SCIENCE
CLASS-X

SOLUTION

SECTION - A

1.(c) Pepsin acts in acidic medium and trypsin in alkaline medium

2.(b) We store silver chloride in dark-coloured bottles to prevent the decomposition of silver chloride into silver and chlorine gas in the presence of sunlight. The decomposition of silver chloride to form silver and chlorine gas in the presence of sunlight is given by the equation:

$$\underset{\text{Silver chloride (gray)}}{2AgCl_{(s)}} \xrightarrow{\text{Sunlight}} \underset{\text{Silver (white)}}{2Ag_{(s)}} + \underset{\text{Chlorine}}{Cl_{2(g)}}$$

3.(a) Two successive homologues would differ by one carbon atom and two hydrogen atoms in terms of atoms in their molecules and thus differ by 14 amu in terms of molecular mass.

Related Theory

For example, C_4H_8 and C_5H_{10} are successive compounds. These two differ by — CH_2

Atomic mass of carbon = 12 amu

Atomic mass of Hydrogen = 1 amu

Molecular mass of—CH_2 group = $(1 \times 12) + (2 \times 1)$

= 14 amu

4.(b) Figure (I) is more appropriate because in a plant, shoots grow upward because they are negatively geotropic, and roots grow downward because they are positively geotropic

5.(a) The direction of current in the conductor should be from top to bottom i.e., from North to South direction. It is given that the current-carrying conductor is held in exactly vertical direction. In order to produce a clockwise magnetic field around the conductor, the current should be passed in the conductor from top to bottom. It is concluded by applying right-hand thumb rule.

6.(a) The focal length of a plane mirror is infinity. The focal length of a plane mirror is infinity as the image can be formed at infinite distance inside the mirror. This is due to the parallel rays after reflection through a plane mirror meet again at infinity.

7.(a) The force acting on the current carrying conductor will be zero if the current and the magnetic field are parallel to each other.

8.(a) It can be inferred from the observation that fused ear lobes is a dominant trait whereas free ear lobes is a recessive trait.

9.(a) Resistance is the slope of VI graph. The slope of graph at T_2 > slope of graph at T_1. Therefore, resistance is higher at T_2.

10.(a) The minimum resistance can be obtained by connecting resistances in parallel When four resistors each of resistance 4 Ohms are connected in parallel, we get,

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

$$\frac{1}{R}=\frac{4}{4}=1\ \Omega$$

Therefore, minimum resistance = 1 Ohm.

11.(a) Our nose contain olfactory receptors that can recognise the aroma of hot food. The olfactory lobes of the forebrain receive this information via nerve impulse and interpret it.

12.(b) Decomposers are the microorganisms which breakdown complex organic substances into simple inorganic substances. They are very important in the ecosystem as:

(1) They decompose biodegradable substances into useful substances like manure. They thus clean the environment.

(2) Decomposed substances go back to the soil and can be used by the plants again. Thus, decomposers participate in the food cycle by replenishing the nutrients of the soil.

13.(c) The balanced chemical equation for the reaction is:

Zinc + Silver nitrate $\longrightarrow$ Zinc nitrate + Silver

$$Zn + 2AgNO_3 \longrightarrow Zn\left(NO_3\right)_2 + 2Ag$$

14.(a) Phenolphthalein solution is a colourless indicator which gives pink colour in basic solution. Phenolphthalein solution remains colourless in acidic solution as well as in neutral solution.

Caution

Student usually get coufused and mark wrong answers. In the given options, only NaOH is basic in nature. HCl and CH_3COOH are acidic while H_2O is neutral). Therefore, if we add a few drops of sodium hydroxide solution, the mixture will become basic and pink colour will appear.

15.(d) The direction of force is perpendicular to the direction of the magnetic field and the current as given by Fleming's left-hand rule.

16.(d) The formula for bleaching powder is $CaOCl_2$

17.(b) Non-biodegradable substances are the substances that cannot be broken down into simpler substances by biological processes. They persist in the environment for a long time and may cause harm to the various members of the ecosystem.

Non-biodegradable substances like plastic can cause air pollution when they are burnt.

18.(d) The effect of root pressure in transport of water is more important during night time as during the day, when stomata are open, the transpiration pull becomes the major driving force in the transport of water in the xylem.

19.(b) Both statements are correct but the given reason does not explain how guard cells open and close stomatal pores. Each stomatal pore is surrounded by a pair of guard cells. When water flows into the guard cells, they swell and cause the pore to open. Similarly when the guard cells lose water, they shrink and the stomatal pore closes.

20.(c) Current is constant in a series circuit as there is only one path for flow of current. But different devices connected in a circuit have different power ratings and therefore draw different amounts of currents.

SECTION - B

21. Difference between arteries and vein :

Arteries	Veins
They transport blood away from the heart	They return blood at low pressure to heart
Their walls are thicker and stronger because of presence of more smooth muscles cells and elastic	Theya re less elastic and relatively thin walls
They are characterized by thick tunica media and thin tunica adventitia	Tunica adventitia is thicker whereas tunica media in thin
They can withstand high pressure and blood flows at much higher pressure within them	These vessels are adapted to withstand low pressure only
They retain the circular shape of their lumen when empty	They collapse when empty

22. Resistance of each part is $\frac{R}{3}\Omega$ (as resistance is proportional to the length of the wire.)

$$\frac{1}{R_1}=\frac{3}{R}+\frac{3}{R}+\frac{3}{R}=\frac{9}{R}$$

$$\therefore \quad R_1=\frac{R}{9} \quad \therefore \frac{R_1}{R}=\frac{1}{9}$$

OR

(A) Resistance of a conductor depends on the following factors:

(1) Length of the conductor

(2) Area of cross section of the conductor

(3) Nature of material of the conductor

(4) Temperature of the conductor

(B) Given: $\mathrm{L}=10\,\mathrm{km}=10000\,\mathrm{m};\mathrm{d}=2\,\mathrm{mm};$

$$\mathrm{r}=1\,\mathrm{mm}=10^{-3}\,\mathrm{m};\rho=2.7\times10^{-8}\,\Omega\,\mathrm{m}$$

$$\mathrm{R}=\rho\frac{\mathrm{l}}{\mathrm{A}}$$

$$=2.7\times10^{-8}\times\frac{10000}{3.4\times\left(10^{-3}\right)^2}$$

$$=0.859\times10^{2}\Omega$$

$$\approx 86\Omega \text{ approximately}$$

23. Contraceptive methods are mainly adopted:

(1) To avoid unwanted pregnancies.

(2) To keep the population of a country under control

(3) To limit the number of children a couple wants to have.

(4) To maintain adequate gap between two consecutive children.

(5) To prevent the transmission of sexually transmitted diseases.

24. The atomic number of carbon is 6 and its electronic configuration is 2,4. It is tetravalent as it has 4 valence electrons. It can neither gain nor lose 4 electrons to acquire the nearest noble gas configuration. Only way is to share the four valence electrons with the electrons of other atoms. The type of bond formed by sharing of electrons is covalent bond.

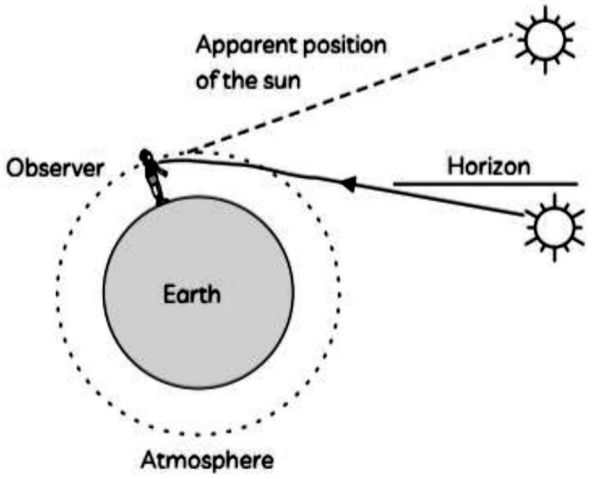
OR

Covalent compounds are poor conductors of electricity as they do not have charged particles since the electrons are shared between atoms. Covalent compounds have low melting and boiling points as they have weak inter molecular forces due to which little energy is required in changing state by overcoming the force of attraction.

25.

S.No.	Xylem	Phloem
(1)	Xylem conducts water and dissolved minerals from roots to leaves and other parts	Phloem conducts prepared food material from leaves to other parts of plant in dissolved form
(2)	In xylem, transport of material takes place through vessels and tracheids.	In phloem, transport of material takes place with the help of companion cells.
(3)	In xylem, upward movement of water and dissolved materials is mainly achieved by transpiration pull. It is caused due to sunction created by evaporation of water molecules from the stomata of a leaf.	In translocation, material is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure that moves the material in the phloem to the tissues which have less pressure.
(4)	Movement of water is achieved by simple physical forces. There is no expenditure of energy. So, ATP molecules are not required.	The translocation in phloem is an active process and requires energy. This energy is taken from ATP molecules.

26. We are able to see the sun 2 minutes before actual sunrise and 2 minutes after actual sunset because sun rays undergo atmospheric refraction as they travel from an optically rarer medium to an optically denser medium when they enter the earth's atmosphere due to which they are refracted downwards and hence appear to be above the horizon.



SECTION - C

27. **(A)** The hormone adrenaline is released into a squirrel's blood when it detects danger, increasing heart rate and blood flow to tissues. As a result, its cells and tissues receive energy more quickly, allowing it to flee dangerous situations.

(B) Sensory neurons transmit impulses to the central nervous system after receiving information from receptors. In order for a muscle, gland, or organ to respond, motor neurons carry messages from the central nervous system to those tissues.

28. A balanced chemical equation tells:

(1) The number of atoms and molecules of reactants and products involved.

(2) The chemical formula of reactants and products involved.

(3) The catalyst involved in the reaction if any.

OR

The law of conservation of mass states that matter can neither be created nor destroyed in a chemical reaction. The mass of the products in a chemical reaction is equal to the mass of the reactants.

Example to illustrate the law of conservation of mass:

In the reaction $CaCO_3 \longrightarrow CaO + CO_2$

The molecular mass of $CaCO_3$

$= 1\times 40 + 1\times 12 + 3\times 16 = 100\,u$

Molecular mass of CaO

$= 1 \times 40 + 1 \times 16 = 56$ u and

molecular mass of $CO_2 = 1\times 12 + 2\times 16 = 44u$

Mass of the reactant = 100 u

Mass of the product = 56 u + 44 u = 100 u. As the mass of the reactant is equal to the mass of the products, law of conservation of mass is verified.

29. **(A)** Both P and Q are North poles. Magnetic field lines emerge from North pole.

(B) Movement of electron beam from back wall to front wall is equivalent to the flow of electric current from front wall to the back wall. Now the deflection of the beam towards right means direction of force is towards the right side. According to Fleming's left-hand rule, the magnetic field inside the chamber is in downward direction i.e, perpendicular to the plane of the paper and directed inwards.

30. **(A)** The rule to determine the direction of magnetic field produced around a straight conductor-carrying current is Right hand thumb rule which states that that if one holds a straight current carrying conductor with right hand such that the thumb points towards the direction of current, then fingers will wrap around the conductor in the direction of field lines of the magnetic field.

(B) The rule to determine the direction of force experienced by a current- carrying straight conductor placed in a magnetic field which is perpendicular to it's Fleming's Left Hand Rule, which states that if the first finger points in the direction of magnetic field and second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

31. **(A)** Ecosystem: It is the structural and functional unit of biosphere. It is a self- sustaining system where energy and matter are exchanged between living and non-living components. The main components of ecosystem are biotic and abiotic components. Biotic components comprise of living organisms: plants, animals, human beings and micro¬organisms. Abiotic components comprise of non-living part of the environment: air. water, soil, minerals, sunlight etc.

(B) When green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment. Some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. Only 10 percent of the energy received by them is converted into their body mass which is available for the organisms of the next trophic levels. The longer the food chain, the less is the energy available to the final members of the food chain and that energy will be insufficient for their survival.

32. Given pH for the solutions are A = 4, B = 1, C = 11, D = 7, E = 9.

Hydrogen ions concentration increases with decrease in pH value and thus strength of acid increases with decrease in pH value from 7 to 0.

On the other hand, hydroxide ion's concentration decreases with increase in pH value and thus strength of bases increases with increase in pH value from 7 to 14.

While neutral solution has pH value = 7.

Therefore,

(A) Solution D is neutral having pH value equal to 7.

(B) Solution C is strongly alkaline as its pH value is equal to 11

(C) Solution B is strongly acidic as its pH value is equal to 1

(D) Solution A is weakly acidic as its pH value is equal to 4

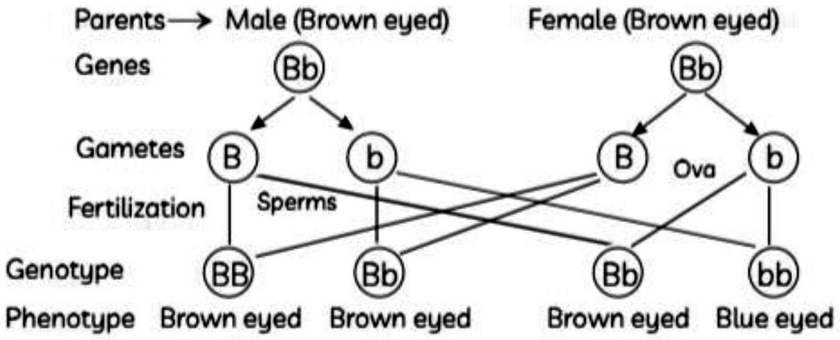
(E) Solution E is weakly alkaline as its pH value is equal to 9

Hence arrangement of given pH value in increasing order of hydrogen ion concentration:

C (11) < E (9) < D (7) < A (4) < B (l)

33. Two people with brown eyes can have a blue-eyed baby but the chances are only 25%

Provided both the parents are heterozygous (Bb). Brown eye colour (B) is dominant and blue eye colour (b) is recessive. Female (Brown eyed)



Genotypic ratio : 1 : 2 : 1

Phenotypic ratio : 3 : 1

The child who inherits 'B' chromosome even from one parent will have brown eyes. The child who inherits 'b' chromosomes from both the parents will have blue eyes so the chances of brown eyed parents to have blue eyed baby is only 25%

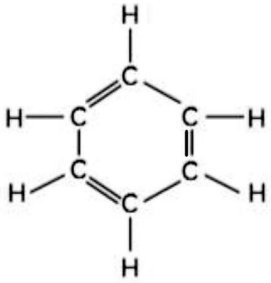
SECTION-D

34. **(A)** $\underset{(X)}{CH_3-CH_2OH} \xrightarrow[K_2Cr_4+Heat]{Alkaline\ KMnO_4+Heat} \underset{(Y)}{CH_3COOH}$

$CH_3-CH_2OH \xrightarrow[H_2SO_4]{Hot\ conc.} CH_2=CH_2 + \underset{(Z)}{H_2O}$

(B) 'A' is detergent and 'B' is soap

(C)



Benzene—C_6H_6

It does not decolourize bromine water because it does not undergo addition reaction.

(D) $CH_3-CH_2OH \xrightarrow[K_2Cr_2O_7+Heat]{Alkaline\ KMnO_4+Heat} \underset{Ethyl\ ethanoate\ (ester)}{CH_3COOC_2H_5}$

$\underset{(A)}{\text{Ethanol}}$ $\underset{Acetic\ acid}{\underset{(B)}{CH_3COOH}}$

35. The different glands, their secretions and functions associated with the human digestive system are tabulated below.

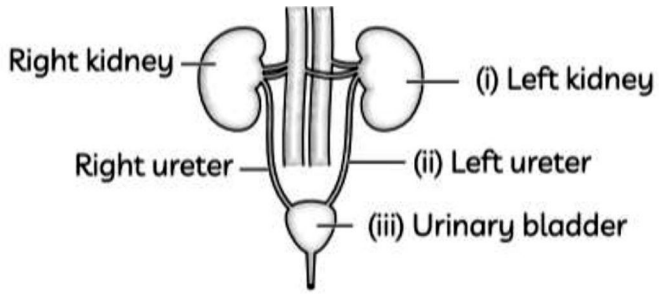
Organ	Gland	Secretion	Enzymes	Action of Enzyme
Mouth	Salivary gland	Saliva	Salivary amylase	Breaks down starch to sugar
Stomach	Gastric glands	Gastric juices	1. Pepsin	Breaks down protein-Peptone.
			2. HCl	Kills germs, creates acidic medium.
			3. Mucus	Protects the walls of stomach from the action of HCl acid.
Small Intestine	Liver	Bile Juice		Emulsification of fats and creates alkaline medium.

OR

(A) Excretion is defined as the biological process of removal of harmful nitrogenous wastes like urea and uric acid from our body which are produced as by products of the various metabolic processes taking place in our body.

(B) The basic filtration unit present in the kidney is the nephron.

(C) The human excretory system is drawn here:



The organs performing the following functions have been labelled in the diagram.

(i) form urine: Kidneys

(ii) is a long tube which collects urine from kidney: Ureter

(iii) stores urine until it is passed out: Urinary bladder

36. **(A)** The student should use a concave mirror, as it forms a real image on the same side of the mirror.

(B) Object distance, u = –15 cm

Image distance, v = –60 cm

Magnification,

$$m = -\frac{v}{u} = -\left(\frac{-60}{-15}\right) = -4$$

(C) Distance of image from the object

$$= v - u = -60 - (-15) = -60 + 15 = -45$$

The image is formed at a distance of 45 cm from the object.

(D) By applying mirror formula,

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

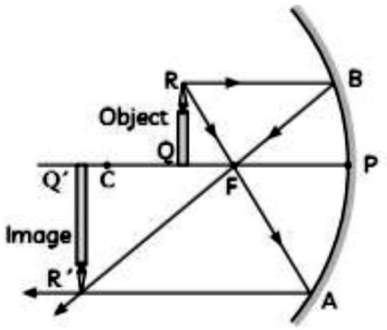
$$\frac{1}{f} = \frac{1}{-60} + \frac{1}{-15}$$

$$= \frac{-1-4}{60} = \frac{-5}{60} = \frac{-1}{60}$$

$$f = -12\,\text{cm}$$

$$C = -24\,\text{cm}$$

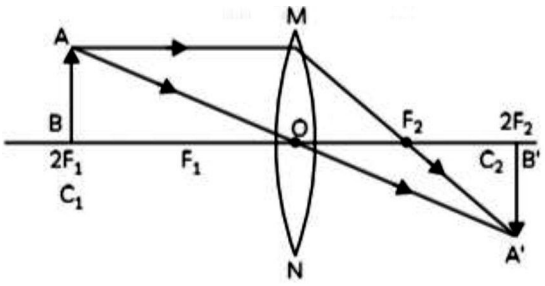
Object will be between F and C and the image will be formed beyond C (centre of curvature). Image will be 4 times magnified, real and inverted.



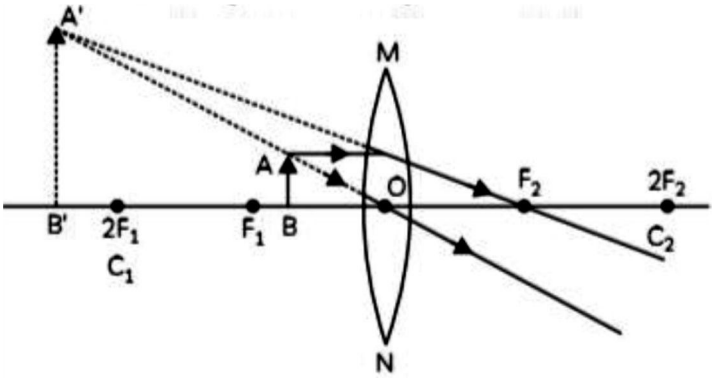
OR

(A) Convex lens can be used as a magnifying glass, Position of the object:

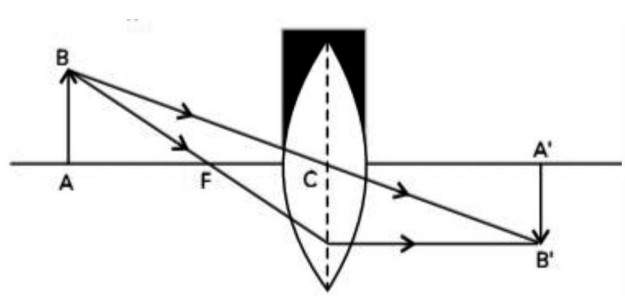
(i) When an object is placed at centre of curvature, a real inverted and equal size image is obtained.



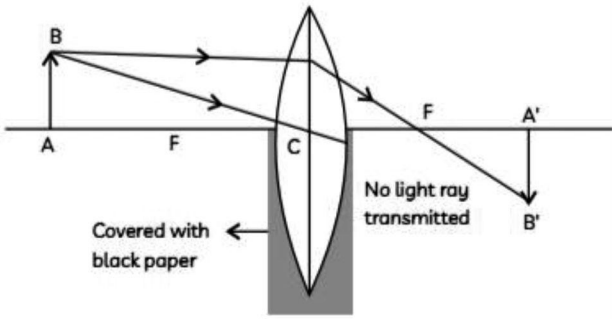
(ii) When an object is placed between the focus and the optical centre of a convex lens, a virtual and erect image of the object is formed.



(B) Even when one half of the convex lens is covered with a black paper, the complete image of the object will be formed. When the upper half of the lens is covered: In this situation, rays of light coming from the object will be refracted by the lower half of the lens. These rays meet at the other side of the lens to form the image of the given object, as shown in the following figure. When the lower half of the lens is covered: In this situation, rays of light coming from the object will be refracted by the upper half of the lens. These rays meet at the other side of the lens to form the image of the given object, as shown in the following figure. We will get a sharp image but the brightness of the image will be less now.



(i)



(ii)

SECTION-E

37. (A)

(i) Plasmodium reproduces by multiple fission whereby a single cell divides into a large number of cells.

Related Theory

In fragmentation, organisms like spirogyra simply break up into several pieces or fragments on attaining maturity and each fragment grows to form a new organism. In budding, a small outgrowth is formed due to repeated cell division at one specific site.

Caution

Students usually get confused and write option (d) as answer. They do not understand the difference between the two types of fission. In binary fission, a cell divides into two cells. Whereas in multiple fission, a cell divides into multiple cells

(ii) P, Q. R and S

Each piece or fragment of Planaria grows into new individual by the method of regeneration. It is carried out by specialised cells.

(B) Spore formation is a common method of asexual reproduction. The hyphae develop sporangia. The nucleus of each sporangium divides several times. Each nucleus gets surrounded by a bit of cytoplasm and develops into spore. Upon maturation, the sporangium ruptures and spores disperse to grow on to new substratum.

OR

(B) The growth of bacteria population increases exponentially with time. The variation of time and number of bacterial cells is not linear, as the graph is not a straight line. The growth pattern is an exponential increase in number of bacterial cells with time.

38. (A) Metals such as silver and gold do not react with oxygen even at high temperatures as they are relatively inert.

Related Theory

Different metals show different reactivity's towards oxygen.

At ordinary temperature, the surfaces of metals such as magnesium, aluminium, zinc, lead, etc., are covered with a thin layer of oxide, which prevents the metal from further oxidation and is therefore a protective layer.

Iron does not burn on heating but iron filings burn vigorously when sprinkled in the flame of a burner.

Copper does not burn, but the hot metal is coated with a black coloured layer of copper (II) oxide.

(B) Copper does not burn but is coated with black coloured copper oxide.

When heated, copper does not burn, but the hot copper metal is coated with a black coloured layer of copper (II) oxide.

$2Cu + O_2 \rightarrow 2CuO$

(C) Almost all metals combine with oxygen to form metal oxides.

Metal + Oxygen $\longrightarrow$ Metal oxide

Some metal oxides, such as sodium oxide and potassium oxide, dissolve in water to form alkalis:

Moreover, some metal oxides, such as aluminium oxide and zinc oxide, show both acidic and basic nature and are known as amphoteric oxides.

OR

(C) The metal oxides sodium oxide and potassium oxide dissolve in water to form alkalis as follows:

$$Na_2O_{(s)} + H_2O_{(l)} \longrightarrow 2NaOH_{(aq)}$$

$$K_2O_{(s)} + H_2O_{(l)} \longrightarrow 2KOH_{(aq)}$$

39. (A) Red ray is least deviated by a prism as the refractive index of glass is least for red.

(B) Violet has the least wavelength among the colours of the visible spectrum. It has the minimum velocity.

(C) Formation of rainbow is due to dispersion of sunlight by the tiny droplets of water present in the atmosphere. Twinkling of stars and early sunrise are due to atmospheric refraction.

OR

(C) The angle between the emergent ray and the incident ray is known as the angle of deviation of a prism as shown in the following figure: