

### 1.12.3 Application of Newton's law of gravitation

- 1) Dimensions of the heavenly bodies can be measured using the gravitation law. Mass of the Earth, radius of the Earth, acceleration due to gravity, etc. can be calculated with a higher accuracy.
- 2) Helps in discovering new stars and planets.
- 3) One of the irregularities in the motion of stars is called 'Wobble' lead to the disturbance in the motion of a planet nearby. In this condition the mass of the star can be calculated using the law of gravitation.
- 4) Helps to explain germination of roots is due to the property of geotropism which is the property of a root responding to the gravity.
- 5) Helps to predict the path of the astronomical bodies.

#### Points to Remember

- ❖ Mechanics is divided into statics and dynamics.
- ❖ Ability of a body to maintain its state of rest or motion is called Inertia.
- ❖ Moment of the couple is measured by the product of any one of the forces and the perpendicular distance between two forces.
- ❖ SI unit of force is newton (N). C.G.S unit is dyne.
- ❖ When a force  $F$  acts on a body for a period of time  $t$ , then the product of force and time is known as 'impulse'.
- ❖ The unit of weight is newton or  $\text{kg f}$
- ❖ The weight of a body is more at the poles than at the equatorial region.
- ❖ Mass of a body is defined as the quantity of matter contained in the object. Its SI unit is kilogram (kg).
- ❖ Apparent weight is the weight of the body acquired due to the action of gravity and other external forces on the body.

- ❖ Whenever a body or a person falls freely under the action of Earth's gravitational force alone, it appears to have zero weight. This state is referred to as 'weightlessness'.

#### SOLVED PROBLEMS

**Problem-1:** Calculate the velocity of a moving body of mass 5 kg whose linear momentum is  $2.5 \text{ kg ms}^{-1}$ .

**Solution:** Linear momentum = mass  $\times$  velocity

$$\text{Velocity} = \text{linear momentum} / \text{mass.} \\ V = 2.5 / 5 = 0.5 \text{ ms}^{-1}$$

**Problem 2:** A door is pushed, at a point whose distance from the hinges is 90 cm, with a force of 40 N. Calculate the moment of the force about the hinges.

**Solution:**

**Formula:** The moment of a force  $M = F \times d$

Given:  $F = 40 \text{ N}$  and  $d = 90 \text{ cm} = 0.9 \text{ m}$ .

Hence, moment of the force  $= 40 \times 0.9 = 36 \text{ N m}$ .

**Problem 3 :** At what height from the centre of the Earth the acceleration due to gravity will be  $\frac{1}{4}$ <sup>th</sup> of its value as at the Earth.

**Solution:**

**Data:** Height from the centre of the Earth,  $R' = R + h$

The acceleration due to gravity at that height,  $g' = g/4$

**Formula:**  $g = GM/R^2$ ,  $g' = GM/R'^2$

$$\frac{g}{g'} = \left(\frac{R'}{R}\right)^2 = \left(\frac{R+h}{R}\right)^2 = \left(1 + \frac{h}{R}\right)^2$$

$$4 = \left(1 + \frac{h}{R}\right)^2,$$

$$2 = 1 + \frac{h}{R} \quad \text{or } h = R. \quad R' = 2R$$

From the centre of the Earth, the object is placed at twice the radius of the earth.



### Points to Remember

- ❖ Light is a form of energy which travels along a straight line
- ❖ The deviation in the path of light ray is called refraction.
- ❖ The ratio of speed of light in vacuum to the speed of light in a medium is defined as refractive index ' $\mu$ ' of that medium.
- ❖ Lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

- ❖ Magnification (m) =  $\frac{h'}{h} = \frac{v}{u}$
- ❖ Power of lens.  $P = \frac{1}{f}$
- ❖ The ability of the eye lens to focus nearby as well as the distant objects is called power of accommodation of the eye.
- ❖ A microscope is an optical instrument which helps us to see the objects which are very small in dimension.
- ❖ Telescope is an optical instrument used to see the distant objects clearly.

### SOLVED PROBLEMS

#### Problem 1

Light rays travel from vacuum into a glass whose refractive index is 1.5. If the angle of incidence is  $30^\circ$ , calculate the angle of refraction inside the glass.

#### Solution:

according to Snell's law,

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

$$\mu_1 \sin i = \mu_2 \sin r$$

$$\text{Here } \mu_1 = 1.0, \mu_2 = 1.5, i = 30^\circ$$

$$(1.0) \sin 30^\circ = 1.5 \sin r$$

$$1 \times \frac{1}{2} = 1.5 \sin r$$

$$\sin r = \frac{1}{2 \times 1.5} = \frac{1}{3} = (0.333)$$

$$r = \sin^{-1}(0.333)$$

$$r = 19.45^\circ$$

#### Problem-2

A beam of light passing through a diverging lens of focal length 0.3m appear to be focused at a distance 0.2m behind the lens. Find the position of the object.

#### Solution:

$$f = -0.3 \text{ m}, v = -0.2 \text{ m}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{-0.2} - \frac{1}{-0.3} = \frac{-10}{6}$$

$$u = \frac{-6}{10} = -0.6 \text{ m}$$

#### Problem-3

A person with myopia can see objects placed at a distance of 4m. If he wants to see objects at a distance of 20m, what should be the focal length and power of the concave lens he must wear?

#### Solution:

Given that  $x = 4\text{m}$  and  $y = 20\text{m}$ .

Focal length of the correction lens is

$$f = \frac{xy}{x-y} \quad (\text{Refer eqn.2.7})$$

$$f = \frac{4 \times 20}{4 - 20} = \frac{80}{-16} = -5 \text{ m}$$

Power of the correction lens

$$= \frac{1}{f} = -\frac{1}{5} = -0.2 \text{ D}$$

#### Problem-4

For a person with hypermeteropia, the near point has moved to 1.5m. Calculate the focal length of the correction lens in order to make his eyes normal.

#### Solution:

Given that,  $d = 1.5\text{m}$ ;  $D = 25\text{cm} = 0.25\text{m}$  (For a normal eye).

From equation (2.8), the focal length of the correction lens is

$$f = \frac{d \times D}{d - D} = \frac{1.5 \times 0.25}{1.5 - 0.25} = \frac{0.375}{1.25} = 0.3 \text{ m}$$



According to Charles's law,

$$V/T = \text{constant} \quad (3.2)$$

According to Avogadro's law,

$$V/n = \text{constant} \quad (3.3)$$

After combining equations (3.1), (3.2) and (3.3), you can get the following equation.

$$PV/nT = \text{constant} \quad (3.4)$$

The above relation is called the combined law of gases. If you consider a gas, which contains  $\mu$  moles of the gas, the number of atoms contained will be equal to  $\mu$  times the Avogadro number,  $N_A$ .

$$\text{i.e. } n = \mu N_A. \quad (3.5)$$

Using equation (3.5), equation (3.4) can be written as

$$PV/\mu N_A T = \text{constant}$$

The value of the constant in the above equation is taken to be  $k_B$ , which is called as **Boltzmann constant** ( $1.38 \times 10^{-23} \text{ JK}^{-1}$ ). Hence, we have the following equation:

$$PV/\mu N_A T = k_B$$

$$PV = \mu N_A k_B T$$

Here,  $\mu N_A k_B = R$ , which is termed as universal gas constant whose value is

$$8.31 \text{ J mol}^{-1} \text{ K}^{-1}.$$

$$PV = RT \quad (3.6)$$

Ideal gas equation is also called as *equation of state* because it gives the relation between the state variables and it is used to describe the state of any gas.

### Points to Remember

- ❖ The SI unit of heat energy absorbed or evolved is joule (J)
- ❖ Heat always flows from a system at higher temperature to a system at lower temperature.
- ❖ **Temperature** is defined as the degree of hotness of a body. The SI unit of temperature is kelvin (K).

❖ All the substances will undergo one or more of the following changes when heated:

- i) Temperature of the substance rises.
- ii) The substance may change state from solid to liquid or gas.
- iii) The substance will expand when heated.

❖ All forms of matter (solid, liquid and gas) undergo expansion on heating.

❖ For a given rise in temperature, a liquid will have more expansion than a solid and a gaseous substance has the highest expansion than the other two.

❖ If a liquid is heated directly without using any container, then the expansion that you observe is termed as **real expansion** of the liquid.

❖ The expansion of a liquid apparently observed without considering the expansion of the container is called the **apparent expansion** of liquid.

❖ For a given heat energy, the real expansion is always more than that of apparent expansion.

❖ If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an **ideal gas** or a **perfect gas**.

❖ Ideal gas equation, also called as equation of state is  $PV = RT$ . Here,  $R$  is known as universal gas constant whose value is  $8.31 \text{ J mol}^{-1} \text{ K}^{-1}$

## Solved Problems

### Example 1

A container whose capacity is 70 ml is filled with a liquid up to 50 ml. Then, the liquid in the container is heated. Initially, the level of the liquid falls from 50 ml to 48.5 ml. Then we heat more, the level of the liquid rises to 51.2 ml. Find the apparent and real expansion.

An LED display uses LEDs for backlight and an array of LEDs act as pixels. LEDs emitting white light are used in monochrome (black and white) TV; Red, Green and Blue (RGB) LEDs are used in colour television. The first LED television screen was developed by James P. Mitchell in 1977. It was a monochromatic display. But, after about three decades, in 2009, SONY introduced the first commercial LED Television.

#### 4.12.1 Advantages of LED television

- It has brighter picture quality.
- It is thinner in size.
- It uses less power and consumes very less energy.
- Its life span is more.
- It is more reliable.

#### Points to Remember

- ❖ The magnitude of current is defined as the rate of flow of charges in a conductor.
- ❖ The SI unit of electric current is ampere (A).
- ❖ The SI unit of electric potential and potential difference is volt (V).
- ❖ An electric circuit is a network of electrical components, which forms a continuous and closed path for an electric current to pass through it.
- ❖ The parameters of conductors like its length, area of cross-section and material, affect the resistance of the conductor.
- ❖ SI unit of electrical resistivity is ohm metre. The resistivity is a constant for a given material.
- ❖ The reciprocal of electrical resistivity of a material is called its electrical conductivity.  

$$\sigma = \frac{1}{\rho}$$
- ❖ The passage of electric current through a wire results in the production of heat.

This phenomenon is called heating effect of current.

- ❖ One horse power is equal to 746 watts.
- ❖ The function of a fuse wire or a MCB is to protect the house hold electrical appliances from excess current due to overloading or a short circuit.

#### Solved Problems

- Two bulbs are having the ratings as 60 W, 220 V and 40 W, 220 V respectively. Which one has a greater resistance?

**Solution:**

$$\text{Electric power } P = \frac{V^2}{R}$$

For the same value of V, R is inversely proportional to P.

Therefore, lesser the power, greater the resistance

Hence, the bulb with 40 W, 220 V rating has a greater resistance.

- Calculate the current and the resistance of a 100 W, 200 V electric bulb in an electric circuit.

**Solution:**

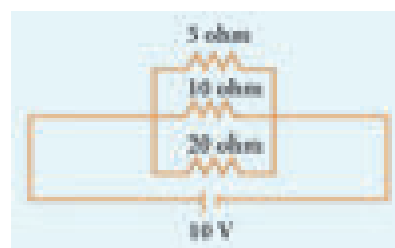
Power  $P = 100 \text{ W}$  and Voltage  $V = 200 \text{ V}$

Power  $P = V I$

$$\text{So, Current, } I = \frac{P}{V} = \frac{100}{200} = 0.5 \text{ A}$$

$$\text{Resistance, } R = \frac{V}{I} = \frac{200}{0.5} = 400 \Omega$$

- In the circuit diagram given below, three resistors  $R_1$ ,  $R_2$  and  $R_3$  of  $5 \Omega$ ,  $10 \Omega$  and  $20 \Omega$  respectively are connected as shown. Calculate:



### 5.5.1 Conditions for no Doppler effect

Under the following circumstances, there will be no Doppler effect and the apparent frequency as heard by the listener will be the same as the source frequency.

- (i) When source (S) and listener (L) both are at rest.
- (ii) When S and L move in such a way that distance between them remains constant.
- (iii) When source S and L are moving in mutually perpendicular directions.
- (iv) If the source is situated at the center of the circle along which the listener is moving.

### 5.5.2 Applications of Doppler effect

#### (a) To measure the speed of an automobile

An electromagnetic wave is emitted by a source attached to a police car. The wave is reflected by a moving vehicle, which acts as a moving source. There is a shift in the frequency of the reflected wave. From the frequency shift, the speed of the car can be determined. This helps to track the over speeding vehicles.

#### (b) Tracking a satellite

The frequency of radio waves emitted by a satellite decreases as the satellite passes away from the Earth. By measuring the change in the frequency of the radio waves, the location of the satellites is studied.

#### (c) RADAR (Radio Detection And Ranging)

In RADAR, radio waves are sent, and the reflected waves are detected by the receiver

of the RADAR station. From the frequency change, the speed and location of the aeroplanes and aircrafts are tracked.

#### (d) SONAR

In SONAR, by measuring the change in the frequency between the sent signal and received signal, the speed of marine animals and submarines can be determined.

#### Points to Remember

- ❖ Wave velocity is the velocity with which the wave travels through the medium.
- ❖ Velocity of a sound wave is maximum in solids because they are more elastic in nature than liquids and gases. Since gases are least elastic in nature.
- ❖ Infrasonic waves are sound wave with a frequency below 20 Hz. A human ear cannot hear these waves.
- ❖ Ultrasonic waves are sound waves with frequency greater than 20 kHz, A human ear cannot detect these waves.
- ❖ Reflection of sound waves obey the laws of reflection.
- ❖ when a compression hits the boundary of a rarer medium, it is reflected as a rarefaction.
- ❖ An echo is the sound reproduced due to the reflection of the original sound wave.
- ❖ The minimum distance between the source and the reflecting surface should be 17.2 m to hear an echo clearly.
- ❖ “The apparent frequency” is the frequency of the sound as heard by the listener.

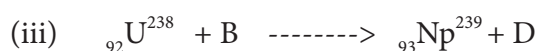
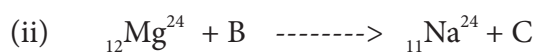
Department of Indian Scientific Research committee at Bombay (now Mumbai) in Maharashtra. It is the nodal agency for all the research done in the field of atomic energy. Dr. Homi Jahangir Bhaba was the first chairman of Indian Atomic Energy Commission. Now, it is known as Bhaba Atomic Research Centre (BARC).

Nuclear power is the fifth largest source of power in India. Tarapur Atomic Power Station is India's first nuclear power station. Now, there are a total of seven power stations, one each in Maharashtra, Rajasthan, Gujarat, Uttar Pradesh and two in Tamilnadu. In Tamilnadu, we have nuclear power stations in Kalpakkam and Kudankulam. Apsara was the first nuclear reactor built in India and Asia. Now, there are 22 nuclear reactors which are operating in India. Some other operating reactors are

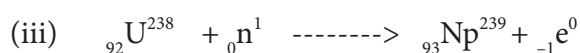
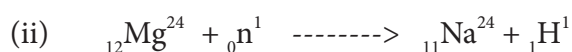
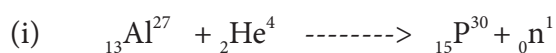
- Cirus
- Dhuruva
- Purnima

### Solved problem 6.1

Identify A, B, C, and D from the following nuclear reactions.



**Solution:**



A is alpha particle, B is neutron, C is proton, and D is electron.

### Solved problem 6.2

A radon specimen emits radiation of  $3.7 \times 10^3$  GBq per second. Convert this disintegration in terms of curie. (one curie =  $3.7 \times 10^{10}$  disintegration per second)

1 Bq = one disintegration per second

$$\text{one curie} = 3.7 \times 10^{10} \text{ Bq}$$

$$1 \text{ Bq} = \frac{1}{3.7 \times 10^{10}} \text{ curie}$$

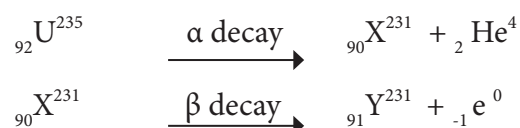
$$\therefore 3.7 \times 10^3 \text{ GBq} = 3.7 \times 10^3 \times 10^9 \times \frac{1}{3.7 \times 10^{10}} \\ = 100 \text{ curie}$$

### Solved problem 6.3

${}_{92}\text{U}^{235}$  experiences one  $\alpha$  - decay and one  $\beta$  - decay. Find number of neutrons in the final daughter nucleus that is formed.

**Solution:**

Let X and Y be the resulting nucleus after the emission of the alpha and beta particles respectively.



$$\begin{aligned} \text{Number of neutrons} &= \text{Mass number} - \text{Atomic number} \\ &= 231 - 91 = 140 \end{aligned}$$

### Solved problem 6.4

Calculate the amount of energy released when a radioactive substance undergoes fusion and results in a mass defect of 2 kg.

**Solution:**

$$\text{Mass defect in the reaction (m)} = 2 \text{ kg}$$

$$\text{Velocity of light (c)} = 3 \times 10^8 \text{ m s}^{-1}$$

By Einstein's equation,

$$\text{Energy released} \quad E = mc^2$$

$$\begin{aligned} \text{So} \quad E &= 2 \times (3 \times 10^8)^2 \\ &= 1.8 \times 10^{17} \text{ J} \end{aligned}$$

### Points to Remember

- ❖ This phenomenon of spontaneous emission of radiation from certain elements on its own is called 'natural radioactivity'.
- ❖ **Curie** is defined as the quantity of a radioactive substance, which undergoes  $3.7 \times 10^{10}$  disintegrations in one second. This is actually close to the activity of 1 g of radium-226.





- ❖ **Rutherford (Rd)** is defined as the quantity of a radioactive substance which produces  $10^6$  disintegrations in one second.  
 $1 \text{ Rd} = 10^6$  disintegrations per second.
- ❖ The SI unit of radioactivity is **becquerel**. It is defined as the quantity of one disintegration per second.
- ❖ Helium nucleus ( ${}_2\text{He}^4$ ) consisting of two protons and two neutrons is known as alpha particle.
- ❖ Beta particles are electrons ( ${}_{-1}\text{e}^0$ ), which are the basic elementary particles present in all atoms.
- ❖ Gamma rays are electromagnetic waves consisting of photons.
- ❖ A nuclear reaction in which an unstable parent nucleus emits an alpha particle and forms a stable daughter nucleus is called as 'alpha decay'.
- ❖ A nuclear reaction in which an unstable parent nucleus emits a beta particle and



- forms a stable daughter nucleus is called as 'beta decay'.
- ❖ The process of breaking (splitting) up of a heavier nucleus into two smaller nuclei with the release of a large amount of energy is called '**nuclear fission**'.
- ❖ The energy released in a nuclear fission process is about 200 MeV.
- ❖ There are some radioactive elements which can be converted into a fissionable material. They are called as '**fertile materials**'. e.g. Uranium-238, Thorium-232, Plutonium-240.
- ❖ Controlled chain reaction is used in a nuclear reactor to produce energy in a sustained and controlled manner.
- ❖ The process in which two lighter nuclei combine to form a heavier nucleus is termed as '**nuclear fusion**'.
- ❖ Nuclear fusion or thermonuclear reaction is the source of light and heat energy in the Sun and other stars.
- ❖ The safe limit of receiving the radiation is about 100 mR per week.



## TEXTBOOK EVALUATION



### I. Choose the correct answer

1. Man-made radioactivity is also known as \_\_\_\_\_
  - a. Induced radioactivity
  - b. Spontaneous radioactivity
  - c. Artificial radioactivity
  - d. a & c
2. Unit of radioactivity is \_\_\_\_\_
  - a. roentgen
  - b. curie
  - c. becquerel
  - d. all the above
3. Artificial radioactivity was discovered by \_\_\_\_\_
  - a. Bequerel
  - b. Irene Curie
  - c. Roentgen
  - d. Neils Bohr
4. In which of the following, no change in mass number of the daughter nuclei takes place
  - i)  $\alpha$  decay
  - ii)  $\beta$  decay
  - iii)  $\gamma$  decay
  - iv) neutron decay
  - a. (i) is correct
  - b. (ii) and (iii) are correct
  - c. (i) & (iv) are correct
  - d. (ii) & (iv) are correct
5. \_\_\_\_\_ isotope is used for the treatment of cancer.

## VI. Calculation based on % composition

Calculate % of S in  $\text{H}_2\text{SO}_4$

molecular mass of  $\text{H}_2\text{SO}_4$

$$= (1 \times 2) + (32 \times 1) + (16 \times 4)$$

$$= 2 + 32 + 64$$

$$= 98 \text{ g}$$

$$\% \text{ of S in } \text{H}_2\text{SO}_4 = \frac{\text{Mass of sulphur}}{\text{Molecular mass of } \text{H}_2\text{SO}_4} \times 100$$

$$\% \text{ of S in } \text{H}_2\text{SO}_4 = \frac{32}{98} \times 100$$
$$= 32.65 \%$$

### Points to Remember

- ❖ Two or more forms of an element having the same atomic number, but different mass number are called Isotopes ( $_{17}\text{Cl}^{35}$ ,  $_{17}\text{Cl}^{37}$ ).
- ❖ Atoms of different elements having the same mass number, but different atomic numbers are called Isobars ( $_{18}\text{Ar}^{40}$ ,  $_{20}\text{Ca}^{40}$ ).
- ❖ Atoms of different elements having the same number of neutrons, but different atomic number and different mass number are called Isotones ( $_{6}\text{C}^{13}$ ,  $_{7}\text{N}^{14}$ ).
- ❖ Relative atomic mass of an element is the ratio between the mass of one atom of the element to 1/12th of the mass of the atom of carbon -12.
- ❖ Average atomic mass of an element is calculated by adding the masses of its isotopes, each multiplied by their natural abundance on the Earth.
- ❖ Relative molecular mass of a molecule is the ratio between the mass of one molecule of the substance to 1/12th of the mass of the atom of carbon - 12.
- ❖ The Avogadro's law states that "equal volumes of all gases under similar conditions of temperature and pressure contain equal number of molecules".
- ❖ The vapour density is defined as "the ratio between the masses of equal volumes of a gas (or a vapour) and hydrogen under the same condition".
- ❖ Atomicity of a monoatomic element = Molecular mass / Atomic Mass.
- ❖ Molecular mass = 2 × Vapour density.



## TEXTBOOK EVALUATION



### I. Choose the best answer.

1. Which of the following has the smallest mass?
  - a.  $6.023 \times 10^{23}$  atoms of He
  - b. 1 atom of He
  - c. 2 g of He
  - d. 1 mole atoms of He
2. Which of the following is a triatomic molecule?
  - a. Glucose
  - b. Helium
  - c. Carbon dioxide
  - d. Hydrogen
3. The volume occupied by 4.4 g of  $\text{CO}_2$  at S.T.P
  - a. 22.4 litre
  - b. 2.24 litre
  - c. 0.24 litre
  - d. 0.1 litre
4. Mass of 1 mole of Nitrogen atom is
  - a. 28 amu
  - b. 14 amu
  - c. 28 g
  - d. 14 g
5. Which of the following represents 1 amu?
  - a. Mass of a C – 12 atom
  - b. Mass of a hydrogen atom
  - c. 1/12<sup>th</sup> of the mass of a C – 12 atom
  - d. Mass of O – 16 atom





### Points to Remember

- ❖ Modern periodic law states that, the physical and chemical properties of the elements are the periodic functions of their atomic numbers.
- ❖ The table in which elements are arranged in rows and columns in regular gradation is called periodic table.
- ❖ Smelting is the process of reducing the roasted metallic oxide into metal in molten condition.
- ❖ Dilute or con.  $\text{HNO}_3$  does not attack aluminium metal, as it renders aluminium passive due to oxide film formation on its surface.
- ❖ The charge used in the metallurgy of iron consists of roasted ore, coke and limestone in the ratio, 8:4:1.
- ❖ Copper vessel on exposure to air and moisture forms a green layer on its surface due to basic copper carbonate.
- ❖ An alloy is a homogeneous mixture of two or more metals.
- ❖ An amalgam is an alloy of mercury with another metal. E.g. Ag-Sn amalgam is used for dental filling.
- ❖ The chemical name of rust is hydrated ferric oxide and its formula is  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ .



### TEXTBOOK EVALUATION



#### I. Choose the best answer.

1. The number of periods and groups in the periodic table are \_\_\_\_\_.  
a) 6,16                      b) 7,17  
c) 8,18                      d) 7,18
2. The basis of modern periodic law is \_\_\_\_\_.  
a) atomic number  
b) atomic mass  
c) isotopic mass  
d) number of neutrons
3. \_\_\_\_\_ group contains the member of halogen family.  
a) 17<sup>th</sup>                      b) 15<sup>th</sup>  
c) 18<sup>th</sup>                      d) 16<sup>th</sup>
4. \_\_\_\_\_ is a relative periodic property  
a) atomic radii              b) ionic radii  
c) electron affinity      d) electronegativity
5. Chemical formula of rust is \_\_\_\_\_.  
a)  $\text{FeO} \cdot x\text{H}_2\text{O}$               b)  $\text{FeO}_4 \cdot x\text{H}_2\text{O}$   
c)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$               d)  $\text{FeO}$
6. In the aluminothermic process the role of Al is \_\_\_\_\_.  
a) oxidizing agent  
b) reducing agent  
c) hydrogenating agent  
d) sulphurising agent
7. The process of coating the surface of metal with a thin layer of zinc is called \_\_\_\_\_.  
a) painting                      b) thinning  
c) galvanization              d) electroplating
8. Which of the following have inert gases 2 electrons in the outermost shell.  
a) He                              b) Ne  
c) Ar                              d) Kr

Mass percentage of the solute = 13.79 %

$$\begin{aligned} \text{(ii) Mass percentage of solvent} &= 100 \\ &- (\text{Mass percentage of the solute}) \\ &= 100 - 13.79 \\ &= 86.21\% \end{aligned}$$

- 3) Find the amount of urea which is to be dissolved in water to get 500 g of 10% w/w aqueous solution?

$$\text{Mass percentage (w/w)} = \frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$$

$$10 = \frac{\text{Mass of the urea}}{500} \times 100$$

Mass of urea = 50g

**(iii) Problem based on volume - volume percentage.**

- 1) A solution is made from 35 ml of Methanol and 65 ml of water. Calculate the volume percentage.

Volume of the ethanol = 35 ml

Volume of the water = 65 ml

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solute} + \text{Volume of the solvent}} \times 100$$

$$\text{Volume percentage} = \frac{35}{35+65} \times 100$$

$$\begin{aligned} \text{Volume percentage} &= \frac{35}{100} \times 100 \\ &= 35\% \end{aligned}$$

- 2) Calculate the volume of ethanol in 200 ml solution of 20% v/v aqueous solution of ethanol.

Volume of aqueous solution = 200 ml

Volume percentage = 20%

$$\text{Volume percentage} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

$$20 = \frac{\text{Volume of ethanol}}{200} \times 100$$

$$\text{Volume of ethanol} = \frac{20 \times 200}{100} = 40 \text{ ml}$$

**Points to Remember**

- ❖ A solution is a homogeneous mixture of two or more substances.
- ❖ An aqueous solution is a solution in which the solvent is water.
- ❖ A non-aqueous solution is a solution in which the solvent is a liquid, other than water
- ❖ A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution.
- ❖ An unsaturated solution is one that contains less solute than the saturated solution at a given temperature.
- ❖ A supersaturated solution is one that contains more solute than the saturated solution at a given temperature.
- ❖ Polar compounds are soluble in polar solvents.
- ❖ Non-polar compounds are soluble in non-polar solvents.
- ❖ In endothermic process, solubility of solid solute increases with increase in temperature.
- ❖ In exothermic process, solubility of solid solute decreases with increase in temperature.



$$[\text{OH}^-] = 1 \times 10^{-4} \text{ mol litre}^{-1}$$

$$\begin{aligned}\text{pOH} &= -\log_{10}[\text{OH}^-] = -\log_{10}[10^{-4}] \\ &= -(-4 \times \log_{10}10) = -(-4) = 4\end{aligned}$$

$$\text{Since, pH} + \text{pOH} = 14$$

$$\begin{aligned}\text{pH} &= 14 - \text{pOH} = 14 - 4 \\ &= 10\end{aligned}$$

**Example 4:** Calculate the pH of a solution in which the concentration of the hydrogen ions is  $1.0 \times 10^{-8} \text{ mol litre}^{-1}$ .

**Solution:** Here, although the solution is extremely dilute, the concentration given is not of an acid or a base but that of  $\text{H}^+$  ions. Hence, the pH can be calculated from the relation:

$$\begin{aligned}\text{pH} &= -\log_{10}[\text{H}^+] \\ \text{given } [\text{H}^+] &= 1.0 \times 10^{-8} \text{ mol litre}^{-1} \\ \text{pH} &= -\log_{10}10^{-8} = -(-8 \times \log_{10}10) \\ &= -(-8 \times 1) = 8\end{aligned}$$

**Example 5:** If the pH of a solution is 4.5, what is its pOH?

**Solution:**

$$\text{pH} + \text{pOH} = 14$$

$$\text{pOH} = 14 - 4.5 = 9.5$$

$$\text{pOH} = 9.5$$

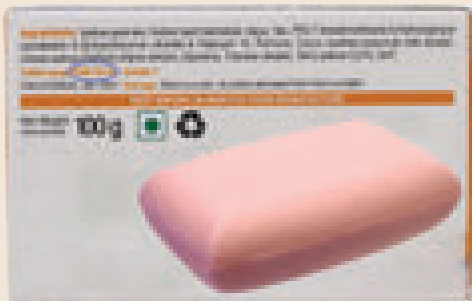
#### Points to Remember

- ❖ A chemical change is a change in which one or more new substances are formed.
- ❖ Most combination reactions are exothermic
- ❖ All photo decomposition reaction are endothermic reactions.
- ❖ Double displacement reaction or metathesis may occur by the mutual exchange of ions.
- ❖ Precipitation reaction gives an insoluble salt as the product.
- ❖ Neutralisation reactions are reactions between an acid and a base that forms salt and water.
- ❖ Neutralisation prevents tooth decay.
- ❖ Most reactions in chemistry are irreversible reactions.
- ❖ Chemical equilibrium-the rate of the forward reaction is equal to rate of the backward reactions.
- ❖ Equilibrium is possible in a closed system.
- ❖ Temperature increases the reaction rate.
- ❖ Pressure increases the reaction rate.
- ❖ The term pH means power of hydrogen.
- ❖ pH plays a vital role in everyday life.
- ❖ In humans all bio chemical reactions take place between the pH value of 7.0 to 7.8.
- ❖ If pH of rain water is below 5.6 its called acid rain.
- ❖ Pure water is a weak electrolyte.

### 11.9.4 Comparison between soap and detergents

Soap	Detergent
It is a sodium salt of long chain fatty acids.	It is sodium salts of sulphonic acids.
The ionic part of a soap is $\text{COO}^-\text{Na}^+$ .	The ionic part in a detergent is $\text{SO}_3^-\text{Na}^+$ .
It is prepared from animal fats or vegetable oils.	It is prepared from hydrocarbons obtained from crude oil.
Its effectiveness is reduced when used in hard water.	It is effective even in hard water.
It forms a scum in hard water.	Does not form a scum in hard water.
It has poor foaming capacity.	It has rich foaming capacity.
Soaps are biodegradable.	Most of the detergents are non-biodegradable.

#### Have you noticed the term "TFM" in soap



**TFM means** TOTAL FATTY MATTER. It is the one of the important factors to be considered to assess the quality of soap. A soap, which has higher TFM, is a good bathing soap.

#### Points to Remember

- ❖ A group or class of organic compounds related to each other by a general molecular formula constitutes homologous series.
- ❖ The IUPAC name of the any organic compound consist of three parts. **ROOTWORD, PREFIX and / or SUFFIX.**

- ❖ Functional group may be defined as an atom or group of atom or reactive part which is responsible for the characteristic properties of the compounds
- ❖ Ethanoic acid is most commonly known as acetic acid and belongs to a group of acids called carboxylic acids.
- ❖ Ethanol or ethyl alcohol or simply alcohol is one of the most important members of the family of alcohols.
- ❖ The slow chemical change that takes place in complex organic compounds by the action of enzymes leading to the formation of simple molecules is called fermentation.
- ❖ Soaps are sodium or potassium salts of some long chain carboxylic acids.
- ❖ Detergents are sodium salts of sulphonic acids. Thus instead of  $\text{COOH}$  group in soaps, detergents contain  $\text{SO}_3\text{H}$  group

process,  $O_2$  the ultimate acceptor of electrons gets reduced to water.

### 12.11.2 Anaerobic respiration

Anaerobic respiration takes place without oxygen. Glucose is converted into ethanol (Ethanol fermentation by yeast) or lactic acid (lactic acid fermentation by bacteria).



### 12.11.3 Respiratory quotient (R.Q)

Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as

$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

### Points to Remember

- ♦ Tissue is a group of similar or dissimilar cells, having a common origin and performing similar functions.
- ♦ Plants are capable of synthesizing glucose from  $CO_2$  and  $H_2O$  in the presence of light, by the process of photosynthesis.
- ♦ Light reaction takes place in grana of chloroplast.
- ♦ Dark reaction takes place in stroma of chloroplast.
- ♦ Respiration involves both external and cellular respiration.
- ♦ Aerobic respiration takes place in the presence of oxygen.
- ♦ Aerobic respiration occurs in three major steps like Glycolysis, Krebs cycle and Electron transport chain.



## TEXTBOOK EVALUATION



### I. Choose the correct answer

1. Casparian strips are present in the \_\_\_\_\_ of the root.
  - a) cortex
  - b) pith
  - c) pericycle
  - d) endodermis
2. The endarch condition is the characteristic feature of
  - a) root
  - b) stem
  - c) leaves
  - d) flower
3. The xylem and phloem arranged side by side on same radius is called \_\_\_\_\_.
  - a) radial
  - b) amphivasal
  - c) conjoint
  - d) None of these
4. Which is formed during anaerobic respiration
  - a) Carbohydrate
  - b) Ethyl alcohol
  - b) Acetyl CoA
  - d) Pyruvate

5. Kreb's cycle takes place in
  - a) chloroplast
  - b) mitochondrial matrix
  - c) stomata
  - d) inner mitochondrial membrane
6. Oxygen is produced at what point during photosynthesis?
  - a) when ATP is converted to ADP
  - b) when  $CO_2$  is fixed
  - c) when  $H_2O$  is splitted
  - d) All of these

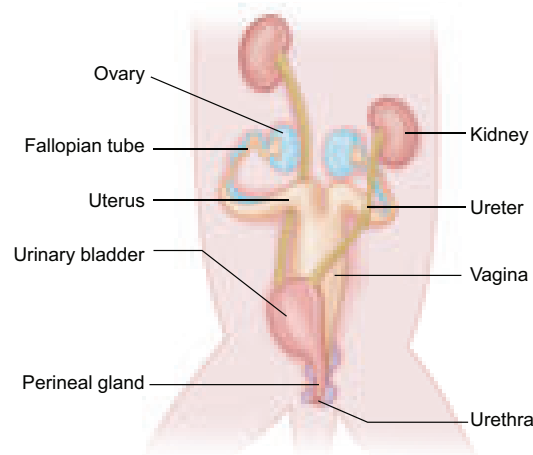
### II. Fill in the blanks.

1. The innermost layer of cortex in root is called \_\_\_\_\_.
2. Xylem and phloem are arranged in an alternate radii constitute a vascular bundle called \_\_\_\_\_.

ovoid structures. They are located behind the kidneys in the abdominal cavity.

A pair of oviducts opens into the body cavity by a funnel shaped opening from each side of the ovary. The anterior part of the oviduct is the fallopian tube. It leads into a wider tube called the **uterus**. The uterus join together to form a median tube called **vagina**. The common tube is formed by the union of urinary bladder and the vagina and is called the **urinogenital canal** or **vestibule**. It runs backwards and opens to the exterior by a slit-like aperture called **vulva**.

A pair of **Cowper's gland** and **perineal gland** are the accessory glands present in the female reproductive system.



**Fig. 13.12** Female reproductive system of Rabbit

#### Points to Remember

- ❖ Leech is metamerically segmented and has 33 segments.
- ❖ It has two suckers which are used to attach to the body of the host. It is also involved in locomotion.
- ❖ The salivary glands of leech produce an anticoagulating substance called hirudin.
- ❖ Leech is a hermaphrodite.
- ❖ Rabbits are warm blooded vertebrates.
- ❖ Canine teeth are absent in rabbit.
- ❖ Respiration takes place through a pair of lungs in rabbit.
- ❖ The heart is four chambered consisting of two auricles and two ventricles.
- ❖ Urinogenital system comprises the urinary (or) excretory system and the genital (or) reproductive system.
- ❖ Mammary glands are modified glands of the skin and help in nourishing the young ones.



### TEXTBOOK EVALUATION

#### I. Choose the correct answer

1. In leech locomotion is performed by
  - a) Anterior sucker
  - b) Parapodia
  - c) Setae
  - d) Contraction and relaxation of muscles
2. The segments of leech are known as
  - a) Metameres (somites)
  - b) Proglottids
  - c) Strobila
  - d) All the above
3. Pharyngeal ganglion in leech is a part of
  - a) Excretory system
  - b) Nervous system
  - c) Reproductive system
  - d) Respiratory system
4. The brain of leech lies above the
  - a) Mouth
  - b) Buccal Cavity
  - c) Pharynx
  - d) Crop
5. The body of leech has
  - a) 23 segments
  - b) 33 segments
  - c) 38 segments
  - d) 30 segments
6. Mammals are \_\_\_\_\_ animals.
  - a) Cold blooded
  - b) Warm blooded
  - c) Poikilothermic
  - d) All the above





**Table 14.2** Distribution of Antigen (RBC) and Antibody (Plasma) in different Blood Groups

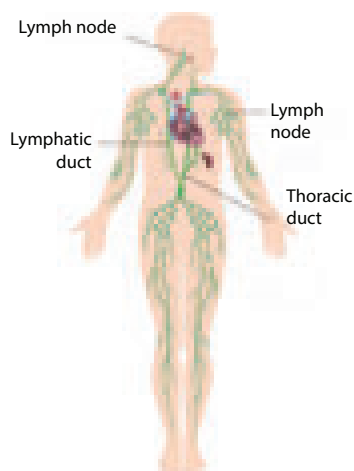
Blood Group	Antigens on RBC	Antibodies in Plasma	Can donate to	Can receive from
A	Antigen A	anti- b	A and AB	A and O
B	Antigen B	anti- a	B and AB	B and O
AB	Antigen A and B	No antibody	AB	A, B, AB and O (Universal Recipient)
O	No Antigen	Both anti a and b	A, B, AB and O (Universal Donor)	O

persons do not have Rh antigen on the surface of RBC. Antibodies developed against this Rh antigen is called **Rh antibodies**.

### 14.18 Lymphatic System

The lymphatic system comprises of lymphatic capillaries, lymphatic vessels, lymph nodes and lymphatic ducts. Lymph is the fluid that flows through the lymphatic system.

The **lymphatic capillaries** unite to form large **lymphatic vessels**. **Lymph nodes** are small oval or pear shaped structures located along the length of lymphatic vessels.



**Figure 14.16** Lymphatic System in Man

#### Lymph

Lymph from the intercellular spaces drains into lymphatic capillaries. Lymph is a colourless fluid formed when plasma, proteins and blood cells escape into intercellular spaces in the tissues through the pores present in the walls of capillaries. It is similar to blood plasma,

but is colourless and contains less proteins. The lymph contains very small amount of nutrients, oxygen, CO<sub>2</sub>, water and WBC.

#### Functions of Lymph

- Supplies nutrients and oxygen to those parts where blood cannot reach
- It drains away excess tissue fluid and metabolites and returns proteins to the blood from tissue spaces.
- The lymph also carries absorbed fats from small intestine to the blood. The lymphatic capillaries of intestinal villi (lacteals) absorb digested fats.
- Lymphocytes in the lymph defend the body from infections.

#### Points to Remember

- ❖ The movement of molecules from a region of higher concentration to a region of their lower concentration without the utilization of energy is called diffusion.
- ❖ Osmosis is the movement of solvent or water molecules from the region of higher concentration to the region of lower concentration through a semi-permeable membrane.
- ❖ Transpiration is the evaporation of water in plants through stomata in the leaves.
- ❖ The circulatory system consists of the circulating fluids, the blood and lymph and the heart and its blood vessels.



- ❖ The blood consists of two main components. The fluid plasma and the formed elements (blood cells) which are found suspended in the plasma.
- ❖ A muscular pumping organ that pumps out the blood into the blood vessels is called heart.
- ❖ The blood circulates in our body as oxygenated and deoxygenated blood.
- ❖ The supply of blood to the heart muscles (cardiac muscles) is called as coronary circulation.
- ❖ One complete contraction (systole) and relaxation (diastole) of atrium and ventricles of heart is called a heartbeat.
- ❖ The sequence of events which occur during the beginning and completion of one heart beat is called cardiac cycle.
- ❖ Blood pressure is usually expressed as systolic pressure and diastolic pressure (120mm / 80 mm Hg)
- ❖ An individual has one of the four blood groups A, B, AB and O.
- ❖ Rh factor was discovered by Landsteiner and Wiener in 1940.
- ❖ Lymph is a colourless fluid formed when plasma, proteins and blood cells escape into intercellular spaces in the tissues through the pores present in the walls of capillaries.



## TEXTBOOK EVALUATION



### I. Choose the correct answer

1. Active transport involves
  - a) movement of molecules from lower to higher concentration
  - b) expenditure of energy
  - c) it is an uphill task
  - d) all of the above
2. Water which is absorbed by roots is transported to aerial parts of the plant through
  - a) cortex
  - b) epidermis
  - c) phloem
  - d) xylem
3. During transpiration there is loss of
  - a) carbon dioxide
  - b) oxygen
  - c) water
  - d) none of the above
4. Root hairs are
  - a) cortical cell
  - b) projection of epidermal cell
  - c) unicellular
  - d) both b and c
5. Which of the following process requires energy?
  - a) active transport
  - b) diffusion
  - c) osmosis
  - d) all of them
6. The wall of human heart is made of
  - a) Endocardium
  - b) Epicardium
  - c) Myocardium
  - d) All of the above
7. Which is the correct sequence of blood flow
  - a) ventricle → atrium → vein → arteries
  - b) atrium → ventricle → veins → arteries
  - c) atrium → ventricle → arteries → vein
  - d) ventricles → vein → atrium → arteries
8. A patient with blood group **O** was injured in an accident and has blood loss. Which group of blood should be used by doctor for transfusion?
  - a) O group
  - b) AB group
  - c) A or B group
  - d) all blood group



9. 'Heart of heart' is called

- a) SA node                      b) AV node
- c) Purkinje fibres              d) Bundle of His

10. Which one of the following shows correct composition of blood

- a) Plasma - Blood + Lymphocyte
- b) Serum - Blood + Fibrinogen
- c) Lymph - Plasma + RBC + WBC
- d) Blood - Plasma + RBC + WBC + Platelets

## II. Fill in the blanks

1. \_\_\_\_\_ involves evaporative loss of water from aerial parts.
2. Water enters into the root hair cell through \_\_\_\_\_ membrane.
3. Part of the root that absorbs water from the soil is \_\_\_\_\_.
4. Normal blood pressure is \_\_\_\_\_.
5. The normal human heartbeat rate is about \_\_\_\_\_ time per minute.

## III. Match the following

### Section I

- 1. Symplastic pathway - Leaf
- 2. Transpiration - Plasmodesmata
- 3. Osmosis - Pressure in xylem
- 4. Root Pressure - Pressure gradient

### Section II

- 1. Leukemia - Thrombocytes
- 2. Platelets - Phagocyte
- 3. Monocytes - Decrease in leucocytes
- 4. Leucopenia - Blood Cancer
- 5. AB blood group - Allergic condition
- 6. O blood group - Inflammation
- 7. Eosinophil - Absence of antigen
- 8. Neutrophils - Absence of antibody

## IV. State whether True or False. If false write the correct statement

1. The phloem is responsible for the translocation of food.
2. Plants lose water by the process of transpiration.
3. The form of sugar transported through the phloem is glucose.
4. In apoplastic movement the water travels through the cell membrane and enter the cell.
5. When guard cells lose water the stoma opens.
6. Initiation and stimulation of heart beat take place by nerves.
7. All veins carry deoxygenated blood.
8. WBC defend the body from bacterial and viral infections.
9. The closure of the mitral and tricuspid valves at the start of the ventricular systole produces the first sound 'LUBB'.

## V. Answer in a word or sentence

1. Name two layered protective covering of human heart.
2. What is the shape of RBC in human blood?
3. Why is the colour of the blood red ?
4. Which kind of cells are found in the lymph?
5. Name the heart valve associated with the major arteries leaving the ventricles.
6. Mention the artery which supplies blood to the heart muscle.

## VI. Short answer questions

1. What causes the opening and closing of guard cells of stomata during transpiration?
2. What is cohesion?
3. Trace the pathway followed by water molecules from the time it enters a plant root to the time it escapes into the atmosphere from a leaf.



4. What would happen to the leaves of a plant that transpires more water than its absorption in the roots?
5. Describe the structure and working of the human heart.
6. Why is the circulation in man referred to as double circulation?
7. What are heart sounds? How are they produced?
8. What is the importance of valves in the heart?
9. Who discovered Rh factor? Why was it named so?
10. How are arteries and veins structurally different from one another?
11. Why is the Sinoatrial node called the pacemaker of heart?
12. Differentiate between systemic circulation and pulmonary circulation.
13. The complete events of cardiac cycle last for 0.8 sec. What is the timing for each event?

#### VII. Give reasons for the following statements

1. Minerals cannot be passively absorbed by the roots.
2. Guard cells are responsible for opening and closing of stomata.
3. The movement of substances in the phloem can be in any direction.
4. Minerals in the plants are not lost when the leaf falls.
5. The walls of the right ventricle are thicker than the right auricles.
6. Mature RBC in mammals do not have cell organelles.

#### VIII. Long answer questions

1. How do plants absorb water? Explain.
2. What is transpiration? Give the importance of transpiration.

3. Why are leucocytes classified as granulocytes and agranulocytes? Name each cell and mention its functions.
4. Differentiate between systole and diastole. Explain the conduction of heart beat.
5. Enumerate the functions of blood.

#### IX. Assertion and Reasoning

**Direction:** In each of the following questions a statement of assertion (A) is given and a corresponding statement of reason (R) is given just below it. Mark the correct statement as.

- a. If both A and R are true and R is correct explanation of A
- b. If both A and R are true but R is not the correct explanation of A
- c. A is true but R is false
- d. Both A and R are false

1. **Assertion:** RBC plays an important role in the transport of respiratory gases.

**Reason:** RBC do not have cell organelles and nucleus.

2. **Assertion:** Persons with AB blood group are called an universal recipients, because they can receive blood from all groups.

**Reason:** Antibodies are absent in persons with AB blood group.

#### X. Higher Order Thinking Skills (HOTS)

1. When any dry plant material is kept in water, they swell up. Name and define the phenomenon involved in this change.
2. Why are the walls of the left ventricle thicker than the other chambers of the heart?
3. Doctors use stethoscope to hear the sound of the heart. Why?
4. How does the pulmonary artery and pulmonary vein differ in their function when compared to a normal artery and vein?
5. Transpiration is a necessary evil in plants. Explain.



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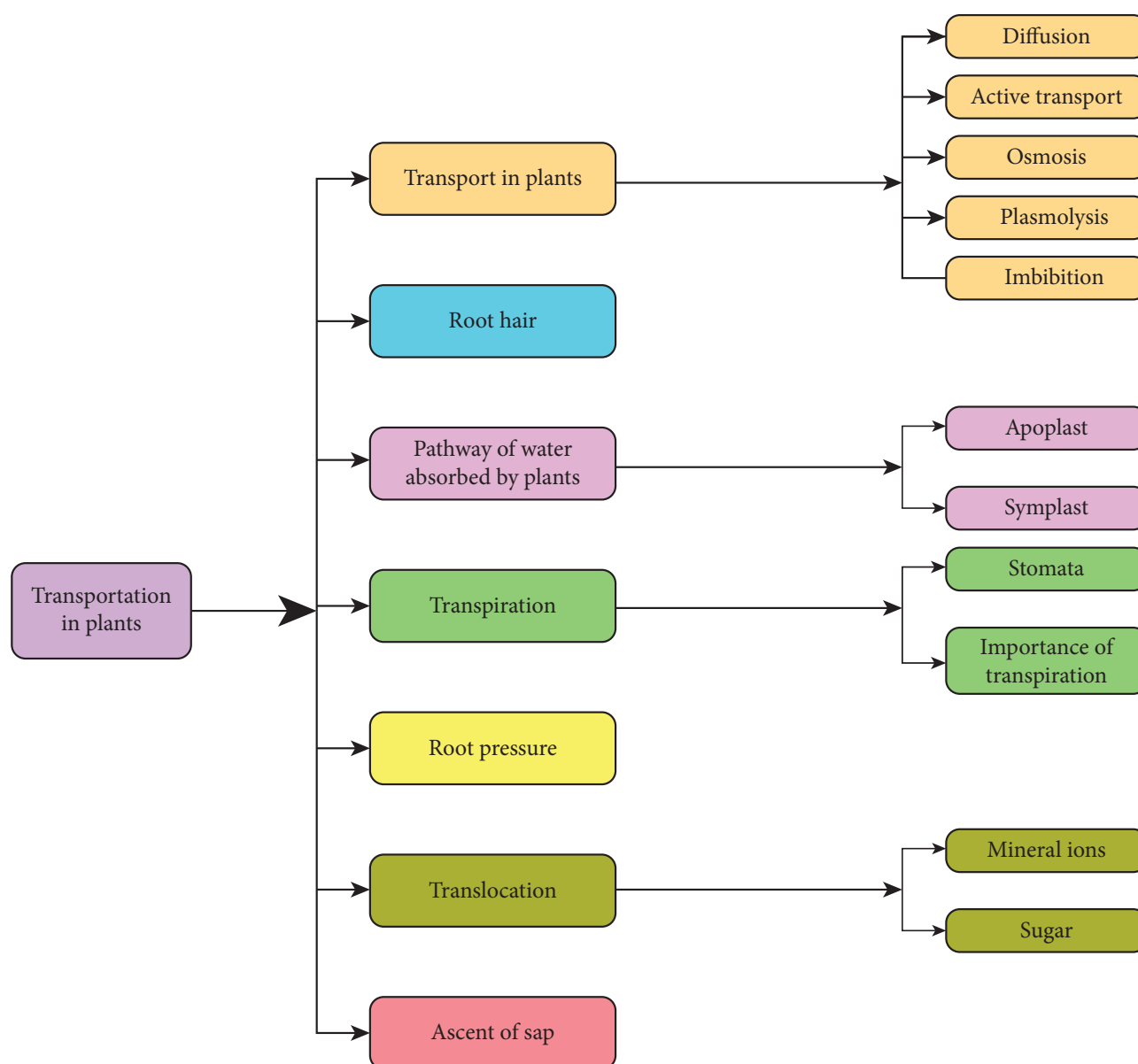


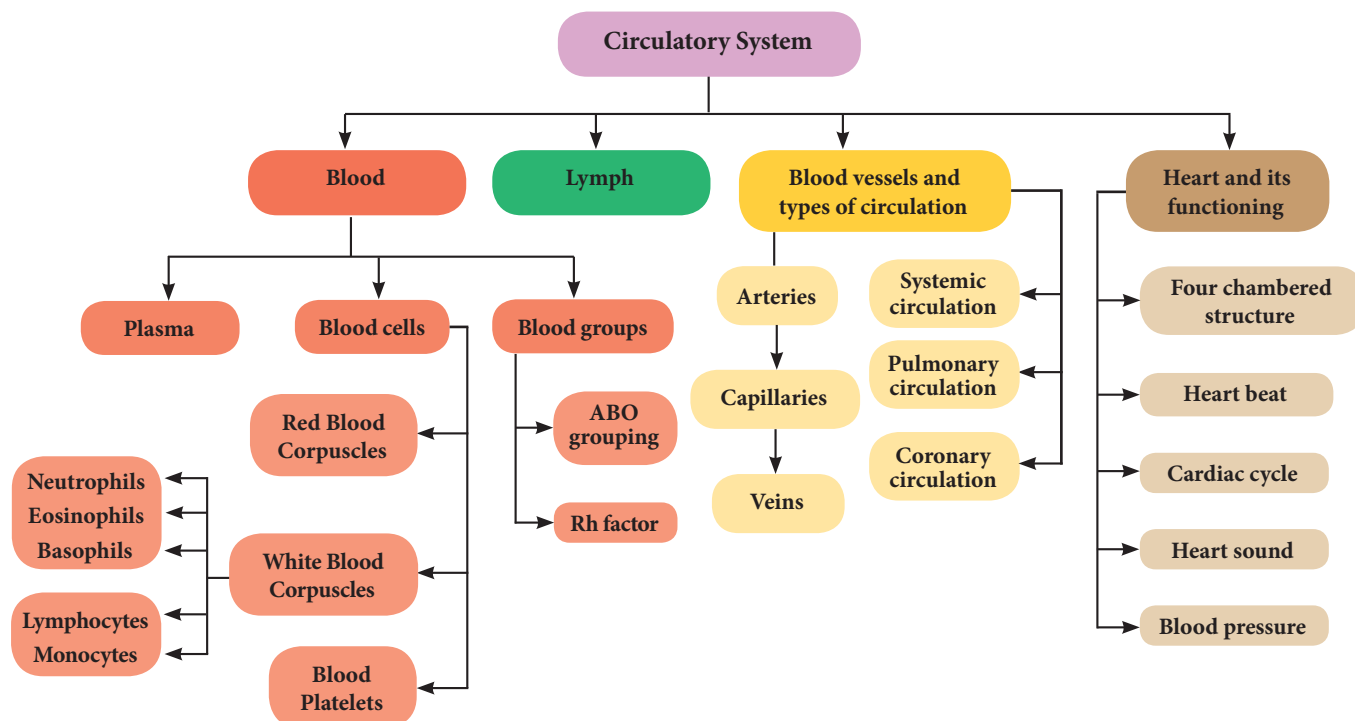
## INTERNET RESOURCES

<http://www.britannica.com/science/human-circulatory-system>

<http://biologydictionary.net/circulatory-system/>

## Concept Map

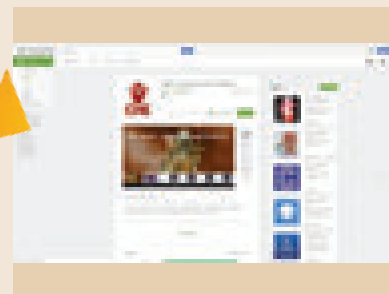




## ICT CORNER

## CIRCULATION IN ANIMALS

**CHE-cardiovascular system-** This 3D application enables the student to know about the structure and functions of cardiovascular system.



### Steps

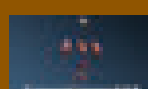
- Access the application CHE – cardiovascular system with the help of URL or QR code given below. After installing it in your device, when you open the app, you can see 4 sections as Introduction, Heart – structure & functions, Blood circulatory system and Blood.
- In each section, description as well as supportive images will be given.
- If you click the picture, a video will be played in it. You can zoom in and zoom out the images and also you can see its any direction by making movements.
- We can maximize as well as minimize the speed of the 3D animation to get clear details of it.



Step1



Step2



Step3



Step4

### Cells alive

URL : <https://play.google.com/store/apps/details?id=com.bodyxq.appbookCardio>

\*Pictures are indicative only



B375\_10\_SCIENCE\_EM





### Points to Remember

- ❖ Nervous system controls and coordinates the activities of our body.
- ❖ Neuron is the structural and functional unit of the cell and has three parts- cyton, dendrites and axon.
- ❖ A receptor is a cell or group of cells that receives the stimuli. An effector is a part of the body which can respond to a stimulus

according to the instructions from the brain or the spinal cord.

- ❖ CNS is formed of brain and spinal cord. PNS consists of all nerves which connect brain and spinal cord to all parts of the body. ANS operates automatically and formed of sympathetic and parasympathetic nerves
- ❖ A reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain.



### TEXTBOOK EVALUATION



#### I. Choose the correct answer

1. Bipolar neurons are found in  
(a) retina of eye (b) cerebral cortex  
(c) embryo (d) respiratory epithelium
2. Site for processing of vision, hearing, memory, speech, intelligence and thought is  
(a) kidney (b) ear  
(c) brain (d) lungs
3. In reflex action, the reflex arc is formed by  
(a) brain, spinal cord, muscle  
(b) receptor, muscle, spinal cord  
(c) muscle, receptor, brain  
(d) receptor, spinal cord, muscle
4. Dendrites transmit impulse \_\_\_\_\_ cell body and axon transmit impulse \_\_\_\_\_ cell body.  
(a) away from, away from  
(b) towards, away from  
(c) towards, towards  
(d) away from, towards
5. The outer most of the three cranial meninges is  
(a) arachnoid membrane (b) pia mater  
(c) dura mater (d) myelin sheath
6. There are \_\_\_\_\_ pairs of cranial nerves and \_\_\_\_\_ pairs of spinal nerves.  
(a) 12, 31 (b) 31, 12 (c) 12, 13 (d) 12, 21

7. The neurons which carries impulse from the central nervous system to the muscle fibre.  
(a) afferent neurons (b) association neuron  
(c) efferent neuron (d) unipolar neuron
8. Which nervous band connects the two cerebral hemispheres of brain?  
(a) thalamus (b) hypothalamus  
(c) corpus callosum (d) pons
9. Node of Ranvier is found in  
(a) muscles (b) axons  
(c) dendrites (d) cyton
10. Vomiting centre is located in  
(a) medulla oblongata (b) stomach  
(c) cerebrum (d) hypothalamus
11. Nerve cells do not possess  
(a) neurilemma (b) sarcolemma  
(c) axon (d) dendrites
12. A person who met with an accident lost control of body temperature, water balance, and hunger. Which of the following part of brain is supposed to be damaged?  
(a) Medulla oblongata (b) cerebrum  
(c) pons (d) hypothalamus

## Testes

Testes are the reproductive glands of the males. They are composed of seminiferous tubules, Leydig cells and Sertoli cells. **Leydig cells** form the endocrine part of the testes. They secrete the male sex hormone called **testosterone**.

### Functions of testosterone

- It influences the process of spermatogenesis.
- It stimulates protein synthesis and controls muscular growth.
- It is responsible for the development of secondary sexual characters (distribution of hair on body and face, deep voice pattern, etc).

## Ovary

The ovaries are the female gonads located in the pelvic cavity of the abdomen. They secrete the female sex hormones

- a. Estrogen
- b. Progesterone

**Estrogen** is produced by the **Graafian follicles** of the ovary and **progesterone** from the **corpus luteum** that is formed in the ovary from the ruptured follicle during ovulation.

### Functions of estrogens

- It brings about the changes that occur during puberty.
- It initiates the process of oogenesis.
- It stimulates the maturation of ovarian follicles in the ovary.
- It promotes the development of secondary sexual characters (breast development, high pitched voice etc).

### Functions of progesterone

- It is responsible for the premenstrual changes of the uterus.
- It prepares the uterus for the implantation of the embryo.

- It maintains pregnancy.
- It is essential for the formation of placenta.

## 16.2.7 Thymus Gland

Thymus is partly an endocrine gland and partly a lymphoid gland. It is located in the upper part of the chest covering the lower end of trachea. **Thymosin** is the hormone secreted by thymus.

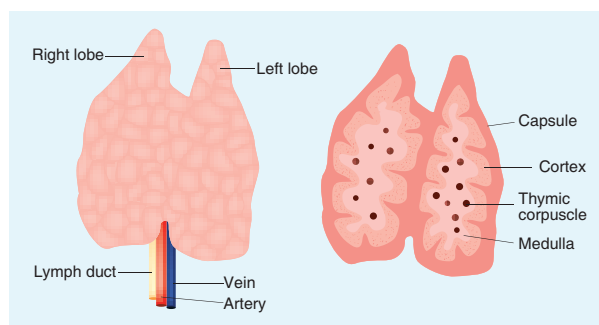


Figure 16.12 Thymus Gland

### Functions of Thymosin

- It has a stimulatory effect on the immune function.
- It stimulates the production and differentiation of lymphocytes.

### Points to Remember

- ❖ Auxins are produced at the tip of stems and roots from where they migrate to the zone of elongation.
- ❖ Cytokinins are the plant hormones that promote cell division or cytokinesis in plant cells.
- ❖ Gibberellins induce the formation of seedless fruit and parthenocarpic fruits.
- ❖ Abscissic acid is a growth inhibitor which regulates abscission and dormancy. It increases tolerance of plants to various kinds of stress.
- ❖ Ethylene is a gaseous plant hormone mainly concerned with maturation and ripening of fruits.



- ❖ The pituitary gland regulates and controls other endocrine glands and so is called as the “Master gland”.
- ❖ The hormones secreted by the thyroid gland are triiodothyronine ( $T_3$ ), and tetraiodothyronine or thyroxine ( $T_4$ )
- ❖ The parathormone act on bone, kidney and intestine to maintain blood calcium levels.

- ❖ Pancreas secretes insulin and glucagon. They maintain blood glucose level.
- ❖ Adrenal cortex secrete cortisol and aldosterone and adrenal medulla secretes epinephrine and norepinephrine.
- ❖ The sex glands are of two types the testes and the ovaries which secrete testosterone and estrogens respectively.



## TEXTBOOK EVALUATION



### I Choose the correct answer

1. Gibberellins cause:
  - a) Shortening of genetically tall plants
  - b) Elongation of dwarf plants
  - c) Promotion of rooting
  - d) Yellowing of young leaves
2. The hormone which has positive effect on apical dominance is:
  - a) Cytokinin
  - b) Auxin
  - c) Gibberellin
  - d) Ethylene
3. Which one of the following hormones is naturally not found in plants:
  - a) 2, 4-D
  - b) GA3
  - c) Gibberellin
  - d) IAA
4. Avena coleoptile test was conducted by
  - a) Darwin
  - b) N. Smit
  - c) Paal
  - d) F.W. Went
5. To increase the sugar production in sugarcane they are sprayed with \_\_\_\_\_
  - a) Auxin
  - b) Cytokinin
  - c) Gibberellins
  - d) Ethylene
6. LH is secreted by
  - a) Adrenal gland
  - b) Thyroid gland
  - c) Anterior pituitary
  - d) Hypothalamus.
7. Identify the exocrine gland
  - a) Pituitary gland
  - b) Adrenal gland
  - c) Salivary gland
  - d) Thyroid gland

8. Which organ acts as both exocrine gland as well as endocrine gland
  - a) Pancreas
  - b) Kidney
  - c) Liver
  - d) Lungs
9. Which one is referred as “Master Gland”?
  - a) Pineal gland
  - b) Pituitary gland
  - c) Thyroid gland
  - d) Adrenal gland

### II Fill in the blanks

1. \_\_\_\_\_ causes cell elongation, apical dominance and prevents abscission.
2. \_\_\_\_\_ is a gaseous hormone involved in abscission of organs and acceleration of fruit ripening.
3. \_\_\_\_\_ causes stomatal closure.
4. Gibberellins induce stem elongation in \_\_\_\_\_ plants.
5. The hormone which has negative effect on apical dominance is \_\_\_\_\_.
6. Calcium metabolism of the body is controlled by \_\_\_\_\_.
7. In the islets of Langerhans, beta cells secrete \_\_\_\_\_.
8. The growth and functions of thyroid gland is controlled by \_\_\_\_\_.
9. Decreased secretion of thyroid hormones in the children leads to \_\_\_\_\_.

3. Wearing loose clothing rather than tight fitting clothes will ensure the airflow around the genitals and prevent sweating.

### More to Know

Every year May 28 is observed as Menstrual Hygiene day to make girls and women aware of maintaining menstrual hygiene and importance of menstrual hygiene for good health. By way of awareness through films, discussions and campaigns menstrual hygiene has taken quite the centre stage in recent days.

### Napkin hygiene

The parents and teachers are to create awareness among the school girls about the use of napkins and their proper disposal. Girls should be educated in the following ways

1. The sanitary pad and tampons should be wrapped properly and discarded because they can spread infections.
2. Sanitary pad or tampon should not be flushed down the toilet.
3. Napkin incinerators are to be used properly for disposal of used napkins.

### Info bits

The menstrual hygiene scheme to provide subsidized sanitary napkins was launched by the Health ministry in 2011.

In Tamil Nadu, UNICEF has developed an affordable incinerator that uses firewood to handle sanitary napkin waste at schools and special wells are equipped where sanitary napkins are composted.



## TEXTBOOK EVALUATION

### I. Choose the correct answer

1. The plant which propagates with the help of its leaves is \_\_\_\_\_.  
a) Onion                      b) Neem  
c) Ginger                      d) *Bryophyllum*
2. Asexual reproduction takes place through budding in \_\_\_\_\_.  
a) *Amoeba*                      b) Yeast  
c) *Plasmodium*                      d) Bacteria

### Points to Remember

- ❖ Many bacteria and protozoa simply divide into two or more daughter cells by fission.
- ❖ Organisms such as hydra can regenerate if they are broken into pieces. They can also give out buds which mature into new individuals.
- ❖ Reproduction in flowering plants involves transfer of pollen grains from the anther to the stigma which is referred to as pollination. This is followed by fertilization.
- ❖ Sexual reproduction involves the fusion of two haploid gametes (male and the female gametes) to form a diploid individual (zygote).
- ❖ The formation of the sperm in male and the ovum in female is called gametogenesis. It involves spermatogenesis (formation of spermatozoa) and oogenesis (the formation of ova).
- ❖ The cyclic events that take place in a rhythmic manner during the reproductive period of a woman's life is called menstrual cycle.
- ❖ The process of attachment of the blastocyst to the uterine wall (endometrium) is called implantation.
- ❖ The placenta is a temporary association between the developing embryo and maternal tissues.
- ❖ Parturition is the expulsion of young one from the mother's uterus.
- ❖ Contraception is one of the best birth control measures. The devices used for contraception are called contraceptive devices.



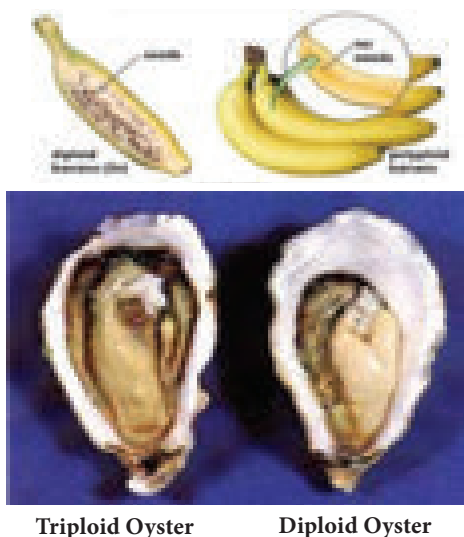


Figure 18.10 Euploidy

**Aneuploidy:** It is the **loss** or **gain** of **one** or **more chromosomes** in a set. It is of three types. **Monosomy** ( $2n-1$ ), **Trisomy** ( $2n+1$ ) and **Nullisomy** ( $2n-2$ ). In man, Down's syndrome is one of the commonly known aneuploid condition.

### Down's syndrome

This condition was first identified by a doctor named **Langdon Down** in 1866.

It is a genetic condition in which there is an extra copy of **chromosome 21 (Trisomy 21)**. It is associated with mental retardation, delayed development, behavioural problems, weak muscle tone, vision and hearing disability are some of the conditions seen in these children.

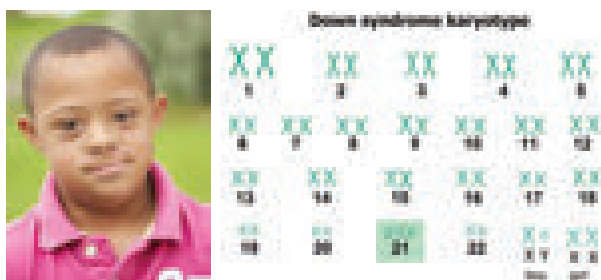


Figure 18.11 Aneuploidy

## 2. Gene or point mutation

Gene mutation is the **changes** occurring in **nucleotide sequence of a gene**. It involves substitution, deletion, insertion or inversion of a single or more than one nitrogenous base. Gene alteration results in abnormal protein formation in an organism.

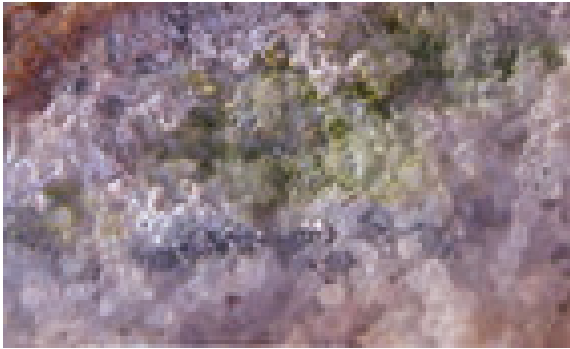


**Sickle cell anaemia** is caused by the mutation of a single gene. Alteration in the gene brings a change in the structure of the protein part of haemoglobin molecule. Due to the change in the protein molecule, the red blood cell (RBC) that carries the haemoglobin is sickle shaped.

### Points to Remember

- ❖ Variations are quite apparent among closely related groups of organisms.
- ❖ Mendel had chosen seven pairs of distinguishing traits: flower colour, position, seed colour, shape, pod colour, pod shape, stem length.
- ❖ Every pea plant has two 'factors' which are responsible for producing a particular character or trait is called allele.
- ❖ The process of acquiring characters or traits from parents is called 'Heredity'.
- ❖ Each human cell contains 23 pairs of chromosomes. Out of these 22 pairs are called autosomes and one pair is called allosomes.
- ❖ A chromosome consists of the regions: primary constriction, centromere, secondary constriction, telomere and satellite.
- ❖ Based on the position of the centromere, the chromosomes are classified as telocentric, acrocentric, sub metacentric and metacentric chromosomes.
- ❖ Each nucleotide of DNA consists of a deoxyribose sugar, a nitrogenous base and a phosphate group. Pairing is always between a purine and a pyrimidine.
- ❖ The sperm, produced by the father, determines the sex of the child. The mother is not responsible in determining the sex of the child.
- ❖ Mutation is an inheritable change in the genetic material of an organism.





**Figure 19.5** Microbial diversity from sandstone and granite from the McMurdo Dry Valleys, Antarctica



NASA is developing the Mars 2020 astrobiology to investigate an astrobiologically relevant ancient environment on Mars, its surface geological processes and the possibility of past life on Mars and preservation of biosignatures within accessible geological materials.

#### Points to Remember

- ❖ Lamarck proposed that the acquired characters are passed on to the offsprings in the next generation
- ❖ Internal vital force, environment and new needs, use and disuse theory and inheritance of acquired characters are the main principles of Lamarckism.
- ❖ Overproduction, struggle for existence, variations, survival of the fittest or Natural selection and origin of species are the main postulates of Darwinism.
- ❖ Each species tends to produce large number of offsprings, but only the fittest can survive.
- ❖ Homologous, analogous organs and embryological evidences explain evolutionary relationships.
- ❖ Some traits in organisms would be similar because they are inherited from a common ancestor.
- ❖ Fossils are evidences of ancient life forms or ancient habitats which have been preserved by natural processes.
- ❖ Ethnobotanical importance of various types of plants are known through traditional knowledge.
- ❖ Astrobiology/exobiology is the science which looks for the presence of extra terrestrial life in the universe



#### TEXTBOOK EVALUATION



##### I Choose the correct answer

1. Biogenetic law states that \_\_\_\_\_
  - a. Ontogeny and phylogeny go together
  - b. Ontogeny recapitulates phylogeny
  - c. Phylogeny recapitulates ontogeny
  - d. There is no relationship between phylogeny and ontogeny
2. The 'use and disuse theory' was proposed by \_\_\_\_\_.
  - a. Charles Darwin
  - b. Ernst Haeckel
  - c. Jean Baptiste Lamarck
  - d. Gregor Mendel





### Points to Remember

- ❖ Crop improvement is the development of improved crop varieties possessing higher yield, better quality, resistance to diseases and shorter duration.
- ❖ When breeding takes place between animals of the same breed, it is called inbreeding. The cross between different breeds is called outbreeding.
- ❖ The superiority of the hybrid obtained by cross breeding is called as heterosis or hybrid vigour.
- ❖ Genetic engineering is the manipulation and transfer of genes from one organism to another organism.
- ❖ Stem cells are undifferentiated or unspecialised mass of cells and can be used for the treatment known as stem cell therapy.



## TEXTBOOK EVALUATION



### I Choose the correct answer

1. Which method of crop improvement can be practised by a farmer if he is inexperienced?  
a. clonal selection    b. mass selection  
c. pureline selection    d. hybridisation
2. Pusa Komal is a disease resistant variety of \_\_\_\_\_.  
a. sugarcane    b. rice  
c. cow pea    d. maize
3. Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of \_\_\_\_\_.  
a. chilli    b. maize  
c. sugarcane    d. wheat
4. The miracle rice which saved millions of lives and celebrated its 50th birthday is \_\_\_\_\_.  
a. IR 8    b. IR 24    c. Atomita 2    d. Ponni
5. Which of the following is used to produce products useful to humans by biotechnology techniques?  
a. enzyme from organism  
b. live organism  
c. vitamins  
d. both (a) and (b)
6. We can cut the DNA with the help of  
a. scissors    b. restriction endonucleases  
c. knife    d. RNAase
7. rDNA is a  
a. vector DNA  
b. circular DNA  
c. recombinant of vector DNA and desired DNA  
d. satellite DNA
8. DNA fingerprinting is based on the principle of identifying ----- sequences of DNA  
a. single stranded    b. mutated  
c. polymorphic    d. repetitive
9. Organisms with modified endogenous gene or a foreign gene are also known as  
(a) transgenic organisms  
(b) genetically modified  
(c) mutated  
(d) both a and b

## More to Know

Many people are ignorant about AIDS and it has been said that – “don’t” die of ignorance”. In our country NACO (National AIDS Control Organization) and other NGO’S (Non- Governmental Organizations) are educating people about AIDS. Every year December 1<sup>st</sup> is observed as the “World AIDS Day”.

### Points to Remember

- ◆ Use of certain drugs by an individual as a regular habit. This is called drug addiction or drug abuse.
- ◆ Tobacco is used for smoking, chewing and snuffing. Inhaling tobacco smoke is called smoking.
- ◆ The dependence of alcohol is called alcoholism and the addict is termed as alcoholic.
- ◆ Prolonged use of alcohol depresses the nervous system, by acting as a sedative and analgesic substance and causes fatty liver (cirrhosis).
- ◆ Diabetes mellitus is a chronic metabolic disorder. It is characterised by increased blood glucose level due to insufficient, deficient or failure of insulin secretion and insulin resistance.
- ◆ Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight.
- ◆ Coronary heart disease is the most common form and is caused by deposition of cholesterol in the blood vessels.
- ◆ Cancer is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor or neoplasm.
- ◆ AIDS is caused by Human immunodeficiency virus.



## TEXTBOOK EVALUATION



### I. Choose the correct answer

1. Tobacco consumption is known to stimulate secretion of adrenaline. The component causing this could be
  - a) Nicotine
  - b) Tannic acid
  - c) Curcumin
  - d) Leptin
2. World 'No Tobacco Day' is observed on
  - a) May 31
  - b) June 6
  - c) April 22
  - d) October 2
3. Cancer cells are more easily damaged by radiations than normal cells because they are
  - a) Different in structure
  - b) Non-dividing
  - c) Mutated Cells
  - d) Undergoing rapid division
4. Which type of cancer affects lymph nodes and spleen?
  - a) Carcinoma
  - b) Sarcoma
  - c) Leukemia
  - d) Lymphoma
5. Excessive consumption of alcohol leads to
  - a) Loss of memory
  - b) Cirrhosis of liver
  - c) State of hallucination
  - d) Suppression of brain function
6. Coronary heart disease is due to
  - a) *Streptococci* bacteria
  - b) Inflammation of pericardium
  - c) Weakening of heart valves
  - d) Insufficient blood supply to heart muscles
7. Cancer of the epithelial cells is called
  - a) Leukemia
  - b) Sarcoma
  - c) Carcinoma
  - d) Lipoma

Solid-waste management involves the collection, treatment and proper disposing of solid material that is discarded from the household and industrial activities.

### Methods of solid wastes disposal

- (i) **Segregation:** It is the separation of different type of waste materials like biodegradable and non biodegradable wastes.
- (ii) **Sanitary landfill:** Solid wastes are dumped into low lying areas. The layers are compacted by trucks to allow settlement. The waste materials get stabilised in about 2-12 months. The organic matter undergoes decomposition.



**Figure 22.6** Collection of degradable and non-degradable solid wastes

- (iii) **Incineration:** It is the burning of non-biodegradable solid wastes (medical wastes) in properly constructed furnace at high temperature.
- (iv) **Composting:** Biodegradable matter of solid wastes is digested by microbial action or earthworms and converted into humus.



**Figure 22.7** Collection of various types of solid wastes in separate bins

### Recycling of wastes

- Papers from old books, magazines and newspapers are recycled to produce papers in papermills.

- Agricultural wastes like coconut shells, jute cotton stalk, bagasse of sugarcane can be used to make paper and hard board. Paddy husk can be used as livestock fodder.
- Cowdung and other organic wastes can be used in gobar gas plant to provide biogas and manure for fields.

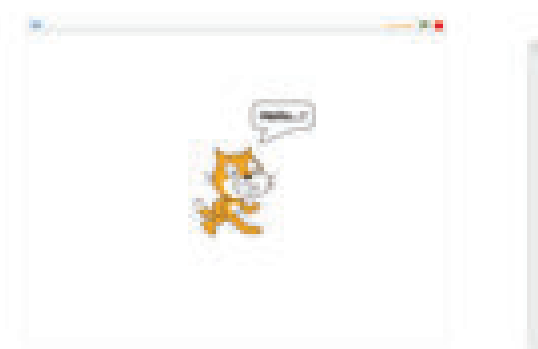
### 4R Approach

The 4R approach such as Reduce, Reuse, Recovery and Recycle may be followed for effective waste management.

### Points to Remember

- ❖ Conservation is a process which is concerned with the use, preservation and proper management of natural resources from destructive activities of human being.
- ❖ Conservation of natural resources contributes to the social and economic development of the country.
- ❖ Forests of a country constitute a major asset for the people of the country.
- ❖ National park is a reserved area for the conservation of entire wildlife including plants and animals.
- ❖ Sanctuary is a place reserved exclusively for the use of animals.
- ❖ Solar cell is a device that absorbs sunlight and converts it into electric energy.
- ❖ Solar water heater does not require electricity, they heat up water directly from sunlight.
- ❖ Biogas is produced by the anaerobic decomposition of cow dung.
- ❖ The technique of collecting and storing rain water for future purpose is known as rainwater harvesting.
- ❖ Unwanted, non-working and outdated electronic products become e-waste.

Output:



## TEXTBOOK EVALUATION



### I. Choose the best answer

- Which software is used to create animation ?  
a) Paint                      b) PDF  
c) MS Word                d) Scratch
- All files are stored in the \_\_\_\_\_  
a) Folder                    b) box  
c) Pai                         d) scanner
- Which is used to build scripts?  
a) Script area                b) Block palette  
c) stage                      d) sprite
- Which is used to edit programs?  
a) Inkscape                  b) script editor  
c) stage                      d) sprite
- Where you will create category of blocks?  
a) Block palette b) Block menu  
c) Script area                d) sprite

### II. Match the Following

1. Script Area	Type notes
2. Folder	Animation software
3. Scratch	Edit programs
4. Costume editor	Store files
5. Notepad	Build Scripts

### III. Answer the following

- What is Scratch?
- Write a short note on editor and its main parts?
- What is Stage?
- What is Sprite?