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Disorder and Stroke, 2001). Protein molecules are the building blocks needed for cell growth and for repair of damages from factors such as stress. Some scientists believe that sleep is essential as it gives neurons used while we are awake a chance to shut down and repair themselves (NINDS, 2001).

- **Adaptation:** In order to protect themselves animals need to develop sleep when it is dark.
- **Growth:** Sleep is beneficial to physical growth and brain development in infant and children. Deep sleep coincides with the release of growth hormone in children (NINDS, 2001).
- **Memory:** It plays an important role in the storage and maintenance of long-term memory—REM phase of sleep (active). Sleep has been linked with the formation of emotional memories in humans (U. Wagner, S. Gais and J. Born, 2001).

In one study, a good night's sleep helped the brain to store the memory of what had been learned during the day (R. Stickgold and A. Hobson, 2000).

Effects of chronic sleep deprivation

In a national survey of more than 1,000 American adults, conducted by the National Sleep Foundation (2001), 63 per cent said that they get less than eight hours of sleep a night, and 31 per cent said that they get less than seven hours of sleep a night. Many said they try to catch up on their sleep on the weekend, but they still reported getting less than eight hours on weekend nights. 40 per cent of those surveyed said that they become sleepy during the day per month, and 22 per cent said their work suffer a few days each week; 7 percent said sleepiness in the job is a daily problem for them.

Sleep expert James Mass (1998), argues that the quality of our lives, if not life itself, is jeopardized by sleep deprivation. An increasing number of research studies underscores that optimal performance is enhanced by sleeping more than eight hours a night and reduce by sleeping less. At one sleep-disorder research centre, the alertness of eight-hour sleepers who claimed to be well rested increased when they added two hours to their sleep (T. Roehrs and T. Roth, 1998). In another study, brain scans revealed that sleep deprivation decreased brain activity in the thalamus and the prefrontal cortex (Thomas and others, 2001). Alertness and cognitive performance also declined. In another study, sleep deprivation was linked with an inability to sustain attention (Doran, Van Dongen, and Dinges, 2001). In yet another study, brain scans of individuals who experienced total sleep deprivation for twenty-four hours revealed a decline in the complexity of brain activity (Jeong and others, 2001). Sleep deprivation can also affect decision-making. A review of studies concluded that sleep deprivation adversely affects aspects of decision-making, such as being able to deal with the unexpected, innovate, and revise plans, and communicate (Harrison and Horne, 2000).

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Sleep Stages of sleep

The five stages of sleep are differentiated by the depth of sleep and the wave patterns detected with an EEG. They are as follows:

- **Stage 1 sleep:** This stage is characterized by theta waves, which are slower in frequency and greater in amplitude than alpha waves. The transition from just being relaxed to entering Stage 1 sleep is gradual.
- **Stage 2 sleep:** Theta waves continue, but are interspersed with a defining characteristic of stage 2 sleep, sleep spindles or sudden increases in wave frequency (Gottselig, Bassetti, and Ackermann, 2002). Stages 1 and 2 are both relatively light stages of sleep, and if people awakened during one of these stages, they often report not having been asleep at all.
- **Stage 3 and 4 sleep:** These stages are characterized by delta waves, the slowest and highest-amplitude brain waves during sleep. These two stages are often referred to as delta sleep. Distinguishing between stage 3 and stage 4 is difficult. Typically, stage 3 is characterized by delta waves occurring less than 50 per cent of the time and stage 4 by delta waves occurring more than 50 per cent of the time. Delta sleep is our deepest sleep, the time when brain waves are least like waking brain waves. Sleepers are most difficult to wake during delta sleep. If awakened during this stage, they usually are disoriented.
- **State 5 sleep:** After going through stages 1 through 4, sleepers drift up through the sleep stages toward wakefulness. However, instead of re-entering stage 1, they enter stage 5, a different form of sleep called REM (rapid-eye-movement) sleep.

2.9.2 Sleep Disorders

Each year, at least 40 million Americans suffer from chronic, long-term sleep disorders, and an additional 20 million experience occasional sleep problems (National Institute of Neurological Disorders and Stroke, 2001). Many people suffer from undiagnosed and untreated sleep disorders (National Commission of Sleep Disorders Research, 1993). Following are some of the major sleep problems:

- **Insomnia:** The inability to sleep, can involve having trouble falling asleep, waking up during the night, or waking up too early (Harvey, 2001; Mahendran, 2001). Behavioural changes can help insomniacs to increase their sleep time, as well as to awaken less frequently in the night. Sleepwalking or somnambulism occur during the deepest stages of sleep. For many years, experts believed that somnambulists were just acting out their dreams. However, somnambulism occurs during stages 3 and 4, usually early in the night, at the time when a person is unlikely to be dreaming (Stein and Ferber, 2001).
- **Sleep talking:** It is another night behaviour (Hublin and others, 2001). Although sleep talkers will talk and make fairly coherent statements, they

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are soundly asleep.

- **Nightmares:** They are frightening dreams that awaken a dreamer from REM sleep. The nightmare's content invariably involves danger—the dreamer is chased, robbed, raped, murdered, or thrown off a cliff. Nightmares peak at 3 to 6 years of age and then decline.
- **Night terrors:** Night terrors are characterized by sudden arousal from sleep and intense fear. Night terrors are accompanied by a number of physiological reactions, such as rapid heart rate and breathing, loud screams, heavy perspiration, and movement (Thiedke, 2001). Night terrors occur during slow-wave, non-REM sleep. Night terrors peak at 5 to 7 years of age and decline thereafter.
- **Narcolepsy:** It is the overpowering urge to sleep. The urge is so strong that the person may fall asleep while talking or standing up. Narcoleptics immediately enter REM sleep rather than progressing through the first four sleep stages (Mignot, 2001; Mignot and Thorsby, 2001).
- **Sleep apnea:** It is a sleep disorder in which individuals stop breathing because the windpipe fails to open or because brain processes involved in respiration fail to work properly. Untreated, sleep apnea can cause high blood pressure, strokes, and impotence.

2.9.3 Dreams

- **Wish fulfilment:** Freud's concept of dreaming is an unconscious attempt to fulfil needs (especially for sex and aggression) that cannot be expressed or that go ungratified while awake.
- **Manifest content:** In Freud's view, a dream's surface content contains symbols that distort and disguise the dream's true meaning.
- **Latent content:** In Freud's view, a dream has hidden content (unconscious).

Freud's theory has largely given way to newer theories of dreams, such as the cognitive theory of dreaming. It proposed that dreaming can be understood by relying on the same cognitive concepts that are used in studying the waking mind. That is, dreaming involves information processing, memory and problem solving. The cognitive theory of dreaming involves little or no search for the hidden, symbolic content of dreams that Freud sought (Foulkes, 1993, 1999).

Neuroscientists address this shortcoming with the view that dreams reflect the brain's effort to make sense out of neural activity that takes place during sleep (Hobson, 1999). When we are awake and alert, the contents of our conscious experience tend to be driven by external stimuli that result in specific motor behaviour. During sleep, however, conscious experience is driven by internally generated stimuli that have no apparent behavioural consequence. A key source of this internal stimulation is spontaneous neural activity in the reticular formation of the limbic system, at the base of the brain (Hobson, 2000).

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2.9.4 Hypnosis and Meditation

Hypnosis

Hypnosis and meditation are psychological states, or possibly a state of altered attention and awareness, in which the individual is unusually receptive to suggestions. Basic hypnotic techniques have been used since the beginning of recorded history in association with various religious ceremonies, magic, the supernatural, and many erroneous psychological theories.

The Nature of hypnosis

A common misconception is that the hypnotic state is much like a sleep state. Unlike sleepers, hypnotized individuals are aware of what is happening and remember the experience later, unless they are instructed to forget what happened. EEG studies document that individuals in a hypnotic state show a predominance of alpha and beta waves, characteristic of person in a relaxed waking state (De Benedittis and Sironi, 1985; Graffin, Ray and Lundy, 1995; Williams and Gruzelier, 2001). However, during hypnosis, individuals show different patterns of brain activity that they do when they are not under hypnosis (Isotani and others, 2001; Jensen and others, 2001).

Explanations of hypnosis

Ernest Hilgard (1977, 1992) proposed that hypnosis involves a special divided state of consciousness, a sort of splitting of consciousness into separate components. One component follows the hypnotist's commands, while another component acts as a 'hidden observer'. Some experts are sceptical that hypnosis is truly an altered state of consciousness (Chaves, 2000). They believe that hypnosis is a normal state in which the hypnotized person behaves the way he or she believes a hypnotized person should behave. In this view, the important questions about hypnosis focus on cognitive factors like the attitude, expectations, and beliefs of good hypnotic participants, and on the social context in which hypnosis occurs (Barber, 1969; Spanos and Chaves, 1989).

Applications of hypnosis

Hypnosis is widely used in medicine and dentistry, in criminal investigations, and in sports. Hypnosis has also been used in psychotherapy to treat alcoholism, somnambulism, suicidal tendencies, overeating, and smoking (Eimer, 2000; Yapko, 2001). Hypnosis is most effective when combined with psychotherapy (Borckardt, 2002). A long history of research and practice clearly has demonstrated that hypnosis can reduce the experience of pain (Crasilneck, 1995; Langenfeld, Cipani and Borckardt, 2002; Patterson and Jensen, 2003). Hypnosis has sometimes been used in attempts to enhance people's ability to accurately recall forgotten events (Coleman, Stevens and Reeder, 2001). For example, police departments sometimes eyewitnesses to crimes hypnotize in the hope that their recall of the crime will significantly improve.

Meditation

Meditation refer to achieving an altered state of consciousness by performing certain exercises like regulating breathing, restricting one's field of attention, eliminating external stimuli, assuming yogi body position, etc. These leads a pleasant, mildly altered subjective state in which the individual feels mentally and physically relaxed. Extensive practice resulted in mystical experiences in which they lose self-awareness and gain a sense of being involved in a wider consciousness. The common techniques of meditation are opening up meditation, in which the person cleans his mind in order to receive new experiences. Another is concentrative mediation, in which the benefits are obtained by actively attending to source object, word or idea.

- **Opening up meditation:** To relax completely and let go of one's mind and body—stepping out of the stream of everchanging ideas and feelings in which your mind is indulged.
- **Concentrative meditation:** The aims of this method are to learn about concentration. The aim is to concentrate on any object. Concentration does not mean analyzing the different parts of the objects; rather, trying to see the object as it exists in itself, without connecting to other things.

After a few session of concentrative meditation, people typically report a number of effects—an altered, more intense perception of the object, sometimes shortening, particularly in retrospect, conflicting perceptions, as if the object fills the visual field and does not fill it, decreasing effect of external stimuli (less distraction eventually less conscious registration) and an impression of the meditative state as pleasant and rewarding.

In his study of a centuries old Tibetan Buddhist text, Brown (1977) has described the complex training required to master the technique. He had also mentioned that cognitive changes can be expected at different levels of meditation. (In this type of meditation people proceed through five levels until they reach a thoughtless, perception-less, selfless state known as concentrative Samadhi.) Meditation may reduce arousal (especially in easily stressed individuals) for people suffering from anxiety and tension. Some researches argued that the benefits of meditation come largely from the relaxation of the body (Holmes, 1984).

Deep muscle relaxation

The individual is thought to experience both tension and relaxation alternatively in each and every group of muscles in the body. Experience of relaxation and appreciation of difference between tension and relaxation immensely helps the individual in maximizing the feelings of calmness. It is also progressive, muscles relaxation follows muscular relaxation.

Bio-feedback

Bio-feedback is based on skin response (GSR), feedback on brain waves (EEG) and feedback in any other physiological parameter. The individual is made to

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study the internal reactions to stress and relaxation. By giving the individual feedback whether he/she is in a state of stress or relaxation, the individual can be made to alter the reaction in favour of relation which one can maintain as much as possible. Visual or auditory feedback is given. In the visual feedback, when the individual experience stress, red-light will switch on. The individual then will have to relax and the state of relaxation will be indicated by green light. Hence, the goal is always to keep the green light on when the individual undergo treatment of management of stress through bio-feedback. Once, the individual masters the art of relaxation to any other situation he can gain perfect control over all the situations.

In case of auditory feedback 'beep' sound will come whenever the individual is tense. Focus is given by the individual to successfully pull off the beep sound. As the very sound may at times prevent the individual from relaxation, visual feedback, is preferred more than the auditory one.

2.10 DRUG USE: THE HIGHS AND LOWS OF CONSCIOUSNESS

Drugs often make people feel powerful. Drugs endow a user with a false sense of power that, of course, recedes when the artificial high ends. Addiction occurs when a person compulsively attempts to continue that high by taking a drug over and over again. People use drugs for many reasons; for example, adolescents have reported that they experimented with marijuana to enhance sexuality; to feel more confident; for pleasure and relaxation; to make them more comfortable in social situations; to understand themselves better; for acceptance by their peers or to achieve elevated social status, etc. All drugs are dangerous; however, crack cocaine is considered to be one of the most dangerous drugs. *Many drug experts suggest that the initial experience of using crack cocaine is so intense that it takes only one use to kick-start an addiction. Furthermore, over time, addicts' bodies develop a tolerance for a drug, meaning they will eventually have to take more and more of their drug of choice each time they use in order to achieve the same high.*

Altered states: Psychoactive drugs

Drugs that alter thinking, perception, memory, or some combination of those abilities called psychoactive drugs. Although some of these drugs can be useful under certain circumstances, they all pose risks as well. One of the dangers of such drugs is their potential to create either a physical or psychological dependence, both of which can lead to a life long pattern of abuse as well as the risk of taking increasingly larger doses, leading to one of the clearest dangers of dependence (a drug overdose). Drug overdoses do not have to happen only with illegal drugs, even certain additives in so called natural supplements can have a deadly effect.

Physical dependence

Drugs that people can become physically dependent on cause the user's body to crave for the drug (Abadinsky, 1989; Fleming and Barry, 1992; Pratt, 1991). After using the drug for some time, the body becomes unable to function normally without the drug and the person is said to be dependent or addicted. Following are the signs of drug dependence or addiction:

- **Drug tolerance:** One sign of physical dependence is the development of a drug tolerance (Part, 1991). As the person continues to use the drug, larger and larger doses of the drug are needed to achieve the same initial effects of the drug.
- **Withdrawal:** Another sign of a physical dependence is that the user experiences symptoms of withdrawal when deprived of the drug. Depending on the drug, these symptoms can range from headaches, nausea, and irritability to severe pain, cramping, shaking, and dangerously elevated blood pressure. These physical sensations occur because the body is trying to adjust to the absence of the drug. Many users will take more of the drug to alleviate the symptoms of withdrawal, which worsens the entire situation.

Psychological dependence

Psychological dependencies can last forever. Some people who gave up smoking pot decades ago still say that the craving returns every now and then (Roffman et al., 1988).

2.10.1 Stimulants

- **Amphetamines:** Amphetamines are stimulants that are synthesized (made) in laboratories rather than being found in nature. Among the amphetamines are drugs like Benzedrine, Methedrine, and Dexedrine. Truck drivers use amphetamines to stay awake while driving long hours, and many doctors used to prescribe these drugs as diet pills for overweight people.

Nausea, vomiting, high blood pressure, and strokes are possible, as is a condition called amphetamine psychosis. This condition causes addicts to become delusional (losing contact with what is real) and paranoid. They think people are out to 'get' them. Violence is a likely outcome, both against the self and others (Kratofil, Baberg, and Dimsdale, 1996).

- **Cocaine:** Cocaine is a natural drug found in coca plant leaves. It produces feelings of euphoria (a feeling of great happiness), energy, power, and pleasure. It also deadens pain and suppresses the appetite. Cocaine is a highly dangerous drug, not just for its addictive properties. Some people suffer convulsions and may even die when using cocaine for the first time (Lacayo, 1995). The brain is the part of the body that develops the craving for cocaine because of chemical changes caused by the drug (Hurley, 1989). There are three basic signs of physical dependency that are as follows:

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- (i) **Compulsive use:** If cocaine is available, the person has to use it. He or she cannot say no to it.
 - (ii) **Loss of control:** Once people start using it, they cannot stop until it is all gone or they have exhausted themselves to the point where they can no longer function.
 - (iii) **Disregard for the consequences of use:** Cocaine addicts will lie, cheat, steal, lose their jobs, damage or break up relationships, and use rent money to buy cocaine; nothing else matters to them but the drug.
- **Nicotine:** Nicotine is a relatively mild but nevertheless toxic stimulant, producing a slight 'rush' or sense of arousal as it raises blood pressure and accelerates the heart, as well as providing a rush of sugar into the bloodstream by stimulating the release of adrenalin (Rezvani and Levin, 2001). As is the case with many stimulants, it also has a relaxing effect on most people (remember the effect of Ritalin on hyperactivity) and seems to reduce stress (Pormerleau and Pormerleau, 1994). Women and teenagers are actually smoking more than before (CDC, 2002).
 - **Caffeine:** Caffeine is another natural substance, like cocaine and nicotine, and is found in coffee beans, tea leaves, cocoa nuts, and at least 60 others types of plants (Braun, 1996). It is a mild stimulant, helps maintain alertness, and can increase the effectiveness of some pain relievers, such as aspirin. Caffeine is often added to pain relievers for that reason and is the key ingredient in medications meant to keep people awake.
 - **Barbiturates or major tranquilizers:** Barbiturates are drugs that have a sedative (sleep-inducing) effect. The effects, depending on dosage levels, range from mild sedation or sleepiness to unconsciousness or coma. Overdoses can lead to death as breathing and heart action are stopped. Barbiturates are highly addictive and users can quickly develop a tolerance. Withdrawal can be as serious as convulsions, which are life threatening (Olin, 1993).
 - **Benzodiazepines or the minor tranquilizers:** The minor tranquilizers (drugs having a relatively mild depressant effect) are called benzodiazepines. These drugs used to lower anxiety and reduce stress.
 - **Narcotics:** All narcotics are a derivative of a particular plant-based substance, opium.
 - **Opium:** Opium, made from the opium poppy, has pain-relieving and euphoria-inducing properties that have been known for at least 2,000 years.
 - **Morphine:** Morphine was created by dissolving opium in an acid and then neutralizing the acid with ammonia.
 - **Heroin:** Heroin was even more powerfully addictive than morphine or opium. Its use as a medicine has ceased, but it is still used by many people.

- **Hallucinogens:** Hallucinogens fall under the category of psychogenic drugs. They actually stimulate the brain into altering its interpretation of sensations (Olin, 1993) and can produce sensory distortions very similar to the disorder synaesthesia.
- **Marijuana:** One of the best known and most commonly abused psychogenic drugs, marijuana (also call pot or weed), comes from the leaves and flowers of the hemp plant called *Cannabis sativa*. (Hashish is the substance scraped from these leaves, and both marijuana and hashish are called cannabinoids). The active ingredient in marijuana is tetra hydro cannabin (THC). Marijuana it is best known for its ability to produce a feeling of well-being, mild intoxication, and mild sensory distortions or hallucinations (Olin, 1993; Tart, 1970). The effects of marijuana are relatively mild compared to the other hallucinogens.

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CHECK YOUR PROGRESS

20. What is consciousness?
21. What does a high level of consciousness represent?
22. Why do blind people have a life-long sleeping disorder?
23. What are psychoactive drugs?

2.11 SUMMARY

- Nature refers to heredity, the influence of inherited characteristics on personality, physical growth, intellectual growth and social interaction.
- Nurture refers to an organism's environmental experiences that include parenting styles, physical surroundings social conditions, etc.
- Behaviour genetics is the study of the degree and nature of heredity's influence on behaviour.
- Evolutionary psychology is focussed on the study of how evolution explains physiological processes.
- Behaviour of human being is meaningful in their cultural context. In terms of shared practices and meaning, different cultures guide us in choosing our goals.
- The meaning of words growth and development is understood interchangeably.
- Development is a qualitative and integral change occurring at physical and mental levels improving the efficiency or functional ability.
- Decision-making in the nervous system occurs in specialized pathways and the network that carried different functions. Sensory nerves carry information to the brain.

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- The central nervous system (CNS) is composed of the brain and the spinal cord both the brain and spinal cord are composed of neurons and glial cells that control the life sustaining functions of the body as well as thoughts, emotions and behaviour.
- This system consists of the group of neurons which transmit information between the CNS and the rest of the body.
- Our senses are our input system and constitute the means by which we determine the nature of the environment within which we exist and behave.
- Most psychologists describe perception as interpretation of sensation. Perception is the process of organizing and interpreting sensory information to give it meaning. The brain automatically perceives the information it receives from the sense organs.
- Perceptual illusions are misconceptions resulting from misinterpretation of sensory information.
- There are many different stimuli in the world which catch our attention and result in perceptual organization.
- Attention can be described as a process that brings some stimuli into the focus. As a result, those stimuli become distinct and clear; objects that lie outside.
- Consciousness is an awareness of external events and internal sensations, including awareness of the self and the thoughts about various experiences.
- Hypnosis and meditation is a psychological state, or possibly a state of altered attention and awareness, in which the individual is unusually receptive to suggestions.
- Drugs often make people feel powerful. Drugs endow a user with a false sense of power that, of course, recedes when the artificial high ends.

2.12 KEY TERMS

- **Growth:** Refers to increase in size, length, height and weight; changes in quantitative aspects, which could be objectively observed and measured, come into the domain of growth
- **Development:** A progressive series of changes that occur in an orderly predictable pattern as a result of maturation and experience
- **Nervous system:** An extensive billion of interconnected cells network of specialized cell that carries information to and from all parts of the body
- **Neurons:** Nerve cells that actually process information
- **Glial cells:** Provide support and nutritional benefits to neurons
- **Sensory neurons:** Transmits incoming signals to the CNS

- **Saturation:** Refers to the purity of the colour. A high saturated light would contain only red wavelength, whereas a less saturated red might contain in mixture of wavelengths
- **Closure:** The tendency to complete figure that are incomplete as it yields subjective contours
- **Depth perception:** The ability to see the world in three dimensions
- **Circadian rhythms:** Twenty-four-hour cycles
- **Meditation:** Refers to achieving an altered state of consciousness by performing certain exercises

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2.13 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Nature refers to heredity, the influence of inherited characteristics on personality, physical growth, intellectual growth and social interaction.
2. Nurture refers to an organism's environmental experiences that include parenting styles, physical surroundings social conditions, etc.
3. Amines are organic structures that contain the genetic codes for building the proteins that make up organic life chain colouring, muscles and skin.
4. Maturation refers to the unfolding or gradual opening-up to traits or potentials present in an individual because of genetic inheritance. It is the net result of what one possesses genetically.
5. Growth curve is important as it indicates that growth is a continuous process with no breaks or discontinuities and that there are no sudden changes. Also, it shows that growth is an ongoing process throughout life.
6. State whether True or False:
 - (i) False
 - (ii) True
 - (iii) False
 - (iv) True
 - (v) True
 - (vi) False
7. The two parts of nervous system are central nervous system and peripheral nervous system.
8. The two types of cells in the nervous system are neurone and glial cells.
9. The three main parts of a neuron are the cell body, the dendrites and the axon.
10. Three main parts of the hind brain are the medulla, cerebellum and pons.
11. The two divisions of PNS are somatic nervous system and the autonomous nervous system.

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12. External stimulus like light is received by a specific sense organ, that is, eye. There are specialized receptors within a sense organ that transform the physical energy into neural signal; this process is known as transduction
13. The three psychological aspects to the experience of light are brightness, colour and saturation.
14. State whether True or False
 - (i) True
 - (ii) False
 - (iii) False
 - (iv) False
15. The main principle, according to gestalt psychologists Kohler, Koffka and Wertheimer (1886–1941), is that the whole is different from the sum of its part, e.g., thousands of tiny dots (parts) make up an image (whole) in print or on computer screen.
16. The Law of Pragnauz state that perceptual organization will always be as good as the prevailing conditions allow.
17. Contiguity is the tendency to perceive two things that happen close together in time as being related. Usually the first occurring event is seen as causing the second event.
18. Perpetual illusions are misconceptions resulting from misinterpretation of sensory information. Sensory illusions are also known as false perception, e.g., in a dark night a rope is perceived as snake and vice versa.
19. Fill in the blanks:
 - (i) laws of organization
 - (ii) motion parallax
 - (iii) figure and background
 - (iv) contours
 - (v) non-visual cues, binocular cues, and monocular cues
20. Consciousness is an awareness of external events and internal sensations, including awareness of the self and the thoughts about various experiences.
21. High-level consciousness represents the most alter states of human consciousness in which individuals activity focus their efforts towards a goal.
22. Blind people experience life-long sleeping problems because their retinas are unable to detect light.
23. Drugs that alter thinking, perception, memory, or some combination of those abilities called psychoactive drugs.

2.14 QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is the difference between identical and fraternal twins?
2. Define behaviour genetics.
3. Define development.
4. What are the specialized psychological functions that evolutionary psychologists study?
6. What are the characteristics of growth?
7. What are the different sense organs?
8. What is the growth curve? Also, define the plateau stage.
9. Briefly describe the four characteristics that allow the nervous system to direct behaviour.
10. How are shape and form critical to perception?
11. What is the difference between figure and backgrounds?
12. What do you understand by the term consciousness?
13. Describe briefly the different states of sleep. Also, mention the importance of sleep.
14. Briefly describe hypnosis, meditation and sleep disorder.
15. Describe the three basic signs of physical dependence.
16. List common stimulants and describe their effects.

Long-Answer Questions

1. Discuss the structure and functions of DNA, chromosomes and genes.
2. Explain how evolution might influence human behaviour.
3. How can you say that gene influences more traits?
4. Describe the structure and functions of neurons.
5. Describe the function of central and peripheral nervous system.
6. Describe the characteristics of sense.
7. Discuss briefly the function of retina, rods and cones.
8. Explain how maturation occurs.
9. Write a detailed note on perpetual organization describing the laws of perpetual organization. Also, discuss the influencers of perception.
10. Discuss the nature and determinants of perception.
11. Discuss the various visual illusions.
12. Write a detailed note on attention. Also, mention its various functions.

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13. Explain the concept of dreams.
14. Describe the effects of psychoactive drugs.
15. What is the role of learning on perception?

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UNIT 3 LEARNING AND MEMORY

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3.0 INTRODUCTION

In this unit, you will be familiarized with the concept of learning and memory. The unit will discuss the concept, principles and methods of learning. You will learn about the concept of programmed and automated learning, and will be introduced to the nature of learning disabilities. The unit will explain the concept of memory in light of process theory, study the different types of remembering, and discuss the basic retrieval process. The unit will also explain the nature and process of thinking, forms of thought and problem-solving, as well as decision-making. Finally, we will explain the development and acquisition of language.

3.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Explain the concept, principles and methods of learning
- Explain the concept of programmed and automated learning
- Discuss the different learning styles and transfer of learning
- Highlight the nature of learning disabilities
- Explain the concept of memory
- Study the different types of remembering
- Discuss the basic retrieval process
- Explain the concept of forgetting
- Explain the nature and process of thinking
- Understand language acquisition and identify the roots of language

3.2 LEARNING

Learning pervades our lives. It helps us in mastering a new skill, developing social interaction, personality, emotions, etc. We learn how to behave in a society. Most learning may be described as a modification of behaviour. Before learning to speak a word, child just babbles; when he learns to use a sentence, his behaviour is further modified; when he tries to write, his movement becomes modified, these are all examples of learning. It takes place under the influence of the environment of objects and persons in which the individuals lives. Learning continues throughout our life, with direct observation. However, learning will make no sense if it is not retained by the person. It is only through the capacity of memory that we are able to relate to different events, experiences, conditions people and objects. The memory makes it possible to operate beyond the constraints of time and place. Memory is a great mental capacity which establishes links across diverse experiences Psychologists have been studying various aspects of memory.

3.2.1 Nature of Learning

Learning is relatively a permanent change in behaviour that occurs through experience. The relatively permanent refers to the fact that when people learn anything, some part of their brain physically changes to record what they have learned. People cannot learn anything in memory if their brain fails to record what happens. Researches suggest that once people learn something, it is always present somewhere in memory (L. W. Barsalu, 1992). Regarding change, not all change is accomplished through learning. Any kind of change in the way an organism behaves is learning. Any changes in the body, e.g., increase in the weight or the size of the brain is controlled by a genetic blueprint. This kind of change is called maturation. Behaviour refers to any action. The modification of behaviour in learning is generally gradual; it does not come at once. Hence, behaviour is very important for learning, and it may be muscular, social mental, or a combination of these. Another important factor in learning is experience or practice; our past experiences and practices help us to learn the things in a proper manner. The definition of learning consists of the following three important characteristics:

- (i) Learning is a continuous change in behaviour.
- (ii) It is a change that takes pace through practice or experience. Changes due to growth, maturation, fatigue or injury are not included in learning. It brings about improvement in performance.
- (iii) The change must be relatively permanent or enduring. It lasts a long time.

Learning is a thoughtful reaction to a given stimulus. A child cannot learn to walk unless his leg muscles are strong enough to support his/her weight. This implies that maturation provides the necessary readiness to learn. Certain level of maturity is required to acquire skill or knowledge. Learning and maturation both result in changes in behaviour. Maturation may be considered as development brought about by growth of the normal and muscular system, while learning is an outcome of stimulating situations.

Reflex action is a direct automatic and immediate response of a muscle or a gland to the stimulation of a sense organ, e.g., blinking of eye in response to a sudden movement of an object in front of a person's eyes. Reflex actions have innate tendencies and are not acquired through practice. However, instinctive behaviour can be modified by learning. Learning can be classified into verbal learning and motor learning. Learning of words, and numbers, and of facts and ideas expressed by words and numbers, is called verbal learning. Learning of the activities that involve movements of body parts is called motor learning. Both types of learning involve some common processes. There are a set of conditions without which learning will not be possible, e.g., ability to learn, effort to learn, meaningfulness of the material. Interest, incentives, etc.

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3.3 PRINCIPLES OF LEARNING AND ITS APPLICATION

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Educational psychologists and pedagogues have identified several principles of learning, also referred to as laws of learning, which seem generally applicable to the learning process. These principles have been discovered, tested, and used in practical situations. They provide additional insight into what makes people learn most effectively. Edward Thorndike developed the first three 'Laws of learning', that include readiness, exercise, and effect. Since Thorndike set down his basic three laws in the early 20th century, four additional principles have been added, viz., primacy, recency, intensity, and freedom.

3.3.1 Classical Conditioning

Classical conditioning is a learning process in which a neutral stimulus associates with another stimulus through repeated pairing with that stimulus. The study of classical conditioning began in the 20th century with the work of the Noble Prize winner Russian Physiologist, Ivon Pavlov. In his experiment on a dog, Pavlov observed that just prior to being fed, the dog secreted saliva from its mouth. In his experiment Pavlov daily placed meat powder in the dog's mouth, causing it to salivate. Pavlov noticed that meat powder was not the only stimulus that causes salivation. The dog salivated in response to a number of stimuli associated with the food. Pavlov identified many key elements that must be responsible for conditioning to take place. They are mentioned as follows:

- **Unconditional stimulus:** Unconditioned denotes unlearned or the naturally occurring stimulus, which leads to the reflex, involuntary response. Food is the unconditioned stimulus here.
- **Unconditioned response:** It is unlearned and occurs because of genetic wiring in nervous system. Salivation of the dog is an example of an unconditioned response.
- **Conditioned stimulus:** Stimulus that is able to produce a learned reflex response by being paired with the original unconditioned stimulus. Conditioned stimulus means learned.
- **Conditioned response:** It is a learned reflex response to a condition stimulus. In his experiment, Pavlov used meat powder as the original unconditioned stimulus, which produced salivation in his dog. Pavlov placed the meat powder in the dog's mouth and rang the bell. Later on, he first rang the bell and little after that he placed the food. He increased the time interval between the sound stimulus (the bell) and the food stimulus (meat powder), and noticed that the sound stimulus produced salivation. After a certain number of such paired administrations of two stimuli, Pavlov presented only the sound stimulus and every time the sound stimulus produced salivation (saliva from the dog's mouth). He called the original stimulus the

unconditioned stimulus (USC) and its response the unconditioned response (UR). He called the new stimulus the conditioned stimulus (CS) and the old response, when attached to the CS, was called conditioned response (CR).

The connection between the CS and CR—the sound stimulus and the salivary response—could be established only when the UCS—the food stimulus—was also subsequently applied. The UCS was therefore called the reinforcement stimulus. CS gained the strength or force from the UCS, which was paired with it, to produce the conditioned response. The paired presentation of the two stimuli could alone establish the new connection. The conditioned reflex principle, when applied to learning of new responses, came to be called the Conditioning Theory of Learning.

The findings of Pavlov have been tabulated in Table 3.1.

Table 3.1 *Conditioning Theory of Learning*

Before Conditioning		
	CS (Sound)	No response or/irrelevant response.
	UCS (Food)	UCR Salivation
After Conditioning		
	CS (Sound)	CR Salivation

Working of classical conditioning

Classical conditioning works in the following manner:

- **Stimulus generalization:** Generalization in classical conditioning is the tendency of a new stimulus that is similar to the original stimulus to elicit a response that is similar to the conditioned response (Nicholas Jones, Ildiko Kemenes and Paul Benjamin, 2001). Pavlov found that the dog not only salivated to the tone of the bell, but also to other sounds that are similar to the original sound of the bell. The similar the bell sounded, the more the dog salivated.
- **Discrimination:** Stimulus generalization cannot continue for a long period of time. When the dog did not receive only food on hearing the similar bell, real CS was followed. With food appearing only after the real bell, the dog started to differentiate between the fake bells and the real one. This process is called stimulus discrimination; the process of learning to response to a particular stimuli and not to others (R.A. Murphy, A.G. Baker and N.A. Fouquet, 2001).
- **Acquisition:** The time interval between the CS and UCS is one of the most important aspects of classical conditioning (S. Kotani, S. Kawahara and Y. Kirino, 2002; G. Weidemann, A. Georgilas and E.J. Kehoe, 1999). Conditioned responses develop when the CS and UCS occur close together; often optimal spacing is a fraction of a second (G.A. Kimble, 1961). In

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Pavlov experiment, the bell rang 15 minutes before the presentation of food. The dog probably would not have associated the ringing of the bell with the food.

- **Extinction:** It means learning that the CS no longer predicts the UCS; it is not unlearning like original learning. It involves formation of a new CS-no UCS memory that inhibits expression of the CS-UCS association. Hence, the dog gradually stopped salivating to the sound of the bell. When the CS (bell) was repeatedly presented in the absence of UCS (food), the salivation (CR) died out
- **Spontaneous recovery:** It refers to the reappearance of a learned response after extinction has occurred. If Pavlov had followed the ringing of the bell with the food—after the dog had stopped salivating to the sound of the bell—the dog's spontaneous salivation would have reoccurred. This is called retraining. Retraining is made simpler by the fact that the extinguished response is not gone, just suppressed.
- **Higher order conditioning:** This occurs when a strong conditioned stimulus is paired with a neural stimulus. The stronger CS can actually play the part of a UCS, and the previous neutral stimulus becomes a second conditioned stimulus. For example, previously the dog was conditioned to salivate at the sound of the bell. If the dog is put in a situation wherein it is exposed to a light followed by the bell on each trial, the light alone will eventually elicit a CR, even though it has never been paired with food. The existence of second-order conditioning greatly increases the scope of classical conditioning especially in human beings, for whom biological significant UCS occurs relatively infrequently.

Application of classical conditioning

The following are the applications of classical conditioning:

- **Survival value:** Classical conditioning has a great deal of survival value (Vernoy, 1995). Due to classical conditioning, we jerk our hands away before they are burned by fire. Pavlov conducted his experiments and concluded that individuals have been conditioned to respond to the sound of a buzzer, a glimpse of light, a puff of air or the touch of a hand (Woodruff-Pak, 1999).
- **Health problems and mental disorders can be attributed to classical conditioning:** B. Watson and Rosalie Rayner (1920) brought to light the role of classical conditioning in phobias (irrational fear). They conducted the 'Little Albert' that included a white rat. They concluded that if we can produce fears through classical conditioning we can eliminate them using conditioning procedure. Counter conditioning is a classical conditioning procedure for weakening a CR by associating a fear-provoking stimulus with a new response incompatible with the fear. Classical conditioning is not restricted to unpleasant emotions. We become conditioned with the

pleasure moment of our life. Certain physical complaints can also be partly the products of classical conditioning. Classical conditioning can be involved in certain aspects of drug use.

- **Classical conditioning used by contemporary advertisers:** Many contemporary advertisers use classical conditioning (J. Perner, 2001). For example, whenever males see a beautiful woman (UCS) their emotion or the UCR is arousal. Therefore, many times a beautiful woman (UCS) is paired with an automobile (not yet a CS). In such a case, the automobile becomes the CS that results in arousal (CR).

Recent research has shown that if the CS is encountered outside the ads, it does not predict the UCS (J.R. Bettman, 2001). Thus, classical conditioning may work best for infrequently encountered products and cases in which the UCS is associated with only one brand. Classical conditioning may work best for infrequently encountered products and cases in which the UCS is associated with only one brand. It also works best when the CS precedes the UCS in ads.

3.3.2 Operant Conditioning

Classical conditioning occurs with reflexive, involuntary behaviour. Learning which is due to voluntary behaviour is called operant conditioning. The concept of operant conditioning was developed by the American psychologist B. F. Skinner (1938). Operant conditioning, also known as instrumental conditioning, is a form associative learning in which consequences of behaviour change the probability of occurrence of behaviour. Skinner described the term operant as the behaviour of the organism—the behaviour operates in the environment, and the environment in turn operates on the behaviour. Operant conditioning consists of voluntary behaviour that acts or operates on the environment and produces rewarding or punishing stimuli. Contingency is an important aspect of classical conditioning, the occurrence of one stimulus is dependent on the presence of another one.

3.3.3 Multiple Response Learning or Thorndike's Law of Effect

Although Skinner was the pioneer contributor of operant conditioning, the experiment by E.L. Thorndike (1874–1949) establishes the power of consequences in determining voluntary behaviour. Thorndike placed a hungry cat inside a puzzle box from which the only escape was to press a lever located on the floor of the box. A piece of fish was outside the puzzle box. The hungry cat made all possible efforts to get out of the cage to have food. It made a series of all possible movements, such as pulling the box bar biting and clawing them, pressing the floor, jumping, etc. During jumping its paw struck against the latch and it was pushed up. The door opened and the cat had the food. Thorndike repeated trial again and again. In his observation, Thorndike found that the number of movements the cat was making, before it could open the door was gradually decreasing from trial to trial. After a certain number of trials, the cat made no other movements than the correct one. It easily lifted the latch and came out. Thorndike mentioned this process as trial and error. Based on this research, Thorndike developed Law of Effect which

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