**Question 1**

The anti-hypertensive effects of clonidine occur due to

A Alpha 1 receptor blockade

B Alpha 2 receptor activation

C Beta receptor blockade

D Ganglion blocking agents

Explanation B

Clonidine stimulates CENTRAL alpha 2-adrenoceptors which inhibits sympathetic nervous system outflow providing the anti-hypertensive effects. Initial hypertensive effect is due to direct stimulation of alpha 1-receptors in arterioles following parenteral use

**Question 2**

Labetalol has the following pharmacodynamic effect

A Alpha 1+ Alpha 2 + B1 + B2 Antagonism

B Alpha 1 + B1 Antagonism

C B1 + B2 Antagonism

D Alpha 1 + B1 + B2 Antagonism

Explanation D

Labetalol is a competitive selective alpha 1 antagonist and a competitive non selective beta 1 (B1) and 2 (B2) antagonist.

Note: in one of the tables in the prescribed TB, Labetalol seems to have some alpha 2 antagonism. However, in the section describing labetalol it reports that it is sea selective alpha 1 antagonist and a potent beta blocker

**Question 3**

Which of the following drugs does not have an effect on AV nodal conduction?

A Amiodarone

B Verapamil

C Lignocaine

D Sotalol

Explanation C

Drugs without an effect on AV nodal refractory period

Dofetilide

Ibutilide

Lignocaine

Mexiletine

**Question 4**

A patient presents with cardiac sounding chest pain, tachycardia and hypertension- 220/130. Which drug is the safest and most efficacious to this in this situation?

A Hydralazine

B Prazosin

C Sodium nitroprusside

D Nitroglycerin

Explanation D

Sodium nitroprusside- arterial and venodilator-hypertensive emergencies and severe heart failure. Side effects include excessive blood pressure lowering, accumulation of cyanide, metabolic acidosis, arrhythmias and death

Hydralazine-arterial dilator only. Patient with heart failure would require an addition of nitrates.

Prazosin- alpha one blocker-arterial only

Glyceral trinitrate- relaxation of both arteries and veins. Evidence suggests that at low doses veins dilate and at higher doses arteries dilate (graded response). Effective dose results in marked preload reduction and increased venous capacitance. Pulmonary vascular pressures and heart size are significantly reduced. The onset of action is rapid, but its haemodynamic effects are quickly reversed when the infusion is switched off.

**Question 5**

An elderly patient presents to your ED with mild heart failure. Vital assessment BP 110/80, pulse 85/min sinus rhythm. She requires an adjustment of her medications. She is on an ACE inhibitor and a diuretic. What drug would be an appropriate addition to her anti failure regime?

A Verapamil

B Hydralazine

C Digoxin

D Bisoprolol

Explanation D

ACE inhibitors are considered first line therapy in patients with heart failure without oedema. Associated oedema requires the addition of a diuretic. In mild failure a thiazide is used but often a loop diuretic is required. Sodium loss can cause secondary potassium loss. Potassium sparing diuretic like spirinolactone is an alternative. The next stage involves the addition of a beta blocker (excess tachycardia and adverse effects of high catecholamines levels on the heart can worsen heart failure). Bisoprolol has been shown to reduce mortality. Vasodilators are useful in class II and III heart failure. Digoxin is useful in patients with HF and atrial fibrillation. Only 50% of patients will have relief if they are in sinus rhythm. Calcium channel blockers have no role in HF. Their depressant effect on the heart may worsen HF

**Question 6**

An elderly patient presents with heart block and a raised potassium. The most likely drug to have caused these effects is?

A Digoxin

B Captorpil

C Metoprolol

D Verapamil

Explanation A

Digoxin inhibits the membrane NA/K ATPase pump, which leads to an increase in intracellular calcium and increased EXTRACELLULAR potassium. Digoxin also enhances vagal tone resulting in decreased SA and AV node conduction velocity.

In acute digoxin toxicity-hyperkalaemia of any magnitude is an important early sign of severe digoxin toxicity

In chronic toxicity- digoxin intoxication commonly develops in the context of intercurrent illness, particularly those that lead to renal impairment and digoxin elimination.

Digoxin immune Fab is the antidote.

Note: Hyperkalaemia is not treated with calcium due to the already elevated levels of calcium intracellular (from the digoxin effect)

**Question 7**

The endogenous anticoagulant antithrombin III inhibits all the following clotting factors EXCEPT

A IXa

B Va

C Xa

D IIa

Explanation B

Antithrombin III inhibits factors IIa, IXa, Xa, Xia and XIIA

Endogenous protein C and S inhibit factors Va and VIIIA

**Question 8**

In normal cells, which of the following drugs shortens the refractory period?

A Quinidine

B Amiodarone

C Procainamide

D Lignocaine

Explanation D

Amiodarone class 1A III, prolongs AP/QRS and ERP.

Sotalol class III-prolongs QT and ERP.

Quinidine class 1A Prolongs AP/QRS but also prolongs ERP/QT.

Lignocaine class 1B- only effects ischaemic tissue and shortens the ERP.

Procainamide class 1A prolongs AP/QRS and prolongs ERP/QT.

Flecainide class 1C does not prolong the AP and has no effect on the QT interval. They increase the QRS duration

NOTE: lignocaine has only a minimal effect on normal cardiac cells. I have not however changed the stem of the question

**Question 9**

Regarding digoxin, which of the following answers are correct?

A It is a negative inotropic

B It increases ventricular excitability

C It inhibits central vagal effects

D It has atropine like effects on heart acetylcholine receptors

Explanation B

Digoxin is a positive inotrope. It increases ventricular excitability, which increases contraction, ventricular ejection, and cardiac output. The increased output eliminates the stimuli evoking increased sympathetic outflow; both heart rate and vascular tone diminish. With decreased end diastolic fiber tension (the result of increased systolic ejection and decreased filling pressure), heart size and oxygen demand decreases. Finally, increased renal blood flow improves glomerular filtration and reduces aldosterone driven sodium reabsorption. It has cardioselective parasympathomimetic effects. Cardiac glycosides inhibit the Na/K ATPase pump. Low K and MG and a high CA potentiate digitalis

**Question 10**

All of the following drugs may increase the effect of digoxin except?

A Frusemide

B Amiodorone

C Verapamil

D Carbamazepine

Explanation D

Other drugs, which potentiate digoxin effect, include: quinidine, NSAIDs, calcium channel blocker- (not in humans though). Antibiotics that alter gut flora may increase bioavailability, and catecholamines may sensitize the myocardium to digitalis-induced arrhythmias.

Verapamil and amiodarone reduce digoxin clearance. The current textbook states that quinidine causes a well documented reduction in the clearance of digoxin and can increase the serum digoxin level if the dose is not adjusted. Several other drugs have the same effect e.g. amiodarone and verapamil.

From the Australian medicine handbook: INTERACTIONS: amiodarone + digoxin. Amiodarone increases digoxin concentration and risk of toxicity and also has additive effects in slowing cardiac conduction. If using together, halve digoxin dose and monitor digoxin concentration; watch for bradyarrhythmia and ECG changes; adjust digoxin dose further if needed. Verapamil + digoxin Verapamil increases digoxin concentration and risk of toxicity; this is dose-dependent. Verapamil also has additive negative effects on heart rate and cardiac conduction; monitor digoxin concentration and clinical effects; reduce digoxin dose as required.

**Question 11**

Which of the following statements regarding adenosine is correct?

A Its receptors are ion channels

B It has a half life of 2 minutes

C It enhances potassium conductance

D It increases AV nodal conduction

Explanation C

Adenosine binds to a G protein receptor and activated CAMP. Its mechanism of action involves enhanced potassium conductance and inhibition of CAMP induced calcium influx. The result of these actions are marked hyperpolarization and suppression of calcium dependent action potentials. It is the drug of choice for the termination of supraventricular tachycardia as it directly inhibits AV nodal conduction and increases the AV node refractory period. It has less effect on the SA node. Half-life <10s. It is less effective in the presence of adenosine receptor blockers such as theophylline, caffeine and increased by adenosine uptake inhibitors such as dipyridamole

**Question 12**

Which of the following drugs does not prolong the refractory period of normal cells?

A Lignocaine

B Amiodarone

C Sotalol

D Quinidine

Explanation A

See Q8

**Question 13**

Which of the following statements regarding verapamil is correct?

A It inhibits activated and inactivated sodium channels

B It is a positive inotrope

C It is an example of a class IV antiarrhythmic

D It is a dihydropyridone

Explanation C

Verapamil is a negative inotropic drug (calcium channel blocker). It slows conduction through the SA and the AV nodes.

Blockade of the calcium channel results in a decrease in cardiac contractility, a decrease in the sinus node pacemaker rate, and AV node conduction velocity.

It blocks L type voltage gated calcium channels.

It is not part of the dihydropyridine group

**Question 14**

When given orally, what is the calcium channel blocker with the most rapid onset of action?

A Verapamil

B Felodopine

C Diltiazem

D Nifedipine

Explanation D

Diltiazem-oral onset of action >30m. Nifedipine-oral onset of action 5-20m. Verapimil-oral onset of action is 30m. Felodipine oral onset of action is 2-5hrs

**Question 15**

Which of the following statements about Adenosine is CORRECT?

A It is drug of choice in VT

B It has a half life of only minutes

C It enhances potassium conductance

D It decreases SA nodal conduction

Explanation C

Adenosine binds to a G protein receptor and activated CAMP. Its mechanism of action involves enhanced potassium conductance and inhibition of CAMP induced calcium influx. The result of these actions are marked hyperpolarization and suppression of calcium dependent action potentials. It is the drug of choice for the termination of supraventricular tachycardia as it directly inhibits AV nodal conduction and increases the AV node refractory period. It has less effect on the SA node. Half-life <10s. It is less effective in the presence of adenosine receptor blockers such as theophylline, caffeine and increased by adenosine uptake inhibitors such as dipyridamole

**Question 16**

Which of the following statements regarding adenosine is corrrect?

A It has a half life of 10 mins

B It opens chloride channels

C It blocks calcium dependant action potential

D It profoundly blocks SA node

Explanation C

Adenosine binds to a G protein receptor and activated CAMP. Its mechanism of action involves enhanced potassium conductance and inhibition of CAMP induced calcium influx. The result of these actions are marked hyperpolarization and suppression of calcium dependent action potentials. It is the drug of choice for the termination of supraventricular tachycardia as it directly inhibits AV nodal conduction and increases the AV node refractory period. It has less effect on the SA node. Half-life <10s. It is less effective in the presence of adenosine receptor blockers such as theophylline, caffeine and increased by adenosine uptake inhibitors such as dipyridamole

**Question 17**

Which of the following statements regarding verapamil is correct?

A It is a positive inotrope

B It increases myocardial contractility

C It blocks active and inactive Ca++ channels (L type)

D It causes skeletal muscle weakness

Explanation C

Verapamil is a negative inotropic drug (calcium channel blocker). It slows conduction through the SA and the AV nodes.

Blockade of the calcium channel results in a decrease in cardiac contractility, a decrease in the sinus node pacemaker rate, and AV node conduction velocity.

It blocks L type voltage gated calcium channels.

It is not part of the dihydropyridine group

Verapamil does not cause skeletal muscle weakness as this tissue relies on intracellular calcium for excitation-contraction coupling.

**Question 18**

Regarding prazosin, which of the following statements is correct?

A It reduces afterload and preload

B It is non-selective alpha 1 blocker

C It is useful in treating hyperlipidaemia

D It has a half life is 18 hours

Explanation A

Prazosin is a selective alpha one blocker. It dilates both resistance and capacitance vessels. It has a half life of 3hrs. It may beneficailly alter lipid levels, but this has not shown to be of any clinical benefit. It does not cause a lupus like syndrome although you may get positive blood tests (reflecting lupus). It can cause a first dose hypotensive response

**Question 19**

Regarding drug-mechanism of action, which of the follwoing is the correct pairing?

A Acetazolamide - distal loop of Henle

B Triamterene - ascending loop of Henle

C Thiazides - DCT

D Frusemide - collecting duct

E Spironolactone - loop of Henle

Explanation C

Triamterene works on the collecting tube.

Amiloride-collecting tube.

Spironolactone-DCT and CT.

Frusemide-Loop of Henle.

Acetazolamide-PCT

**Question 20**

Regarding GTN, which of the following statements is correct?

A It has a moderate incidence of MetHb

B It works via NO and cGMP

C Tolerance is due to an accumulation of sulfhydryl groups

D It works well to increase coronary blood flow in atherosclerosis

Explanation B

GTN releases nitric oxide (NO) -which is a potent vasodilator - via an enzymic reaction. NO activates of guanylyl cyclase and an increase in cGMP. Which are the first steps toward smooth muscle relaxation. Tolerance is due to a decrease in sulfhydral groups, and it can only be partially reversed or prevented with a sulfhydral-regenerating agent. It may dilate coronary arteries. However, if you have a concentric atheroma in the artery it won’t dilate (eccentric atheroma may still dilate). GTN cause a very low incidence of MetHb.

Extra: Regarding coronary blood flow, in regions affected by atherosclerosis the autoregulatory mechanisms of coronary circulation result in maximal dilation of the affected vessel. Administration of nitrates has minimal effect on these vessels, but dilation of surrounding unaffected vessels may in fact reduce perfusion to regions affected by atherosclerosis - coronary steal. The anti-anginal effect of nitrates is secondary to reduce preload and afterload, both of which reduce cardiac work and therefore myocardial oxygen demand.

**Question 21**

Regarding calcium channel blockers, which of the following statemetns is correct?

A Diltiazem is the prototypical dihydropyridine

B Verapamil slows AV conduction

C They are classified as group II antiarrhythmics

D Causes postural hypotension

Explanation B

Verapamil is a negative inotropic drug (calcium channel blocker). Blockade of the calcium channel results in a decrease in cardiac contractility and a decrease in the sinus node pacemaker rate and on the AV node conduction velocity. It slows conduction through the SA and the AV node. It blocks L type voltage gated calcium channels. Verapamil and diltiazem are not part of the dihydropyridine group. They are classified as type IV antiarrhythmics. In the vascular system , arterioles appear to be more sensitive than veins: orthostatic hypotension is not a common side effect

**Question 22**

Regarding propranolol, which of the following statements is correct?

A It is beta 1 selective

B It has Na+ blocking activity

C It is minimally lipid soluble

D It has intrinsic sympathomimetic activity

Explanation B

Propanolol is a non-selective beta receptor blocker. It has no sympathomimetic activity. It is highly lipid soluble and readily crosses the BBB. Because of its Na channel blocking activity, it causes widening of the QRS, and may lead to VF arrest in overdose. It causes seizures in overdose as it crosses the BBB. Treatment is bicarbonate. Half life 3.5-6hrs

**Question 23**

Regarding nitrates, which of the following statements is correct?

A They cause significant Methaemaglobinaemia

B They increase collateral flow even if there is a fixed constriction

C They cause an increase in LVED volume

D Arteries respond to nitrates at lower doses than veins

Explanation B

GTN releases nitric oxide (NO) - which is a potent vasodilator-via an enzymatic reaction. NO activates of guanylyl cyclase and an increase in cGMP. Which are the first steps toward smooth muscle relaxation.

GTN cause a very low incidence of MetHb. LVED volume decreases.

Veins respond to nitrates at lower doses than the arteries.

Tolerance is due to a decrease in sulfhydral groups, and it can only be partially reversed or prevented with a sulfhydral-regenerating agent.

It may dilate coronary arteries; however, if you have a concentric atheroma in the artery it won’t dilate (eccentric atheroma may still dilate). If the collateral arteries are not affected, then even with a concentric atheroma, the collaterals will dilate and increase flow.

Extra: If no collaterals have formed, beware risk of CORONARY STEAL SYNDROME. Given distal to circumferential plaque is maximally dilated, other vessels will dilate and blood will preferentially follow path of least resistance- paradoxically reducing flow to affected area (more common with dypiridamole than nitrates)

**Question 24**

Which of the following statements regarding diazoxide is NOT true?

A It does not cause salt and water retention

B Is used to treat severe hypertension

C It is an arteriolar dilator

D Is chemically similar to thiazide diuretics

Explanation A

Diazoxide is chemically similar to thiazide diuretics but with no diuretic effect. It is a predominantly arteriolar vasodilatator with little effect on venous smooth muscle. Arteriolar vasodilatation results in reflex sympathetic stimulation, leading to tachycardia and fluid retention. indication: hypertensive emergency

**Question 25**

Which of the following statements regarding hydralazine is correct?

A Is a useful drug in the treatment of pre-eclampsia

B It causes an abrupt but transient fall in blood pressure

C It causes postural hypotention

D It dilates veins and not arterioles

Explanation A

Hydralazine dilates arterioles and not veins.

Tachyphylaxis to hypertensive effects develops rapidly.

Half life of 2-4hrs.

In patients with ischaemic heart disease, reflex tachycardia and sympathetic stimulation may provoke angina or ischaemic arrhythmias.

Hydralazine relaxes smooth muscle of arterioles. Decreased arterial resistance and decreased mean arterial blood pressure elicit compensatory responses, mediated by baro-receptorsand the sympathetic nervous system, as well as renin, angiotensin and aldosterone. Because sympathetic reflexes are intact, vasodilatory therapy does not cause orthostatic hypotension.

It a drug used widely in the treatment of pre-eclampsia

**Question 26**

Which of the following drugs is the most lipid soluble beta blocker?

A Metopralol

B Sotalol

C Propranolol

D Atenolol

Explanation C

Lipid solubility for propanolol is high; Atenolol-low; metoprolol-moderate; and sotalol-low

**Question 27**

Which of the following statements regarding propranolol is correct?

A It is poorly lipid soluble

B It is a highly selective beta receptor antagonist

C It has an oral bioavaliability of > 50 %

D It has sodium channel blocking action

Explanation D

Propranolol is a non-selective beta receptor blocker. It has no sympathomimetic activity. It is highly lipid soluble and readily crosses the BBB. Because of its Na channel blocking activity, it causes widening of the QRS and VF arrest in overdose. It causes seizures in overdose as it crosses the BBB. Treatment is bicarbonate. Half-life 3.5-6hrs. Bioavailability is 30% and dose dependent

**Question 28**

The CAST ONE trial highlighted the adverse effects of which of the following drugs?

A Sotalol

B Flecanide

C Metoprolol

D Verapamil

Explanation B

The trail looked at the benefit of treated PVCs post AMI (even if asymptomatic PVCs) with antiarrhytmics to prevent sudden death. The trail concluded that those patient treated with Flecaninde and encainide (no longer available) were at an increased risk (more than two fold) compared with patients that were given a placebo

**Question 29**

All of the following anti-hypertensive drugs act directly on vascular smooth muscle EXCEPT?

A Indapamide

B Prazosin

C Hydralazine

D Nitroprusside

Explanation B

Prazosin selectively blocks alpha1 receptors on the vascular smooth muscles in arterioles and venules. Prazocin does not act directly on the vessel. Although Indapamide is known to have a direct vasodilating effects on the vessel, by inhibiting the passage of calcium, it is considered more of a diuretic than a vasodilator. Sodium nitroprusside's direct vasodilatory effect is via increased intracellular cGMP (it also releases NO from drug and endothelium). Hydralazine's direct effect is via release of NO from drug and endothelium). Hydralazine dilates arterioles but not venules

I am not sure that this is the correct answer. I have added another thought form a user:

Prazosin directly blocks a cell surface receptor on the SM cell - fairly direct as actually drug touches the cell

Indapamide seems to be a thiazide similar diuretic but also apparently reduces Ca++ entry to SM cells - equally direct as prazosin as again touches the cell

Hydralazine apparently requires the endothelium to make NO for the SM cell, so acts on endothelium, not SM cell,

Nitroprusside needs to enter RBC to react with Hb to give off NO which then goes to SM cell, so acts on RBC, not SM cell, less direct...

**Question 30**

Which of the following drugs causes iatrogenic diabetes insipidus?

A Lithium

B Amiloride

C Triamterene

D Frusemide

Explanation A

Amiloride and triamterene are potassium sparing diuretics.

Lithium appears to affect the tubules by entering the collecting tubule cells by sodium channels, accumulating and interfering with the normal response to ADH. Nephrogenic diabtes insipidus occurs. The mechanism is not fully understood

Note: demeclocycline (a tetracycline antibiotic can also cause DI)

Frusemide is a loop diuretic

**Question 31**

Regarding carbonic anhydrase inhibitors, which of the following statements is correct?

A They decrease the pH of CSF

B All of the above

C They were developed from early antibiotics

D They cause metabolic acidosis

Explanation B

CAI are unsubstituted sulfonamide derivatives and were developed when it was noted that bactriostatic sulfonamides caused an alkaline duiresis and a hyperchloremic metabolic acidosis. Formation of CSF by the choroid plexus involved bicarbonate secretion into the CSF. This process is significantly inhibited by CAI, which in both cases dramatically alter the pH and the quantity of the fluid produced

**Question 32**

Which of the following statements regarding diuretics is not true?

A Furosemide is used in the prophylaxis of acute mountain sickness

B Loop diretics can be used to treat hypercalcemia

C Hydrochlorothiazide is useful in treating nephrogenic diabetes insipidus

D Cirrhotic patients respond to spironolactone

Explanation A

Acetazolamide is the drug of choice in the management of mountain sickness. Mountain sickness symptoms can be diminished by acetazoleamide by decreasing cerebro-spinal fluid formation (inhibition of HCO3 secretion into the CSF) and by decreasing the pH of CSF and brain.

Note: Hypercalcaemia can be a medical emergency. Loop diuretics reduce Ca reabsorption significantly and can be quite effective in promoting Ca diuresis. However, loop diuretics alone can cause marked volume contraction. If this occurs, loop diuretics are ineffective (and potentially counterproductive) because Ca reabsorption in the proximal tubule would be enhanced. Therefore, NACL must be administered simultaneously with loop diuretics if an effective Ca diuresis is to be maintained. The usual approach is to infuse NACL and frusemide IVI. Once the diuresis occurs, you match the NACL infusion to cover the volume of diuresis to avoid volume depletion

The proposed mechanism of action of HCTZ for nephrogenic diabetes insipidus: An initial reduction of sodium reabsorption in the distal tubule increases sodium excretion and causes extracellular fluid volume contraction. As a result, the glomerular filtration rate decreases and the proximal tubular sodium and water reabsorption increases. Consequently, less water and sodium are delivered to the collecting tubules and, as a result, less water is excreted

Furosemide-not a preferred treatment for altitude sickness: furosemide will assist in removing fluid from the lungs in HAPO and reverse the suppression of urine brought on by altitude. However, furosemide can also lead to collapse from low volume shock if the victim is dehydrated.

**Question 33**

Which drug is not appropriately matched to its site of action?

A Triamterene and the descending loop of Henle

B Spironolactone and the collecting duct

C Frusemide and the ascending loop of Henle

D Thiazides and the proximal part of the distal tubule

Explanation A

Triamterene- a potassium sparing diuretic- works on the collecting tube.

Amiloride-collecting tube.

Spironolactone-DCT and CT.

Frusemide- ascending loop of Henle.

Acetazolamide-PCT

**Question 34**

Which of the following statements regarding sodium nitroprusside is correct?

A It decreases vascular resistance but increases blood pressure

B It increases cGMP by release of nitric oxide

C It has its onset of action in 10-15 minutes

D It is predominantly an arteriodilator

Explanation B

Sodium nitroprusside is a powerful, parenterally administered, vasodilator that is used in hypertensive emergencies as well as severe cardiac failure. It dilates both arterioles and veins resulting in both peripheral vascular resistance and venous return. The action occurs as a result of activation of guanylyl cyclase, either via release of NO or by direct stimulation of the enzyme. The result is increased intracellular cGMP, which relaxes vascular smooth muscle. Onset is quick with effects disappearing in 1-10minutes after discontinuation

**Question 35**

Which of the following statements regarding ACE inhibitors is correct?

A They directly inhibit angiotensin receptors

B They cause a concomitant reduction in bradykinin

C They can cause angioneurotic oedema

D They work predominantly by venodilation

Explanation C

Increased tissue bradykinin is produced when ACE is inhibited acts on B2 receptors to produce the annoying cough (in up to 20% of patients)

ACE inhibitors not only block the conversion of ANG I to ANG II but also inhibit the degradation of other substances including bradykinin, substance P and enkephalins. The action of ACE inhibitors to inhibit bradykinin metabolism contributes significantly to the hypotensive action and is responsible for some adverse effects, including cough and angioedema. These drugs are contraindicated in pregnancy because they cause foetal kidney damage.

ACE inhibitors are directed against the active site of the angiotensin converting enzyme. Angiotensin receptor antagonists selectively compete at the AT I receptor

**Question 36**

Which of the following statements regarding hydralazine is correct?

A It is not effective in the treatment of eclampsia

B Tachyphylaxis to its antihypertensive effects develop rapidly

C It is predominantly a venodilator

D It does not cause fluid retension

Explanation B

Hydralazine vasodilates arteries and arterioles not veins. Tachyphylaxis to its antihypertensive effects develops rapidly. Half life of 2-4hrs. In patients with ischaemic heart disease, reflex tachycardia and sympathetic stimulation may provoke angina or ischaemic arrhythmias. Addition of a beta blocker to prevent this reflex tachycardia is recommended Is recommended as one of the blood pressure lowering drugs of eclampsia. Hydralazine may also increase plasma renin concentration, resulting in fluid retention. Some texts quote hydralazine having a biphasic control of BP.

Note:the older editions of Katzung-the wording is such "tachyphylaxis to its hypertensive effects develop radpidly"

In the new edition it has been corrected "tachyphylaxis to its ANTI-hypertensive efffects develop rapidly"

**Question 37**

Which of the following statements regarding frusemide is correct?

A It has no effect on digoxin function

B It is more potent than triamterene

C It causes hypocalcaemia

D It causes hyperkalaemia

Explanation B

Frusemide is a diuretic. Its site of action is the ascending loop of Henle. Because it causes hypokalaemia, it can potentiate the effects of digoxin. It is used in the treatment of acute hypercalcaemia together with IVI fluids

Note: Hypercalcaemia can be a medical emergency. Loop diuretics are very useful in promoting Ca diuresis. However, loop diuretics alone can cause marked volume contraction. If this occurs loop diuretics are ineffective, because Ca reabsorption in the PCT would be enhanced. Therefore, saline must be administered simultaneously with loop diuretics if an effective diuresis is to be maintained

Loop diuretics can also cause hypercalcaemia in volume depleted patients who have another, previously occult, cause for hypercalcaemia such as metastatic breast/lung CA

Loop diuretics do not GENERALLY cause hypocalcaemia. However in disorders that cause hypercalcaemia, Ca excretion can be usefully enhanced by treatment with loop diuretics combined with saline infusions

Triamterene is a potassium sparing diuretic that works like amiloride. It is however less potent as a potassium sparing diuretic and more toxic.

**Question 38**

Which of the following statements regarding nitrates is INCORRECT?

A They demonstrate tachyphylaxis/tolerance

B They increase collateral coronary blood flow

C They cause water and sodium retention

D They demonstrate physical dependance

Explanation D

With continous exposire to nitrates, isolated smooth muscle may develop complete tolerance (tachyphylaxis), and the intacthuman becomes progressively more tolerant when long acting preperations (oral, transdermal) or continous intravenous infusionsare used for more than a few hours without interruption

There is no evidence that physical dependence develops as a result of the therapeutic use of short-acting nitrates for angina, even in large doses

Increasing collateral blood flow is a potential benefit of nitrates

Sodium and water retention may be significant with intermediate and long acting nitrates

**Question 39**

Which of the following statements regarding ACE inhibitors is correct?

A They can cause angioedema

B They are safe in pregancy

C They have no effect on bradykinin

D They do not interact with NSAID

Explanation A

The use of ACE inhibitors is contraindicated in the second and third trimester of pregnancy because of the risk of fetal hypotentsion, anuria, and renal failure. They are sometimes associated with fetal malformation and death. NSAIDs may may impair the hypotensive effects of the ACE inhibitors by blocking bradykinin mediated vasodilitation. The ACE inhibitor’s hypotensive effect results form both an inhibitory action on the rennin angiotensin system and a stimulating action on the kallikrein-kinin system.

**Question 40**

Which of the following statements regarding mannitol is correct?

A It is metabolised to glycerol

B It inhibits H2O absorption in proximal tubule, loop of henle, and collecting tubule

C It is of no value when renal haemodynamics are compromised

D It decreases TBW and total body cation content equally

Explanation B

Mannitol is not metabolized and is handled primarily by glomerular filtration, without any important tubular reabsorption or secretion. It is excreted within 30-60minutes. Mannitol primarily increases urine volume. There is a decrease in contact time between the water and tubular epithelium. As a result of this there is a reduction in sodium reabsorption. However the resulting natriuresis is of lesser magnitude that the water diuresis, leading eventually to a hypernatraemia

Mannitol elevates blood plasma osmolality, resulting in enhanced flow of water from tissues, including the brain and cerebrospinal fluid, into interstitial fluid and plasma

**Question 41**

Which drug causes severe hypotension in patient with dehydration?

A Bretylium

B ACE inhibitor

C Calcium channel blockker

D Digoxin

Explanation B

The Angiotensin converting enzyme inhibitors (ACE) can cause severe hypotension after initial dosing in patients who are hypovolaemic due to diuretics, salt restriction, or gastrointestinal fluid loss. Other adverse effects common to all ACE inhibitors include: hyperK, acute renal failure, dry cough and angiodema. ACE inhibitor use in second and third trimester of pregnancy is contraindicated due to the risk of foetal hypotension, anuria, and renal failure.

**Question 42**

Which is true regarding Glyceryl trinitrate?

A Glyceryl trinitrate has a useful antiplatelet action

B Glyceryl trinitrate is denitrated to glyceryl dinitrate and nitric oxide

C Glyceryl trinitrate is not useful in Prinzmetal's angina

D Glyceryl trinitrate causes no change in afterload

Explanation B

Gylceral trinitrate is denitrated to 1,2 glyceryl dinitrate and nitric oxide. Nitroglycerin relaxes all types of smooth muscle regardless of the cause of the preexisitng muscle tone. It has practically no direct effect on cardiac or skeletal muscle. Both the veins and arteries relax in response to GTN. Veins however, respond at lower doses. Preload is lowered as the capcitance vessels vasodilate. Arterial pressure decreases (afterload), end diastolic volume and ejection time decreases, and their is a reflex increase in heart rate and contractility (via the baro-receptors). GTN is beneficial in patients with variant angina (Prinzmetal's angina) by relaxing the smooth muscle of the epicardial coronary arteries and relieving coronary artery spasm. GTN is responsible for a decrease in platelet aggregation, but studies have not proven to show a benefit in survival when GTN is used in ana cute AMI (as a n antiplatelet agent)

**Question 43**

 Which of the following local anaesthetics shortens the action potential duration?

A Prilocaine

B Lignocaine

C Bupivacaine

D Ropivacaine

Explanation B

Class 1b antiarrhytmic drugs shorten the action potential. Lignocaine is a 1b antiarrhythmic drug. Other drugs include mexiletine. Class 1a lengthens the action potential and class 1c does not affect the action potential. Lignociane is the drug of choice for the termination of ventricular tachycardia and prevention of ventricular fibrillation after cardioversion in the ischaemic setting.

**Question 44**

Which of the following mechanisms of action best describes moxonidine?

A Alpha 2 receptor agonist

B Imidazoline receptor agonist

C Ganglion blocking agent

D Tyrosine kinase receptor inhibitor

Explanation B

Moxonidine is a new generation centrally acting antihypertensive drug. Moxonidine is a selective agonist at the imidazoline receptor. The receptor is found in the both the ventero-lateral pressor and ventromedial depressor area of the medulla. It therefore causes a decrease in the sympathetic nervous system activity and a decrease in blood pressure

**Question 45**

What is the elimination half life of metoprolol?

A 6-9hrs

B 3-4hrs

C 3,5-6hrs

D 5hrs

Explanation B

Metoprolol: 3-4hrs

Atenolol: 6-9hrs

Labetalol: 5hrs

Propanolol: 3.5-6hrs