

SUMMATIVE ASSESSMENT-II

SCIENCE

[Time allowed: 3 hours]

[Maximum marks: 80]

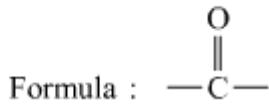
General Instructions:

- (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 questions 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.

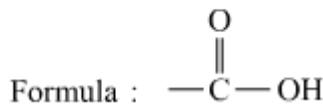
SECTION A

1. Name the functional group present in each of the following organic compounds: (1)
- (i) CH_3COCH_3
 - (ii) $\text{C}_2\text{H}_5\text{COOH}$

Ans. (i) CH_3COCH_3
Functional Group : Ketone



(ii) $\text{C}_2\text{H}_5\text{COOH}$
Functional Group : Carboxylic acid



2. Which phenomenon is responsible for making the path of light visible? (1)

Ans. Scattering is the phenomena responsible for making the path of light visible. When a beam of light interacts with particles of a medium it is redirected in many different direction.

3. Which class of carbon compounds is responsible for the depletion of ozone layer at the higher level of the atmosphere? (1)

Ans. The synthetic chemical, chlorofluorocarbons (CFCs) containing halogen as functional group is responsible for the depletion of ozone layer.

4. Select two non-biodegradable substances from the following waste generated in a kitchen: (1)
Spoilt food, paper bags, milk bags, vegetable peels, tin cans, used tea leaves

Ans. Non-biodegradable substance are: Milk bags and tin cans.

5. Define the term puberty. List two changes observed in girls at the time of puberty. (2)

Ans. Puberty is the process of physical changes by which a child's body matures into an adult body capable of sexual reproduction to enable fertilization.

Two changes observed in girls at this stage are:

- (i) Increase in breast size
- (ii) Start of menstruation

6. What is meant by asexual reproduction? List its any two different forms. (2)

Ans. Asexual reproduction is a mode of reproduction in which offspring arise from a single parent. Binary fission and budding are two forms of asexual reproduction.

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

Ans. Advantages of water stored in the ground are:

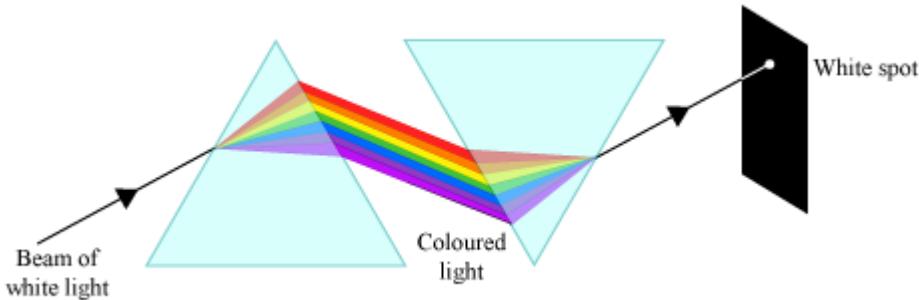
- (i) It does not evaporate and is available to wells.
- (ii) It does not provide breeding grounds for mosquitoes etc.
- (iii) It provides moisture for vegetation over a wide range.
- (iv) It is also protected from contamination by human and animal waste.

8. "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 in intense global warming.

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 back white light.



10. List four properties of the image formed by a concave mirror when object is placed between focus and pole of the mirror. (2)

Ans. Properties of the image by a concave mirror when object is placed between focus and pole of the mirror,
 (i) Virtual
 (ii) Erect
 (iii) Magnified
 (iv) Image is formed behind the mirror

11. An element 'M' has atomic number 12. (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' = 12
 (i) Electronic configuration : 2, 8, 2
 (ii) Since, the valence shell contains 2 electrons, it belongs to group 2.
 (iii) M is a metal.
 (iv) The formula of its chloride is MCl_2 .

12. How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9 (nine)? (2)

Ans. If electronic configuration is known, then the valency of an element is determined by the number of valence electrons present in the outermost shell. The electronic configuration of an element of atomic number 9 is 2, 7. It requires one electron to get stable noble gas configuration. Hence its valency is 1.

- 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.** 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 i.e., group 17. Atomic size increases down the group. This is because new shells are added. Br has 4 shells, as compared to 2 and 3 in F and Cl respectively. Hence, Br has the largest atomic radius.
(ii) F is most reactive due to smaller size, high effective nuclear charge and high electronegativity.

- 15.** 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 are transmitted during sexual intercourse.

STDs caused due to

- (i) bacterial infection
Gonorrhea
Syphilis
- (ii) Viral infection
AIDS
Herpes

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

- 16.** 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, | It may be explained in terms of the environment, acting through the agency of natural selection, favouring those variations which confer increased survival |

| | |
|---|--|
| 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. | 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.**

17. Define the term ‘evolution’. “Evolution cannot be equated with progress”. Justify this statement. (3)

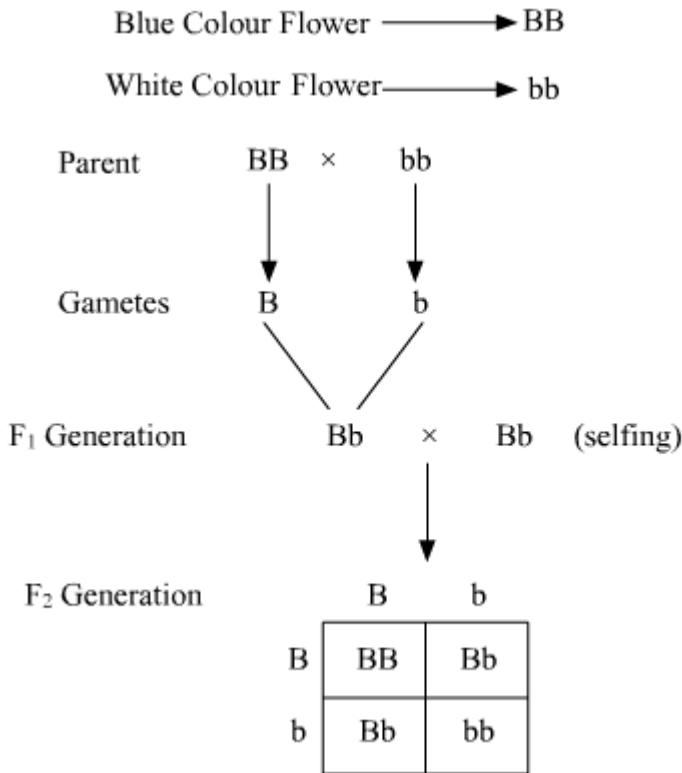
Ans. **Evolution** is the cumulative changes that occur in a population over time. It is the result of change in the genetic make up of the organism due to mutations and other sources of variation. The favourable mutations are accepted by nature and provide the organism an adaptive advantage. Evolution ultimately results into speciation.

Evolution cannot always be equated to progress because

- Evolution does not always lead to the formation of a new species.
- The newly formed species as a result of evolution may have complex organisation but cannot be considered 'better' to the earlier species.
- Evolution simply leads to diversification.

18. 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:



- (a) In F₁ generation, all plants will have blue flower.
- (b) In the F₂ generation, 25% of flowers are white in color.
- (c) The ratio of the genotypes BB and Bb in the F₂ generation would be 1(BB) : 2(Bb).

19. Complete the following equations: (3)

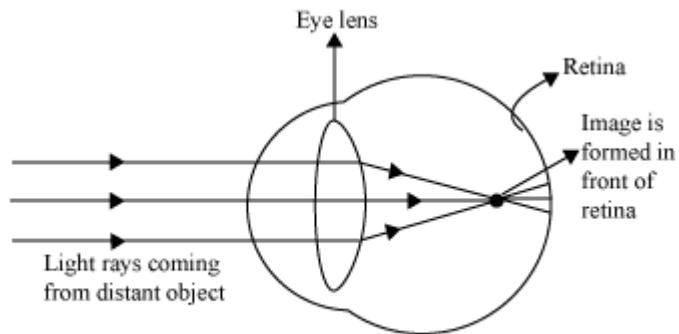
- (a) $\text{CH}_4 + \text{O}_2 \longrightarrow$
- (b) $\text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{Hot Conc. H}_2\text{SO}_4}$
- (c) $\text{CH}_3\text{COOH} + \text{NaOH} \longrightarrow$

- Ans.** (a) 
- (b) 
- (c) 

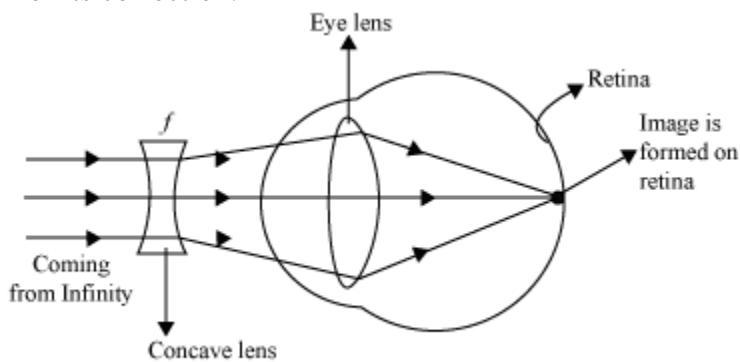
20. A student cannot see a chart hanging on a wall placed at a distance of 3 m from him. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagrams for the (i) defect of vision and also (ii) for its correction. (3)

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.



- 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.** The image of a candle flame placed at a distance 36 cm from a spherical lens is formed on a screen placed at a distance of 72cm from the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 2.5 cm, find the height of its image. (3)

Ans. $u = -36 \text{ cm}$

$$v = 72 \text{ cm}$$

$$h = 2.5 \text{ cm}$$

Using lens formula,

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

$$\frac{1}{f} = \frac{1}{72} - \frac{1}{(-36)} = \frac{1}{72} + \frac{1}{36} = \frac{1+2}{72} = \frac{3}{60} = \frac{1}{20}$$

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

Positive focal length represents convex lens,

Now,

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

$$\Rightarrow \frac{72}{-36} = \frac{h'}{2.5}$$

$$h' = \frac{-72}{36} \times 2.5$$

$$h' = -5.0 \text{ cm}$$

23. 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)

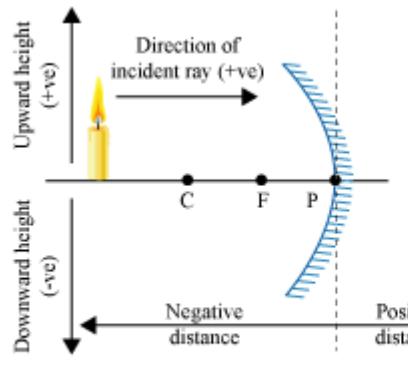
Or

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.

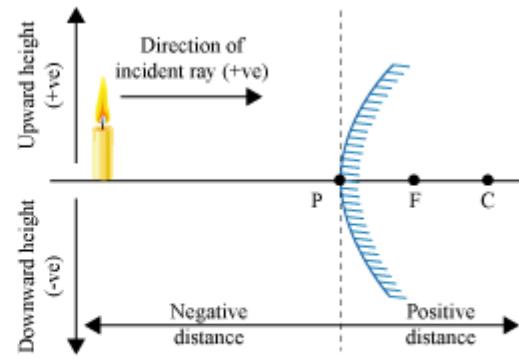
The refractive indices of glass and water with respect to vacuum are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. If the speed of light in glass is $2 \times 10^8 \text{ m/s}$, find the speed of light in (i) vacuum, (ii) water.

Ans. Sign conventions for spherical mirrors

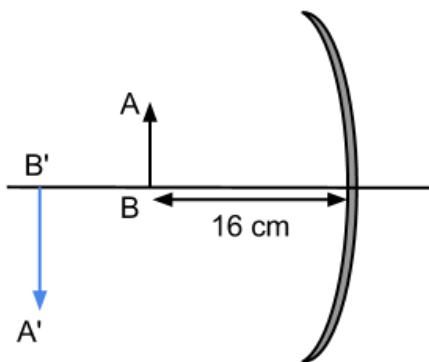
- I. Objects are always placed to the left of the mirror i.e. light must fall on the mirror from left to right.
- II. All distances are measured from the pole of the mirror.
- III. Distances along the direction of the incident ray (along positive X - axis) are taken as positive, while distances along 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.



Concave mirror



Convex mirror



Given,

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

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

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,

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

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

- 24.** 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)

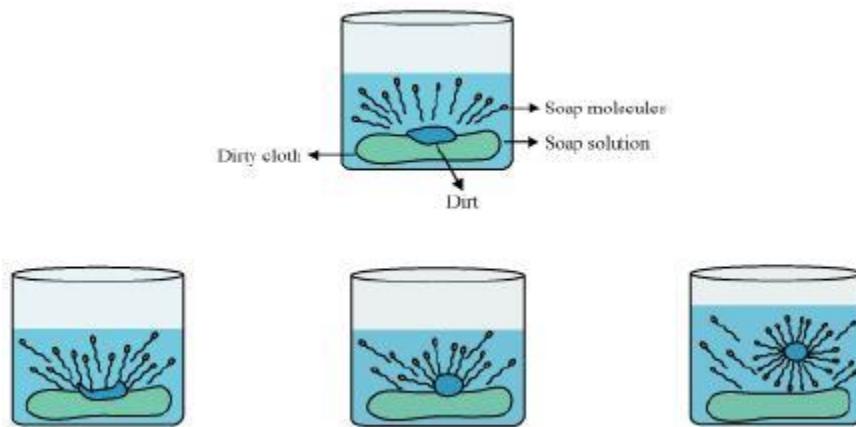
Or

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 dust 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. |

25. 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.

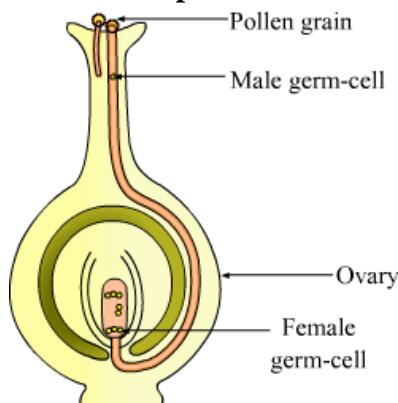
Or

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.