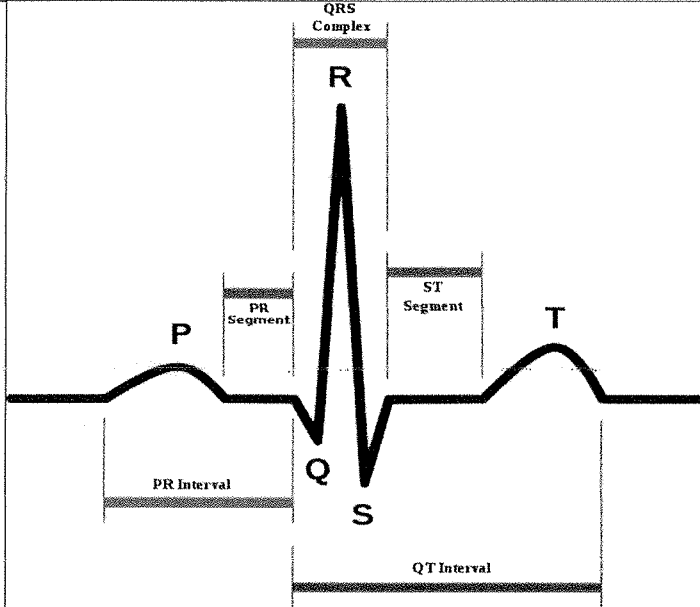


SCORING INDICATORS

COURSE NAME : MEDICAL ELECTRONICS
 COURSE CODE : 6041A

QID: 2102240069

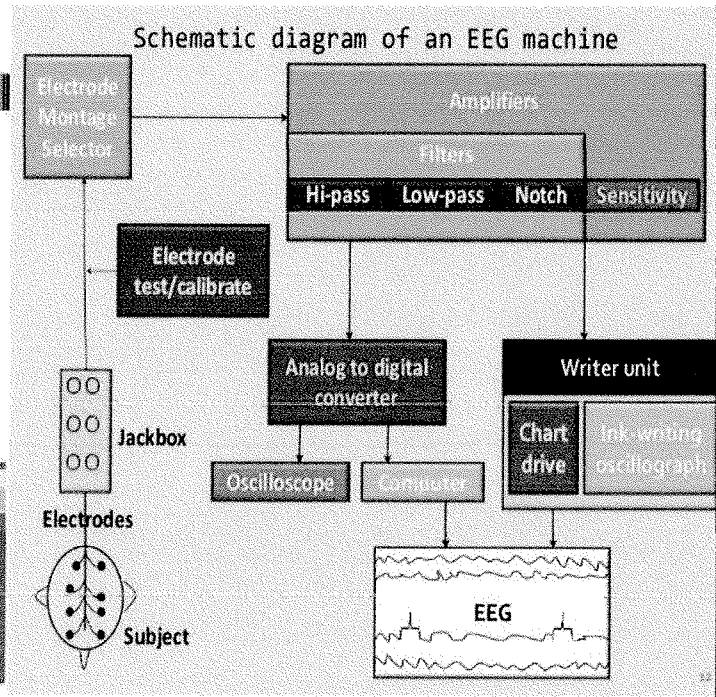
Q No	Scoring Indicators	Split score	Sub Total	Total score
	PART A			9
I. 1	Electromyography (EMG) measures muscle response or electrical activity in response to a nerve's stimulation of the muscle.		1	
I. 2	Electrode converts bioelectric potential to electronic potential		1	
I. 3	The minimum pressure in the arteries while the heart is resting in between heartbeats		1	
I. 4	Laser, a device that stimulates atoms or molecules to emit light at particular wavelengths and amplifies that light, typically producing a very narrow beam of radiation.		1	
I. 5	healthcare & pharmaceuticals, defense & public safety services (defense, firefighting & law enforcement), oil and gas industries, manufacturing (automotive, chemical, metal fabrication, food and beverage, wood working, paper and pulp), mining, construction, agriculture and forestry, cement production, power generation, shipbuilding and the textile industry (any two uses)		1	
I. 6	1. Controlled mode 2. Assisted mode 3. Assist-control mode (any two)		1	
I. 7	Fibrillation result from a rapid discharge of impulses from atria or ventricles		1	
I. 8	Macroshock is an electric shock due to the contacts applied to the exterior of the body		1	
I. 9	<ul style="list-style-type: none"> ➤ anomalies of the brain and spinal cord ➤ tumors, cysts, and other anomalies in various parts of the body ➤ breast cancer screening for women who face a high risk of breast cancer ➤ injuries or abnormalities of the joints, such as the back 		1	

	<p>and knee</p> <ul style="list-style-type: none"> ➤ certain types of heart problems ➤ diseases of the liver and other abdominal organs <p>(any two)</p>			
	PART B			24
II. 1	 <p>ECG consists of P wave, QRS complex, T wave and U wave. PR and PQ interval marks the time in which an impulse leaving the SA node takes to reach the ventricles. P wave- Atrial depolarisation or contraction QRS complex- Repolarisation of the atria and depolarisation of the ventricles T wave - Ventricular Repolarisation U wave- Slow repolarisation of the (Purkinje Fibres)</p>	Fig(2 marks) + Exp (1 mark)	3	
II. 2	<ol style="list-style-type: none"> 1. Delta waves-Frequency range 0.5 -4 Hz. These occur in deep sleep. These are the lowest type of wave but have the highest amplitude. Delta waves are common in children under one year. 2. Theta waves-frequency range 4-8 Hz. These waves occur during sleep. They are not obvious in adults who are awake. These are recorded from the potential and temporal regions of the scalp. 3. Alpha waves-Frequency range 8-13Hz. Found in normal person when they are awake in a quite resting state. During sleep they disappear. They occur normally in occipital region. 4. Beta waves-frequency range 13-30Hz. These are recorded from the parietal and frontal region of the scalp. These are often seen in 	1 + 1 + 1	3	

	<p>people who are awake.</p> <p>(any three)</p>			
II. 3	<p>Features of needle electrodes</p> <ul style="list-style-type: none"> ➤ Very small size electrode are used ➤ Used to penetrate the skin to record EEG potentials from a local region of the brain, or EMG potentials from a specific group of muscles ➤ Advantage of needle electrodes is that they are less susceptible to movement errors than surface electrodes. ➤ Also the needle electrodes have lower impedances when compared to surface electrodes as it makes direct contact with the sub-dermal tissues or intra cellular fluid <p>(any three)</p>		3	
II. 4	<p style="text-align: center;">Blood Gas Analyzer Block Diagram</p> <pre> graph LR pH --> IS1[Input Stage] Ref --> IS1 IS1 --> PDA[pH Differential Amplifier] pCO2 --> IS2[Input Stage] Ref --> IS2 IS2 --> PCDA[pCO2 Differential Amplifier] pO2 --> IVC[pO2 I/V Converter] pCO2_pO2_Leak --> DDC[pCO2-pO2 Leak Detector Circuit] PDA --> MUX[MULTIPLEXER] PCDA --> MUX IVC --> MUX DDC --> MUX MUX --> ADC[A/D Converter] ADC --> PROC[Processor] </pre>	Fig(3marks)	3	
II. 5	<p><u>Need of Pulseoximeter</u></p> <ul style="list-style-type: none"> ➤ During or after surgery or procedures that use sedation ➤ To see how well lung medicines are working ➤ To check a person's ability to handle increased activity levels ➤ To see if a ventilator is needed to help with breathing, or to see how well it's working ➤ To check a person has moments when breathing stops during sleep (sleep apnea) <p>(any three)</p>		3	
II. 6	<p>Principle of Diathermy</p> <ul style="list-style-type: none"> ➤ Diathermy means “through heating” or producing deep heating directly in the tissues of the body ➤ Dipole molecules of the body which are normally placed random rotate and align themselves according to the direction of field lines. ➤ Micro heating effects result from continuous 		3	

	realignment of molecules			
II. 7	<p><u>Advantages of portable dialysis machine</u></p> <ul style="list-style-type: none"> ➤ It is portable so there is no restriction to patients movement ➤ The device is light and can be comfortably worn by the patient ➤ Patients are not tethered to a full-size dialysis machine they are free to walk, work or sleep while undergoing continuous dialysis. ➤ several innovations like pulse pumps and detectors and these enhance patients safety ➤ Lithium Battery is used, which is long lasting 		3	
II. 8	<p>Echo Cardiography</p> <ul style="list-style-type: none"> ➤ Echocardiography, also known as cardiac ultrasound, is the use of ultrasound to examine the heart. ➤ It is a type of medical imaging, using standard ultrasound or Doppler ultrasound. ➤ The visual image formed using this technique is called an echocardiogram, a cardiac echo, or simply an echo 		3	
II.9	<pre> graph LR Electrodes --> B[Biological signal(ECG,EEG)] B --> T[Transducer] T --> AF[Amplifier & Filter(Conditioner)] AF --> TC[Transmission channel] TC --> OU[Output unit] OU --- VRC["(Video recorder CRO)"] </pre>		3	
II.10	<p>Properties Of X ray</p> <ul style="list-style-type: none"> ➤ They propagate with a speed of light ➤ They are unaffected by electric and magnetic fields ➤ Xrays are able to penetrate through the materials which readily absorb and reflect visible light ➤ X rays are absorbed while passing through the matter 		3	

	<p>and produce secondary radiation</p> <ul style="list-style-type: none"> ➤ X rays produce ionization in gas and influence the electrical properties of liquids and solids ➤ X-rays produces fluorescence in certain materials to emit light ➤ X-rays affect photographic film in the same way as ordinary visible light <p>(any three)</p>			
	PART C			42
III.	<p>Resting potential is defined as the electrical potential of an excitable cell relative to its surroundings when not stimulated or involved in passage of an impulse. It ranges from -60mV to -100mV.</p> <p>Action potential is defined as the change in electrical potential associated with the passage of an impulse along the membrane of a cell.</p> <p>Absolute Refractory Period: It is the period when the cell is non-responsive to any stimulus</p>	Fig(4 marks) + exp (3marks)	7	
IV	EEG	Fig(4marks) + Exp(3 marks)	7	



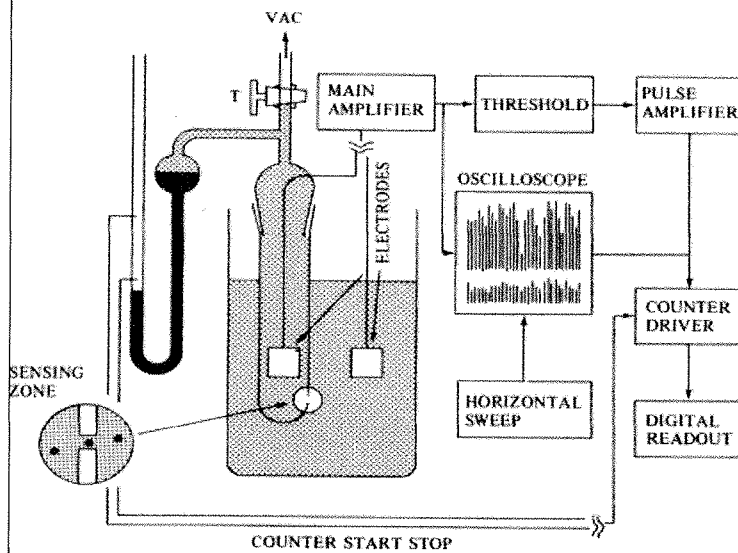
- Montage- A pattern of electrodes on the head and the channels where they are connected is known as montage
- EEG signals are transmitted from the electrode to the jack box and then to montage selector
- Each signal is passed through a preamplifier having high gain and low noise characteristics
- The amplifier should have high common mode rejection to minimize stray interference signals coming from power lines and other electrical equipment
- The overall gain is 20,000 for 50 mv signal
- Upper cut off frequency is controlled by HPF is used
- Notch filter tuned at 50Hz eliminate interference from the frequency of main power supply

V	<p>Coulter Method</p> <p>Working</p> <p>A platinum electrode is placed inside the orifice tube and a second electrode is submerged into the beaker containing the cell dilution, creating an electrical circuit between the two electrodes.</p> <p>Current will flow from one electrode to the other through the orifice.</p>	<p>Fig(4 marks) + Exp(3 marks)</p>	7
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When the cell suspension is drawn through the orifice cell will cause a resistance change which is converted to a voltage change, amplified and displayed the blood cells have much lower electrical conductivity.

Number of pulses –number of particles

Height of pulses-volume of particles

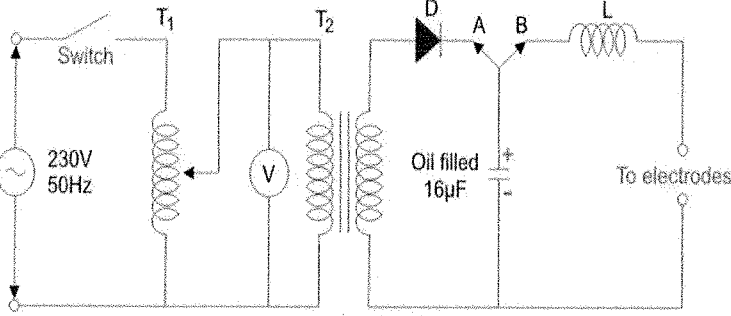


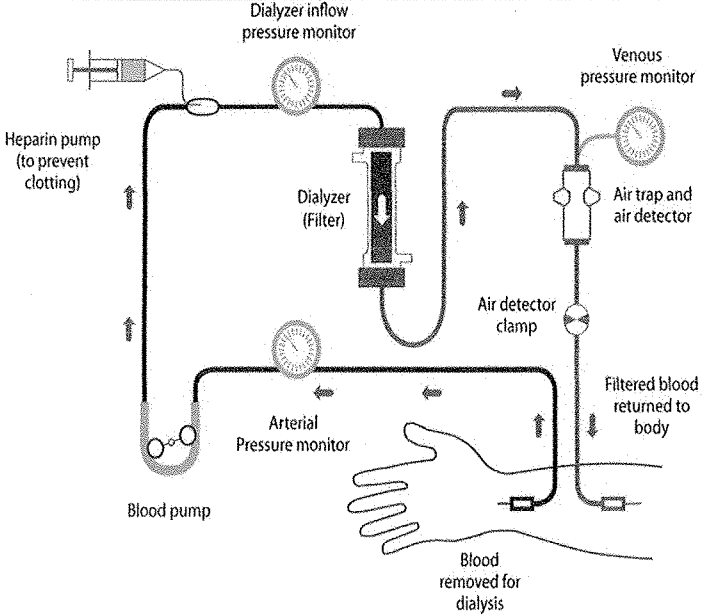
Indirect Method(Sphygomomanometer)

VI

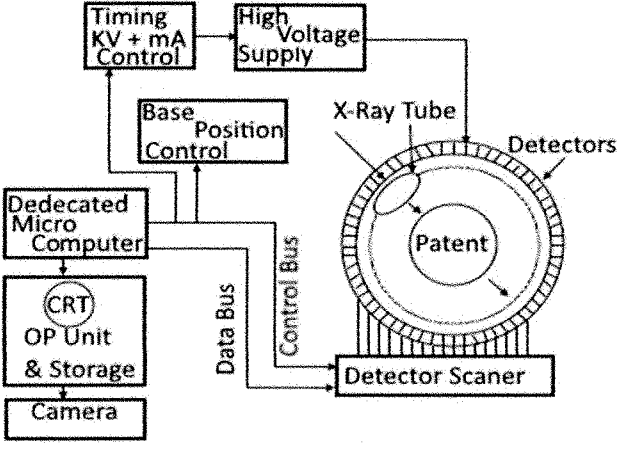
- The sphygmomanometer composed of a inflatable pressure cuff and mercury barometer to measure the pressure in the cuff
- The cuff consists of a rubber bladder and will have a fabric covering that can be wrapped around the upper arm
- The cuff is usually inflated manually with the help of a rubber bulb and deflated (push out the air) slowly through a valve
- The stethoscope carries the sound energy to the ear of the physician via a column of air
- Initially the pressure in the cuff is raised to a level above the systolic pressure so that the blood flow is completely terminated
- Now the pressure in the cuff is released at a known rate
- When the pressure in the cuff reaches a level below the systolic pressure blood flows for a brief period
- If the cuff pressure is made to fall further just below the diastolic pressure value ,the blood flow normally without interruption

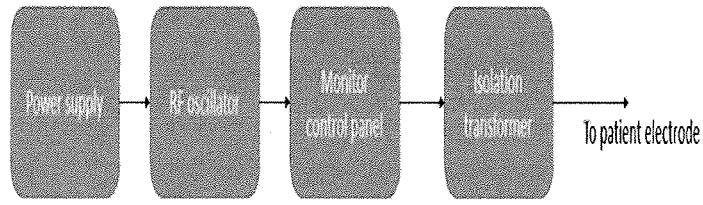
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	<ul style="list-style-type: none"> ➤ The korotkoff sounds first appear ,when the cuff pressure falls just below the systolic pressure ➤ The Korotkoff sound disappear when the cuff pressure falls just below the diastolic pressure 			
VII	 <p style="text-align: center;">DC Defibrillator</p> <ul style="list-style-type: none"> ➤ DC defibrillator does not produce side effects and produces normal heartbeat ➤ DC defibrillator consists of auto transformer T1 that acts as primary of the high voltage transformer T2. ➤ A diode rectifier rectifies the output voltage from T2. <ul style="list-style-type: none"> ➤ It is connected to vacuum type-high voltage over switch. ➤ At position A, switch is connected to one end of the capacitor. ➤ When connected in this position capacitor charges to a voltage. ➤ A foot switch present on the handle of the electrode is used to deliver shock to the patient. ➤ The high voltage switch changes it position to B that makes the capacitor to discharge to the heart through electrodes ➤ L induces a counter voltage that reduces the capacitor discharge value. 	Fig(4marks) + Exp (3 marks)	7	
VIII	Hemodialysis	Fig(4 marks) + Exp(3marks)	7	

	 <p>Hemodialysis is a procedure where a dialysis machine and a special filter called an artificial kidney, or a dialyzer, are used to clean your blood</p> <ul style="list-style-type: none"> ➤ The dialyzer, or filter, has two parts, one for your blood and one for a washing fluid called dialysate. ➤ A thin membrane separates these two parts. ➤ Blood cells, protein and other important things remain in your blood because they are too big to pass through the membrane. ➤ Smaller waste products in the blood, such as urea, creatinine, potassium and extra fluid pass through the membrane and are washed away 			
IX	<p>Application Of LASER</p> <p>Lasers are used for</p> <ul style="list-style-type: none"> ➤ bloodless surgery. ➤ to destroy kidney stones. ➤ in cancer diagnosis and therapy. ➤ eye lens curvature corrections. ➤ in fiber-optic endoscope to detect ulcers in the intestines. ➤ The liver and lung diseases could be treated by using lasers. ➤ to study the internal structure of microorganisms and 		7	

	<p>cells.</p> <ul style="list-style-type: none"> ➤ to produce chemical reactions ➤ to create plasma. ➤ to remove tumors successfully. ➤ to remove the caries or decayed portion of the teeth. <p>in cosmetic treatments</p>			
X	<p><u>Classification Of Blood Cell</u></p> <p>Main Blood Cell Components</p> <ol style="list-style-type: none"> 1.Red Blood Cells 2.White blood Cells 3.Platelets <p>Plasma- fluid containing dissolved and suspension substances</p> <p>RBC</p> <ul style="list-style-type: none"> ➤ No nucleus and disk like shape ➤ Each RBC contain four iron atoms in a structure known as the haemoglobin molecule ➤ Oxygen from the lung alveoli enters the blood stream and chemically combines with haemoglobin to form oxyhaemoglobin ➤ RBCs transport oxygen to the tissues and pick up carbondioxide to form carbominoheamoglobin <p>WBC</p> <ul style="list-style-type: none"> ➤ Contain nucleus ➤ They are also present in the lymph fluid and engulf invading bacteria and foreign substances to destroy the invaders effect <p>Platelets</p> <ul style="list-style-type: none"> ➤ These form a repair substance that initiates blood coagulation and clotting ➤ A protein,thrombin also acts on fibrinogen to generate insoluble fibrin ➤ Fibrin deposits as fine thread to form the frame work of the blood clot 	<p>1 mark + 2 marks + 2 marks + 2marks</p>	7	

<p>XI</p>	 <p style="text-align: center;">Block Diagram of CT Scanner</p> <ol style="list-style-type: none"> 1. High voltage supply drives the x-ray tube that can be mechanically rotated along the circumference of a gantry. 2. Patient is lying in a tube in the center of gantry. 3. The X-rays passes through the patient and produces an image on detectors, which are fixed in a place around the circumference of the gantry in a large quantity. 4. Microcomputer sense the position of tube in the gantry and samples the output of the detector scanner which is opposite to the x-ray tube. 5. A calculation based on the data of a computer scan of the tube is made by the computer 6. The O/P unit then produces a visual image of a transverse plane cross the section of patient. 7. Output may be displayed on the cathode ray tube or photographed with a camera to produce a hard copy record. 	<p>Fig(4 marks) + Exp(3 marks)</p>	<p>7</p>	
<p>XII</p>	<h3 style="text-align: center;">General Precautions</h3> <ul style="list-style-type: none"> ❖ Only Trained personnel shall be permitted to operate an analytical unit. ❖ Be familiar with the procedure to be carried out. ❖ Never expose any part of your body to the primary beam. ❖ Turn the X-ray beam OFF before attempting to make any changes to the experimental set-up (except for beam alignment) ❖ While the beam is on DO NOT attempt to handle, manipulate or adjust any object (sample, sample holder, collimator, etc.) which is in the direct beam path (except for beam alignment procedures). ❖ Examine the system carefully for any system modifications or irregularities. ❖ Follow the operating procedures carefully. DO NOT take short cuts! ❖ Never leave the energized system unattended in an area where access is not controlled. 		<p>7</p>	
<p>XIII</p>	<p>Shortwave diathermy</p>	<p>Fig(4marks) + Exp(3marks)</p>	<p>7</p>	



Heating of tissues is carried out at a frequency of 27.12 MH when we use currents with high frequencies, sensory nerves are not stimulated and there is no contraction of muscles. So there is no discomfort for the patients.

High energy power supply is given to the RF oscillator. Output of the RF oscillator is applied to the pair of electrodes.

Frequency, wavelength, and output power can be controlled with the help of monitor control panel.

Isolation transformer keeps the patient circuit in resonance with the output circuit.

Methods of applying electrodes in shortwave diathermy

1. Capacitor or condenser method
2. Inductive method or inductotherapy

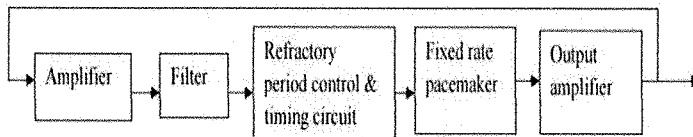


Figure 3.1 Ventricular synchronous pacemaker.

XIV

- Synchronous pacemakers are implanted pacemaker that synchronizes the physiological events in the atrium with those of the ventricle; it stimulates the ventricle when triggered by the P-wave from the atrium
- This electrode is used to sense the R-wave.
- If ventricular contractions are absent, then the pacemaker provides the impulses.
- Electrode is given to the amplifier which is used to amplify the cardiac signal. Filter is used to remove unwanted noise signal.
- If the R wave is below the certain level at that time only, this pacemaker will deliver the pulses

Fig(4 marks)
+Exp (3 marks)

7