**Question 1**

Regarding ethylene glycol overdose, which of the following statements is correct?

A It causes formic acid crystals in urine

B Fomepizole is used as a temporising antidote

C It causes metabolic alkalosis

D Toxicity is due to polycyclic hydrocarbon ring structure

Explanation B

Ethylene glycol toxicity results in a severe metabolic acidosis secondary to the accumulation of glycolic acid and lactate. Calcium oxalate crystals form in the tissues, including the renal tubules, myocardium, muscles and brain. Hypocalcaemia follows and acute renal failure occurs.

Haemodialysis is the definitive treatment.

Metabolism of ethylene glycol into its toxic metabolites can be blocked by inhibiting the enzyme alcohol dehydrogenase with a competing drug-ethanol or fomepizole. Ethanol is harder to achieve a safe and effective blood level

The other toxic metabolite-methanol produces the toxic metabolite formic acid leading to severe metabolic acidosis, coma and blindness

**Question 2**

Regarding cocaine, which statement is incorrect?

A It inhibits monoamine oxidase

B It has local anaesthetic effects

C It has central and peripheral effects

D It blocks re-uptake of catecholamines

Explanation A

Cocaine’s sympathomimetic effects are due to the blockade of presynaptic catecholamine re-uptake. It also has a sodium channel blockade effect and local anaesthetic effect. CNS effects results in excitation, seizure and in severe cases hyperthermia. It is an ester type local anaesthetic.

Note: elevated extracellular calcium partially antagonises the action of local anaesthetics, conversely increased levels of potassium enhances the level of the local effect

Cocaine works in the CNS by inhibiting dopamine reuptake into neurons in the "pleasure centres" of the brain. It produces an amphetamine like psychological effect that is shorter lasting and more intense than amphetamines

**Question 3**

Yet another overdose presents to your ED. You examine them and find them to have: blurred vision, urinary retention, dilated pupils and to be very agitated. What have they taken?

A Tricyclic antidepressant

B MDMA

C Morphine

D Cocaine

Explanation A

Tricyclic antidepressant overdose causes anticholinergic features which are represented in the question. A good way to remember all of them are: blind as a bat- mydriases, mad as a hatter- delirium, red as a beet-flushing and vasodilatation, dry as a chip- anhydrosis”. Other important features are urinary retention and constipation

**Question 4**

Regarding methanol intoxication, which of the following statements is correct?

A It is treated in part with activated charcoal

B It is partly due to the inhibition of aldehyde dehydrogenase

C It is due to formation of oxalic acid

D It can be treated with 4 methylpyrazole

Explanation D

Methanol is metabolized in the liver by alcohol dehydrogenase to formaldehyde, which in turn is metabolized by aldehyde dehydrogenase to formic acid. Ethanol or fomepizole (4-methylpyrazole) competitively inhibits alcohol dehydrogenase so that methanol cannot be metabolized to formaldehyde. GIT decontamination is not recommended

**Question 5**

Regarding cannabinoids, which of the following statements is correct?

A They have an antipsychotic action

B They constrict the pupils

C They act on a number of non-specific receptors

D They produce tachycardia

Explanation D

Cananbinoids are a powerful psychoactive compound (highly lipid soluble). They act on a protein coupled cannabinoid receptor. THC causes disinhibition of dopamine neurons, mainly by the presynaptic inhibition of GABA neurons in the VTA. The most prominent effects are euphoria and relaxation. Two characteristic physiological signs are increased pulse rate and reddening of the conjunctiva. Pupil sizes do not change

**Question 6**

Regarding Marijuana, which of the following statements is correct?

A Hydroponic indoor-grown varieties are not more potent than soil grown

B Has antipsychotic properties

C It causes conjunctival hyperaemia and tachycardia

D It causes miosis

Explanation C

Cananbinoids are a powerful psychoactive compound (highly lipid soluble). They act on a protein coupled cannabinoid receptor. THC causes disinhibition of dopamine neurons; mainly by the presynaptic inhibition of GABA neurons in the VTA. The most prominent effects are euphoria and relaxation. Two characteristic physiological sings are increased pulse rate and reddening of the conjunctiva. Pupil sizes do not change

**Question 7**

A 30 year old male patient presents with an acute myocardial infarction. Which drug has most likely caused this?

A Increased adrenalin production due to heroin

B Monoamineoxidase inhibition by amphetamine derivative

C Increased serotonin due to fluoxetine

D Increased noradrenaline effects of cocaine

Explanation D

The sympathomimetic effects of cocaine are due to the blockade of presynaptic catecholamine re-uptake of noradrenaline (and dopamine).

Increased circulating catecholamine concentrations cause excessive stimulation of alpha- and beta-adrenoceptors and can result in vascular dissection, intracranial haemorrhage and acute cardiomyopathy.

Vasospasm and endothelial fissuring result in acute coronary syndrome

Extra: Use of cocaine may have several consequences:

There is a risk of myocardial infarction, both the subjects with coronary atheroma and those with normal coronary arteries (when it is unclear if the mechanism is thrombosis, embolism, or spasm),

There is a risk of spontaneous cerebral haemorrhage, which may occur even in subjects with normal blood pressure.

This may be a consequence of arterial malformation, ischaemia, arterial vasoconstriction, cerebral vasculitis, cardiac rhythm disturbance, or myocardial infarction

**Question 8**

Regarding ethanol metabolism which of the following statements is correct?

A The alcohol dehydrogenase pathway is inducible

B Most alcohol dehydrogenase is found in the stomach

C It obeys zero order kinetics

D The MEOS system is the main pathway

Explanation C

The main pathway of ethanol metabolism is: alcohol is oxidized by alcohol dehydrogenase to acetaldehyde, which is in turn metabolized by aldehyde dehydrogenase to acetyl CoA. Both steps involve the reduction of NAD to NADH. Metabolism follows zero order kinetic which means that a constant amount is of ethanol is metabolized per unit time. Most of the alcohol dehydrogenase is found in the liver

**Question 9**

The type of metabolism which leads to the accumulation of toxic metabolites in a paracetamol overdose is?

A Sulphation

B Hydroxylation

C Glucuronidation

D Methylation

Explanation B

Acetaminophen is conjugated to harmless glucuronide and sulfate metabolites when it is taken in normal doses. If large overdose is taken, the metabolic pathway gets overwhelmed and a P450 dependent system converts some of the drug to a reactive intermediate NAPQI. If the gluthathione stores are exhausted (in an overdose), NAPQI binds with proteins in the hepatocytes inducing liver damage.

Example of P450-dependent oxidation reactions: hydroxylation, N-dealkylation, O-dealkylation, N-oxidation, S-oxidation and deamination. Other type I reactions: oxidation P450 independent systems, reductions and hydrolyses.

Example of phase II reactions: glucuronidation, acetylation, glutathione conjugation, glycine conjugation, sulfate conjugation and methylation.

**Question 10**

Alkalinisation of urine increases the excretion of which drug?

A Quinidine

B Amphetamines

C Phenobarbitone

D Cocaine

Explanation C

An alkaline urinary pH can result in some drugs being predominantly in an ionised form and unable to be reabsorbed across the tubular epithelium. Phenobarbitone and salicylate are two types of drugs which follow this principle

**Question 11**

A young woman presents to the ED with increased temperature, rhabdomyolysis and sweating, which is the likely drug?

A Aspirin

B Methyl amphetamine

C Heroin

D Amitriptyline

Explanation B

Stimulant drugs include illegal ones like amphetamines (MDMA, ecstasy), methamphetamine (cranck), cocaine (crack) as well as legal substances e.g. pseudoephedrine (sudafed) and caffeine (plus other dietary stimulants or fat burners). At low doses euphoria and wakefulness are accompanied by a sense of power and well being. At higher doses, restlessness, agitation and psychosis appear together with tachycardia and hypertension. Prolonged muscular activity may contribute to hyperthermia and rhabdomyolysis. Severe hyperthermia >40C can lead to brain damage and multi-organ failure. Sweating is a classical feature of amphetamine ingestion. The apocrine sweat glands located on the palms of the hands and a few other areas, respond to adrenoceptor stimulants with increased sweat production. Amphetamine is an example of a non catecholamine sympathomimetic drug