SET-1

Series QQDRR/4

Code No. 31/4/1

Roll No. | | | | | | | | |

Candidates must write the Q.P. Code on the title page of the answer-book.

- Please check that this question paper contains **16** printed pages.
- Q.P. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **15** questions.
- **Please write down the Serial Number of the questions in the answer-book beforeattempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

SCIENCE
HINTS & SOLUTIONS

Time allowed: 2 hours **Maximum Marks: 40**

General Instructions:

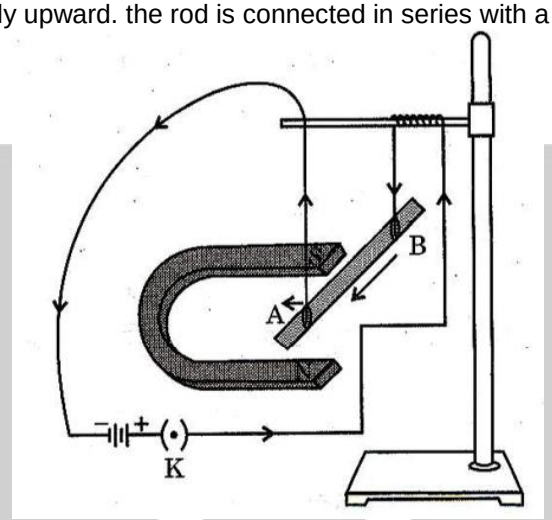
(i) The question paper consists of **15 questions.** All questions are compulsory.
(ii) This question paper is divided into three Sections viz. Section A, B and C.
(iii) **Section A** – Question numbers **1 to 7** are short answer type questions. Each question carries **two marks.**
(iv) **Section B** – Question numbers **8 to 13** are short answer type questions. Each question carries **three marks.**
(v) **Section C** – Question numbers **14 to 15** are short answer type questions. Each question carries **four marks.**
(vi) Internal choices have been provided in some questions. Only one of the alternatives has to be attempted.

SECTION A

1. Explain giving reason why although the nuclear charge in atoms increases in moving from left to right in a period as well as in moving from top to bottom in a group in the modern periodic table, but the size of the atoms does not vary similarly in both situations. **2**

Sol. Top to bottom group $\rightarrow$ number of shells increases and electrons can loose easily.
Left to right period $\rightarrow$ number of shells remains same so the effective nuclear charge increases and the size decreases.

2. As shown in the diagram an aluminium rod 'AB' is suspended horizontally between the two poles of a strong horse shoe magent in such a way that the axis of rod is horizontal and the direction of the magnetic field is vertically upward. the rod is connected in series with a battery and a key. **2**



State giving reason:

(a) What is observed when a current is passed through the aluminum rod from end B to end A?

(b) What change is observed in a situation in which the axis of the rod 'AB' is moved and aligned parallel to the magnetic field and current is passed in the rod in the same direction ?

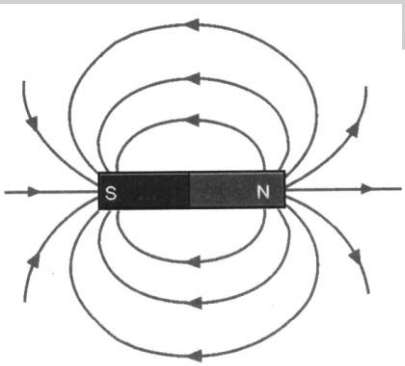
OR

"Magnetic field is a physical quantity that has both direction and magnitude." How can this statement be proved with the help of magnetic field lines of a bar magnet?

Sol. **(a)** when a current is passed through the aluminum rod from end B to end A then due to magnetic force the rod will deflect towards left as per flemings left hand rule.

(b) As in this situation current will be parallel to magnetic field direction so force will be zero.

OR



Denser the lines of force more will be the magnitude.
According to the definition of magnetic lines of force, the imaginary path of unit north pole is known as magnetic line of force it moves from north pole of magnet to south pole of magnet outside the magnet. Tangent drawn at any point on magnetic line of force shows the direction of magnetic field.

3. Using height (tallness/dwarfness) of a plant as an example, show that genes control the characteristics or traits in an organism. **2**

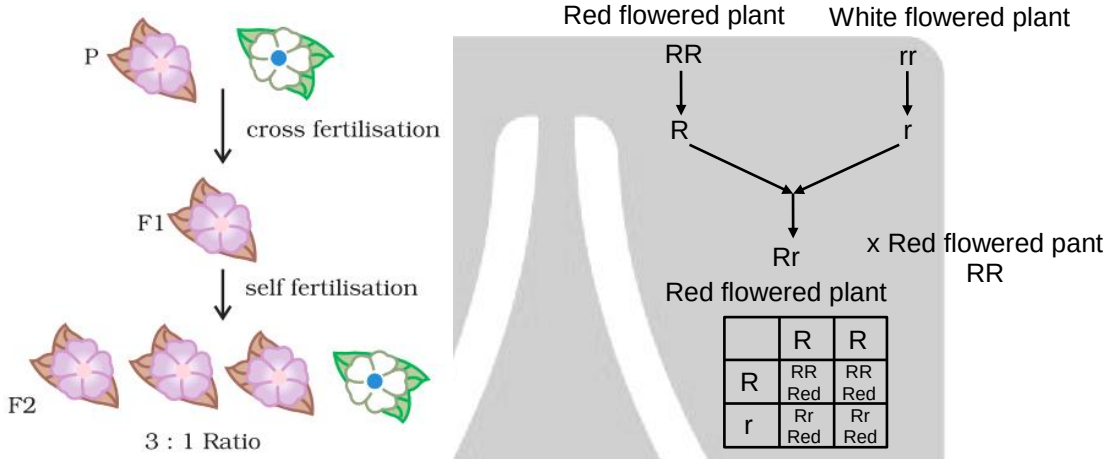
OR

In a cross between red coloured and white coloured flowers, when plants with red coloured flowers of F1 generation were self pollinated, plants of F2 generation were obtained in which 75% of plants were with red flowers and 25% plants were with white flowers. Explain the inheritance of traits in the above cross with the help of a flow chart only along with the ratio of plants obtained.

Sol. We know that plants have hormones that can trigger growth. Plant height can thus depend on the amount of a particular plant hormone. The amount of the plant hormone made will depend on the efficiency of the process for making it. Consider now an enzyme that is important for this process. If this enzyme works efficiently, a lot of hormone will be made, and the plant will be tall. If the gene for that enzyme has an alteration that makes the enzyme less efficient, the amount of hormone will be less, and the plant will be short. Thus, genes control characteristics, or traits.

OR

Inheritance of traits will be as follows:



	R	R
R	RR Red	RR Red
r	Rr Red	Rr Red

Phenotypic ratio = 3 : 1
Genotypic ration = 1 : 2 : 1

4. Mention the functions of (a) Placenta (b) Fallopian tubes (e) Uterus and (d) Ovary in the human female reproductive system. **2**

Sol. **(a)** Placenta – Removal of waste from the developing embryo. Also helps in exchange of nutrients.

(b) Fallopian tubes – Site of fertilization.

(c) Uterus – Site for development of foetus .Provide nourishment to the developing embryo.

(d) Ovary – Produce female gamete. Also female sex hormone.

5. "The improvement in our lifestyle has led to the generation of large amount of waste material." List two reasons to justify this statement. **2**

OR

"The change in packaging has resulted in waste becoming non biodegradable."
Giving two examples from daily life, justify this statement.

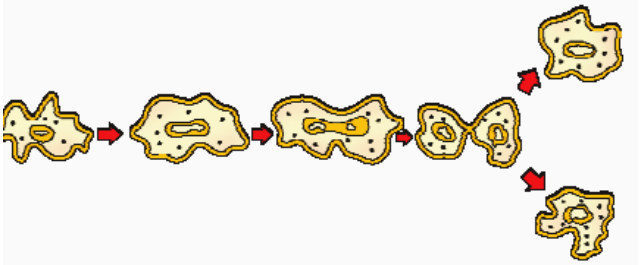
Sol. The improvement in our lifestyle have lead to greater amounts of waste generation. Increased use of paper or plastics plates, polythene etc. and alminium foil, polythene in packaging industries have resulted large amount of waste accumulation.
Re-use of plastic containers, polythene bags can reduce the non-bioderadable wastes instead jute bags or paper bags can be used instead of the polythene bags. Another example of reuse, the plastic bottles in which you buy various food- items like jam or pickle can be used for storing things in the kitchen

OR

(i) Food packaging- plastic container, aluminum foil paper etc.
(ii) Poly bags

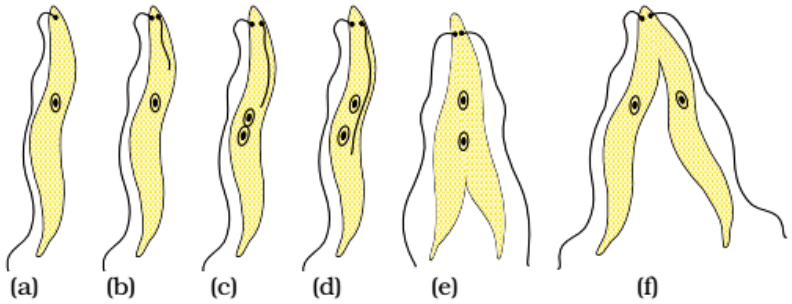
6. **(a)** Differentiate between binary fission in Amoeba and binary fission in Leishmania. **2**

Sol.



Binary fission in Amoeba

In amoeba the binary fission takes In leishmania flagellum divides place at any part of the organisms.

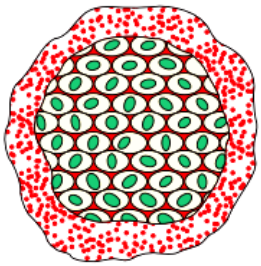


Binary fission in Leishmania

In leishmania flagellum divides first then divides the body.

(b) How does reproduction take place in malarial parasite?

Sol.



Multiple fission in Plasmodium

Multiple fission – Plasmodium produces many daughter cells after division

7. Consider the carbon compounds having following molecular formula: **2**

(1) C_3H_6 **(ii)** C_3H_8 **(iii)** C_4H_6 **(iv)** C_6H_6 **(v)** C_6H_{12}

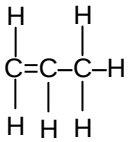
(a) State the number of double covalent bonds present in C_3H_6

(b) Write the formula of first member of the homologous series to which the carbon compound C_4H_6 belongs.

(c) Which one of the above compounds forms ring structure of carbon atoms?

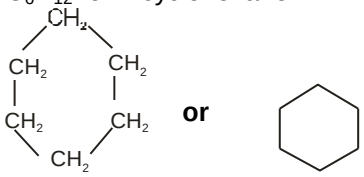
(d) Identify, which of the above compounds, is a member of alkane series.

Sol. **(a)** C_3H_6 contains 7 single bonds and 1 double bond.



(b) First member $\rightarrow C_2H_2$
Formula $\rightarrow C_nH_{2n-2}$

(c) C_6H_{12} form cyclohexane



Cyclohexane

(d) C_3H_8 is the member of alkane series
Formula $\rightarrow C_nH_{2n+2}$

SECTION B

8. Name the elements whose compounds formed the basis of classification in Mendeleev's periodic table. Why did Mendeleev choose these elements ? How the formulae of these compounds had helped Mendeleev in deciding the position of an element in his periodic table? **3**

Sol. Oxygen and Hydrogen formed the basis of classification of Mendeleev periodic table. He choose them because they react with most of the element to form compound.
With the formulae of these compound he calculated the valencies of the element and arranged them according to the valencies on the basis of similarities and dissimilarities.
Mendeleev table was based on mass number.

9. What are trophic levels? Why are autotrophs considered to be at the first trophic level of all food chains? State the reason for limited number of trophic levels in nature. **3**

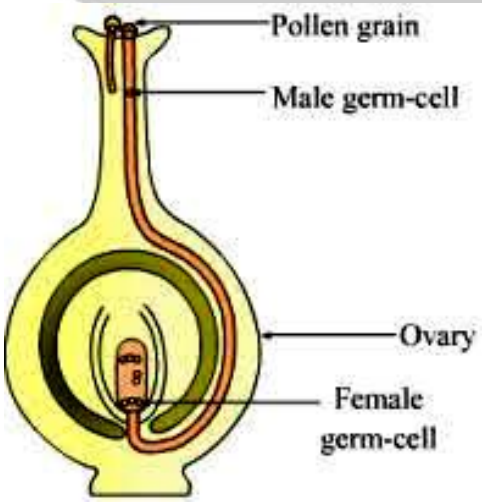
Sol. Trophic level – The various steps in a food chain at which the transfer of energy take place are called tropic levels

Because plants are autotrophs and synthesize their own food. They convert the solar energy into food by the process of photosynthesis. Hence they form the first trophic level.

The energy flow decreases with each successive tropic level as only 10% of energy is transferred from one trophic level to the next trophic level.

10. In flowering plants, the pollen grains are transferred to stigma by pollination but the female germ cells are present in the ovary. Explain with the help of a labelled diagram (only concerned parts), how the male germ cell reaches the ovary. **3**

Ans.



Pollen grain on stigma
↓ Absorbs water
Germinates
↓ Forms
Pollen tube
↓ enters
Ovary
(Ovule)
↓
Pollen grain
Releases male gametes

11. "Two different forms of carbon diamond and graphite have different structures and very different physical properties even though their chemical properties are same." Explain why. **3**

OR

State the reasons, why carbon cannot
(i) Lose four electrons to form C^{4+} cation, and
(ii) Gain four electrons to form C^{4-} anion.

How does carbon overcome this problem to form compounds?

Sol. In diamond → one carbon atom bonded with 4 other carbon atom with strong covalent bond, so it is hard.
In graphite → Each carbon atom forms two strong bonds with other carbon atoms and one weak bond is formed with 3rd carbon atoms and forms hexagonal rings which slide over each other, so it is soft.

OR

(i) Carbon cannot form C^{4+} cation because the removal of 4 electrons requires large amount of energy(I.E. or I.P.)
(ii) Carbon cannot forms C^{4-} anion as it would be difficult for its nucleus with 6 proton to hold on to 10 electrons.
To overcome this problem carbon atoms share electrons and forms covalent compounds.

12. **(a)** A student wants to use an electric heater, an electric bulb and an electric fan simultaneously. How should these gadgets be connected with the mains ? Justify your answer giving three reasons.
(b) What is an electric fuse? How is it connected in a circuit? **3**

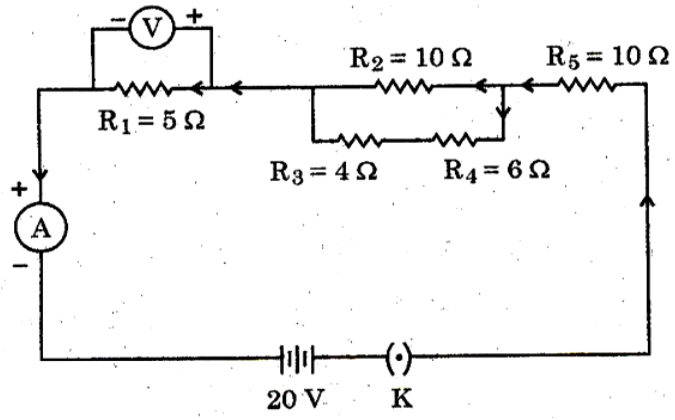
Sol. **(a)** All gadgets will be connected in parallel.
Reasons are following
(i) In parallel combination potential (V) will be same.
(ii) We can use different switches for different appliance.
(iii) In case of one gadget stop working then other will continue working.

(b) Fuse is safety device in the form of wire made of alloy (lead 37% + Tin 63%)
It is connected in series in live wire of circuit.

13. An electric motor rated 1100 W is connected to 220 V mains. Find: **3**
(i) The current drawn from the mains,
(ii) Electric energy consumed if the motor is used for 5 hours daily for 6 days.
(iii) Total cost of energy consumed if the rate of one unit is Rs. 5.

OR

Study the following circuit and find:



(i) Effective resistance of the circuit
(ii) Current drawn from the battery
(iii) Potential difference across the 5 Ω resistor

Sol. **(i)** Power P = VI

So I = $\frac{P}{V} = \frac{1100}{220} = 5\,\text{Amp.}$

(ii) Energy = Power × Time

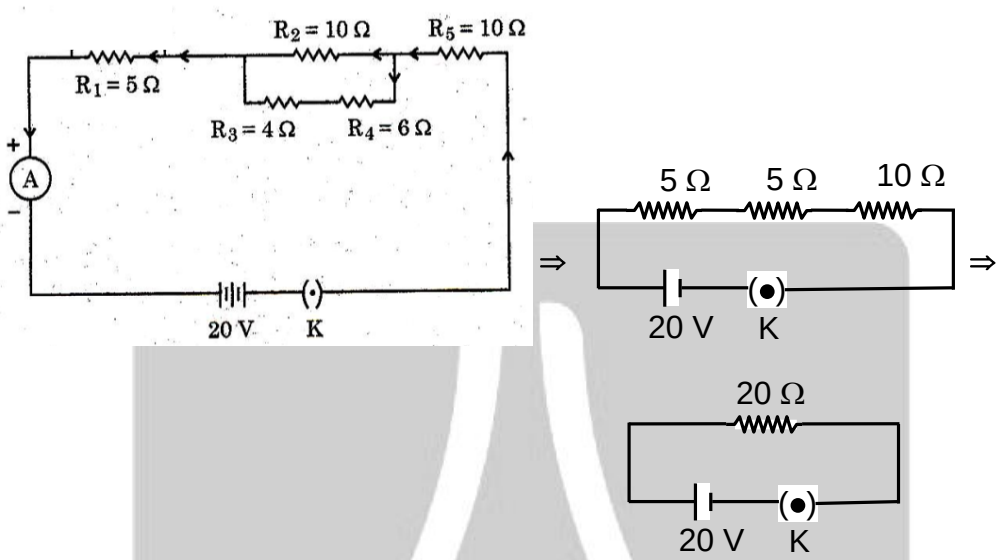
$= \frac{1100 \times 5 \times 6}{1000} = 33\,\text{kWh}$

(iii) Cost = (Rs per unit) × (no. of units)

= 5 × 33 = Rs.165

OR

(i)



(i) R_3 & R_4 are in series so equivalent of R_3 & R_4 = 4 + 6 = 10 Ω

This will be in parallel with R_2 so equivalent will be 5 Ω

R_{eff} = 5Ω + 5Ω + 10Ω = 20 Ω

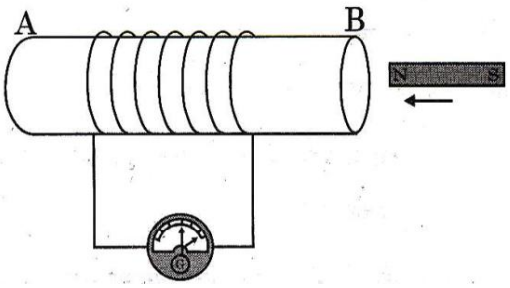
(ii) I = $\frac{20}{20} = 1\,\text{Amp.}$

(iii) V = IR =1 × 5 = 5 Volt

SECTION C

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

14. AB is a coil of copper wire having a large number of turns. The ends of the coil are connected with a galvanometer as shown. When the north pole of a strong bar magnet is moved towards the end B of the coil, a deflection is observed in the galvanometer. **4**



(a) State the reason for using galvanometer in the activity and why does its needle deflects momentarily when magnet is moved towards the coil.

(b) What would be observed in the galvanometer in a situation when the coil and the bar magnet both move with the same speed in the same direction? Justify your answer.

(c) State the conclusion that can be drawn from this activity.
Will there be any change in the momentary deflection in the galvanometer if number of turns in the coil is increased and a more stronger magnet is moved towards the coil ?

OR

What in electromagnetic induction? What is observed in the galvanometer when a strong bar magnet is held stationary near one end of a coil of large number of turns? Justify your answer.

Sol. **(a)** Galvanometer gives the deflection it shows that current is flowing in the circuit which is due to the change in magnetic flux in the coil.
Deflection is momentarily because when magnet moves then flux changes but when magnet stops then change in flux is zero, e.m.f. is only produced when flux passing through coil changes.

(b) When magnet and coil will move with same speed in same direction then there will be no change in flux so there will be no deflection in coil.

(c) **Conclusion** : When there is a change in magnetic line of force passing through coil then galvanometer gives deflection, but when there is no change in magnet flux, the deflection in galvanometer is zero - induced current or induced e.m.f. will produce only when flux passes through coil changes.
On increasing the number of turns deflection will increase.
On using strong magnet deflection will increase.

OR

Whenever there is a change in the magnetic lines of force associated with a conductor, an electromotive force (e.m.f.) is set up at the ends of the conductor which lasts as long as the change is taking place. This phenomenon is called electromagnetic induction.
The magnetic field passing through the coil remains constant. Thus the magnetic flux does not change. Hence no current will be induced in the coil. Therefore, galvanometer will show no deflection.

15. Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental cues, while in some other animals the individuals can change their sex during their life time indicating that sex of some species is not genetically determined. However, in human beings, the sex of an individual is largely determined genetically. **4**

(a) In what way are the sex chromosomes 'X' and 'Y' different in size? Name the mismatched pair of sex chromosome in humans.

Sol. X-chromosome is longer than Y-chromosome XY-chromosome pair is mismatched pair sex chromosome.

(b) Write the number of pair/pairs of sex chromosomes present in human beings. In which one of the parent (male/female) perfect pair /pairs of sex chromosomes are present?

Sol. 1 pair of sex chromosome present in human beings. In female perfect pair of sex chromosome are present.

(c) Citing two examples, justify the statement "Sex of an individual is not always determined genetically".

Sol. Turtle species eggs from cooler nests hatch as all males and eggs from warmer nests hatch as all females.

OR

Draw a flow chart to show that sex is determined genetically in human beings.

Sol.