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**CBSE Sample Paper-04**  
**SUMMATIVE ASSESSMENT –II**  
**SCIENCE (Theory)**  
**Class – X**

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Time allowed: 3 hours

Maximum Marks: 90

**General Instructions:**

- a) All questions are compulsory.
- b) The question paper comprises of two sections, A and B. You are to attempt both the sections.
- c) Questions 1 to 3 in section A are one mark questions. These are to be answered in one word or in one sentence.
- d) Questions 4 to 6 in section A are two marks questions. These are to be answered in about 30 words each.
- e) Questions 7 to 18 in section A are three marks questions. These are to be answered in about 50 words each.
- f) Questions 19 to 24 in section A are five marks questions. These are to be answered in about 70 words each.
- g) 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.

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**Section A**

1. What is acid rain?
  2. Name the product formed beside soap that is obtained during saponification process.
  3. Are the laws of reflection applicable to plane surfaces also valid for curved surfaces?
  4. In what S.I. unit is power of lenses rated? A convex lens has a focal length of 50 cm, Calculate its power.
  5. How does the metallic character change along the period?
  6. 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.
  7. What is accommodation? Explain how does the ciliary muscles do help in accommodation?
  8. What is persistence of vision? How do we make a motion picture possible?
  9. Why are the some substances biodegradable and some non-biodegradable?
  10. Write the cause of depletion of ozone layer in the atmosphere.
  11. What are homologous organs? How do they provide evidence in support of evolution?
  12. Explain how a new species is generated.
  13. Define Mendeleev's Periodic Law. Give two advantages of Mendeleev's Periodic Table.
  14. Why was it necessary to change the basis of classification from atomic mass to atomic number.
  15. How does binary fission differ from multiple fission?
  16. Explain double fertilization in plants.
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17. Ramesh and his friends performed well in SA-1. They wanted to go for outing, so they made a request to the principal in this regard. It was decided that they will go by cycle to witness the famous Ranapur water fountain show, situated nearly eight kilometers from their place, with their physical education teacher.

It was sunny day. They all enjoyed, rejuvenated and rejoiced mind and body. Ramesh was thrilled as he saw an exciting natural spectrum appearing in the sky when he looked at the sky through the water fountain, with the sun behind him. He came back with a number of questions in his mind.

Read the given passage and answer the following questions:

- (a) Name the natural spectrum appearing in the sky. How does it form?
  - (b) Draw a ray diagram showing formation of natural spectrum appearing in the sky.
  - (c) What value of shown by Ramesh
18. 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:
- (a) Distance at which the object is placed.
  - (b) Size and nature of the image formed.
19. Discuss in brief the various modes of reproduction used by single organisms.

**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.
20. A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm. away from the lens? What would be the size of the image formed if the object is 2 cm high? With the help of a ray diagram show the formation of the image by the lens in this case?

**Or**

- (i) Define: (a) Centre of curvature (b) Pole of a concave mirror
  - (ii) State the mirror formula and its magnification.
  - (iii) Using the same find the distance at which an object to be placed for getting a real, inverted enlarged image at 45 cm using a concave mirror of focal length 20 cm.
21. Draw a labelled diagram which shows the refraction of light through a triangular glass prism. Mark the:
- (i) Angle of deviation
  - (ii) Angle of emergence
  - (iii) Angle of prism

**Or**

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

22. Give five differences between diamond and graphite.
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**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.

23. (a) Which hydrocarbons burn with  
(i) non-sooty blue flame      (ii) sooty yellow flame  
(b) What happens when methane reacts with chlorine?  
(c) What is rectified spirit?  
(d) Why does soap not work in hard water?  
(e) What is glacial acid?

**Or**

(a) What is hydrogenation? Give one reaction. What is its industrial application?  
(b) What is esterification?

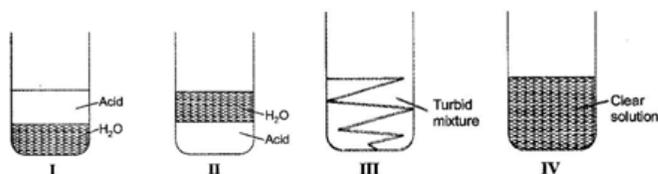
24. Describe the human female reproductive system with the help of a labelled diagram.

**Or**

Describe the process of fertilization in the human female.

### Section B

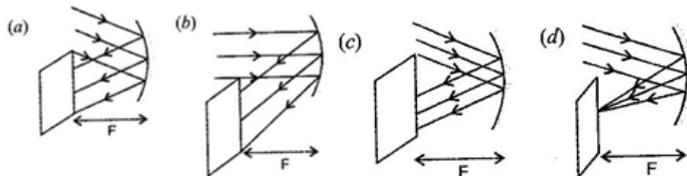
25. Five mL of acetic acid was added to 5 mL of water in a test tube.  
(a) The resulting mixture is correctly represented in which diagram.  
(b) Justify your answer.



26. Which process is shown in the figure of given slides A and B? Give reason also.

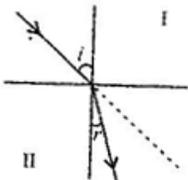


27. Which of the following pictures depict the correct image formation and why?



28. Glacial acetic acid is:  
(a) 10% acetic acid      (b) 50% acetic acid      (c) 100% acetic acid      (d) 5% acetic acid
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29. Acetic acid, when dissolved in water, it dissociates into ions reversibly 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
30. Binary fission occurs in:  
(a) Plasmodium (b) Hydra (c) Pomegranate (d) Paramecium
31. Which of the following organisms shows budding:  
(a) Spirogyra (b) Hydra (c) Amoeba (d) Paramecium
32. A male child will be born if:  
(a) father is healthy.  
(b) mother is well fed during pregnancy.  
(c) genetic composition of child has XY set of chromosomes.  
(d) genetic composition of child has XX set of chromosomes.
33. Chromosomes are made up of:  
(a) Proteins (b) DNA  
(c) Both of the above (d) RNA
34. While performing the experiment with glass slab, pins should:  
(a) be fixed vertically (b) stand in a line  
(c) not be hammered (d) All of these
35. As light gets in from air into glass, light will bend:  
(a) towards the normal (b) away from the normal  
(c) parallel to incident surface (d) retrace its path
36. The II medium shown with refracted ray for the given incident ray is:



- (a) denser  
(b) rarer  
(c) may be denser or rarer  
(d) none of these
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**(Solutions)**

**SECTION-A**

1. Oxides of sulphur and nitrogen when dissolve in rain water form sulphuric acid and nitrous acid or nitric acid. The polluted rain with these acid is called acid rain.
2. Glycerol.
3. Yes, the same laws of reflection are valid for both plane and curved surfaces.
4. The S.I. unit of power is dioptre.

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

5. As we go from left to right in a period, the metallic character decreases, because of the addition of an electron in the same energy shell each time. So, attraction between the nucleus and the electrons in the outermost shell increases. Thus tendency to lose an electron decreases and metallic character decreases.
6. 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.

7. The ability of the eye lens to adjust its focal length to see objects at varying distance is called Accommodation.

Eye lens has fibrous jelly like material. The curvature of the eye lens is altered by the ciliary muscles. When the muscles are relaxed, the focal length of the eye lens is 2.5 cm and distant objects can be seen clearly. But when the nearby objects are to be seen, the muscles contract and assume a more rounded shape. This decreases the focal length on the photo-sensitive screen – retina.

8. Image formed on the retina stays for about  $\frac{1}{16}$ th of a second after the object is removed. This is called Persistence of vision.
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In order to produce smooth sequence of still picture possible in films, the images are to be projected on the screen more than 24 times per second. This principle of more than 24 frames per second makes possible motion picture.

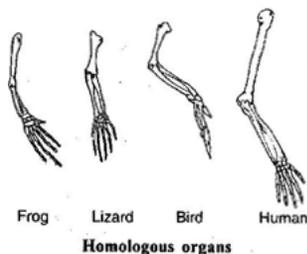
9. The micro-organisms like bacteria and other decomposers organisms (called saprophytes) present in our environment specific in their action. They break down the materials or products made from natural materials (paper) as they have some peculiar enzymes for this process. But as enzymes are specific in their action, these cannot break down many man-made materials likes plastic. These can be acted upon by physical processes but not by biological processes. Therefore these types of substances persist for long time and cannot be decomposed into simpler substances.

10. **Causes of depletion of ozone layer:** There are several reasons for depletion of ozone layer:

- The foremost is the use of chlorofluorocarbons (CFCs). The other factor responsible for ozone destruction is the pollutant nitrogen monoxide (NO).
- When the harmful chemicals like chlorofluorocarbons (CFCs) are released into the air, it accumulates in the upper atmosphere and reacts with ozone resulting in reduction of the ozone layer by forming a hole.
- Thus, the ozone layer in the atmosphere becomes thinner and gets depleted allowing more ultraviolet rays to pass through the earth.
- The Antarctic hole in ozone layer is caused due to chlorine molecules present in chlorofluorocarbons (CFCs), that are used by human beings.

11. **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.



12. When a population of a species splits into two, it cannot reproduce with each other and then a new species is generated. For example:

- A huge population of beetles feed on bushes spread a wide mountain range.
  - Individual beetle however feed on nearby bushes.
  - There is sub-population of beetles in a neighbourhood and reproduction takes place within the sub-population. Occasionally a migrant beetle enter a different sub-population and reproduce with them, thus genes of the migrant beetle enter in a new population.
  - Change due to genetic drift and natural selection will result in isolation of two sub-population which becomes more and more different from each other.
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- Ultimately these two groups will be incapable of reproducing with each other and two generation of beetles are being generated.

13. **Mendeleev's Periodic Law:** The physical and chemical properties of elements are the periodic function of their atomic masses.

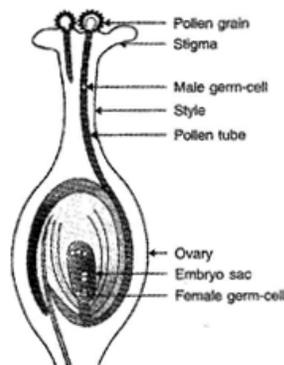
- He could classify all the 63 elements discovered at that time on the basis of similarities in properties.
- He left gaps for some undiscovered elements and predict their properties.

14. Isotopes have different atomic mass therefore they should be given separate place in periodic table which is not possible because they have similar chemical properties. Therefore it was necessary to change the basis of classification from atomic mass to atomic number.

15.

	Binary fission	Multiple fission
1.	In binary fission, the parent organism splits into two daughter nuclei, followed by division of cytoplasm, thus resulting into two identical individuals (daughter cells).	Multiple fission is the simultaneous division of the parent body into many daughter individuals.
2.	It occurs during favourable conditions.	It occurs when an organism faces unfavourable environmental conditions.
3.	Nucleus divides only once during this form of reproduction.	Nucleus divides repeatedly to form large number of nuclei.
4.	Protective covering is not formed around an organism.	Protective covering, a cyst, is formed around the organism during multiple fission.
5.	Example: Amoeba, Paramecium.	Example: Plasmodium.

16. **Double Fertilization in plants.** Pollination is followed by fertilization in plants.



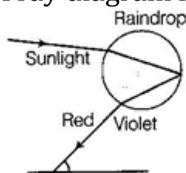
Fertilisation in flowering plant

- After the pollen lands on a suitable stigma, it has no reach the female germ cells in the ovary.
- The pollen tube grows out of the pollen grain through the style to reach the ovary.
- After fertilization the zygote divides several times to form an embryo within the ovule.
- The ovule then develops a tough coat and gets converted into a seed.
- The seeds contain the future embryo which develops into seedling.
- The ovary develops and ripens to form a fruit.

- The process of double fertilization occurs inside each embryo sac, in which two fusions, syngamy and triple fusion take place.
- When one male gamete fuses with the egg contained in the embryo sac of the ovule, this fusion of male and female gametes is called syngamy and its product is the zygote.
- The other male gamete fuses with the two polar nuclei and this process is called triple fusion, where three nuclei are involved in the fusion process, one male gamete and two polar nuclei.

17. (a) A rainbow is a natural spectrum appearing in the sky after a rain shower. A rainbow is always formed in a direction opposite to that of the sun. The water droplets act like small prisms. They disperse the white light due to which rainbow forms.

(b) A ray diagram for the formation of natural spectrum appearing in the sky:



(c) Value shown by Ramesh are faith in authority, discipline and friendship.

18. Here  $h = 3$  cm,  $f = -15$  cm,  $v = -10$  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.

19. The various modes of reproduction used by single organisms or sexual methods of reproduction are as follows:

- Fission:** This is the simplest method of asexual reproduction in unicellular forms of life such as Amoeba, Paramecium and other protozoa. In this process, the parent organism splits or divides to form two or more new organisms.
- Fragmentation:** Multicellular organisms with simple body organization such as filamentous algae – Spirogyra breaks up into two or more small pieces or fragments upon maturation. These fragments grow into new individuals.
- Regeneration:** It is the ability of a fully differentiated organism to give rise to new individual organism from its body parts. For example, simple organisms like Hydra and Planaria can be cut into any number of pieces and each piece grows into a complete organism.
- Budding:** In budding, a small part of a body of the parent grows out as a 'bud' which then detaches and becomes a new organism.

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- (v) **Vegetative Propagation:** In vegetative propagation, new plants are obtained from the parts of the old plants like stems, roots and leaves without the help of any reproductive organ. There are two ways of vegetative propagation: (i) Natural vegetative propagation and (ii) Artificial vegetative propagation.
- (vi) **Spore formation:** When a slice of a bread is kept in moist dark place for a few days, spores of Rhizopus present in air settle on the bread to form new fungus plant of Rhizopus.

**Or**

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 become green.
- Crows cannot see green coloured beetles on green leaves and hence cannot eat them, resulting more green beetles than red ones in the beetle population.

**(b) Situation due to accidental survival:**

- Due to colour variation during reproduction, a blue colour 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 in not inherited over generation.

20.  $f = +10cm$

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

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

$$\frac{1}{10} = \frac{1}{20} + \frac{1}{V}$$

$$\frac{1}{V} = \frac{1}{20} - \frac{1}{10}$$

$$\frac{1}{V} = \frac{1-2}{20}$$

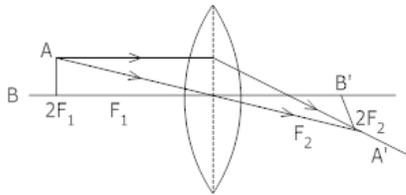
$$\frac{1}{V} = \frac{-1}{20}$$

$$V = -20\text{cm}$$

$$m = \frac{-v}{V} = \frac{-20}{-20}$$

$$m = +1$$

image formed is real.



Object at  $2F_1$

image formed at  $2F_2$

Same size & Real & inverted

**Or**

(i) (a) The point on the principal axis, about which the spherical surface is generated is called centre of curvature. Any ray passing through this will retrace its path after reflection in the spherical mirror.

(b) The centre of the spherical surface (reflecting) is called pole. Any ray falling at this point coming from one side of the principal axis, will emerge at the same angle on the other side of the principal axis.

(ii) Mirror formula:  $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

Magnification:  $m = \frac{-v}{u}$

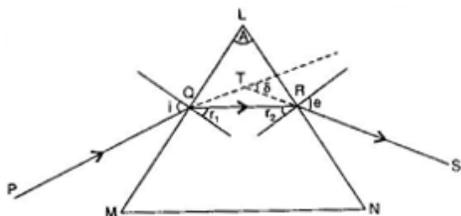
(iii)  $v = 45\text{ cm}$ ,  $f = -20\text{ cm}$ ,

Using  $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ , we get,  $\frac{1}{u} = \frac{1}{f} - \frac{1}{v} = \frac{1}{-20} - \frac{1}{45} = -\left[\frac{45+20}{900}\right] = \frac{-65}{900}$

$\Rightarrow u = \frac{-900}{65} = -13.8\text{ cm}$

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21.



- (i)  $\delta$  = Angle of deviation
- (ii)  $e$  = Angle of emergence
- (iii)  $A$  = Angle of prism

Or

**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 $60^\circ$ .	(v) The angular region covered is about $150^\circ$ .

22. Difference between Diamond and Graphite:

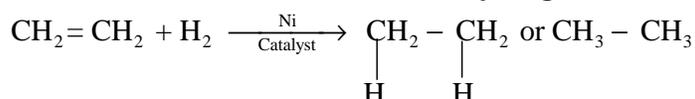
Diamond	Graphite
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- (d) Hard water contains  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions. Soap reacts with these ions of hard water and forms scum (precipitate) of insoluble calcium salt and magnesium salt. Scum sticks to the clothes. That's why soap does not produce lather or foam with hard water.
- (e) Pure acetic acid is called glacial acetic acid.

Or

- (a) When unsaturated hydrocarbons react with hydrogen in the presence of a catalyst like Nickel, the hydrogen gets added across the double/triple bond and saturated hydrocarbons are formed. Such reactions is called hydrogenation.



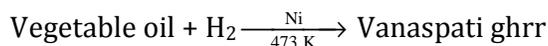
Ethene

Ethane

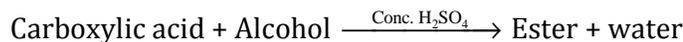
(Unsaturated)

(Saturated)

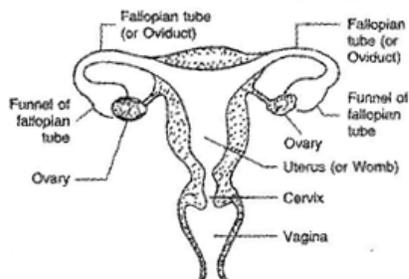
**Industrial Use:** It is used in the preparation of vanaspati ghee from vegetable oil.



- (b) When carboxylic acid reacts with alcohol in presence of conc.  $\text{H}_2\text{SO}_4$ , ester is formed. This is called esterification.



24. Female Reproductive system: The female germ-cells or eggs are made in the ovaries and are responsible for the production of some hormones. The human female reproductive system consists of the following organs:



**Human Female Reproductive System**

- (i) **Ovaries** are a pair of small and oval-shaped organs, located in the abdominal cavity near the kidney. Ovaries are the female primary reproductive organs which perform dual functions of production of female gamete or ovum and the secretion of female sex hormones, estrogen and progesterone.
- (ii) **Fallopian tubes or Oviduct** are a pair of long convoluted tubes that carry ova or eggs from the ovary to the uterus. The fallopian tube has a funnel shaped opening near the ovary. These tubes from both the sides open into an elastic bag-like structure, the uterus.
- (iii) **Uterus** or womb is a hollow, pear-shaped organ within which the embryo develops. Its upper portion is broader, while its lower portion is narrower, called cervix.

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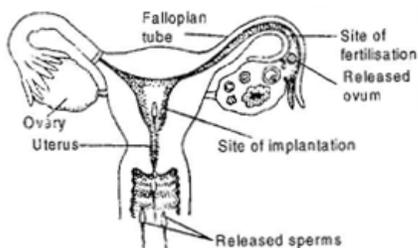
(iv) **Vagina:** The uterus opens into the vagina through the cervix. Vagina is a tubular structure called "Birth canal". It receives sperms from the male and also serves as the passage through which the fully developed foetus is born.

**Or**

The process of fertilization in human female is internal, i.e. it takes place inside the female human body.

**Sexual Reproduction in Human Beings:**

- The male gamete (sperm) is introduced inside the female genital tract (vagina) by the process of copulation or mating. Fertilization occurs in the fallopian tube.
- Sperms are highly active and mobile which move up through cervix into the uterus and then pass into the fallopian tubes.



**Fertilization takes place inside the fallopian tube**

- In the fallopian tube only one sperm fertilizes the ovum to form a zygote. This is called fertilization.
- Fertilization occurs only if copulation takes place during the ovulatory period.
- The embryonic development of the zygote starts immediately in the fallopian tube and pregnancy starts while menstruation stops.
- The embryo moves down to reach the uterus. The embedding of embryo in the thick inner lining of the uterus is called implantation.
- Then, a special tissue develops between the uterine wall and the embryo (foetus) called placenta, where the exchange of nutrients, oxygen and waste products takes place.
- The time period from the development of foetus inside the uterus till birth is called gestation.
- The act of living birth of the fully developed foetus at the end of gestation period is termed as parturition.
- The development of the child inside the mother's body takes approximately nine months.

**Section B**

25. (a) Figure IV is the correct representation of the resulting mixture.

(b) Acetic acid dissolves in water forming a true solution which is a homogeneous solution (clear solution).

26. Slide A – Binary fission in Amoeba, Slide B – Daughter cells of Amoeba.

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In binary fission of Amoeba, nucleus divides first, then the cytoplasm and daughter cells are formed.

27. 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.

28. (c)

29. (a)

30. (d)

31. (b)

32. (c)

33. (c)

34. (a)

35. (a)

36. (a)

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