(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR, SECOND TRIMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN PHYSIOTHERAPY

COURSE CODE: BSP 213

COURSE TITLE: ELECTROTHERAPY

DATE: ---------- **TIME:** ----------

INSTRUCTIONS TO CANDIDATES

Answer all Questions

Sec A: Multiple Choice Questions (MCQ) 20 Marks
Sec B: Short Answer Questions (SAQ) (40 marks)
Sec C : Long Answer Questions (LAQ) (40 marks)

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

OC moderated 8/1/2018

SECTION A: MULTIPLE CHOICE QUESTIONS (20marks)

1. For an electrical current to flow all are present except
   a) Source of electrons
   b) Movement of ions from negative to positive poles
   c) A vacuum is used
   d) Material that allows passage of electrons

2. Which of the following statements is/ are correct about short-wave diathermy
   a) Uses a frequency of 27.12 mhz
   a) Effective for deep heating of large areas
   b) Machines can be expensive
   c) Parameters for safe use over metal implants have not been established
   d) All of the above are correct

3. Which of the following, which is/are true regarding continuous ultrasound?
   a) At 1 MHz, tissue temperature increases of 4° require more than a 5-min application.
   b) Less application time is required for the same temperature increase with use of 3 MHz rather than 1 MHz
   c) A lower treatment frequency results in heating in deeper tissues.
   d) a and b are correct.
   e) a, b, and c are correct

4. What is the primary determinant of the depth of heating with therapeutic ultrasound
   a) Frequency
   b) Duty cycle
   c) Intensity
   d) Effective radiating area
   e) None of the above

5. All of the following are specific categories of lasers based on the way they are made EXCEPT
   a) Semiconductor (diode)
   b) Full conductor (polar)
   c) Liquid (dye)
   d) Solid (ruby)
   e) Gas (helium-neon)

6. All of the following are forms of biofeedback used in sport and rehabilitation EXCEPT
    a) Respiration monitors
    b) Heart rate monitors
    c) Visual feedback through mirrors
    d) Galvanic skin response measures
    e) All of the above

7. Trigger points are _____.
    a) Bands of tight, hypersensitive connective tissue
    b) Associated with myofascial pain syndromes
    c) Tender to palpation
    d) Usually found bilaterally
    e) A, b, c, and d are correct

8. Which of the following is not a potential benefit of cryotherapy
    a) Decreases local blood viscosity
    b) Reduces the acute inflammation response
    c) Decrease local metabolic rate and secondary hypoxia
    d) Causes vasoconstriction leading to a decrease in local circulation
    e) Counter irritant reducing pain

9. A 60 year old lady, presents with a stroke of the right side hemiplegia. Complains of pain in the shoulder during results also when attempting activities of daily living. On examination the humeral head is displaced. Which modality would be the most appropriate for her condition?

    a) Transcutaneous electrical nerve stimulation TENS
    b) Short wave diathermy SWD
    c) Functional electrical stimulation FES
    d) Interferential therapy IFT
    e) Russian current

10. An athlete presents five days following a hamstring strain. The athlete has some pain with activity and demonstrates a loss of hamstring flexibility. The athlete performs an ice massage over the injured hamstring and four long, slow hamstring stretches. The athlete stretches much farther than before applying the ice. What is the best explanation for this observation?

    a) Cold-induced vasodilation has increased the connective tissue temperature, making it more elastic.
    b) Cold has decreased the muscle spindle hypersensitivity, allowing the muscle to be stretched without a reflexive muscle spasm.

c) Cold has anesthetized the tissue, preventing the athlete from sensing pain during stretching.
d) Cold has activated the gate control and is blocking the sensation of pain during stretching
e) None of the above

11. Which of the following would be the best treatment choice for the following patient problem? The athlete is a 45-year-old tennis player who underwent an operation for a displaced fracture of the proximal phalanx of the index finger eight weeks ago. The pin fixation was recently removed. The primary complaint is lack of motion in the MIP and PIP joints.

a) Hot pack
b) Contrast bath
c) Paraffin
d) Fluidotherapy
e) Cryokinetics

12. All of the following are correct about choosing a laser EXCEPTs

a. Wavelength
b. Depths of penetration
c. Ease of application
d. Power density (intensity)
e. All of the above should be considered

13. Numbness in the palm aspect of the fourth and fifth fingers following the application of ice to the elbow is consistent with which of the following?

a) Cold-induced radial nerve palsy
b) Cold-induced ulnar nerve palsy
c) Cold-induced median nerve palsy
d) Cold urticarial
e) None of the above

14. The direct current used in electrotherapy treatment is

a) TELSA
b) Faradic
c) Sinusoidal
d) TENs

15. All of the following are physiochemical effects that can occur under the positive electrode during a galvanic stimulation treatment EXCEPT

a) Hardens tissue
b) Attracts acids
c) Sedative
d) Increases hemorrhage
e) Contracts tissues

16. Which of the following is/are true regarding biofeedback?
a) Biofeedback provides immediate feedback on changes in physiological or neural activity
b) EMG biofeedback can be used to promote increases or decreases in neuromuscular activity.
c) EMG biofeedback is generally preferred over neuromuscular stimulation by the athlete/patient for neuromuscular reeducation.
d) a and b are correct.
e) a, b, and c are correct

17. All of the following could be considered to minimize electrode resistance EXCEPT
a) Smaller electrodes
b) Removal of excess hair and oil from the skin
c) Even, firm, moist electrode contact with the skin
d) Clean electrodes
e) All of the above

18. All of the following are true about the placement of electrodes EXCEPT
a) When electrodes are placed close together, the current is dense in the superficial tissues
b) When electrodes are placed farther apart, the current goes deeper
c) Current density is most concentrated in the larger electrode
d) d. a and b only

19. During the acute inflammatory response, use of an ice pack should be combined with
a) Compression,
b) Elevation
c) Protection
d) a, b, ,c,
e) None of the above

20. All of the following are correct regarding the conducting media for ultrasound except
    a) Amount of sound energy conducted varies greatly between different media
    b) Medium is needed because sound beams cannot travel through the air
    c) US gel and gel pads are superior to other conducting media
    d) Water is a good but not a great conducting medium
    e) All of the above are correct

SECTION B: SHORT ANSWER QUESTIONS (40 MARKS)

1. What is the Lewis hunting response in relation to cryotherapy? (2 marks)

2. What determines the temperature changes in tissues during cryotherapy? (8marks)

3. A physiotherapist applies TENS to the shoulder of an athlete with a acromioclavicular separation. The stimulus produces a tingling sensation without causing a muscle contraction. The team physician inquires as to why the TENS unit is being applied. What explanation could the physiotherapist provide regarding how the TENS can reduce the athlete's pain? (6 marks)

4. What is cavitation; and the types of cavitation are there with regard to the application of ultrasound treatment (6 marks)

5. Explain the 3 characteristics of LASER wave. (6marks)

5) Which superficial heating modality would be the best treatment choice for the following patient problem? Giving characteristics that give it advantage over the other modalities and method of application. The athlete is a 45-year-old tennis player who underwent open reduction internal fixation (ORIF) for a displaced fracture of the proximal phalanx of the index finger eight weeks ago. The pin fixation was recently removed. The primary complaint is lack of motion in the MIP and PIP joints. (6 marks)

6. An Olympian athlete comes to you to help strengthen his muscles he has no pathology, which current would you use, describe it and why? (6 marks)

SECTION C: LONG ANSWER QUESTIONS (40marks)

1. What is the Short wave diathermy (SWD)? Describe the different units used and the methods of application. What are the contraindications of SWD name 6? (20 marks)

2. On objective examination on a patient with a hamstring strain. You discover they have deep pain within the muscles. What Electrical stimulation would be best to alleviate this symptom? Describe the method of application and the two ways you may place the electrode. What would be the contraindications for this treatment in this patient? (20 marks)

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BSP 213 ELECTROTHERAPY 1 (3 Units)

Purpose of the Course

The student will learn the Principles, Techniques, Effects, Indications, Contraindications and the dosage parameter for various indications of electro therapeutic modalities in the restoration of physical function.

Expected Learning Outcomes

To be able to list the indications for Electrotherapy.
To understand the contraindications to the procedure.
To understand the dosing modalities for Electrotherapy
To demonstrate the different techniques, and describe their effects on various conditions.

Course Content:

Section I – Introductory Physics; Electricity definition, types; Static Electricity; Production of electrical charges; Characteristics of charged body; Characteristics of lines of force; potential difference and EMG.

Current Electricity

Units of electricity, faraday, volt, ampere, coulomb, watt; Resistance in series and parallel. Ohms law and its application to DC/AC; Fuse; Shock; Micro/Macro shocks, safety precautions and management, earthing techniques precautions, Burn: electrical and chemical burns, prevention and management; Conductors: definitions, principles, types of construction, working and uses; Magnesium: Definition, properties, electro-magnetic induction, electro-magnetic spectrum; Valves, transformers, types, principles, construction and working; Ionization: Principles, effects of various technique of medical ionization.

Therapeutic Electricity

Low frequency currents; Basic types of current: Direct Current: types, physiological and therapeutic effects. Alternating Current. Types of current used in Therapeutic; Modified D. C.
Faradic Current; Galvanic Current; Modified A. C; Sinusoidal current; Diadynamic Current
Faradic current: Definition, Modifications, Techniques of Application of individual muscle and Group Muscle stimulation, physiological and therapeutic effects of faradic current, Precautions, Installations and Contra-indications, Dangers.

Galvanic Current: Definition, Modifications, Physiological and Therapeutic effects of Galvanic Current, Indications and Contra-indications, Dangers, Effects of Interrupted galvanic current on normally innerved and denervated muscles and partially denervated muscles.
Sinusoidal Current and Diadynamic Current in Bried. HVPGS – Parameter and its uses.
Ionization / Iontophoresis: Technique of Application of lontopheris, indications, Selection of Current, Commonly used Ions (Drugs) for pain, hyperhydrosis, would healing.

Cathodal / Anodal galvanism. Micro Current and Macro-Current. Types of Electrical Stimulators NMES – Construction component. Neuromuscular diagnostic stimulator – construction component.
Components and Working Principles
Principles of Application: Electrode tissue interface, Tissue Importance, types of Electrode, Size and Placement of Electrode – Waterbath, Unipolas, Bi – polar, Electrode coupling. Current flow in tissues, Lowering Skin Resistance.

Nerve Muscle Physiology: Action Potential, Resting Membrance Potential, Propagation of Action Potential, Motor Unit, synapse, Accommodation, Stimulation of healthy muscle, stimulation of denervated Muscle, Stimulation for Tissue Repair.

TENS: Define TENS, Types of TENS, Conventional TENS. Acupuncture TENS, Burst TENS, Brief and Intense TENS, Modulated TENS, Types of Electrodes and Placement Electrodes, dosage parameters, Physiological and Therapeutic effects, Indication and Contraindications.
Pain: Define Pain, Theories of Pain (Outline Only), Pain Gate Control theory in detail.

Section II B – Electro-diagnosis
FG TEST
SD Curve: Methods of Plotting SD Curve, Apparatus selection. Characters of normally denervated muscle, Characters of Partially Denervated Muscle, Characters of Completely denervated Muscle. Chronaxie and Rheobase; Nerve Conduction velocity studies; EMG: construction of EMG equipment. Bio-feedback. Medium Frequency. Interferential Therapy: Define IFT, Principle of Production of IFT, Static Interference System, Dynamic Interference System, Dosage Parameters for IFT, Electrode Placement in IFT, Physiological and Therapeutic Effects, Indication and Contraindications. Russian Current. Rebox type Current. Section III – Thermo and Actinotherapy (HIGH Frequency Current). Eletro Magnetic spectrum.
SWD: Define shortwave, frequency and Wavelength of SWD, Principle of Production of SWD, Circuit diagram and Production of SWD, Methods of Heat Production by SWD treatment, Types of SWD Electrode. Placement and Spacing of Electrodes, Tuning, Testing of SWD Apparatus.
Pulsed Electro Magnetic Energy: Principles, Production and Parameters of PEME, Uses of PEME.
Micro Wave Diathermy: Define Microwave, Wave length and Frequency, Production of MW, Applications, Dosage Parameters, Physiological and therapeutic effects, indications and Contraindications, Dangers of MWD.
Ultrasound: Define Ultrasound, Frequency, Piezo Electric effects: Direct, Reverse, Production of US, Treatment dosage parameters: continuous and pulsed mode, Intensity, US fields: Near field, Far field, half value distance, attenuation, coupling media, Thermal effects, Non-thermal effects.
Principles and Application of US: Direct Contact, Water Bath, Solid sterile gel pack method for would. User of US, Indication and Contraindications, Dangers of Ultrasound. Phonophoresis: Define phonophoresis, Methods of Application Commonly used and drugs, uses. Dosages of US

IRR: Define IRR, wavelength and parameters, types of IRR generators, production of IRR, Physiological and Therapeutic effects, Duration and Frequency of treatment, Indication and Contraindication.
UVR: Define UVR, Types of UVR, UVR generators High Pressure mercury vapour lamp, Water cooled mercury lamp, Kromayer lamp, fluorescent tube, Theraktin tunnel, PUVA apparatus, Physiological and Therapeutic effects, Sensitizers and Filters. Test dosage evaluation. Calculation of EI, E2, E3, E4 doses. Indication, contraindications, Dangers Dosages for different therapeutic effects Distance in UVR lamp.
LASER: Define Laser, Types of Laser. Principles of Production. Production of Laser by various methods. Methods of application of Laser. Dosage of Laser. Physiological and Therapeutic effects of Laser, Safety precautions of Laser. Classification of Laser. Energy density and power density,
Section IV – Superficial heating Modalities
Wax Therapy: Principle Wax Therapy application – latent heat, Composition of wax bath Therapy Unit, Methods of Application of wax, Physiological and therapeutic effects, indications and contraindications, Dangers.
Contrast Bath: Methods of Application. Therapeutic uses, Indications and contraindications. Moist heat Therapy: Hydro collator packs – in brief methods of application, Therapeutic Uses, indications and contraindications. Cyclotherm: Principles of production. Therapeutic uses, indication and contraindications. Fluidotherapy: Construction, Method of Application, Therapeutic uses, Indications and Contraindications. Whirl Pool Bath: Construction, Method of Application, Therapeutic uses, Indications and Contraindications. Magnetic Stimulation, Principles, Therapeutic uses, indications and contraindications. Cryotherapy: Define Cryotherapy, Principle-Latent heat of fusion, Physiological and Therapeutic effects, Techniques of applications, indications and contraindications, Dangers, Methods of application with dosages.

Practical

Student of Electrotherapy should be able to demonstrate the use of electrotherapy modalities applying the principles of electrotherapy with proper techniques, choice of dosage parameters and safety precautions.

Demonstrate the technique of patient evaluation – receiving the patient and positioning the patient for treatment using electrotherapy.
Collection of materials required for treatment using electrotherapy modalities and testing of the apparatus.
Demonstrate placement of electrodes for various electrotherapy modalities.
Electrical stimulation for the muscles supplied by the peripheral nerves.
Plotting SD curve with chronaxic and rheobase.
Demonstrate FG test.
Application of Ultrasound for different regions-various methods of application.
Demonstrate treatment techniques of using SWD, IRR and Microwave.
Demonstrate the technique of UVR exposure for various conditions – calculation of test dose.

Demonstrate treatment method using IFT for various regions.
Calculation of dosage and technique of application of LASER.
Technique of treatment and application of Hydro collator packs, cryotherapy, contrast baths, wax therapy.
Demonstrate the treatment method using whirl pool bath.
Winding up procedure after any electrotherapy treatment method.

Mode of Delivery
Lectures
Demonstration
Hands on practical in the laboratory.

Instructional Material
Audiovisuals equipment
Flip charts
Chalkboards
Handouts

Course Assessment
Practical Examination 20%
Continuous Assessment Tests 30%
Written Examination 50%

Core Reading Materials
Claytons Electrotherapy by Forster and Plastongs
Electrotherapy Explained by L O and Reed
Clinical Electrotherapy by Nelson.

Recommendation Reference Materials
Electrotherapy Evidence based practice by Sheila Kitchen
Thermal agents by Susan Michlovitz
Principles of Electotherapy by Michile Camreeon