Answers to RST–DS2/Set-2

1. (*d*) Only (*i*)

2. (*b*) increases abruptly

3. (*a*) P > Q > R > S

The pH value and hydrogen ion concentration are inversely proportional. This means if hydrogen ion concentration increases, the pH decreases, causing solution to become more acidic.

4. (*a*) Both are placed externally in the body of the animal.

5. (*b*) Aluminium – 13(2, 8, 3)

6. (*c*) (*i*) and (*iii*)

7. (*a*) Aluminium reacts with steam to form aluminium oxide and hydrogen.

$2Al(s) + 3H_2O(g) \longrightarrow Al_2O_3(s) + 3H_2(g)$

8. (*c*) (*iii*) and (*iv*)

9. (*b*) more at the ends/poles

10. (*b*) Chemical method

11. (*a*) Basic copper carbonate

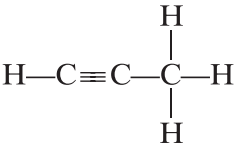
12. (*c*) DNA

13. (*d*) Sodium hydrogen carbonate

14. (*c*) (*ii*) and (*iv*)

15. (*b*) 220 V, 50 Hz

16. (*d*)



17. (*b*) Both A and R are true and R is not the correct explanation of A.

18. (*a*) Both A and R are true and R is the correct explanation of A.

19. (*d*) A is False but R is true.

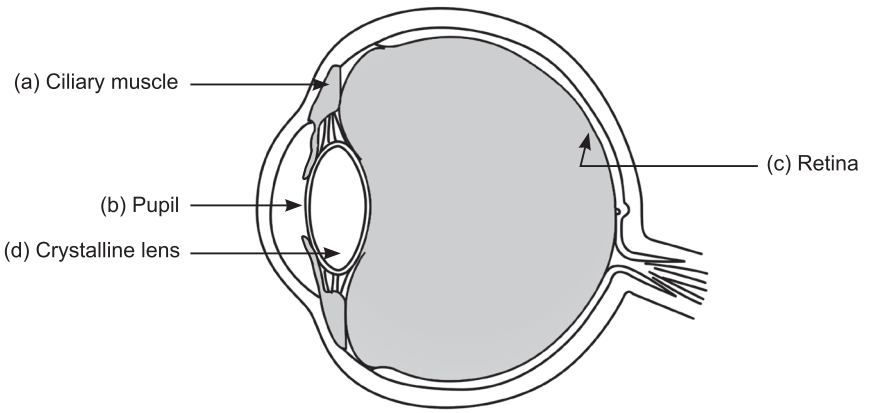
20. (*b*) Both A and R are true and R is not the correct explanation of A.

21. (*a*) The defect of the eye is myopia also known as near-sightedness.

(*b*) Myopia defect may arise due to

- elongation of the eyeball
- excessive curvature of the eye lens.

OR



22. (*a*) (*i*) The salt 'X' is bleaching powder, calcium oxychloride ($CaOCl_2$)

(*ii*) $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

(*b*) Bleaching power is used

- for disinfecting drinking water to make it free of germs.
- as an oxidising agent in many chemical industries.
- for bleaching cotton and linen in the textile industry (*any two*)

OR

(*a*) (*i*) The salt 'X' is baking soda, sodium hydrogen carbonate ($NaHCO_3$).

(*ii*) $NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$

(*b*) $NaHCO_3$ is mild non-corrosive base so it is a basic salt. Its pH would be around 8.2.

The acid and base from which sodium hydrogen carbonate is formed are carbonic acid (H_2CO_3) and sodium hydroxide (NaOH)

$H_2CO_3 + NaOH \longrightarrow NaHCO_3 + H_2O$

23. (*a*) In series, $R_S = R_1 + R_2$

$= 2 + 4 = 6\ \Omega$

By applying Ohm's law

$$I = \frac{V}{R} = \frac{12}{6} = 2 \text{ A}$$

$$P_S = I^2R = (2)^2 \times 4$$

$$= 2 \times 2 \times 4 = 16 \ \Omega$$

(*b*) In parallel

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{44} + \frac{1}{4}$$

$$= \frac{1+11}{44} = \frac{12}{44}$$

$$R_P = \frac{44}{12}$$

$$I = \frac{V}{R}$$

$\Rightarrow$ $$I = \frac{22 \times 12}{44} = 6\text{A}$$

$$P_P = I^2R$$

$$= (6)^2 \times 4 = 144 \text{ W}$$

24. (*a*) The experimental set up done by Amita shows that carbon dioxide is necessary for photosynthesis.

(*b*) Potassium hydroxide has been kept in the watch glass in set up (*i*).

Potassium hydroxide absorbs the carbon dioxide present in the bell jar.

(*c*) In set up (*i*), the leaf of the plant remains colourless showing the absence of starch. This is due to the carbon dioxide in set up (*i*) has been absorbed by potassium hydroxide and the plant has not performed photosynthesis in the absence of carbon dioxide.

25. (*a*) Red colour has the largest wavelength. It is scattered the least by fog or smoke. Hence it can be seen from maximum distance. That is why red colour is selected for danger signal lights.

(*b*) When sunlight passes through the earth's atmosphere, it is scattered in all directions by the gaseous and other fine particles present in the atmosphere.

The blue colour has a shorter wavelength than the red. So, according to Rayleigh scattering law, the blue colour of sunlight is scattered more strongly by the large number of fine particles having size smaller than the wavelength of visible light in the earth's atmosphere. The scattered blue light enters our eyes, hence the sky appears blue.

26. (*a*) (*i*) Heredity

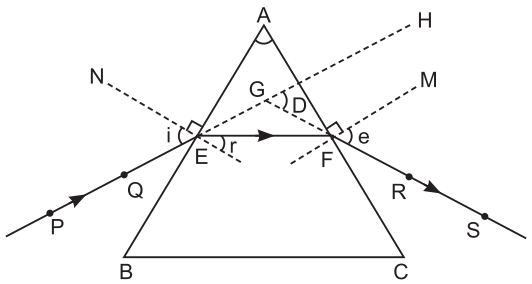
(*ii*) Genes

(*b*) Mendel selected garden pea plant as it

- was easy to grow.
- had a short life cycle.
- had distinct contrasting variants of features.
- is bisexual (*any two*)

27. **Angle of prism:** A triangular glass prism has two triangular bases and three rectangular lateral surfaces. These surfaces are inclined to each other at some suitable angle, which is called angle of prism.

Angle of deviation: The peculiar shape of the prism makes the emergent ray bend at an angle to the direction of the incident ray. This angle is called angle of deviation.



$\angle i$ — Angle of incidence

$\angle e$ — Angle of emergence

$\angle$A — Angle of prism

$\angle$D — Angle of deviation

28. (*a*) A base in aqueous solution ionises to produce $OH^-(aq)$ ions. For example,

$$NaOH(s) \xrightarrow{H_2O} Na^+(aq) + OH^-(aq)$$

Due to the presence of $OH^-(aq)$ ions in the solution, a base conducts electricity.

(*b*) Dilution of concentrated acid i.e. adding acid to water is a highly exothermic process. If water is added to concentrated acid, the heat produced is so large that the solution may splash out and the beaker in which the dilution is carried out may break due to excessive localised heating.

(*c*) Calcium chloride is a salt of strong acid (HCl) and strong base [$Ca(OH)_2$] so it is neutral.

$Ca(OH)_2(aq) + 2HCl\ (aq) \longrightarrow CaCl_2\ (aq) + 2H_2O(l)$

Ammonium chloride is a salt of strong acid (HCl) and weak base (NH_4OH) so it is acidic in nature.

$NH_4OH\ (aq) + HCl\ (aq) \longrightarrow NH_4Cl + H_2O$

29. (*a*) Nitrogen and phosphorus are absorbed by plants in the inorganic form. Nitrogen is taken up as nitrates and phosphorus as phosphates.

(*b*) (*i*) Differences between respiration in plants and respiration in animals

Respiration in plants	Respiration in animals
– Occurs at a slower rate.	– Occurs at a faster rate.
– Each part respires individually.	– Performs respiration as a single unit.
– Little transport of gases from one part to another.	– Gases are transported over long distances.

(*ii*) Differences between Artery and Vein

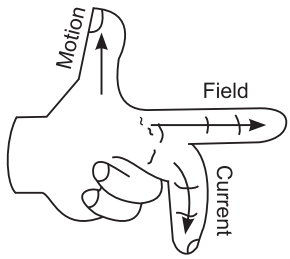
Artery	Vein
– It carries oxygenated blood from heart to body parts except pulmonary artery.	– It carries deoxygenated blood from body parts to heart except pulmonary vein.
– The wall is thick and elastic.	– The wall is thin and less elastic.
– It is deep seated.	– It is present superficially.

30. (*a*) The factors on which the direction of force depends upon are:

- direction of current
- direction of magnetic field

(*b*) The devices that use current carrying conductors and magnetic fields are electric motor, electric generator, loudspeakers, microphones etc. (*any two*)

(*c*) **Fleming's Left-Hand Rule:** Stretch the thumb, forfinger and middle finger of the left hand mutually perpendicular to each other such that the forefinger point towards the direction of magnetic field, the middle finger points in the direction of current, then the thumb will indicate the direction of force experienced by the conductor. It is to be applied only when the current and magnetic fields both are perpendicular to each other.



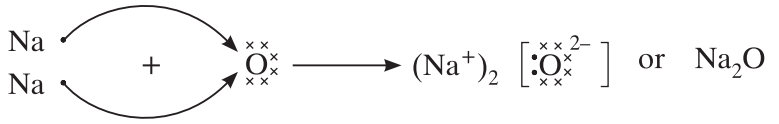
31. (*a*) Chlorofluorocarbons (CFCs) produce active radicals in the presence of ultraviolet radiations. These radicals, through chain reactions, then destroy the ozone by converting it into oxygen and thus thickness of ozone layer declines.

(*b*) More energy will be available to hawk in food chain II.

As per 10% law, energy available at any trophic level in a food chain is 10% of the previous one and out of the rest 90% a great deal of energy is lost as heat to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. Since hawk is present at 4th trophic level in food chain II whereas in food chain I, hawk is present at 5th trophic level, so hawk will have more energy in food chain II.

32. The compounds formed by the transfer of electrons from a metal to a non-metal are known as ionic compounds.

Formation of sodium oxide by electron dot transfer



Most of the ionic compounds are solids and hard because of the strong force of attraction between the positive and negative ions.

OR

(*a*) (*i*) Roasting

(*ii*) Reduction

(*b*) An alloy is a homogeneous mixture of two or more metals or a metal and a non-metal.

Alloy is prepared by first melting the primary metal and dissolving the other elements in it in definite proportion. It is then cooled to room temperature.

Composition of alloys

(*i*) Brass—Copper and zinc

(*ii*) Solder — Lead and tin

33. Self pollination can take place in *Hibiscus* or mustard or any other bisexual flower.

When a pollen lands on a compatible stigma, a pollen tube grows through the style, to reach the female germ cell in the ovary to cause fertilisation.

Events that occur till the seed formation in the ovary

- The male germ cell fuses with the female germ cell to form a zygote.
- Zygote divides several times to form an embryo within the ovule.
- The ovule develops tough coat and gradually gets converted into a seed.

34. (*a*) (*i*) $Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI_2\downarrow + 2KNO_3(aq)$

(*ii*) $2H_2S(g) + 3O_2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$

(*iii*) $2K(s) + 2H_2O(l) \longrightarrow 2KOH(l) + H_2(g)$

(*b*) She will observe the white salt of AgCl turns to grey in colour.

Silver chloride is white in colour. When it is exposed to the sunlight, it turns grey.

The type of reaction which takes place is decomposition reaction. It is also called photolytic decomposition as silver chloride decomposes in presence of sunlight.

$2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$

Photolytic decomposition of silver chloride is used in black and white photography.

OR

(*a*) 'X' — Calcium oxide (CaO) or Quick lime

'Y' — Calcium hydroxide [$Ca(OH)_2$] or Slaked lime.

(*b*) A vigorous reaction takes place between quick lime and water. This reaction is highly exothermic, a lot of heat is given out due to which the beaker becomes hot.

(*c*) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2 + Heat$

(*d*) The type of reaction is combination reaction. When two or more substances (elements or compounds) combine to form a single product, the reaction is called a combination reaction.

(*e*) Solution 'Y' is calcium hydroxide. It reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls. Calcium carbonate is formed after two to three days of white washing, which gives a shiny finish to the walls.

$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

35. (*a*) The plant hormone which inhibits growth is abscisic acid. Its effects include wilting of leaves.

(*b*) The thread like structures which help the plant to grow are tendrils. Tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it.

Auxin is the hormone that promotes the growth of tendril around a support as it is synthesised at the tip of the shoot and stimulates the growth of the cells on the opposite side which causes coiling of the tendrils around the other plant or around the support.

(*c*) The directional movement of a part of plant in response to chemicals is called chemotropism. One example of chemotropism is the growth of pollen tubes towards ovules.

The part of plant which shows

(*i*) Positive phototropism—Stem

(*ii*) Negative geotropism—Stem

(*iii*) Negative phototropism—Root

OR

35. (*a*) • Electrical impulses reach only those cells that are connected by nervous tissue.

• Once an electrical impulse is generated in a cell and transmitted, the cell will take some time to reset its mechanisms before it generates and transmits a new impulse.

These limitations are overcome in multicellular organisms by chemical communication. When stimulated cells release a chemical compound the compound would diffuse all around the original cell and other cells of the body. Though this method of communication is slower but works steadily and persistently.

(*b*) 'A'—Thyroid gland

'B'—Adrenal gland

Hormones secreted by endocrine glands 'A' and 'B' alongwith their function

A(Thyroid gland) secretes hormone thyroxine which regulates carbohydrates, proteins and fat metabolism in the body so as to provide the best balance for growth.

B(Adrenal gland) secretes hormone adrenaline which helps the body to fight stress. This hormone is also known as fight or flight hormone.

36. (*a*) The SI unit of resistance is ohm.

If the potential difference across the two ends of a conductor is 1 V and the current through it is 1 A, then the resistance R of the conductor is 1 Ω.

$$1 \text{ Ohm} = \frac{1 \text{ Volt}}{1 \text{ Ampere}}$$

Factors on which resistance of a conductor depends

- Length of the conductor

$$R \propto l$$

- Area of cross-section of the conductor

$$R \propto \frac{l}{A}$$

- Temperature

$$R \propto T$$

- Nature of material

(*b*) (*i*) Least count is calculated by dividing the reading on main scale with the total number of divisions.

For ammeter

Reading on main scale i.e. 200 – 100 = 100 or 100 – 0 = 100

Total number of divisions between the marks i.e. 0 – 100 or 100 – 200 are 10.

$$\text{Least count of milliammeter} = \frac{\text{Reading on main scale}}{\text{Total number of divisions}}$$

$$\therefore \text{ Least count of milliammeter} = \frac{100}{10} = 10 \text{ mA}$$

For voltmeter

Total number of division between the two marks = 5
Reading on main scale i.e. 2 – 1 = 1

$$\text{Least count of voltmeter} = \frac{1}{5} = 0.2 \text{ V.}$$

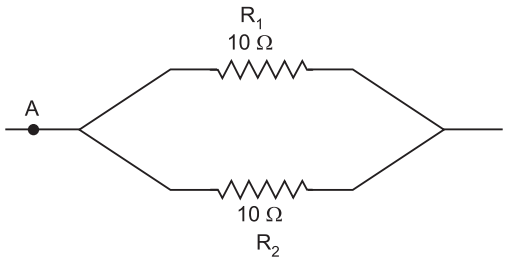
(*ii*) Current $I = 10 \text{ mA} = 10 \times 10^{-3}\text{A}$

Potential difference $V = 0.2$ V

$$R = \frac{V}{1} = \frac{0.2}{10 \times 10^{-3}} = 20\ \Omega$$

OR

(*a*) In the first loop, resistors of resistance 10 Ω each are connected in parallel to each other.



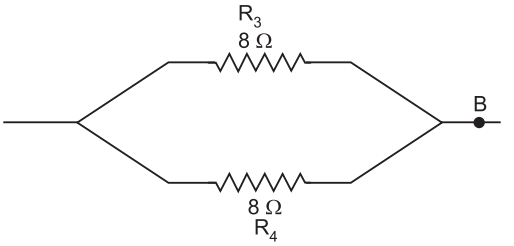
$$\frac{1}{R_{p_1}} = \frac{1}{R_1} + \frac{1}{R_2}$$

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

$$= \frac{2}{10} = \frac{1}{5}$$

$$R_{p_1} = 5\Omega$$

In the second loop, resistors of resistances 8 Ω each are connected in parallel to each other



$$\frac{1}{R_{p_2}} = \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{8} + \frac{1}{8} = \frac{2}{8}$$

$$R_{p_2} = 4\Omega$$

Now R_{p_1} and R_{p_2} are in series. So the equivalent resistance between the two points A and B in the circuit is

$$R_{eq} = R_{p_1} + R_{p_2} = 5 + 4 = 9\ \Omega$$

(*b*) $V = 4$ V, $I = 500$ mA $= 500 \times 10^{-3}$ A $= 0.50$ A

(*i*) Power of the bulb

$$P = VI = 4 \times 0.50 = 2 \text{ W}$$

(*ii*) Resistance of the bulb

$$R = \frac{V}{I} = \frac{4}{0.5} = 8\ \Omega$$

(*iii*) Energy consumed by the bulb is 8 hours

$$W = Pt = 2 \times 8 = 16 \text{ Wh}$$

Now, $1 \text{ W} = 1 \text{ J/s}$

$\therefore$ $16 \text{ Wh} = 16 \text{ W} \times 3600 \text{ sec} = 57600 \text{ J}$

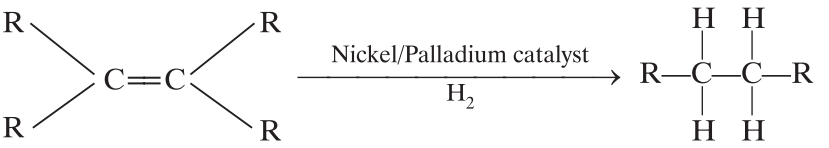
37. (*a*) Hydrocarbon 'X' burns with a clean flame, does not leave any residue and is not very reactive. These all are the properties exhibited by saturated hydrocarbons. Hence hydrocarbon 'X' is saturated hydrocarbon.

Unsaturated hydrocarbons burns with a yellow flame, results in a sooty deposit on the metal plate when it is placed above the flame. These hydrocarbons are very reactive as they have either double or triple bonds. Hence hydrocarbon 'Y' is unsaturated hydrocarbon.

(*b*) Hydrocarbon 'X' having four carbon atoms is butane (C_4H_{10}) as it is a saturated hydrocarbon.

Hydrocarbon 'Y' having two carbon atoms is ethene (C_2H_4) or ethyne (C_2H_2) as they are unsaturated hydrocarbon.

(*c*) Out of 'X' and 'Y', 'Y' will show addition reaction as it is an unsaturated hydrocarbon. Unsaturated hydrocarbon add hydrogen in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons.



Addition reaction is generally used in the hydrogenation of vegetable oils.

OR

(*c*) 'X' is a saturated hydrocarbon and 'Y' is an unsaturated hydrocarbon. Saturated hydrocarbons contain only single covalent bonds whereas unsaturated hydrocarbons contain at least one or more double or triple carbon-carbon bonds. Saturated hydrocarbons are more stable and less reactive while unsaturated hydrocarbons are less stable and more reactive. The general formula of saturated hydrocarbons, is C_nH_{2n+2} whereas for unsaturated hydrocarbons, the formula is C_nH_{2n} for alkenes and C_nH_{2n-2} for alkynes. Saturated hydrocarbons show substitution reaction while unsaturated hydrocarbons show addition reaction.

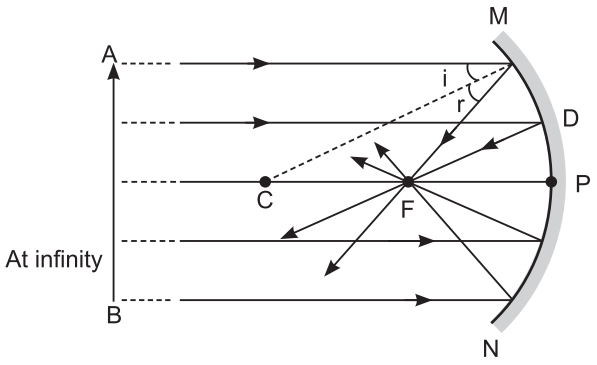
38. (*a*) The light from the sun is converged at a point as a sharp, bright spot by the mirror. In fact, this spot of light is the image of the sun on the sheet of paper.

The heat produced due to the concentration of sunlight at one point ignites the paper.

(*b*) Adi has concave mirror or converging mirror in his hand.

Principal Focus: It is a point on the principal axis at which all the incident rays parallel to principal axis meet after reflection from a concave mirror or appear to meet in case of convex mirror.

(*c*) Adi will be able to determine the approximate value of the focal length of concave mirror. The distance of the image from the position of the mirror gives the approximate value of focal length of the mirror.



OR

(*c*) Height of image h_i = –6.0 cm

Height of object h_o = 4.0 cm

$$m = \frac{h_i}{h_o},$$

$$= \frac{-6.0}{4.0} = -1.5 \text{ cm}$$

Since the image formed is real, it will be inverted and is taken as negative. A negative sign in the value of magnification indicates that the image is real. The height of image (h_i) is taken positive for virtual images.

Radius of curvature of the concave mirror (R) = –25 cm

We know $R = 2f$

$$\therefore \quad f = \frac{R}{2}$$

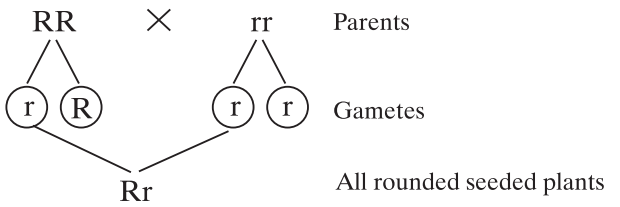
$$= \frac{-25}{2} = -12.5 \text{ cm}$$

In a concave mirror, focal length is taken as negative.

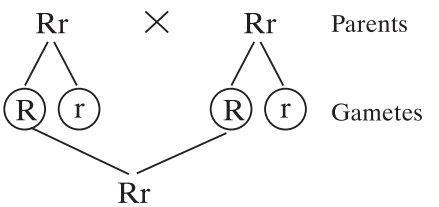
39. (*a*) A cross between the pea plants with one pair of contrasting characters is called a monohybrid cross. The set of genes parent in F_1 progeny is Rr.

(*b*) Traits like round seeded ('R') are called dominant traits while traits like wrinkled seeded ('r') are called recessive traits.

In a cross between a pair of contrasting characters, only one parental character will be expressed in F_1 generation which is called dominant trait and the other is called recessive trait.



(*c*) On self pollination of F_1 plants (Rr) and (Rr), the progeny formed will have round seeded plants as well as wrinkled seeded plants.



	R	r
R	RR	Rr
r	Rr	rr

(*c*) Phenotypic ratio 3 Round : 1 wrinkle

Genotypic ratio 1 : 2 : 1

RR : Rr : rr

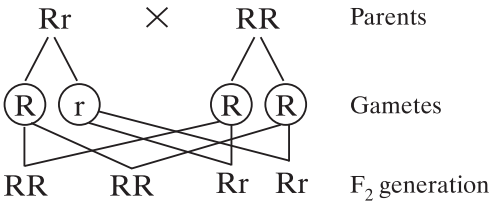
On self pollination, 400 plants were obtained.

The number of wrinkled seeded plants (rr)

$$\frac{1}{4} \times 400 = 100 \text{ plants}$$

OR

(*c*) The genotype of F_1 plants is Rr and of round seeded parent is RR. When they are cross pollinated



Genotype RR : Rr

2 : 2

Number of round seeded homozygous plants (RR) = $\frac{2}{4} \times 400 = 200$

Number of round seeded heterozygous plants (Rr) = $\frac{2}{4} \times 400 = 200$.

The number of homozygous and heterozygous round seeded plants obtained were 200 each.

Note: The progeny of F_1 plants have genotype Rr and are round in shape.

When there is cross pollination, the genotype of other parent has to be different from the progeny of F_1 plants. Since parents are round seeded plants so the genotype of other parent plant would be RR.