

## **Suntanning Association for Education:**

### **SAE BANC correspondence course study guide.**

#### **-What is light?**

Since the earliest time, man has been curious as to where and how the light we can see reaches the earth. As far back as the Greeks and Romans scientists studied light and recorded their findings. Sir Isaac Newton and his work with prisms gave us the insights into the seen and unseen sources of energy that are generated from the sun.

Over the last 400 years scientists have learned that the energy from the sun is a complex SPECTRUM which the earth's atmosphere absorbs and/or scatters in a variable, selective and often unpredictable manner. This spectrum includes many different electro-magnetic signals. (Wavelengths) which vary in length, frequency and intensity. Each group blends into another and it is impossible to find an exact dividing line.

The range of these wavelengths includes the very small Gamma and X-Rays, the Ultraviolet, the Visible, the Infra-Red, as well as the signals used for radio and television.

#### **-Electromagnetic Wavelength**

1. Light consists of minute energy parcels called photons. Photons move through space as wave-shaped rays at great speed and oscillate (sway) back and forth as they travel in a certain direction (in a wavelength).

The wavelength is the distance between the crests of the waves and is measured in NANOMETERS.

NANOMETER- One millionth of a millimeter, or a billionth of one meter (a meter is approx 3 feet).

Each wave transmits a certain amount of energy. The smaller the wavelength, the higher the amount of energy generated per wave. The spectral radiant flux or spectral distribution provides a description of radiation.

#### **-Light & UV Light: BASICS**

Light reaching the earth:

1. Infrared- 60% of sun's radiation
2. Visible- 37% of sun's radiation

3. Ultraviolet- 3% of sun's radiation

UV light is commonly divided according to these wavelengths:

UVA: 320-400NM-

1. Serves to darken existing skin pigmentation (oxidation).
2. Can cause severe reactions if combined with photo sensitizers.
3. Between 97% to 99% of UV irradiation that reaches the earth is UVA.
4. Is emitted by all indoor tanning technology.

UVB: 280-320NM-

1. Capable of producing sunburn.
2. Most efficient wavelength for stimulation of melanin production.
3. Between 1 and 3% of UV irradiation that reaches the earth is UVB.

UVC: 200-280NM-

1. Does not reach the earth; filtered by the ozone layer.
2. Highly destructive of life.
3. Used as germicidal

Factors that affect intensity of UV radiation on earth:

1. Clouds can reduce intensity by as much as 50%
2. Air pollution contaminants reduce intensity by another 20%
3. Seasons; more intense during summer months
4. Time of day
5. Altitude (more intense at higher elevations).
6. Reflective surfaces (water, cement, etc).
7. Latitude (proximity to the equator).

### **Skin Basics & Biological effects of UV light:**

The skin: Anatomy and Physiology

1. Skin: The largest organ of the body, made up of millions of skin cells.
  - a. 15% of total body weight
  - b. Approximately 6 feet long and 3 feet wide.
  - c. Functions: waterproofs the body; prevents bacteria and chemicals from entering the body and regulates body temperature.
2. Skin Layers (2 main Layers, Epidermis and Dermis)  
Skin is composed of 2 separate and distinct layers of tissues. The outer layer is called the EPIDERMIS. The inner layer is called the DERMIS and is thicker than the epidermis. Beneathe the

dermis are masses of loose connective tissues that bind the skin to underlying organs called the SUBCUTANEOUS LAYER.

- a. EPIDERMIS: The outermost layer- as thick as a sheet of paper and it's 4 mini layers:
  - HORNY LAYER: Made up of dying cells filled with a tough waterproof layer called keratin (makes the skin tough and prevents fluids and certain substances from passing through the layer—found only in the epidermis layer, hair and nails).
  - GRANULAR LAYER
  - PRICKLE LAYER (also called spinous layer)
  - BASAL LAYER

Main function is to protect the body against water loss and abrasions.

Skin replaces itself every 28-30 days as part of the repair mechanism between basal cells are melanocytes which produce melanin upon exposure to primarily the UVB portion of the spectrum. Sunburn happens here. Chronic overexposure can lead to basal cell and squamous cell carcinoma.

- b. DERMIS: lower skin level

Main function is to hold the body together and keep it resilient.

Much thicker than epidermis (15 to 40 times thicker). Contains fewer cells and is made up of mostly connective tissue, blood vessels and nerve endings. \*No built in repair mechanism- ANY DAMAGE IS PERMANENT! Can be penetrated by UVA. Chronic overexposure can lead to premature aging of skin.

- c. SUBCUTANEOUS TISSUE: Under the skin layers

Main function is to act as the skin's insulator and "shock absorber".

Made up of connective tissue, blood vessels and cells that store fat can be penetrated by UVA.

### **Biological effects of UV light:**

1. FACTORS WHICH DETERMINE UV LIGHT'S EFFECT ON THE SKIN:
  - a. Permeability-do the rays have enough energy to penetrate the skin?
  - b. Absorption- is the radiation taken up by the skin cells?
  - c. Dosage- Is the energy strong enough to create an effect?
2. THE SKIN'S REACTION TO UV LIGHT:
  - a. Inflammatory response (sunburn or erythema)

**Erythema** is the medical term for Sunburn. Can become visible ½ hour to 8 hours following exposure, reaching maximum at 12-24 hours. Can be repaired by the skin's repair mechanism chronic overexposure of the skin can lead to the weakening of the connective tissues and can promote premature wrinkling of the skin.

### **Types of Tanning:**

## 1.

1. IMMEDIATE TANNING- Coloring (perhaps reddening) begins immediately and fades within minutes.

2. DELAYED TANNING- The desired, long lasting tan induced by repeated exposure to UVA and UVB: Begins about 10 hours after exposure.

a. UVB induced delayed tanning may be visible after 24 hours and becomes obvious in 3-5 days; lasts for weeks or months.

b. UVA induced delayed tanning may be visible 36-48 hours.

### THE MELANIN PROCESS IN DETAIL:

In delayed tanning melanosomes are colorless at first, but begin to pigment as they move into the prickle cells.

The melanocytes continue to produce new melanocytes and distribute melanin to the prickle cells for a few days, becoming much less active after 10 days. The normal cellular reproductive process will push the pigmented prickle cell layers upward where they will become flattened and are eventually shed. The continuation (maintenance) of a tan requires repeated exposure of UVB light to reactivate the melanocytes. Constitutive melanin pigmentation: Coloring induced by genetic factors and not influenced by external stimuli (the natural coloring of skin). Facultative melanin pigmentation: Increase in tanning response due to external stimuli, especially UVB exposure.

Melanin is formed in the melanocytes in the basal layer of the epidermis.

- a. Melanocytes produce small bodies called melanosomes
- b. Melanosomes are secreted in the prickle cells
- c. Individuals with skin type II process melanosomes differently from individuals with skin type IV despite differences in the skin color among different people, the number of melanocytes in all skin is approximately the same.

### **NUDE TANNING CAUTIONS:**

Areas that contain no melanin;

- |                 |                          |
|-----------------|--------------------------|
| -Lips           | -Soles of feet           |
| -Genitalia      | -Eyelids                 |
| -Palms of Hands | -Fresh scars and tattoos |

### **SKIN TYPE ANALYSIS**

Tanning works differently for different skin types. These differences can be very considerable. People with a very sensitive skin, such as the Celtic races, will rapidly suffer problems with sunburn. The blonde, North-European type also has to be aware of sunburn and will need to exercise patience with tanning. The more dark-skinned European and Mediterranean types often have naturally darker skin colors and will have few problems with further tanning. From this, it would seem that not everyone with a pale skin runs the same risks regarding sunburn. They all react in their own manner to irradiation with UV. This is dependent upon the amount of pigmentation already naturally present in the outer skin and the capability to build up additional protection with UV radiation, such as facultative genetically determined; this applies for the constitutive as well as facultative pigmentation. The sensitivity of the skin also depends on the area of the body, the age of the individual and the time of year.

People are divided into skin types varying from I-VI, according to their skin color. In practice, tanning is only calculated on the basis of skin types I to IV, inclusive, because skin types V and VI need no tanning.

Caucasians are divided into 4 skin types (types I to IV inclusive). Skin type I is the type with the whitest/palest skin. The unirradiated skin of this type contains no pigment and, when radiated with UV, is hardly able, or even unable, to form pigment. Under tempered UV radiation, this type of skin only turns red and will display no pigmentation. Persons with this skin type therefore run the highest risk of sunburn.

Skin type VI is exactly the opposite of pale skin. The outer skin of the type already contains some natural pigment, while radiation with UV causes additional pigment to be readily formed without any danger of sunburn.

Skin types II and III represent the transition in types I to IV.

When using tanning equipment, it is therefore desirable that persons who are to make use of it should know their skin sensitivity and skin type.

**Type I:** Always burns easily and severely, then peels- never tans, very fair skin, red or blonde hair & freckles.

**Type II:** Burns easily, tans minimally or lightly and peels, usually fair skinned.

**Type III:** Burns moderately, tans eventually.

**Type IV:** Burns minimally, always tans well.

**Type V:** Rarely burns, always tans readily.

**Type VI:** Never burns, tans profusely.

**The sun, the skin and the Risk: Skin Cancer**

Scientific data confirms that excessive exposure to the sun without the proper precautions can cause harm i.e. that exposure to the sun includes risk. Any choice we make that includes risk also includes scientific ways to minimize such risk. The same holds true for UV exposure, whether from the direct sun or from indoor tanning technology. Sun overexposure can be harmful.

An immediate result of overexposure to the sun's UV rays is sunburn. Another result of too much sun is prematurely aged skin. The sun weakens the skin's elasticity and can also cause dark patches and scaly gray growths, keratoses, which are often pre-cancerous.

Almost all of the more than 500,000 cases of skin cancer developed annually in the US are considered by the American Cancer Society to be sun related. Fortunately, if treated in time, the two most common forms of skin cancer, basal and squamous cell cancers, are curable.

**THERE IS NO CONCLUSIVE EVIDENCE THAT THE BROWNING OF THE SKIN WITHOUT CAUSING BURNING IS HARMFUL!**

**The risk factors of skin cancer:**

- Heredity and excessive exposure to UV radiation; an adult who has had one severe sunburn as a child has double the chance of developing melanoma.
- Fair skinned; Skin type I, notably persons with red or blonde hair, are at the highest risk.
- Occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium.

**The signs of skin cancer:**

- A skin growth that increases in size and appears pearly, translucent, tan, brown, black or multicolored.
- A mole, birthmark, or beauty mark that; changes color, increases in size or thickness, changes in texture and is irregular in outline.
- A spot or growth that continues to itch, hurt, crust, scab, erode, or bleed.
- An open sore or wound on the skin that does not heal or persists for more than 4 weeks, or heals and then reopens.

**What is photosensitivity?**

Photosensitivity comes from the Latin "photo" which means "light" and "sensitivus," which means feeling. Thus, "sensitive to light." It is a condition in which the skin reacts abnormally to light, especially UV rays of sunlight, due to the presence of medications, hormones, of heavy metals in the system.

Thus, if we can identify a substance or photosensitizer which, in combination with light, will cause a sensitivity reaction in an organism such as our skin, we can take steps to ensure proper tanning.

Another word you should be familiar with is photoallergy. This is an immunological reaction produced by the interaction of light rays and certain chemicals. It is a form of a contact allergic reaction where light is necessary to cause a sensitivity reaction. As a matter of interest, some of the photocontact allergens are:

- Phenothiazine
- Sunscreen agents
- Certain cleaning agents
- Sulfonamides
- Optical bleaches
- Hexochlorophene
- topical antihistamines

#### **Symptoms of photosensitivity:**

- Usually severe burning
- blotch formation
- Rash
- Uneven pigmentation

#### **The why's and wherefore's of eye protection**

##### **Is eye protection required for indoor tanning?**

Yes. Strict federal laws require that eye protection be worn by every indoor tanner. Indoor tanning is regulated by the US food and drug administration (FDA), under the code of federal regulations (CFR) 21, eye protection is specifically discussed in Subchapter J, "Radiological Health."

##### **Protecting yourself**

###### **SUNSCREEN:**

Chances are you spend some time in natural sunlight. You still could benefit from using sunscreens with sun protection factor (SPF) numbers of 15 or more. The SPF number gives you some idea of how long you can stay in the sun without burning. For example, if you normally burn in 10 minutes without sunscreen, you should be protected from burn for 150 minutes using SPF 15. Swimming and perspiration reduce the actual SPF value for many sunscreens, so be sure to reapply even if the product is water-resistant.

While all sunscreens provide some level of protection against UVB rays, no product screens out all UVA rays. Some may advertise UVA protection, but there's no system yet for rating UVA protection. Even when you use a sunscreen with a high SPF number, there's no way to know how much UVA protection you're getting.