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**Q1 (A)**

Ans: 1g of ice at 0⁰c is the energy of ice that we apply on patient and 1g of water at 37⁰c is the energy of the body. We know that energy is always flow from higher potential to lower potential.

So energy in the body are more than the ice ,so energy of the body start flow towards the ice and body gradually loss the heat and ice start melting.

If we convert the ice into water it consumes 491j energy.

If we apply cold water on body it consume 115j energy so this is the main reason that we use ice for therapeutic purpose because it loss more heat from the body.

**(B)**

Ans: Skin contain both thermal and cold receptors but cold receptor are more than warm so when we apply ice therapy it reduce or slow down the conduction of nerve. The other reason is that when we repetitively apply ice therapy it burst the neuronal circuit lead to decrease nerve conduction and can also cause motor nerve paralysis.

**(C)**

Ans: Cryotherapy is contraindicated in cardiac patients because we know that when we apply ice therapy it cause vasoconstriction which increase the blood pressure and increase the risk of cardiac complication.

**(D)**

Ans: Uses of ice cube massage:

It is used for two main reasons (1) counter-irritant action and (2) muscle stimulation.

For the relief of pain we perform circular massage and for nerve activation we apply ice cube for short period of time.

Other uses of ice cube massage include; it can reduce the inflammation and swelling, reduce rashes, reduce dark circles, cures acne, cleans skin pores, it can reduce puffiness under eyes, reduce wrinkles, it can remove facial hair, cause softness of lips, brighten the skin also, treat heat rashes, use for skin beauty and skin massage, relief from sunburns, give oil free look, eye strain, tweezing pain, natural make up, reduce eye anxiety and for reducing pores on face we use ice cube massage.

**Q2 (A)**

Ans: When we apply ice on the surface of the body it activate the cold receptors which give signal to the posterior horn of the spinal card through sensory nerve which activate the anterior horn and then generate motor response. We know that pain nerve fiber are of small diameter and cooling nerve fiber are of larger diameter so larger diameter nerve fiber compress the smaller nerve fiber and reduce the pain but its effect is for short duration when we remove the ice pain will increase again so in this case we prescribed certain exercises for permanent results.

**(B)**

Ans: Spasticity develop whenever upper motor neuron is damaged or some lesion are occur in the upper motor neuron which give fastly signals towards the anterior horn of the spinal cord and increase the motor response and neuron fires spontaneously and increase the muscle tone.

So when we apply ice therapy it slow down the nerve conduction which reduce the signals which are going towards the anterior horn which reduce the nerve firing and finally decrease the muscle tone.

So in this way we reduce the spasticity.

**Q3 (A)**

**Luminous generator Non-luminous generator**

It is high temperature generators. It is low temperature generators.

It produces infra- red, visible, and ultra violet rays. It produces only infra-red rays

It consist of more than one incandescent lamp it consist of simply a wire which are coil around

In which currents are passes through filament a cylinder made up of insulating material after

It will produce heat and finally produce infra-red that we pass current through it which produces

 Visible and ultra-rays. Heat and finally produce infra-red rays.

It takes less time to heat up. It takes more time to heat up.

Its wave length range from 350-4000nm. Its wave length range from 1500-12000nm.

Penetrate from epidermis, dermis & subcutaneous penetrate from epidermis & superficial dermis.

Tissue.

Use for chronic inflammation. Use for acute conditions.

It reduces the pain via counter-irritant effect. It reduces the pain via sedative effects.

Duration of treatment is 15- 20minutes. Duration of treatment is 20-30minutes.

It absorb deeply. It absorb superficially.

**(B)**

Ans: Yes of course infra-red rays are more effective in reliving a pain than UV rays because it can penetrate deeply into the tissues of the body.

According to the research which is conducted by the George D Gale, MBBS FRCA FRCPC DAAP,Peter J Rothbart, MD FRCPC,and Ye Li. The aim of this study to assess the intensity of pain relief by using the infra-red energy in those patients which are suffering from low back pain.

In this study forty patients are presented to Rothbart pain management clinic North York, Ontario.

Out of forty patients 21 patients received infra-red therapy.

The result of this study shows that infra-red therapy reduces level of pain approximately 50% which was greater towards the end of the seven weeks.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2539004/>

Infra-red therapy improves the blood circulation and provides nutrients to the cell and enabling them to perform its function properly and can also stimulate the repair and regeneration process of tissue and reducing the pain and process of inflammation. It promotes the faster healing and reduces the pain.

It can be applied in many health conditions such as back pain, arthritis, bursitis, carpal tunnel syndrome, neck pain, diabetic neuropathy, rheumatoid arthritis, TMJ pain, tendonitis, wounds, sciatica, and surgical incisions etc.

<https://www.news-medical.net/health/How-Does-Infrared-Therapy-Work.aspx>

According to the NASAs experiments, in this experiment they use cold light for plant growth.

After that further experimentation is performed on rats, and then on humans they discovered that infra-red light can penetrates deeply and increase the healing process and reduce the pain.

While on the other hand UV rays produce superficial effects it can be use full in treating condition such as cancer, erythema, pigmentation, solar elastosis and aging, and helpful in vitamin D production.

It can also indicate in acne vulgaris, psoriasis, vitiligo, skin wounds, alopecia areata, vitamin D deficiency, treatment of jaundice in babies.