

1. Rhythm – is it regular?
2. Rate – how fast is the heart rate?
3. Is “P” wave upright & present?
4. “PR” interval measurement?
5. “QRS” duration?
6. “ST” is it elevated or depressed?
7. “QT” duration?
8. Any ectopic?

“**J-Point**” on isoelectric line is normal, if above the line it is elevated, if below the line it is depressed.

EKG:

- One **small** box = 0.04 seconds (↔)
 - One **large** box = 0.20 seconds (↔)
 - One **small** box = 0.1mv amplitude (↑)
 - One **large** box = 0.5mv (↑)
 - “**P**” wave = 3 small boxes or **0.06-0.12 seconds wide**
 - “**PR**” interval = 3-5 small boxes or **0.12 – 0.20 seconds wide**, if > 0.20 seconds wide means slow conduction; consider heart block at the AVN
 - “**QRS**” complex = 1-2 ½ small boxes or **0.04 – 0.10 seconds wide if > 0.10 there is a block, a bundle branch block in the ventricles**
 - “**QT**” interval = 1-2 big squares or 0.36-0.44 seconds.
 - “**T**” wave = upright, well rounded, and **less than** ½ the height of the “QRS” complex.
 - Determine Atrial rate = measure “P” to “P”
 - Determine Ventricular rate = measure “R” to “R”
 - “P” wave = atrial depolarization
 - “PR” interval = Atrial Kick from SAN to AVN. Rates > 130 bpm you lose atrial kick.
 - “QRS” = Ventricular depolarization = Contraction
 - “ST” = heart’s resting period (isoelectric)
 - “T” = Ventricular repolarization
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Conduction:

- **SAN** (sinus rhythm) 60 – 100 bpm; < 60 bpm = sinus bradycardia; > 100 bpm = sinus tachycardia (have upright “P”)
 - **AVN** (junctional) 40 – 60 bpm; < 40 bpm = junctional bradycardia; > 60 bpm = accelerated junctional; > 100 bpm = accelerated junctional tachycardia (with no “P” or inverted “P”)
 - **BB** (idio) 20 – 40 bpm; > 40 bpm = accelerated idioventricular rate (have no “P”)
 - **PF** (agonal) < 20 bpm
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“QRS”:

- **Narrow “QRS” complex (0.04 – 0.10)**
 - “P” present = sinus rhythm can be normal: 60-100 bpm; Tachy > 100 bpm, Brady < 60 bpm
 - No “P” present or inverted = Junctional rhythm (nodal)
 - **Wide “QRS” complex (> 0.10 = a block in the ventricles)**
 - Single PVC
 - Double = couplet PVC’s
 - Three or more PVC’s = short run VTach if three PVCs, more than three - VTach
 - 20-40 bpm coming from the ventricles, no “P” = idioventricular
 - Agonal < 20 bpm
 - Ventricular Tachycardia (VTach) 140 – 250 bpm
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Pacemakers:

- Count b/w the spikes to get the rate
 - ‘V’ paced = spike with ‘QRS’ = Ventricles.
 - ‘A’ paced = spike with ‘P’ = atria
 - AV paced = spike with every ‘P’ & spike with every ‘QRS’.
 - Failure to capture = spike without a response
 - Failure to sense = pacemaker does not recognize initiated beat then you see a spike.
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Myocardial Status:

- “T” wave inversion = Ischemia (tissue has died)
- “ST” depression = Ischemia
- “ST” elevation = Infarction / Injury – needs immediate intervention before heart tissue becomes ischemic.

Counting for the Rate:

- $1500 \div \# \text{ of small boxes between R} \leftrightarrow \text{R}$ or $\text{P} \leftrightarrow \text{P}$
- Count the number of complexes in a six second strip x 10 (irregular rhythms)

of small boxes

•	5.....300
•	6.....250
•	7.....214
•	8.....188
•	9.....167
•	10.....150
•	11.....136
•	12.....125
•	13.....115
•	14.....107
•	15.....100
•	16.....94
•	17.....88
•	18.....84
•	19.....79
•	20.....75
•	21.....72
•	22.....68
•	23.....65
•	24.....63
•	25.....60
•	26.....58
•	27.....56
•	28.....54
•	29.....52
•	30.....50
•	31.....48
•	32.....47
•	33.....45
•	34.....44
•	35.....43
•	36.....42
•	37.....41
•	38.....40
•	39.....39
•	40.....38
•	41.....37
•	42.....36
•	43.....35
•	44.....34
•	45.....33

Narrow 'QRS' Complexes (0.04 – 0.10):

'P' present = Sinus, can be either:

- Normal = 60 – 100 bpm
- Bradycardia = < 60 bpm
- Tachycardia = > 100 bpm

Junctional Rhythms - No 'P' wave present or 'P' wave inverted or 'P' wave retrograded (follows the QRS)

This occurs at the 'AV' Junctional (nodal)

Can be either:

- Junctional bradycardia < 40 bpm
- Junctional escape 40 – 60 bpm
- Accelerated Junctional 60 – 100 bpm
- Junctional tachycardia > 100 bpm

Wide 'QRS' Complex (> 0.10):

Coming from the Ventricles.

- Single = Premature Ventricular Contraction (PVC)
- Double = Couplet
- Three or more = short run VTach or VTach.

No 'P' wave – coming from the Bundle branch in the ventricles. Loss of atrial kick.

- Idioventricular 20 – 40 bpm
- Ventricular Tachycardia (Vtach) 140 – 250 bpm
- Agonal < 20 bpm (bad, death)

Heart Blocks: (key is the 'PR' interval)**Non-Lethal:**

- 1st degree AV block – 'PR' interval > 0.20 & the length is constant.
 - Rate is normal
 - No dropped beats
 - Atrial rate =s Ventricular rate
- 2nd degree AV block type I (Mobitz I, Wenkebach) – two complexes then drops one.
 - Rate is normal
 - 'PR' interval progressively gets longer, variable.
 - Drops a beat

Lethal:

- 2nd degree AV block type II (Mobitz II). Mobitz of 'P's, too many 'P's.
 - Rate is slower
 - More than one dropped beat
 - 'PR' interval same length with each beat, does not progressively get longer.
- 3rd degree AV block (complete heart block). No association with one another, complexes doing their own thing.
 - No communication going on
 - The 'R' is constant.
 - Rate is very slow
 - The only block where "P" waves can be buried
 - Pacemaker needed

Paroxysmal – sudden onset or stop of any arrhythmias.

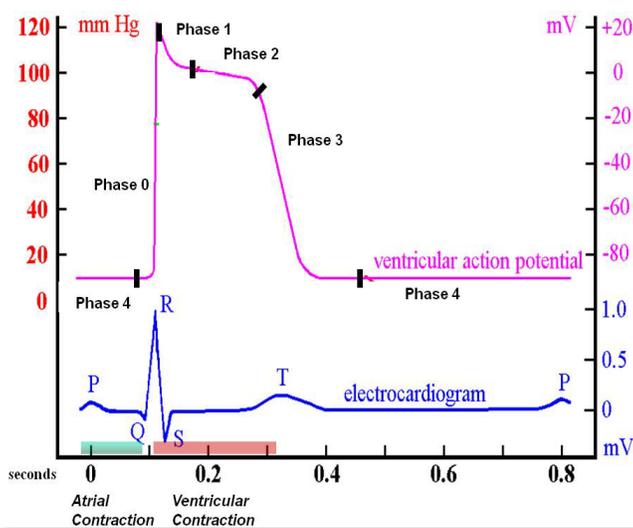
Bundle Branch Block:

- Has 'P's
- 'QRS' ≥ 0.10
- 'QRS' may or may not have rabbit ears
- Occurs at bundle branches
- Rate is slow

Narrow Complex Atrial Tachcardia:

Sinus tachycardia:

- Sinus Tachycardia (ST) 100 - 140bpm
- Have 'P's
- Atrial Tachycardia (AT) 160 – 250bpm
- Supraventricular Tachycardia >150bpm



Phase 4: This is the cells **resting phase**. The cell is ready to receive an electrical stimulus (associated with diastole)

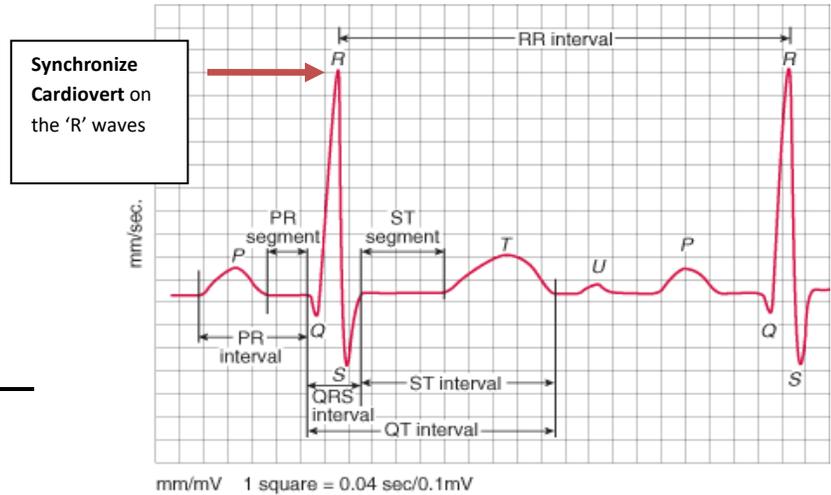
Phase 0: Is the **upstroke**; the cell receives an impulse from a neighboring cell and depolarizes, during this phase the cell depolarized and begins to contract.

Phase 1: Is the **spike**; contraction is in process and the cell begins an early, rapid, partial repolarization.

Phase 2: Is the **plateau**; contraction completes and the cell begins to relax. This is a prolonged phase of slow repolarization.

Phase 3: is the downslope; this is the final phase of rapid repolarization and is complete by the end of phase 3.

Phase 4: Returns back to the resting period and is the period between action potentials



- Cardiovert the tip of the 'R' wave
- J-point of the 'Q' to the upslope of the 'T' wave = Absolute Refractory Period (ARP) – cannot respond to stimulus.
- Relative Refractory Period (RRP) – can respond if strong stimulus on top of the 'T' wave.
- Supernormal Period (SNP) – irritable phase, easily thrown into VTACH, if PVC hits on the downslope of the 'T' wave

Chronotropic – Rate

Inotropic – Contractility

Dromotropic – AV node Conduction

Cardiac Death:

- Endocardium is the inner part of the heart: takes 20-30 minutes to die
- Myocardium is the thick muscle mass of the heart: takes 3 hours to die.
- Epicardium is the outer surface of the heart
- Transmural meaning the entire heart: takes 5-8 hours to die.