Electrotherapy

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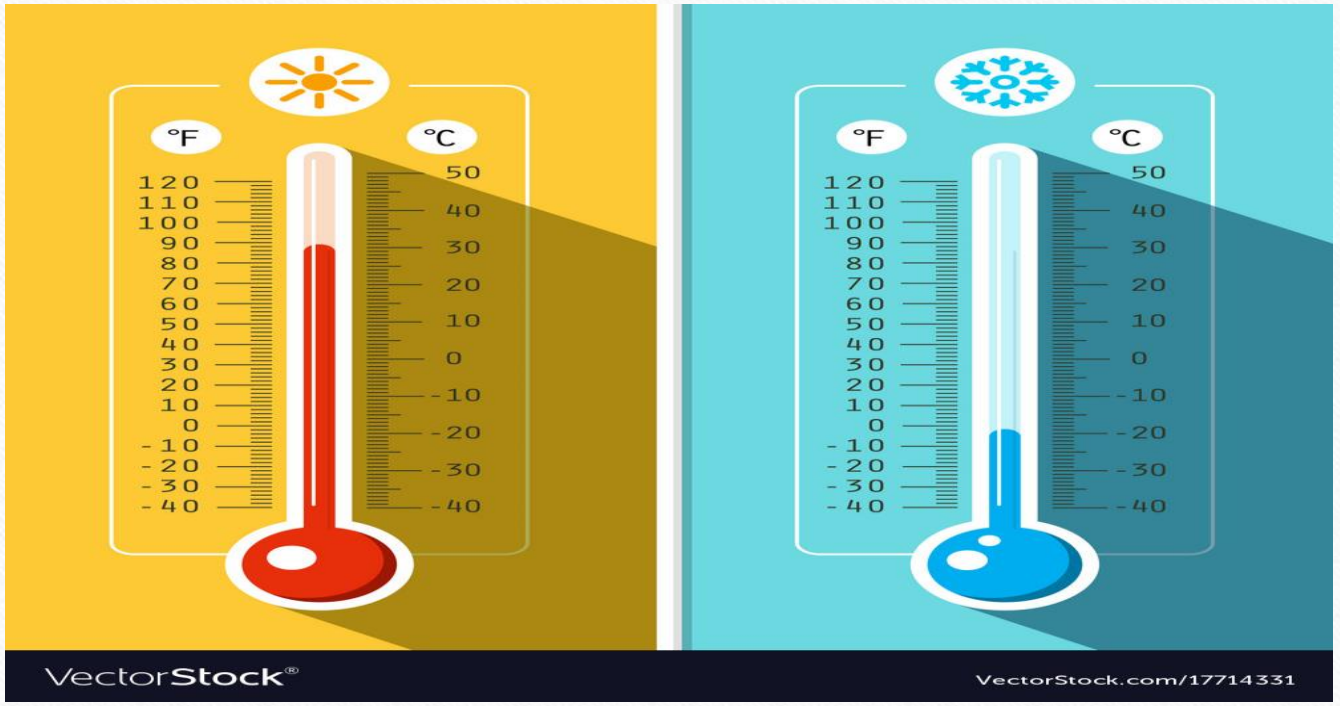
Fsc PT I

PHYSICAL EFFECTS OF HEAT AND TEMPERATURE



1. EXPANSION

- The objects expands on heating
- Exception is the water(contract between 0 C and 4C)
- The amount of expansion produced by a certain rise in temperature differs for different materials and is indicated by the **coefficient of linear expansion**

Coefficient of Linear Expansion

- Is the increase in length per unit length of a solid when the temperature is raised from 0 to 1 C.

Coefficient of Cubical Expansion

- Increase in volume per unit volume when the temperature of body is raised from 0 to 1C

2. CHANGE OF STAT

- LATENT HEAT
- Is the heat required to change the stat without raising the temperature.
- “the latent heat of fusion of ice is the quantity of heat required to convert unit quantity of ice into water at the same temperature.
- Latent heat of fusion of ice is 80 calories
- Latent heat of vaporization of water is 540 calories
- A corresponding amount of heat is liberated as the substance changes from a gas to a liquid or from a liquid to asolid.
- The heat given off as liquid wax solidifies is utilised for treatment purpose.

3. ACCELERATION OF CHEMICAL ACTION

- VAN'T HOFF LAW
- Any chemical action capable of being accelerated by heat is accelerated by rise in temperature

4. PRODUCTION OF DIFFERENCE OF POTENTIAL

- If strips of two different metals are joined and the junction is heated a difference of potential is set up between their free ends

5. PRODUCTION OF ELECTROMAGNETIC WAVES

- When object is heated the increased vibration of the molecules causes displacement of electrons from one orbit to another. As electrons returns to their original orbits, energy is released,

6. THERMIONIC EMISSION

- The agitation of molecules which occurs on heating disturbs the electrons and some of them may leave the surface of the object before dropping back.
- They form a continually moving cloud around the object and the phenomenon is termed thermionic emission.

7. REDUCED VISCOSITY OF FLUIDS

- Fluids exhibits the property of viscosity due to the friction between their layers as they move on each other.
- Heat reduces this effect and renders the fluid less viscid

Transmission of Heat

Heat may be transferred from one place to another by

1. Conduction
2. Convection
3. Radiation

Conduction

- Heat is transmitted by conduction between objects which are
- in contact with each other
- Between different parts of one object
- Temperature difference
- Molecules vibrate_____ strike to other____ transmit energy _____ from one part to another
- Metal are good conductor of heat
-

Convection

- Heat is transmitted by convection in liquid or gas.
- Fluid expands and its density becomes less than that of un heated fluid
- The less dense fluid rises and,, cooler and more dense fluid take its place
- Thus transfer heat from one part of the fluid to another

Radiation

- A hot object emits infra-red and possibly also visible and ultra-violet rays,
- Travel away from the source of radiation
- When infra-red or longer waves are absorbed heat is produced
- The rays do not produce an effect until they are absorbed, so they do not heat the intervening medium

RADIANT ENERGY

- Radiant energy is energy in the form of waves and rays.
- Wave length
- Velocity
- Frequency

CONTINUED

- Electromagnetic waves travel in straight lines with a velocity of 300,000 kilometers per second.

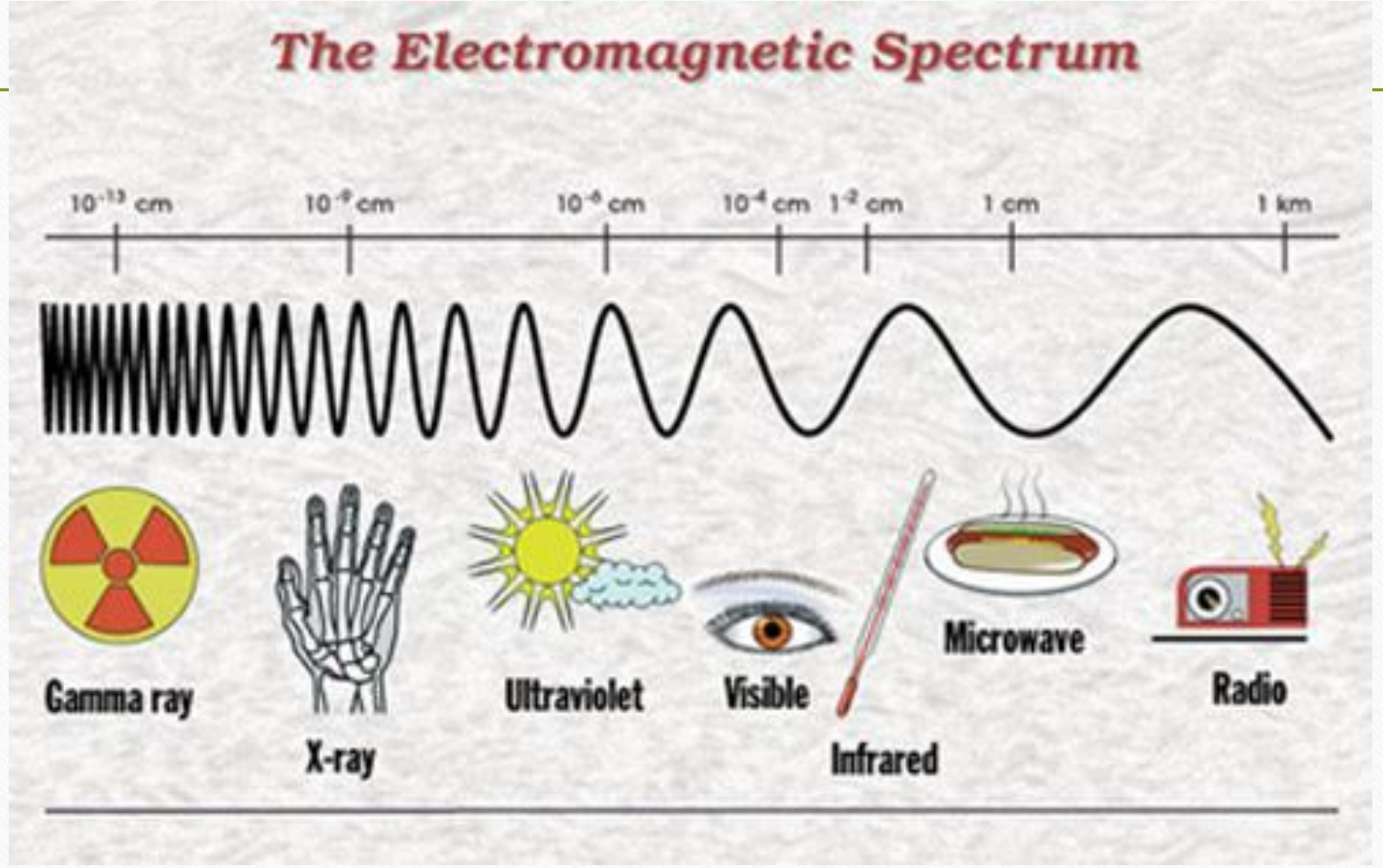
- Velocity =frequency * wavelength
- Velocity is constant for all electromagnetic waves, so the frequency varies inversely with wave_length

CONTINUED

- Frequency
- One cycle is the sequence of events that takes place between a point on one wave and the same point on the next wave
- **Frequency is the number of cycles which occure in unit time.**
- A high frequency current may produce wireless waves with a wavelength of 20 meters and a frequency of 10 million cycles per second. Etc.

Electromagnetic spectrum

1. Wireless waves ___kilometers to 1,000,000 A
2. Infrared rays_____4,000,000 to 7700 A
3. Visible rays _____7700 to 3900 A
4. Ultraviolet rays ____3900 to 136 A
5. X-rays _____1019 to 0.06 A
6. Gamma rays_____upto to 1.4 A


The Electromagnetic Spectrum
10^{-13} cm
10^{-9} cm
10^{-6} cm
10^{-4} cm
1^{-2} cm
1 cm
1 km
Gamma ray
X-ray
Ultraviolet
Visible
Infrared
Microwave
Radio