

SUMMATIVE ASSESSMENT-II

SCIENCE

[Time allowed: 3 hours]

[Maximum marks:80]

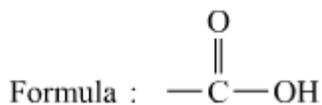
General Instructions:

- (i) The question paper comprises of two sections, A and B. You are to attempt both the sections.
- (ii) All questions are compulsory.
- (iii) There is no overall choice. However, internal choice has been provided in all the three questions of five marks category. Only one option in such questions is to be attempted.
- (iv) All question of Section A and all questions of Section B are to be attempted separately.
- (v) Question numbers 1 to 6 in Section A and 19 to 21 in Section B are short answer type question. These questions carry one mark each.
- (vi) Question numbers 7 to 12 in Section A and 22 to 24 in Section B are short answer type questions and carry two marks each.
- (vii) Question numbers 13 to 16 in Section A and 25 and 26 in Section B are also short answer type questions and carry three marks each.
- (viii) Question numbers 17 and 18 in Section A and question number 27 in Section B are long type questions and carry five marks each.

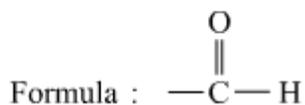
SECTION A

1. Name the functional group present in each of the following compounds: (1)
- (i) HCOOH
 - (ii) C₂H₅CHO

Ans. (i) HCOOH
Functional Group : Carboxylic acid



(ii) C₂H₅CHO
Functional Group : Aldehyde



2. The sky appears dark instead of blue to an astronaut. State its reason. (1)

Ans. The sky appears dark to an astronaut as scattering of blue light is not prominent at very high altitude.

3. Depletion of ozone in the ozone layer is a cause for our worry. Why? (1)

Ans. The ozone layer is present in the troposphere of the earth's atmosphere. It forms a protective shield and protects the surface of earth from the sun's ultraviolet (UV) radiation. Depletion of ozone layer can cause skin cancer and eye damage in human beings.

4. Name two decomposers operating in our ecosystem. (1)

Ans. Bacteria and fungi, are two decomposers operating in our ecosystem. They break down the dead remains of plants and animals.

5. State the modern periodic law for classification of elements. How many (i) groups and (ii) periods are there in the modern periodic table? (2)

Ans. Modern periodic law:

“Properties of elements are a periodic function of their atomic number”.

- (i) There are 18 groups (group 1 – group 18) and
- (ii) 7 periods in the modern periodic table.

6. An element 'M' has atomic number 11. (2)

- (a) Write its electronic configuration.
- (b) State the group to which 'M' belongs.
- (c) Is 'M' a metal or a non-metal.
- (d) Write the formula of its chloride.

Ans. Atomic number of 'M' = 11

- (i) Electronic configuration : 2, 8, 1
- (ii) Since, the valence shell contains 1 electron, it belongs to group 1.
- (iii) M is a metal.
- (iv) The formula of its chloride is M Cl.

7. List two advantages of vegetative reproduction practiced in case of an orange plant. (2)

Ans. Advantage of vegetative reproduction practiced in case on an orange plant are

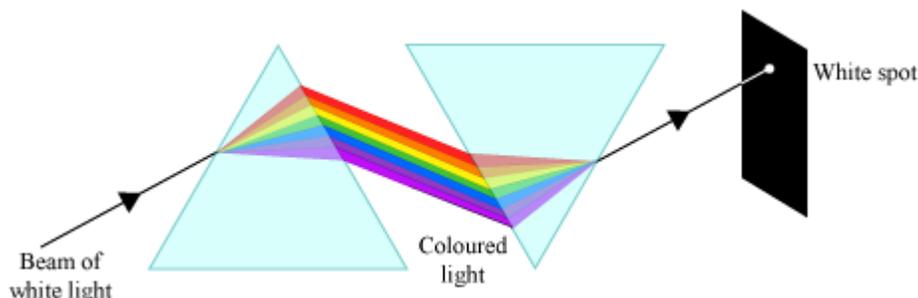
- (i) It enables the propagation of plants that have lost the capacity to produce viable seeds.
- (ii) All plants produced are genetically similar to parent plant and have all its characteristics.

8. How does growing embryo get nutrition from the mother's blood? (2)

Ans. The embryo gets nutrition from the mother's blood with the help of a tissue called placenta. Glucose and oxygen are passed from the mother to the embryo through it. Waste generated by embryo are also removed into mother's blood by placenta.

9. When we place a glass prism in the path of a narrow beam of white light a spectrum is obtained. What happens when a second identical prism is placed in an inverted position with respect to the first prism? Draw a labelled ray diagram to illustrate it. (2)

Ans. The first prism disperses white light into its seven constituent colours and forms the spectrum. The other inverted prism recombines all the seven colors and gives a white light.



10. List four properties of the image formed by a convex mirror. (2)

Ans. Four properties of the image formed by a convex mirror

- Image is always erect
- Small in size
- Virtual
- Always forms behind the mirror between focus and pole.

11. List four advantages of water stored in the ground. (2)

Ans. Advantage of water stored in the ground

- It does not evaporate and is available to wells
- It does not provide breeding grounds for mosquitoes etc.
- Provides moisture for vegetation over a wide range.
- It is also protected from contamination by human and animal waste.

12. "Burning fossil fuels is a cause of global warming." Justify this statement. (2)

Ans. Fossil fuels are composed of carbon, hydrogen, nitrogen and sulphur. When these are burnt, the products are CO_2 , H_2O , oxides of nitrogen and sulphur. Incomplete combustion of fossil fuels produces green house gases such as CO_2 . If huge amount of fossil fuels are burnt, it would produce high amount of CO_2 resulting intense global warming.

13. A star sometimes appears brighter and some other times fainter. What is this effect called? State the reason for this effect. (2)

Ans. A star sometimes appears brighter and some other times fainter, this effect is called as twinkling

effect. This effect arises due to atmospheric refraction. Our atmosphere is constantly moving. Light travelling from the stars gets bent in different directions making them twinkle.

14. Define homologous series of organic compounds. List its two characteristics. Write the name and formula of the first member of the series of alkenes. (3)

Ans. A homologous series is a series of carbon compounds that have different number of carbon atoms but contain the same functional group.

For example, methane, ethane, propane, butane, etc. are all part of the alkane homologous series.

Methane CH_4

Ethane CH_3CH_3

Propane $\text{CH}_3\text{CH}_2\text{CH}_3$

Butane $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

There is a difference of $-\text{CH}_2$ unit between each successive compound.

Characteristics of homologous series:

All the members of the homologous series have same functional groups and hence similar chemical properties.

Two successive members of a homologous series differ by a $-\text{CH}_2$ unit and 14u.

The first member of the series of alkenes is ethene. Its formula is C_2H_4 .

15. F, Cl and Br are the elements each having seven valence electrons. Which of these (i) has the largest atomic radius, (ii) is most reactive? Justify your answer stating reason for each. (3)

Ans. (i) F, Cl, Br belong to same group 17. Atomic size increase down the group. This is because new shells are added. Hence, Br has largest atomic radius because it has 3 shells compared to 2 in Cl and F respectively.
(ii) F is most reactive due to smaller size, high effective nuclear charge and high electro negativity.

16. Explain the meaning of sexually transmitted diseases (STDs). Give two examples of STDs each, caused due to (i) bacterial infection and (ii) viral infection. State in brief how the spread of such diseases may be prevented. (3)

Ans. STD stands for Sexually Transmitted Disease. These diseases transmitted during sexual intercourse.

STDs caused due to

(i) Bacterial infection

Gonorrhoea

Syphilis

(ii) Viral infection

AIDS

Herpes

The spread of these diseases can be prevented by advocating the use of condoms.

17. State and describe in brief any three main factors responsible for the rise of a new species. (3)

Ans. There are various factors that can lead to the rise of a new species.

- (i) **Geographical isolation**- Geographical barriers such as mountain ranges, seas or rivers may produce a barrier to gene flow and the inability of organisms or their gametes to meet leads to reproductive isolation and hence speciation.
- (ii) **Natural selection**- The theory of Natural selection states that there is "struggle for existence" within a population and variation exists within all population. The continuous competition between individuals for environmental resources creates a 'struggle for existence' and this struggle makes sure that certain organisms would fail to survive or reproduce. This would eliminate less suited organisms and better adapted organisms would survive and pass on their traits to next generation leading to evolution.
- (iii) **Genetic drift**- Genetic drift is the variation in gene frequencies within populations that occur by chance, changes in allele and genotype frequencies within the populations, as a result of the effect of natural selection on the range of phenotypes produced by mutation and sexual recombination, lead to the formation of races and subspecies. Continued genetic isolation leads to the formation new species.

18. Distinguish between homologous organs and analogous organs. In which category would you place wings of a bird and wings of a bat? Justify your answer giving a suitable reason. (3)

Ans.

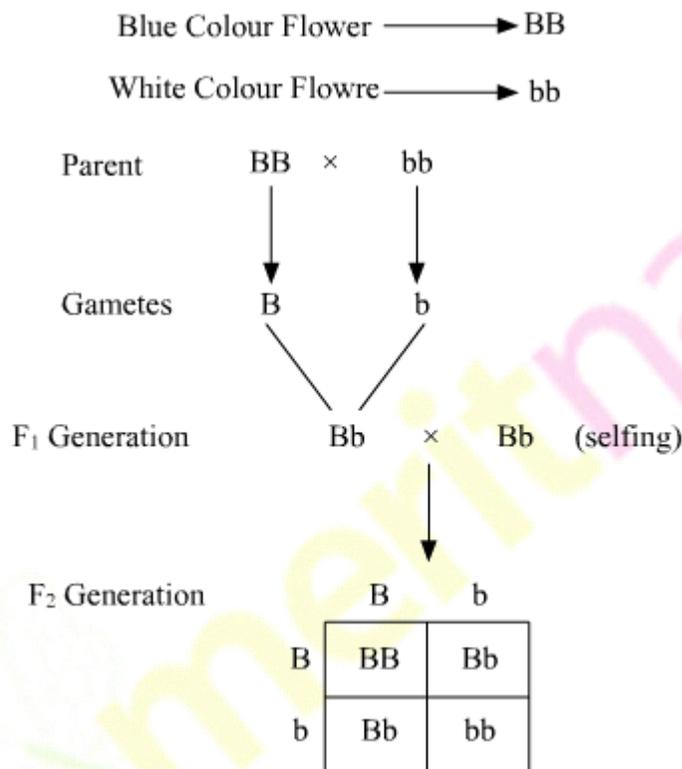
Homologous organs	Analogous organs
Homologous organs are those organs which are similar in origin but different in function.	Analogous structures are those which are different in origin but similar in function.
They represent a case of divergent evolution.	The existence of analogous structures suggests the occurrence of convergent evolution.
The presence of a structure or physiological process in an ancestral organism, which has become greatly modified in more specialized, apparently related organisms, may be interpreted as indicating a process of descent by modification. In this case the function of organs diversified and became different from the common ancestor.	It may be explained in terms of the environment, acting through the agency of natural selection, favouring those variations which confer increased survival and reproductive potential on those organisms which possess them. In this case different organs with different origins start performing similar functions and differ from their ancestral trait.
Example: The forelimbs of birds and humans	Example: The forelimbs of birds and bats

The wings of a bird and a bat are similar in function but this similarity does not mean that these animals are more closely related. If we carefully look at these structures, then we will find that the wings of a bat are just the folds of skin that are stretched between its fingers whereas the

wings of birds are present all along the arm. **Therefore, these organs are analogous organs.**

19. A blue colour flower plant denoted by BB is crossbred with that of white colour flower plant denoted by bb. (3)
- State the colour of flower you would expect in their F₁ generation plants.
 - What must be the percentage of white flower plants in F₂ generation if flowers of F₁ plants are self-pollinated?
 - State the expected ratio of the genotypes BB and Bb in the F₂ progeny.

Ans. Blue colour flower plant:- BB
White colour flower plant:- bb
The cross involved is as follows:



- In F₁ generation, all plants will have blue flower.
 - In the F₂ generation, 25% of flowers are white in color.
 - The ratio of the genotypes BB and Bb in the F₂ generation would be 1(BB) : 2(Bb).
20. The image of a candle flame placed at a distance 30 cm from a spherical lens is formed on a screen placed at a distance of 60 cm from the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 2.4 cm, find the height of its image. (3)

Ans. $u = -30$ cm
 $v = 60$ cm
 $h = 2.4$ cm
Using lens formula,

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

$$\frac{1}{f} = \frac{1}{60} - \frac{1}{(-30)} = \frac{1}{60} + \frac{1}{30} = \frac{1+2}{60} = \frac{3}{60} = \frac{1}{20}$$

$$f = +20 \text{ cm}$$

Positive focal length represents convex lens,

Now,

$$m = \frac{v}{u} = \frac{h'}{h}$$

$$\Rightarrow \frac{60}{-30} = \frac{h'}{2.4}$$

$$h' = \frac{-60}{30} \times 2.4$$

$$h' = -4.8 \text{ cm}$$

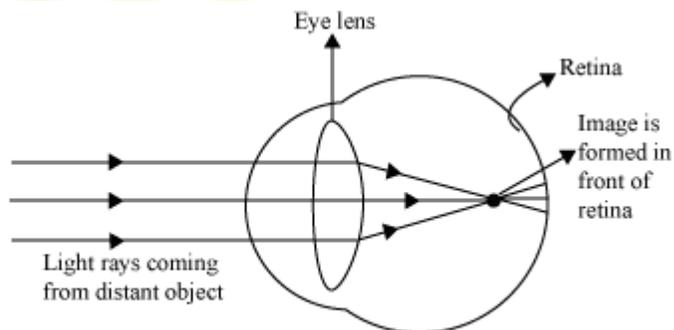
- 21.** State the type of mirror preferred as (i) rear view mirror in vehicles, (ii) shaving mirror. Justify your answer giving two reasons in each case. **(3)**

Ans. Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of them. They are preferred as a rear-view mirror in vehicles because they give a wider field of view, which allows the driver to see most of the traffic behind him.
Concave mirrors are used for shaving as it gives larger and erect image of the face.

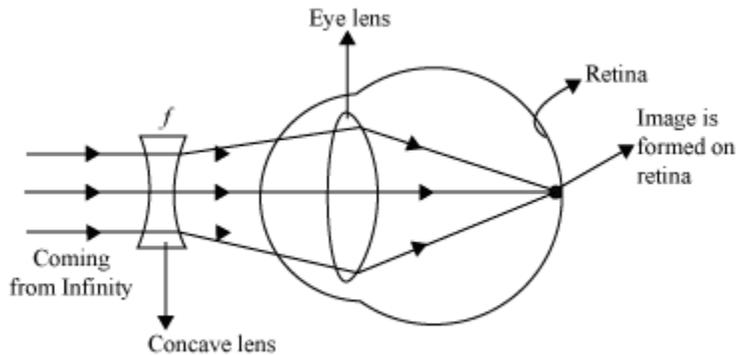
- 22.** A student cannot see a chart hanging on a wall placed at a distance of 3 m from him. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagrams for the (i) defect of vision and also (ii) for its correction. **(3)**

Ans. The defect of vision is myopia. It can be corrected by using a concave lens of suitable power. Following are the ray diagrams:

- (i) Defect of vision.



(ii) For its correction.



23. Define the terms pollination and fertilisation. Draw a diagram of a pistil showing pollen tube growth into the ovule and label the following: (5)
Pollen grain, male gamete, female gamete, ovary.

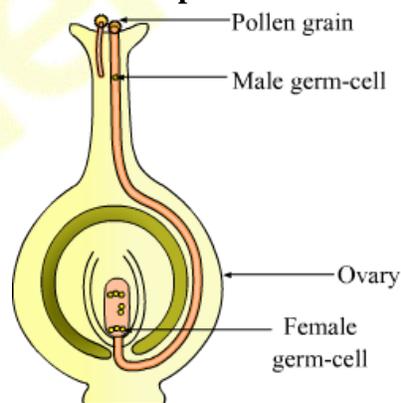
Or

Describe in brief the role of (i) testis (ii) seminal vesicle, (iii) vas deferens, (iv) ureter and (v) prostate gland in human male reproductive system.

Ans. Pollination is the process in which the transfer of pollen grains takes place from anther to stigma for the purpose of fertilization in plants.

Fertilization refers to the fusion of male and female gamete.

Diagram of pistil showing formation of pollen tube



OR

1. **Testis:** The testes are the male reproductive organs that are located outside the abdominal cavity within a pouch called scrotum. It produces sperms and also produce a hormone called testosterone, which brings about secondary sexual characters in boys.
2. **Seminal vesicles:** Seminal vesicles secrete mucus and alkaline fluid that helps the sperm to swim and also neutralizes the acidic condition in vagina.
3. **Vas deferens:** It carries sperm from the vasa efferentia to the urethra.

4. **Ureter:** When blood is filtered by the kidney, the waste material (urine) is passed on to urinary bladder via the ureters. The function of ureter is to carry urine from the kidney to the urinary bladder.
 5. **Prostate glands:** It produces an alkaline fluid (prostatic fluid), which is a constituent of the semen. The prostatic fluid provides motility, longer survival period (neutralizes the acidic environment of the female reproductive tract) and protection to sperms.
24. List the sign conventions for reflection of light by spherical mirrors. Draw a diagram and apply these conventions in the determination of focal length of a spherical mirror which forms a three times magnified real image of an object placed 16 cm in front of it.
(5)

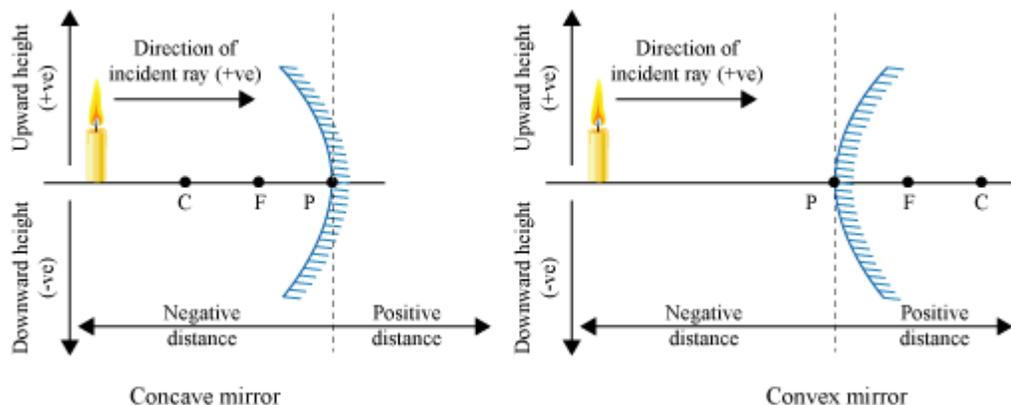
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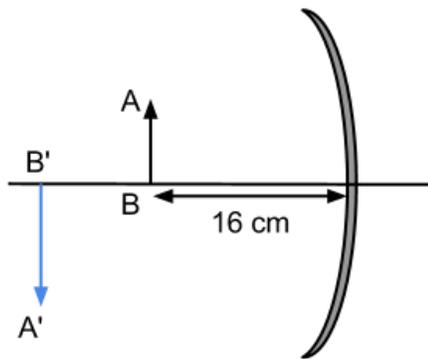
State the law of refraction of light that defines the refractive index of a medium with respect to the other. Express it mathematically. How is refractive index of any medium 'A' with respect to a medium 'B' related to the speed of propagation of light in two media A and B? State the name of this constant when one medium is vacuum or air.

The refractive indices of glass and water with respect to vacuum are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) vacuum, (ii) water.

Ans. Sign conventions for spherical mirrors

- I. Objects are always placed to the left of the mirror i.e. light must fall on the mirror from left to right.
- II. All distances are measured from the pole of the mirror.
- III. Distances along the direction of the incident ray (along positive X - axis) are taken as positive, while distances along the direction of the reflected ray (along negative X-axis) are taken as negative.
- IV. Heights measured perpendicular to and above the principal axis (along positive Y-axis) are taken as positive.
- V. Heights measured perpendicular to and below the principal axis (along negative Y-axis) are taken as negative.





Given,

$$m = -3 \text{ (real image is inverted always)}$$

$$u = -16\text{cm}$$

Now,

$$m = -\frac{v}{u} = -\frac{v}{(-16)} = \frac{v}{16}$$

$$-3 = \frac{v}{16}$$

$$v = -48\text{cm}$$

Using mirror formula,

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

$$\frac{1}{f} = \frac{1}{(-48)} + \frac{1}{(-16)} = -\frac{1}{12}$$

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

OR

The law of refraction that defines the refractive index of a medium with respect to the other is given by first law of refraction known as Snell's law.

First law of refraction

The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. This is known as **Snell's law**. Mathematically, it can be given as follows:

$$\frac{\sin i}{\sin r} = \text{constant} = {}^a\mu_b$$

Here, ${}^a\mu_b$ is the relative refractive index of medium b with respect to medium a.

Consider a ray of light travelling from medium B into medium A. Let v_1 be the speed of light in medium A and v_2 be the speed of light in medium B. Then the refractive index of medium A with respect to medium B is given by

$$n_{AB} = \frac{v_2}{v_1}$$

If one medium is vacuum or air then the constant is named as absolute refractive index of the medium.

Let, absolute refractive index of glass, $n_g = \frac{3}{2}$

Absolute refractive index of water, $n_w = \frac{4}{3}$

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

(i) Speed of light in vacuum

$$n_g = \frac{c}{v_g}$$

$$c = n_g \times v_g = \frac{3}{2} \times 2 \times 10^8 = 3 \times 10^8 \text{ m/s}$$

(ii) Speed of light in water,

$$n_w = \frac{c}{v_w}$$

$$v_w = \frac{c}{n_w} = \frac{3 \times 10^8}{\left(\frac{4}{3}\right)} = 2.25 \times 10^8 \text{ m/s}$$

25. What is the difference between the chemical composition of soaps and detergents? State in brief the action of soaps in removing an oily spot from a shirt. Why are soaps not considered suitable for washing where water is hard? (5)

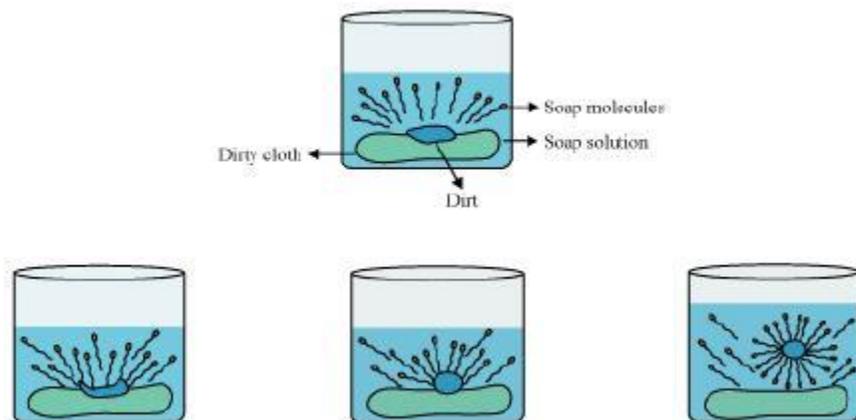
Or

List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated.

- Ans.** Soaps are potassium or sodium salts of long chain carboxylic acid. On the other hand, detergents are ammonium or sulphonate salts of long chain carboxylic acid.

Action of soap in removing an oily spot from a shirt

The dirt present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dirt particles are easily rinsed away by water.



Soap does not work properly when the water is hard.

A soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum. A lot of soap is wasted in the process.

OR

Difference in physical properties of ethanol and ethanoic acid

Ethanol	Ethanoic acid
It is liquid at room temperature.	It often freezes in winter.
Its melting point is 156 K.	Its melting point is 290 K.
Its boiling point is 351 K.	Its boiling point is 391 K.

Difference in chemical properties of ethanol and ethanoic acid

Ethanol	Ethanoic acid
It releases hydrogen gas on reaction with metallic sodium.	It does not release hydrogen gas on reaction with metallic sodium.
It does not release carbon dioxide gas on reaction with sodium bicarbonate.	It releases carbon dioxide gas on reaction with sodium bicarbonate.

Ethanol and Ethanoic acid be differentiated on the basis of their following properties –

- Ethanol is a liquid at room temperature with a pleasant smell. Ethanoic acid has a melting point of 17°C . Since it is below the room temperature so, it freezes during winter. Moreover, ethanoic acid has a smell like vinegar.
- Ethanol does not react with metal carbonates while, ethanoic acid reacts with metal carbonates to form salt, water and carbon dioxide. For example,

$$2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$$
- Ethanol does not react with NaOH while ethanoic acid reacts with NaOH to form sodium ethanoate and water. For example,

$$\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$$

- (iv) Ethanol is oxidized to give ethanoic acid in presence of acidified KMnO_4 while, no reaction takes place with ethanoic acid in presence of acidified KMnO_4 .

Ethanoic acid and ethanol can be distinguished by their reaction with sodium bicarbonate given as under:-

- (i) Ethanoic acid give effervescence with the sodium bicarbonate by the liberation of carbon dioxide. Ethanol does not give this test. $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CO}_2 + \text{CH}_3\text{COONa} + \text{H}_2\text{O}$
- (ii) ethanol has burning taste whereas ethanoic acid has sour taste.