CBSE – CLASS X SCIENCE- 2012

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) Questions number 1 to 4 in Section A are short answer type questions. These questions carry one mark each

(vi) Questions number 5 to 13 in Section A are short answer type questions. These questions carry two marks each

(vii) Questions number 14 to 22 in Section A are also short answer type questions and carry three marks each

(viii) Questions number 23 to 25 in Section A are long answer type questions and these questions carry five marks each

Q1

(i) CH_3COCH_3

Functional Group: Ketone

Formula — C(=O) —

(ii) C_2H_5CHOOH

Functional Group: Carboxylic acid

Formula — C(=O) — OH

Q2

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.

Q3

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

Q4

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

Q5

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

Q6

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

Q7

Advantages of water stored in the ground are:

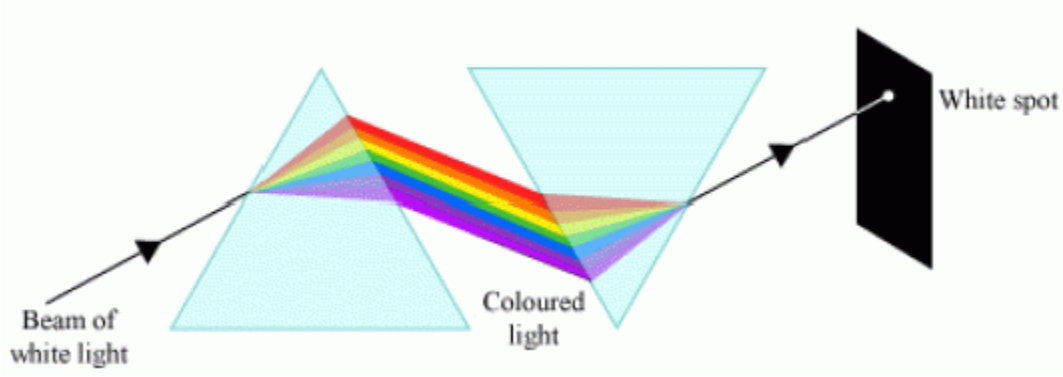
(i) It does not evaporate and is available to wells.
(ii) It does not provide breeding grounds for mosquitoes etc.
(iii) It provides moisture for vegetation over a wide range.
(iv) It is also protected from contamination by human and animal waste.

Q8

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.

Q9

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



Q10

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

Q11

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 M Cl_2.

Q12

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.

Q13

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.

Q14

(i) F, Cl, Br belong to same group 17. Atomic size increase 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 electro negativity.

Q15

STD stands for Sexually Transmitted Disease. These diseases 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.

Q16

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.**

Q17

Evolution is the cumulative changes that occur in a population over time. It is the result of change in the genetic makeup of the organism due to mutations and other sources of variation. The favorable 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 organization but cannot be considered 'better' to the earlier species.
- Evolution simply leads to diversification.

Q18

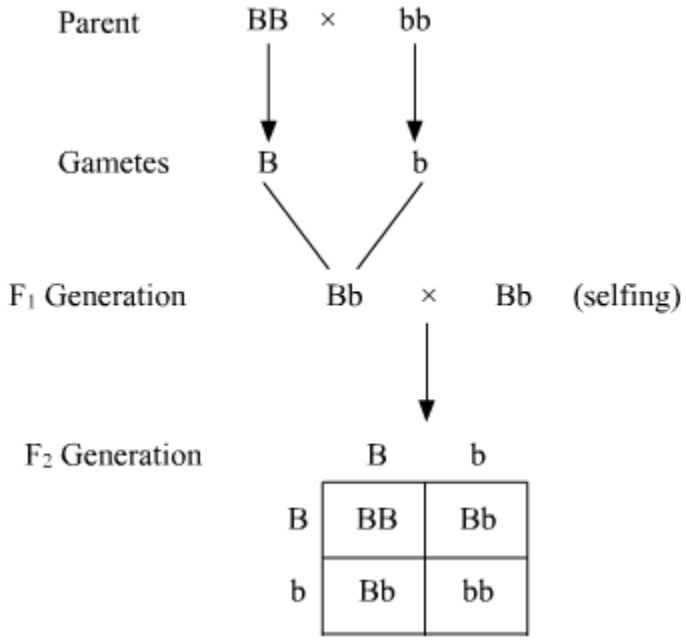
Blue colour flower plant – BB

White colour flower plant – bb

The cross involved is as follows:

Blue Colour Flower $\longrightarrow$ BB

White Colour Flower $\longrightarrow$ bb



(a) In F_1 generation, all plants will have blue flower.
(b) In the F_2 generation, 25% of flowers are white in color.
(c) The ratio of the genotypes BB and Bb in the F_2 generation would be 1(BB) : 2 (Bb).

Q19

(a) $CH_4 + O_2 \longrightarrow CO_2 + H_2O$ + Heat and Light

(b) $CH_2 + H_5OH \xrightarrow{\text{Hot Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$

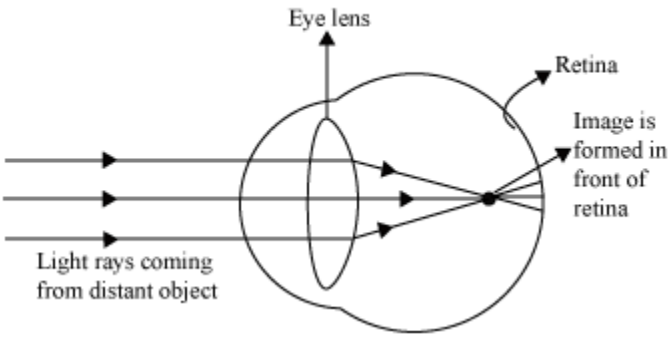
(c) $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

Q20

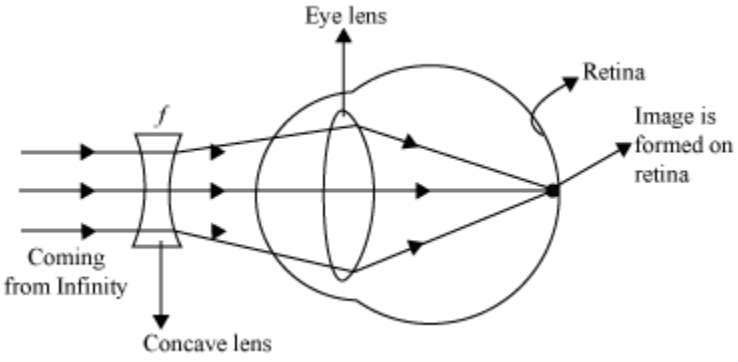
The defect of vision is myopia. It can be corrected by using a concave lens of suitable power.

Following are the ray diagrams:

(i) Defect of vision.



(ii) For its correction.



Q21

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.

Q22

$u = -36$ cm

$v = 72$ cm

$h = 2.5$ 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,

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

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

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

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

Q23

Sign conventions for spherical mirrors

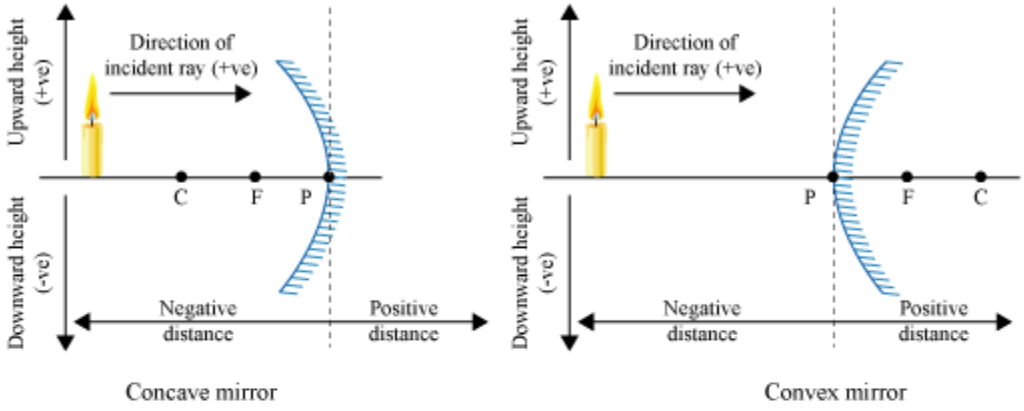
I. Objects are always placed to the left of the mirror i.e. light must fall on the mirror from left to right.

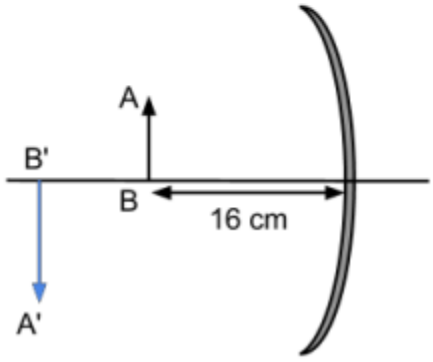
II. All distances are measured from the pole of the mirror.

III. Distances along the direction of the incident ray (along positive X-axis) are taken as positive.

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 (real image is inverted always)

u = $-16\ cm$

Now,

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

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

$v = -48\ cm$

Using mirror formula,

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

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

$f = -12\ cm$

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, $v_g = 2.10^8$ 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,

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

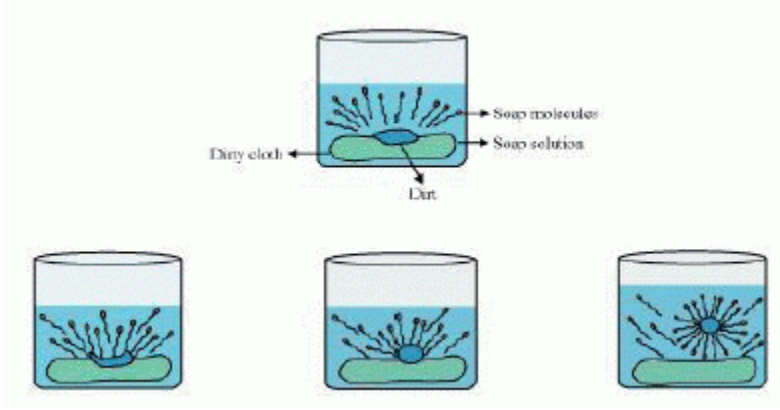
$$v_w = \frac{c}{n_w} = \frac{3 \times 10^8}{\left(\frac{4}{3}\right)} = 2.25 \times 10^8 \text{ m/s}$$

Q24

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 melting point is 351 K.	Its boiling point is 391 K.

Difference in chemical properties of ethanol and ethanoic acid

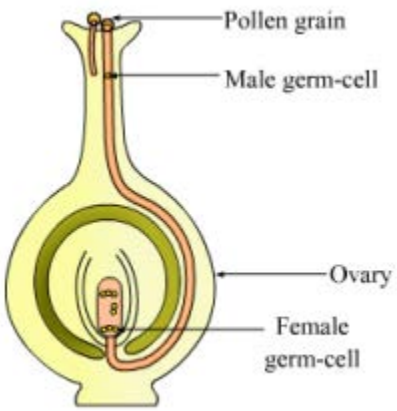
Ethanol	**Ethanoic acid**
1. It releases hydrogen gas on reaction	1. It does not release hydrogen gas on
with metallic sodium.	reaction with metallic sodium.
2. It does not release carbon dioxide	2. It releases carbon dioxide gas on reaction
gas on reaction with sodium bicarbonate.	with sodium bicarbonate.

Q25

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.

Q26

Both amoeba and yeast are unicellular organisms. In Amoeba, a single cell divides to give rise to two identical daughter cells by the process of binary fission. In yeast, the cells reproduce by the process of budding.

The Correct Answer is A

Q27

During budding in yeast, a single cell develops a protrusion wherein the nucleus divides to give rise to two daughter nuclei. One of the daughter nucleus migrates into the protrusion to form a bud. This bud then enlarges in size and may undergo budding while attached to the parent cell. Hence, budding results in a chain of cells.

The Correct Answer is D

Q28

The correct order of steps is a, d, c, b.

The Correct Answer is C

Q29

During binary fission, a single cell gets divided into two equal and identical daughter cells.

The Correct Answer is C

Q30

The raisins after being soaked in water are dried on a piece of filter paper in order to remove the excess water present on their surface.

The Correct Answer is D

Q31

The percentage of water absorbed by raisins is calculated by using the formula

$$\frac{W_2 - W_1}{W_1} \text{ x } 100$$

where, W_2 is the weight of wet raisin and W_1 is the weight of dry raisin.

The Correct Answer is D

Q32

The odour of vinegar is same as that of acetic acid. Also, being an acid (through weak) it turns blue litmus to red.

The Correct Answer is D

Q33

Acetic acid reacts with Na_2CO_3 to form sodium acetate, carbon dioxide and water. It is the colourless gas carbon dioxide gas which comes out as bubbles.

The Correct Answer is C

Q34

Acetic acid forms a homogeneous solution with water.

The Correct Answer is D

Q35

Cu is present in +2 oxidation state and iron is present in +3 oxidation state.

The Correct Answer is D

Q36

Reaction in beaker X: Fe + $CuSO_4$ (blue) $FeSO_4$ (green) + Cu

Reaction in beaker Y: Zn + $FeSO_4$ (green) $ZnSO_4$ (colourless) + Fe

The Correct Answer is D

Q37

Using Snell's law, sin i/sin r = n_2/n_1, check the ratio of the sine values of I and r which gives 1.5 (we know, n_2 = 1.5 and n_1 = 1) will be the answer.

The Correct Answer is D

Q38

Incident and emergent angles are measured from the normal of the plane.

The Correct Answer is C

Q39

The correct sequence of steps is c, d, a, e, b.

The Correct Answer is B

Q40

Screen is moved to get the focused image for a fixed object and mirror position.

The Correct Answer is A

Q41

Focal length is the distance between the focus and the mirror. The image of the distant object forms at the focus of the mirror.

The Correct Answer is B