HEART PHYSIOLOGY MCQ

2008

1- Cardiac Valves:

a- Prevent backflow of blood from the ventricles to the atria during diastole.

b- The cusps of the semilunar valves attached to the papillary muscles

c- The cusps of the AV valves pulled inward toward the ventricles during systole.

d- Normally allow flow of some blood to the atria during ventricular systole.

2- All are the functions of the atrium EXCEPT:

a- A blood reservoir.

b- Atrial systole is followed by ventricular systole

c- Pump the blood to the ventricle.

d- Contracts weakly to help move the blood into the ventricle.

3- Cardiac cells:

a- Represent 90 % of the total volume of the heart.

b- Are rich in mitochondria (30% of cell volume) as in skeletal muscle.

c- Contain sarcoplasmic reticulum which takes up Ca2+ during contraction cycle.

d- They function as a syncytium.

4- All are the functions of the intercalated disks EXCEPT:

a- Connect two adjacent cardiac cells.

b- Provide strong union between fibers.

c- Connect actin filaments of adjacent cells at M lines.

d- Contain gap junctions that allow electrical continuity between cardiac cells.

5- Cardiac gap junctions:

a- Composed of several ligand-gated channels permeable to ions.

b- Largely distributed in AV node.

c- Are Low-resistance intercellular junctions.

d- Are little in Purkinje fibers.

6- Dystrophin:

a- A rod like structure connects the actin filaments of two adjacent cardiac cells.

b- Connects actin with extracelular matrix.

c- Helps platelets adhesion.

d- When dysfunctioned the connection between cardiac cells becomes slow.

7- Titin:

a- Very large elongated stiff protein.

b- Binds actin to the Z line.

c- Keeps myosin thick filaments centered in the sarcomere.

d- When dysfunctioned the heart is dialated abnormally in systole.

8- The resting cardiac cell membrane:

a- Is primarily permeable to K^+ ions.

b- Has resting membrane potential - 65 mV.

c- Favors inward movement of K^+ ions at -85 mV.

d. Influenced by extra-cellular Na+ ion concentration.

9- The cardiac resting membrane potential (RMP):

a- The delayed rectifying potassium channels are responsible for establishing the RMP.

b- At both low and high K+ concentrations, the membrane becomes less excitable.

c- Is about -85 mV in the ordinary cardiac cells.

d- When extracellular K+ ions is decreased to very low levels, the Na-K pump is enhanced.

10- The inwardly rectifying K^+ channels:

a- Responsible for establishing the resting membrane potential at -100 mV.

b- Favor inward movements of K^+ ions at membrane potential -65 mV.

c- Inactivate with time.

d- Conduct outward current physiologically.

11- Regarding "cardiac action potential" all the followings are correct EXCEPT:

a- Transient depolarization-repolarization.

b- At threshold voltage, the membrane becomes primarily permeable K+ ions.

c- The membrane resists any change from the polarized state.

d- Has long duration from 200 to 300 msec.

12- The cardiac fast voltage- gated Na^+ channels:

a- Conduct inward current (INa) that responsible for slow action potential upstroke.

b- INa depolarizes the membrane to levels of activation of inward Ca2+ & outward K+ currents.

c- Quickly depolarize the membrane to +47 mV.

d- Blocked by dihydropyridines “DHP”.

13- The followings cause the first rapid repolarization of cardiac ventricle EXCEPT:

a- Rapid inactivation of INa

b- Transient efflux of K+

c- Transient influx of Cl-

d- Rapid influx of Ca+.

14- Regarding "the plateau of ventricular action potential" all are correct EXCEPT:

a- Unique to cardiac cell.

b- Provides sustained depolarization and contraction needed to empty the heart.

c- Prevents premature activation.

d- Maintained by balance between inward Na^+ current and outward K^+ current.

15- Regarding "L- type Ca2+ current (Ica-L)" all are correct EXCEPT :

a- Ligand operated current.

b- Blocked by dihydropyridines (DHP).

c- Induces Ca^{2+} release from SR.

d- Inactivated very slowly.

16- The terminal part of cardiac plateau is prolonged by:

a- Electrogenic Na-K ATPase pump.

b- Ca2+-induced Ca2+ release.

c- Spontaneous diastolic depolarization.

d- Electrogenic Na+/Ca2+ exchanger.

17- Delayed outward rectifier K^+ channels:

a- Repolarizes the cell back to - 85 mV.

b- Voltage operated channels deactivated at +10 mV.

c- Activated during the late repolarization phase.

d- Activated during the plateau phase competing with the inward Ca2+ current.

18- Regarding the refractory period (RP) of cardiac muscle:

a-Tetanus can not occur because absolute RP occupies part of systole.

b- Extra-systole occurs after diastole.

c- Fatal ventricular fibrillation may occur during 1st half of diastole.

d- Vulnerable period is a critical period coincides with the 2nd half of diastole.

19- The contractile response of the cardiac muscle:

a- Lasts 2 times the action potential.

b- Begins just with the start of depolarization.

c- Systole reaches its maximum by the end of plateau.

d- The 2nd half of diastole coincides with the late rapid phase of re-polarization.

20- The sinoatrial (SA) node tissue:

a- Characterized by spontaneous systolic depolarization.

b- Initiates repetitive contractions.

c- The spontaneous depolarization starts at -65 mV.

d- Has stable resting membrane potential.

21- Nodal action potential:

a- Has rapid upstroke because of presence of fast sodium current (INa).

b- There is no plateau because of rapid onset of potassium-dependent repolarization.

c- Fires at -65 mV and depolarization initiates the nodal action potential.

d- Has an apex up to 20 mV.

22- All are the characters of SAN action potential EXCEPT:

a- Unstable resting membrane potential.

b- Slow upstroke.

c- Activation of T-Ca^{2+} channels at E_m -50 mV.

d- Balance between depolarization & repolarization at +10 mV.

23- All are the pacemaker currents in SAN EXCEPT:

a- Inward rectifying K+ current 'Ik1' .

b- Inward funny current ‘ If ’.

c- Background inward current (Ib).

d- Slow inward nodal calcium currents.

24- The inward funny current ‘ If ’ of the SAN:

a- Activated at the apex of the action potential.

b- Is due to influx of both Na+ & K+ ions through a specific ion channel.

c- Remains when all other currents are blocked.

d- Is due to the spontaneous inward movement of Na+ ions along its concentration gradient.

25- Regarding the slow inward nodal calcium currents the followings are correct EXCEPT:

a- Are essential for SA nodal pacemaker activity.

b- Explains the slowly rising depolarization phase of the action potential.

c- The transient T type Ca2+ channels opens first.

d- The long-lasting component activated before the transient component.

26- Pacemaker currents:

a- Present in all the conductive system.

b- When blocked there are "latent pace-maker" in Purkinje fibers.

c- Disappeared in denervated heart.

d- Present only in the SA node.

27- The SAN is the normal pace-maker of the HR because of the following EXCEPT:

a- Is more rapid than other parts of the conduction system.

b- Discharges at a rate from 90 to 105 /min.

c- Is slowed by the tonic vagal discharge.

d- Discharges spontaneously after other parts of the conductive system.

28- Vagal nerve stimulation to the heart:

a- Decreases the heart rate (+ve chronotropic effect).

b- Decreases the K+ conductance of the nodal tissue.

c- Hyperpolarizes the membrane.

d- Increases the conductance of the membrane to chloride ions.

29- Sympathetic nerve stimulation to the HR:

a- Has +ve chronotropic effect.

b- Increases intracellular cGMP via B_1 receptors.

c- Increases the rapidity of repolarization.

d- Facilitates opening of T-type Ca2+ channels.

30- All the followings have +ve chronotropic effects EXCEPT:

a- Most types of fever.

b- Administration of digitalis.

c- Atropine.

d- Beta-1 adrenergic stimulation.

31- Regarding the excitation-contraction coupling in cardiac muscle:

a- Cardiac cells directly trigger Ryanodine (Ry) channel Ca^{2+} release.

b- Is an example of Ca induced Ca release (CICR) as all excitable muscles.

c- Blocked by dihydropyridine (DHP).

d- Calmodulin sufficiently induced relaxation.

32- The followings are the mechanisms lower intracellular Ca2+ and produce relaxation EXCEPT:

a- Sarcoplasmic reticulum ATP-dependent Ca2+ reuptake.

b- Na+-Ca2+ exchanger.

c- Calmodulin.

d- Inhibition of Na-K pump.

33- Ca^{2+} released from Sarcoplasmic reticulum (SR) in cardiac cells:

a- Binds with tropomyocin to initiate contraction.

b- Partially buffered by mitochondria.

c- Pumped back to SR that inhibited by digitalis.

d. Exchanged with extra- cellular K+.

34- When a cardiac muscle strip is stretched by a load and stimulated:

a- Maximal developed tension occurs with maximal stretching length.

b- The tension increases without shortening causing isometric contraction.

c- The muscle contracts and shortens isotonically with further increase in tension.

d. The length at which the load is lifted is the afterload.

35- In the whole intact heart all the followings are correct EXCEPT:

a- The length of the muscle fiber is proportionate to the end-diastolic volume.

b- The tension developed is proportionate to the pressure developed in the ventricle..

c- The preload is the degree to which the myocardium is stretched before it contracts

d. The afterload equals the end diastolic pressure.

36- Regarding the afterload in the whole intact heart :

a- Is the resistance against which blood is expelled.

b- It equals the end systolic pressure

c- Approximately equals the aortic pressure.

d. All of the above.

37- The performance of the cardiac muscle can be measured by the followings EXCEPT:

a- The ejection fraction (EF).

b- The extent of shortening (ΔL) .

c- The velocity of shortening (dl/dt).

d- The rate of frequency (b/min).

38- The performance of cardiac muscle is affected by:

a- Mechanical determinants (preload and contractility).

b- Heart rate.

c- Contractility that depends on preload and afterload

d- All of the above

39- Regarding the extent and velocity of shortening of the cardiac muscle:

a- Increased by increments in preload.

b- Decreased by increments in after-load.

c- Raised by decrease in after-load.

d- All of the above.

40- In length-tension curve of the cardiac muscle all of the followings are correct Except:

a- Increasing preloads is associated with increasing in extent of shortening.

b- Increasing afterloads is associated with decreasing in extent of shortening.

c- At the same level of preload and afterload, -ve inotropic stimulus shifts the curve upwards and to the left.

d- More shortening occurs with +ve inotropic stimulus.

41- The load-velocity curve of the cardiac muscle describes:

a- Direct relation with afterload.

b- Inverse relation with preload.

c- The muscle is faster and can shorten more at higher preload.

d- The muscle is faster with digitalis when afterload increased.

42- In the fundamental rules of the ECG all the following are right EXCEP:

a- It is a biphasic record of myocardial action potential fluctuations.

b- Deflection record occurs only during complete depolarization or repolarization.

c- +ve wave occurs when depolarizing current approaches the +ve terminal electrode of the meter.

d- -ve wave happens when repolarizing current approaches the +ve terminal electrode.

43- Regarding the causes of the ECG waves all the following are correct EXCEPT:

a- P wave by atrial depolarization.

b- QRS complex by ventricular depolarization.

c- T wave by ventricular repolarization.

d- U wave by papillary muscle depolarization.

44- The causes of the ECG “intervals”:

a- PR by AV nodal conduction.

b- ST by atrial repolarization.

c- QT by ventricular depolarization and ventricular repolarization.

d- All of the above.

45- In the ECG:

a- ST segment is part of depolarization & coincides with plateau.

b- T wave has the same voltage of QRS.

c- QRS & T wave are in the same direction.

d- QRS & T wave are in opposite directions.

46- The voltage of the ECG:

a- Is normal summation of QRS complexes in standard limb leads.

b- Is normally ≥1.5 mV.

c- Is low in individual having body mass index (BMI) 35.

d- All of the above.

47- Regarding the flow of electrical currents around the heart all the followings are correct EXCEPT:

a- From left to right in the mid portion of the ventricular septum.

b- From the base to the apex during almost depolarization.

c- From the epicardium to the subendocardium during repolarization.

d- From the epicardium to the subendocardium during depolarization.

48- Axis of the heart is:

a- Mean instantaneous vector of QRS complexes in vertical plane.

b- Normally from-30 to +60.

c- Deviated to left side in full term pregnant woman.

d- Deviated to right side in long slender person (e.g., +80).

49- The P-wave of normal ECG:

a- Has voltage and duration nearly equal 2.5 × 2.5 mm.

b- Is upright in aVR.

c- Represents right atrial depolarization in its second half.

d- Coincides with atrial systole.

50- The configuration of QRS complex in normal ECG:

a- Depends only on the direction of depolarizing current.

b- Is mainly positive in right ventricular surface pattern.

c- Exhibits growing R in chest leads.

d- Is positive in aVR.

51- As regards Q wave all the followings are correct EXCEPT:

a- Represents septal depolarization from left to right in $V_{5.}$

b- Its depth is not more than 1/4 its corresponding R.

c- Its duration is not more than 0.04 sec.

d- Deep and wide Q is seen in recent myocardial infarction.

52- In normal ECG:

a- The average duration of QT interval is 0.50 sec.

b- The ST segment is an isoelectric line.

c- The T wave is rounded and symmetrical.

d- The height of the T wave is > 10 mm in chest leads.

53- Regarding the Voltage of ECG:

a- Algebraic summations of QRS complexes in LI, II, & III

b- Normally from ≥ 1.5 mV to ≤ 3.5 mV

c- Low in obesity, hypothyroidism, and hypernatremia

d- High in ventricular hypertrophy and short stunted adult individuals

54- Regarding the PR interval of the ECG all the followings are correct EXCEPT:

a- Represents atrial depolarization and conduction through AV node.

b- Normal duration from 0.16 to 0.20 second.

c- Prolonged in right bundle branch block.

d- Prolonged in 1st degree heart block.

55- Regarding the ECG findings in atrial (A) arrhythmias all the followings are correct EXCEPT:

a- (A) fibrillation: caused by multiple atrial ectopic foci that discharged very rapidly and irregularly .

b- (A) tachycardia: paroxymal rapid and irregular rate (150-200 b/min).

c- (A) flutter: saw tooth waves associated with partial AV block.

d- (A) fibrillation: absence of P waves, very irregular rate and normal QRS.

56- Ventricular premature beat “VPB” is:

a- Caused by an ectopic ventricular focus that discharges regularly.

b- Preceded by P wave and has bizarre prolonged QRS.

c- Followed by a compensatory pause.

d- Occurs in series without normal beats in between.

57- All the followings cause low voltage ECG EXCEPT:

a- Hyponatremia.

b- Body mass index (BMI) > 35.

c- Hypothyroidim.

d- Hypokalemia.

58- Left axis deviation of the ECG is described when:

a- The axis of the heart is from -30° to +90 °.

b- The QRS complex is prominent positive in lead aVF.

c- The QRS is prominent positive in lead I and prominent negative in lead III .

d- Right ventricle is enlarged.

59- Regarding the ECG findings in heart block (HB) all the followings are correct EXCEPT:

a- Complete (HB): complete dissociation between P waves and QRS complexes.

b- 1st degree(HB): PR interval is abnormally long.

c- 2nd degree (HB): a ventricular beat may follow every 2nd or 3rd atrial beat.

d- 1st degree(HB): PR interval lengthens progressively until a ventricular beat is dropped.

60- The ECG findings of bundle branch block (BBB):

a- Associated with absence of P waves.

b- HR rate is slowed <60 b/min.

c- Double hump QRS complex occurs in V5 & V6 in right BBB.

d- QRS complexes are prolonged & deformed.

61- Regarding the ECG of ventricular hypertrophy (VH):

a- Axis of the heart is from - 30 ° to +90 ° in right VH.

b- S wave in V_1 or V_2 plus R wave in V_5 or V_6 account > 35 mm in left VH in adults.

c- S wave is deep in V_1 and V_2 and R wave is tall in V_5 and V_6 in right VH.

d- Right VH may occur in systemic hypertension.

62- Regarding the ECG findings of myocardial infarction (MI) all the following are correct EXCEPT:

a- Elevation of the ST segment in recent (acute) MI.

b- Deep and wide Q in old MI.

c- Low voltage in massive MI .

d- Prominent U wave.

63- The ECG findings in electrolyte imbalance:

a- Tall and peaked T wave in hypokalemia.

b- T wave inversion & prominent U wave in hyperkalemia.

c- Prolonged QT interval in hypocalcemia.

d- High voltage in hyponatremia.

64- Regarding the length of systole and diastole:

a- At heart rate 75 b/min, the duration of cardiac cycle is 0.8 s, divided equally into systolic and diastolic periods.

b- When the heart rate is increased diastole is shortened to a much greater degree than systole.

c- During diastole the heart rests and coronary blood flow to the epicardial portions of the left ventricle occurs.

d- At very high heart rates, filling is sufficient and cardiac output per minute is increased by an increase in rate.

65- Regarding atrial systole all the followings occurs EXCEPT:

a- The mitral and tricuspid valves are open and the aortic and pulmonary valves are closed.

b- Contraction of the atria pushes 30% of blood into the ventricles.

c- Contraction of the atrial muscle prevents regurgitation of blood into the veins.

d- P wave precedes atrial systole.

66- During isovolumetric ventricular contraction phase:

a- The mitral and tricuspid valves are close causing second heart sound.

b- The intraventricular pressure is increased without change in ventricular volume.

c- The atrioventricular valves bulge into the atria causing a drop in atrial pressure.

d- QRS complex coincides with ventricular contraction.

67- During ventricular ejection:

a- The left ventricular pressure is increased to 120 mmHg and that of the right ventricle to 80 mmHg.

b- Late in systole the momentum keeps the blood moving forward because the aortic pressure drops suddenly.

c- The amount of the blood ejected by each ventricle per cycle at rest is 130 mL.

d- The atrioventricular valves are pulled down and atrial pressure drops.

68- During isovolumetric ventricular relaxation phase all the followings are correct EXCEPT:

a- The closure of the semilunar valves produce the 2nd heart sound.

b- The intraventricular pressure decreases without change in ventricular volume.

c- When the ventricular pressure falls below the atrial pressure the atrioventricular valves open.

d- The rapid uptake of calcium by sarcoplasmic reticulum ends the ventricular relaxation.

69- Regarding the pressure-volume graph of the left ventricle:

a- A filling pressure of 5 mmHg causes the ventricle to fill actively to EDV of 130 ml.

b- When the heart is activated, it moves from the diastolic curve with low compliance to the systolic curve with high compliance.

c- During the period of ejection the muscle changes from isotonic to isometric contraction

d- The stroke volume is related indirectly to afterload through changes of the end systolic volume.

70- In Aortic Pressure Curve:

a- During ventricular systole the walls of the aorta and arteries are stretched causing systolic pressure 120 mm Hg.

b- The dicrotic notch occurs when the aortic valve opens.

c- Incisura is caused by forward flow of blood before closure of the valve.

d- The elastic recoil of walls of the aorta and arteries maintain a pressure 80 mm Hg (diastolic pressure).

71- Regarding the arterial pulse all the followings are correct EXCEPT:

a- The arterial pulse rate is much higher than the velocity of the blood flow.

b- The pulse wave moves faster in elderly.

c- The strength of the pulse is determined by the pulse pressure.

d- The pulse is thready in shock, weak in aortic regurgitation and strong during exercise.

72- During cardiac cycle the atrial pressure:

a- Rises during atrial systole and drops during isovolumetric contraction.

b- Falls rapidly during ventricular ejection.

c- Rises as blood flows passively into the ventricles.

d- Decreased markedly in tricuspid regurgitation.

73- Regarding the first heart sound all the followings are correct Except:

a- Is caused by the sudden closure of the mitral and tricuspid valves at the start of ventricular diastole.

b- The mitral component is heard better at the apex of the heart.

c- The tricuspid component is heard at the lower end of the sternum.

d- Is loud (accentuated) in tachycardia.

74- Regarding the second heart sound all the followings are correct EXCEPT:

a- Caused by closure of the aortic and pulmonary valves at mid diastole.

b- Frequently reduplicated during inspiration normally.

c- High pitched sound and has a shorter duration than 1st sound.

d- Loud (accentuated) in systemic hypertension.

75- Regarding the cardiac output (COP):

a- The output per minute per square meter surface area (cardiac index) equals 5 L/min/m2 normally.

b- Stroke volume equals the difference between end-diastolic volume (EDV) and end-systolic volume (ESV).

c- Ejection fraction is the fraction of ventricular volume that is ejected per minute.

d- COP decreases during sleep.

76- In indicator dilution technique used to measure the cardiac output (COP):

a- The use of log concentrations is to eliminate the small differences.

b- The amount of indicator taken by the body/min = arterio-venous difference of indicator × COP.

c- The concentration of the indicator rises and then falls when the indicator recirculates again.

d- COP is calculated from the average concentrations of the indicator in arterial blood.

77- In thermodilution technique used to measure the cardiac output (COP):

a- Cold saline is injected into the right atrium and the temperature change is recorded in the brachial artery .

b- The cold saline is scattered in the tissues and repeated determinations cannot be done.

c- The temperature change in the pulmonary artery is inversely proportionate to blood flowing through it.

d- The only advantage of thermodilution is the harmless of the saline.

78- Cardiac output is increased in the following conditions EXCEPT:

a- Anxiety and excitement (50-100%).

b- Eating (30%).

c- Exercise (up to 70%).

d- Sitting or standing from lying position (20-30%).

79- Regarding the control of cardiac output all the followings are correct EXCEPT:

a- Heterometric autoregulation means regulation of COP as a result of changes in the preload.

b- Homometric autoregulation means regulation of COP due to changes in contractility and afterload.

c- The rate of blood flow returning to the heart is primarily influenced by peripheral circulation.

d- Blood flow from the left ventricle is primarily affected by cardiac function.

80- In normal heart calculate the resistance to venous return when:

a- Venous return = 5.5 L/min.

b- Mean systemic filling pressure = 6 mmHg .

c- Right atrial pressure = 1 mmHg.

d- Resistance to venous return = …. ../../..

81- Regarding the venous filling pressure all the followings are correct EXCEP:

a- The distending pressure of all vessels in the circulation.

b- The pressure gradient between mean systemic filling pressure and right atrial pressure.

c- The primary determinant of venous return.

d- Equals 5 mm Hg.

82- The mean systemic filling pressure "MSFP" is:

a- The distending (backward) pressure of all vessels in the circulation.

b- Influenced by alterations in blood volume and the tone of the veins.

c- Normally in the range of 10-12 mmHg.

d- Decreased with sympathetic stimulation.

83- Regarding right atrial pressure (RAP):

a- Exerts a forward force for cardiac output.

b- Normally equals -1 mmHg.

c- Venous return increases as RAP rises within limit.

d- Plateau occurs when RAP falls below - 4 mmHg.

84- Resistance to venous return (RVR):

a- Equals 1.4 mm Hg/mL/min normally.

b- Occurs mainly in the veins because of larger resistance of venous bed.

c- Mild compression of the inferior vena cava in the abdomen has no effect on cardiac out put

d- Alters the mean systemic filling pressure significantly.

85- All the following factors increase venous return EXCEPT:

a- Increasing blood volume.

b- Venoconstriction at constant blood volume.

c- Reducing of venous resistance.

d- Mild compression of the inferior vena cava in the abdomen.

86- Guided by Ohm's law when :

a- Cardiac output = 5.6 L/min.

b- Systolic and diastolic BP = 120/80 mm Hg

c- Mean systemic filling pressure = 7 mm Hg & right atrial pressure = 0.0 mm Hg.

d- Systemic vascular resistance = … …/…/…

87- All the following factors increase end-diastolic volume (EDV) EXCEPT:

a- Increased total blood volume

b- Increased venous tone.

c- Decreased ventricular compliance.

d- Increasing pumping action of skeletal muscle.

88- The following factors increase cardiac output:

a- Decreased afterload by increasing end-systolic volume.

b- Digitalis by decreasing end-systolic volume.

c- Increased heart rate (>170 b/min) in stressful conditions.

d- Pressure overload hypertrophy.

89- The following factors decrease cardiac output EXCEPT:

a- Raised blood pressure (hypertension).

b- Myocardial infarction.

c- Decreased heart rate (< 60 b/min).

d- Negative pressure breathing.

90- Cardiac sympathetic nerve activation:

a- Shifts the cardiac output curve downwards and to the right.

b- Increases the formation of cAMP via β1 receptors.

c- Deactivates the ligand-gated Ca^{2+} channels of the Ryanodine receptor .

d- Decreases active reuptake of Ca^{2+}.

91- Regarding the Cardiac sympathetic nerve stimulation all the followings are correct EXCEPT:

a- Has +ve inotropic effect.

b- Causes L-Ca^{2+} channel to spend more time in the open state.

c- Accelerates relaxation and shortens systole.

d- Lengthens the AV nodal delay.

92- The -ve inotropic effect is described in the followings EXCEPT:

a- Ischemic heart disease “IHD”.

b- Congestive heart failure “CHF”.

c- Digitalis

d- Dihydropyridines (DHP).

93- Digitalis:

a- Slows heart rate.

b- Lengthens AV- nodal delay.

c- Increases contractility by inhibiting Na+ - K+ pump partially .

d- All of the above.

94- The following factors enhance cardiac contractility EXCEPT:

a- Ca2+ antagonists such as dihydropyridines (DHP).

b- Digitalis.

c- Glucagon and caffeine.

d- Reflex adrenergic neural stimulation of the heart.

95- Choose the most effective factor that increases COP during exercise:

a- Increasing heart rate.

b- Increasing mean systemic filling pressure.

c- Increasing ventricular filling time.

d- increasing inotropic effect.

96- Ventricular volume overload hypertrophy in marathons is associated with:

a- Increased end-diastolic volume (EDV).

b- Some thickening of the wall.

c- Normal level of basal inotropic state.

d- All of the above.

97- Regarding ventricular pressure overload hypertrophy all the followings are correct EXCEPT:

a- Occurs as a consequence of hypertension.

b- Increased thickness of the left ventricular wall.

c- Increase in the size of the left ventricular chamber to maintain COP.

d- Leads to heart failure.

98- Ejection fraction is:

a- The fraction of ventricular volume that is ejected per minute.

b- Only measured invasively.

c- The most important index of contractility in clinic today

d- Only affected by contractility.

99- Ejection fraction value:

a- Should be about 0.6 for a healthy heart.

b- Below 0.5 suggest cardiac disease.

c- Below 0.3 is associated with high mortality.

d- All of the above.

100- Supine to erect posture causes:

a- A marked fall in cardiac output (COP) due to exaggerated vagal stimulation.

b- An increase in mean systemic filling pressure due to pooling of blood in veins of lower limbs.

c- A fall in arterial pressure that causes reflexes restoring COP by shifting VR and COP curves downwards.

d- Postural hypotension in long standing diabetic patients and some elderly persons.

101- In long distance runners (marathon):

a- Heart undergoes pressure overload.

b- The end-diastolic volume is increased.

c- The wall tension is dramatically increased.

d- Total peripheral resistance is increased.

102- Regarding Valsalva maneuver all the followings are correct EXCEPT :

a- The intrathoracic pressure rises to very high levels.

b- Strong contraction of the abdominal muscles shifts VR curve upward.

c- Reflex sympathetic nerve stimulation increases heart rate and inotropic state.

d- The displacement of blood from the lungs to the peripheral circulation decreases venous return.

103- The acceleration in heart during exercise is due to:

a- Increases in sympathetic tone.

b- Vagal withdrawal.

c- Reflexes from exercising muscles.

d- All of the above.

104- Exercise in untrained normal subjects is associated with:

a- Raised end-diastolic volume due to volume overload of the left ventricle.

b- Elevated mean systemic filling pressure due to metabolic venous dilatation in the exercising muscles.

c- Upward shifting of the COP curve.

d- Increased COP to 35 L/min.

105- Regarding the metabolism of the cardiac muscle:

a- Utilizes mainly glucose.

b- Is mainly aerobic.

c- Exhibits oxygen debt.

d- Uses about 2% of body's resting oxygen consumption.

106- Human heart:

a- Has numerous mitochondria (about 10% by volume).

b- Utilizes 90% of its basal caloric need from carbohydrates.

c- Utilizes 60% of its basal caloric need from fat .

d- Is provided by 10% of its energy need anaerobically.

107- Regarding the myocardial oxygen consumption all the followings are correct EXCEPT:

a- 9 ml/ 100 gm/min by the beating heart.

b- Increased by increasing O_2 extraction.

c- Increased by increasing coronary blood flow.

d- More increased by pressure work (afterload) than volume work (preload).

108- The myocardial oxygen consumption is determined by the followings EXCEPT:

a- Diastolic pressure.

b- Shortening extent (stroke volume).

c- Inotropic state (contractility).

d- Heart rate (beat/min).

109- Regarding the myocardial stroke work all the following are correct EXCEPT:

a- The product of stroke volume and mean arterial pressure.

b- The same for both ventricles in the steady state

c- 6 times greater in left ventricle than that of right ventricle

d- Associated with more cardiac O_2 consumption in aortic stenosis (pressure work).

110- Calculate the cardiac minute work output from the followings:

a- The stroke volume (SV) = 70 mL.

b- The arterial pressure = 140/90 mm Hg

c- The heart rate = 80 beat/min

d- The minute work output = … …/…/…

111- The cardiac efficiency:

a- Is 20 to 25% maximally in the normal heart.

b- Is increased as aortic pressure is elevated.

c- Equals 0.0% in heart failure.

d- Represents the total energy that appears as mechanical work.

112- The following factors are responsible for cardiac reserve EXCEPT:

a- Heart rate (+ve chronotropic).

b- Volume overload hypertrophy.

c- Contractility (+ve inotropic).

d- Increased afterload.

113- Cardiac reserve:

a- In normal young adult = 200%.

b- In athletically trained person, it is increased to 300%.

c- In elderly person, it may be decreased to 100%.

d- In heart failure, there is no CR at all.

114- In heart failure all the followings are correct EXCEPT:

a- There is no cardiac reserve.

b- Ejection fraction falls (20%)

c- The end-systolic volume is decreased in systolic dysfunction.

d- Diastolic compliance is reduced in diastolic dysfunction.

115- In cardiovascular responses to exercise all the followings occur EXCEPT :

a- The main systemic filling pressure is increased.

b- β_2 sympathetic vasodilation & local skeletal muscle metabolites decrease total peripheral resistance.

c- Stroke volume increment is the determinant factor in increasing COP.

d- Left ventricular volume overload occurs in marathon.

116- Hypertension is harmful for the heart because it causes the followings EXCEPT:

a- Left ventricular concentric hypertrophy.

b- Excess myocardial O_2 consumption.

c- Increased end diastolic volume.

d- Diastolic left ventricular dysfunction.

117- After myocardial infarction the followings may occur EXCEPT :

a- End-systolic volume is increased.

b- Diastolic left ventricular dysfunction.

c- Deep wide Q wave in ECG.

d- Marked reduction in cardiac reserve.

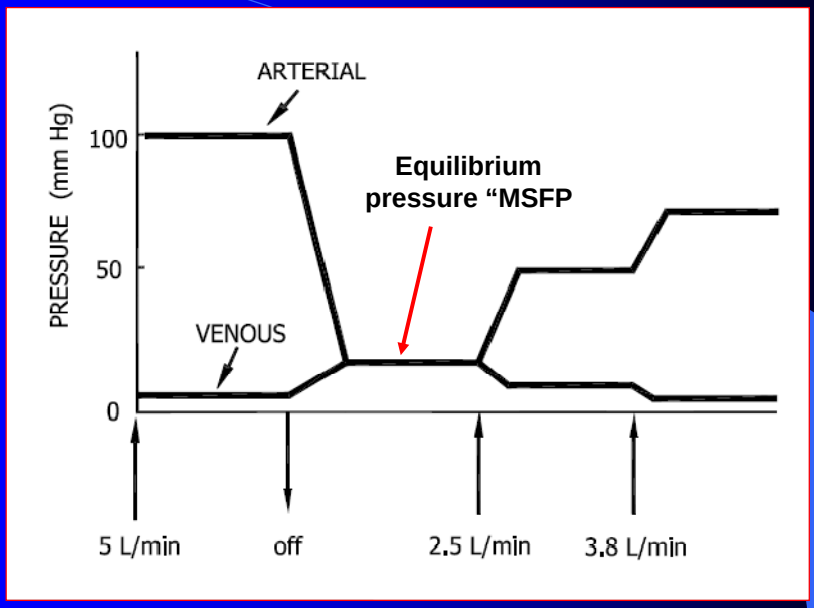
118- All the followings are risk factors for cardiac disease except:

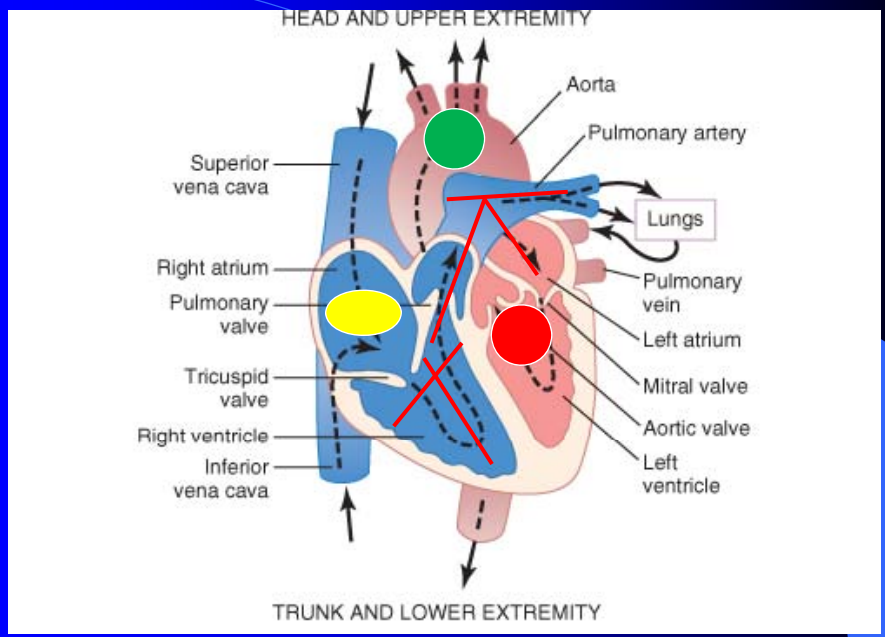
a- Obesity.

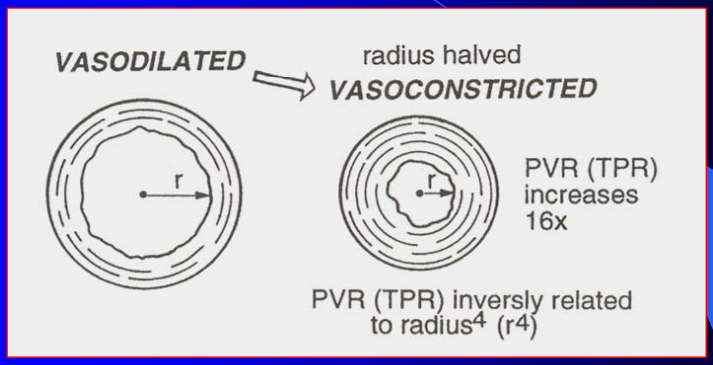
b- Smoking.

c- Hypertension.

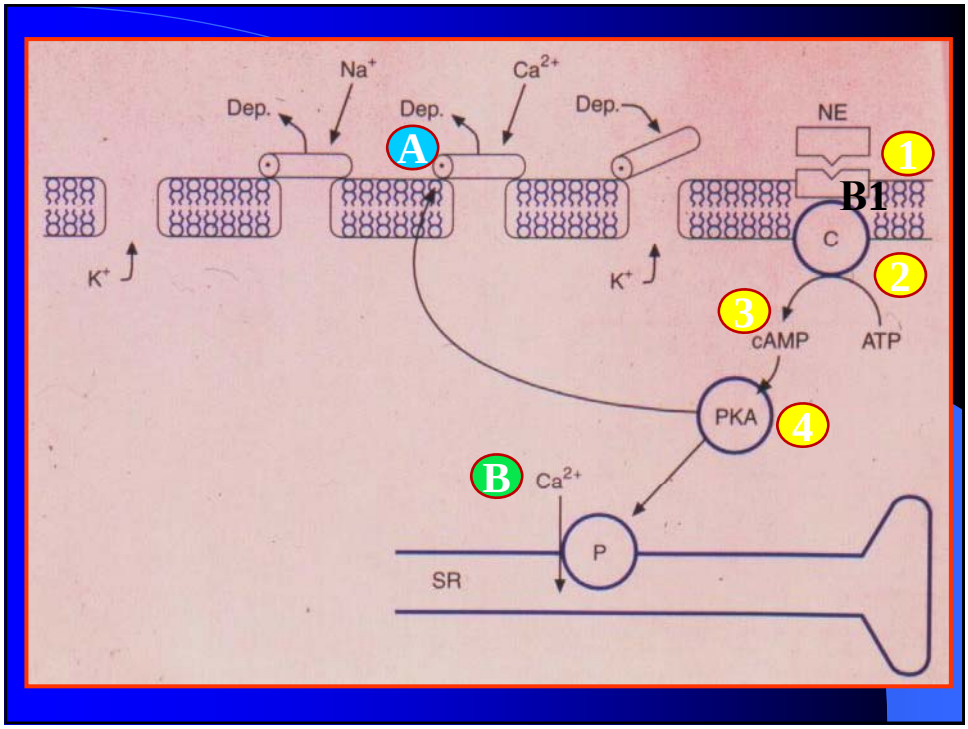
d- Daily mild exercise.

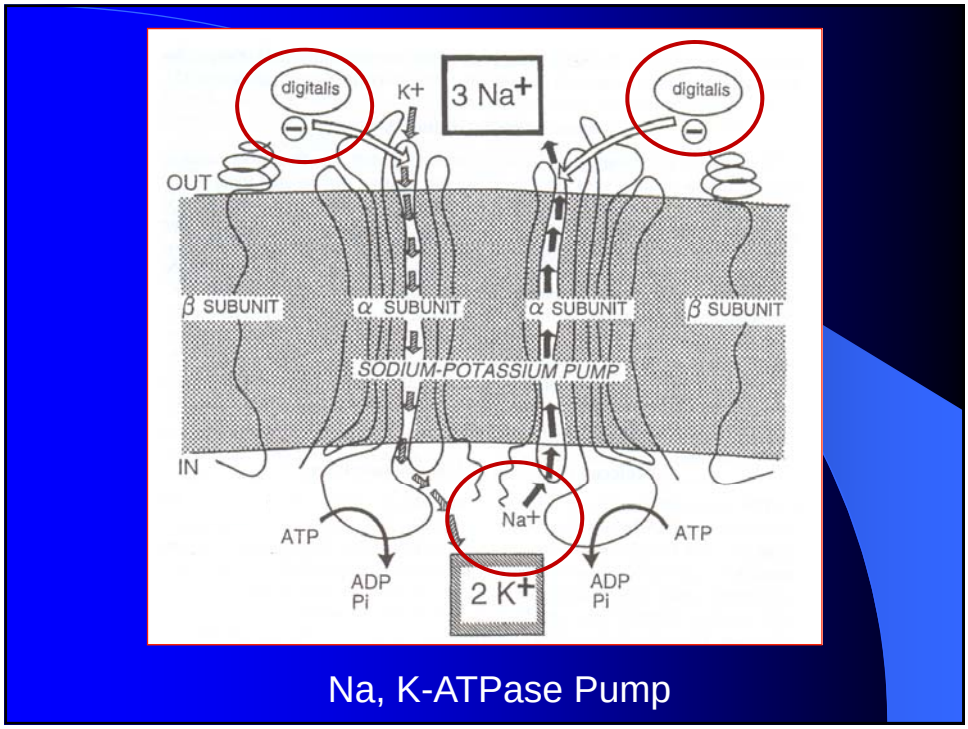




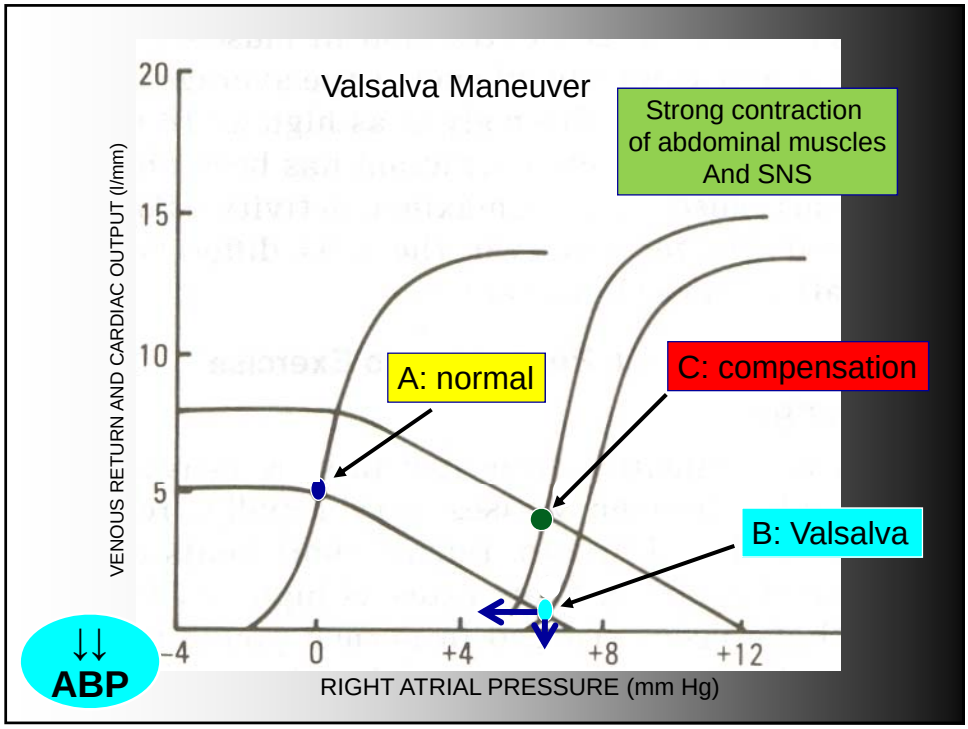


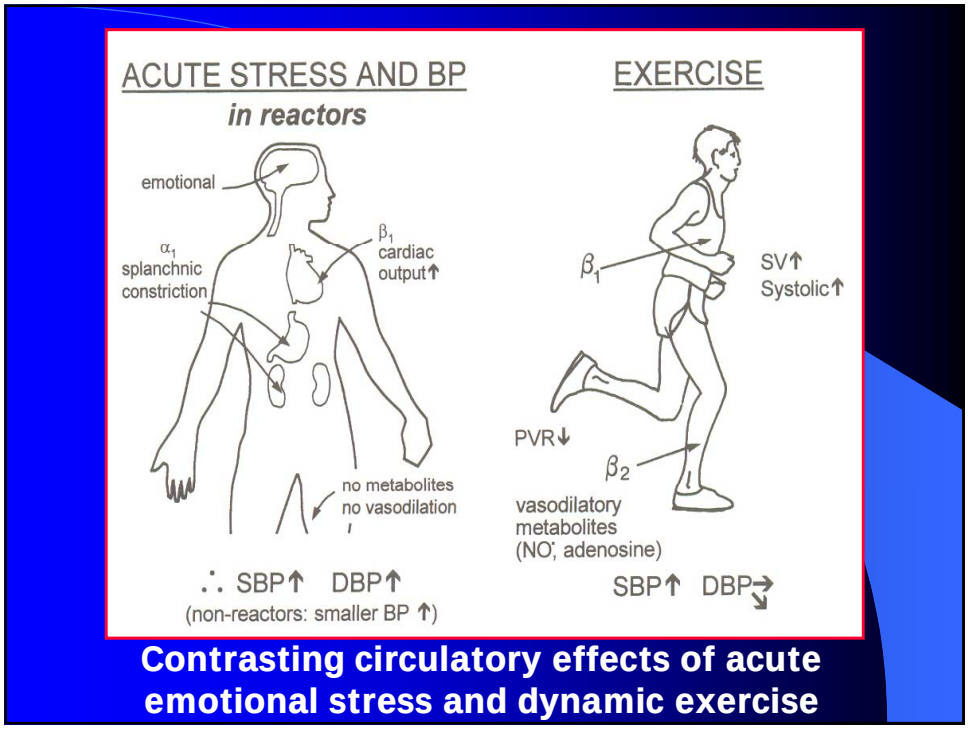
Resistance (R) = length (L) × 8 η / radius^4 (r^4)

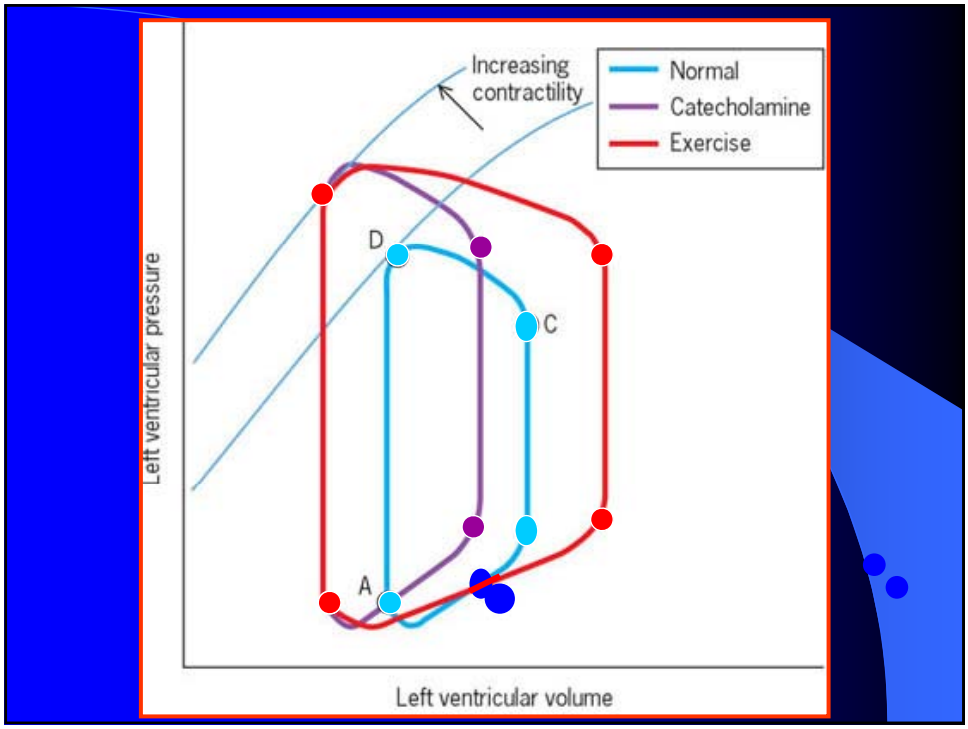




Na, K-ATPase Pump


Valsalva Maneuver
Strong contraction
of abdominal muscles
And SNS
A: normal
C: compensation
B: Valsalva
VENOUS RETURN AND CARDIAC OUTPUT (l/mm)
20
15
10
5
−4
0
+4
+8
+12
RIGHT ATRIAL PRESSURE (mm Hg)
↓↓
ABP


ACUTE STRESS AND BP
in reactors
emotional
α1
splanchnic
constriction
β1
cardiac
output↑
no metabolites
no vasodilation
∴ SBP↑ DBP↑
(non-reactors: smaller BP ↑)
EXERCISE
β1
SV↑
Systolic↑
PVR↓
β2
vasodilatory
metabolites
(NO, adenosine)
SBP↑ DBP→
Contrasting circulatory effects of acute
emotional stress and dynamic exercise



Resting blood flow & O2 consumption of various organs in 63-kg adult man with MAP 90 mm Hg & O2 consumption of 250 mL/min.

Region	Mass (kg)	Blood Flow mL/min	Blood Flow mL/100 g/min	AV-O_2 Difference (mL/L)	O_2 Consumption mL/min	O_2 Consumption mL/100 g/min	% of Total COP
Liver	2.6	1500	57.7	34	51	2	27.8
Kidneys	0.3	1260	420	14	18	6	23.3
Brain	1.4	750	54	62	46	3.3	13.9
Skin	3.6	462	12.8	25	12	0.3	8.6
Skeletal muscle	31	840	2.7	60	50	0.2	15.6
Heart muscle	0.3	250	84	114	29	9.7	4.7
Rest of body	23.8	336	1.4	129	44	0.2	6.2
Whole body	63	5400	8.6	46	250	0.4	100

AV-O2, arteriovenous oxygen; Cons., consumption.