

**SUMMER- 2018 EXAMINATION**

**Subject Code:**

**17671**

**Model Answer**

**Important Instructions to examiners:**

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills)
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	(A)	<b>Attempt any THREE</b>	<b>12 M</b>
	a)	<p><b>List any four properties of laser.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Monochromatic: Narrow wavelength</li> <li>2. Coherent: It has same phase and has same direction</li> <li>3. High power density</li> <li>4. Collimated beam: Parallel beam</li> <li>5. High power output</li> <li>6. Unidirectional: Its direction is same</li> </ol>	<b>04 M</b>
	b)	<p><b>With neat block diagram, explain traction unit.</b></p> <p><b>Ans:</b></p> <div style="text-align: center;"> <p>Block Diagram of lumbar &amp; Cervical traction</p> </div> <p><b>Fig: Block diagram of traction unit</b></p> <p>It is a routine therapy in which the pressure is applied on specific muscles and joints to properly realign the joints structure as well as to maintain proper gap between the bones. In this therapy muscle involvement of patient is required. The block diagram of Traction machine is as shown in above figure.</p> <p><b>Control Unit:</b> It consists of a control unit through which all the control signals are given to motor and actuator for back and seat. There is a control panel on which the controls for various positions can be adjusted.</p>	<p><b>02 M</b></p> <p><b>02 M</b></p>

		<p><b>Display:</b> There is a display provided on the control panel to see the actual parameters according to adjustments.</p> <p><b>Emergency handle switch:</b> One emergency switch is also provided to stop the unit in the case of emergency or discomfort to the patient.</p> <p><b>Keypad:</b> To operate various controls given on the machine for different settings.</p>	
	<b>c)</b>	<p><b>List any four effects of ultrasound on human body.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Heating or thermal effect for pain relief</li> <li>2. Micro massage or mechanical effect for reducing odema</li> <li>3. Chemical effect for wound healing</li> <li>4. Biological effect for Tissue repair</li> </ol>	<b>04 M</b>
	<b>d)</b>	<p><b>State and explain any two application techniques of cold therapy.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. <b>Ice towels:</b> Prepare the ice solutions by filling a bucket with crushed ice to one part water. In This solution towel is immersed and applied over the body part to be treated.</li> <li>2. <b>Ice packs:</b> Crushed ice may be placed inside a specially made terry-towel bag or an ice towel folded into an appropriate shape. The part to be treated is exposed and put into comfortable position and ice pack is to be treated.</li> <li>3. <b>Immersion:</b> In this technique the part which is to be treated is immersed in an ice solution.</li> <li>4. <b>Ice-cube massage:</b> A large block of ice can be wrapped in a towel and can be applied over the part to be treated.</li> <li>5. <b>Excitatory cold:</b> The sensory stimulus of ice on skin may be used to facilitate contraction of inhibited muscles.</li> </ol>	<b>04 M</b>
	<b>(B)</b>	<p><b>Attempt any ONE</b></p>	<b>06 M</b>
	<b>a)</b>	<p><b>With neat diagram, explain working principle of ultrasonic therapy machine. List any four technical specification of ultrasound machine.</b></p> <p><b>Ans:</b></p> <div style="text-align: center;"> </div>	<b>02 M</b>
		<p style="text-align: center;"><b>Fig: Ultrasound therapy machine</b></p> <p>The ultrasonic generator or ultrasound therapy machine is constructed on the basis of Piezoelectric effect. A high frequency oscillator of current of 0.75-3MHz is applied to a crystal whose acoustic vibrations cause the mechanical vibrations of the transducer head. The block diagram shows typical ultrasound therapy unit. The heart of the system is an oscillator which produces the oscillations of required frequency. 230AC, 50Hz is applied to a timer circuit through a fuse of 1A rating. The timer is set for the duration of ultrasonic therapy treatment which can be varied from 0 to 30 minutes. Unless the timer is switched</p>	<b>02 M</b>

ON, the input supply is not passed to the power control system. A neon lamp is used as the mains indicator. It is an AC power control circuit using DIAC and TRIAC. The output of oscillator can be controlled by controlling the output power of the circuit and it can be done directly by using a variable transformer or by controlling the firing angle of TRIAC. The machine can be operated in either continuous or pulsed mode by switching the output of power and voltage control circuit to half wave rectifier or full wave rectifier. The rectifier output is given to the oscillator which generates the output of 1MHz frequency. The power amplification is done with the power amplifier and finally it is given to the piezoelectric crystal.

**Technical specifications of ultrasound therapy machine**

1. Input supply voltage: 230V AC, 50Hz.
2. Output power: 21 watt for pulse mode, 15 watt for continuous mode.
3. Frequency of operation: 0.75-3MHz
4. Maximum setting time: 15min.
5. Treatment head radiating area: 5 to 6 cm<sup>2</sup>

02 M

**b) Draw different types of cutting and coagulation electrodes. List any four technical specification of cautery machine.**

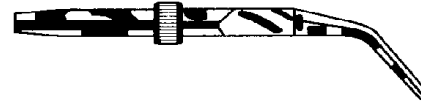
**Ans:**

**Types of cutting and coagulation electrodes:**

(a) Needle electrode



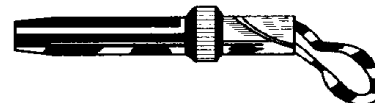
(b) Angulated lancet electrode



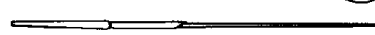
(c) Wire loop electrode



(d) Angulated band loop electrode



(e) Straight lancet electrode



**Fig.27.9 Coagulation electrodes of different shapes and sizes**

**Technical specification of cautery machine:**

1. Input power- 230 V, 50 Hz
2. Frequency of operation – 250KHz – 1MHz
3. Power delivering output – 400w for cutting and 150w for coagulation
4. Coagulation duration – 10-15 sec

02 M

02 M

02 M



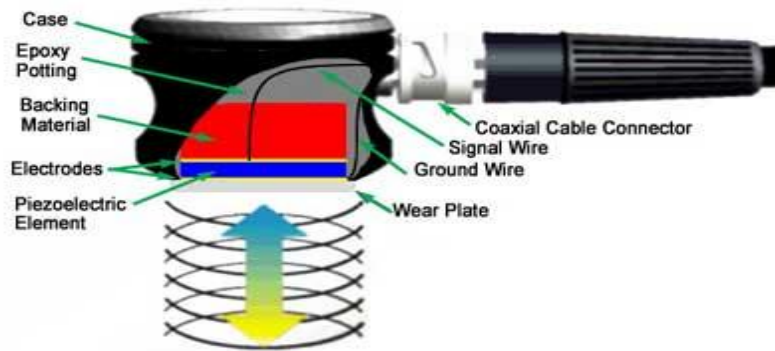
2.		<b>Attempt any FOUR</b>	<b>16 M</b>
	a)	<b>State any four needs of traction unit.</b> <b>Ans:</b> In orthopedic medicine traction refers to the set of mechanism for straightening broken bones or relieving pressure on the spine & skeletal system. The need of traction treatment, 1. Regain normal length and alignment of involved bone. 2. To rescue an immobilized and fractured bone. 3. To lessen or eliminate muscle spasm. 4. To prevent or reduce skeletal deformities or muscle contraction.	<b>04 M</b>
	b)	<b>What is nerve muscle stimulator? Explain principle of operation of it.</b> <b>Ans:</b> <b>Nerve muscle stimulator:</b> The nerve muscle stimulator is a one type of therapeutic equipment. It is used in physiotherapy department for the treatment of totally, partially paralysis and peripheral circulatory disturbances. In which used different types of currents such as galvanic current, faradic current, exponential current, surged faradic current, biphasic current, interrupted DC current for stimulate nerves and muscles. <b>Principle operation of nerve muscle stimulator:</b> Electrotherapy unit should give specific output waveform for specific applications. The unit gives output current wave forms to cover whole range of electrotherapeutic currents. The unit must be of constant voltage or constant current type. It is capable of generating different types of pulses at its output by using a selector switch. Galvanic current of required intensity is achieved by simple DC supply tapping circuit. Electric current is directly applied to a patient. To set basic stimulation frequency variable rate multivibrator M1 is used. The output from this M1 triggers monostable multivibrator M2 which sets pulse width. The output from M2 provides an interrupted galvanic. Another astable multivibrator M3 produces short duration pulses called faradic current. By modulating the faradic current with the required pulse duration we can get the surged faradic current. It is done in a mixer ckt. Triangular pulse generator is used to get exponentially progressive current. This is done by integrating the output of M2 so that the interrupted galvanic pulses are modified to have exponential rise and fall.	<b>02 M</b>  <b>02 M</b>
	c)	<b>State and explain contra-indication of cold therapy.</b> <b>Ans:</b> 1. <b>To be avoided in elder patients:</b> It should not be used to particularly the elder patients as it may create discomfort to them. 2. <b>To be avoided in cardiac conditions:</b> The initial shock of the ice application may cause a marked drop in blood pressure thus causing an increase in heart rate. It can cause problem to heart patient. 3. <b>To be avoided in peripheral nerve injuries:</b> These types of injuries lose their normal response to cooling. If such an area were cooled with ice it may become very cold and take many hours to regain normal temp. 4. <b>Peripheral vascular disease:</b> As cold application may reduce an already inadequate blood supply ice is avoided.	<b>04 M</b>
	d)	<b>List out different methods of accident prevention.</b> <b>Ans:</b> 1. Grounding 2. Double insulation 3. Protection by low voltage 4. Ground- fault circuit interrupter 5. Isolation of patient connected parts	<b>04 M</b>



		6. Isolated power distribution system	
e)	<b>List out steps to be carried out for maintenance of electrosurgical unit.</b> <b>Ans:</b> <ol style="list-style-type: none"><li>1. Clean dust from exterior and cover equipment after use.</li><li>2. Remove any foreign body from equipment.</li><li>3. Check regular electro surgical unit &amp; make sure that both power indicators are off when switch is off.</li><li>4. Check controls for correct positioning &amp; operation.</li><li>5. Check all bulbs, heaters &amp; connectors for function, repair or replace if necessary.</li><li>6. Check cables and electrodes safely stored.</li><li>7. Check all fittings and accessories are mounted correctly.</li><li>8. Check for leakage current, check grounding connection.</li><li>9. Choose correct electrode tip for desired procedure.</li><li>10. Open the machine and test the continuity of circuit at different test points.</li><li>11. Repeat the above procedure and test the performance of the machine for different level controls.</li><li>12. Every six months biomedical technician check machine.</li></ol>	<b>04 M</b>	
f)	<b>Explain the concept of electrostatic discharge.</b> <b>Ans:</b> <p>Electrostatic discharge (ESD) is the release of static electricity .ESD first requires a buildup of an electrostatic charge. This occurs when two different materials rub together. One of the materials becomes positively charged; and the other becomes negatively charged. The positively charged material now has an electrostatic charge .When that charge comes into contact with right material .it is transferred and we have an ESD event. Heat from the event is extremely hot although we do not feel it when we are shocked. However when the charge is released on electronic device such as expansion card, the intense heat from the charge can melt or vaporize the tiny parts in the cards causing the device to fail. For example, hard drive components are sensitive to only 10v .For this reason, manufacturers of electronic devices incorporate measures to prevent (ESD).Sensitive devices can be packed with materials that shield the product from a charge. Examples of ESD like the shock we receive when we walk across carpet and touch a metal doorknob and the static electricity we feel after drying clothes in clothes dryer. While most ESD events are harmless, it can be an expensive problem in many industrial environments.</p>	<b>04 M</b>	
3.	<b>Attempt any <u>FOUR</u></b>	<b>16 M</b>	
a)	<b>List out any four physiological effects of IR on human body.</b> <b>Ans:</b> <ol style="list-style-type: none"><li>1. Cutaneous vasodilation: Due to consequences of heating with IR radiations irregular patches appear on the skin.</li><li>2. Sweating: Due to intense heating sweating will start occurs.</li><li>3. Sensation of thermal heating.</li><li>4. Increase in metabolism.</li><li>5. Cronic changes: Extensive and prolonged IR application can cause brown discoloration of the skin.</li></ol>	<b>04 M</b>	
b)	<b>With neat diagram, explain working of ultrasonic therapy transducer.</b> <b>Ans:</b> <p>Ultrasound transducer is a transducer that works on the principle of ultrasound. Construction of ultrasound transducer is as shown in fig. It consists of piezoelectric crystal like Lead Zirconate Titanate (PZT). A high frequency (0.75 to 3MHz) AC current is applied to crystal whose acoustic vibrations causes the mechanical vibrations of transducer head,</p>		

which is directly located in front of the crystal. Mechanical constructions include parameters such as radiation surface area, mechanical damping, housing, connector type etc. Practical transducers are constructed from barium Titanate or lead Zirconate titan ate (PZT) having 5 to 6 cm effective radiating area. PZT is commonly used in a transducer made up of ceramic material.

- In order to get desired wavelength of frequency of ultrasonic signal the piezoelectric crystal cut in such a way that it resonates at required frequency so that it gives maximum OLP. To distribute the electric field through the crystal it is provided with metal plates on both sides which form parallel plate capacitors.
- To get as much energy out of transducers as possible an impedance matching is to be made which is done by keeping proper matching layer in between the front plate and the electrodes. The matching layer must be half the thickness of the PZT crystal.
- For the contact type transducer matching layer is made up of such a material that it should protect the active element from scratching.
- They have a replaceable wear plate. In order to direct the energy out from the crystal the backing material is applied to the surface of the crystal opposite to the head of the transducer.
- The voltage is applied to the crystal through the metal surface i.e. electrodes and the front electrode is grounded which provides return path for electric voltage.



**Fig: Ultrasonic therapy transducer**

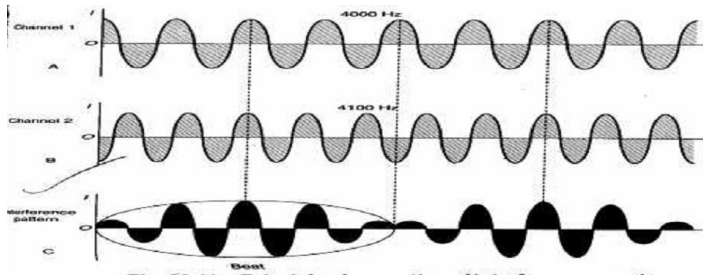
c) **Explain effects of electric current on human tissue.**

**Ans:**

1. It is an application of high frequency electric current through the biological tissue. It can be used to cut coagulate desiccated or fulgurate the tissue.
2. The tissues are heated to such an extent the cells which are immediately under the electrode are torn apart by the boiling of the cell fluid. Its benefit includes ability to make precise cut with limited blood loss. The frequency of current used in surgical diathermy machine is in the range of 1-3MHz. Surgical diathermy depends on the heating effect of electric current.
3. When high frequency current flows through the sharp edge of the wire loop or a point of a needle to the tissue, there is high concentration of current occur at that point.
4. The current flowing through the active electrode and passive is the same. But as the active electrode has very small cross sectional area the current density of an active electrode is much larger than the current intensity of the passive electrode.
5. As there is difference between current density of two electrodes the tissues under passive electrode are heated slightly while the tissues under active electrode, are heated to cause cutting.



	<p>d) <b>State and explain application, techniques of electrotherapy.</b> <b>Ans:</b> <b>1. Monopolar technique:</b> The Monopolar technique makes use of small active electrodes. In this technique the indifferent or dispersive or ground electrode is of large area and is placed near to the active electrode. Each muscle is stimulated with the active electrode and a ground electrode is held over the lower end of the muscle to be stimulated. The electrode must be kept moving over the muscles to ensure that the current passes through maximum number of fibers. In this method current is regulated to produce the optimum contraction of each muscle and each muscle is rested while other groups of muscles are being stimulated. In this method there is less irritation as only one active electrode is used. Electrode can be of ball or plate electrode which is mounted on special handle which has fingertip switch for convenient control of output current.</p> <p><b>2. Bipolar technique:</b> In this technique both the electrodes are active electrodes and are placed on the body. These are placed at each end of the muscle to be stimulated. This method is useful for stimulation of deeply placed muscles which are difficult to isolate. Placement of the electrode should be in such a way that all muscles should contract equally. This method has advantage that it permits a large number of muscle contraction simultaneously. It is difficult for operator to hold both electrodes and at the same time to regulate the current intensity. Hence to fasten electrodes may be fixed in position by a rubber strap. One is placed at the origin of the muscle and the other placed over the lower end of the muscle group to be stimulated. In this method as the current is of high intensity the area of electrode should be sufficiently large so as to avoid uncomfortable heat sensation to the patient.</p>	<p><b>02 M</b></p> <p><b>02 M</b></p>
	<p>e) <b>State any physiological effects of cold therapy on human body.</b> <b>Ans:</b> 1. Decreased circulation 2. Increased tissue stiffness 3. Local vasoconstriction 4. Decreased muscle spasm 5. Decreased inflammatory effects 6. Decreased pain 7. Decreased metabolism 8. Decreased nerve conduction velocity</p>	<p><b>04 M</b></p>
<p>4.</p>	<p>(A) <b>Attempt any <u>THREE</u></b></p>	<p><b>12 M</b></p>
	<p>a) <b>Explain capacitive and inductive field application technique of diathermy machine.</b> <b>Ans:</b> <b>Capacitive method:</b> In capacitor field method the output of SWD machine is connected to the metal electrodes which are positioned on the body over the region to be treated. Electrodes are placed on each side of the body part to be treated In the terminology of the diathermy these electrodes are called as PADS. Electrodes don't directly come in contact with the skin usually layers of towels are interposed between the metal plate and the surface of the body. The pads are placed so that the portion of the body to be treated is sandwiched between them. This arrangement is called condenser method. The metal electrodes act as two plates of the capacitor while the body tissue along with insulating material forms the dielectric of the capacitor. When RF output is applied to the electrodes rapidly alternating charges are set up on the electrodes and gives rise to an alternating electric field between them. Due to the</p>	<p><b>02 M</b></p>

	<p>dielectric losses of the capacitor heat is generated in the tissues. Dielectric losses takes place due to the rotation of dipoles and the vibrations of the ions in the tissue fluids and molecular distortion in the tissues</p> <p><b>Inductive Method:</b></p> <p>In this the output of SWD machine is connected to a flexible cable. When SWD is applied by the use of cable the effect of electric field or magnetic field may be used. The electrode consists of a thick insulated cable which completes the patient circuit of the machine A cable is arranged in contact with the patient so as to cover the treatment area but separated from the patient's body by a layer of an insulating material as shown in fig. This cable is coiled around the arm or knee or any other portion of the patients body where plate electrodes are inconvenient to use. When RF current is passed through this cable the heating is produced inside the body.</p>	<p><b>02 M</b></p>
<p>b)</p>	<p><b>List any four technical specification of nerve muscle stimulator.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Power supply- 230V, 50Hz.</li> <li>2. Output voltage- 0 to 150v.</li> <li>3. Output current- up to 80mA.</li> <li>4. Variable pulse duration- 0.3,1,10,30,100,300 msec.</li> <li>5. Pulse repetitive duration - 0.3,1,3 up to 10 msec.</li> <li>6. Surged faradic frequency- 6 to 60 surges/min.</li> </ol>	<p><b>04 M</b></p>
<p>c)</p>	<p><b>List and explain medical application of laser.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Tissues Healing</li> <li>2. Pain control</li> <li>3. Osteoarthritis</li> <li>4. Retinal Coagulation</li> <li>5. Measurement of eye activity</li> </ol> <ol style="list-style-type: none"> <li>1. <b>Tissues Healing:</b> Laser radiations are used to accelerate wound healing for this purpose red part of visible spectrum have been particularly employed and found to be effective.</li> <li>2. <b>Pain control:</b> Laser therapy is used for relief of acute and long term pain, It can be used for treating of Rheumatoid arthritis.</li> <li>3. <b>Osteoarthritis:</b> Various back pains, nerve inflammation, muscular sprain etc. lasers help in pain relieving effect and reduction of joint swelling pain is also treated by application of laser source to trigger acupuncture points neurogenic pain can be relieved in some patient by laser application.</li> <li>4. <b>Retinal Coagulation:</b> The heat generated by laser results in retina being attached with the choroid.</li> <li>5. <b>Measurement of eye activity:</b> The laser used for measurement of eye activity.</li> </ol>	<p><b>02 M</b></p> <p><b>( Explain Any 2 )</b></p> <p><b>02 M</b></p>
<p>d)</p>	<p><b>Explain the principle of interference therapy with suitable diagram.</b></p> <p><b>Ans:</b></p> 	<p><b>02 M</b></p>



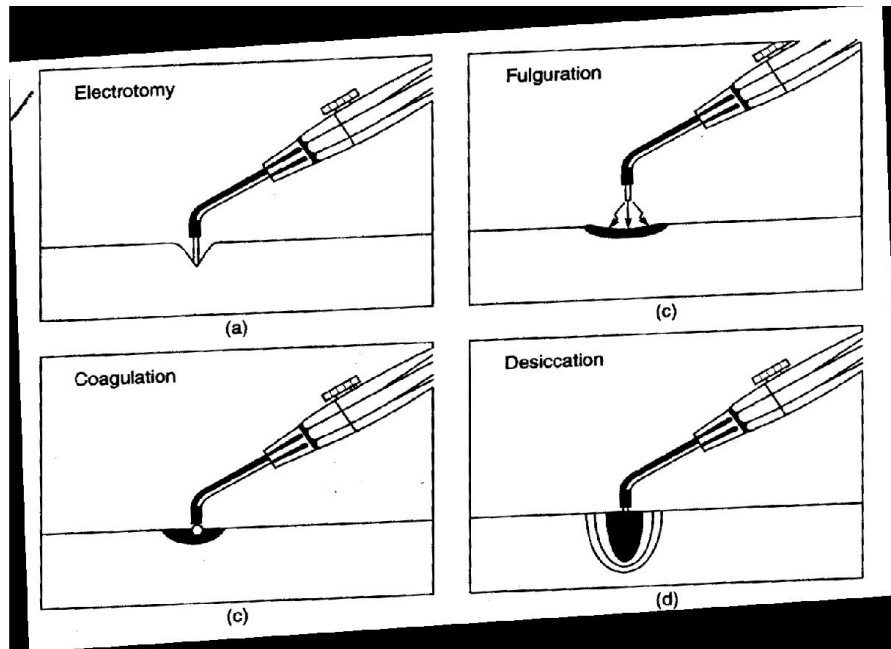
Interferential Therapy is a form of electrical treatment in which to midium frequency currents are used to produce low frequencies currents. The basic principal is when two midium frequency currents crosses in patients tissue it produces interference effect in that tissue. In this method one current is kept at constant frequency 4000 Hz. and second can be adjustable from 4000 to 4400 Hz. When fixed and adjustable frequency are combine they produces desired beat frequency as shown in wave form. The beat frequency is equal to the difference in between frequency of two currents. The conventional stimulator delivers most of the stimulations directly under electrodes but with interfeintional stimulator the currents passes at greater depth and over a larger volume of tissue. As the midium frequency current is tolerated better by the skin the therapy can be used for longer time.

02 M

(B) Attempt any ONE

06 M

a) With neat diagram, explain cutting, coagulation, fulguration and desiccation modes of ESU. State any safety precaution to be considered while using electro-surgical unit.  
Ans:

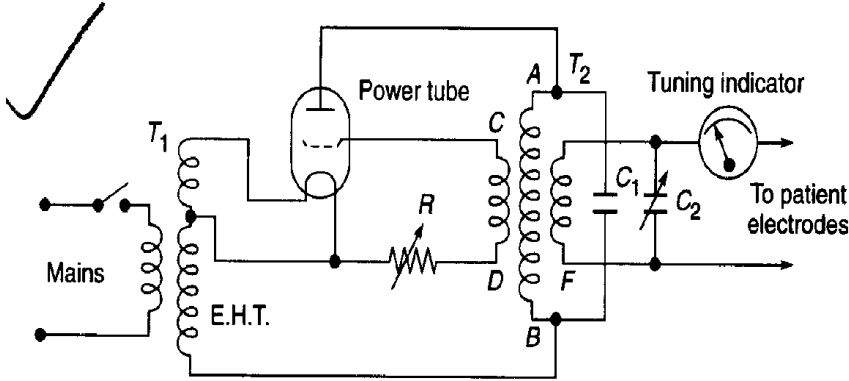


02 M

Fig: Cutting, coagulation, fulguration and desiccation modes

1. **Cutting or Electrotony:** when electrode touches the tissue sufficiently high power density is applied to the cells. So there is boiling effect of the cell fluid it vaporizes and tissue gets torn apart. Needle type electrode is used for this purpose.
2. **Coagulation:** Coagulation of tissues is caused by high frequency current flowing through the tissue and heating it locally so that it coagulates from inside. Ball type electrode is used for this purpose.
3. **Fulguration:** It is superficial tissue destruction without affecting deep seated tissues. Electrode in the form of needle or a ball electrode held near the tissue without touching it. An arc is formed whose heat dries out the tissues.
4. **Desiccation:** In this a needle point electrode is stuck into the tissues & then kept steady. This treatment may be used for treating the nodules under the skin where minimum damage to the skin surface is desired.

02 M

	<p><b>Safety precaution to be considered while using electrosurgical:</b></p> <ol style="list-style-type: none"> <li>1. Inspect machine for worn or broken wires before use.</li> <li>2. Keep ESU electrode in non-conductive holder when not in use, this prevents accidental activation.</li> <li>3. Liquids or solutions should not keep near the patient plate.</li> <li>4. Don't keep ESU foot switch in pool of liquid.</li> <li>5. Do not turn ESU activation sound completely off sound also alerts surgical team to accidental activation of ESU.</li> </ol>	<p><b>02 M</b></p>
<p>b)</p>	<p><b>With neat diagram, explain principle of short wave diathermy.</b></p> <p><b>Ans:</b></p>  <p><b>Fig: Short wave diathermy</b></p> <p>Short Wave diathermy current is a high frequency alternating current. The heat energy obtained from the wave is used for giving relief to the patient. Its frequency is 27,120,000 cycles per second and the wavelength is 11 meter. The method consists of applying the output of radio frequency oscillator to a pair of electrodes which are positioned on the body over the region to be treated. When high frequency is applied across electrodes molecules try to orient in the direction of current which creates inter molecular friction and hence the heat is generated inside the body. The RF energy heats the tissues and promotes healing of injured tissues and inflammations.</p>	<p><b>03 M</b></p> <p><b>03 M</b></p>
<p>5.</p>	<p><b>Attempt any <u>FOUR</u></b></p>	<p><b>16 M</b></p>
<p>a)</p>	<p><b>With neat block diagram, explain CPM unit.</b></p> <p><b>Ans:</b></p> <p>The CPM contains timer circuit which is used to set treatment time. Before starting the machine to set flexion, extension, speed and pause duration using limit set circuit. Motor &amp; relay driver circuits are used for movement of the CPM machine. If patient have discomfort then patient switch is used for ON and OFF machine. CPM means continuous passive motion. In this therapy there is no involvement patient's muscle. Force is not applied. It is specially used as post-operative therapy. When patient is unable or find difficult to move any body part especially joints such as Knee joint, Shoulder joint etc. after surgery or lengthy immobilization then CPM machine is used to give passive movement to that body part so that patient will be able to move it freely. It is complete passive movement; there is no involvement of any muscles of patient. Types are Knee joint, Shoulder joint, wrist joint etc.</p>	<p><b>02 M</b></p>

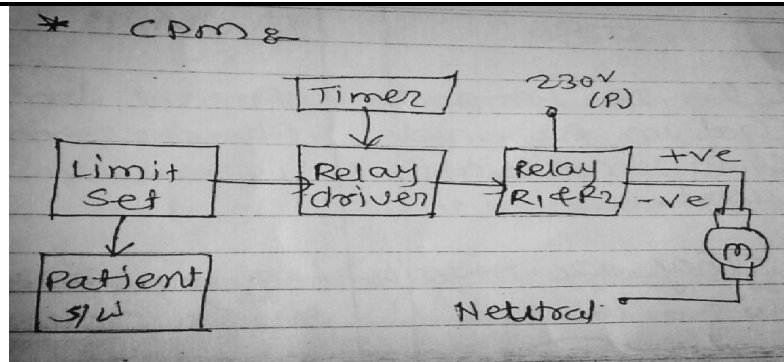


Fig: Block diagram of CPM machine

02 M

b) Explain physiological effects of short wave on human body.

Ans:

- 1. Increased metabolic activity:** Heating treatment given through SWD can accelerate rate of metabolism, it is more in the superficial tissues.
- 2. Increased blood flow:** Increased blood supply ensures the optimum conditions for muscle contraction.
- 3. Heating of nerves creating sedative effects:** Heat appears to produce sedative effects due to heating of nerves.
- 4. Heating of muscles and tissues results in muscles relaxation:** Rise in temperature includes muscle relaxation and increases the efficiency of muscle action.

04 M

c) Draw neat waveforms of surged faradic and biphasic currents and explain its application of stimulation.

Ans:

**Surged faradic current:** If the peak current intensity applied to the patient increases and decreases rhythmically or periodically and the rate of increased and decreased of the peak amplitude is slow, it can provide relaxation and contraction of muscles. The ratio of ON time and OFF time of surging is also adjustable so that graded exercise may be given.

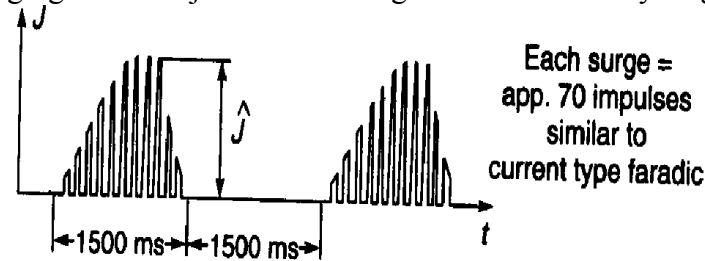


Fig: Surged faradic current

01 M

01 M

**Biphasic Current:** The cell recovery from the effect of stimulus current can be achieved by the passage of lower intensity current of opposite polarity over a longer period. Such type of combination of positive and negative pulse is called as biphasic stimulation. In this the stimulating pulse are followed by a pulse of opposite polarity of  $1/10^{\text{th}}$  of the amplitude and 10 times the width.

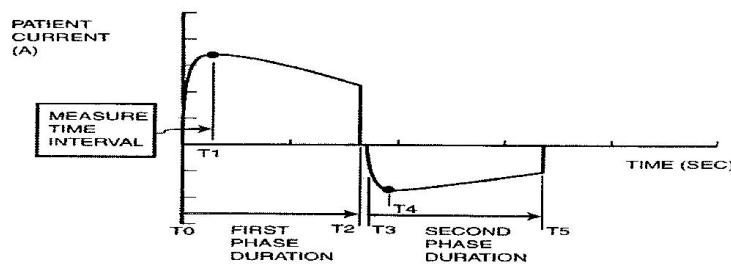


Fig: Biphasic current

01 M



d)	<p><b>State significance of circulatory response and neural response.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"><li><b>Circulatory response:</b> It is the initial response of the skin to cooling is an attempt to preserve heat. The initial vasoconstriction is often used to limit the blood flow into the tissues in injury like sports injury.</li><li><b>Neural response:</b> The skin contains primary thermal receptors. There are several times colder than warm receptors. The cold receptors respond to cooling by a sustained discharge of impulses, the rate of which increases with further cooling. It has been shown that the rate of conduction of nerve fibers in a mixed peripheral nerve is reduced by cooling.</li></ol>	<p><b>02 M</b></p> <p><b>02 M</b></p>
e)	<p><b>Define microshock and macro shock and also state the physiological effects of electric shock.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"><li><b>Microshock:</b> In this case current passes directly through the heart wall (Internal part of body). In this case small amount of current cause very dangerous to the person. Micro current applied internally to the body. In this case directly current pass through the heart. Therefore less current to produce ventricular fibrillation. Such situations are commonly generated in hospital.</li><li><b>Macroshock:</b> In macro shock or gross shock current flows through the external body parts of person ex. Hand, Foot. Macroshock will be generated by the person accidental contact with electrified object at any point on the surface of body. The majority accident involves or develops passage of current from one upper limb to the feet. The value of electric current flowing through the body varies from person to person. The value of current depend upon the contact impedance, age, weight, condition of skin, sex, frequency of current, duration of current etc.</li></ol> <p><b>Physiological effects of electric shock:</b></p> <ol style="list-style-type: none"><li>Severe burn</li><li>Respiration paralysis</li><li>Ventricular fibrillation</li><li>Muscle contraction</li><li>Tingling sensation</li><li>Pain</li><li>Fainting or unconscious</li><li>Neurological effects</li><li>Permanent damage of body organs</li><li>Death</li></ol>	<p><b>01 M</b></p> <p><b>01 M</b></p> <p><b>02 M</b></p>
f)	<p><b>Describe any two methods for accident prevention.</b></p> <p><b>Ans:</b></p> <ol style="list-style-type: none"><li><b>Grounding:</b> Is one of the most frequently method used for accident prevention. The principle of this method is to make grounding resistance small enough that for all fault resistance values, majority of fault current by passes body of the victim &amp; body current remains at safe level even if contact &amp; body resistances are small.</li><li><b>Double Isolation:</b> In this method, fault resistance is very large. Double isolated equipment need not be grounded. It is widely used as method of protection in hand held power tool &amp; electric powered garden equipment e.g. lawn mowers.</li><li><b>Protection by low voltage:</b> A low operating voltage can be obtained by means of step down transformer, in addition to bowering the voltage; the transformer provides isolation of supply voltage from ground.</li></ol>	<p><b>04 M</b></p>

		<p><b>4. Ground fault circuit interrupter:</b> All current that enters a device through hot wire returns through neutral wire. Current actually return through body of victim &amp; through ground, in this method difference between the currents in the hot and neutral wires of power line is an electric amplifier. If this difference exceeds a certain value, usually 5 mA, power is interrupted by a circuit breaker. In case of large current flow through body of victim, no harmful effects are encountered.</p>	
<b>6.</b>		<b>Attempt any <u>FOUR</u></b>	<b>16 M</b>
	<b>a)</b>	<p><b>List out maintenance procedure to be carried out for ultrasound machine.</b> <b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Clean ultrasound machine regularly.</li> <li>2. Checking parts of machine along with some calibration test.</li> <li>3. Cover equipment after use.</li> <li>4. Check all fittings and accessories are mounted correctly.</li> <li>5. Check cables and probe safely stored.</li> <li>6. Clean probes after use.</li> <li>7. Test the performance of the machine for different level controls.</li> <li>8. Open the machine and test the continuity of circuit at different test points.</li> <li>9. Every six months biomedical technician check machine.</li> </ol>	<b>04 M</b>
	<b>b)</b>	<p><b>State any four electric hazards in hospital environment.</b> <b>Ans:</b></p> <ol style="list-style-type: none"> <li>1. Hazard caused by electrical wiring failures that allow personal contact with the live wire or surface at the full power line voltage such things as frayed power cords, broken plugs, faulty lamp sockets and wrongly wired outlets all have the potential of allowing contact with electrical live parts and lethal voltages.</li> <li>2. The second electrical hazard is leakage current, electrical current can be accidently transmitted to the body by operational error, equipment defects, potential from external sources on signal leads.</li> <li>3. The patient or the operator may not realize that a potential hazard exists. This is because potential differences are small and high frequency and ionizing radiations are not directly indicated.</li> <li>4. The environmental conditions in hospitals, particularly in the operating theatres, cause an explosion or fire hazards due to the presence of anesthetic agents, humidity and cleaning agents.</li> </ol>	<b>04 M</b>
	<b>c)</b>	<p><b>With neat diagram, explain construction of high pressure mercury vapour lamp UV generator.</b> <b>Ans:</b></p> <div style="text-align: center;"> <p style="text-align: center;"><b>Fig: Constructional diagram of UV lamp</b></p> </div>	<b>02 M</b>

		<p>It consists of 'U' shape quartz tube. It allows the passage of UV radiation can withstand very high temperature and has low coefficient of expansion. The tube is filled with argon gas at low pressure a small quantity of mercury is also enclosed in the tube. An electrode is sealed on the either ends of the tube. Argon gas is extremely stable and inert high amount of energy is required to ionize the argon gas. It is obtained by applying high voltage (400V) from an autotransformer across a tube for a fraction of seconds. Once the argon has been ionized normal AC mains voltage is applied across the tube. When argon gas is ionized there are number of free electrons which can move randomly inside the tube. It will cause collision between free electrons and mercury atoms as well as free electrons and neutral argon atoms, which causes further ionization current across the tube. This current flow can be seen as a glow discharge.</p>	<b>02 M</b>									
	<p><b>d)</b></p>	<p><b>Suggest the possible solution and state the cause for following faults on ESU:</b></p> <ol style="list-style-type: none"> <li><b>1. Alarm tone deactivates.</b></li> <li><b>2. Cutting electrodes not working properly.</b></li> </ol> <p><b>Ans:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Faults</th> <th style="width: 30%;">Cause</th> <th style="width: 40%;">Solution</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"><b>Alarm tone deactivates</b></td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>1. Loose or damaged connection between speaker board and main circuit board</li> <li>2. Faulty power entry module or connections.</li> </ol> </td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>1. Check connection/ Replace the faulty speaker.</li> <li>2. Replace faulty power connections.</li> </ol> </td> </tr> <tr> <td style="vertical-align: top;"><b>Cutting electrodes not working properly</b></td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>1. Electrode may be damaged.</li> <li>2. Output of frequency generator is improper.</li> </ol> </td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>1. Repair or replace the electrode.</li> <li>2. Check the output of the frequency generator.</li> </ol> </td> </tr> </tbody> </table>	Faults	Cause	Solution	<b>Alarm tone deactivates</b>	<ol style="list-style-type: none"> <li>1. Loose or damaged connection between speaker board and main circuit board</li> <li>2. Faulty power entry module or connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check connection/ Replace the faulty speaker.</li> <li>2. Replace faulty power connections.</li> </ol>	<b>Cutting electrodes not working properly</b>	<ol style="list-style-type: none"> <li>1. Electrode may be damaged.</li> <li>2. Output of frequency generator is improper.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or replace the electrode.</li> <li>2. Check the output of the frequency generator.</li> </ol>	<p><b>02 M</b></p> <p><b>02 M</b></p>
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	<p><b>e)</b></p>	<p><b>Identify given below figure A. Mention names of electrodes at position A and B.</b></p> <div style="text-align: center;"> <p style="text-align: center;">Fig. A</p> </div> <p><b>Ans:</b></p> <p><b>Figure A</b> is monopolar mode of Electrosurgical unit</p> <p><b>Electrode at position A:</b> An active electrode it can be needle or loop electrode</p> <p><b>Electrode at position B:</b> Passive electrode or differential electrode or patient's plate it provides return path.</p>	<p><b>02 M</b></p> <p><b>01 M</b></p> <p><b>01 M</b></p>									