

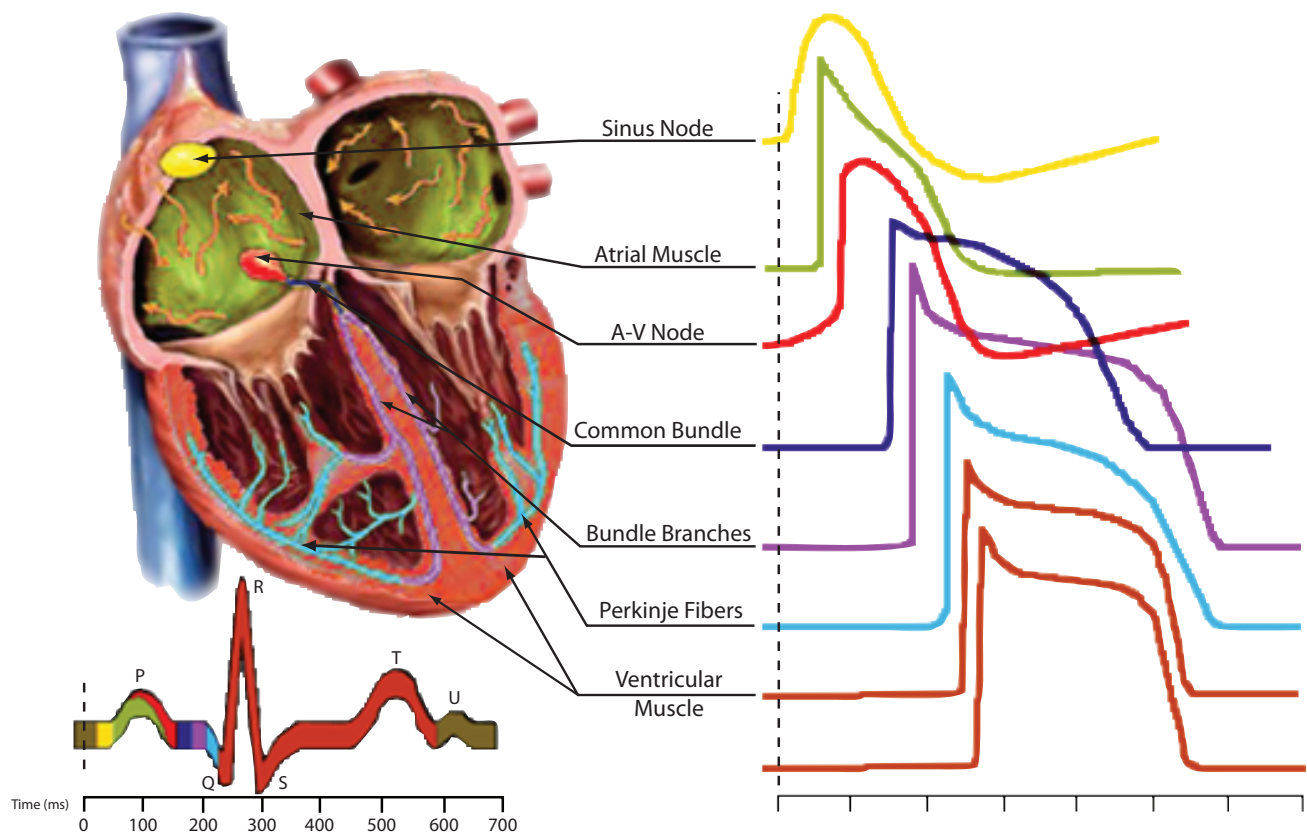
**Fast
Response**

School of Health Care Education



ECG

Basic Arrhythmia



**Study
Guide**

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Toll free: 1.800.637.7387**

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Dear EKG – Basic Arrhythmia student:

Please read this letter carefully!

This letter confirms your registration in the *EKG – Basic Arrhythmia* course.

Please be on time as it will be difficult for late students to catch up once we start. Class starts promptly at 9:00 am. If you are more than 15 minutes late you may be turned away. Students are expected to attend and *participate* in the entire course. If you miss a significant portion of either day of instruction you must retake the entire course.

Garage parking is available in the area. We do not validate parking. Street parking is metered. BART Downtown Berkeley Station is located 100 yards from our facility.

The ***EKG – Basic Arrhythmia*** course **reviews** basic cardiac anatomy, physiology, and electrophysiology and teaches EKG rhythm acquisition and identification. It is recommended that you prepare for the course in advance by studying the information in the course Study Guide, reading at least the recommended chapters of the course text (see below), and spending some time practicing EKG rhythm recognition using the textbook or the CD. With advance preparation you will be able to complete the course with greater comprehension and retention..

How to Prepare

The course covers an extensive amount of material in a short time. **Therefore you will need to prepare beforehand**, especially if your background does not include basic cardiac anatomy and physiology. You should prepare for the course by doing the following:

1. Review the enclosed Study Guide, especially the first section.
2. Complete Appendices A and B of the text: **Cardiac Anatomy and Physiology and Pathophysiology and Clinical Implications of Arrhythmias**.
3. *At a minimum*, complete the first three chapters of the text: **Electrophysiology, Waves and Measurements**, and **Analyzing EKG Rhythm Strips**.
4. Review the “Key Points” sections of the arrhythmia chapters of the text (chapters 4-8). These can be found on pages 80 (Sinus Rhythms), 112 (Atrial Rhythms), 161 (Junctional Rhythms), 205 (Heart Blocks), and 249 (Ventricular Rhythms).

What to Bring and What to Wear

It is essential that you bring your EKG – Basic Arrhythmia Study Guide and your copy of *Basic Arrhythmias* with you to class; you will need them during each lesson in the course.

Please wear comfortable.

Please be aware:

Reschedule Policy

- **No refunds will be issued. All registrations are final.**
- You may reschedule your course by calling us at least 5 business days prior to your scheduled course date. **You will be charged a rescheduling fee of \$25.**
- If you reschedule your course fewer than 5 business days prior to the course start date, **you will be charged 50% of the course fee.**
- **If you reschedule within fewer than 48 hours prior to the course start date, you will forfeit the entire course fee.**
- Course must be rescheduled and attended within 30 days from the original start date. No additional rescheduling requests will be honored.
- Only one reschedule request will be honored per course.
- Our Administrative Offices are closed on weekends and holidays. We do not accept rescheduling requests on weekends or holidays.
- We do not accept requests left on the answering machine.

Cancellation Policy

- **We do not issue refunds for course fees. All registrations are final.**
- If you cancel or do not attend the class you have registered for, you will forfeit your entire course fee.

Late Arrival

- Our classes start on time. Please plan your trip accordingly and remember to allow time for parking.
- If you are late for your scheduled class, you will not be admitted into class and you must reschedule.

Lisa Dubnoff, R.N., EMT-P
ACLS Program Director

Christopher Ché King, EMT-P
Director Continuing Education

EKG – Basic Arrhythmia Course Agenda

Day 1

0900-0915	Welcome / Course Overview
0915-0945	Anatomy & Physiology of the Heart
0945-1030	Electrical Conduction and EKG Waveform Recognition
1030-1045	Break
1045-1130	Sinus Rhythms
1130-1215	Atrial Rhythms
1215-1315	Lunch
1315-1400	Junctional Rhythms
1400-1445	Heart Blocks
1445-1530	Break
1445-1530	Ventricular Rhythms
1530-1600	Wrap-up

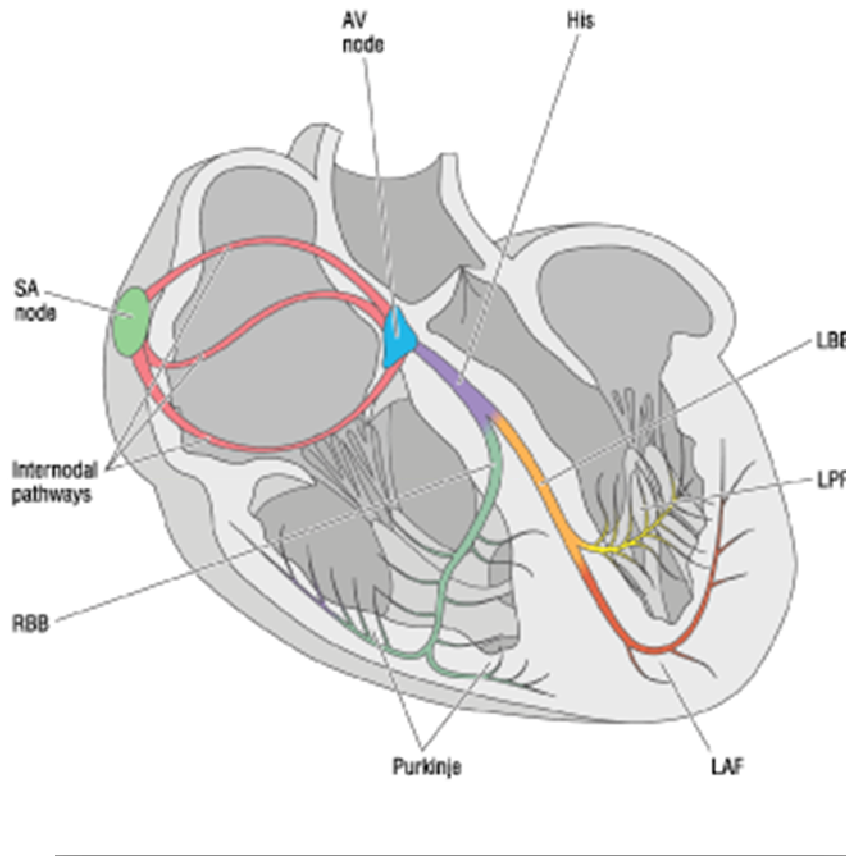
Day 2

0900-1000	Questions, Review of Rhythms
1000-1100	EKG Practice
1100-1200	Static Cardiology/EKG Practice
1200-1300	Lunch
1300-1400	Static Cardiology/EKG Practice
1400-1600	Written Test
1600-1630	Course Wrap-up





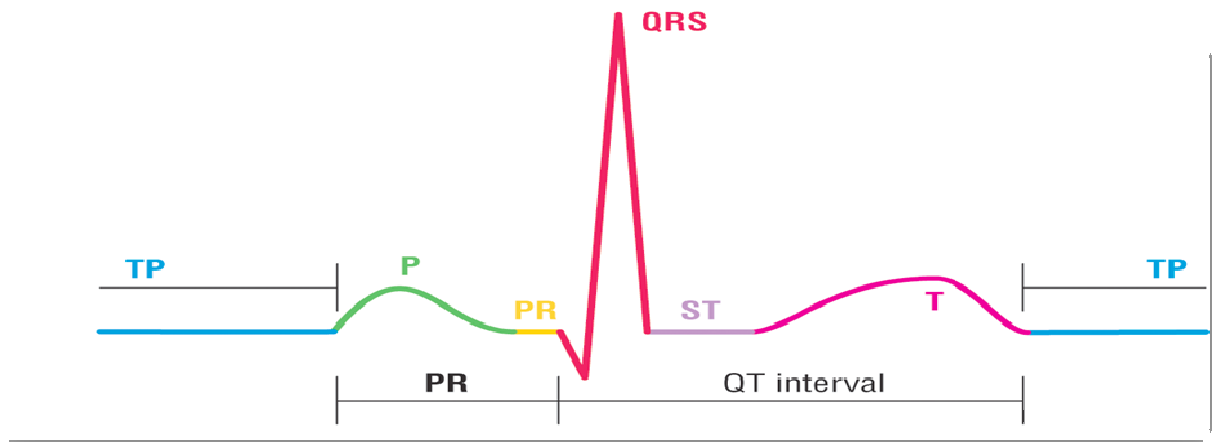
The Electrical Conduction System



Normally, electrical impulses in the heart originate in the Sino Atrial Node (SA Node), which generates an impulse 60 and 100 times per minute. When the SA Node is not firing properly, or irritability exists in the heart, other sites may take over as the pacemaker. For example, if the atria are irritable, sites in the atria may fire independently resulting in an Atrial Dysrhythmia, such as Wandering Atrial Pacemaker. If the SA Node fails to fire, or if it fires irregularly or too slowly, the Atrio-Ventricular Node (AV Node) or the ventricles may take over.

Even if an EKG rhythm originates in a specific pacemaker, its rate can be different than this inherent rate. If the rate is greater than the site's inherent rate of 100 or less, the rhythm is said to be **Accelerated**. If the rate is greater than 100, the rhythm is defined as a **Tachycardia**. If the rate is slower than the site's inherent rate, the rhythm is defined as **Bradycardia**.

SA Node	60-100 BPM
Atrial Cells	55-60 BPM
AV Node	40-60 BPM
His Bundle/Bundle Branch	40-45 BPM
Purkinje cells	20-40 BPM



P Wave:

The first deflection in the cardiac cycle represents Atrial depolarization. Normal P waves are small, upright, rounded, and regular (i.e., there should be one P wave for each QRS complex).

QRS Complex:

Represents the time in which depolarization of the ventricles occurs. Normal QRS complexes do not have a Q wave (or have only a very small deflection), are narrow, have the same shape (morphology), and are regular (i.e., there is one QRS complex for every P wave and the RR Interval is always the same). Normal duration is less than .12 seconds or less.

T Wave:

Represents the later phase in repolarization of the ventricles. Normal T waves are rounded and upright. T waves are usually larger than the P wave and smaller than the QRS complex.

U Wave:

An aberrant wave which follows the T wave in patients with electrolyte disturbances.

PR Interval:

The distance from the start of the P wave to the first deflection of the QRS complex is the PR Interval (PRI). The PRI represents the time required for the impulse to leave the SA node and travel through the atria. It should be between .12 and .20 seconds.

QT Interval:

Beings at the onset of the QRS complex and ends at the end of the T wave.

RR Interval:

The distance between the peaks of two consecutive R waves. The RR interval is used to measure the heart rate, and should be consistent from complex to complex.

ST Segment:

Represent the early phase of repolarization (absolute refractory period) of the right and left ventricles. The ST Segment should be along the isoelectric line, not elevated (above) or depressed (below) it.

TP Segment:

The segment between the T and P waves. Also known as the isoelectric line.

Analyzing EKG Rhythms in 5 Easy Steps

Step 1: Determine the Regularity of the R Waves

Measure the interval between the first two R waves, and then measure each successive RR Interval, noting any variation in the rhythm – more than 0.12 seconds (3 small squares) means the rhythm is irregular. All of the QRS complexes should look the same. Any variation (in the rhythm or individual ectopic beats) must be noted.

Step 2: Calculate the Heart Rate

- **For Irregular Rhythms:** Count the number of QRS complexes on a 6-second strip and multiply by 10. **This will be an estimate only.**
- **For Regular Rhythms:** Count the number of small squares between two consecutive R waves and divide 1500 by that number. (The Heart Rate Conversion Table can be used to quickly estimate the heart rate from the number of small boxes counted.)

Step 3: Identify and Examine the P Waves

Normal P waves are *present, upright, rounded, and regular (PURRS)*. All of the P waves should look the same and the interval between successive sets of P waves should be the same. Inverted P waves indicate an impulse generated in the AV node; missing P waves represent impulses generated in the AV node or the ventricles (see Step 5, below). P waves of different shapes/orientation in a rhythm strip indicate an Atrial arrhythmia.

Step 4: Measure the PR Interval

Measure the interval between the beginning of the P wave and the first deflection of the QRS complex. The interval should be between 0.12 and 0.20 seconds (3-5 small squares). A PRI longer than 0.20 seconds indicates a heart block.

Step 5: Measure the QRS Complex

Measure the interval between the first deflection of the QRS complex and the return to the isoelectric line. In aberrant complexes measure to the first identification of the T wave. The duration should be less than 0.12 seconds (3 small squares). A QRS duration of longer than 0.12 seconds indicates an impulse that has originated in the ventricles and/or has had delayed conduction through the ventricles.

Differentiating Regular EKG Rhythms and Ectopic Beats

Most *regular* EKG rhythms and ectopic beats can be easily distinguished by looking at a few characteristics. The following chart can be used as a quick reference, but should not replace full measurement and analysis of the rhythm, nor will every rhythm be categorized so easily.

Regular Heart Rhythms

QRS Complexes	P waves	Heart Rate	EKG Rhythm
narrow (< 0.12 seconds)	upright	<60	Sinus Bradycardia
		60-100	Normal Sinus Rhythm
		100-150	Sinus Tachycardia
	upright (aberrant morphology)	>150	Atrial Tachycardia
		60-100	Atrial Flutter
	inverted or absent	40-60	Junctional Escape
		60-100	Accelerated Junctional
		100-150	Junctional Tachycardia
	variable	60-100	Wandering Atrial Pacemaker
wide (> 0.12 seconds)	absent	Can't discern	>150 60-100
			Supraventricular Tachycardia Atrial Fibrillation
		20-40	Idioventricular
absent	absent	40-100	Accelerated Idioventricular
		>100	Ventricular Tachycardia
		0	Asystole
Indiscernible	Indiscernible	0	Ventricular Fibrillation

Ectopic Beats

QRS Complexes	P waves		Ectopic Beat
narrow (< 0.12 seconds)	upright		Premature Atrial Contraction (PAC)
	inverted / absent		Premature Junctional Contraction (PJC)
wide (> 0.12 seconds)	absent		Premature Ventricular Contraction (PVC): <ul style="list-style-type: none"> <i>Unifocal</i>: complexes have the same shapes <i>Multifocal</i>: complexes have different shapes

Heart Rate Quick Reference Chart

To calculate the heart rate of a *regular* rhythm, count the number of small boxes between the peaks of two adjacent R complexes then cross-reference on the chart below (**as described in Step 5 of Analyzing EKG Rhythms, page 7**).

Number of Small Boxes	Heart Rate
4	375
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	83
19	79
20	75
21	71
22	68
23	65
24	63
25	60

Number of Small Boxes	Heart Rate
26	58
27	56
28	54
29	52
30	50
31	48
32	47
33	45
34	44
35	43
36	42
37	40
38	39
39	38
40	38
41	37
42	36
43	35
44	34
45	33
46	33
47	32

Number of Small Boxes	Heart Rate
48	31
49	31
50	30
52	29
54	28
56	27
58	26
60	25
62	24
65	23
68	22
72	21
75	20
79	19
83	18
88	17
94	16
100	15
107	14
115	13
120	13
125	12

Graph Paper

