

Solved Question Paper 2016
Class 10
Summative Assessment II
Subject - Science

Time allowed: 3 hours

Maximum Marks: 90

General Instructions:

- (i) The questions paper comprises **two** Sections, **A** and **B**. You are to attempt both the sections.
- (ii) All questions are compulsory
- (iii) There is no choice in any of the questions.
- (iv) All questions of Section-A and all questions of Section-B are to be attempted separately.
- (v) Question numbers **1** to **3** in Section-A are one mark questions. These are to be answered in one word or one sentence.
- (vi) Question numbers **4** to **6** Section-A are two marks questions. These are to be answered in about 30 words each.
- (vii) Question numbers **7** to **18** in Section-A are three marks questions. These are to be answered in about 50 words each
- (viii) Question numbers **19** to **24** in Section-A are five marks questions These are to be answered in about 70 words each.
- (ix) Question numbers **25** to **33** in Section-B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.
- (x) Question numbers **34** to **36** in Section-B are two-marks questions based on practical skills. These are to be answered in brief.

Section – A

Question1. Write the name and structure of an aldehyde with four carbon atoms in its molecule.

Solution:

Butanal has 4 carbon atoms in its molecule and its structure is $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CHO}$.

Question 2. List two functions of ovary of human female reproductive system.

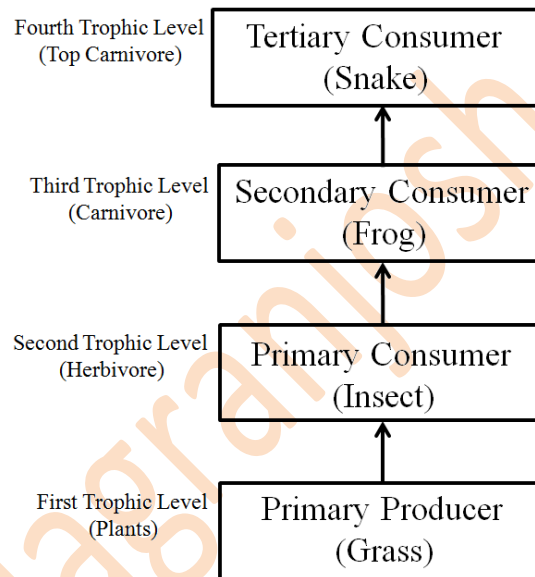
Solution:

Ovary is also the source of female hormone like estrogen. Estrogen is required for the development of secondary sex characteristics in females.

Ova in female are produced by ovary through a process of oogenesis.

Question 3. In a food chain of frog, grass, insect and snake, assign trophic level to frog.

Solution:



Question 4. The refractive indices of glass and water with respect to air are $3/2$ and $4/3$, respectively. If speed of light in glass is 2×10^8 m/s, find the speed of light in water.

Solution:

Here,

Refractive index of glass with respect to air = $\mu_g = 3/2$

Refractive index of water with respect to air = $\mu_a = 4/3$

Speed of light in glass = $v_g = 2 \times 10^8$ m/s

Let speed of light in vacuum is c speed of light in water is v_w .

Speed of light in a medium = $\frac{\text{Speed of light in vacuum}}{\text{Refractive index of the medium}}$

$$\Rightarrow 2 \times 10^8 = \frac{c}{\left(\frac{3}{2}\right)}$$

$$\Rightarrow 3 \times 10^8 = c$$

Now,

$$\text{Speed of light in water} = \frac{\text{Speed of light in air}}{\text{Refractive index of water}}$$

$$\Rightarrow v_g = \frac{3 \times 10^8}{\left(\frac{4}{3}\right)}$$

$$\Rightarrow v_g = 2.25 \times 10^8 \text{ m/s.}$$

Question 5. List four stakeholders which may be helpful in the conservation of forests.

Solution:

Four stakeholders which may be helpful in the conservation of forests

- (i) the people who live in or around forests are dependent on forest produce for various aspects of their life.
- (ii) the Forest Department of the Government which owns the land and controls the resources from forests.
- (iii) the industrialists – from those who use ‘tendu’ leaves to make bidis to the ones with paper mills – who use various forest produce, but are not dependent on the forests in any one area.
- (iv) the wild life and nature enthusiasts who want to conserve nature in its pristine form.

Question 6. The construction of large dams leads to social and environmental problems. List two problems of each category.

Solution:

Environmental problems:

- 1: Transformation of free flowing river system into water reservoir leads to changed physical and chemical properties of once free flowing river ecosystem which in turn adversely affect the native, host non native and invasive plant and animal species.
- 2: Trapping of sediment by dam construction blocks the sediment transport to downstream fertile lands forcing farmer to use harmful chemical fertilizers as compensatory action.

Social problems:

- 1: Eviction of large number of people from their land and home causing financial losses, cultural decline, spread of stress and many infectious diseases among them.

2: Reduced fertility of downstream fertile lands, loss of fisheries etc adversely affect livelihood of indigenous people.

Question 7. The positions of eight elements in the Modern Periodic Table are given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li (3)	Be (4)
3	Na (11)	Mg (12)
4	K (19)	Ca (20)
5	Rb (37)	Sr (38)

- (i) Write the electronic configuration of Ca.
- (ii) Predict the number of valence electrons in Rb.
- (iii) What is the number of shells in Sr?
- (iv) Predict whether K is a metal or a non-metal.
- (v) Which one of these elements has the largest atom in size?
- (iv) Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.

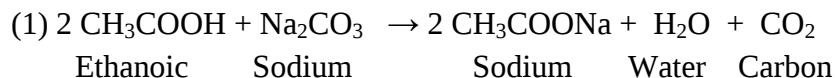
Solution:

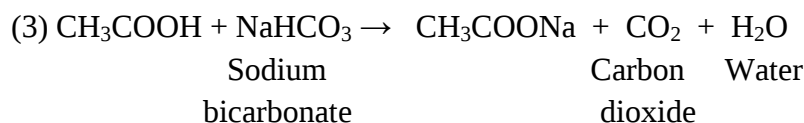
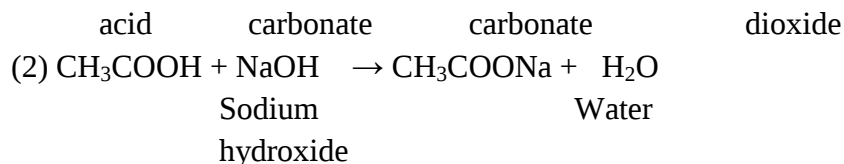
- (i) The electronic configuration of Ca is 2, 8, 8, 2.
- (ii) Rubidium is an element of group 1. Therefore number of valence electrons in rubidium is 1.
- (iii) Strontium is an element of period 5 of the periodic table, so it has 5 shells.
- (iv) K (Potassium) has 1 electron in its outermost shell. So, it has tendency of losing electron to achieve noble gas configuration. Therefore, it is a metal.
- (v) Atomic size of elements decreases across a period and increases down a group. Therefore, in the given table, Rb has the largest size.
- (vi) Increasing order of atomic radius is: $\text{Be} < \text{Mg} < \text{Ca} < \text{Rb}$.

Question 8. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write a balanced chemical equation in each case. Write the names of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.

Solution:

Three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate are:





Question 9. An element 'X' belong to 3rd period and group 13 of the Modern Periodic Table.

(a) Determine the number of valence electrons and the valency of 'X'.

(b) What is the molecular formula of the compound formed when 'X' reacts with an element 'Y'? (atomic number = 8).

(c) Write the name and formula of the compound formed when 'X' combines with chlorine.

Solution:

Here, period number of element X is 3 and group number of element Y is 13.

Therefore, atomic number of element is 13 and its electronic configuration is 2, 8, 3.

(a) Number of valence electrons of element X is 3 and it has a tendency to lose 3 electrons so, its valency is 3.

(b) As, atomic number of element Y is 8 so, its electronic configuration is 2, 6 and its valency is $(8 - 6 =) 2$. Therefore, molecular formula of the compound formed is X_2Y_3 .

(c) The atomic number of chlorine is 17, so its electronic configuration is 2, 8, 7 and its valency is $(8 - 7 =) 1$. Hence, molecular formula of the compound is XCl_3 .

Element X is aluminium, so the name of the compound AlCl_3 is aluminium chloride.

Question 10. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also, write group number, period number and valency of 'X'.

Solution:

Here,

Number of neutrons = 18,

Mass number of element = 35

Atomic number = Number of protons = (Mass number of elements) – (Number of neutrons)

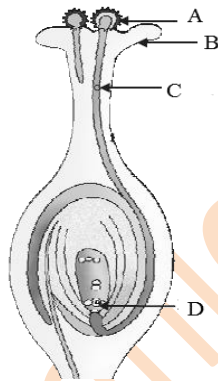
⇒ Atomic Number of element X = $35 - 18 = 17$

Electronic configuration of element X = 2, 8, 7.

Therefore, group number of the element = 17, period number of the element = 3 and valency of the element is $(8 - 7 =) 1$.

Question 11. (a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

(b)



(i) Name the part marked 'A' in the diagram.

(ii) How does 'A' reaches part 'B'?

(iii) State the importance of the part 'C'.

(iv) What happens to the part marked 'D' after fertilisation is over?

Solution:

(a) Sexual reproduction is a process in which the genetic materials from two individuals (male and female) combine to form the offspring. Two reasons for the appearance of variation among the progeny formed by sexual reproduction may be as follows:

- The progeny formed by sexual reproduction is the result of the combination of the genetic material from two different individuals. So, the offspring acquires half of the traits from the mother and half from the father. Thus, the combination of various traits results in the variation in the offspring due to which the offspring is different from both the parents.
- Crossing over is the process in which the DNA is exchanged between the homologous chromosomes during meiosis. It occurs during gamete production, and as a result of this the gametes produced by an individual do not have the same genetic material as of the individual. This adds to the variation as the genetic material of an organism is

recombined before formation of gametes and the recombined gametes fuse to form the zygote which gives rise to the offspring. So, the offspring will not have exact set of genes from the parents but will have recombined set from each of them.

(b) (i) Part marked with alphabet 'A' is Pollen grain.

(ii) Part marked with alphabet 'B' is stigma. Pollen grain reaches to stigma by external agents such as water, winds, insect and birds.

(iii) Part marked with alphabet 'C' is pollen tube. After the pollen lands on a suitable stigma, it has to reach the female germ-cells which are in the ovary. When pollen lands on a suitable stigma, it has to reach the female germ-cells which are in the ovary. Pollen tube serves this purpose.

(iv) Part marked with alphabet 'D' is female germ cell. The fusion of male germ cell with the female germ cell resulting in the formation of a single cell known as zygote. After fertilisation, the zygote divides repeatedly to form an embryo which resides inside the seed.

Question 12. Define reproduction. How does it help in providing stability to the population of species?

Solution:

Reproduction: The process of production of offspring by parent organisms via sexual or asexual methods is termed as reproduction.

Reproduction ensures production of own kind by living organisms i.e. cat gives birth to baby cats only and human to baby human only. Individuals of population of each species face interspecific and intraspecific competition for food, reproduction and shelter. Hence, the process of natural selection and struggle for existence cause loss of many individuals from different population. Further, the process of ageing and death also keeps a check on the population size. All these factors, together, work to reduce the population size continuously. Reproduction is the only process that compensates the loss of individuals caused by above mentioned natural processes and thereby ensures a constant population size of different species.

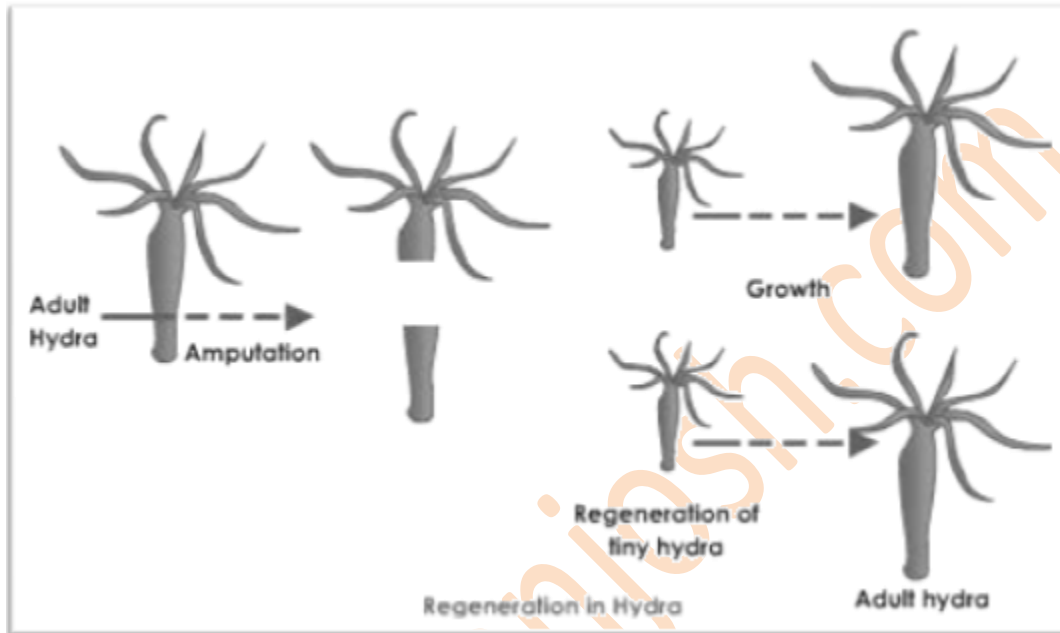
Question 13. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like *Hydra*.

Solution:

Regeneration is a mode of asexual reproduction that occurs in some invertebrates belonging to the animal kingdom. When cut, individual body parts of these animals have the ability to grow

into new organisms. Invertebrates such as Planaria and Hydra are capable of regeneration. Hydra is a freshwater coelenterate.

Hydra, when cut accidentally, is capable of regeneration. The basal part regenerates the head portion and the head portion regenerates the basal part.



Question14. "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement.

Solution:

Evolution is gradual change in inherited characters of organisms over successive generation and thereby generating variations at each level of biological organization. Classification is arrangement of organisms into groups on the basis of their similarities and is preceded by identification and nomenclature. Similarities refer to resemblance of any biological structure or characters and form the basis for taxonomic classification. Therefore, the more the morphological/biochemical/anatomical/physiological similarities between two organisms; the more are the chances for them to share common ancestors which in turn makes them more close from evolutionary prospect.

For example: On the basis of presence or absence of vascular tissues, all the plants are classified as non vascular (algae, fungi, bryophytes) and vascular plants. All vascular plants further evolved under two lineages: non seed plants (pteridophytes) and seed (spermatophytes) plants. Further evolution of seed plants lead to emergence of gymnosperms and angiosperms. Hence, it

can be said that classification of organisms into different taxonomic categories represents their ancestral relationship, lineages and evolutionary history.

Question15. How does Mendel's experiment show that traits are inherited independently?

Solution:

Independent assortment is segregation of factors for a trait independent of other factors during gamete formation followed by their random rearrangement in progeny thereby producing both parental and new combinations. To show independent assortment, he performed dihybrid cross between two pure breeding dihybrid pea plants. Tallness (T-) and red flower colour (R-) are dominant over dwarfism (t) and white colour (r) respectively.

Parent Generation: TTRR (tall plant, red flower) x ttrr (dwarf plant, white flower)

F1 generation: TtRr (tall plant, red flower)

P2generation: TtRr × TtRr

Gametes TtRr→ TtRr	TR	Tr	tR	tr
TR	TTRR (tall plant, red flower)	TTRr (tall plant, red flower)	TtRR (tall plant, red flower)	TtRr (tall plant, red flower)
Tr	TTRr (tall plant, red flower)	TTrR (tall plant, white flower)	TtRr (tall plant, red flower)	Ttrr (tall plant, white flower)
tR	TtRR (tall plant, red flower)	TtRr (tall plant, red flower)	ttRR (dwarf plant, red flower)	ttRr (dwarf plant, red flower)
tr	TtRr (tall plant, red flower)	Ttrr (tall plant, white flower)	ttRr (dwarf plant, red flower)	ttrr (dwarf plant, white flower)

Phenotypic ratio = 9 tall plant, red flower: 3 tall plant, white flower: 3 dwarf plant, red flower: 1 dwarf plant, white flower

Presence of both parental (tall plant, red flower and dwarf plant, white flower) and recombinant (tall plant, white flower and dwarf plant, red flower) offspring in F_2 generation represents the independent inheritance of two characters (height and color of flower).

Question 16. The activities of man have adverse effects on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and the non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself, but also of the entire living organisms on the mother earth. One of your classmates is an active member of the 'Eco-club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.

(a) Why is it necessary to conserve our environment?

(b) State the importance of green and blue dust-bins in the safe disposal of the household waste.

(c) List two values exhibited by your classmate who is an active member of the Eco-club of your school.

Solution:

(a) Interaction of living organisms among themselves as well as their interaction with abiotic components of ecosystem makes the life possible on earth. Environment is one of the important abiotic components of ecosystem, the proper functioning of which is critical for survival of living organisms on the earth. Environment conservation is important so as:

1. To protect natural habitat of animals as they occupy different trophic level during flow of energy in ecosystem.
2. To prevent natural calamities like flood, drought, desertification etc.
3. To ensure regular supply of many natural resources such as plant and animal products, fossil fuel, wood, food products etc.
4. To keep a check on production of green house gases which in turn cause global warming. Some adverse effects of global warming are melting of polar ice, rising of sea level, increase of earth temperature, flooding in lower areas etc.
- 5: To maintain the soil fertility and to ensure crop productivity to meet the food demand of rising population.

(b) Separation of biodegradable and non-biodegradable waste at earlier stages helps to collect and recycle the degradable waste as well as ensures proper safety action taken to dispose off the

non degradable waste. For the purpose, the green bins collect food (both raw and cooked) and garden waste while the blue bin collect cans, cardboard items, paper, glass, plastic etc.

(c)

1. Self awareness about the duty towards our environment
2. Feeling of being a responsible and active citizen.

Question 17. The image formed by a spherical mirror is real, inverted and is of magnification -2 . If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror.

Solution:

Here,

Magnification = $m = -2$, image distance = $v = -30$ cm, focal length = $f = ?$, object distance = u

$$\text{Magnification} = -\frac{v}{u}$$

$$\Rightarrow -2 = -\frac{(-30)}{u}$$

$$\Rightarrow u = -15 \text{ cm}$$

Using mirror formula,

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

$$\Rightarrow \frac{1}{f} = \frac{1}{(-30)} + \frac{1}{(-15)}$$

$$\Rightarrow f = -10 \text{ cm}$$

When the object moved by 10 cm towards the mirror, then the new position of object is $U = -(15 - 10) \text{ cm} = -5 \text{ cm}$.

Let V be the image distance then,

$$\frac{1}{V} + \frac{1}{U} = \frac{1}{F}$$
$$\Rightarrow \frac{1}{V} = \frac{1}{(-10)} - \frac{1}{(-5)}$$
$$\Rightarrow V = 10 \text{ cm}$$

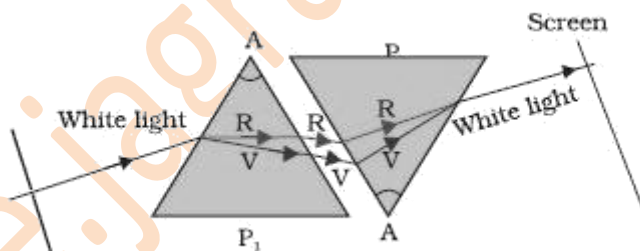
$$\text{Magnification} = -\frac{V}{U} = -\frac{10}{(-5)} = 2.$$

Here, V is positive so image will be formed in front of mirror and will be real, inverted and magnified.

Question 18. Describe an activity to show that the colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also, draw a ray diagram to show the recombination of the spectrum of white light.

Solution:

Dispersion of white light and their recombination can be done with the help of two identical prism. First a ray of light is passed through a glass prism and a spectrum of seven colours will be obtained. Now, place a second identical prism in an inverted position with respect to the first prism. As shown in figure given below.



When seven colours passing through second prism will be recombine and a beam of white light will be obtain again.

Question 19. It is desired to obtain an erect image of an object using concave mirror of focal length 12 cm.

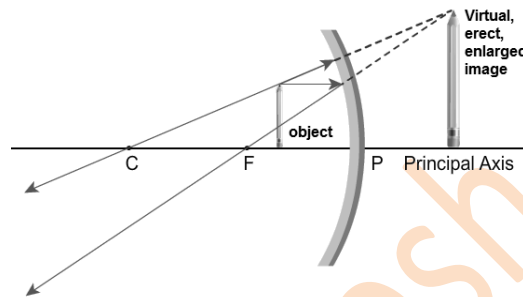
- What should be the range of distance of an object placed in front of the mirror?
- Will the image be smaller or larger than the object? Draw a ray diagram to show the formation of image in this case.
- Where will the image of this object be if it is placed 24 cm in front of the mirror? Draw a ray diagram for this situation to justify your answer.

Show the positions of the pole, the principal focus and the centre of curvature in the above ray diagrams.

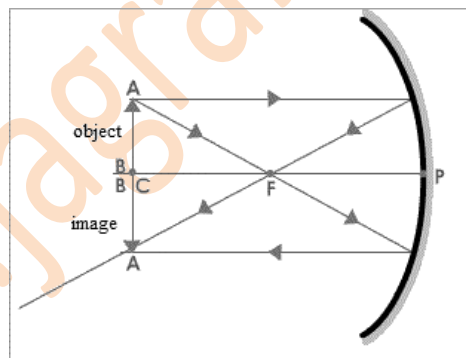
Solution:

(i) In order to obtain erect image, the object must be placed between focus and pole i.e. at a distance less than 12 cm.

(ii) The image formed will be greater in size.



(iii) As the focus (f) of the mirror is at 12 cm so the centre of curvature will be at ($2f =$) 24 cm. When object is placed at centre of curvature of concave mirror then the image formed will be real, inverted and of same size as that of object.



Question20. Define evolution. How does it occur? Describe how fossils provide us evidences in support of evolution.

Solution:

Evolution is the gradual process of accumulation of adaptive changes in population's genetic makeup through successive generations. Mutations produce sudden, discontinuous variations which accumulate in the gene pool. These random variations are acted upon by natural selection that favors, through differential reproduction, only those which confer survival and/or reproductive advantage to the individuals over others. Accumulation of these adaptive variations

in lineages over generation makes them better adapted to existing environmental conditions. Further, reproductive isolation of populations of species by geographical and/or physiological barriers leads to formation of new species i.e. evolution.

Fossils are the preserved remains of ancient organisms and are formed by their burial, rot away of soft parts. Over time sediment builds over the top and press downs the buried remains. The hard bony skeleton of animals and woody parts of plants are preserved by mineralization with simultaneous transformation of sediment into rock due to pressure and chemical reactions. Thus, as one moves from lower to upper strata of these rocks, older fossils are found in lower strata while the recent one are found in upper strata. Respective location of fossils in different strata and the anatomy and physiology exhibited by them represent the evolutionary trend of different taxonomic groups and individual forms over different geographical periods. Further, transitional fossil organisms (carrying characters of two different present day groups; missing links or connecting links) provide proof for evolutionary relationship between different groups of organisms and thereby establishing evolutionary sequence.

Question21. What is placenta? Describe its structure. State its functions in case of a pregnant human female.

Solution:

The placenta is an organ found only in mammals during development of foetus. It is made up of cells derived from both mother and foetus.

Placenta is a disc of specialised tissue embedded in the uterine wall and serves as the connecting link between the mother's body and the baby. It contains blood spaces on the mother's side and thousands of villi (small projections) on the foetal side that provide a large surface area required for the exchange of nutrients and oxygen between the mother and the foetus.

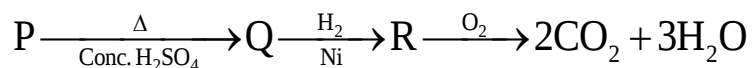
Functions of placenta

- Placenta allows the exchange of materials between mother and foetus.
- It allows the transfer of nutrients and oxygen from mother to foetus.
- Waste products excreted by the foetus like urea, uric acid and even carbon dioxide are diffused to maternal blood stream by the placenta.
- Placenta secretes several hormones that are essential for foetal development.
- Antibodies pass through the placenta that provides immunity to the foetus.

Question22. A carbon compound 'P', on heating with excess conc. H_2SO_4 , forms another carbon compound 'Q', which, on addition of hydrogen in the presence of nickel catalyst, forms a saturated carbon compound 'R'. One molecule of 'R', on combustion, forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved.

Solution:

According to the question,



The data given here shows that, R must be a hydrocarbon, Q must be unsaturated hydrocarbon, and P may be an alcohol.

The equation will be satisfied if, R is CH_3CH_3 , Q is $\text{CH}_2 = \text{CH}_2$ and P is $\text{C}_2\text{H}_5\text{OH}$.

Question 23. What is atmospheric refraction? Use this phenomenon to explain the following natural events:

- (a) Twinkling of stars
- (b) Advanced sunrise and delayed sunset

Draw diagrams to illustrate your answer.

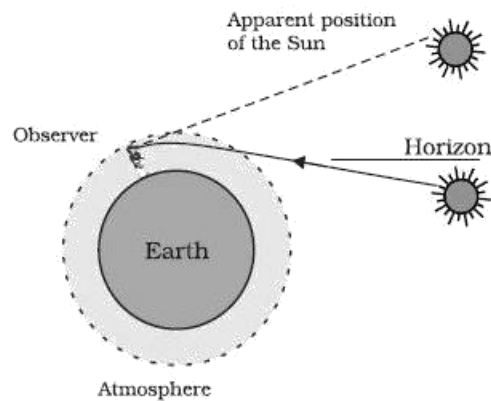
Solution:

The refraction of light caused by the earth's atmosphere having air layers of varying optical density is called atmospheric refraction.

- (a) The physical conditions of the atmosphere keep on changing continuously due to which density of air in different layers of atmosphere also keeps on changing.

As a result of which refractive index of various layers of atmosphere also keeps on changing continuously. So, light coming from stars suffers multiple refraction and they appear like they are twinkling.

- (b) The Sun is visible to us about 2 minutes before the actual sunrise, and about 2 minutes after the actual sunset because of atmospheric refraction. By actual sunrise, we mean the actual crossing of the horizon by the Sun. The figure given below shows the actual and apparent positions of the Sun with respect to the horizon. The time difference between actual sunset and the apparent sunset is about 2 minutes.



Question24. (a) Define focal length of a divergent lens.

(b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

(c) Draw a ray diagram to show the formation of image in the above situation.

Solution:

(a) The distance between pole and principal focus of a concave lens is known as its focal length. By convention sign of the focal length is always negative.

(b) Here, focal length of the lens = $f = -30$ cm, size of object = $h = 6$ cm, image distance = $-v$, object distance = $u = ?$

Using lens formula,

$$\begin{aligned}\frac{1}{v} - \frac{1}{u} &= \frac{1}{f} \\ \Rightarrow \frac{1}{u} &= \frac{1}{v} - \frac{1}{f} \\ \Rightarrow \frac{1}{u} &= \frac{1}{(-15)} - \frac{1}{(-30)} \\ \Rightarrow u &= -30 \text{ cm}\end{aligned}$$

$$\Rightarrow \frac{1}{u} = \frac{1}{(-15)} - \frac{1}{(-30)}$$

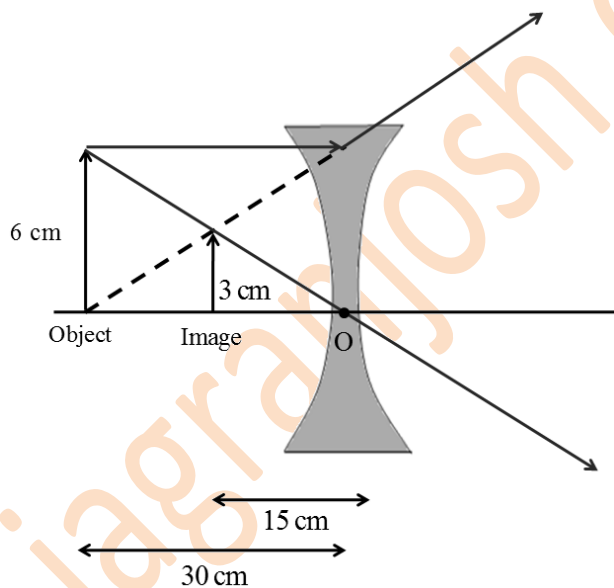
$$\Rightarrow u = -30 \text{ cm}$$

$$\text{magnification} = \frac{\text{image distance}}{\text{object distance}} = \frac{\text{height of image}}{\text{height of object}}$$

$$\Rightarrow \frac{-15}{-30} = \frac{\text{height of image}}{6}$$

$$\Rightarrow \text{height of image} = 3 \text{ cm}$$

Distance of the image is 30 cm and height of the object is 3 cm above the principal axis.



Section – B

Question 25. A student, while observing an embryo of a pea seed in the laboratory, listed various parts of the embryo as given below:

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon

On examining the list, the teacher remarked that only three parts are correct. Select the three correct parts from the above list:

- (a) Testa, Radicle, Cotyledon
- (b) Tegmen, Radicle, Micropyle

- (c) Cotyledon, Plumule, Testa
- (d) Radicle, Cotyledon, Plumule

Solution:

(d)

The parts of dicot embryo include radical, plumule and a pair of cotyledons.

Question26. If you are asked to select a group of two vegetables, out of the following, having homologous structures, which one would you select?

- (a) Carrot and radish
- (b) Potato and sweet potato
- (c) Potato and tomato
- (d) Lady finger and potato

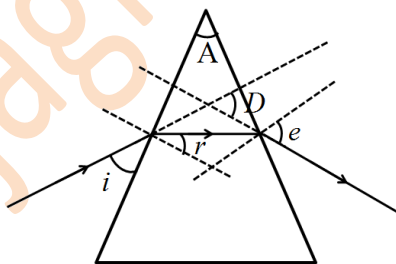
Solution:

(a)

Homologous structures are those structures that have the same origin but can perform same or different functions in different organisms.

Here, both carrot and radish are modifications of the root for food storage.

Question27. In the following ray diagram, the correctly marked angle are:



- (a) $\angle i$ and $\angle e$
- (b) $\angle A$ and $\angle D$
- (c) $\angle i$, $\angle e$ and $\angle D$
- (d) $\angle r$, $\angle A$ and $\angle D$

Solution:

(d)

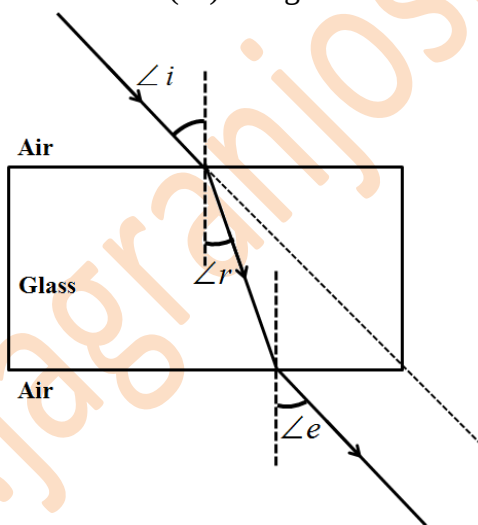
In this figure, $\angle i$ should be the angle between incident ray and the normal which is shown incorrectly. Rest angles are shown correctly.

Question 28. In your laboratory, you trace the path of light rays through a glass slab for different values of angle of incidence ($\angle i$) and in each case, you measure the value of the corresponding angle of refraction ($\angle r$) and angle of emergence ($\angle e$). On the basis of your observations, your correct conclusion is that

- (a) $\angle i$ is more than $\angle r$ but nearly equal to $\angle e$
- (b) $\angle i$ is less than $\angle r$ but nearly equal to $\angle e$
- (c) $\angle i$ is more than $\angle e$ but nearly equal to $\angle r$
- (d) $\angle i$ is less than $\angle r$ but nearly equal to $\angle r$

Solution:

Initially a ray goes from rarer medium (air) to denser medium (glass), so the ray will bend towards the normal and angle of incidence ($\angle i$) < angle of refraction ($\angle r$).



Now light ray after refraction again emerges out in the air and light ray will bend away from the normal. If angle of emergence is $\angle e$ then, in this case $\angle e = \angle i$. From a glass slab the light ray will shift laterally as it will enter and emerge out from the glass slab.

Question 29. To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a screen. The image obtained on the screen, as compared to the object, is always

- (a) laterally inverted and diminished
- (b) inverted and diminished
- (c) erect and diminished
- (d) erect and highly diminished

Solution:

(b)

When the object is at infinity then the image formed by concave mirror is at the focus of the screen placed in front of it.

The image formed will be real, inverted highly diminished in size.

Question 30. Suppose you have focused on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the sun, reaching your laboratory table, on the same screen, what you are expected to do is to move the

- (a) lens slightly towards the screen
- (b) lens slightly away from the screen
- (c) lens slightly towards the sun
- (d) lens and screen both towards the sun

Solution:

(a)

The sun is at an infinite distance from the lens, so the image of the sun will be formed at the focus of the lens.

In first case, candle can be assumed to be at some finite distance greater than $2f$, so the image of the candle will be formed on the screen placed between f and $2f$. This distance is greater than f .

In second case the position of object is at infinity so we will move the lens towards screen so that the screen will be at a distance f from the lens and image of the sun is formed on the screen.

Question 31. For preparing soap in the laboratory, we require an oil and a base. Which of the following combinations of an oil and a base would be best suited for the preparation of soap?

- (a) Caster oil and calcium hydroxide
- (b) Turpentine oil and sodium hydroxide
- (c) Caster oil and sodium hydroxide
- (d) Mustard oil and calcium hydroxide

Solution:

(c)

Soaps are potassium or sodium salts of long-chain fatty acids. They are prepared by the reaction of a long-chain fatty acid with either KOH or NaOH

Turpentine oil is more used for medicinal purposes. Whereas, Castor oil adds lather and moisturising properties to the soap. Hence, (c) option is correct.

Question 32. A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper. He may observe that

- (a) there is no change in the blue litmus paper and the red litmus paper turns white
- (b) there is no change in the red litmus paper and the blue litmus paper turns red
- (c) there is no change in the blue litmus paper and the red litmus paper turns blue
- (d) no change in colour is observed in both the litmus paper

Solution:

Soaps are sodium or potassium salts of long-chain fatty acids. These salts are basic in nature. Thus, when a student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper, there is no change in the blue litmus paper and the red litmus paper turns blue.

Hence, the correct answer is option (c)

Question 33. In the neighbourhood of your school, hard water required for an experiment is not available. From the following groups of salts available in your school, select a group of salts, each member of which, if dissolved in distilled water, will make it hard:

- (a) Sodium chloride, calcium chloride
- (b) Potassium chloride, sodium chloride
- (c) Sodium chloride, magnesium chloride
- (d) Calcium chloride, magnesium chloride

Solution:

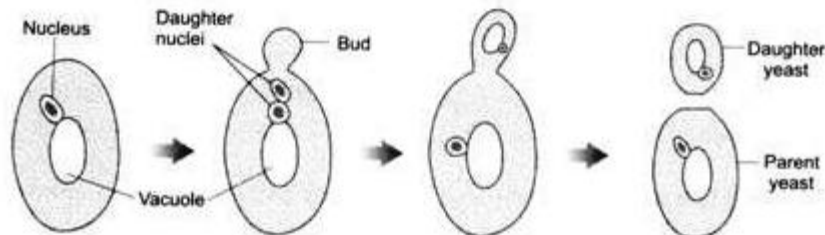
- (d)

Hardness of water is due to the presence of magnesium and calcium ions. In order to make distilled water hard, salts of calcium chloride and magnesium chloride must be added.

Question 34. A student is observing a permanent slide showing, sequentially, the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams of what he observes in a proper sequence.

Solution:

Asexual reproduction taking place in yeast takes place by the process of budding.



Question35. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark the optical centre 'O', principal focus F and height of the image on the diagram.

Solution:

Here,

Height of object = $H = 2.5$ cm, object distance = $u = -15$ cm, focal length of the lens = $f = 10$ cm, height of the object = $O = 2.5$ cm, height of image = $I = ?$, image distance = $v = ?$

By using lens formula,

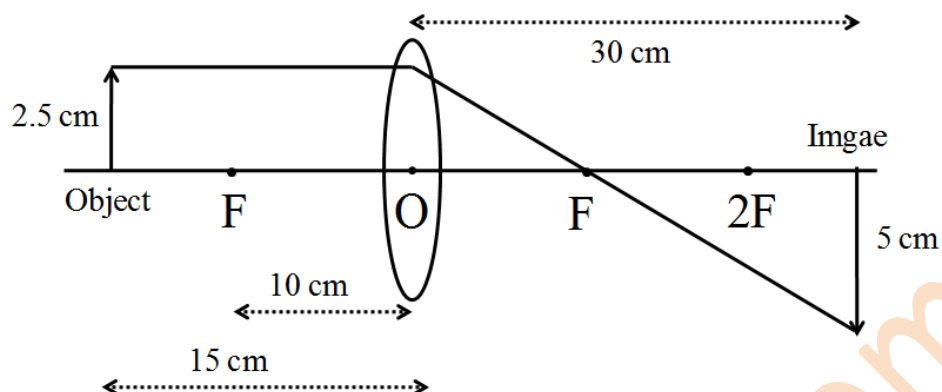
$$\begin{aligned}\frac{1}{v} - \frac{1}{u} &= \frac{1}{f} \\ \Rightarrow \frac{1}{v} + \frac{1}{15} &= \frac{1}{10} \\ \Rightarrow \frac{1}{v} &= \frac{1}{10} - \frac{1}{15} \\ \Rightarrow \frac{1}{v} &= \frac{3-2}{30} \\ \Rightarrow v &= 30 \text{ cm}\end{aligned}$$

$$\text{Magnification} = \frac{\text{height of image}}{\text{height of object}} = \frac{\text{image distance}}{\text{object distance}}$$

$$\Rightarrow \frac{\text{height of image}}{\text{height of object}} = \frac{\text{image distance}}{\text{object distance}}$$

$$\Rightarrow \frac{I}{2.5} = \frac{30}{-15}$$

$\Rightarrow I = -5$ cm. Negative sign shows orientation of image will be below principal axis.



Question36. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations that he/she must note in his/her notebook about the reaction that takes place. Also, write chemical equation for the reaction.

Solution:

Two important observations that must be noted when student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid are:

1. Brisk effervescence is observed due to the release of CO_2 from the reacting mixture.
2. Heat is released during the reaction.

Chemical equations for the reaction are:

