CBSE Grade X

Science

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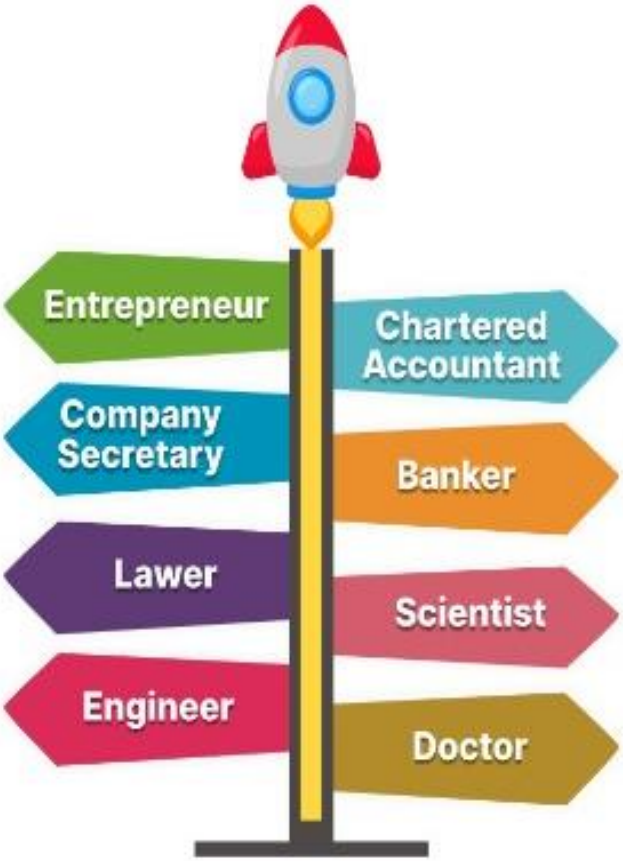

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Sample Paper 1

CLASS X (2021-22) Term 2

SCIENCE (CODE 086)

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. What happens (write the chemical equation in each case)
(i) ethanol is burnt in air.
(ii) a piece of sodium is dropped into ethanol?

2. The electronic configuration of an element is 2, 8, 4. State its:
(a) group and period in the Modern Periodic Table.
(b) name and write its one physical property.

3. What will happen when :
(a) A mature Spirogyra filament attains considerable length?
(b) Planaria gets cut into two pieces?

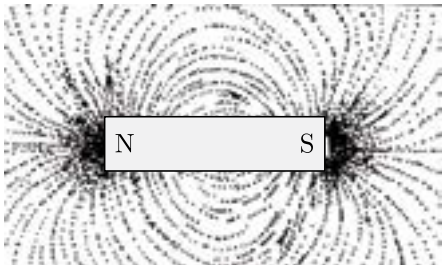
4. (a) Identify the asexual method of reproduction in each of the following organisms :
(i) Rose, (ii) Yeast.
(b) What is fragmentation? Name a multicellular organism which reproduces by this method.

5. What is grafting? What do the terms 'stock' and 'scion' mean in grafting?

or

Variations are important for the survival of species overtime. Justify this statement with reasons.

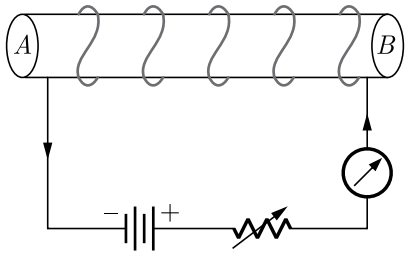
6. Study the diagram given below and answer the questions that follow :



(a) Why do the iron filings arrange in such a pattern?
(b) What does this pattern demonstrate ?

or

Diagram below shows a circuit containing a coil wound over a long and thin hollow cardboard tube. Copy the diagram.



(i) Show the polarity acquired by each face of the solenoid.
(ii) Draw the magnetic field lines of force inside the coil and also show their direction.

7. Draw a diagram to show energy flow in the food chains.

or

"Energy flow in a food chain is unidirectional." Justify this statement.

Section B

8. The following questions refer to the elements of the Periodic Table with atomic numbers 3 to 18.
(a) Which of them are noble gases ?
(b) Which of them are halogens ?
(c) Which of them are alkali metals ?

9. Two elements X and Y have atomic numbers 12 and 16 respectively.
(a) To which period of the modern periodic table do these two elements belong ?
(b) What type of bond will be formed between them and why ?
(c) Give the chemical formula of the compound formed ?

or

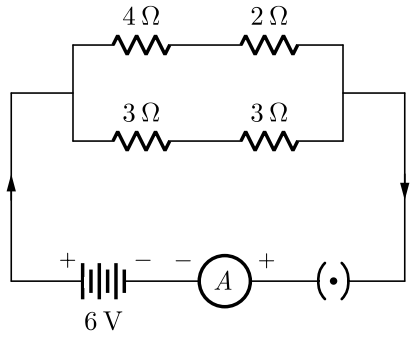
Account for the following :
(a) Noble gases are placed in a separate group.

(b) All the elements of the same group have similar chemical properties.

10. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants.

11. (a) Write the mathematical expression for Joule's law of heating.
(b) Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

12. In the given circuit, find :



(a) Total resistance of the network of resistors
(b) Current through ammeter A

or

You are given two identical looking iron bars. Just using these two bars how will you identify whether any or both of these bars is/are a magnet ?

13. (i) Create a terrestrial food chain depicting four trophic levels.
(ii) Why do we not find food chains of more than four trophic levels in nature?

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.

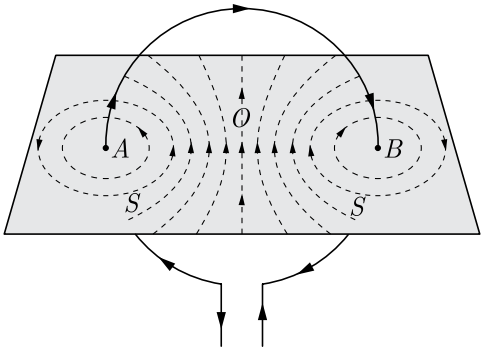
14. Read the following case based passage and answer the questions given after passage.
The rules for inheritance of such traits in human beings are related to the fact that both the father and the mother contribute practically equal amounts of genetic material to the child. This means that each trait can be influenced by both parental and maternal DNA.

(i) What is inheritance?
(ii) Who was the person who gave the three laws of inheritance?
(iii) What is the meaning of paternal and maternal DNA?

or

What is the phenotypic ratio of the dihybrid cross?

15. Read the following case based passage and answer the questions given after passage.
When a current is passed through the circular loop of wire, a magnetic field lines near the coil are nearly circular and concentric. At the centre of the circular loop, the magnetic field lines are straight.
The strength of the magnetic field produced by a current-carrying circular coil (or circular wire) depends on :
(a) current flowing through the coil.
(b) radius of the circular coil.
(c) number of turns of wire in the circular coil.
The direction of the field lines can be found by applying Right-Hand Thumb Rule.



(i) State Right-hand Thumb rule.
(ii) A long horizontal power line is carrying a current of 100 A in the east-west direction. What is the direction of magnetic field at a point 1.0 m below it?
(iii) What type of curve we get, between magnetic field and distance along the axis of a current carrying circular coil?

or

If a current carrying straight conductor is placed in east-west direction, then find the direction of the force experienced by the conductor due to earth's magnetic field.

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Sample Paper 1 Solutions

Class X (TERM – II) 2021-22
Science (086)

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. What happens (write the chemical equation in each case)
(i) ethanol is burnt in air.
(ii) a piece of sodium is dropped into ethanol?

Ans :

(i) When ethanol is burnt in air, forms carbon-dioxide gas and water vapour.

$$CH_3CH_2OH + O_2 \longrightarrow CO_2 + H_2O + \text{Heat}$$

(ii) When a piece of sodium is dropped into ethanol, forms sodium ethoxide and hydrogen.

$$2CH_3CH_2OH + Na \longrightarrow \underset{\text{Sodium ethoxide}}{2CH_3CH_2O^-Na^+} + H_2\uparrow$$

2. The electronic configuration of an element is 2, 8, 4. State its:
(a) group and period in the Modern Periodic Table.
(b) name and write its one physical property.

Ans :

(a) If the configuration is 2, 8, 4, it means that it belongs to 3^{rd} period and 14^{th} group.
(b) The name of element is Silicon.
It is a non-metal so it is a poor conductor of electricity.

3. What will happen when :
(a) A mature Spirogyra filament attains considerable length?
(b) Planaria gets cut into two pieces?

Ans :

(a) If a mature Spirogyra attains considerable length, its filament breaks into smaller fragments and each fragment gives rise to a new filament through fragmentation.
(b) If a Planaria is cut into two pieces each piece regenerates into a new Planaria.

4. (a) Identify the asexual method of reproduction in each of the following organisms :
(i) Rose, (ii) Yeast.
(b) What is fragmentation? Name a multicellular organism which reproduces by this method.

Ans :

(a)
(i) Vegetative propagation by stem
(ii) Budding.
(b) Fragmentation is a method of asexual reproduction in which a multicellular organism breaks up into smaller pieces upon maturation. These pieces or fragments grow into new complete individuals. A multicellular organism which reproduces by this method is spirogyra.

5. What is grafting? What do the terms 'stock' and 'scion' mean in grafting?

Ans :

Grafting is a method in which two parts of two closely related plants are joined in such a way that they grow as one plant.
'Stock' is the rooted plant in which grafting is performed. 'Scion' is the portion of other plant (bud, branch etc.) that is grafted on the stock.

or

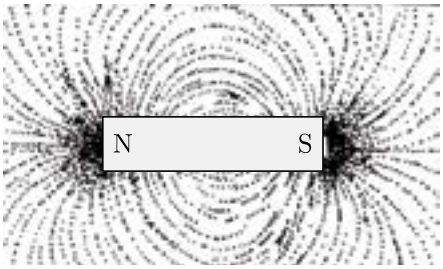
Variations are important for the survival of species overtime. Justify this statement with reasons.

Ans :

Variations (change in DNA structure) help the individuals to survive even after the drastic change occur in nature due to accumulations of various new

which leads to evolution of new species. Which is more suitable to these new changes in environment. These changes may be in the niche, temperature, salinity or water levels, etc.

6. Study the diagram given below and answer the questions that follow :



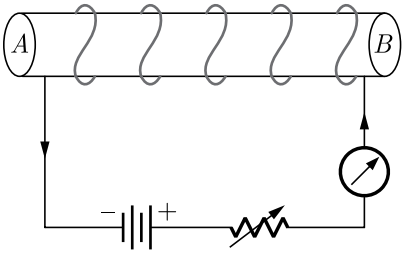
(a) Why do the iron filings arrange in such a pattern?
(b) What does this pattern demonstrate ?

Ans :

(a) The iron fillings arrange themselves in a pattern because they get attracted by the bar magnet. The pattern that they form can also be called the magnetic field lines of the bar magnet.
(b) The pattern is demonstrated that the magnetic field is the strong at poles of the magnet and the magnetic field becomes weaker if we goes far from the magnet. Magnetic filed lines emerge from the north pole of the magnet and ends at the south pole of the magnet.

or

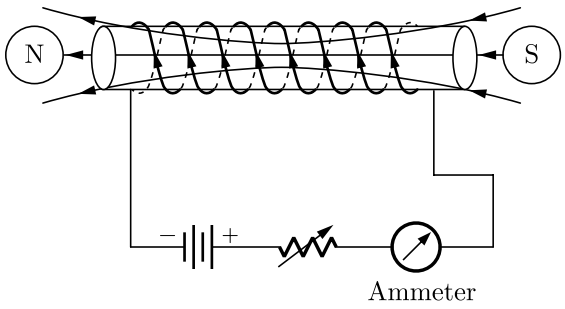
Diagram below shows a circuit containing a coil wound over a long and thin hollow cardboard tube. Copy the diagram.



(i) Show the polarity acquired by each face of the solenoid.
(ii) Draw the magnetic field lines of force inside the coil and also show their direction.

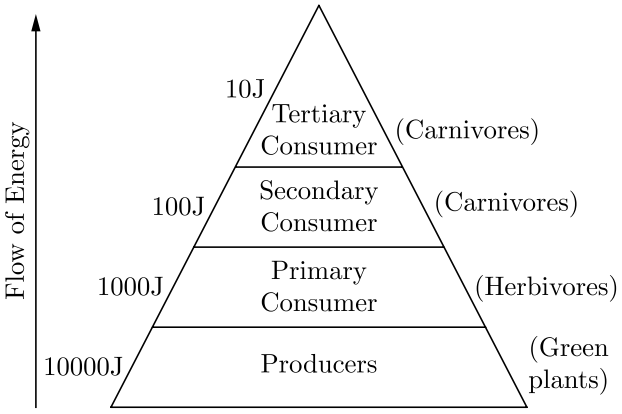
Ans :

(i) The polarity acquired by the two ends is as shown below. (A shows North and B shows South polarity).
(ii)



7. Draw a diagram to show energy flow in the food chains.

Ans :



or

"Energy flow in a food chain is unidirectional." Justify this statement.

Ans :

In a food chain the energy moves progressively through the various trophic levels. It is no longer available to the previous level (autotrophs) and the energy captured by the autotrophs does not go back to the solar input and also quantity of total available energy decreases gradually on each trophic level due to 10% law. Hence, the flow of energy is unidirectional.

Section B

8. The following questions refer to the elements of the Periodic Table with atomic numbers 3 to 18.
(a) Which of them are noble gases ?
(b) Which of them are halogens ?
(c) Which of them are alkali metals ?

Ans :

(a) Noble gases : Elements having atomic numbers 10 and 18.

(b) Halogens : Elements having atomic numbers 9 and 17.
(c) Alkali metals : Elements having atomic numbers 3 and 11.

9. Two elements X and Y have atomic numbers 12 and 16 respectively.
(a) To which period of the modern periodic table do these two elements belong ?
(b) What type of bond will be formed between them and why ?
(c) Give the chemical formula of the compound formed ?

Ans :

Element	**Atomic number**	**Electronic configuration**
X	12	2, 8, 2
Y	16	2, 8, 6

(a) Both X and Y belong to 3rd period because both have three shells.
(b) Ionic bond will be formed.
Reason: X is a metal while Y is a non-metal. X has tendency to lose 2 electrons while Y has tendency to gain 2 electrons to attain the stable electronic configuration i.e., to complete the octet. Therefore, due to transfer of electrons from the outermost shell, an ionic bond is formed between X and Y.
(c) Chemical formula : XY

Hint : X Y $\Rightarrow X_2Y_2 \Rightarrow XY$
Valency : +2 −2

or

Account for the following :
(a) Noble gases are placed in a separate group.
(b) All the elements of the same group have similar chemical properties.

Ans :

(a) Noble gases like helium, neon and argon were discovered very late because they are very inert and present in extremely low concentrations in our atmosphere. Hence, they were placed in a new group without, disturbing the existing order.
(b) All the elements of a group have similar chemical properties because they have same number of valence electrons in their outermost shell.

10. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants.

Ans :

Mendel used pea plant (Pisum sativum). When he crossed tall and short pea plants, the progeny obtained in F_1 generation were tall. When the F_1 plants were self-crossed the F_2 generations showed three tall and one dwarf plant. The genotypic ratio of F_2 generation is 1 : 2 : 1 (TT : Tt : tt)
The phenotypic ratio is 3 : 1 (Tall : Dwarf)

T T t t Parent gametes
Tt Tt F_1 generation
Tt × Tt Self-cross

	T	t
T	TT	Tt
t	Tt	tt

F_2 generation

Monohybrid Cross

11. (a) Write the mathematical expression for Joule's law of heating.
(b) Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

Ans :

(a) According to the Joule's law of heating, heat produced in a resistor is directly proportional to the :
(i) square of current I for a given resistance.
(ii) resistance R for a given current.
(iii) the time t for which the current flows through the resistor.
Mathematical form of Joule's law of heating is:

$$H = I^2Rt$$

(b) Given, charge,

$$q = 96000\,\text{C}$$

Time, $t = 2$ hrs $= 120$ min $= 7200$ s

Potential difference,

$$V = 40 \text{ volt}$$

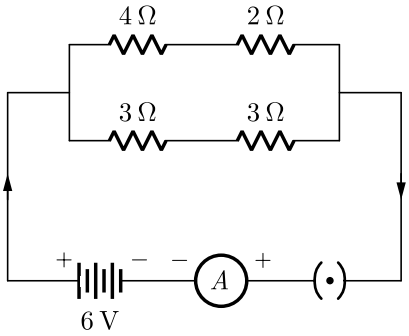
We know that,
Heat $H = VIt$, where I is current ...(1)

Also, $I = \frac{q}{t}$ where q is charge and t is time in seconds. ...(2)

Substituting $I = \frac{q}{t}$ in equation (1) we get,

$$\begin{aligned} H &= \left(V \times \frac{q}{t}\right) \times t \\ &= \frac{Vqt}{t} = Vq \\ &= 40 \times 96000 = 3840000 \text{ Joule} \\ &= 3840 \text{ kJ} \end{aligned}$$

12. In the given circuit, find :



(a) Total resistance of the network of resistors
(b) Current through ammeter A

Ans :

(a) In the given circuit diagram $4\,\Omega$ and $2\,\Omega$ resistances are connected in series combination and $3\,\Omega$ and $3\,\Omega$ resistance are also connected in the series combination.

$$R_1 = 4 + 2 = 6\,\Omega$$

$$R_2 = 3 + 3 = 6\,\Omega$$

Now the equivalent resistance of circuit

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

$$= \frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

$$R_{eq} = \frac{6}{2} = 3\,\Omega$$

(b) According to ohm's law,

$$V = IR_{eq}$$

$$I = \frac{V}{R_{eq}} = \frac{6}{3} = 2 \text{ A}$$

or

You are given two identical looking iron bars. Just using these two bars how will you identify whether any or both of these bars is/are a magnet ?

Ans :

Repeatedly tap one of the bars. If it is the iron bar nothing much will change. If it is the magnet bar, it will demagnetize a bit reducing the force between the two bars. If you get no effect after many taps, you could switch to trying the other just to make sure that you get some effect one way or the other.

13. (i) Create a terrestrial food chain depicting four trophic levels.
(ii) Why do we not find food chains of more than four trophic levels in nature?

Ans :

(i) Terrestrial food chain

$$\underset{\text{I}}{\text{Grass}} \longrightarrow \underset{\text{II}}{\text{Insect}} \longrightarrow \underset{\text{III}}{\text{Frog}} \longrightarrow \underset{\text{IV}}{\text{Bird}}$$

(ii) According to the 10% law, the amount of the energy available will not be sufficient for the survival of the organism in the 5th trophic level.

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.

The rules for inheritance of such traits in human beings are related to the fact that both the father and the mother contribute practically equal amounts of genetic material to the child. This means that each trait can be influenced by both parental and maternal DNA.

(i) What is inheritance?
(ii) Who was the person who gave the three laws of inheritance?
(iii) What is the meaning of paternal and maternal DNA?

or

What is the phenotypic ratio of the dihybrid cross?

Ans :

(i) Traits of organisms can pass from the parents to their offspring and this mechanism is known as an inheritance.

(ii) Gregor Mendel was a monk and he discovered three laws that describe the inheritance of factors from parents to offsprings.

(iii) The parental DNA is defined as the DNA that is received from the father while the DNA that is received by the mother is called the maternal DNA.

or

Gregor Mendel discovered that the dihybrid cross yields a phenotypic ratio of 9 : 3 : 3 : 1.

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

When a current is passed through the circular loop of wire, a magnetic field lines near the coil are nearly circular and concentric. At the centre of the circular loop, the magnetic field lines are straight.

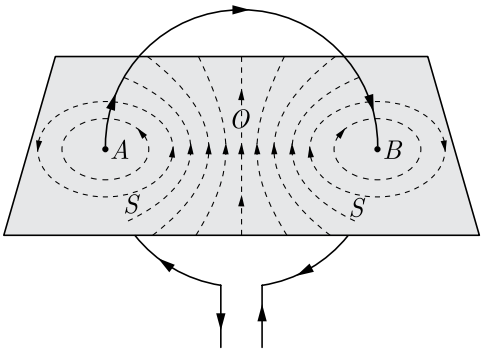
The strength of the magnetic field produced by a current-carrying circular coil (or circular wire) depends on :

(a) current flowing through the coil.

(b) radius of the circular coil.

(c) number of turns of wire in the circular coil.

The direction of the field lines can be found by applying Right-Hand Thumb Rule.



(i) State Right-hand Thumb rule.

(ii) A long horizontal power line is carrying a current of 100 A in the east-west direction. What is the direction of magnetic field at a point 1.0 m below it?

(iii) What type of curve we get, between magnetic field and distance along the axis of a current carrying circular coil?

or

If a current carrying straight conductor is placed in east-west direction, then find the direction of the force experienced by the conductor due to earth's magnetic field.

Ans :

(i) According to right hand thumb rule, imagine a straight conductor in your right-hand such that the thumb points in the direction of current. The direction of curl of fingers of the right-hand gives the direction of magnetic field lines.

(ii) The current flows in the east-west direction. From right-thumb rule, we get the direction of magnetic field as from north to south. The direction of magnetic field will be same at every point below the power line.

(iii) At smaller distances, the magnetic field will be described by concentric circles around the wire. As the distance increases, the circles become larger and larger. At the centre of the loop/ coil, the magnetic field will appear as straight line.

or

The force will act in upward direction perpendicular to both, the direction of current as well as to the field. The direction of force experienced by the conductor gets reversed, i.e., in the downward direction.

□□□□□□□

Sample Paper 2

CLASS X (2021-22) Term 2

SCIENCE (CODE 086)

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. Answer the following question :

(a) Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and allkeynes.

(b) Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

2. (a) State Modern Periodic Law.

(b) Why is position assigned to hydrogen in Periodic Table considered anomalous ?

3. (a) Trace the path of sperms from where they are produced in human body to the exterior.

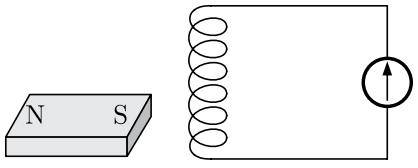
(b) Write the functions of secretions of prostate gland and seminal vesicles in humans.

4. In the diagram of human male reproductive system given below :

(a) Label parts A and B.

(b) Name the hormone produced by organ 'X'. What is the role of this hormone in the human male?

5. A coil of insulated wire is connected to a galvanometer as show in figure. What would be seen if a bar magnet with its south pole towards one face of the coil is :

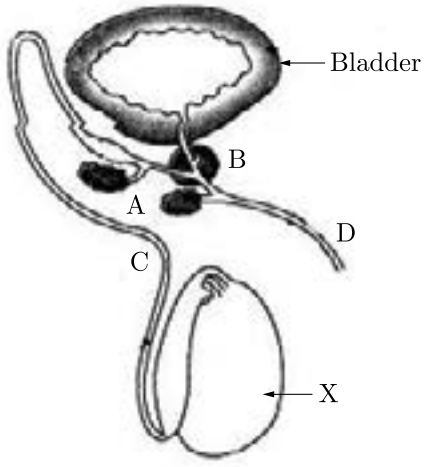


(a) moved quickly towards it ?

(b) moved quickly away from it ?

or

(i) A compass needle gets deflected when brought near a current carrying conductor why ?
(ii) What happens to the deflection of needle when current in the conductor is increased?



6. Leaves of Bryophyllum fallen on the ground produce new plants, whereas the leaves of Jasmine do not. Why ?

or

What are the disadvantages of natural vegetative propagation?

7. Government of India is imposing ban on the use of polythene bags for stopping. List for advantages of using cloth or jute bags over polythene bags.

or

Pesticides like DDT which are sprayed to kill pests on crops are found to be present in the soil, ground water, water bodies etc. Explain how do they reach these places.

Section B

8. Study the data of the following three categories A, B and C.

Category	Name of the element	Atomic Mass
A	Li	7
	Na	23
	K	39
B	N	14
	P	31
	As	74
C	B	10.8
	Al	27
	Ga	69.7

(a) From the given three categories A, B and C, pick the one which forms Dobereinefs Triads.
(b) Why did Mendeleev placed elements of category A, B and C in three different groups?
(c) Is Newland law of octaves applicable to all the three categories? Give reason to justify your answer.

9. An element X has mass number 35 and number of neutrons 18.
(a) Write the atomic number of X.
(b) Give electronic configuration of X.
(c) To which group and period does it belong?

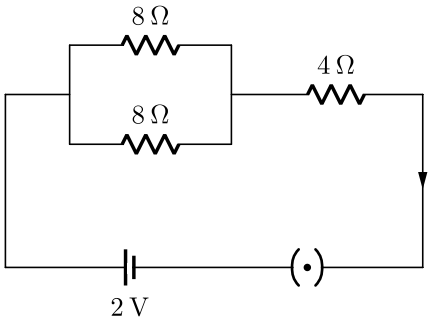
or

(a) State the Modern Periodic Law.
(b) Name the element which has twice as many electrons in its second shell as in its first shell. Write its electronic configuration also.

10. How do Mendel's experiments show that traits may be dominant or recessive?

11. (a) In a given ammeter, a student saw that needle indicates 12th division in ammeter while performing an experiment to verify Ohm's law. If ammeter has 10 divisions between 0 to 0.5 A, then what is the ammeter reading corresponding to 12th division ?
(b) How do you connect an ammeter and a voltmeter in an electric circuit ?

12. Study the given electric circuit and calculate :
(i) the current flowing through the 4 Ω resister and
(ii) potential difference across the combination of two resistor of 8 Ω each.



or

Demonstrate that due to motion of a magnet near a solenoid coil an induced current is set up in the coil.

13. (a) "Improvements in our lifestyle have resulted in greater amounts of waste generation." Give two examples to support the given statement. Suggest one change that we can incorporate in our lifestyle in order to reduce non-biodegradable waste.
(b) The following organisms form a food chain.
Insect, Hawk, Grass, Snake, Frog
Which of these will have highest concentration of non-biodegradable chemicals? Name the phenomenon.

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. Study the following table and answer the following questions.

	Contraceptive method	**Duration of efficiency**	**Hormonal exposure**
1.	Copper IUD	10 years	No
2.	Pills	Use days	Yes
3.	Diaphragm	Reusable	No

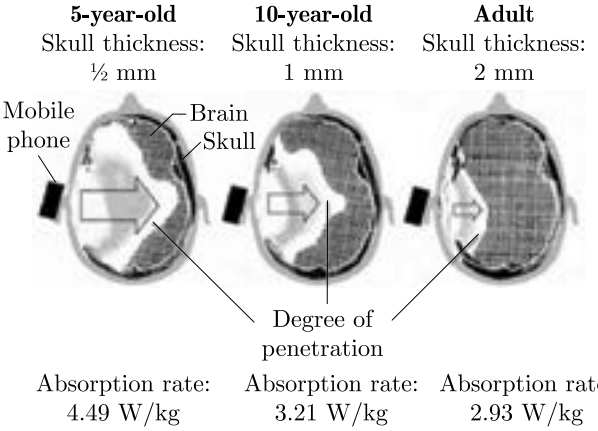
(i) Name the contraceptive device that is commonly used by the males.
(ii) What is the part of the male reproduction organ that is cut in the process of vasectomy?
(iii) What are STDs?

or

Syphilis is caused by any microbe. Name it.

15. Read the following case based passage and answer the questions given after passage.
The mobile phone is an excellent communication device. Mobile phones uses electromagnetic radiation in the microwave range. Part of the radio wave emitted by the mobile phone handset will be absorbed by the head.
Head is in the 'near field' of radiation, so that most of the heating effect occurs in the head. Temperature in the internal ear, brain increases by 1 degree or more. This adversely affect the functioning of these organs since these have fluid filled cavities. But prolonged heating effect can alter brain functions and hearing ability also. Other harmful effects such as Premature Cataract, Confusion and loss of memory may also be possible. Following figure shows that how mobile phone radiation penetrates the brain.

How mobile phone radiation penetrates the brain



Source: Institute of Electrical and Electronic Engineer's journal on Microwave Theory and Techniques

(i) Which radiations are used in mobile phones?
(ii) How does prolonged heating effect due to mobile radiations can effect adversely?

(iii) What precautions should be taken while using mobile phones?

or

In which part of our body, most of the heating effect occurs due to use of mobiles?

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Sample Paper 2 Solutions

Class X (TERM – II) 2021-22
Science (086)

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. Answer the following question :

(a) Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and allkeynes.

(b) Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

Ans :

(a) Certain compounds are called as hydrocarbons because they are formed mainly from carbon and hydrogen.
Formula for homologous series of alkanes : C_nH_{2n+2}
Formula for homologous series of alkenes : C_nH_{2n}
Formula for homologous series of alkynes : C_nH_{2n-2}

(b) Hydrogenation converts alkenes into alkane.
$CH_2 = CH_2 + H_2 \xrightarrow{Pt/Pd/Ni} CH_3 - CH_3$
Dihydrogen gas adds to alkene in the presence of finely divided catalysts like platinum, palladium or nickel to form alkanes.

2. (a) State Modern Periodic Law.

(b) Why is position assigned to hydrogen in Periodic Table considered anomalous ?

Ans :

(a) Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.

(b) Hydrogen resembles both alkali metals and halogens. In one hand, it can lose one electron like alkali metals, in the other, like halogens it forms diatomic molecule and combines with metals and non-metals to form covalent compounds and also gains one electron like halogens. So, no fixed position can be given to hydrogen.

3. (a) Trace the path of sperms from where they are produced in human body to the exterior.

(b) Write the functions of secretions of prostate gland and seminal vesicles in humans.

Ans :

(a) The sperms produced in testes are delivered through the vas deferens which unites with a another tube urethra emerging from urinary bladder. Urethra carries the sperms to an organ called penis. The penis passes the sperms from the man's body into vagina in the woman's body during mating.

(b)

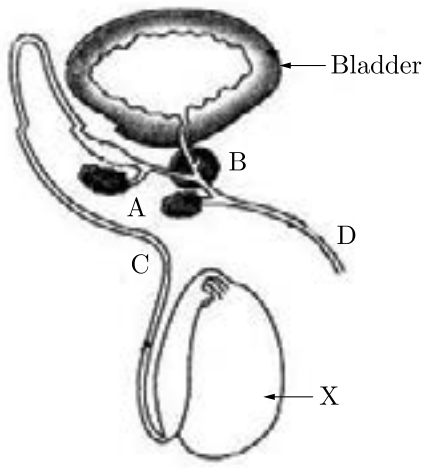
(i) **Seminal vesicles :** It secretes alkaline secretions which lower the pH of the semen and provide nourishment to sperms.

(ii) **Prostate glands :** The secretions of these glands keeps the sperms active and mobile. It secretes fluid comprising up to a third of semen volume and assists sperm motility.

4. In the diagram of human male reproductive system given below :

(a) Label parts A and B.

(b) Name the hormone produced by organ 'X'. What is the role of this hormone in the human male?



Ans :

(a) A : Seminal vesicle, B : Prostate gland.
(b) The organ 'X' testis produces testosterone hormone.
Role :
(i) It controls sperm formation.
(ii) It is responsible for secondary sexual characters.

5. Leaves of Bryophyllum fallen on the ground produce new plants, whereas the leaves of Jasmine do not. Why ?

Ans :

In case of Bryophyllum. It bears adventitious buds produced in the notches along the leaf margin, when these leaves fall on the soil they develop into a new plant. But in case of Jasmine, no such buds are produced in the notches of leaves.

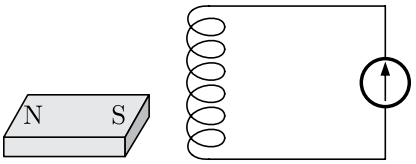
or

What are the disadvantages of natural vegetative propagation?

Ans :

The disadvantages of natural vegetative propagation are :
(i) There is less adaptability to the environment since there is no genetic variation.
(ii) The disease of the parent plant gets transferred to the offspring.
(iii) Undesirable characters cannot be eliminated.
(iv) New characters cannot be introduced.

6. A coil of insulated wire is connected to a galvanometer as show in figure. What would be seen if a bar magnet with its south pole towards one face of the coil is :



(a) moved quickly towards it ?
(b) moved quickly away from it ?

Ans :

(a) We get a momentary deflection in galvanometer.
(b) We again get a momentary deflection in galvanometer but in the reverse direction.

or

(i) A compass needle gets deflected when brought near a current carrying conductor why ?
(ii) What happens to the deflection of needle when current in the conductor is increased?

Ans :

(i) Current carrying conductor produces a magnetic field around it.
(ii) Deflection increases with increase in current.

7. Government of India is imposing ban on the use of polythene bags for stopping. List for advantages of using cloth or jute bags over polythene bags.

Ans :

Advantages of jute and cloth bags are :
(i) They are re–usable.
(ii) They are biodegradable.
(iii) They are stronger than polythene bags and can carry more load.
(iv) They can be repaired at home if torn.

or

Pesticides like DDT which are sprayed to kill pests on crops are found to be present in the soil, ground water, water bodies etc. Explain how do they reach these places.

Ans :

Soil : Pesticides like DDT are used to protect crops plants from insects and pests. They, in the end, get settled into the soil particles, when used on plants and cause soil pollution.
Ground water : Through irrigation these pesticides present in the soil pass into lower layers of soil and reaches ground water and ground water pollution.
Water bodies : When the waste water or other agricultural waste is thrown or rain off with rain water in water bodies like rivers, canals, ponds etc the pesticides affect water bodies and polluted it.

Section B

8. Study the data of the following three categories A, B and C.

Category	Name of the element	Atomic Mass
A	Li	7
	Na	23
	K	39
B	N	14
	P	31
	As	74
C	B	10.8
	Al	27
	Ga	69.7

(a) From the given three categories A, B and C, pick the one which forms Dobereinefs Triads.
(b) Why did Mendeleev placed elements of category A, B and C in three different groups?
(c) Is Newland law of octaves applicable to all the three categories? Give reason to justify your answer.

Ans :

(a) Category A forms Dobereiner's triads.
(b) Mendeleev placed the elements of category A, B and C in different groups because they all have different atomic masses.
(c) The law of octaves states that every eighth element has similar properties when the elements are arranged in the increasing order of their atomic masses. Therefore, it is applicable to all three categories.

9. An element X has mass number 35 and number of neutrons 18.
(a) Write the atomic number of X.
(b) Give electronic configuration of X.
(c) To which group and period does it belong?

Ans :

(a) Atomic number of the element X = Mass number − Number of neutrons $= 35 - 18 = 17$
(b) Electronic configuration of $X = 2, 8, 7$.
(c) The element X belongs to 17th group and 3rd period.

or

(a) State the Modern Periodic Law.
(b) Name the element which has twice as many electrons in its second shell as in its first shell. Write its electronic configuration also.

Ans :

(a) Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.
(b) Carbon.

Electronic configuration :	K	L
	2	4

10. How do Mendel's experiments show that traits may be dominant or recessive?

Ans :

Traits may be dominant or recessive. When Mendel cross-bred plants of two different traits of character, a tall pea plant (TT) and a dwarf pea plant (tt) to get a progeny, in F_1 generation, all plants were tall. Thus, only the dominant trait was visible in this generation. But when plants of F_1 generation were self-crossed, then the two traits of character got separated in the plants of F_2 generation. All plants obtained in the F_2 generation were not tall. One-fourth of the F_2 plants were short.
Appearance of tall characters in both the F_1 and F_2 generations shows that it is a dominant character. Whereas, the absence of dwarf character in F_1 generation and its reappearance in F_2 generation shows dwarfness is the recessive character.

11. (a) In a given ammeter, a student saw that needle indicates 12th division in ammeter while performing an experiment to verify Ohm's law. If ammeter has 10 divisions between 0 to 0.5 A, then what is the ammeter reading corresponding to 12th division ?
(b) How do you connect an ammeter and a voltmeter in an electric circuit ?

Ans :

(a) The ammeter is having 10 division in between $0 - 0.5$ A.

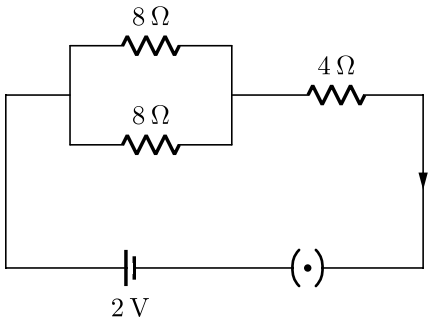
$$\text{Least count of ammeter} = \frac{0.5 - 0}{10}$$
$$= 0.05 \text{ A}$$

Hence, the reading of 17 division will be

$$= 17 \times 0.05$$
$$= 0.85 \text{ A}$$

(b) Ammeter is connected in series combination and voltmeter is connected in the parallel combination.

12. Study the given electric circuit and calculate :
(i) the current flowing through the $4\,\Omega$ resister and
(ii) potential difference across the combination of two resistor of $8\,\Omega$ each.



Ans :

(i) As we know that,

$$V = IR$$
$$2 = I \times 4$$
$$I = 0.5\,\text{A}$$

(ii) Two $8\,\Omega$ resistors are in parallel, so then equivalent resistance.

$$\frac{1}{R_{\text{eq}}} = \frac{1}{8} + \frac{1}{8} = \frac{2}{8}\,\Omega = \frac{1}{4}\,\Omega$$
$$R_{\text{eq}} = 4\,\Omega$$

Now, two $4\,\Omega$ resistors are in series.
So, total resistance,

$$R_{\text{Total}} = 4\,\Omega + 4\,\Omega = 8\,\Omega$$

Total current,

$$I_{\text{Total}} = \frac{V}{R} = \frac{2}{8} = \frac{1}{4}\,\text{A}$$

Voltage across equivalent resistance of two $8\,\Omega$ resistors

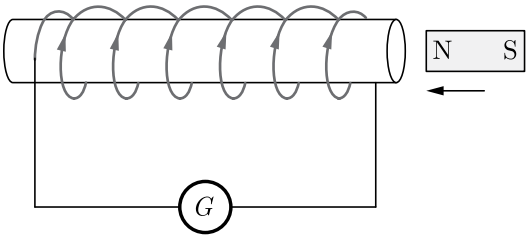
$$V = \frac{I_{\text{Total}}}{R_{\text{eq}}} = \frac{1}{4} \times 4 = 1\,\text{V}$$

or

Demonstrate that due to motion of a magnet near a solenoid coil an induced current is set up in the coil.

Ans :

Take a solenoid coil of insulated copper wire AB having a number of turns (about 20 or more). Connect the ends of coil to a sensitive galvanometer. Now take a bar magnet NS and rapidly bring the magnet towards the end B of coil as shown in Figure. The galvanometer suddenly gives momentary deflection in one direction. Now take the magnet away from the coil, the galvanometer again gives momentary deflection but in the opposite direction. It clearly shows that motion of magnet induces, a current in the coil and it is the phenomenon of electro-magnetic induction.



Now fix the magnet in any one position so that it is stationary with respect to the coil. We find that there is no deflection in galvanometer.
Again keep the magnet fixed and gently move the coil AB either towards the magnet or away from the magnet. We get deflection in galvanometer even now. Thus, it is proved that induced current due to electromagnetic induction is produced whenever there is relative motion between the coil and the magnet.

13. (a) "Improvements in our lifestyle have resulted in greater amounts of waste generation." Give two examples to support the given statement. Suggest one change that we can incorporate in our lifestyle in order to reduce non-biodegradable waste.
(b) The following organisms form a food chain.
Insect, Hawk, Grass, Snake, Frog
Which of these will have highest concentration of non-biodegradable chemicals? Name the phenomenon.

Ans :

(a) Now-a-days, changes and improvement in our lifestyle has resulted in more and more use of disposable items like polythene bags, plastic items and paper plates etc. These materials are increasing the generation of wastes.
Suggestion : We can reduce non-biodegradable wastes by adopting techniques like recycling and reuse. We must encourage the reuse of plastic and glass containers to store the household items. Packaging materials should be made out of recyclable materials like cloth and paper.
(b) The proper sequence of this food chain is:
Grass → Insect → Frog → Snake → Hawk
The last trophic level 'Hawk' will have highest concentration of non-biodegradable chemicals. This phenomenon is called Biomagnification.

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. Study the following table and answer the following questions.

Table-A

	Contraceptive method	**Duration of efficiency**	**Hormonal exposure**
1.	Copper IUD	10 years	No
2.	Pills	Use days	Yes
3.	Diaphragm	Reusable	No

(i) Name the contraceptive device that is commonly used by the males.
(ii) What is the part of the male reproduction organ that is cut in the process of vasectomy?
(iii) What are STDs?

or

Syphilis is caused by any microbe. Name it.

Ans :

(i) The contraceptive device that is commonly used by the males is the condom.
(ii) Male vas deferens are cut down and tied to prevent sperm from entering into urethra.
(iii) There are a number of diseases that are caused by sexual intercourses. These diseases are called STDs "Sexually Transmitted Disease".

or

Treponema pallidum is the bacterium that causes a disease called syphilis in humans.

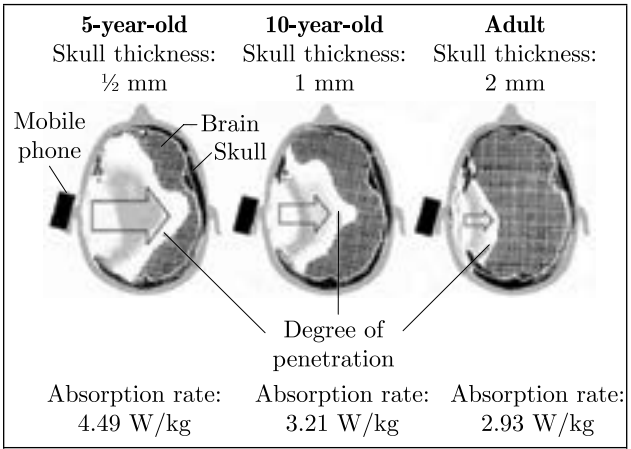
15. Read the following case based passage and answer the questions given after passage.

The mobile phone is an excellent communication device. Mobile phones uses electromagnetic radiation in the microwave range. Part of the radio wave emitted by the mobile phone handset will be absorbed by the head.

Head is in the 'near field' of radiation, so that most of the heating effect occurs in the head.

Temperature in the internal ear, brain increases by 1 degree or more. This adversely affect the functioning of these organs since these have fluid filled cavities. But prolonged heating effect can alter brain functions and hearing ability also. Other harmful effects such as Premature Cataract, Confusion and loss of memory may also be possible. Following figure shows that how mobile phone radiation penetrates the brain.

How mobile phone radiation penetrates the brain



Source: Institute of Electrical and Electronic Engineer's journal on Microwave Theory and Techniques

(i) Which radiations are used in mobile phones?
(ii) How does prolonged heating effect due to mobile radiations can effect adversely?
(iii) What precautions should be taken while using mobile phones?

or

In which part of our body, most of the heating effect occurs due to use of mobiles?

Ans :

(i) Electromagnetic radiations of microwave range are used in mobile phones.
(ii) Heating effect can alter brain functions and hearing ability also. Other harmful effects such as premature cataract, confusion and loss of memory may also be possible.
(iii) Try to consider mobile phone as a communication device and not an entertainment device. Even if you are not talking, the cell phone is emitting strong signals to keep a link with the base station.

or

Head.

□□□□□□□

Sample Paper 3

CLASS X (2021-22) Term 2

SCIENCE (CODE 086)

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. Give the IUPAC names of

(a) $CH_3 - CH_2 - Br$

(b) $CH_3 - CH_2 - CH_2 - CH_2 - C \equiv CH$

2. Account for the following :

(a) Elements of group 17 are monovalent.

(b) Elements of group 18 are called zero valent.

3. (a) Write full form of DNA.

(b) Why are variations essential for the species?

4. (a) List three distinguishing features between sexual and asexual types of reproduction.

(b) Explain why variations are observed in the offsprings of sexually reproducing organisms ?

5. What are the functions of testis in the human male reproductive system? Why are these located outside the abdominal cavity?

or

In a bisexual flower inspite of the young stamens being removed artificially, the flower produces fruit.

Give reasons.

6. State what would happen to the direction of rotation of a motor, if

(i) the current were reversed ?

(ii) both current and magnetic field were reversed simultaneously.

or

The given magnet is divided into three part A, B and C.

A	B	C

Name the parts where the strength of the magnetic field is :
(i) maximum,
(ii) minimum.
How will the density of magnetic field lines differ at these parts ?

7. In the following food chain, 5 J of energy is available to man. How much energy was available at producer level ?
Plant → Sheep → Man.

or

Aquarium need to be cleaned once in a while whereas ponds or lakes do not require any cleaning : Explain

Section B

8. Three elements X, Y and Z have atomic numbers 7, 8 and 9 respectively.
(a) Arrange them in the decreasing order of their atomic radii.
(b) Which of the three is most electronegative? Why?
(c) Write the formula of compound formed between
(i) X and Y
(ii) X and Z

9. Na, Mg, Al, Si, P, S, Cl and Ar are the elements of third period :
(i) Which one of them is an inert gas ? Why?
(ii) Which one of them has the valency 4 ? What kind of bond does it form ionic or covalent ?

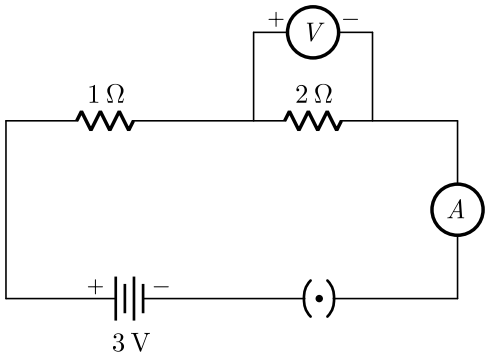
or

Give reasons for the following :
(a) Lithium atom is smaller than sodium atom.
(b) Chlorine (atomic number 17) is more electronegative than sulphur (atomic number 16).

10. Distinguish between the acquired traits and the inherited traits in tabular form, giving one example for each.

11. (a) List the factors on which the resistance of a conductor in the shape of wire depends.
(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
(c) Why are alloys commonly used in electrical heating devices? Give reason.

12. What would be the reading of ammeter and voltmeter in the given circuit?



or

Answer the following questions :

(i) What is the direction of magnetic field lines outside a bar-magnet ?

(ii) The magnetic field lines in a given region are getting crowded. What does it indicate ?

(iii) State one advantage of AC over DC.

13. You have been selected to talk on "ozone layer and its protection in the school assembly" on "Environment Day".

(i) Why should ozone layer be protected to save the environment ?

(ii) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as 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. Study the follwoing table and answer the following questions.

Table-A

	Characters	**Males**	**Females**
1.	Total no. of chromosomes	23 pairs	23 pairs
2.	No. of autosome	22 pairs	22 pairs
3.	No. of sex chromosome	1 pair	1 pair

(i) What is sex determination?

(ii) What are the sex chromosomes in the males?

(iii) What are the sex chromosomes in the females?

(iv) Is the father responsible for the sex of the child?

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

A room has two tube lights, a fan and a TV. Each tube light draws 40 W, the fan draws 80 W

and the TV draws 60 W on the average, the tube lights are kept on for five hours, the fan for twelve hours and the TV for eight hours every day. The rate for electrical energy is ₹ 3.10 per kWh.

(i) Calculate the energy consumed by each tube light in a day.
(ii) What is the total energy consumed in a day?
(iii) Find the cost of electricity used in this room in a 30-day month.

or

What quantities determines the rate at which energy is delivered by current?

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Sample Paper 3 Solutions

Class X (TERM – II) 2021-22
Science (086)

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. Give the IUPAC names of

(a) $CH_3 - CH_2 - Br$

(b) $CH_3 - CH_2 - CH_2 - CH_2 - C \equiv CH$

Ans :

(a) The IUPAC name of $CH_3 - CH_2 - Br$ is Bromo ethane.

(b) The IUPAC name of $CH_3 - CH_2 - CH_2 - CH_2 - C \equiv CH$ is Hexa-1-yne.

2. Account for the following :

(a) Elements of group 17 are monovalent.

(b) Elements of group 18 are called zero valent.

Ans :

(a) For group 17 elements :
Electronic configuration : 2, 8, 7
Valence shell electron : 7
Valency : $8 - 7 = 1$

(b) For group 18 elements :
Electronic configuration : 2, 8, 8
(Mono valent) valence shell electron : 8
Valency : $8 - 8 = 0$
(Zero valent)

3. (a) Write full form of DNA.

(b) Why are variations essential for the species?

Ans :

(a) Deoxyribonucleic Acid.

(b) It important for the survival of species through evolution.

4. (a) List three distinguishing features between sexual and asexual types of reproduction.

(b) Explain why variations are observed in the offsprings of sexually reproducing organisms ?

Ans :

(a)

	Asexual Reproduction	**Sexual Reproduction**
1.	Offspring arises from a single individual parent	It involves two individuals of different sexes-male and female.
2.	Fusion of gametes is not involved.	Fusion of gamete takes place
3.	Meiosis does not occur at any time during reproduction.	Meiosis occurs at the time of gamete formation.

(b) During sexual reproduction, the DNA copying mechanism is not accurate due to meiosis during haploid sex cells formation and the resultant errors as well as genetic recombination of chromosome of two different individuals i.e., father and mother are a source of variations in populations of organisms.

5. What are the functions of testis in the human male reproductive system? Why are these located outside the abdominal cavity?

Ans :

The functions of testes are (i) to produce male sex cells called sperms and (ii) to produce the male sex hormone called testosterone. The testosterone hormone brings about sexual secondary sex changes seen in the appearance of boys at the time of puberty.

The testis are outside the abdominal cavity of the body because the sperm formation requires a lower temperature than the normal body temperature. Being outside the abdominal cavity, the temperature of scrotum is about 3°C lower than the temperature inside the body. In this way, testis provide an optimum temperature for the formation of sperms.

or

In a bisexual flower inspite of the young stamens being removed artificially, the flower produces fruit. Give reasons.

Ans :

Even if the young stamens are removed, the pistil remains intact. So, when cross-pollination occurs, it leads to fertilization and hence formation of fruits takes place.

6. State what would happen to the direction of rotation of a motor, if

(i) the current were reversed ?

(ii) both current and magnetic field were reversed simultaneously.

Ans :

(i) Direction of rotation would be reversed.

(ii) Direction of rotation would remain unchanged.

or

The given magnet is divided into three part A, B and C.

A	B	C

Name the parts where the strength of the magnetic field is :

(i) maximum, (ii) minimum.

How will the density of magnetic field lines differ at these parts ?

Ans :

(i) Maximum magnetic field is in the region A and C.

(ii) Minimum magnetic field is in the region B.

This is because A and C are magnetic poles and have maximum number of magnetic field lines which determine the intensity of magnetic field while B is centre of the magnet that has no magnetic field lines. So, intensity of magnetic field near B is almost zero.

7. In the following food chain, 5 J of energy is available to man. How much energy was available at producer level ?

Plant → Sheep → Man.

Ans :

Plant → Sheep → Man.

Energy available to man in the above food chain is 5 J.

According to 10% law, energy available to sheep is 50 J.

Again according to 10% law, energy available to plants, i.e., at produce level is 500 J.

or

Aquarium need to be cleaned once in a while whereas ponds or lakes do not require any cleaning : Explain

Ans :

Aquarium need to be cleaned because it is not a self–sustained natural ecosystem. It is man-made or artificial ecosystem

Ponds and lakes are self-sustained naturals ecosystem in which nutrient cycle and energy flow occur naturally.

Section B

8. Three elements X, Y and Z have atomic numbers 7, 8 and 9 respectively.

(a) Arrange them in the decreasing order of their atomic radii.

(b) Which of the three is most electronegative? Why?

(c) Write the formula of compound formed between

(i) X and Y

(ii) X and Z

Ans :

(a) The elements can be arranged according to the decreasing order of atomic radii as follows :

$X > Y > Z$

Size of the atom decreases when moving from left to right in a period. This is due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom.

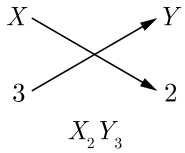
(b) Z is most electronegative since electronegativity increases from left to right in periodic table. As the effective nuclear charge acting on the valence shell electrons increases across a period, the tendency to lose electrons will decrease.

(c) (i) When X combines with Y :

Valency of $X = 3$

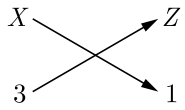
Valency of $Y = 2$

Cross-multiplying the valences



The compound formed is X_2Y_2.

(ii) When X combines with Z
Valency of $X = 3$
Valency of $Z = 2$
Cross-multiplying the valences



The compound formed is XZ_3.

9. Na, Mg, Al, Si, P, S, Cl and Ar are the elements of third period :

(i) Which one of them is an inert gas ? Why?

(ii) Which one of them has the valency 4 ? What kind of bond does it form ionic or covalent ?

Ans :

(i) Argon (A_{18}) is an inert gas. Its electronic configuration is $\begin{pmatrix} K & L & M \\ 2 & 8 & 8 \end{pmatrix}$ which is completely filled and stable.

(ii) Silicon Si_{14} $\begin{pmatrix} K & L & M \\ 2 & 8 & 4 \end{pmatrix}$ has the valency 4. The element completes its octet to attain noble gas configuration by sharing of electrons and forming covalent bond.

or

Give reasons for the following :

(a) Lithium atom is smaller than sodium atom.

(b) Chlorine (atomic number 17) is more electronegative than sulphur (atomic number 16).

Ans :

(a) Electronic configuration of Li is 2, 1 and that of Na is 2, 8, 1. Since sodium has more number of shells, it has a larger size.

(b) Electronic configuration of Cl = 2, 8, 7
Electronic configuration of S = 2, 8, 6
As sulphur is placed before chlorine in the Periodic Table, it has a bigger size and its tendency to gain electrons is less than chlorine.

10. Distinguish between the acquired traits and the inherited traits in tabular form, giving one example for each.

Ans :

	Acquired traits	**Inherited traits**
1.	These are somatic variations and do not bring any change in DNA	These are genetic variations and bring about changes in the DNA.
2.	These traits develop throughout the life time of an individual and are not inherited. **Example :** learning of dance and music.	These traits are transferred by or inherited from the parents to the offspring. **Example:** Eye colour, Hair colour.

11. (a) List the factors on which the resistance of a conductor in the shape of wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

(c) Why are alloys commonly used in electrical heating devices? Give reason.

Ans :

(a) Resistance of a conductor depends directly on its length, inversely proportional to the area of cross-section, directly proportional to the temperature and it depends on the nature of the conductor.

(b) Metals have free electrons which can move and conduct electricity, whereas glass does not have free electrons which can flow freely to conduct electricity.

(c) The resistivity of an alloy is generally higher than that of pure metal. Alloys do not oxidise (burn) readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made of an alloy rather than pure metal.

12. Answer the following questions :

(i) What is the direction of magnetic field lines outside a bar-magnet ?

(ii) The magnetic field lines in a given region are getting crowded. What does it indicate ?

(iii) State one advantage of AC over DC.

Ans :

(i) North pole to south pole.

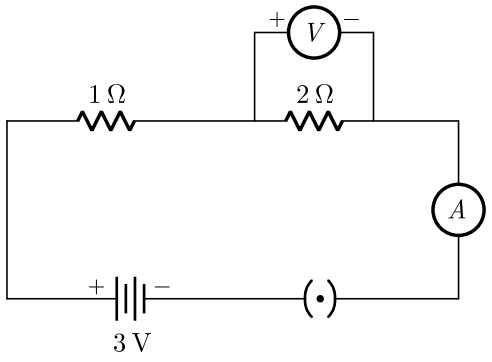
(ii) The strength of magnetic field is higher in this

region.

(iii) AC voltage can be stopped up and transmitted over long distances without much loss of energy.

or

What would be the reading of ammeter and voltmeter in the given circuit?



Ans :

Here, $R_1 = 1\,\Omega,\ R_2 = 2\,\Omega$

The resistance are connected in the series combination hence the equivalent resistance is given by

$$R = R_1 + R_2$$
$$= 1 + 2 = 3\,\Omega$$
$$I = \frac{V}{R} = \frac{3}{3} = 1\,\text{A}$$

$$\text{Ammeter reading} = 1\,\text{A}$$
$$\text{Voltmeter Reading} = IR = 1 \times 2 = 2\,\text{V}$$
$$\text{Voltmeter reading} = 2\,\text{V}$$

13. You have been selected to talk on "ozone layer and its protection in the school assembly" on "Environment Day".

(i) Why should ozone layer be protected to save the environment ?

(ii) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

Ans :

(i) Ozone layer helps in shielding the Earth from the harmful UV radiations coming from sun. If ozone layer gets depleted UV radiations an directly reach the Earth's surface and drastically affect the life on Earth.

(ii) **Ozone layer can be protected by :**

(a) Stop the release of Chlorofluorocarbon.

(b) Reduce the usage of air conditioner.

(c) Removing the pollutant nitrogen monoxide.

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. Study the follwoing table and answer the following questions.

Table-A

	Characters	**Males**	**Females**
1.	Total no. of chromosomes	23 pairs	23 pairs
2.	No. of autosome	22 pairs	22 pairs
3.	No. of sex chromosome	1 pair	1 pair

(i) What is sex determination?

(ii) What are the sex chromosomes in the males?

(iii) What are the sex chromosomes in the females?

(iv) Is the father responsible for the sex of the child?

Ans :

(i) The process by which the sex of a newborn organism is detected is called sex determination.

(ii) The males have two sex chromosomes which are X and Y.

(iii) The sex chromosomes in the females are X and X.

(iv) Yes, the mother is solely responsible for the sex of the child because the mother gives only the X chromosome to the child. It is the father that gives either the X or Y chromosome to the child.

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

A room has two tube lights, a fan and a TV. Each tube light draws 40 W, the fan draws 80 W and the TV draws 60 W on the average, the tube lights are kept on for five hours, the fan for twelve hours and the TV for eight hours every day. The rate for electrical energy is ₹ 3.10 per kWh.

(i) Calculate the energy consumed by each tube light in a day.

(ii) What is the total energy consumed in a day?

(iii) Find the cost of electricity used in this room in a 30-day month.

or

What quantities determines the rate at which

energy is delivered by current?

Ans :

(i) For each tube light,

Power, $P = 40 \text{ W} = \frac{40}{1000} \text{ kW}$

Energy consumed by each tube light in a day is,

$$= P \times t$$
$$= \left(\frac{40}{1000}\text{kW}\right) \times 5\,\text{h}$$
$$= 0.2 \text{ kW h}$$

(ii) Energy consumed by tube light in a day is,

$$= 0.2 \text{ kWh}$$

Energy consumed by the fan in a day is,

$$= \frac{80}{1000}\text{kW} \times 12\,\text{h}$$
$$= 0.96 \text{ kWh}$$

Energy consumed by the TV in a day is,

$$= \frac{60}{1000}\,\text{kW} \times 8\,\text{h}$$
$$= 0.48 \text{ kWh}$$

Total energy consumed in a day is,

$$= 2 \times 0.2\,\text{kWh} + 0.96\,\text{kWh} + 0.48\,\text{kWh}$$
$$= 1.84 \text{ kWh}$$

(iii) Energy consumed in a day

$$= 1.84 \text{ kWh}$$

Energy consumed in a day

$$= 30 \times 1.84 \text{ kWh}$$
$$= 55.2 \text{ kWh}$$

The cost of electricity

$$= ₹\,3.1 \times 55.2 = ₹\,171.12$$

or

The rate at which energy is delivered is determined by :

(a) the potential difference across the conductor.

(b) the current flowing in the circuit.

□□□□□□□

Sample Paper 4

CLASS X (2021-22) Term 2

SCIENCE (CODE 086)

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?

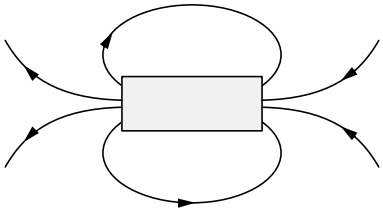
or

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

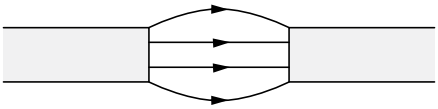
6. What is a compass needle ? What happens when a compass needle is placed :
(a) in a region having no magnetic field,
(b) near a bar magnet ?

or

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

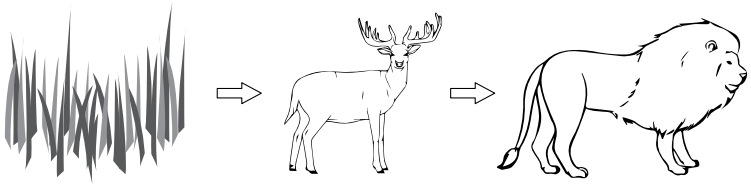


(i)



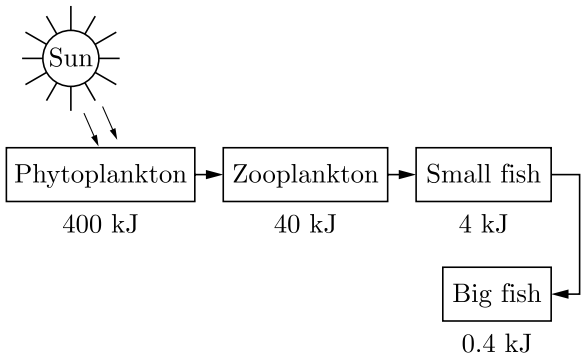
(ii)

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:

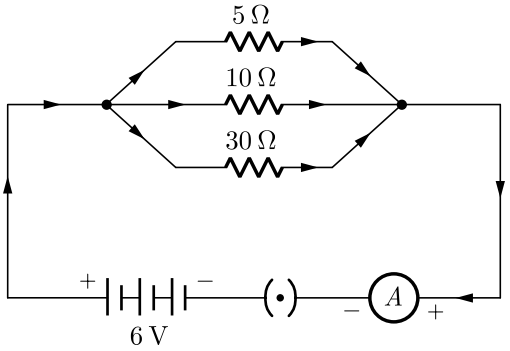
Group 15	**Group 16**	**Group 17**
.....	.....	.....
.....	.....	Q
.....	.....	.....
P	.....	R

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

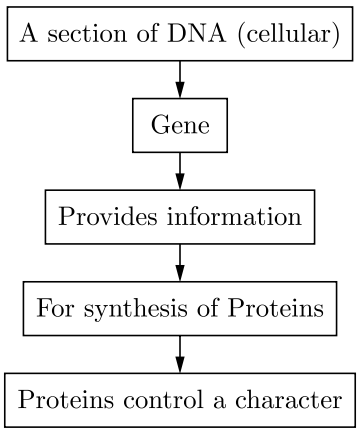
Why does a current carrying conductor kept in magnetic field experience force. On what factors does the direction of this force depend ? Name and state the rule used for determination of direction of this force.

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?

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Sample Paper 4 Solutions

Class X (TERM – II) 2021-22
Science (086)

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

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.

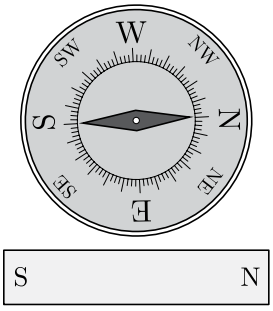
Ans :

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 :

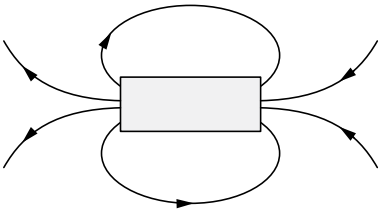
A compass needle consists of a short and thin magnet pivoted at its center and enclosed in a glass casing as shown in the given figure.



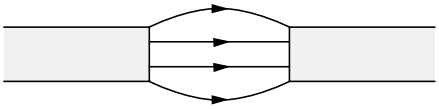
(a) When a compass needle is placed in a region having no magnetic field, it stays in the north-south direction.
(b) Compass needle shows deflection when brought near a bar magnet.

or

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

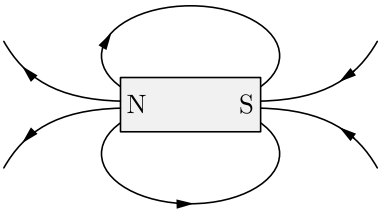


(i)

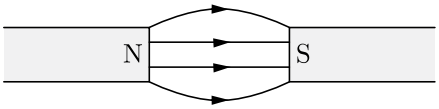


(ii)

Ans :

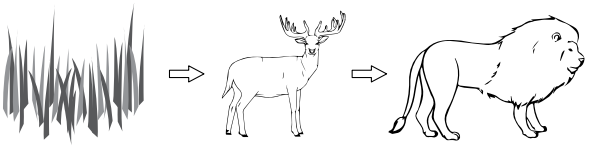


(i)



(ii)

7. Consider the food chain :



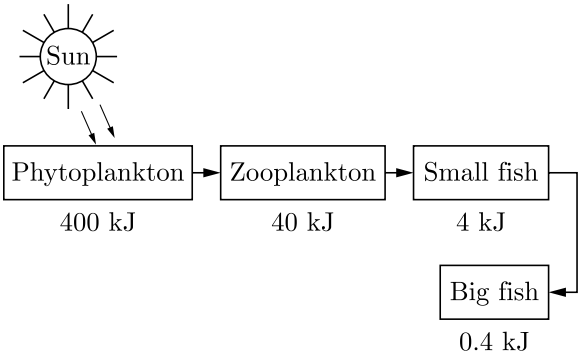
Grass Deer Lion

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,

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

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

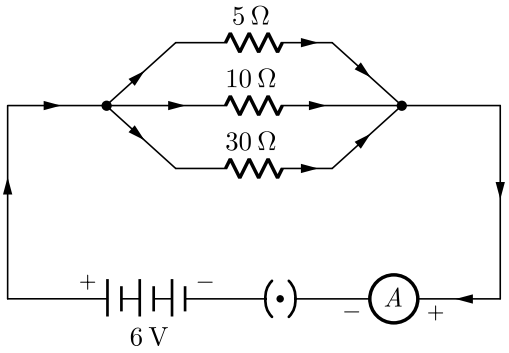
Total energy consumed in the month of September,

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

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.

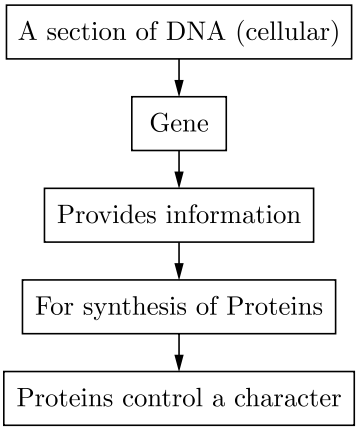
Section C

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;

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

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

□□□□□□□

Sample Paper 5

CLASS X (2021-22) Term 2

SCIENCE (CODE 086)

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. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound.'Why are such compounds:

(i) poor conductors of electricity? and

(ii) have low melting and boiling points? What happens when this compound burns in oxygen?

2. (a) State Modern Periodic Law.

(b) Where do you think hydrogen should be placed in the Modern Periodic Table ?

3. (a) Name an organism in which binary fission occurs in a definite orientation.

(b) Draw a neat diagram of a germinating seed and label on it the following : Cotyledon, Plumule, Radicle.

4. Define the following processes of asexual reproduction.

(a) Spore formation

(b) Regeneration

(c) Multiple fission

5. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

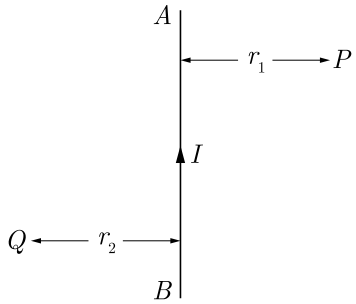
or

Protozoans reproduce by binary fission as well as by multiple fission. In your opinion, which process is better and why?

6. AB is a current carrying conductor in the plane of the paper as shown in figure.

(a) What are the directions of magnetic fields produced by it at points P and Q? Given $r_1 > r_2$,

(b) Where will the strength of the magnetic field be larger ?



or

A student performs an experiment to study the magnetic effect of current around a current carrying straight conductor with the help of a magnetic compass. He reports that :

(i) the degree of deflection of the magnetic compass increases when the compass is moved away from the conductor.

(ii) the degree of deflection of the magnetic compass increases when the current through the conductor is increased.

Which of the above observations of the student appears to be wrong and why ?

7. If a lake is contaminated with pesticides, which one of the following organisms will contain in its body the maximum concentration of pesticides and why ?
Small fish, Pelicans, Zooplanktons, Phytoplanktons, Big fish.

or

What will happen to the garbage and dead animals and plants in absence of microorganisms ?

Section B

8. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

(a) What is the position of elements X and Y in Periodic Table ?

(b) What will be the nature of oxide of element Y. Identify the nature of bonding in the compound formed.

9. (a) Complete the following reactions and name the main product formed in each case :

(i) $CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4}$

(ii) $CH_3COOC_2H_5 \xrightarrow{NaOH}$

(iii) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$

or

Fluorine (atomic number 9) and chlorine (atomic number 17) are members of the Periodic Table.

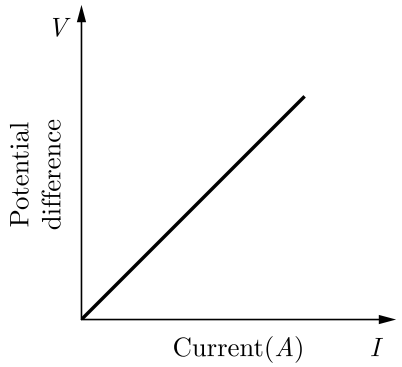
(i) Write their electronic configurations.

(ii) Which one is more electro-negative ? Give one reason.

10. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism?

11. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of 4Ω in series with a combination of two resistors (8Ω each) in parallel and a voltmeter across parallel combination. Each of them dissipate maximum energy and can withstand a maximum power of 16W without melting. Find the maximum current that can flow through the three resistors.

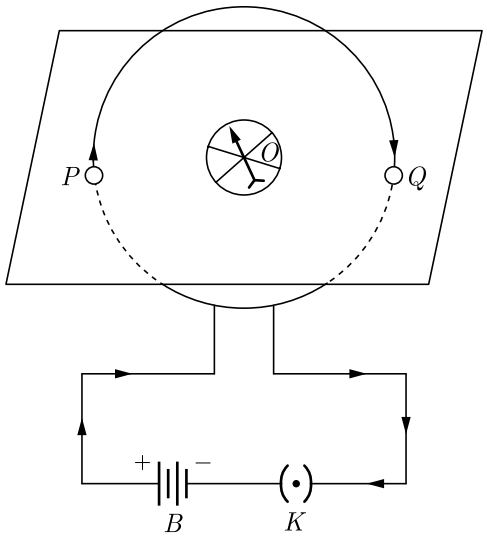
12. V-I graph for a conductor is as shown in figure.



(i) What do you infer from this graph ?
(ii) State the law expressed here
(iii) Name the physical quantity represented by the slope of this graph and its unit.

or

The flow of current in a circular loop of wire creates a magnetic field at its center. How may existence of this field be detected ? State the rule which helps to predict the direction of this magnetic field.



13. Explain the phenomenon of Biological Magnification. How does it affect organisms belonging to different trophic levels particularly the tertiary consumers ?

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. Study the follwoing table and answer the following questions.

Table-A

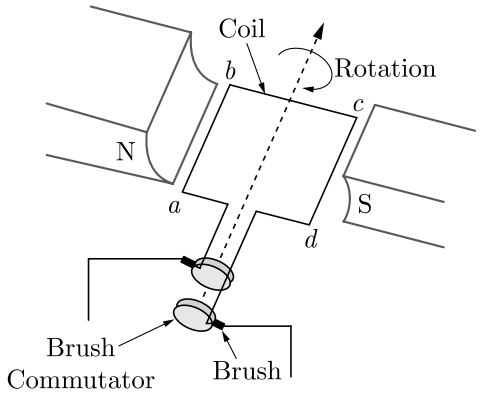
S. No.	Generation	Phenotypic ratio
1.	F_1 generation	23 pairs
2.	F_2 generation	22 pairs

(i) State the law of dominance.
(ii) What is the dominant allele?
(iii) Define the term phenotype.

or

What is the meaning of genotype?

15. Read the following case based passage and answer the questions given after passage.
A D.C. generator also called a D.C. dynamo converts mechanical energy into electrical energy (D.C.). It works on the principle that when a coil rotates in a uniform magnetic field, a current is induced in the coil. The direction of induced current is determined by Fleming's right hand rule. The schematic diagram of a D.C. generator is as shown in figure.



(i) What is the main difference in structure of AC and DC generator ?
(ii) What is the frequency of D.C.?
(iii) What type of dynamo is used in a bicycle? What is the function of dynamo in bicycle ?

or

A D.C. motor is rotating in clockwise direction. How can the direction of rotation be reversed?

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Sample Paper 5 Solutions

Class X (TERM – II) 2021-22
Science (086)

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

General Instructions:

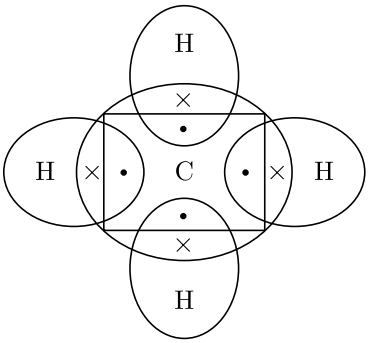
1. All questions are compulsory.
2. The question paper has three sections and 15 questions. All questions are compulsory.
3. Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.
4. Internal choices have been provided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

Section A

1. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound.'Why are such compounds:
(i) poor conductors of electricity? and
(ii) have low melting and boiling points? What happens when this compound burns in oxygen?

Ans :

Methane is a hydrocarbon formed by the combination of carbon with hydrogen. Its molecular formula is CH_4. It is a main green house gas. The type of bond formed in methane is covalent bond.
Electron dot structure of methane (CH_4) :



(i) Covalent compounds are poor conductors of electricity because it has no free electrons to conduct electricity. Moreover this compound is formed by sharing of electrons. So no electron is available for the conduction.
(ii) They have weak forces of attraction between them so less energy is required to break the force of binding. Thus they have low melting and boiling points.

When this compound burns in oxygen, combustion reaction takes place.

$$CH_4 \xrightarrow{O_2} CO_2 + H_2O + \text{Heat} + \text{light}$$

2. (a) State Modern Periodic Law.
(b) Where do you think hydrogen should be placed in the Modern Periodic Table ?

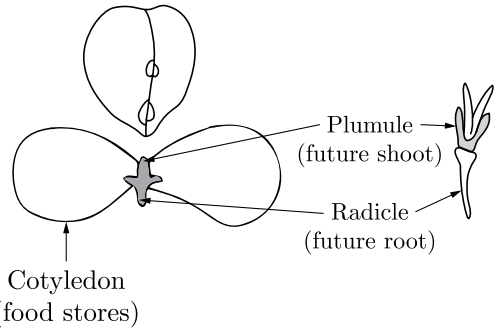
Ans :

(a) Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.
(b) Atomic number of hydrogen is 1, so it should be kept in the 1st period. It resembles alkali metals but at the same time it shows similarity with halogens and hence it should be kept in group 17. Because of its lowest atomic number and lowest atomic mass, it is usually placed along with alkali metals in group 1.

3. (a) Name an organism in which binary fission occurs in a definite orientation.
(b) Draw a neat diagram of a germinating seed and label on it the following :
Cotyledon, Plumule, Radicle.

Ans :

(a) Leishmania
(b)



4. Define the following processes of asexual reproduction.
(a) Spore formation
(b) Regeneration
(c) Multiple fission

Ans :

(a) Minute, Single celled, thin or thick walled spores produced by sporangia develop into new life under suitable conditions.
(b) Organisms are cut into any number of pieces and each piece grows into a complete organism.
(c) Unicellular organisms divide into many daughter cells simultaneously.

5. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

Ans :

Significance or reproductive health:

- Prevent STDs,
- Advantage of small family,
- Less mortality among new borns,
- Reduces the cases of maternal mortality.

Areas which have improved : Family planning and Decreases in STD cases.

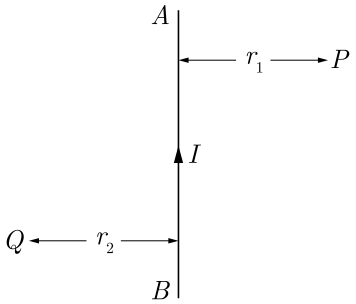
or

Protozoans reproduce by binary fission as well as by multiple fission. In your opinion, which process is better and why?

Ans :

In my opinion multiple fission is better because it forms a protective cyst and at one time so many daughter cells can be produced which increase survival changer of species.

6. AB is a current carrying conductor in the plane of the paper as shown in figure.
(a) What are the directions of magnetic fields produced by it at points P and Q? Given $r_1 > r_2$,
(b) Where will the strength of the magnetic field be larger ?



Ans :

(a) Magnetic field lines come into the paper at P and go out of the paper at Q. Hence, the direction of magnetic field at P is inwards and at Q is outwards.
(b) The strength of the magnetic field is larger at the point located closer, i.e., at Q.

or

A student performs an experiment to study the magnetic effect of current around a current carrying straight conductor with the help of a magnetic compass. He reports that :
(i) the degree of deflection of the magnetic compass increases when the compass is moved away from the conductor.
(ii) the degree of deflection of the magnetic compass increases when the current through the conductor is increased.
Which of the above observations of the student appears to be wrong and why ?

Ans :

The first observation is wrong.
Because as the distance from the conductor increases, the strength of the magnetic field decreases. So, the degree of deflection of the compass should decrease instead of increasing.

7. If a lake is contaminated with pesticides, which one of the following organisms will contain in its body the maximum concentration of pesticides and why ? Small fish, Pelicans, Zooplanktons, Phytoplanktons, Big fish.

Ans :

Pelican birds will contain the maximum concentration of pesticides in its body as it is at the highest trophic level (top consumer) in the food chain of the given organisms. It happens due to biomagnification, i.e., amount of harmful chemicals magnifies successively in the higher trophic levels.

or

What will happen to the garbage and dead animals and plants in absence of microorganisms ?

Ans :

The garbage and dead plants and animals will not decompose if there are no decomposer, i.e., saprophytic bacteria and fungi. The bodies cannot be decayed in the absence of bacteria or fungus and nutrients will not get recycle.

Section B

8. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.
(a) What is the position of elements X and Y in Periodic Table ?
(b) What will be the nature of oxide of element Y. Identify the nature of bonding in the compound formed.

Ans :

X is a non-metal.
Y is a metal.
When X and react, they form YX_2.
(a) Position of X – Group 17, Period 3.
Position of Y – Group 2, Period 4.
(b) The nature of oxide of Y, i.e., nature of YO would be basic.
The nature of bonding in the compound, YO is ionic.

9. (a) Complete the following reactions and name the main product formed in each case :

(i) $CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4}$

(ii) $CH_3COOC_2H_5 \xrightarrow{NaOH}$

(iii) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$

Ans :

(a) (i) $CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4} \underset{\text{Ethanoic acid}}{CH_3COOH}$

(ii) $CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COONa + \underset{\text{Ethanol}}{C_2H_5OH}$

(iii) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Chloromethane}}{CH_3Cl} + HCl$

or

Fluorine (atomic number 9) and chlorine (atomic number 17) are members of the Periodic Table.
(i) Write their electronic configurations.
(ii) Which one is more electro-negative ? Give one reason.

Ans :

(i) Electronic configuration of fluorine :

K	L	M	N
2	7		

Electronic configuration of chlorine :

K	L	M	N
2	8	7	

(ii) Fluorine (F) is more electronegative.
Reason : Small atomic size and more electron affinity.

10. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism?

Ans :

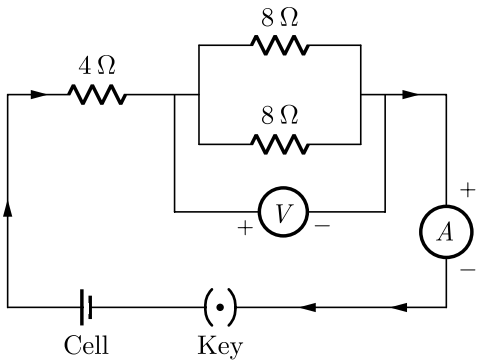
Yes; in Mendel's experiment, when pure tall pea plants were crossed with pure dwarf pea plants, only tall pea plants were obtained in F_1 generation. On selfing the pea plants of F_1 generation both tall and dwarf pea plants were obtained in F_2 generation. Reappearance of the dwarf pea plants in F_2 generation proves that the dwarf trait was inherited but not expressed in F_1 generation. The recessive trait does not express itself in the presence of the dominant trait. So, it is possible that one trait may be inherited but may not be expressed in an organism.

	Tall			Dwarf	
	TT	×		tt	
F_1 →	All Tall (Tt)				
	Tt	×		Tt	
	↓				
F_2 →	TT	Tt	Tt	tt	
	Tall	Tall	Tall	Dwarf	

11. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of 4Ω in series with a combination of two resistors (8Ω each) in parallel and a voltmeter across parallel combination. Each of them dissipate maximum energy and can withstand a maximum power of 16W without melting. Find the maximum current that can flow through the three resistors.

Ans :

We know, $P = I^2R$



$$P = 16\text{ W}$$

Now, $$I = \sqrt{\frac{P}{R}}$$

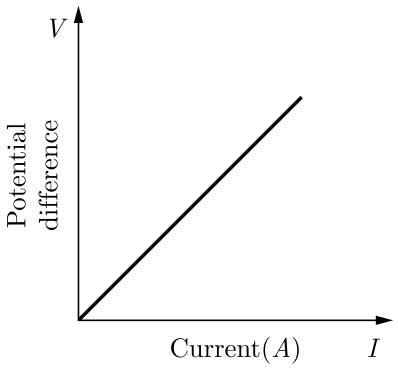
So, maximum Current of $4\,\Omega$ resistor,

$$I = \sqrt{\frac{16}{4}} = 2\text{ A}$$

So, current through each 8Ω resistor will be,

$$= \frac{1}{2} \times 2 = 1\text{ A}$$

12. V-I graph for a conductor is as shown in figure.



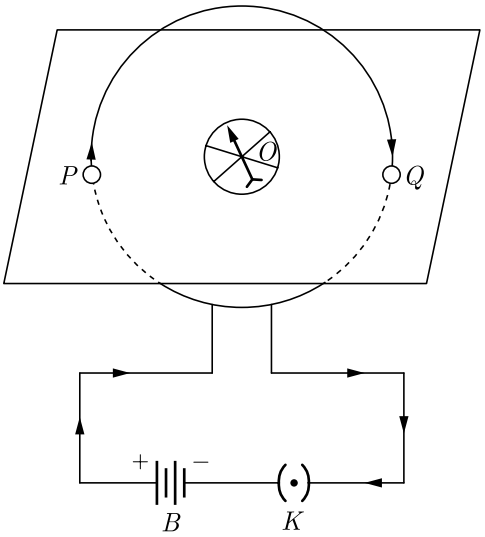
(i) What do you infer from this graph ?
(ii) State the law expressed here
(iii) Name the physical quantity represented by the slope of this graph and its unit.

Ans :

(i) Inference from graph $V \propto I$
(ii) The law states the current passing through a conductor is directly proportional to the potential difference across the ends, provided the physical conditions like temperature, density, etc., remain unchanges. This is ohm's law.
(iii) The slope of the graph represents the resistance and the unit of resistance is ohm.

or

The flow of current in a circular loop of wire creates a magnetic field at its center. How may existence of this field be detected ? State the rule which helps to predict the direction of this magnetic field.



Ans :

Take a cardboard sheet. Drill two fine holes P and Q on it along a straight line at a suitable distance. Take an insulated copper wire loop and pass it through the holes so that the loop is in a vertical plane. Connect a 6-12 V battery B and a plug key K with the ends of wire loop. Put a sensitive compass at the center point O of the cardboard. The compass rests in north-south direction. Now put the plug in key K so that a current begins to flow in the loop as shown in Figure. We observe that the compass needle gets deflected. It shows that a magnetic field is set up at the center of current-carrying circular loop.
The direction of field is given by right-hand rule.

13. Explain the phenomenon of Biological Magnification. How does it affect organisms belonging to different trophic levels particularly the tertiary consumers ?

Ans :

Biological magnification : Means accumulation of non-biodegradable chemicals like pesticides (DDT) in the living organisms in a food chain. The increase in concentration of harmful chemicals in the body of living organisms of each trophic level of a food chain is called biological magnification.
Pesticides such as DDT, when enters the food chain, the plants absorb these harmful chemicals from soil along with water and minerals. They enter the food chain at producer level and then transfers to the next trophic level. In animals, DDT gets accumulate in fatty tissue, thus, continuous consumption of same

plants results in higher concentration of DDT in animals. The tertiary consumers or top carnivorous animal get highest levels of these chemicals.

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. Study the follwoing table and answer the following questions.

Table-A

S. No.	Generation	Phenotypic ratio
1.	F_1 generation	23 pairs
2.	F_2 generation	22 pairs

(i) State the law of dominance.
(ii) What is the dominant allele?
(iii) Define the term phenotype.

or

What is the meaning of genotype?

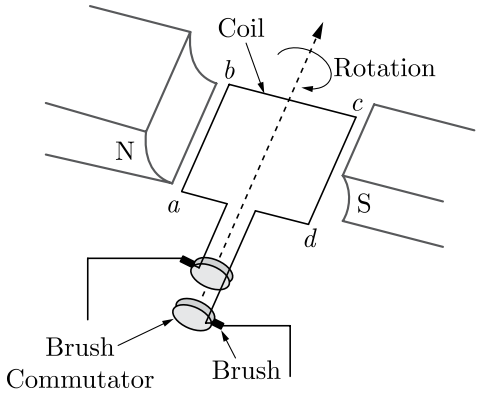
Ans :

(i) According to the law of dominance, the parent contains two alleles out of which one is the dominant allele while the other is the recessive allele.
(ii) The allele that expresses itself and reduces the expression of other alleles is termed as the dominant allele.
(iii) The set of the morphological characteristics of an organism that are resulted from the interactions of the genes is known as the phenotype of the individual. For example, in pea plants, tallness is a phenotypic trait.

or

The set of the alleles in DNA that carries the information for the expression of a trait in an individual is known as its genytype. For example, genotype 'TT' expresses the tallness in plants.

15. Read the following case based passage and answer the questions given after passage.
A D.C. generator also called a D.C. dynamo converts mechanical energy into electrical energy (D.C.). It works on the principle that when a coil rotates in a uniform magnetic field, a current is induced in the coil. The direction of induced current is determined by Fleming's right hand rule. The schematic diagram of a D.C. generator is as shown in figure.



(i) What is the main difference in structure of AC and DC generator ?
(ii) What is the frequency of D.C.?
(iii) What type of dynamo is used in a bicycle? What is the function of dynamo in bicycle ?

or

A D.C. motor is rotating in clockwise direction. How can the direction of rotation be reversed?

Ans :

(i) A.C. generator has slip rings while the D.C. generator has a commutator.
(ii) Zero
(iii) We use a D.C. dynamo in a bicycle. The dynamo is used to generate the electricity. It converts mechanical energy into electrical energy.

or

The direction of rotation of the motor can be reversed by reversing the direction of current through the coil. This can be achieved by interchanging the terminals of the battery connected to the brushes of the motor.

□□□□□□□

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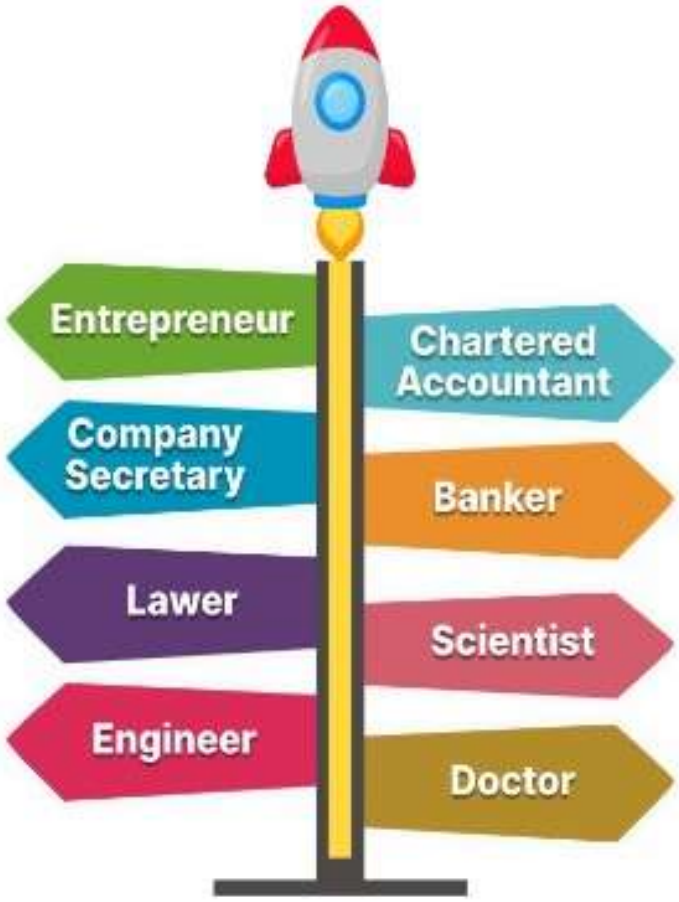

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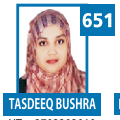

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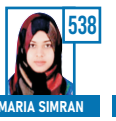

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