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Class X Science

CBSE Board Set - 2

General Instructions:

(i)   The question paper comprises two sections, A and B. You are to attempt both the sections.

(ii)   All questions are compulsory.

(iii)   There is no choice in any of the question.

(iv)   All questions of Section – A and all questions of Section – B are to be attempted by separately.

(v)   Question numbers 1 to 3 in Section – A are two marks question. These are to be answered in about 30 words each.

(vi)   Question numbers 4 to 6 in Section – A are two marks question. These are to be answered in about 30 words each.

(vii)   Question numbers 7 to 18 in Section – A are three marks question. There are to be answered in about 50 words each.

(viii) Question numbers 19 to 24 in Section – A are five marks question. These are to be answered in about 70 words each.

(ix)   Question numbers 25 to 33 in Section – B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.

(x)   Question numbers 34 to 36 in Section B are two marks questions based on practical skills. These are to be answered in brief.

Q.1   Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n+2}.

Sol.1 C_nH_{2n+2} is general formula of alkanes.

The name of 2nd member of alkanes: Ethane

The formula of 2nd member of alkanes: C_2H_6 or $CH_3 – CH_3$

Q.2   What is the magnification of the image formed by plane mirrors and why?

Sol.2   Magnification is the ratio between the size of image to the size of the object So, $m = \frac{I}{O}$. Plane mirror produce images which have a magnification of 1. This is because of that, "images formed by plane mirrors are vertical, upright, left-right reversed, the same distance from the mirror as the object's distance and the same size as the object."

Q.3   What is meant by power of a lens?

Sol.3   Power of a lens:-

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The reciprocal of the focal length of a lens, expressed in meter, is called its power.

Representing focal length of a lens, expressed in meter, is called it's power

Therefore, $P = \dfrac{1}{f}$

Q.4   Write two differences between binary fission and multiple fission in a tabular form.

Sol.4

	Binary Fission		Multiple Fission
1.	Unicellular parent divides to form two daughter cells	1.	Parent nucleus divides repeatedly into many daughter cells.
2.	It occurs in most prokaryotes	2.	This occurs in eukaryotes

Q.5   **(a)** Why do need to our resources carefully?

(b) Why management of natural resources require a long term perspective?

Sol.5   (a) We need to manage our resources carefully because they are repeating day by day & we need to conserve them.

(b) Management of natural resources requires a long term perspective because it is aimed to fulfill the need of present as well as generation to come.

Q.6   List our measures that can be taken to conserve forests.

Sol.6   Four measures that can be taken to conserve forests are:-

1) Afforestation

2) Reforestation

3) Separation of Commercial forestry

4) Grazing should be regulated.

Q.7   Na, Mg and Al are the element of the same period of modern periodic table having one, two and three valence electrons respectively, which of these elements (i) has the largest atomic radius, (ii) is least reactive? Justify your answer starting reason for each case.

Sol.7   **(i)** We know that atomic radius decreases along the period with increase in atomic number. So the order of atomic radius would be

Na > Mg > Al

So, the element with highest atomic radius is Na.

(ii) All these elements are metals. Reactivity of metals decreases with decrease in atomic radius along the period.

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So, the order of reactivity is

Na > Mg > Al

Hence, Na is most reactive among the three.

Q.8 From in the following elements:

$_4Be$; $_9F$; $_{19}K$; $_{20}Ca$
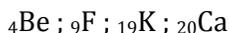
(i) Select the elements having one electron in the outmost shell.

(ii) two elements of the same group

Write the formula of and mention the nature of the compound formed by the union of $_{19}K$ and element X (2, 8, 7).

Sol. 8 **(i)** "K" has only one electron in the outermost shell

$_{19}K$: 2, 8, 8, 1
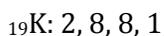
(ii) Be and Ca both are the members of 2nd group.

K has only one e^- in its outermost shell while the element X is only one e^- short from its octet.

So there would be transfer of one e^- from K to X.
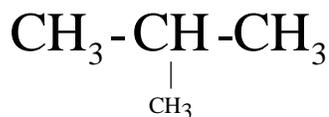
Formula of compound: KX

Nature of compound: Ionic or Electrovalent.

Q.9 What is the meant by isomers? Draw the structure of two isomers of butane, C_4H_{20}. Explain why we cannot have isomers of first three members of alkane series.

Sol.9 Isomers are those compounds which have same chemical formula but differ in their structural formula

Isomers of Butane: $CH_3 - CH_2 - CH_2 - CH_3$

n – Butane

$$CH_3\text{-}CH\text{-}CH_3$$
$$|$$
$$CH_3$$

2 – Methyl propane

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First three members of alkane series cannot have any isomers because there is only and only one structure possible for these.

$$CH_4 \quad CH_3\text{-}CH_3 \quad CH_3\text{-}CH_2\text{-}CH_3$$

Methane   ethane   Propane
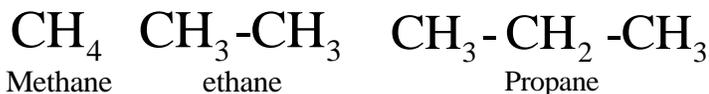
Q.10 What is the difference between the molecules of soaps and detergents, chemically? Explain the cleansing action of soaps.

Sol.10 **Soaps:** Soaps are water – soluble sodium or potassium salts of fatty acids.

Detergents: Detergents are usually alkyl benzene sulfonate.

Soaps are biodegradable while detergents are non-biodegradable.

Cleansing Action of soap:

Soap molecule has one polar head (sodium or potassium ion) and a non-polar tail (Chain of fatty acids)

The non- polar end is hydrophobic while the polar end is hydrophilic in nature.

When soap is dissolved in water, its hydrophobic end attaches itself to dirt while the hydrophilic end tends to move toward surface of water.

The molecules of soap arrange themselves in a micelle formation and trap the dirt at the centre. The overall force on the dirt particle pulls it out from the cloth and takes it toward the surface.
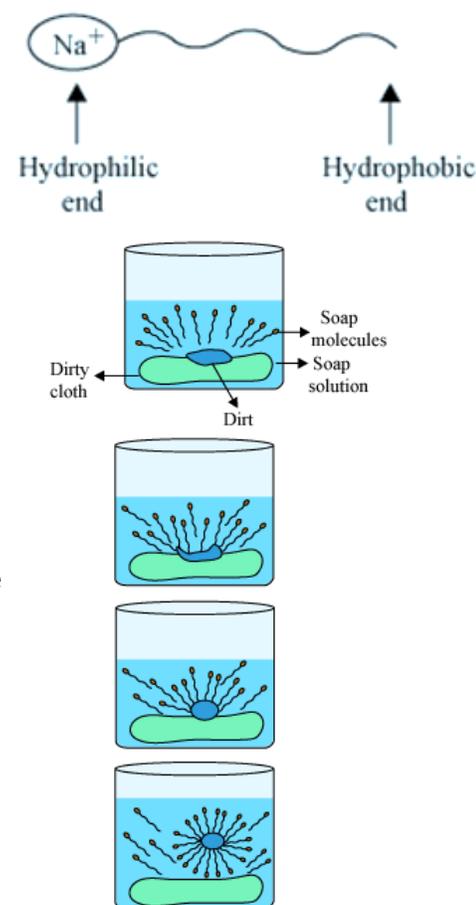
Q.11 What are sexually transmitted diseases. List two example of each diseases caused due to (i) bacterial infection and (ii) viral infection. Which device or devices may be used to prevent the spread of such diseases.

Sol.11 Sexually transmitted diseases are the diseases that can be transmitted from person to person by performing a sexual act.

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(i) Bacterial infection – Gonorrhea, Syphilis.

(ii) Viral infection – Warts, HIV-AIDS

Condom for the penis during sex helps to prevent transmission of many of these infections to some extent.

**Q.12** What is DNA copying? State its importance.

Sol.12 DNA copying is process of replication of DNA in which the DNA molecule separates to form two parent strands and then each strand is copied or replicated to form a daughter strand. **Importance of DNA copying: -** DNA copying helps in the formation of additional copies of DNA which can be passed on to the next generation. The inheritance of the DNA is responsible for variations in the offspring.

Q.13 Explain budding in hydra with the help of labeled diagram only.

Sol.13 **Budding in Hydra:-** Budding is a type of asexual reproduction. It involves production of new individual from an outgrowth or small projection, from the parent, called a 'bud'. It gradually enlarges in size & it develops a mouth & tentacles & later after it detaches from the parent body.

The new hydra becomes fully developed & it is attached to other location.
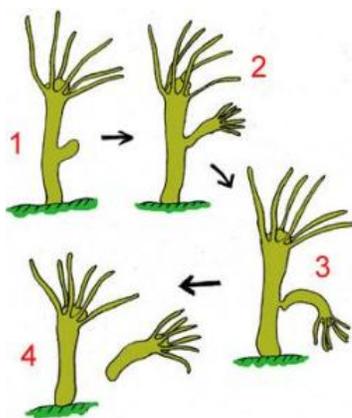
Hydra Budding

Q.14 what is speciation? List four factors responsible for speciation.

Sol.14 The origin of new species from the existing one due to reproductive isolation of a part of its population is called speciation. Four factors responsible for speciation are:-

1) Natural selection

2) Geographical isolation

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3) Genetic isolation

4) Mutation

Q.15   **(i)** Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animal together to establish a common evolutionary origin? Justify your answer.

(ii) "Birds have evolved from reptiles". State evidence to prove the statement.

Sol.15   **(i)** Yes, we can. The earliest eyes were photo receptors that sense light called eyespots. Eyespots can only sense brightness & distinguish light from dark. They are not involved in vision.

(1) Planaria :- Eyespot gradually evolved & formed a depression in the eyespot, that can slightly distinguish light direction.

(2) Insects: - Insects have ommatidia which evolved from eyespots.

(3) Octopus: - Octopus have eyes resembling a pin-hole camera. Blind spot is absent in the octopus eye.

(4) Vertebrates: - They also have eyes resembling a pin-hole camera. The only difference is that there is a blind spot.

(ii) Archaeopteryx is the connecting link between reptiles and birds. Archaeopteryx has toothed beak, long tail with many vertebrae and winged claws which are reptilian characters and feathered wings which is an avian character.

Q.16   After the examinations Rakesh with his friends went on a picnic to a nearby park. All friends carried cooked food packed in plastic bags or plastic cans. After eating the food some friends collected the leftover food and plastic bags etc. and planned to dispose them off by burning. Rakesh immediately checked them and suggested to segregate the leftover food and peels of fruits from the plastic materials and respectively dispose them off separately in the green and red dustbins placed in the corner of the park.

(a) In your opinion, is burning plastic an eco-friendly method of waste disposal? Why? State the advantage of method suggested by Rakesh

(b) How can we contribute in maintaining the parks and roads neat and clean?

Sol. 16 **(a)** Burning plastic is not an eco-friendly method of waste disposed because it will create is pollution. By segregating the left-over food & peels of fruits from plastic materials & disposing them off separately in green & red dustbins, management of wastes will be easier & it will not create pollution.

(b) We can take following measures:-

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1) We should keep dustbins in parks & at road sides.

2) Trees should be planted. Small height plants should be planted at road sides.

3) We should not throw wastes from eatables etc. anywhere.

Q.17 To construct a ray diagram we use two rays of light which are so chosen that it is easy to determine their directions after reflection from the mirror. Choose these two rays and state the path of these rays after reflection from a concave mirror. Use these two rays to find the nature and position of the image of an object placed at a distance of 15 cm from a concave mirror of focal length 10 cm.

**Sol. 17** Image: Inverted, real & magnified.

Ray (1) which falls parallel to the principle axis passes through the focus after reflection from the mirror.

Ray (2) falls at O and gets reflected by the law of reflection, so that ∠i = ∠r
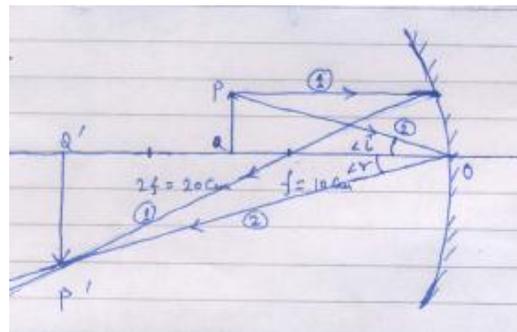
Q.18 With the help of a labeled diagram, explain why the sun appears reddish at the sun-rise and the sun-set.

Sol. 18 At the time of sun-rise and sun-set, the sun light has to pass through a thicker layer of atmosphere. Blue wavelength is scattered the most. Hence, blue light is scattered away, leaving mainly red color which reaches our eyes. Hence sky appears reddish.
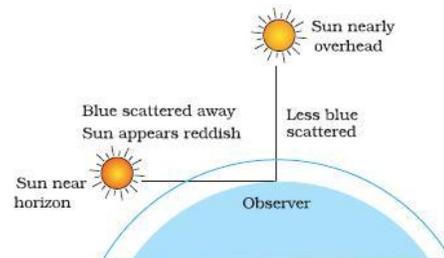
Q.19 The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 60 cm from the optical centre of the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 3 cm, find the height of its image.

Sol.19 $u = -30\ cm$

$v = 60\ cm$

Now, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{1}{60} - \frac{1}{-30} = \frac{3}{60} = \frac{1}{20}$

$\Rightarrow f = 20\ cm$. So, it is a convex lens

Now, $m = \frac{v}{u} = \frac{h_i}{h} \Rightarrow \frac{60}{-30} = \frac{h_i}{3} \Rightarrow$ h$_i$ $= -6cm$ Negative sign means the image is inverted.

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Q.20 (a) State the laws of refraction of light. Explain the term absolute refractive index of a medium and write an expression to relate it with the speed of light in vacuum.

(b) The absolute refractive indices of two media 'A' and 'B' are 2.0 and 1.5 respectively. If the speed of light in medium 'B' is 2×8^8 m/s, calculate the speed of light in:

(i) vacuum,
(ii) medium 'A'.

Sol. 20 Laws of refraction

(i) Incident, refracted and normal lies in the same plane to the interface of given two transparent media.

(i) The ratio of sine of angle of incidence and sine of angle of refraction is always constant for the light of given colour and for the pair of given media. It is also known as Snell's law of refraction

$$\frac{\text{Sin i}}{\text{Sin r}} = \mu = \text{constant}$$

Absolute refractive Index:-

When one medium is taken as vacuum and speed of light is taken in it, then the refractive index of second medium with respect to vacuum is called Absolute Refractive index and generally denoted by

$$\mu = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in given medium}}$$

$$\mu = \frac{c}{v}$$

(b) Given:- $\mu_A = 2$

$\mu_B = 1.5$

$V_B = 2 \times 10^8$ m/s

We have to find

(i) Vacuum,

Since, $(\mu)_m = \frac{c}{(V)_B} \Rightarrow 1.5 = \frac{c}{2 \times 10^8}$

$\Rightarrow c = 3 \times 10^8$ m/s

(ii) In medium 'A'

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Since, $(\mu)_A = \frac{c}{(v)_A}$

$\Rightarrow v_A = \frac{c}{\mu_A} = \frac{3\times10^8}{2} = 1.5 \times 10^8 m/s$

Q.21 A student is unable to see clearly the words written on the blackboard placed at a distance of approximately 4 m from him. Name the defect of vision the boy is suffering from. Explain the method of correction this defect. Draw ray diagram for the:

(i) defect of vision and also

(ii) for its correction.

Sol.21 (a) Myopia, or short sighted means having good near vision but poor distance vision. As the student is not able to see clearly the words written on the blackboard placed at a distance of 4 m.

(b) The defect is corrected by placing a concave lens before the eye.
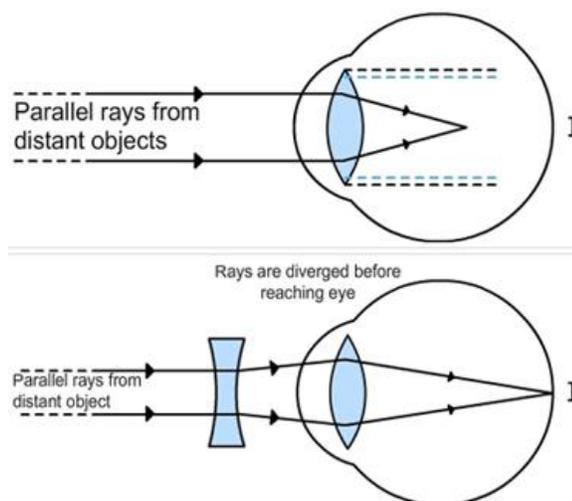
Q.22 Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reason for carbon forming a large number of compounds. Why does carbon from strong bonds with most other elements.

Sol. 22 Electronic configuration of carbon is 2,4. It has 4 electrons in its outer most shell. For stability, the number of electrons in outermost shell must be 8, for this carbon can either gain or lose 4 electrons.

But loosing or gaining 4 electrons, require large amount of energy. Hence, in place of gaining or losing 4 electrons, carbon does sharing of these 4 electrons to form 4 covalent bonds.

Reason for carbon forming a large number of compounds:

(i) **Catenation:** The tendency of carbon to form chains of identical atoms is known as catenation. Carbon forms long chains by combining with other carbon atoms through covalent bonds.

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(ii)   Tetravalency: It has 4 valence electrons, so it can form 4 covalent bonds with four different atoms, or two double bonds or a single and a triple bond with other atoms. This tendency helps carbon to form a large range of compounds.

Carbon forms strong bonds with most of other elements like H, O, S, N, Cl. Br, I etc. due to its small size which helps it to attract more number of electrons.

Q.23   How many pairs of chromosomes are present in human beings? Out of these how many are sex chromosomes? How many types of sex chromosomes are found in human beings?

"The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it". Draw a flaw chart showing determination of sex of a newborn to justify this statement.

Sol.23   23 pairs of chromosomes are present in human beings. Out of these only 1 pair is sex chromosomes. These are 2 types of sex chromosomes i.e. X & Y in human beings.
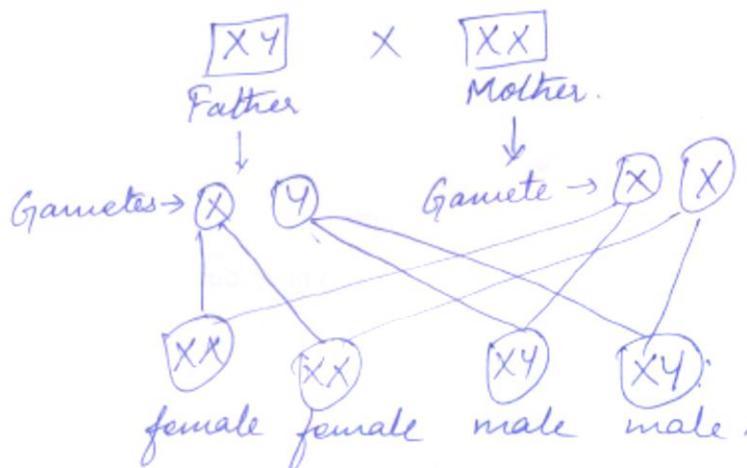
Q.24   Write the function of the following in human female reproductive system:

Ovary, oviduct, uterus

How does the embryo get nourishment inside the mother's body? Explain in brief.

Sol.24   Functions:-

(1) Ovary:-The ovaries produce eggs, one at a time, every alternate month.

(2) Oviduct: - Oviducts are the sites for fertilization of the eggs by the sperms.

(3) Uterus: - Uterus provides the site of implantation of the embryo.

The foetus remains attached to the mother through an umbilical cord which is embedded in a tissue called placenta at one end. The placenta in turn is embedded into the uterine wall &

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is richly supplied with vessels. The nutrients from the mother's blood pass into the umbilical cord through the placenta.

Q.25 A student has obtained a point image of a distant object using the given convex lens. To find the focal length of the lens he should measure the distance between the:

(A) lens and the object only

(B) lens and the screen only

(C) object and the image only

(D) lens and the object and also between the object and the image

Sol. 25 (B)

An object forms a point image only when the object is at infinity, which implies the image forms at the focal length. So, we need to measure only the distance between the lens and the screen.

Q.26 Study the following diagram and select the correct statement about the device 'X'

(A) Device 'X' is a concave mirror of radius of curvature 12 cm

(B) Device 'X' is a concave mirror of focal length 6 cm

(C) Device 'X' is a concave mirror of focal length 12 cm

(D) Device 'X' is a convex mirror of focal length 12 cm

Sol. 26(C)

Explanation A concave mirror forms a real image at the focus when toys rays are coming for infinity.

Q.27 After tracing the path of a ray of light through a glass prism a student marked the angle of incidence (∠i), angle of refraction (∠r) angle of emergence (∠e) and the angle of deviation (∠D) as shown in the diagram. The correctly marked angles are:
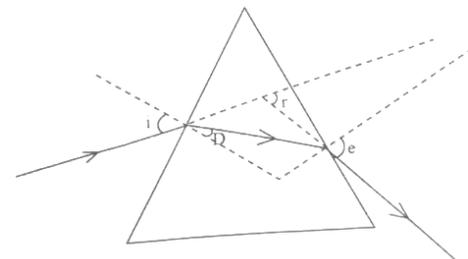
Sol.27
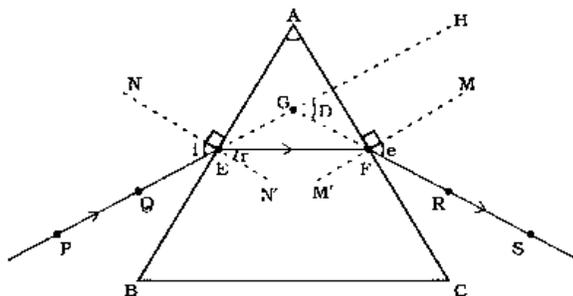

PE – Incident ray   ∠i – Angle of incidence
EF – Refracted ray   ∠r – Angle of refraction
FS – Emergent ray   ∠e – Angle of emergence
∠A – Angle of the prism   ∠D – Angle of deviation

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Q.28 Four students P, Q, R, and S traced the path of a ray of light passing through a glass slab for an angle of incidence 40° and measured the angle of refraction. The values as measured them were 18°; 22°; 25° and 30° respectively. The student who has performed the experiment methodically is

(A) P

(B) Q

(C) R

(D) S

Sol.28 Student Q has traced the path correctly

when light is travelling from a rarer medium to a denser medium, it bends towards the normal to the surface, while the light from a denser medium to a rarer medium bends away from the normal to the surface. Hence, the correct option is B.
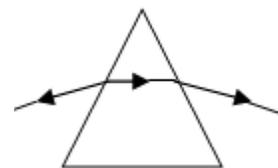
Q.29 Hard water is not available for an experiment. Some salts are given below:

(I) Sodium chloride

(II) Sodium sulphate

(III) Calcium chloride

(IV) Calcium sulphate

(V) Potassium chloride

(VI) Magnesium sulphate

Select from the following a group of these salts, each member of which may be dissolved in water to make it hard.

(A) I, II, V

(B) I, III, V

(C) III, IV, VI

(D) II, IV, VI

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Sol. 29 (C)

Explanation:

Hard water is that water which contains salts of calcium and magnesium. Thus the salts which can be used are Calcium Chloride, Calcium Sulphate & Magnesium Sulphate. i.e. III, IV & VI

Q.30 A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction. Some observation related to this are given below.

(I) Sodium hydroxide solution turns red litmus blue

(II) Sodium hydroxide readily dissolves in water

(III) The beaker containing solution appears cold when touched from outside

(IV) The blue litmus paper turns red when dipped into the solution

The correct observation are :

(A) I, II and IV

(B) I, II and III

(C) Only III and IV

(D) Only I and II

Sol. 30 **(D)**

Sodium hydroxide is a strong base so it turns red litmus blue. It is ionic in nature so readily dissolves in water to give Na^+ and OH^- ions. The process of dissolution of NaOH in water is exothermic so the beaker containing solution appears hot and not cold.

The correct observations are only I & II

Q.31 A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test tube well and leaves it to settle for some time. After about 5 minutes he observes that in the test tube there is:

(A) a clear transparent colorless solution

(B) a clear transparent pink solution

(C) a precipitate setting at the bottom of the test tube

(D) a layer of water over the layer of acetic acid

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Sol.31 (A)

Explanation:

Acetic acid is soluble in water. Molecules of acetic acid behave like a weak acid and get dissolved in it to give a clear transparent colorless solution.

Q.32 Four students A, B, C, and D reported the following set of organs to be homologous. Who is correct?

(A) Wings of a bat and a butterfly

(B) Wings of a pigeon and a bat

(C) Wings of a pigeon and a butterfly

(D) Forelimbs of cow, a duck and a lizard.

Sol. 32 (D)

Forelimbs of cow, duck & a lizard are homologous organs because their structure is same but each of them performs different functions.

Q.33 A student identified the various parts of an embryo of a gram seed and listed them as given below:

(I) Testa

(II) Plumule

(III) Radicle

(IV) Cotyledon

(V) Tegman

Out of these the actual parts of the embryo are:

(A) I, II, III

(B) II, III, IV

(C) III, IV, V

(D) II, IV, V

Sol.33 (B) II, III, IV

Testa & Tegmen are parts of a seed. Plumule, Radicle & Cotyledon are parts of an embryo.

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Q.34 To find the image – distance for varying object – distances in case of a convex lens, a student obtains on a screen a sharp image of a bright object placed very far from the lens. After that he gradually moves the object towards the lens and each time focuses its image of the screen.

(a) In which direction – towards or away from the lens, does the move the screen to focus the object?

(b) What happens to the size of image – does it increase or decrease?

(c) What happen when he moves the object very close to the lens?

Sol.34 (a) He moves the screen away from the lens.

(b) Size of image starts to increase and eventually image becomes virtual in character

(c) Virtual image is formed as the same side of the object, is erect & magnified.

Q.35 List two observations which you make when you add a pinch of sodium hydrogen carbonate to acetic in a test tube. Write chemical equation for the reaction that occurs.

Sol.35 $NaHCO_3 + CH_3COOH \rightarrow CH_3COONa + H_2O + CO_2$

1) Carbon-dioxide gas is evolved.

2) White precipitate of sodium acetate is formed.

Q.36 Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Draw the initial and the final stages of this type of reproduction. State the event with which this reproduction stars.

Sol.36 Parental identity is lost in binary fission which is a type of asexual reproduction. Mainly two events occur during reproduction

(1) Karyokinesis ; division of nucleus

(2) Cytokinesis; division of cytoplasm

Binary fission