

**CBSE**  
**Class X Science**  
**Sample Paper 3 – Solution**

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**SECTION A**

1. Resistance is the ratio of potential difference and current.
2. The main constituent of petroleum gas is butane.
- 3.

(a)

<b>Parents</b>	RRYY (Round, yellow) × rryy (Wrinkled, green)
<b>F<sub>1</sub></b>	RrYy (Round, yellow) × ?

The given cross is a dihybrid cross where two characters are taken into consideration.

(i) Since the F<sub>1</sub> progeny is self-pollinated, RrYy combination will be crossed with RrYy. Therefore, the correct genotype is RrYy.

(ii) Different combinations of characters produced in the F<sub>2</sub> progeny:

Round, yellow : Round, green : Wrinkled, yellow : Wrinkled, green = 9 : 3 : 3 : 1

	<b>RY</b>	<b>Ry</b>	<b>rY</b>	<b>ry</b>
<b>RY</b>	RRYY Round, yellow	RRYy Round, yellow	RrYY Round, yellow	RrYy Round, yellow
<b>Ry</b>	RRYy Round, yellow	RRyy Round, green	RrYy Round, yellow	Rryy Round, green
<b>rY</b>	RrYY Round, yellow	RrYy Round, yellow	rrYY Wrinkled, yellow	rrYy Wrinkled, yellow
<b>ry</b>	RrYy Round, yellow	Rryy Round, green	rrYy Wrinkled, yellow	rryy Wrinkled, green

(b)

(i) If the object is moved to F<sub>1</sub>, the image will be formed at infinity, and the nature of the image is real, inverted and highly magnified.

(ii) If the magnification of the lens is –2 cm, then it means that the image is real, inverted and magnified.

4.

- (a) Solutions B and D
- (b) Solutions A and C
- (c) Solutions A and D
- (d) Solution C is highly acidic, and solution B is highly alkaline.

5. (iv) four times

$$P = \frac{V^2}{R}$$

$$P = \frac{(2V)^2}{R} = 4 \left( \frac{V^2}{R} \right)$$

**OR**

(iii) kilowatt hour

Commercial unit of energy is kilowatt hour.

6. (iii) 0 Hz

The frequency of direct current is 0 Hz.

7. (ii) 150°

With one eye open, a human being has a horizontal fieldview of about 150°.

8. (i) Chipko Movement

The Chipko Movement was started by the women of Advani village in Reni, Garhwal, against the felling of trees.

**OR**

(iv) All of these

Reduction in global warming can be achieved by using fans, CFL bulbs, energy-efficient electric appliances, planting more trees etc.

9. (c) (c) and (d)

Development of placenta and secretion of oestrogen are functions associated with the female reproductive system. The testes is a part of the male reproductive system.

10.(i) Copper, when exposed to moist air, forms a green coating on the surface. This green coating is of copper carbonate.

11.(i)  $2\text{CO} + \text{O}_2 \xrightarrow{\Delta} 2\text{CO}_2$  is an example of a combination reaction.

**12.(c) neutrophils and monocytes**

Phagocytosis involves neutrophils and monocytes. During inflammation due to localised invasion of germs or injury, leucocytes destroy germs by phagocytosis.

**OR**

(b) 15–18 times/min

On an average, the adult human being at rest breathes 15–18 times per minute.

**13.ii) Both A and R are true, but R is not the correct explanation of the assertion.**

Arteries are thick-walled and elastic in nature because they carry blood under tremendous pressure.

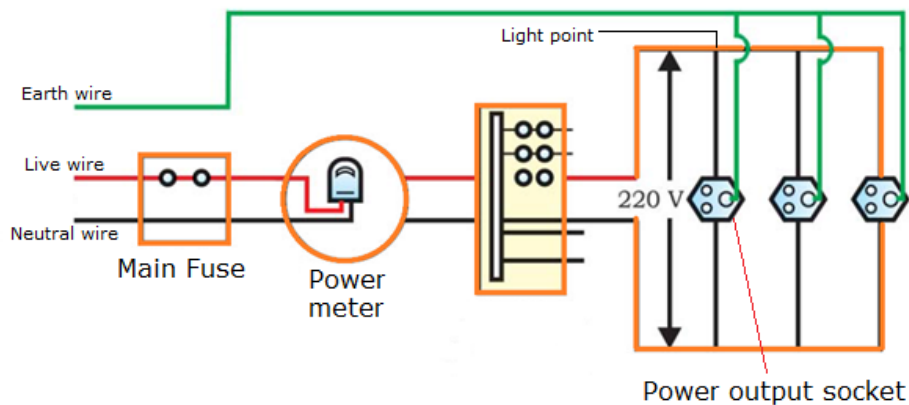
**14. A is true, but R is false.**

When white light passes through a glass prism, red colour is deviated the least because red colour has maximum speed in the prism.

**Section B**

**15.**

(a) Domestic wiring circuit:



(b) The on/off switch of the mains is connected to the live wire.

**16. Translocation is the movement of materials from the leaves to the other parts of the plant body.**

During photosynthesis, carbohydrates from the leaves are transported to non-photosynthetic parts of plants such as roots, stem and fruits. This process is performed by translocation. Therefore, translocation is essential in plants.

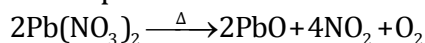
Sugars are synthesised in the leaves of plants. Plant hormones are not secreted by any gland. However, each plant cell can produce hormones.

**17.** Self-pollination is the process of transferring the pollen from the anther to the stigma in the same flower. Cross-pollination is the transfer of pollen grains from the anther of a flower to the stigma of another flower in a different plant of the same or different species.

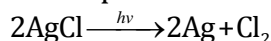
Double fertilisation is the process in angiosperms (flowering plants) during reproduction in which two sperm nuclei from each pollen tube fertilise two cells in an ovary. The pollen grain adheres to the stigma of the carpel (female reproductive structure) and grows a pollen tube which penetrates the ovum through a tiny pore called a micropyle. Two sperm cells are released into the ovary through this tube. One of the two sperm cells fertilises the egg cell (at the bottom of the ovule near the micropyle), forming a diploid ( $2n$ ) zygote. The other sperm cell fuses with two haploid polar nuclei (contained in the central cell) in the centre of the embryo sac (or ovule). The resulting cell is the triploid ( $3n$ ) primary endosperm nucleus. This triploid cell divides through mitosis and forms the endosperm, a nutrient-rich tissue, inside the seed.

**18.**

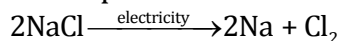
(a) Decomposition reaction where heat is supplied for energy:



(b) Decomposition reaction where light is supplied for energy:



(c) Decomposition reaction where electricity is supplied for energy:



**19.** Mendel's experiment can be studied in the following ways:

(i) Mendel first crossed pure-bred, tall pea plants with pure-bred, short pea plants and found that tall pea plants were produced in the  $F_1$  generation.

(ii) Mendel crossed tall pea plants of the  $F_1$  generation and found that tall plants and dwarf plants are in the ratio 3:1. Mendel observed that the dwarf trait of the pea plant which had disappeared in the  $F_1$  generation progeny reappeared in the  $F_2$  generation. He concluded by saying that traits are inherited independently.

**20.**

(a) As the resistors are connected in parallel, the voltage across each resistor is the same. Hence, current through each resistor is

$$I_5 = \frac{V}{5} = \frac{12}{5} = 2.4 \text{ A}$$

$$I_{10} = \frac{V}{10} = \frac{12}{10} = 1.2 \text{ A}$$

$$I_{20} = \frac{V}{20} = \frac{12}{20} = 0.6 \text{ A}$$

(b) Total current in the circuit is

$$I = I_5 + I_{10} + I_{20}$$

$$\therefore I = 2.4 + 1.2 + 0.6$$

$$\therefore I = 4.2 \text{ A}$$

(c) Total resistance in the circuit is

$$V = IR_{\text{eq}}$$

$$\therefore R_{\text{eq}} = \frac{V}{I} = \frac{12}{4.2}$$

$$\therefore R_{\text{eq}} = 2.85 \Omega$$

**OR**

Rating of the electrical appliance is 200 V–100 W.

Therefore, the resistance of the appliance is

$$P = \frac{V^2}{R}$$

$$\therefore R = \frac{V^2}{P} = \frac{200^2}{100}$$

$$\therefore R = 400 \Omega$$

Total power consumed by 5 bulbs will be 500 W.

Hence, for a four-hour operation, the energy consumed is

$$E = Pt$$

$$\therefore E = 500 \times 4 = 2000 \text{ Wh} = 2 \text{ kWh}$$

Cost of electricity per unit is Rs 4.60.

Hence, the total cost is

$$\text{Cost} = 2 \times 4.60 = \text{Rs. } 9.2$$

**21.** Ozone is a molecule formed by three atoms of oxygen. The ozone layer forms a thick layer in the stratosphere, encircling the Earth. In the first step, solar ultraviolet radiation breaks apart one oxygen molecule ( $\text{O}_2$ ) to produce two oxygen atoms (2O). In the second step, each of these highly reactive atoms combines with an oxygen molecule to produce an ozone molecule ( $\text{O}_3$ ).

It may affect an ecosystem in the following ways:

(a) At the surface of the Earth, it is a deadly poison for all lower forms of life.

(b) If this layer gets depleted, then it may cause cancer in human beings.

**OR**

Biomagnification is the increasing concentration of a substance, such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain.

In the food chain,

Grass ----> Grasshopper ----> Frog ----> Snake ----> Peacock

Peacock occurs at the highest trophic level (on the extreme right); therefore, it will have the maximum concentration of harmful chemicals in its body.

**22.** Rusting of iron can be prevented by painting, oiling, greasing, galvanising, chrome plating or making an alloy.

- (a) Galvanisation is a method of protecting rusting of steel and iron by coating them with a thin layer of zinc.
- (b) Alloying is also a very good method of improving the properties of metals. When iron is mixed with chromium and nickel, we get stainless steel which does not rust.
- (c) When moisture comes in contact with the metal surface, it oxidises and forms a coating of rust on it. As oil and water do not mix with each other, oiling forms a protective layer on the metal surface and hence prevents rusting.
- (d) Painting is yet another cost effective method of preventing corrosion.

**23.**

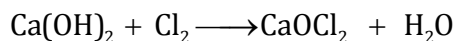
- (a) When we enter a darkened room from bright sunlight, we are unable to see at first. This is because the size of the pupil is small. When we enter the dark room, the pupil expands and more light enters the eye enabling us to see.
- (b) The iris controls the size of the pupil. So, when our eye encounters bright light, the iris contracts the pupil and protects the retina from damage.
- (c) A person is wearing spectacles of power +1.5 D. So, the lens has a positive focal length which indicates that he is wearing a convex lens. Hence, he is suffering from hypermetropia or long-sightedness. For a person wearing spectacles of power –1.5 D, the lens has a negative focal length which indicates that he is wearing a concave lens. Hence, he is suffering from myopia or short-sightedness.

**24.**

- (a) Test the three solutions with blue litmus paper; one solution will change blue litmus red. This solution is acidic.
- (b) Test the remaining two solutions with the red litmus paper [which changed in activity (a)]; one solution will change it again to blue. This solution is basic.
- (c) So, the third solution is distilled water.

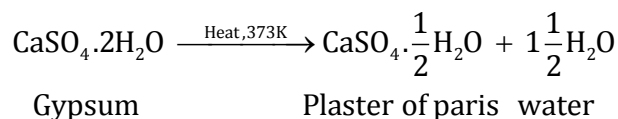
**OR**

- (a) Bleaching powder

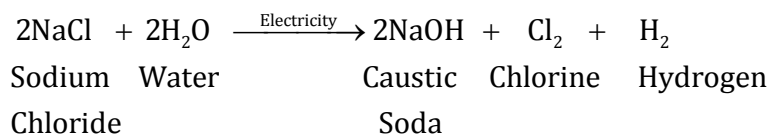


Calcium	Chlorine	Calcium	Water
oxide		oxychloride	

(b) Plaster of Paris



(c) Caustic soda

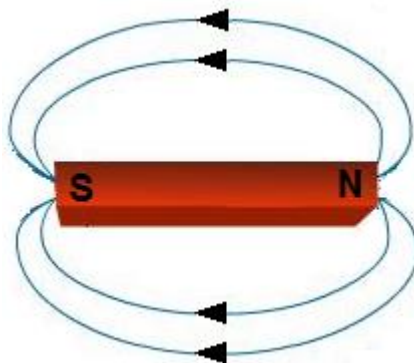


## Section C

25.

(a) The space around a magnet in which the force of attraction and repulsion due to the magnet can be detected is called the magnetic field. The direction of the magnetic field is taken to be the direction in which the North Pole of the compass needle moves inside it.

(b) Magnetic field lines around a magnet:



(c) Properties of magnetic field lines:

- (i) Field lines originate from the North Pole and end at the South Pole.
- (ii) Magnetic field lines come closer to one another near the poles of a magnet, but they are widely separated at other places.
- (iii) Field lines do not intersect each other.

**OR**

A dynamo works on the principle of electromagnetic induction. The current produced by moving a straight wire in a magnetic field is called induced current. The phenomenon is called electromagnetic induction.

A dynamo converts mechanical energy to electrical energy.

A dynamo is also known as an electric generator.

After every half revolution, each side of the generator coil starts moving in the opposite direction in the magnetic field. The side of the coil which was initially

moving downwards in the field starts moving in the opposite direction after a half revolution. And again after a half revolution, it starts moving in the upward direction. Due to this change in direction of motion of the coil, the direction of current in them also changes after every half revolution.

**26.** From the electronic configuration, it is clear that the compound is chlorine (Cl).

- (a) Atomic number: 17
- (b) Chlorine is a non-metal.
- (c) F, as it belongs to the same group as the element chlorine.
- (d) The compound is sodium chloride (NaCl) also known as common salt.
- (e) The compound is calcium bicarbonate  $\text{Ca}(\text{HCO}_3)_2$  which causes temporary hardness of water.

**27.** The process by which a new species develops from the existing species is known as speciation.

Factors which lead to speciation:

- (i) Geographical isolation
- (ii) Genetic drift
- (iii) Natural selection
- (iv) Reduction in gene flow

Geographical isolation cannot be a major factor in speciation of a self-pollinating plant as it does not depend on another plant for reproduction.

**OR**

(a) The testes produce sperms and secrete the hormone testosterone which helps in the development of the testes and secondary sexual characters.

(b)

- (i) Fertilisation takes place in the fallopian tube.
- (ii) Implantation occurs in the uterus.

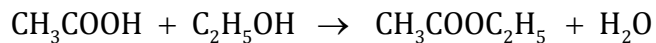
The embryo gets nourishment from the mother's blood by a special disc-shaped tissue embedded in the uterine wall called the placenta. It contains villi on the embryo's side and blood vessels surrounding the villi on the mother's side. Glucose and oxygen pass from the mother to the embryo through the placenta. Also, waste substances are removed through the placenta and enter the mother's blood.



28.

(a) Compound A with molecular formula  $C_2H_4O_2$  is ethanoic acid, also called acetic acid. Its structural formula is  $CH_3COOH$ . A dilute solution of acetic acid called vinegar is used as a preservative of pickles.

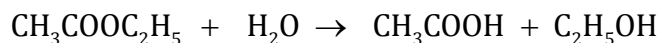
(b) Compound A reacts with ethanol to form compound B which is an ester and has a pleasant smell. The reaction is called an esterification reaction.



Ethanoic acid

Ethyl ethanoate

(c) Compound A can be obtained from ethyl ethanoate by reacting with water in the presence of dilute hydrochloric acid acting as a catalyst.



Ethyl ethanoate

Ethanoic acid

(d) The process is ester hydrolysis.

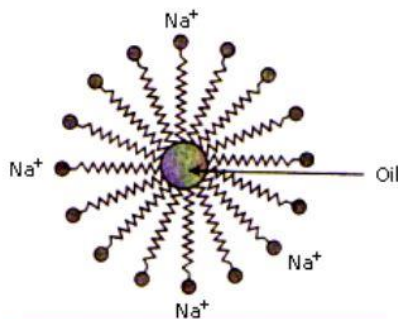
(e) Carbon dioxide is evolved with effervescence when compound A reacts with washing soda.

**OR**

(a) A soap is a sodium or potassium salt of long chain fatty acids. A soap molecule has two parts, namely the non-polar (hydrocarbon) hydrophobic chain and the polar (ionic) hydrophilic head,  $COO-Na^+$ .

The long hydrocarbon chain being hydrophobic is insoluble in water but soluble in oil and grease. On the other hand, the ionic part of soap being hydrophilic is soluble in water but insoluble in oil and grease.

When soap is added to water, soap molecules arrange in a cluster to keep the non-polar hydrophobic tail towards the interior of the cluster and the polar hydrophilic head towards water. Since the dirt present on clothes is organic in nature and insoluble in water, the hydrophobic ends of the clusters attach to the dirt. This cluster formation in which the dirt is entrapped is the micelle. The micelles stay in solution as a colloid and does not come together to precipitate because of ion-ion repulsion.



**Formation of Micelles**

Micelle formation does not occur in alcohol because the alkyl chain of soap becomes soluble in alcohol.

(b) Soap does not work properly when water is hard. A soap is a sodium or potassium salt of long chain carboxylic acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions, which are present in hard water, readily react with the carboxylate ion of the soap to form insoluble substance called scum. A lot of soap is wasted in the process.

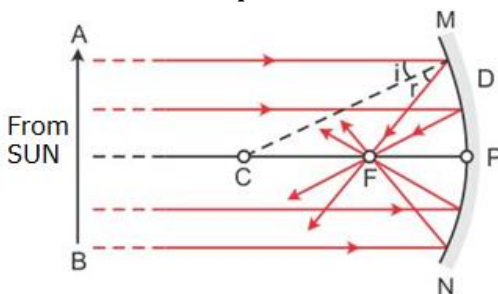
29.

(a) Separation of oxygenated and deoxygenated blood allows a highly efficient supply of oxygen to the body. This is especially important in birds and mammals which have high energy needs and constantly use energy to maintain their body.

(b) The lungs contain millions of alveoli which provide a surface for the exchange of gases. An extensive network of blood vessels is present in the wall of the alveoli. By lifting our ribs and flattening the diaphragm, the chest cavity becomes spacious. Air is sucked into the lungs and alveoli. The oxygen from the breath diffuses into the blood and carbon dioxide from the blood (brought from all over the body) diffuses out to the air.

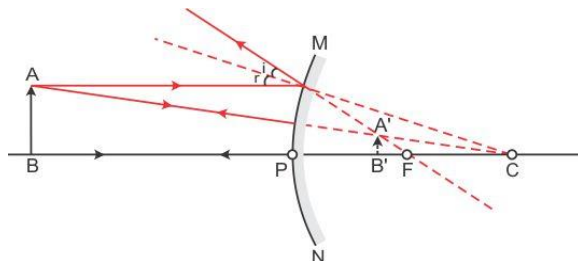
The trachea has rings of cartilage around it. These rings of cartilage prevent the trachea from collapsing when we breathe out.

30. The mirror used in a solar furnace is a concave mirror. Image formed by a concave mirror when placed inside a solar furnace:



The mirror used as a rear-view mirror is a convex mirror.

Image formed by a convex mirror:



A concave mirror can form a magnified and virtual image. A convex mirror cannot form an enlarged image. When the object is placed between the pole and the focus of the mirror, the image formed is virtual, enlarged and erect.

