

Class: 10
Subject: Science
Topic: OASK1510SA201
No. of Questions: 32

Time: 3 Hrs.

M.M. 90

General Instructions

1. All questions are compulsory.
2. The question paper comprises of two sections, A and B. You are to attempt both the sections.
3. Questions 1 to 3 in section A are one mark questions. These are to be answered in one word or in one sentence.
4. Questions 4 to 6 in section A are two marks questions. These are to be answered in about 30 words each.
5. Questions 7 to 18 in section A are three marks questions. These are to be answered in about 50 words each.
6. Questions 19 to 24 in section A are five marks questions. These are to be answered in about 70 words each.
7. Questions 25 to 27 in section B are 2 marks questions and Questions 28 to 36 are multiple choice questions based on practical skills. Each question of multiple choice questions is a one mark question. You are to select one most appropriate response out of the four provided to you.

SECTION – A

Q1. What is denaturated alcohol?

Sol. Denaturated alcohol is Ethanol mixed with poisonous substance like CuSO_4 or pyridine or methanol.

Q2. Write a food chain in a forest ecosystem.

Sol. Grass (Producers) \rightarrow Deer (herbivore) \rightarrow Lion (Carnivore)

Q3. Are the laws of reflection applicable to plane surfaces also valid for curved surfaces?

Sol. Yes, the same laws of reflection are valid for both plane and curved surfaces.

Q4. Explain why atomic number is more important than atomic weight in determining chemical properties?

Sol. Chemical properties depend upon valence electrons which depend upon electronic configuration. Electronic configuration depends upon atomic number, therefore chemical properties depend upon atomic number and not upon atomic mass. Atomic number is equal to number of protons and also equal to number of electrons in case of neutral atom.

Q5. Name one organ analogous to the wing of the bird. Why are they both analogous? Can you include the wing of bat also with them under the same category? Give reason.

Sol. The wings of insects are analogous to the wing of the bird. They both are analogous because they perform the same function, but are not similar in structural plan and development origin. Yes, the wings of birds are analogous to wings of bats. Bat wings consist of flaps of skin stretched between the bones of the fingers and arms. Bird wings consist of feathers extending all along the arm. They both have separate evolutionary origins, but are superficially similar because they evolved to serve the same function. Analogies are the result of convergent evolution.

Note (Just for knowledge not for examination purpose) : Though bird and bat wings are analogous as wings, but as forelimbs they are homologous. Birds and bats did not inherit wings from a common ancestor with wings, but they did inherit forelimbs from a common ancestor with forelimbs.

Q6. In what S.I. unit power of lenses is rated? A convex lens has a focal length of 50 cm, Calculate its power.

Sol. The S.I. unit of power is dioptre.

$$\text{If } f = 50 \text{ cm} = \frac{1}{2} \text{ m, then } P = \frac{1}{f} = 2D$$

Q7. What is electron affinity? The electron affinity values of three elements, A, B and C of a group are 324, 295 and 333 kJ mol^{-1} . Arrange these in increasing order of their atomic numbers.

Sol. Electron Affinity : Affinity is the energy change when an electron is gained by a gaseous atom. It depends on atomic size and electronic configuration. It decreases down a group $C (333) > A (324) > B (295)$ are in increasing order of atomic numbers.

Q8. What was Doberenier's basis of classification of elements?

Sol. Dobereiner classified elements in triads such that atomic mass of middle elements was average of atomic mass of first and third elements. e.g .

Li	Na	K
7	23	39

Average atomic mass of Li and K = $\frac{7+39}{2} = 23$ which is atomic mass of Na.

Q9. It is the responsibility of the government to arrange for the management and disposal of waste. As an individual you have no role to play. Do you agree? Support your answers with two reasons.

Sol. I do not agree. As an individual, I also have the responsibility and can contribute in the following ways :-

- (a) Cut down waste generation
- (b) Make compost pit for bio degradable waste.
- (c) Recycle non-biodegradable waste.

Q10. Why rain harvest water stored underground has many advantages? Give any three advantages.

Sol. (a) The water stored underground does not evaporate.
(b) The water stored underground percolates, which enriches the water table and reaches ground water sources.
(c) The water stored underground is protected from contamination by human and animals wastes, and also does not promote breeding of pests.

Q11. Define the term "Heredity". In which type of organisms in heredity supposed to be better defined – in sexually reproducing or asexually reproducing kind? Why?

Sol. "Heredity" refers to the transmission of characters or traits from the parents to their off springs. Heredity is better defined as asexually reproduction kinds. Heredity is better defined as asexually reproducing kinds, because asexual reproduction tends to preserve the similarities among all the individuals belonging to a given line of descent.

- Q12. An object 3 cm high is placed perpendicular to the principal axis of a concave lens of focal length 15 cm. The image is formed at a distance of 10 cm from the lens. Calculate:
- Distance at which the object is placed
 - Size and nature of the image formed.

Sol. Here $h = 3 \text{ cm}$ $f = -15 \text{ cm}$, $v = -10 \text{ cm}$

(a) From lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{(-10)} - \frac{1}{(-15)}$

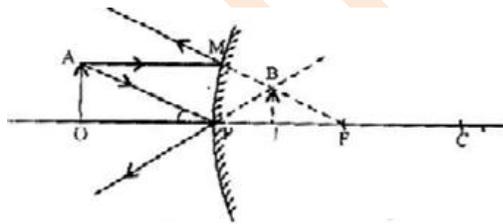
$$\Rightarrow \frac{1}{u} = \frac{1}{15} - \frac{1}{10} = \frac{-1}{30} \Rightarrow u = -30 \text{ cm}$$

(b) $m = \frac{h'}{h} = \frac{v}{u} \Rightarrow h' = \frac{v}{u} \times h = \frac{-10}{-30} \times 3 = +1$

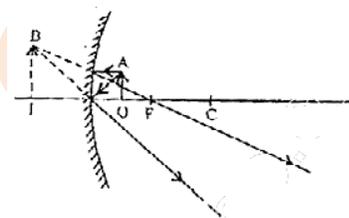
From the above, it is clear that image is formed on the same side of object placed at a distance of 30 cm and image is virtual, erect and of same size.

- Q13. An object of size 'l' cm is placed in front of a (i) convex mirror and (ii) concave mirror. With a neat ray – diagram, explain how an erect image is formed.

Sol. (a) Convex mirror



(b) Concave mirror



- Q14. (a) Is the speed of light a constant?
(b) Which colour has the greatest speed in the visible region?
(c) Is it possible to combine the seven colours in the spectrum to form white?

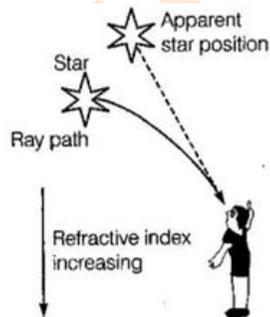
Sol. (a) Yes, speed of light is constant in free space.
(b) In free space all colours will travel with same speed.
(c) Yes, by keeping a prism inverted after a prism to split the white light, it is possible to reunite the colours to form white light.

- Q15. Sheeba studies in grade 9 and is a secretary of school's club. As per practice in the school, all members of science club assemble in Physics lab in last two periods on every Friday. Sheeba also extends help to her mother in kitchen. One day she observed that the apparent the fire in the kitchen. She discussed about this with her friends and decided to raise the questions in school's science club meeting.

Read the given passage and answer the following questions:

- (a) Explain the reason behind the observation.
(b) Name the similar phenomenon on a larger scale. Also, draw the ray diagram.

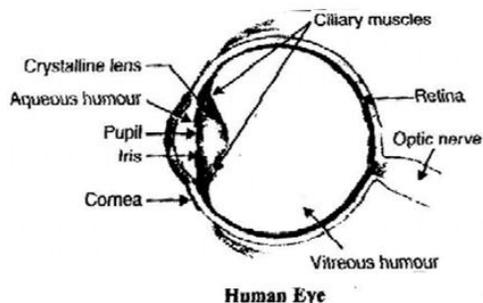
Sol. (a) The air Just above the becomes hotter than the air further up. The hotter air is lighter(less dense) than the cooler air above it and has a refracting index slightly less than that of the apparent position of the object as seen through the hot air, fluctuates.
(b) Twinkling of stars is a similar phenomenon on a much larger scale.



- (c) Values shown by Sheeba are friendship, concern for each other, practical mind and cooperative attitude.

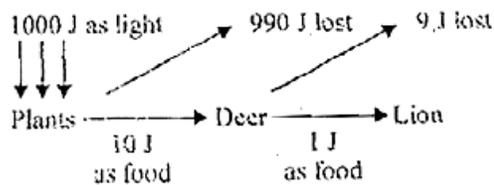
Q16. Draw a neat labeled diagram of human eye.

Sol. Labeled diagram of human eye.



Q17. What is ten percent law? Explain with an example how energy flows through different trophic levels?

Sol. Energy available at each successive trophic level of food chain is 10 percent of the previous level. This is called 10 percent law. This is due to the fact that 90% energy is lost to the environment at each trophic level.



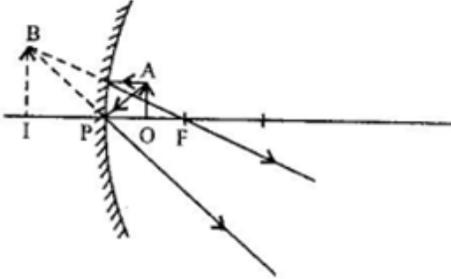
Q18. Replenishment of forests is essential. Justify the statement by giving any three reasons.

Sol. Replenishment of forest is essential because of the following reasons:

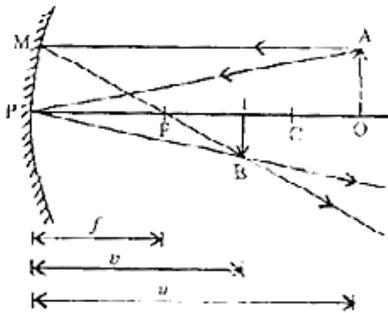
- Tress give out enormous amount of water by the process of transpiration. This helps in the rain clouds.
- Plants prevent the washing away of top soil which is rich in organic matter. It prevents soil erosion.
- Forests provided raw materials for many industries and form a natural habitat for wildlife.

Q19. Draw a ray diagram to show the formation of image of an object placed between the pole and focus of a concave mirror. Obtain the relation between u , v and f for a given concave mirror. State clearly the assumption involved and sign convention used.

Sol. Image formed by concave mirror when object is placed between the pole and the focus of the mirror. Image is erect and enlarged.



Consider a concave mirror. Light from object OA placed beyond C will form a real, inverted and diminished image between F and C.



From similar triangles OAP and IBP, we get, $\frac{OA}{IB} = \frac{PO}{PI} = \frac{u}{v}$

From similar triangles, MPF and IBF, we get $\frac{MP}{IB} = \frac{OA}{IB} = \frac{PF}{FI} = \frac{f}{v-f}$

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

Cross multiplying and then dividing all terms by uvf , we get $\frac{1}{f} - \frac{1}{v} = \frac{1}{u}$

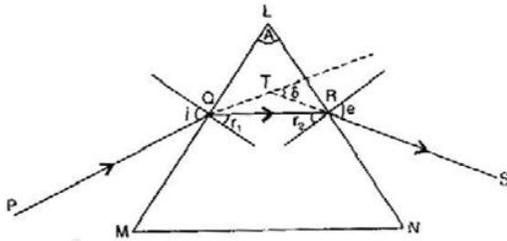
OR

One half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.

Sol.

- Q20. Draw a labeled diagram which shows the refraction of light through a triangular glass prism.
 Mark the:
 (a) Angle of deviation
 (b) Angle of emergence
 (c) Angle of prism

Sol.



- (a) δ = Angle of deviation
 (b) e = Angle of emergence
 (c) A = Angle of prism

OR

Give some points of similarities and dissimilarities between a camera and a human eye.

Sol. Points of similarities

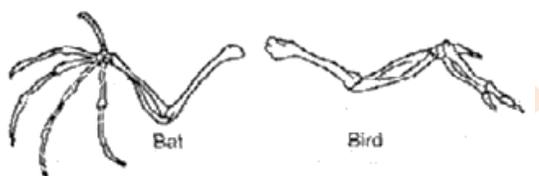
Camera	Human Eye
(i) Image is formed by a convex lens made of glass.	(i) Image is formed by the eye lens (a convex lens) made of fibrous jelly like material.
(ii) A real and inverted image is formed on the photographic film.	(ii) A real and inverted image is formed on the retina.
(iii) Diaphragm controls the amount of light entering the camera.	(iii) Pupil in the iris controls the amount of light entering the eye.
(iv) Time of exposure is controlled by a shutter.	(iv) Time of exposure is controlled by the eyelids.

Points of dissimilarities:

Camera	Human Eye
(i) Focal length of camera lens is fixed.	(i) Focal length of eye lens can be changed with the help of ciliary muscles.
(ii) Focussing is done by changing the distance between the camera lens and the photographic film.	(ii) Focussing is done by changing the shape of the eye lens by the action of ciliary muscles.
(iii) Photographic film retains the image permanently.	(iii) The retina of the eye retains the impression of an image for about $\frac{1}{16}$ th of a second.
(iv) A photograph has to be changed for getting next image.	(iv) The same retina can be used for viewing an unlimited number of images.
(v) The angular region covered is about 60° .	(v) The angular region covered is about 150° .

Q21. Explain : (i) Analogous organs (ii) Natural selection

Sol. (i) **Analogous organs** are those organs which have different basic structural design and development origin but have similar appearance and perform similar functions. Example: The wings of the birds and bats look similar but have different design in their structure. Wings of the bats are skin folds stretched between elongated fingers but wings of birds are covered by feathers all along the arm.



Analogous organs : The wing of a bat and the wing of a bird

(ii) **Natural selection:** is the process, according to Darwin, which brings about the evolution of new species of animals and plants.

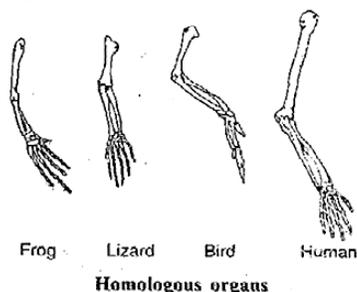
- It was noted that the size of any population tends to remain constant despite the fact that more offspring are produced than are needed to maintain.
- Darwin found that variations existed between individuals of the population and concluded that disease, competition and other forces acting on the population eliminated those individuals less well adapted to their environment.
- The surviving population would pass the hereditary advantageous characteristics to their offspring.
- But with time this process would give rise to organisms different from the original population and new species are formed.

Or

What are homologous organs? How do they differ from analogous organ? How does the study of comparative anatomy provide evidence in favor of Organic Evolution?

Sol. **homologous organs** are those organs which have the same basic structural design and developmental origin but have different functions and appearance.

Example: The forelimb of a frog, a lizard, a bird and a man seem to be built from the same basic design of bones, but they perform different functions.



Difference between Homologous organs and Analogous organs:

Homologous Organs	Analogous Organs
(i) These organs have similar embryonic origin and basic structure.	(i) These organs have different embryonic origin and basic structure.
(ii) These may look different and may perform different function, e.g. forelimb of man and flipper of a whale.	(ii) These look alike and perform same functions, e.g. wings of birds and insects.

The study of comparative anatomy provides evidence in favour of Organic Evolution in the following ways:

- (i) Presence of vestigial organs, the organs which are rudimentary and functionless in the evolved form but are completely functional in the ancestral forms, provides evidence for evolution of organisms, e.g., presence of vestige of pelvic girdle in python and porpoises indicates that they have evolved from four-footed organisms.
- (ii) Presence of homologous and analogous organs also provides evidence for common ancestry of organisms.

Q22. Study the given data and answer the questions following the data:

Parental plants cross fertilised and seeds collected	F1 First Generation offspring	F2 Offspring of self pollination of F1
Male parents always bore red flowers. Female parent always had white flowers.	330 seeds sown and observed. All 330 gave red flowers.	Out of 44 seeds 33 seeds gave plants with red flowers and 11 seeds gave plants with white flowers.

- (a) What is the term for this type of cross?
- (b) What does the data of the column marked F_1 indicate?
- (c) Express the gene type the (a) parents (b) F_1 progeny and (c) F_2 progeny

- Sol.
- (a) Monohybrid cross
 - (b) Red colour of flower dominant over white flower
 - (c) (i) Parents – (RR) and (rr)
 - (ii) F_1 progeny - Rr
 - (iii) F_2 progeny – RR, Rr and rr

Or

Explain with example how characteristics of a population changes over the years for the following situations:

- (a) To gain survival advantage.
- (b) Due to accidental survival
- (c) Temporary change of characteristics.

- Sol. The characteristics of a population changes over the years for the following situations:
For example : 12 red beetles live in a green leafy bush grows by sexual reproduction and generate variation.

(a) Situation to gain survival advantage :

- Crows eat these beetles, leaving only fewer beetles available for reproduction.
- Due to colour variation during reproduction, only one green beetle evolves and therefore, all its progeny beetles becomes green.
- Crows cannot see green coloured beetles on green leaves and hence cannot eat them, resulting more green beetles than ones in the beetle population.

(b) Situation due to accidental survival :

- Due to colour variation during reproduction, a blue beetle appears and all its progeny beetles become blue.
- Crows can see red and blue beetles and therefore, eat them
- Initially there are less number of blue beetles and more of red beetles.
- Then an elephant stumps on the bushes and kills most of the beetles. By chance. Few beetles that survived were mostly blue.
- Thus the blue beetle population slowly expands.
- There is no survival advantage on this variation and provides diversity without adaptation.

(c) Situation of temporary change of characteristics :

- As the beetle population begins to expand, the bushes suffer from a disease and amount of leaf available for beetles have reduced.

- Thus the beetles are poorly nourished and the average weight of an adult beetle has decreased.
- After few years, the plant disease is eliminated and enough food is available for the beetles. Thus the beetles have come back to its normal size and weight.
- This change is not inherited over generation.

Q23. Give five differences between diamond and graphite.

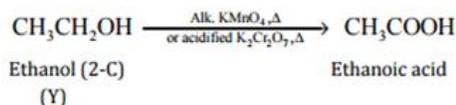
Sol. Difference between Diamond and Graphite:

Diamond		Graphite	
(i)	It is the hardest substance.	(i)	It is soft and slipperty.
(ii)	It is transparent and colourless.	(ii)	It is opaque and black coloured.
(iii)	It is a non – conductor of electricity.	(iii)	It is a good conductor of electricity.
(iv)	In diamond, all carbon atoms are tetrahedral bonded.	(iv)	In graphite, there are some free valencies.

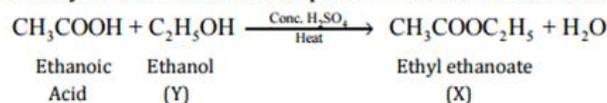
Or

(a) A compound X is formed by the reaction of carboxylic acid having the molecular formula $C_2H_4O_2$ and alcohol (Y) in the presence of conc. H_2SO_4 . The same carboxylic acid is obtained by the oxidation of alcohol (Y). Name the compounds X and Y. Give the chemical equation for the reaction.

Sol. (a) Alcohols on oxidation with alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$ give acids. Carboxylic acid ($C_2H_4O_2$) contains 2 – carbon atoms, therefore alcohol (Y) should also contain 2 – carbon atoms. So it is ethanol and the carboxylic acid is ethanoic acid.



The carboxylic acid and alcohol in presence of conc. H_2SO_4 react to produce ester (X).

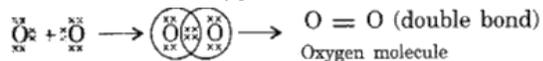


So compound X is ethyl ethanoate and compound Y is ethanol.

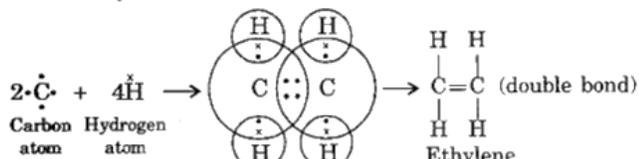
Q24. Explain double bond and triple bond with help of two examples in each case.

Sol. **Double bond:** The bond formed between two atoms by sharing of two pairs of electrons is called a double bond.

Examples: Formation of Oxygen molecule.

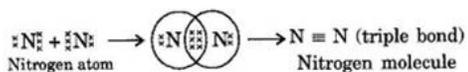


Formation of Ethylene molecule

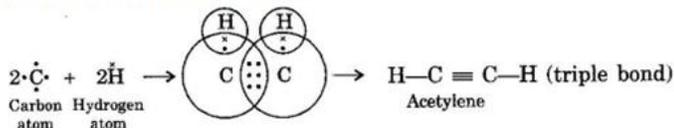


Triple bond: The bond formed between two atoms by sharing of three pairs of electrons is called a triple bond.

Examples: Formation of Nitrogen molecule.



Formation of Acetylene molecule



Or

Explain the following terms:

- Emulsifying
- Substitution reaction
- Polymerization
- Saponification
- Methylated spirit

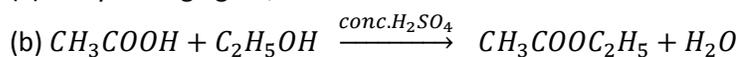
- Sol.
- Emulsifying action:** The action of soaps and detergents on dirt in clothes is called emulsifying action.
 - Substitution reaction:** Reactions in which an atom or group of atoms of a compound is replaced by other atom or group of atoms.
 - Polymerization:** Process in which similar or different molecules combine together in the presence of catalyst to form long chain compounds.
 - Saponification:** Process in which an ester reacts with sodium hydroxide to form alcohol and sodium salt of acid.

(v) **Methylated spirit** : Ethyl alcohol contaminated with methyl alcohol and other impurities.

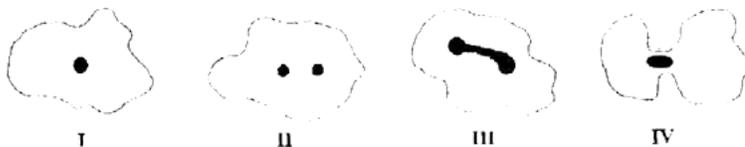
SECTION – B

- Q25. (a) When acetic acid reacts with ethyl alcohol, we add conc. H_2SO_4 . It acts as ___ and the process is called _____.
(b) Write the chemical equation for the same.

Sol. (a) Dehydrating agent, esterification



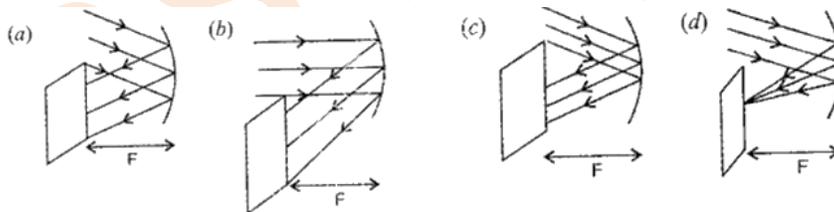
- Q26. (a) Which is the correct diagram showing an Amoeba undergoing binary fission?



(b) Justify your answer:

- Sol. (a) Figure III is showing the correct binary fission in Amoeba.
(b) Because the nucleus of Amoeba divides first.

- Q27. Which of the following pictures depict the correct image formation and why?



- Sol. Figure d depicts the correct image formation because parallel beams getting reflected from the concave mirror will converge at focus to produce a sharp image.

- Q28. Glacial acetic acid is:
- (a) 10% acetic acid
 - (b) 50% acetic acid
 - (c) 100% acetic acid
 - (d) 5% acetic acid

Sol.

- Q29. Acetic acid, when dissolve in water, it dissociates into ions reversely because it is:
- (a) It is a weak acid.
 - (b) It is a strong acid.
 - (c) It is a weak base.
 - (d) It is a strong base

Sol.

- Q30. Regeneration observed in:
- (a) Starfish
 - (b) Earthworm
 - (c) Hydra
 - (d) All of these

Sol.

- Q31. Fission of two types of gamete known as:
- (a) Fertilization
 - (b) Zygote
 - (c) Binary fission
 - (d) Cytokinesis

Sol.

- Q32. How many times the process of budding continuous in the yeast:
- (a) 2 – 3 times
 - (b) 3 – 4 times
 - (c) 50 – 70 times
 - (d) 100 – 500 times

Sol.