Metabolism of analgesics in neonates is characterised by:
A. Clearance of paracetamol at the level of older children
B. Impaired sulphation
C. Impaired glucuronidation
D. A morphine clearance of about twice that of older infants
E. Same pathways of elimination as in adults

52. Droperidol
A. is a thioxanthine
B. increases cerebral blood flow
C. is antiemetic is large doses only
D. may cause hypotension
E. is metabolised by the kidneys

53. Opioid metabolism
A. Catechol-O-methyltransferase takes part in degradation of morphine
B. Morphine-6-glucuronide has no analgesic efficacy
C. Morphine-6-glucuronide is found in higher concentrations than morphine during chronic oral morphine administration
D. Less than 5% of Caucasians are poor metabolisers of codeine
E. Tramadol is metabolized by the same pathway as morphine

54. Which of the following is NOT TRUE regarding aminophylline:
A. is a mixture of theophylline and ethylenediamine
B. is metabolized by xanthine oxidase
C. has an elimination half-life of 12 hours
D. causes peripheral vasodilation
E. is a central nervous system (CNS) stimulant

55. Adenosine
A. Causes AV block via action at A1 receptors
B. Causes bronchoconstriction via A2 receptors
C. Causes renal vasodilation
D. Causes profound depression of the SA node
E. has an exaggerated response in the presence of methyl xanthines

56. Malignant hyperthermia:
A. Is an inherited hypermetabolic disorder of smooth muscle
B. Is triggered by non-depolarizing muscle relaxants
C. Reconstituted dantrolene has a pH of 9 which is an irritant to veins
D. Does not occur is children under 2 years of age
E. Is caused by a single gene defect on chromosome 5p

57. Sugammadex:
A. inhibits acetylcholinesterase
B. reverses actracurium
C. Binds flucloxacillin
D. undergoes hepatic metabolism
E. is a beta-cyclodextrin

58. The following drugs are effective treatments for post-anaesthetic shivering:
A. Pethidine

B. Clonidine
C. Ketanserin
D. Ondansetron
E. All are correct

59. The following are correct examples of isomeric forms:
A. tautomer: isoflurane and enflurane
B. enantiometer: keto and enol forms of thiopentone
C. racemic: cisatracurium
D. structural: S and R forms of ketamine
E. geometric: cis and trans forms

60. Compared to bupivacaine; ropivacaine:
A. Has a higher pKa
B. Is more lipid soluble
C. Blocks type C nerve fibres faster
D. Blocks type A nerve fibres more slowly
E. Is more cardiotoxic

61. Amiloride:
A. Potassium sparing antidiuretic which blocks the aldosterone receptor
B. Blocks luminal sodium channels in the collecting tubules
C. Increases potassium excretion.
D. Is metabolised by the liver.
E. Has a short elimination half time.

62. As an in vivo buffer, THAM (Tris-Hydroxymethyl- Amino-Methane) has the following advantages over sodium bicarbonate:
A. Does not cause pulmonary oedema
B. It does not increase PaCO2
C. Less irritation to peripheral veins
D. It does not cross the blood brain barrier
E. Less respiratory depression

63. Regarding the nicotinic acetylcholine receptor, all are true EXCEPT:
A. Possesses four transmembrane domains.
B. Each receptor has one binding site for acetylcholine.
C. Consists of a-and b subunits.
D. Is a ligand-gated ion channel receptor.
E. Is a pentamer.

64. Of cardiovascular agents
A. Dopamine prevents renal failure
B. Milrinone is antiarryhthmic
C. Levosimendan is a lusitropic agent
D. Vasopressin improves inotropy

E. T3 is routinely administered in most ICUs

65. The following drugs can be used safely in a patient on long-term monoamine oxidase inhibitors:
A. Ephedrine
B. Pethidine
C. Ketamine
D. Fentanyl
E. Tricyclic antidepressants

66. Regarding voltage-gated sodium channels, all are true EXCEPT:
A. work on a second or minute timescale
B. exist in three major conformational states
C. inactivate very slowly
D. are the molecular basis for the rapid transient sodium current first described by Hodgkin and Huxley
E. are crucial for controlling the cellular resting potential of excitable cells

67. The following drugs induce hepatic microsomal enzymes:
A. Cimitidine
B. Sodium valproate
C. Isoniazid
D. Rifampicin
E. Phenelzine

68. Stomach emptying is stimulated by:
A. atropine
B. dopamine
C. salbutamol
D. small bowel distention
E. propranolol

69. Aprotinin
A. Is a polypeptide
B. Inhibits plasmin and kallikrein
C. Is derived from bovine lung
D. Is metabolized and excreted by the kidney
E. All of the above

70. The drug with the largest volume of distribution at steady state is:
A. Propofol
B. Midazolam
C. Etomidate
D. Thiopentone
E. Methohexitone

71. Lignocaine has a pKa of 7.9 At pH 6.9, the percentage ionised is:
A. 1%
B. 10%
C. 50%
D. 90%
E. 99%

72. Which of the following is the most toxic effect of atropine in children?
A. Hypotension
B. Tachycardia
C. Hyperthermia
D. Hypertension
E. Dry mouth

73. Neuroleptic malignant syndrome:
A. Occurs only with chronic use
B. 80% (60%) mortality
C. dantrolene acts as an antidote
D. Can be caused by acute withdrawal of L-Dopa therapy
E. Is treated with cyproheptadine

74. Drugs which bind preferentially to and stabilize the inactivated conformation of voltage-gated sodium channels include
A. prilocaine
B. lidocaine
C. gabapentin
D. flecainide
E. all of the above

75. In reversing neuromuscular blockade, which of the following combinations is best matched with respect to time of onset?
A. Atropine & neostigmine
B. Atropine & glycopyrrolate
C. Atropine & edrophonium
D. Atropine & physostigmine
E. Glycopyrrolate and edrophonium