The Society for Cardiological Science and Technology

Diploma in Electrocardiography

The Society makes this award to candidates who can demonstrate the ability to accurately record a resting 12-lead electrocardiogram (ECG) and to recognise a broad range of electrocardiographic patterns under examination conditions. This is designed as an intermediate level award for all cardiac healthcare professionals who wish to demonstrate skills and knowledge in ECG recording and interpretation.

Candidates will be expected to demonstrate the following outcomes in practical and written examinations:

- Evaluate the indication for the test and explain the ECG abnormalities that may be associated with this
- Identify potential health and safety risks related to ECG and select appropriate strategies to minimise risks
- Recognise and address patient anxiety and recording difficulties
- Perform an accurate resting 12-lead ECG according to SCST consensus guidelines
- Accurately measure standard ECG intervals and compare these with normal values
- Describe how electrical events on the ECG are related to the cardiac cycle
- Correctly identify normal and abnormal wave morphology and rhythms using standard terminology to describe these
- Explain which cardiovascular pathologies may be associated with specific ECG abnormalities (provide a differential diagnosis)

Candidates should ensure that their preparation for the examination considers all points in the following syllabus.
Syllabus

Practical electrocardiography

Instrumentation
Instrumentation and basic principles of lead theory needed for the effective and safe practice of electrocardiography.

Standard recording settings and how to alter controls
- Paper speed
- Gain
- Filters
- Lead selector
- Manual/automatic operation

Care of the equipment
- Care of recording paper
- Battery maintenance
- Care of leads and cables

Electrodes
- Application of and connection to electrodes
- Care of electrodes
- Electrode positions

Lead systems
- Hexaxial reference system
- Wilson’s central terminal
- Einthoven’s triangle
- Significance of right leg (neutral) electrode

Preparation of the patient
- Explanation of the procedure at a level appropriate to the patient and obtaining oral consent
- Positioning of the patient
- Encouraging the patient to relax
- Maintaining the privacy and dignity of the patient at all times.

Recording the electrocardiogram
- Choice of appropriate leads for a particular patient category
- Setting of controls as appropriate for the specific recording
- Correct application and positioning of limb and chest electrodes in accordance with the Society for Cardiological Science and Technology guidelines.
- Preparation of electrode sites to give optimum electrode contact and to minimise artefact
- Recording of a resting electrocardiogram from patients of all ages using both manual and automatic mode
- Recording of the resting electrocardiogram from a patient who:
- Is unconscious,
- Has language or communication difficulty,
- Is infectious or is in isolation,
- Has a physical disability (including amputation),

- Evaluation of the recording, re-recording as appropriate
- Recognition and elimination or reduction of artefacts due to:
  - Muscle tension
  - Muscle tremor
  - Alternating current interference
  - Limb movement
  - Broken lead
  - Sweat
  - Respiratory chest movement
- Recognition of ECG findings associated with transposal of the right arm and left arm connections:
- Labelling of completed recordings as appropriate
- Cleaning, preparation and storage of equipment ready for subsequent recording, including correct decontamination and disposal procedures

Electrocardiographic interpretation

Normal features and basic measurements
- Relationship of the electrocardiogram to the electrical events of the heart
- Relationship of the electrical events to the mechanical events of the cardiac cycle
- Waveform components (P, Q, R, S, T and U)
- Definitions, measurement and normal ranges of heart rate, PR interval, QRS duration, QT interval and mean frontal plane axis
- Calculation of corrected QT interval (QTc) by Bazett’s formula
- Appearance of the normal resting electrocardiogram including R wave progression in precordial leads

Normal variations of the electrocardiogram in relation to:
- Age
- State of activity
- Body build
- Ethnic origin
- Athletic training

Rhythms arising from the sinus node
- Normal sinus rhythm
- Sinus arrhythmia
- Sinus tachycardia
- Sinus bradycardia

Supraventricular arrhythmias
- Atrial premature beats
- Wandering pacemaker
- Atrial tachycardia
- Atrial flutter
- Atrial fibrillation
- AV nodal re-entrant tachycardia
- AV re-entrant tachycardia
- Accelerated AV nodal (junctional) rhythm

Bradyarrhythmias and conduction abnormalities
- Sinus pauses, sino-atrial block and sinus arrest
- Left and right bundle branch block
- Left anterior and posterior fascicular block
- 1\textsuperscript{st} degree AV block
- 2\textsuperscript{nd} degree AV block: Mobitz I (Wenckebach), Mobitz II and 2:1 block
- High grade (advanced) AV block
- 3\textsuperscript{rd} degree (complete) AV block
- Escape rhythms
- Ventricular standstill

Rhythms arising from the ventricles
- Ventricular premature beats
- Accelerated idioventricular rhythm
- Ventricular tachycardia
- Ventricular flutter
- Ventricular fibrillation

The electrocardiogram associated with an artificial cardiac pacemaker
- Identification of pacemaker stimulus on the electrocardiogram
- Unipolar and bipolar pacing
- Differentiation between atrial and ventricular pacing
- Failure to sense
- Failure to capture

Electrocardiographic features of abnormal cardiac conditions, including
- Myocardial ischaemia
- Myocardial infarction
- Left ventricular hypertrophy
- Right ventricular hypertrophy
- Left atrial abnormality
- Right atrial abnormality
- Pericarditis
- Myocarditis
- Dextrocardia
- Massive pulmonary embolism
- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Arrhythmogenic RV cardiomyopathy
- Cardiac amyloidosis
- Ventricular pre-excitation
- Atrial septal defect
Electrocardiographic features of abnormal metabolic, endocrine and electrolyte states

- Hypothermia
- Hypothyroidism
- Hyperthyroidism
- Hyperkalaemia
- Hypokalaemia
- Hyperventilation

Electrocardiographic features associated with drug administration

- Digitalis therapy and toxicity
- Beta-blocker therapy and overdose

Electrocardiographic features of ion ‘channelopathies’

- Long QT syndrome
- Brugada syndrome
- ‘Early repolarisation syndrome’

Electrocardiographic features associated with neuromuscular and neurological conditions

- Stroke
- Sub-arachnoid haemorrhage
- Muscular dystrophy