Sample Question Paper - 19
Science (086)
Class- X, Session: 2021-22
TERM II

Time: 2 Hours **Max. Marks: 40**

General Instructions:

1. All questions are compulsory.
2. The question paper has three sections and 15 questions. All questions are compulsory.
3. Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.
4. Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

Section A

1. Illustrate the following reactions with example :
(a) Substitution reaction
(b) Addition reaction

2. Inert gases are placed in a separate group in the modern periodic table :
(a) How many valence electrons do most of them have?
(b) Why are they unreactive ?

3. (a) What is vegetative propagation ?
(b) Write any two advantages of practising this method.

4. (a) Explain the terms :
(i) implantation,
(ii) placenta
(b) What is the average duration of human pregnancy?

5. How does the process of budding differ from the process of spore formation?

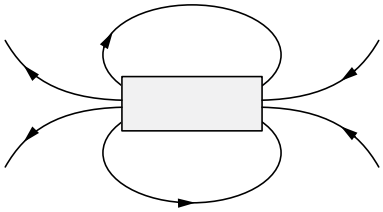
or

What are sexually transmitted diseases? Name an STD which damages the immune system of human body.

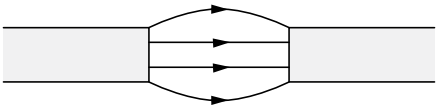
6. What is a compass needle ? What happens when a compass needle is placed :
(a) in a region having no magnetic field,
(b) near a bar magnet ?

or

Identify the poles of the magnet in the given Figure (i) and (ii).

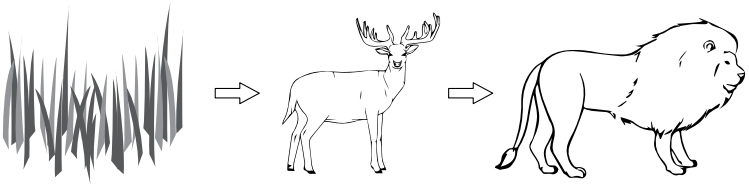


(i)



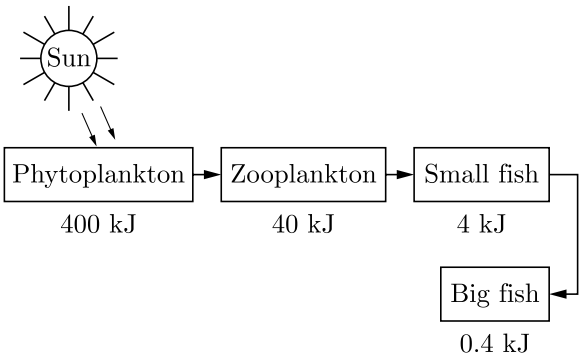
(ii)

7. Consider the food chain :



What will happen it lions are removed from the above food chain ?

or



What is depicted in the above mentioned scheme ?

Section B

8. Differentiate between the arrangement of elements in Mendeleev's periodic table and Modern periodic table.

9. The electronic configuration of four elements A, B, C and D are given as follows:
A–2, 8, B–2, 8, C–2, 8, 2, D–2, 8, 8.

(a) Which of them belong to the same period? Name the period.
(b) Which of them belong to the same group? Name the group.

or

(a) How does atomic radius change as we move from left to right in a period ?
(b) The positions of three elements P, Q and R in the Periodic Table are shown below:

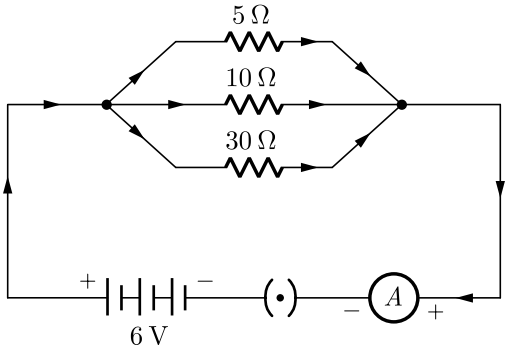
Group 15	**Group 16**	**Group 17**
.....	.....	.....
.....	.....	Q
.....	.....	.....
P	.....	R

Which one of the three elements is most non-metallic?

10. How did Mendel's experiments show that different traits are inherited independently? Explain.

11. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is ₹ 6.00.
(i) Electric heater of 1000 W for 5 hours daily.
(ii) Electric refrigerator of 400 W for 10 hours daily.

12. For the circuit diagram given below calculate :
(a) the value of current through each resistor.
(b) the total current in the circuit.
(c) the total effective resistance of the circuit.



or

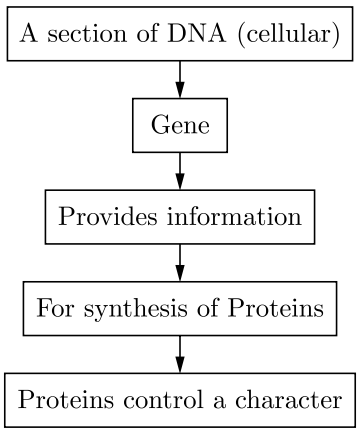
Why does a current carrying conductor kept in magnetic field experience force. On what factors does the direction of this force depend ? Name and state the rule used for determination of direction of this force.

13. (a) What are decomposers ?
(b) State in brief the role of decomposers in the environment.

Section C

This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. Read the following case based passage and answer the questions given after passage.
A gene is the basic physical and functional unit of heredity genes are maple up of DNA.
Most of the characters or traits of an organism are controlled by the genes. Genes are actually segments of DNA guiding the formation of proteins by the cellular organelles. These proteins may be enzymes, hormones, antibodies, and structural components of different types of tissues. In other words, DNA/ genes are responsible for structure and functions of a living body. Genotype of an individual controls its phenotype.



Gene T	→	Responsible for synthesis of efficient enzyme (Proteins)	→	More production of growth hormone	→	Result in Tall Plants
Gene t	→	Responsible for synthesis of less efficient enzyme	→	Less production of growth hormone	→	Result in Short Plants

(i) Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F_1 progeny that have round, yellow (RrYy) seeds. When F_1 plants are selfed, the F_2 progeny will have new combination of characters. Choose the new combination from the following.
I. Wrinkled, green
II. Wrinkled, yellow
III. Round, green
IV. Round, yellow

(a) I and II (b) I and IV
(c) II and III (d) I and III

(ii) A section of DNA providing information for one protein is called-
(a) Gene
(b) Nucleus
(c) Chromosomes

(d) Trait

(iii) Which one of the following is present in the nucleus?

(a) Chromosomes

(b) Gene

(c) DNA

(d) All of these

(iv) Select the statements that describe characteristics of genes

I. In individuals of a given species, a specific gene is located on a particular chromosome

II. A gene does not code for proteins

III. Genes are specific sequence of bases in a DNA molecule

IV. Each chromosome has only one gene

(a) I and II (b) I and III

(c) I and IV (d) III and IV

(v) A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. In the progeny, all bore violet flowers, but almost half of them were short. This suggests that the genetic makeup of tall plant can be depicted as

(a) TtWw (b) TTWW

(c) TTww (d) TtWW

15. Read the following case based passage and answer the questions given after passage.

In the series combination, the resistances are joined end to end. For a series combination of resistors, $R_s = \sum R_i$ and current through each resistor is same but their potential difference between their ends are different according to their resistance. When two or more resistors are combined in such a way that their first ends are connected to one point and the second ends to another point. In a parallel combination of resistors, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + ...$ and potential drop across each resistor is same but current in different resistances are different.

(i) If we connect n bulbs each with a rated power P in series, what is the total power consumed by combination at rated current?

(ii) If we connect n bulbs each with a rated power P in parallel, what is the total power consumed by combination at rated voltage?

(iii) The power consumed by n equal resistance in parallel is x times that of power consumed in series, if the voltage supply is same. Find the value of x.

or

If resistors, $4\,\Omega$, $5\,\Omega$ and $6\,\Omega$ are connected in series with 5V battery, calculate the total power consumed by the combination?

Solution

SCIENCE - 086

Class 10 - Science

Time: 2 Hours **Max. Marks: 40**

General Instructions:

1. All questions are compulsory.
2. The question paper has three sections and 15 questions. All questions are compulsory.
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Section A

1. Illustrate the following reactions with example :
(a) Substitution reaction
(b) Addition reaction

Ans :

(a) Replacement of an atom or group from an organic compound under suitable condition is called as substitution reaction.

$$CH_4 + Cl_2 \xrightarrow{\text{Light}} CH_3Cl$$

(b) Addition of simple molecules to unsaturated compounds to get saturated compounds is called as addition reaction.

$$CH_2 = CH_2 + H_2 \xrightarrow{\text{Ni}} CH_3 - CH_3$$

2. Inert gases are placed in a separate group in the modern periodic table :
(a) How many valence electrons do most of them have?
(b) Why are they unreactive ?

Ans :

(a) Valence electrons are 8.
(b) All elements of group 18 have completed their octet so do not take or give electrons during reaction, hence are unreactive.

3. (a) What is vegetative propagation ?
(b) Write any two advantages of practising this method.

Ans :

(a) **Vegetative propagation :** Is a sexual method of reproduction by which new plants are developed by using the vegetative parts of the plants, like roots, leaves or stems.

(b) **Advantages of practising vegetative propagation :**
(i) It is useful for those plants which do not have seeds or have few seeds only.
(ii) New plants can be produced in comparatively very less time.

4. (a) Explain the terms :
(i) implantation, (ii) placenta
(b) What is the average duration of human pregnancy?

Ans :

(a) (i) The embedding of embryo in the thick lining of the uterus is called implantation.
(ii) After implantation, a disc like special tissue develops between the uterus wall and the embryo called placenta. The exchange of nutrients, oxygen and waste products between the embryo and the mother takes place through the placenta.
(b) The average duration of human pregnancy is about nine months and ten days (40 weeks).

5. How does the process of budding differ from the process of spore formation?

Ans :

Budding is the process of asexual reproduction where bud develops as an outgrowth of body due to repeated cell division and grows into tiny individuals when matures which can later saprate from parent body e.g. hydra.
Spore formation is the process of asexual reproduction in which tiny bulb like structures called sporangia develop in organisms like Rhizopus. Sporangia contains minute, single celled and thin or thick walled spores which grow into new organisms in suitable environment conditions.

or

What are sexually transmitted diseases? Name an STD which damages the immune system of human body.

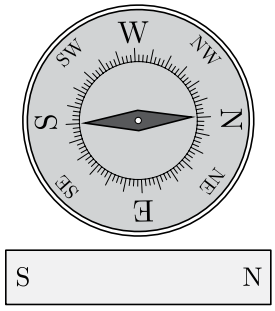
Ans :

Diseases that spread through the sexual contact, are called sexually transmitted diseases.
An STD which damages the immune system of human body is AIDS.

6. What is a compass needle ? What happens when a compass needle is placed :
(a) in a region having no magnetic field,
(b) near a bar magnet ?

Ans :

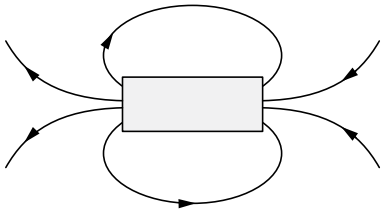
A compass needle consists of a short and thin magnet pivoted at its center and enclosed in a glass casing as shown in the given figure.



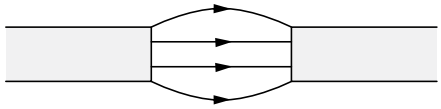
(a) When a compass needle is placed in a region having no magnetic field, it stays in the north-south direction.
(b) Compass needle shows deflection when brought near a bar magnet.

or

Identify the poles of the magnet in the given Figure (i) and (ii).

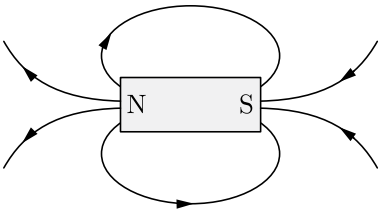


(i)

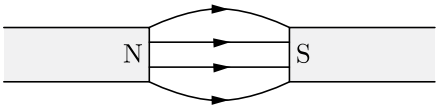


(ii)

Ans :

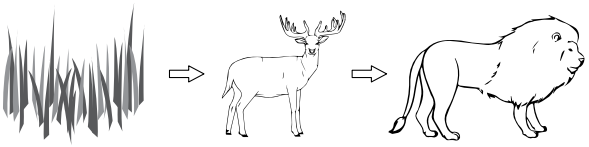


(i)



(ii)

7. Consider the food chain :



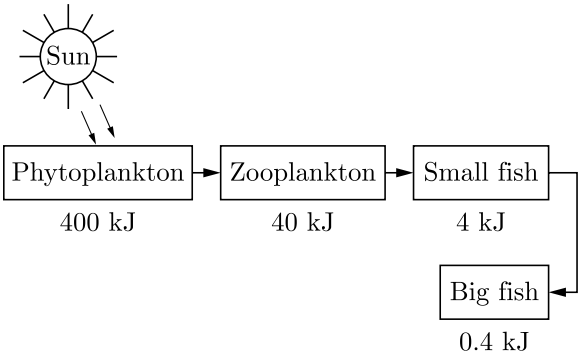
Grass Deer Lion

What will happen it lions are removed from the above food chain ?

Ans :

Removal of lion (carnivorous) from the above food chain will cause disturbance in environmental balance and will increase the number of deer (herbivorous) to much an extent that they will eat up the whole grass. The density of product erst like grass will be very much reduced and this will turn the area into a desert which eventually result in death of all dears due to lack of food.

or



What is depicted in the above mentioned scheme ?

Ans :

The given scheme indicates that in a food chain each trophic level transfers only 10% of total energy to next trophic level which gradually decrease

the total amount of energy in food chain rapidly according to the lindeman's 10% law.

Section B

8. Differentiate between the arrangement of elements in Mendeleev's periodic table and Modern periodic table.

Ans :

	Mendeleev's Periodic table	**Modern Periodic table**
1.	Arrangement of the elements is in the increasing order of their atomic masses.	Arrangement of the elements is in the increasing order of their atomic numbers.
2.	Position of hydrogen element was not justified because hydrogen has some properties which are similar to alkali metals and some properties similar to halogens.	Hydrogen has been given a unique position due to its resemblance to alkalis and halogens. This position is justified as it has one valence electron like that of valence electron in the atoms of alkali metals.
3.	Isotopes of the same element will get different positions as these have different atomic masses.	Isotopes of the same element will get the same position as these have same atomic number.
4.	Cobalt (Co) with slightly higher atomic mass (58.9) comes first and Nickel (Ni) with slightly lower atomic mass (58.7) comes later.	Modern Periodic Law justifies the position of Cobalt (Co) and Nickel (Ni). As Co with lower atomic no. 27 should come first and Ni with atomic no. 28 should come later even if their atomic masses are in the wrong order.

9. The electronic configuration of four elements A, B, C and D are given as follows:
A–2, 8, B–2, 8, C–2, 8, 2, D–2, 8, 8.

(a) Which of them belong to the same period? Name the period.
(b) Which of them belong to the same group? Name the group.

Ans :

(a) B, C and D elements has atomic number of occupied shells, therefore they are placed in the same period i.e., period 3.
(b) A and D belong to group-18 of the periodic table, as both of them are inert noble gases and their octet is complete.

or

(a) How does atomic radius change as we move from left to right in a period ?
(b) The positions of three elements P, Q and R in the Periodic Table are shown below:

Group 15	**Group 16**	**Group 17**
.....	.....	.....
.....	.....	Q
.....	.....	.....
P	.....	R

Which one of the three elements is most non-metallic?

Ans :

(a) Atomic radius is generally decreases from left to right along a period because the electrons are added to same shell due to this they experience a great force from the nucleus.
(b) Q is the most non-metallic.

10. How did Mendel's experiments show that different traits are inherited independently? Explain.

Ans :

When a cross was made between a tall pea plant with round seeds and a short pea plant with wrinkled seeds, the F_1 progeny plants are all tall with round seeds. This indicates that tallness and round seeds are the dominant traits.
When the F_1 plants are self pollinated, the F_2 progeny consisted of some tall plants with round seeds and some short plants with wrinkled seeds which are the parental traits all well as some of their new combinations such as tall plants with wrinkled seed and dwarf plants with round seeds.
Thus, it may be concluded that tall and short traits and round and wrinkled seed traits have been inherited independently.

11. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is ₹ 6.00.

(i) Electric heater of 1000 W for 5 hours daily.

(ii) Electric refrigerator of 400 W for 10 hours daily.

Ans :

(i) Energy consumed by electric heater,

$$= P \times t = 1000 \times 5 = 5000 \text{ Wh}$$

(ii) Energy consumed by refrigerator,

$$= P \times t = 400 \times 10 = 4000 \text{ Wh}$$

Total energy consumed in one day,

$$= 5000 \text{ Wh} + 4000 \text{ Wh}$$

$$= 9000 \text{ Wh} = \frac{9000}{1000} \text{ kWh} = 9 \text{ kWh}$$

Total energy consumed in the month of September,

$$= 30 \times 9 = 270 \text{ kWh} = 270 \text{ units}$$

Cost of 1 unit of electricity is = ₹ 6

Thus cost of 270 units of electricity,

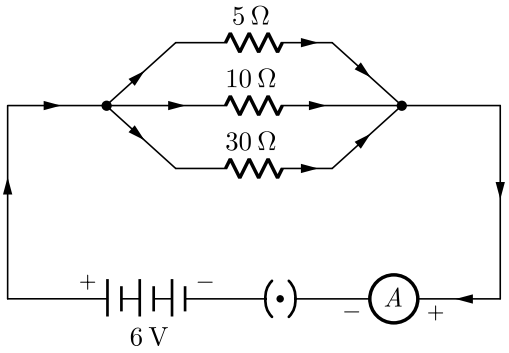
$$= 6 \times 270 = ₹ 1,620$$

12. For the circuit diagram given below calculate :

(a) the value of current through each resistor.

(b) the total current in the circuit.

(c) the total effective resistance of the circuit.



Ans :

(a) Since the three resistances, shown in the circuit have been joined in parallel, hence voltage across each of them is same having a value 6 V.

Current I_1 through resistance $R_1 = 5\,\Omega$,

$$I_1 = \frac{V}{R_1} = \frac{6}{5} = 1.2 \text{ A}$$

Current I_2 through resistance $R_2 = 10\,\Omega$,

$$I_2 = \frac{V}{R_2} = \frac{6}{10} = 0.6 \text{ A}$$

and current I_3 through resistance $R_3 = 30\,\Omega$,

$$I_3 = \frac{V}{R_3} = \frac{6}{30} = 0.2 \text{ A}$$

(b) Total current in the circuit

$$I = I_1 + I_2 + I_3$$

$$= 1.2 + 0.6 + 0.2 = 2.0 \text{ A}$$

(c) Total effective resistance of the circuit

$$R_{eq} = \frac{V}{I} = \frac{6}{2.0} = 3.0\,\Omega$$

or

Why does a current carrying conductor kept in magnetic field experience force. On what factors does the direction of this force depend ? Name and state the rule used for determination of direction of this force.

Ans :

An electric current flowing through a conductor produces a magnetic field. This field exerts a force on a magnet placed near the conductor. In accordance with Newton's third law, the magnet also exert an equal and opposite force on the current carrying conductor. Thus, a magnetic field exerts a force on a current carrying conductor.

If a current I is flowing along the wire of length L , which is placed perpendicular to the direction of the magnetic field B, then the force F experienced by the wire perpendicular to the current and the magnetic field is expressed as :

$$F = BIL$$

Then F depends on current I, length L and strength of field F. The rule is known as.

Fleming's Right Hand Rule : Hold the thumb, the fore finger and the center finger of your right hand at right angles to one another. Adjust your hand in such a way that fore finger points in the direction of magnetic field, and thumb points in the direction of motion of conductor, then the direction in which center finger points, gives the direction of induced current in the conductor.

13. (a) What are decomposers ?

(b) State in brief the role of decomposers in the environment.

Ans :

(a) **Decomposers :** Decomposers decompose the complex organic molecules present in the dead plants and animals to the simple molecular level. Thus, decomposers help the return of various nutrients to the soil/water so that these are available to the producers once again. So, if decomposers are removed from the earth, the soil/water will become deficient in nutrients and the operation of various mineral cycles will get affected.

(b) **Role of decomposers :** The differences between

autotrophs and decomposers are:

	Autotrophs	Decomposers
1.	Autotrophs make their food from CO_2, H_2O and minerals in the presence of sunlight e.g., green plants.	Decomposers decompose the complex molecules present in the bodies of the dead plants and animals e.g., saprophytic bacteria and fungi.
2.	Autotrophs convert simple inorganic substances into complex organic substances.	Decomposers breakdown the complex organic substances into simple inorganic substances.

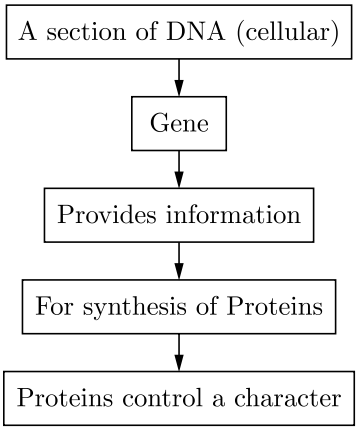
Section C

This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. Read the following case based passage and answer the questions given after passage.

A gene is the basic physical and functional unit of heredity genes are maple up of DNA.

Most of the characters or traits of an organism are controlled by the genes. Genes are actually segments of DNA guiding the formation of proteins by the cellular organelles. These proteins may be enzymes, hormones, antibodies, and structural components of different types of tissues. In other words, DNA/ genes are responsible for structure and functions of a living body. Genotype of an individual controls its phenotype.



Gene T	→	Responsible for synthesis of efficient enzyme (Proteins)	→	More production of growth hormone	→	Result in Tall Plants
Gene t	→	Responsible for synthesis of less efficient enzyme	→	Less production of growth hormone	→	Result in Short Plants

(i) Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F_1 progeny that have round, yellow (RrYy) seeds. When F_1 plants are selfed, the F_2 progeny will have new combination of characters. Choose the new combination from the following.

I. Wrinkled, green
II. Wrinkled, yellow
III. Round, green
IV. Round, yellow

(a) I and II (b) I and IV
(c) II and III (d) I and III

(ii) A section of DNA providing information for one protein is called-

(a) Gene (b) Nucleus
(c) Chromosomes (d) Trait

(iii) Which one of the following is present in the nucleus?

(a) Chromosomes (b) Gene
(c) DNA (d) All of these

(iv) Select the statements that describe characteristics of genes

I. In individuals of a given species, a specific gene is located on a particular chromosome
II. A gene does not code for proteins
III. Genes are specific sequence of bases in a DNA molecule
IV. Each chromosome has only one gene

(a) I and II (b) I and III
(c) I and IV (d) III and IV

(v) A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. In the progeny, all bore violet flowers, but almost half of them were short. This suggests that the genetic makeup of tall plant can be depicted as

(a) TtWw (b) TTWW
(c) TTww (d) TtWW

Ans :

(i) (b) I and IV
(ii) (a) Gene
(iii) (d) All of these
(iv) (b) I and III
(v) (d) TtWW

15. Read the following case based passage and answer the questions given after passage.

In the series combination, the resistances are joined end to end. For a series combination of resistors, $R_s = \sum R_i$ and current through each resistor is same but their potential difference between their ends are different according to their resistance. When two or more resistors are combined in such a way that their first ends are connected to one point and the second ends to another point. In a parallel combination of resistors, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + ...$ and potential drop across

each resistor is same but current in different resistances are different.

(i) If we connect n bulbs each with a rated power P in series, what is the total power consumed by combination at rated current?

(ii) If we connect n bulbs each with a rated power P in parallel, what is the total power consumed by combination at rated voltage?

(iii) The power consumed by n equal resistance in parallel is x times that of power consumed in series, if the voltage supply is same. Find the value of x.

or

If resistors, $4\,\Omega$, $5\,\Omega$ and $6\,\Omega$ are connected in series with 5V battery, calculate the total power consumed by the combination?

Ans :

(i) When resistors are in series combination, then

$$R_s = R_1 + R_2 + ...R_n$$

$$\frac{V^2}{P_s} = \frac{V_1^2}{P_1} + \frac{V_2^2}{P_2} + ... + \frac{V_n^2}{P_n}$$

When bulbs are of equal power, then

$$\frac{V^2}{P_s} = \frac{nV^2}{P}$$

$$P_s = \frac{P}{n}$$

(ii) When resistors are in parallel combination, then

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_n}$$

or $$\frac{P_p}{V^2} = \frac{P_1}{V^2} + \frac{P_2}{V^2} + ... + \frac{P_n}{V^2}$$

$$P_p = P_1 + P_2 + ... + P_n$$

or $$P_p = nP$$

(iii) Power consumed in series,

$$P_s = \frac{V^2}{nR}$$

and in parallel,

$$P_p = \frac{V^2}{(R/n)}$$

$$P_p = xP_s$$

$$\frac{V^2}{(R/n)} = x\frac{V^2}{(nR)}$$

$$n = \frac{x}{n}$$

$$x = n^2$$

or

Power consumed;

$$P = \frac{V^2}{R_q} = \frac{V^2}{R_1 + R_2 + R_3}$$

$$= \frac{(5)^2}{4+5+6} = \frac{5}{3}\text{ W}$$