Solved Paper 2022
Science (TERM-II)
CLASS-X

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

General Instructions :

Read the following instructions carefully and strictly follow them:

(i) *This Question paper contains **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 number **1** to **7** are short answer type questions. Each question carries **two** marks.*

(iv) *Section–B—Question number **8** to **13** are also short answer type questions. Each questions carries **three** marks.*

(v) *Section–C—Question number **14** to **15** are case based questions. Each question carries **four** marks.*

(vi) *Internal choices have been provided in some questions. Only one of the alternatives has to be attempted.*

TERM-II, DELHI SET-I—SERIES: QQCRR/2   *Code No. : 31/2/1*

SECTION - A

1. "Carbon prefers to share its valence electrons with other atoms of carbon or with atoms of other elements rather than gaining or losing the valence electrons in order to attain noble gas configuration." Give reasons to justify this statement.   **2**

Ans. The atomic number of carbon is 6. Its electronic configuration can be written as K, L = 2, 4.

Thus, it has four electrons in its outermost shell and requires 4 electrons to achieve the inert gas electronic configuration. Carbon can attain its stable noble gas configuration in two ways:

(i) It may gain four electrons to form C^{4-} anion. But in that case, it would be difficult for the nucleus with six protons to hold on to ten electrons.

(ii) It could lose four electrons to form C^{4+} cations. But in that case, it would require huge amount of energy which is not energetically favourable.

Thus, carbon overcomes this problem by sharing its valence electrons with other atoms of carbon or with atoms of other elements and forms covalent compounds.

* 2. The atomic number of an element 'X' is 11.

(i) Write the electronic configuration of X and find its valency.

(ii) Write the formula and nature of its oxide.   **2**

3. Give reasons:

(i) Placenta is extremely essential for foetal development.

(ii) Uterine lining becomes thick and spongy after fertilisation.   **2**

Ans. (i) The developing embryo gets nutrition from the mother's blood with the help of placenta. Placenta contains villi on the embryo's side of the tissues and blood spaces on the mother's

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* Out of Syllabus

side surround the villi. These villi provide a large surface area that facilitates passage of nutrition and oxygen to embryo from mother through blood. Waste substances produced by embryo are removed through placenta into mother's blood.

(ii) Every month one egg is released by the ovary and uterus prepares itself to receive a fertilised egg. As a result, the lining of the uterus becomes thick and spongy. This is required for nourishing the embryo after fertilisation.

4. (a) Name the reproductive and non-reproductive parts of bread mould (*Rhizopus*).

(b) List any two advantages of vegetative propagation.   **2**

Ans. (a) Hyphae are considered the non-reproductive part of the bread mould. It has a knob like structure which is involved in reproduction and is called sporangia. Each sporangium contains hundreds of black spores which get dispersed into air to germinate on suitable substratum.

(b) Advantages of vegetative propagation:

(i) Offsprings are genetically identical and therefore useful traits can be preserved.

(ii) It is a rapid and economical method.

(iii) Seedless varieties can be obtained.

5. Name the reproductive parts of an angiosperm. Where are these parts located? Explain the structure of its male reproductive part.   **2**

OR

What is puberty? Mention any two changes that are common to both boys and girls in early teenage years.

Ans. The stamen and pistil are the reproductive parts of an angiosperm.

They are located in the flower.

Stamen is the male reproductive part of a flower. A stamen consists of anther and filament.

(i) **Anther:** Anther is a sac-like structure that produces pollen grains.

(ii) **Filament:** Filament is a thin stalk-like structure that supports anther.

OR

Puberty is the period of sexual maturity. In this phase, the rate of general body growth begins to slow down and the reproductive tissue begins to grow.

Two changes that are common to both boys and girls in early teenage years are:

• Thick hair growth in armpits and genital area.

• Skin becomes oily, may result in pimples.

6. **(a)** **Name the poles P, Q, R and S of the magnets in the following figures 'a' and 'b':**   ½+½+1=2
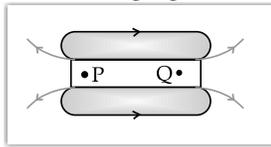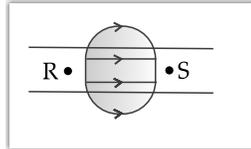
Figure 'a'

Figure 'b'

(b) **State the inference drawn about the direction of the magnetic field lines on the basis of these diagrams.**

OR

When is the force experienced by a current – carrying straight conductor placed in a uniform magnetic field.   1+1=2

(i) **Maximum**

(ii) **Minimum**

Ans. (i) The force experienced by a current carrying straight conductor placed in a uniform magnetic field is maximum when the conductor carrying current is perpendicular to the direction of a uniform magnetic field.

(ii) The force experienced by a current carrying straight conductor placed in a uniform magnetic field is minimum when the conductor carrying current is parallel or anti parallel to the direction of a uniform magnetic field.

OR

(a) In Figure (a)- P is north pole and Q is the south pole.

In figure (b)- R is the north pole and S is the south pole.

(b) In the given diagrams, the direction of magnetic field shows that outside the magnet, the magnetic field lines emerge from the North pole of a magnet and merge at the south pole of the magnet.

7. **In the following food chain, only 2J of energy was available to the peacocks. How much energy would have been present in Grass? Justify your answer.** 2

GRASS → GRASS HOPPER → FROG → SNAKE → PEACOCK

OR

(a) **What is meant by garbage? List two classes into which garbage is classified.**

(b) **What do we actually mean when we say that the "enzymes are specific in their action"?**

Ans. According to ten percent law," only ten percent of energy is transferred to each trophic level from the lower trophic level.

Total amount of energy from the snake

$$= A = A \times \frac{10}{100} = 2J$$

Or $\qquad A = 20 \ J$

Total energy from the frog

$$= B = B \times \frac{10}{100} = 20 \ J$$

Or $\qquad B = 200 \ J$

Total energy from the grasshopper,

$$C = C \times \frac{10}{100} = 200 \ J$$

Or $\qquad C = 2000 \ J$

Total energy from the grass ,

$$D = D \times \frac{10}{100} = 2000 \ J$$

Or $\qquad D = 20000 \ J$

GRASS → GRASS HOPPER → FROG → SNAKE
(20,000J) (2000J)   (200J)   (20J)
→ PEACOCK
        (2J)

This means, the amount of energy present in the grass is 20,000 J.

OR

(a) Garbage is a waste substance that is no longer useful for humans. It includes household waste, kitchen waste, animal waste, plant waste etc.

There are two types of garbage:

(i) **Biodegradable wastes:** Substances which can be decomposed by the action of micro-organisms are called biodegradable substances. e.g., : Fruit and vegetable peels, cotton, jute, dung, paper etc.

(ii) **Non-biodegradable Wastes:** Substances which cannot be decomposed by the action of micro-organisms are called non-biodegradable wastes. e.g.,: Plastic, polythene, pesticides etc. Most of the non-biodegradable wastes results from human activities.

(b) Enzymes are proteins that enhance the rate of reaction. They are specific in nature as a specific enzyme is required to perform a specific function. For e.g., salivary amylase is an enzyme present

in saliva and is required for the breakdown of starch into simple sugars.

SECTION - B

* **8. (a)** State Newland's Law of Octaves.

$$1+1+1/2+1/2 = 3$$

(b) With an example, explain Dobereiner's Triads.

(c) List one limitation each of both the attempts mentioned in 'a' & 'b'.

9. Consider the following organic compounds: **3**

(i)
```
    H  H  H
    |  |  |
H — C— C— C=O
    |  |
    H  H
```

(ii)
```
    H  H
    |  |
H — C— C=O
    |
    H
```
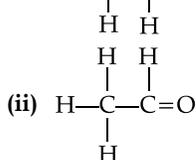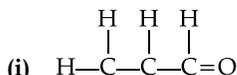
(a) Name the functional group present in these compounds.

(b) Write the general formula for the compounds of this functional group.

(c) State the relationship between these compounds and draw the structure of any other compound having similar functional group.

OR

(a) Draw the electron dot structure for ethyne.

$$1+2=3$$

(b) List two differences between the properties exhibited by covalent compounds and ionic compounds.

Ans. (a) Functional group: Aldehyde

(b) General formula: $C_nH_{2n}O$

(c) It forms the part of the homologous series of the aldehydes as these compounds differ from each other by $-CH_2$ unit.

Structure of 4th member of this series is :

```
      H    H    H    H
      |    |    |    |
H — C — C — C — C = O
      |    |    |
      H    H    H
           C₄H₈O
```
C_4H_8O
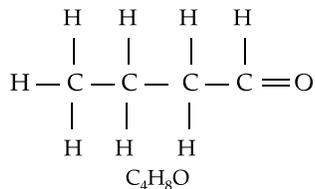
OR

(a) Electron dot structure of ethyne is:

C_2H_2

(b)

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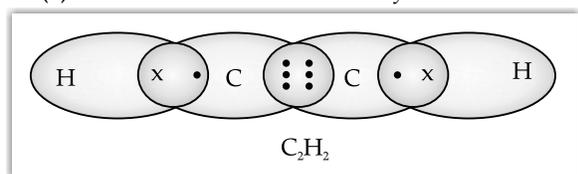
Ionic compounds	Covalent compounds
They have high melting and boiling points.	They have low melting and boiling points.
They are formed by transfer of electrons between the combining atoms.	They are formed by sharing of electrons between the combining atoms.

10. (a) Name the two types of gametes produced by men. ½+½

(b) Does a male child inherit X chromosome from his father? Justify. ½+1

(c) How many types of gametes are produced by a human female? ½

Ans. (a) Human male produces sperms which can be of two types: One containing X chromosome and other containing the Y chromosome.

(b) A male child has XY sex chromosomes. When a Y chromosome containing sperm fuses with the ovum, it produces a boy child and when the X chromosome containing sperm fuses with the ovum, it produces a girl child. This means, the male child cannot inherit X chromosome from his father. He inherits the X chromosome from the mother.

(c) A human female produces only a single type of gamete called ovum that bears the X chromosome.

11. (a) State Ohm's Law. Represent it mathematically. **3**

(b) Define 1 ohm.

(c) What is the resistance of a conductor through which a current of 0.5 A flows when a potential difference of 2V is applied across its ends?

Ans. Ohm's law: It states that "Electric current through a metallic conductor is directly proportional to potential difference across the conductor of the circuit provided that temperature remains constant.

Mathematical expression for Ohm's Law: $I \propto V$.

Or $\qquad\qquad V = IR$

Or $\qquad\qquad I = \dfrac{V}{R}$

Where, R = constant called resistance of a given metal.

(b) 1 Ohm = When potential difference is 1 V and current through the circuit is 1 A, then the resistance is 1 ohm

$$1 \text{ ohm} = \dfrac{1 \text{ volt}}{1 \text{ ampere}}$$

(c) Given, I= 0.5 A

Potential difference, V= 2 V

Applying ohm's law, V= IR

Or, $R = \dfrac{V}{I} = \dfrac{2}{0.5} = 4\ \Omega$

Hence, the resistance of a conductor is 4 Ω.

12. (a) **List the factors on which the resistance of a uniform cylindrical conductor of a given material depends.** **2+1**

(b) **The resistance of a wire of 0.01 cm radius is 10 Ω. If the resistivity of the wire is 50 × 10⁻⁸ Ω m, find the length of this wire.**

OR

(a) **What is the meaning of electric power of an electrical device? Write its SI unit.** **1½**

(b) **An electric kettle of 2 kW is used for 2h. Calculate the energy consumed in**

(i) **kilowatt hour and**

(ii) **joules.** **½**

Ans. (a) Factors on which the resistance of a conductor depends:

(i) **Length of conductor:** Resistance is directly proportional to the length of conductor. This means resistance increases with increase in length of the conductor. This is why long wires create more resistance to the electric current.

(ii) **Area of cross-section:** Resistance is inversely proportional to the area of cross-section of the conductor. This means resistance decreases with increase in area of cross-section of conductor and vice versa. This is why; a thick copper wire creates less resistance to electric current.

(iii) **Temperature:** Resistance is directly proportional to the temperature.

(iv) **Nature of material:** Resistance depends on nature of material. Some materials like silver are good conductor of electricity while some like plastic are bad conductor of electricity.

(b) Given, Radius, $r = 0.01$ cm $= 0.0001$ m

Resistance, R = 10 Ω

Resistivity, ρ = 50 × 10⁻⁸ Ω m

$$R = \rho \dfrac{L}{A}$$

$$L = \dfrac{RA}{\rho}$$

$$= \dfrac{10 \times 3.14 \times (0.0001)^2}{50 \times 10^{-8}}$$

$= 0.628$ m   (Area, A = πr^2)

Hence, the length of the wire is 0.628 m.

OR

Electric power is the measure of the rate of electrical energy transfer by an electric circuit per unit time.

$$P = \dfrac{E}{t}$$

Its SI unit is watt (W).

(b) (i) Power, $P = \dfrac{E}{t}$

So, energy consumed,

E = P × t = 2 × 2 = 4 kWh

(ii) Energy consumed,

E = 4 kWh

= 4 × 1000 × 3600 J

= 1.44 × 10⁷ J

13. (a) **We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Why?** **1+2**

(b) **Why is ozone layer getting depleted at the higher levels of the atmosphere? Mention one harmful effect caused by its depletion.**

Ans. (a) We do not clean ponds or lakes but an aquarium needs to be cleaned. An aquarium is an artificial ecosystem and it does not have enough population of decomposers to decompose waste materials produced by aquatic animals. Ponds or lakes are natural ecosystems that have plenty of producers, consumers and decomposers.

(b) The ozone layer is getting depleted at the higher levels of the atmosphere due to the action of chlorofluorocarbons (CFCs). CFCs are used in refrigerators and fire extinguishers.

Depletion of ozone layer is allowing greater amount of UV radiation to reach the Earth. UV radiation can affect the ecosystem by affecting photosynthesis in plants, destroying planktons and decomposers. In human beings, UV radiation may cause skin cancer, cataract of eyes and damage to immune system.

SECTION - C

The 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. **Mendel blended his knowledge of science and mathematics to keep the count of the individuals exhibiting a particular trait in each generation. He observed a number of contrasting visible characters controlled in pea plants in a field. He conducted many experiments to arrive at the laws of inheritance.**

(a) **What do the F₁ progeny of tall plants with round seeds and short plants with wrinkled seeds look like?**

(b) **Name the recessive traits in above case.**

(c) **Mention the type of the new combinations of plants obtained in F_2 progeny along with their ratio, if F_1 progeny was allowed to self pollinate.**

1+1+2=4

If 1600 plants were obtained in F_2 progeny, write the number of plants having traits:

(i) **Tall with round seeds.**

(ii) **Short with wrinkled seeds.**

Write the conclusion of the above experiment.

Ans. (a) F_1 progeny of tall plants with round seeds and short plants with wrinkled seeds will be heterozygous tall plant with round seeds (TtRr) as tall and round are the dominant traits.

	♂		♀
Parents	TTRR	×	ttrr
Gametes	Ⓣ Ⓡ		Ⓣ Ⓡ
F_1 progeny	TtRr		
	(Tall and round)		
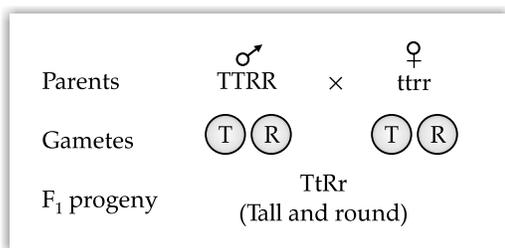
(b) The recessive traits are short plants and wrinkled seeds.

(c) The different types of combination obtained in F_2 progeny are:

TtRr

F_1 progeny ↓ self pollination

♂   ♀

TtRr   TtRr

Gametes Ⓣ Ⓡ Ⓣ Ⓡ × Ⓣ Ⓡ Ⓣ Ⓡ
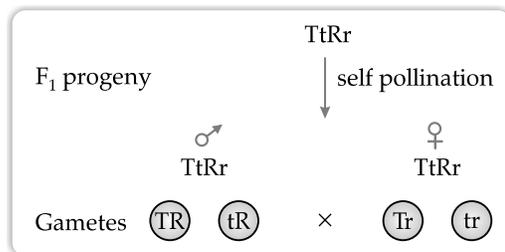
F_2 progeny ♀\♂	TR	tR	Tr	tr
TR	TTRR Tall Round	TtRR Tall Round	TTRr Tall Round	TtRr Tall Round
tR	TtRR Tall Round	ttRR short round	TtRr Tall Round	ttRr Short round
Tr	TTRr Tall Round	TtRr Tall Round	TTrr Tall wrinkled	Ttrr Tall wrinkled
tr	TtRr Tall Round	ttRr Short round	Ttrr Short wrinkled	ttrr Tall wrinkled

Tall plants with round seeds = 9

Short plants with round seeds = 3

Tall plants with wrinkled seeds = 3

Short plants with wrinkled seeds = 1

Phenotypic ratio   Tall round : short round : tall wrinkled : short wrinkled

      9   3   3   1

OR

If 1600 plants were obtained in F_2 progeny, the number of plants having traits will be:

Tall plants with round seeds = $\frac{9}{16} \times 1600$ = 900

Short plants with wrinkled seeds = $\frac{1}{16} \times 1600$

= 100

The conclusion of the above experiment states the "Law of independent assortment". This law states that the alleles of two (or more) different genes get sorted into gametes independently of one another.

15. **A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminium rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions:** **4**
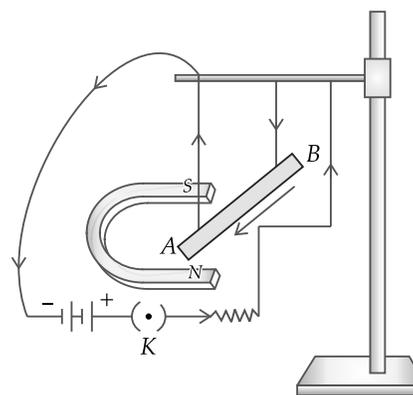
(a) **Why does the rod get displaced on passing current through it?**

(b) **State the rule that determines the direction of the force on the conductor AB.**

(c) (i) **If the U shaped magnet is held vertically and the aluminium rod is suspended horizontally with its end B towards due north, then on passing current through the rod from B to A as shown, in which direction will the rod be displaced?**

(ii) **Name any two devices that use current carrying conductors and magnetic field.**

OR

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

Ans. (a) When a current carrying conductor is placed in a magnetic field, it experiences a force, due to which the rod gets displaced.

(b) The rule that determines the direction of force on the conductor AB is Fleming's left hand rule. According to this rule of the direction of electric

current is perpendicular to the magnetic field, the direction of force is also perpendicular to both of them.

Stretch the thumb, fore finger and middle finger of your left hand such that they are mutually perpendicular.

If forefinger points in the direction of magnetic field, middle finger in the direction of current, then thumb will point in the direction of motion of force.
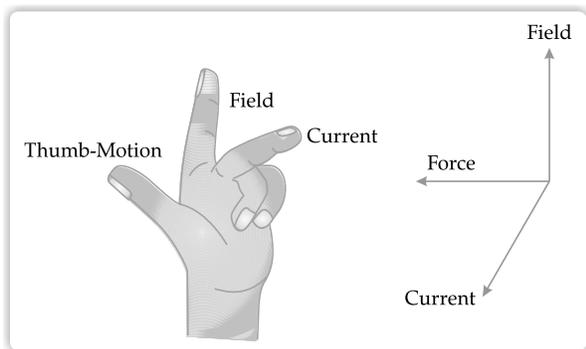
(c) (i) According to Fleming's left hand rule, the rod will get displaced upwards.

(ii) Devices that use current carrying conductors and magnetic field are electric motor, electric generator, loudspeaker, microphones etc.

OR

The magnetic field lines around a current carrying conductor can be represented by concentric circles.

The direction of magnetic field can be determined by using right hand thumb rule.

The direction of magnetic field lines is clockwise when seen from the upper end

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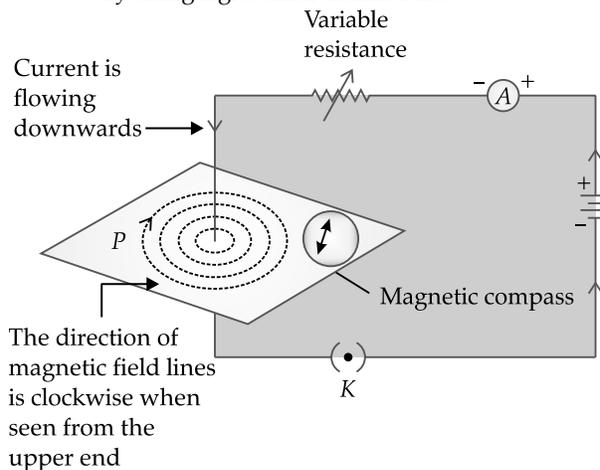
TERM-II, DELHI SET-2—SERIES: QQCRR/2   *Code No. : 31/2/2*

Note : Except these all other Questions are from Set - I

<div style="text-align:center">**SECTION - A**</div>

5. In the following figure showing a germinating gram seed, name the parts labelled as A, B and C:

½ × 4 = 2
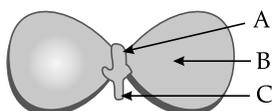
Why is Part 'B' considered to be important during germination?

Ans. The part labelled as A is Plumule; B is Cotyledon while C is Radicle.
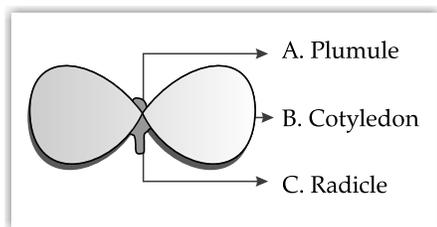
The part B is the cotyledon which serves as a food store during germination. It provides nutrients to the growing embryo during germination.

* 6. A part of modern periodic table is given below. On its basis, answer the following questions:

½ × 4 = 2

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* *Out of Syllabus*

Group No. → Period ↓	1	2	13	14	15	16	17	18
2		A				B		
3	E			D			F	C

(a) Write the molecular formula of the compound formed by the combination:
   (i) A and F   (ii) E and B
(b) Which of the element is a
   (i) Noble gas   (ii) Metalloid

7. Write the chemical formula of two consecutive homologous of organic compounds having functional group –OH. What happens to the (i) boiling points and (ii) solubility of organic compounds of a homologous series as the molecular mass increases.   ½×4=2

Ans. The general formula of the homologous series of the compound –OH group is $C_nH_{2n+1}OH$.

The two consecutive homologous are: Methanol (CH_3OH) and ethanol (C_2H_5OH).

(i) As the molecular mass increases in homologous series, the boiling point also increases.

(ii) The solubility of an organic compound decreases with increase in molecular mass.

<div style="text-align:center">**SECTION - A**</div>

10. In the given circuit determine the value of: 3
   (i) Total resistance of the circuit

(ii) Current flowing through the ammeter.
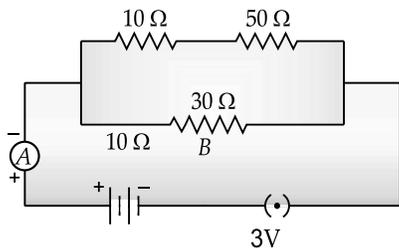
Ans. (i) The resistance 10 Ω and 50 Ω are connected in series, so their equivalent resistance is:

$R_s = 10 + 50 = 60$ Ω

Now R_s and 30 Ω are connected in parallel, so their equivalent resistance is:

$$\frac{1}{R_{total}} = \frac{1}{60} + \frac{1}{30}$$

$$\frac{1}{R_{total}} = \frac{3}{60} = 20 \text{ Ω}$$

Hence, total resistance of the circuit is 20 Ω. **2**

(ii) Given, V = 6 V

Current flowing through the ammeter,

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

Or, $I = \dfrac{6}{20}$ or $\dfrac{3}{10}$ = 0.3 A

Thus, the current flowing through the ammeter is 0.3 A.

11. A green stemmed tomato plant denoted by (GG) is crossed with a tomato plant with purple stem denoted by (gg). **3**

(i) What colour of the stem would you expect in their F_1 progeny?

(ii) In what ratio would you find the green and purple coloured stem in plants of F_2 progeny?

(iii) What conclusion can be drawn for the above observations?

Ans. (i) All the plants in F_1 progeny will be of green coloured stem.

(ii) Cross for F_2 progeny is:

The phenotypic ratio will be 3 (green): 1(purple)

(iii) From the above cross, it is confirmed that recessive traits are not expressed in the F_1 generation as they are present in heterozygous condition whereas the recessive traits get expressed in F_2 generation in homozygous condition. This is known as the "law of dominance".

TERM-II, DELHI SET-3—SERIES: QQCRR/2   *Code No. : 31/2/3*

Note: Except these all other Questions are from Set - I

SECTION - A

* 1. (i) Write the electronic configuration of element X, given by its symbol as under:

$$^{40}_{20}X$$

(ii) Determine its position in the modern periodic table.

(iii) What is the nature of its oxide?

(iv) Name one other element of its group. **½ × 4**

2. (i) Write the name and draw the structure of a saturated hydrocarbon with four carbon atoms.

(ii) Write the number of single covalent bonds present in this compound. **2**

Ans. (i) Name of the saturated hydrocarbon with four carbon atoms is butane (C_4H_{10}).

Structure:
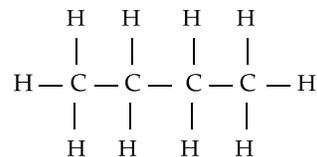
(ii) The number of single covalent bonds is 13.

4. (a) State one drawback of each of the following:

½ × 4 = 2

(i) Oral contraceptive pills

(ii) Copper-T

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* Out of Syllabus

(b) Under which category of contraceptive methods, is the use of condom kept? In what way, its use is better as compared to other methods of contraception?

Ans. (a) (i) Oral contraceptive pills acts by changing the hormonal balance of the body so that the eggs are not released and the process of fertilisation does not take place. As these pills change the hormonal balance, it may cause side effects to the body.

(ii) Copper T is placed in the uterus to prevent pregnancy. It can cause side effects due to the irritation of the uterus.

(b) Condom acts as a mechanical barrier that prevents the meeting of sperm and egg.

Condom prevents the direct contact of body fluids during the sexual intercourse and hence prevents the transmission of sexually transmitted diseases.

SECTION - B

10. (a) What is the heating effect of electric current? 3

(b) Write an expression for the amount of heat produced in a resistor when an electric current is passed through it stating the meanings of the symbols used.

(c) Name two appliances based on heating effect of electric current.

Ans. (a) When electricity is supplied to a purely resistive conductor, the energy of electric current gets dissipated entirely in the form of heat. As a result, resistor gets heated. The heating of resistor because of dissipation of electrical energy is known as heating effect of electric current.

(b) When an electric current I passes through the conductor, the amount of heat produced in time t is:
$$H = VIt$$
Since, $\qquad V = IR$
So, $\qquad H = I^2Rt$

(c) Two appliances based on heating effect of electric current are electric iron and electric geyser.

11. What are Chromosomes? Explain how stability of the DNA of the species is ensured in sexually reproducing organisms.

Ans. Chromosomes are thread like structures which are made up of proteins and DNA. DNA contains the information of traits which are passed from parents to offspring from one generation to another. In sexually reproducing organisms, stability of DNA is ensured by the DNA copying mechanism. The DNA replication process is very efficient and error free which in turn maintains the stability of the DNA. The chromosome number is also maintained during reproduction by the process of meiosis during gamete formation.

TERM-II, OUTSIDE DELHI SET-1—SERIES: QQDRR/4   *Code No. : 31/4/1*

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**

Ans. Atomic size is the distance between the center of the nucleus and the outer most shell of an isolated atom. Atomic size refers to the radius of an atom. Atomic size of the elements increases as we move down the group. This is because new shells are being added as we go down the group. This increases the distance between the outer most shell and the nucleus so that the atomic size increases in spite of the increase in the nuclear charge.

Also, atomic radius of the elements decreases on moving from left to right across a period. This happens due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of an atom.

2. As shown in the diagram an aluminium rod 'AB' is suspended horizontally between the two poles of a strong horse shoe magnet 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.

State giving reason:

(a) What is observed when a current is passed through the aluminium 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?

Ans. (a) It is observed that the rod is displaced towards the left as force is exerted on the current carrying aluminium rod when it is placed in a magnetic field.

(b) No displacement will be observed as rod will not experience any force because angle between magnetic field and current carrying conductor is zero.

OR

Magnetic field is a quantity that has both direction and magnitude. The direction of the magnetic field is taken to be the direction in which a north pole of the compass needle moves inside it. Therefore it is taken by convention that the field lines emerge from North Pole and merge at the South Pole. Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus, the magnetic field lines are closed curves.

The relative strength of the magnetic field is shown by the degree of closeness of the field lines. The field is stronger, that is, the force acting on the pole of another magnet placed is greater where the field lines are crowded.
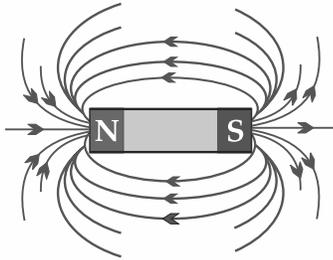
3. Using height (tallness/dwarfness) of a plant as an example, show that genes control the characteristics or traits in an organism. **2**

OR

In a cross between red coloured and white coloured flowers, when plants with red coloured flowers of F_1 generation were self pollinated, plants of F_2 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.

Ans. A gene is the section of DNA on a chromosome that codes the formation of a protein controlling a specific characteristic of the organisms. Suppose, a plant progeny possess gene for the characteristic called "tallness". The gene for tallness will give instructions to the plant cell to generate many plant growth hormones due to which the plant will grow tall. On the other hand, if the plant has the gene for shortness, less plant growth hormones will be produced, due to which the plant will not grow much and remain a dwarf plant.

OR

When a pure red flowered plant is crossed with pure white flowered plant, in the next generation, plants with red flowers are produced. It is called Mendel's Monohybrid cross.
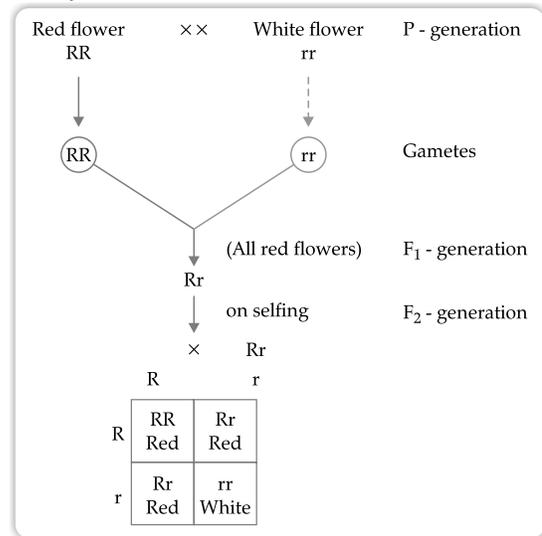
(a) Phenotypic ratio: Red : White : 3 : 1

(b) Genotypic ratio: Pure Red : Hybrid Red : Pure White: 1 : 2 : 1

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

Ans. (a) Placenta: Provides nourishment to the embryo from mother's blood / Removal of waste from embryo to mother's blood. **(Any one)**

(b) Fallopian tube: Releases egg/ female gamete/ ovum releases oestrogen/ female hormones. **(Any one)**

(c) Uterus: Development of embryo/ foetus.

(d) Ovary: Releases egg/ female gamete/ ovum releases oestrogen/ female hormones. **(Any one)**

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

OR

"The change in packaging has resulted in waste becoming non-biodegradable."

Giving two examples from daily life, justify this statement.

Ans. The day to day improvement in our lifestyle has resulted in greater amount of waste generation. Evidences to support this statement are:

(i) The use of disposable items like paper plates, plastic items, polythene etc., is increasing day by day. These are usually made up of non-biodegradable substances like plastic and styrofoam which eventually result in polluting our environment.

(ii) Use of aluminium foil and plastic wraps for packaging at small scale and large scale has resulted in greater amount of waste.

OR

Increased use of disposable items like paper plates, plastic items, polythene, etc., and use of aluminium foil and plastic wraps for packaging at small scale and large scale has resulted in greater amount of non-biodegradable waste. To reduce non-biodegradable waste, polythene bags and plastic containers should be reused.

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

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

Ans. (a) In *Amoeba*, splitting of the cell into two during cell division can take place in any plane.

Leishmania has a whip like structure at one end of the cell. Hence, binary fission occurs in a definite orientation in relation to this structure.

(b) *Plasmodium* (malarial parasite) reproduces by the process of multiple fission in which within the cyst, the nucleus of the cell divides multiple times and surrounds itself by a small amount of cytoplasm.

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

(i) 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.

Ans. (a) Only 1 double covalent bond is present, others are single covalent bonds.

(b) C_2H_2 is the first member of alkyne series having formula C_nH_{2n-2}

(c) C_6H_6 has ring structure of carbon atoms. (known as benzene ring)

(d) C_3H_8 is a member of Alkane series having formula 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? **3**

How the formulae of these compounds had helped Mendeleev in deciding the position of an element in his periodic table?

9. What are trophic level? 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**

* *Out of Syllabus*

Ans. A specific place of organisms in the food chain is known as their trophic level.

Producers (green plants) constitute first trophic level in a food chain. It is because they take nutrients from the soil or the water, and manufacture their own food by photosynthesis, using energy from the sun.

In a food chain, the number of trophic levels is limited to 4 - 5. This, is because according to 10% law of energy transfer of only 10% of energy passes from one trophic level to next. Thus, the amount of energy decreases with successive trophic levels.

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. After pollen lands on a suitable stigma, the pollen grain absorbs water and nutrients. It produces a tube called pollen tube. Pollen tube grows through style and reaches the ovary. Its tip contains a tube nucleus and two male gametes or sperm cells. The advancing pollen tube enters an ovule, generally through micropyle and reaches the interior of the embryo sac. Here, the tube bursts to release its two male gametes. One male gamete fuses with egg to form zygote. The process is known as syngamy. The second male gamete fuses with binucleate central cells which forms endosperm. Since, the process involves the fusion of three haploid nuclei, it is known as triple fusion. Thus, triple fusion is the fusion of male gamete with two polar nuclei inside the embryo sac of the angiosperm.
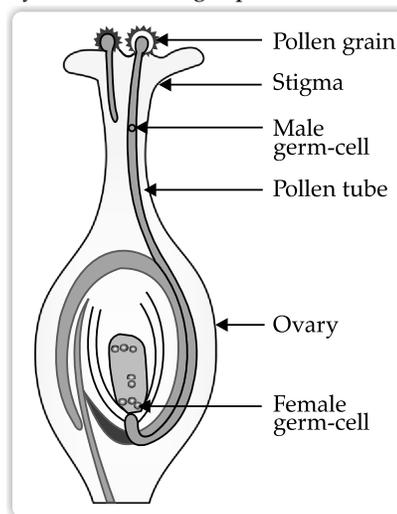
11. "Two different forms of carbon – diamond and graphite have different structure and very different physical properties even though their chemical properties are same." Explain why. **3**

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?

Ans. Diamond and graphite are allotropes of carbon. Allotropes are the different forms of the element having different physical properties. The element carbon occurs in various forms in nature with different physical properties but nearly same chemical properties. Diamond is giant molecule of carbon atoms in which each carbon atom is bonded to four other carbon atoms forming a rigid three dimensional structure, which is responsible for its hardness. Graphite crystal consists of layer of carbon atoms in which each carbon atom is bonded to three other carbon atoms in the same plane giving a hexagonal array. Graphite structure is formed by hexagonal array being placed in layer one above the other.

OR

(i) Carbon can lose four electrons to form C^{4+} cations. But in that case, it would require huge amount of energy which is not energetically favourable.

(ii) Carbon may gain four electrons to form C^{4-} anion. But in that case, it would be difficult for the nucleus with six protons to hold on to ten electrons.

Thus, carbon overcomes this problem by sharing its valence electrons with other atoms of carbon or with atoms of other elements. The bond formed by mutual sharing of electron pairs between two atoms in a molecule is known as covalent bond.

12. (a) A student wants to use an electric heater, an electric bulb and an electric fan simultaneously. **3**

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?

Ans. All these electrical gadgets can be connected in parallel. It is because :

(i) All appliances will get same potential difference in parallel so flow of any one appliance is not affected on switching on or off of other appliance.

(ii) In parallel arrangement if one appliance is switched off or fuses other can effectively work.

Electric fuse is a safety device that protects our electrical appliances in case of short circuit or overloading. It is made up of pure tin or alloy of copper and tin. It is always connected in series with live wire.

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 ₹ 5.

OR

Study the following circuit and find:
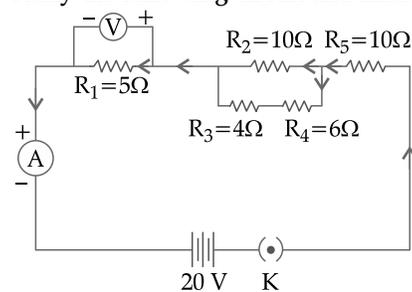
(i) **Effective resistance of the circuit**

(ii) **Current drawn from the battery**

(iii) **Potential difference across the 5 Ω resistor**

Ans. Given,

Voltage   (V) = 220 V

Power   (P) = 1100 W

Time   (t) = 2h = 2 × 60 × 60 = 7200 s

(i) Power (P) is given by the expression,

$$P = V \times I$$
$$1100 = 220 \times I$$
$$I = \frac{1100}{220} = 5A$$

(ii) Energy consumed by the motor = P × t

$$P = 1100 \times 7200$$
$$P = 7.92 \times 10^6 \text{ J}$$

Therefore, power of the motor = 1100 W

Energy consumed by the motor

$$= 7.92 \times 10^6 \text{ J}$$

OR

(i) The resistance R_3 and R_4 are connected in series, so their equivalent resistance is :

$$R_s = 4 + 6 = 10 \text{ Ω}$$

Now R_s and R_2 are connected in parallel, so their equivalent resistance is :

$$\frac{1}{R_p} = \frac{1}{10} + \frac{1}{10} = \frac{1+1}{10} = \frac{2}{10}$$

$$R_P = \frac{10}{2} = 5 \text{ Ω}$$

Now R_p is connected in series with R_1, so their equivalent resistance is :

$$R_{total} = 5 + 5 + 10 = 20 \text{ Ω}$$

Hence, effective resistance of the circuit is 20 Ω.

(ii) Given, V = 20 V, R = 20 Ω

According to ohm's law,

$$V = IR$$

Or, $20 = I \times 20$

Or, $I = \frac{20}{20} = 1 \text{ A}$

(iii) Given, I = 1 A and R = 5 Ω

As per Ohm's law,

$$V = IR$$
$$V = 1 \times 5 = 5 \text{ V}$$

Potential difference across 5 Ω resistor = 5 V

SECTION - C

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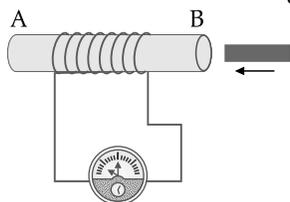
(a) **State the reason for using galvanometer in the activity and why does its needle deflects momentarily when magnet is moved towards the coil.**

(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 is 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.

Ans. (a) Galvanometer is an instrument used to detect the presence of current in a circuit. Depending upon the direction of current, it deflects either to the left or to the right of the zero mark.

When a bar magnet is pushed toward the coil, the magnetic field linked with the coil increases. Hence, induced current e.m.f. is set up in the coil. Hence, galvanometer deflects right.

(b) When the coil and a magnet are moved in the same direction and at the same speed, then there is no change in the magnetic field across the coil and hence no induced current.

(c) From these observations, we conclude that a potential difference is induced in the coil 2 whenever the electric current through the coil

1 is changing (starting or stopping). Coil 1 is called the primary coil and coil 2 is called the secondary coil. As the current in the first coil changes, the magnetic field associated with it also changes. Thus the magnetic field lines around the secondary coil also change. Hence the change in magnetic field lines associated with the secondary coil is the cause of induced electric current in it.

This process, by which a changing magnetic field in a conductor induces a current in another conductor, is called electromagnetic induction.

By increasing the number of turns in the coil and using a strong magnet, the strength of the magnetic field increase.

OR

The process, by which a changing magnetic field in a conductor induces a current in another conductor, is called electromagnetic induction.

If the bar magnet is held stationary inside the coil, then there is no induced current in the coil, because there is no change in magnetic field through it. As a result, galvanometer does not show any deflection.

15. Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental ones, 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.**

(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 chromosome are present?**

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

OR

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

Ans. (a) The father can contribute an X or a Y chromosome, while the mother always contributes an X. The Y chromosome is one-third the size of the X chromosome and contains about 55 genes while the X chromosome has about 900 genes.

X chromosome has mismatched pair in a normal human male.

(b) There is 1 pair of sex chromosomes present in human beings.

Females have perfect pair of chromosomes i.e., XX.

(c) Sex of an individual is not always determined genetically. For e.g.,

(i) In some animals, the temperature at which fertilised eggs are kept determines whether the developing animal in egg is male or female.

(ii) In some animals like snail, individual can change sex.

OR

Sex determination in human beings:
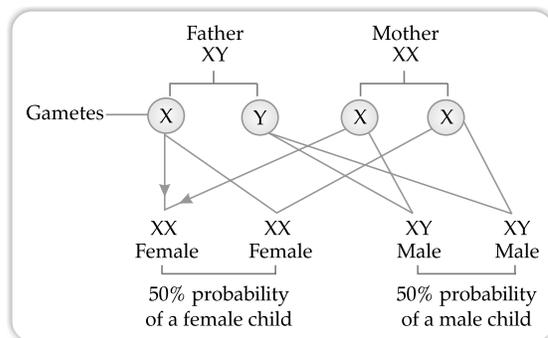
TERM-II, OUTSIDE DELHI SET-2—SERIES: QQDRR/4   *Code No. : 31/4/2*

Note : Except these all other Questions are from Set - I

SECTION - A

3. Consider the following molecular formulae of carbon compounds: **2**
(i) CH$_3$COOH (ii) CH$_3$OH (iii) C$_2$H$_6$ (iv) C$_3$H$_4$ (v) C$_4$H$_8$

(a) Which one of these compounds belongs to homologous series of alcohols?

(b) Identify the compound having triple bond between carbon – carbon atoms.

(c) Write the molecular formula of the first member of the homologous series to which CH$_3$COOH belongs.

(d) Write the general formula of the series to which the compound C$_4$H$_8$ belongs.

Ans. (a) (ii) Methanol (CH$_3$OH) belongs to homologous series of alcohols.

(b) (iv) C$_3$H$_4$ has triple bond between carbon atoms.

(c) Methanoic acid (HCOOH)

(d) General formula of C$_4$H$_8$ is C$_n$H$_{2n}$

5. **What is Regeneration? Explain the process of regeneration in *Planaria*.** **2**

Ans. Regeneration is the ability of an organism to give rise to a new organism/individual from their body parts. In this method, small cut or broken parts of the organisms body grows into a complete organism. Regeneration is carried out by specialized cells called regenerating cells. Example, *Planaria*, has the amazing capacity to regenerate its lost body part. When the flatworm is cut horizontally, separating the head from the tail, the tail will regenerate the lost head and the head will regenerate the lost tail.
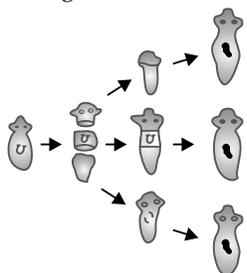
* 7. **State Modern Periodic Law. How many rows and columns are there in the Modern Periodic Table? 2**

SECTION - B

13. **Draw a diagram showing flow of energy from solar input to a food chain having four trophic levels in an ecosystem. List two inferences that can be drawn from the energy flow diagram.** **3**

Ans. Energy flow diagram:
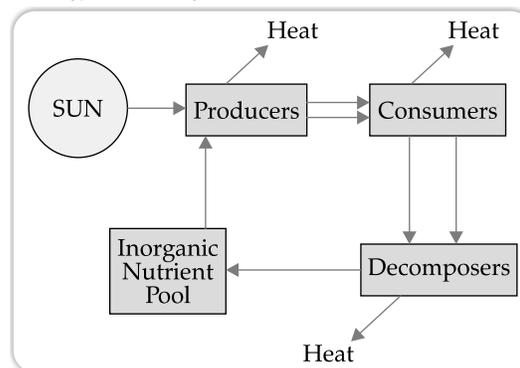
Two inferences that can be drawn are:

(i) The flow of energy in an ecosystem is always linear or unidirectional. The energy captured from producers does not revert to the solar input. Also, the energy which passes to the herbivores does not come back to autotrophs.

(ii) At every step in a food chain, the energy received by the organism is also used for its own metabolism and maintenance. The left over is passed to next higher trophic level. Thus, energy flow decreases with successive trophic levels.

(iii) The number of trophic levels in a food chain is restricted by 10% flow of energy, less amount of energy available to the last trophic level.

(iv) The number of steps is limited to four or five in a food chain for the transfer of energy.

(Any two)

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* Out of Syllabus

TERM-II, OUTSIDE DELHI SET-3—SERIES: QQDRR/4 | *Code No. : 31/4/3*

Note : Except these all other Questions are from Set - I

SECTION - A

1. **Differentiate between the process of binary fission and multiple fission giving an example of each.** 2

Ans. **Binary fission:** In this process, the cell divides into halves, and each half develops into an adult. e.g., *Amoeba, Paramecium*.

Multiple fission: It is the division of parent cell into many individuals. In this process, the nucleus divides repeatedly to produce large number of nuclei. Each nucleus gathers a bit of cytoplasm around itself, develops a membrane around each structure. Many daughter cells develop which on liberation grow into adult organism. *Plasmodium* exhibits this type of fission.

* 4. **Give the criteria on the basis of which elements are placed (i) in a group and (ii) in a period in the modern periodic table. The atomic number of an element is 16. According to the criteria, in which group and period it should be placed?** 2

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

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

    (a) State the number of covalent bonds present C_3H_8.

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

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

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

Ans. **(a)** There are Ten covalent bonds. Structure is

$$
\begin{array}{c}
\quad H \quad H \quad H \\
\quad | \quad\; | \quad\; | \\
H - C - C - C - H \\
\quad | \quad\; | \quad\; | \\
\quad H \quad H \quad H
\end{array}
$$
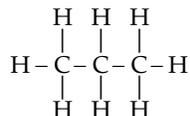
(b) C_4H_6 belongs to alkynes and the general formula for alkynes is C_nH_{2n-2}. Therefore, the molecular formula of lower homologue is C_2H_2 (Ethyne).

(c) Benzene (C_6H_6) has a ring-carbon chain structure. Benzene ring is made up of six carbon atoms, in which each carbon atom is joined by single bond on one side and double bond on other side, i.e., alternate single and double bonds.

(d) (ii) C_3H_8 is a member of alkane series.

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

    (i) C_2H_2 (ii) C_2H_6 (iii) C_3H_7OH (iv) C_2H_6COOH (v) CH_3CHO

    (a) Identify which one of the above compounds, is a member of aldehyde series.

    (b) Write the general formula of the series to which compound C_2H_2 belongs.

    (c) Which one of the above compounds has triple bonds between carbon – carbon atoms?

    (d) Write the molecular formula of the first member of the homologous series to which the compound C_3H_7OH belongs.

Ans. **(a) (v)** CH_3CHO is a member of aldehyde series.

(b) The general formula for alkynes is C_nH_{2n-2}.

(c) (i) C_2H_2 has triple bonds between carbon carbon atoms.

(d) CH_3OH (Methanol)

*SECTION - B

11. **In 1987, the United Nations Environment Programme (UNEP) forget an agreement to freeze the production of a certain chemical to year 1986 level. Name the chemical and the manufacturing companies in which his chemical was being mostly used.**

    In what way this chemical damages (i) the upper layers of the atmosphere and ultimately (ii) the organisms on the earth. 3

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* *Practical Part*