Sample Question Paper - 16
Science (086)
Class- X, Session: 2021-22
TERM II

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

General Instructions:

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

Section A

1. 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?

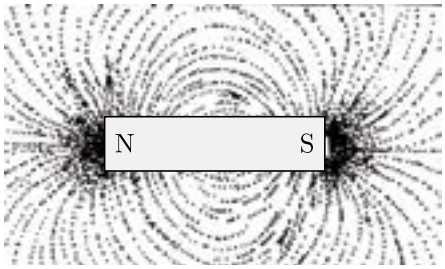
4. (a) Identify the asexual method of reproduction in each of the following organisms :
(i) Rose, (ii) Yeast.
(b) What is fragmentation? Name a multicellular organism which reproduces by this method.

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.

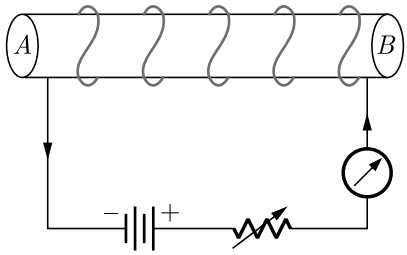
6. Study the diagram given below and answer the questions that follow :



(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

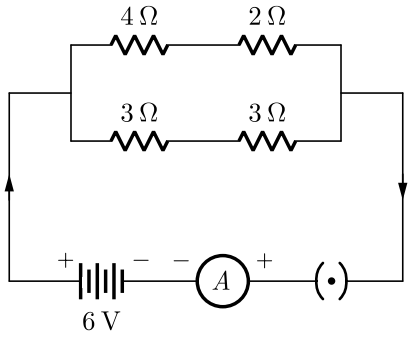
Account for the following :
(a) Noble gases are placed in a separate group.

(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.

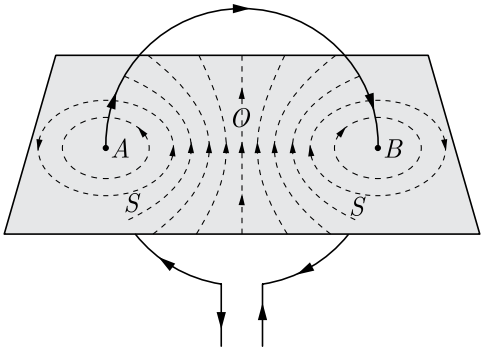
14. Read the following case based passage and answer the questions given after passage.
The rules for inheritance of such traits in human beings are related to the fact that both the father and the mother contribute practically equal amounts of genetic material to the child. This means that each trait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

Solution

SCIENCE - 086

Class 10 - Science

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

General Instructions:

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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

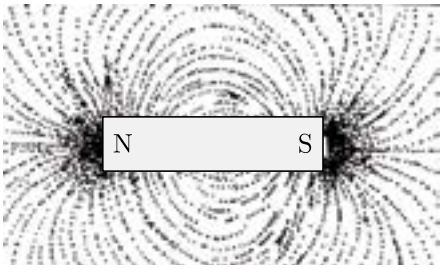
Variations are important for the survival of species overtime. Justify this statement with reasons.

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 :



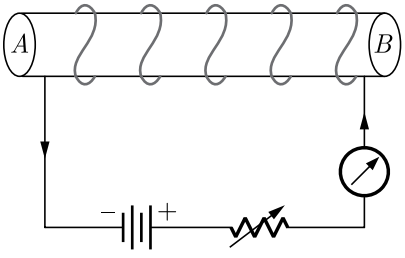
(a) Why do the iron filings arrange in such a pattern?
(b) What does this pattern demonstrate ?

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

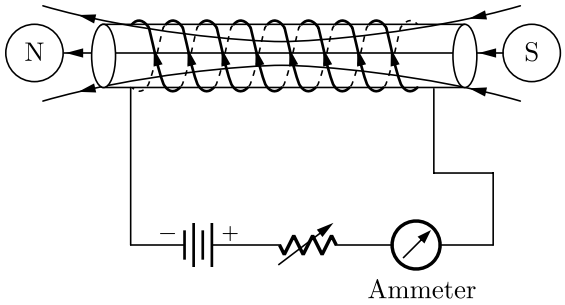
Diagram below shows a circuit containing a coil wound over a long and thin hollow cardboard tube. Copy the diagram.



(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.

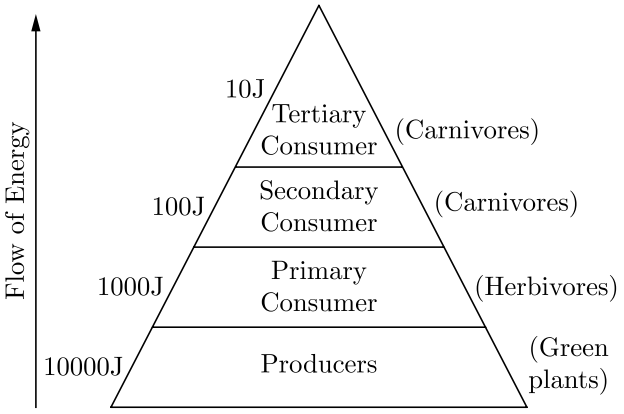
Ans :

(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, $t = 2\ \text{hrs} = 120\ \text{min} = 7200\ \text{s}$

Potential difference,

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

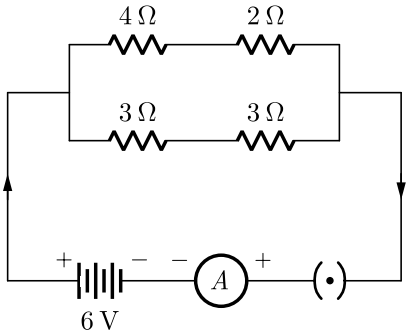
We know that,
Heat $H = VIt$, where I is current ...(1)

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,

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

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.

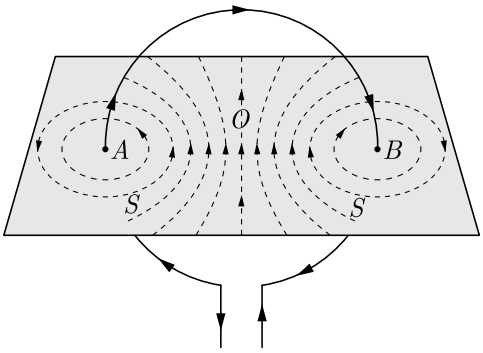
The strength of the magnetic field produced by a current-carrying circular coil (or circular wire) depends on :

(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.