

**Sample Question Paper - 20**  
**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.
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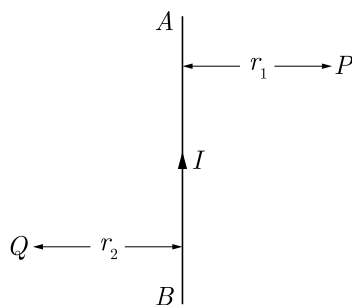
**Section A**

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)  $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{Alkaline KMnO}_4}$
  - (ii)  $\text{CH}_3\text{COOC}_2\text{H}_5 \xrightarrow{\text{NaOH}}$
  - (iii)  $\text{CH}_4 + \text{Cl}_2 \xrightarrow{\text{Sunlight}}$

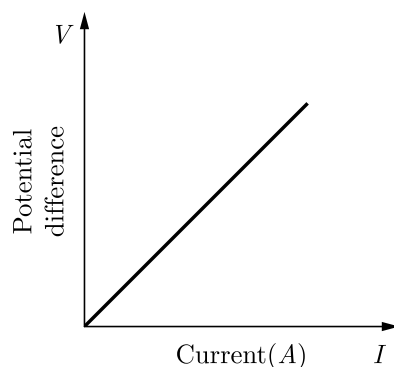
or

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.



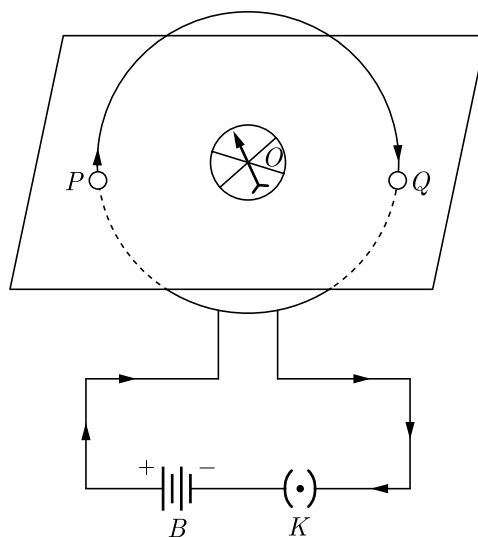
10. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism?
11. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of  $4\Omega$  in series with a combination of two resistors ( $8\Omega$  each) in parallel and 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 following table and answer the following questions.

**Table-A**

S. No.	Generation	Phenotypic ratio
1.	F <sub>1</sub> generation	23 pairs
2.	F <sub>2</sub> generation	22 pairs

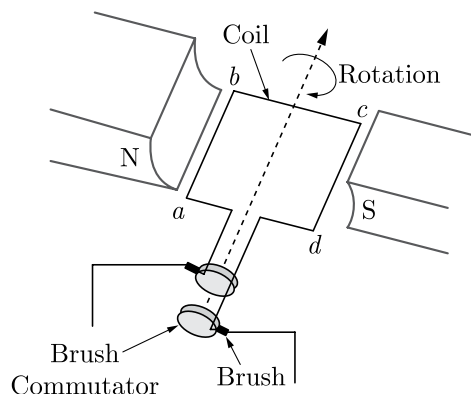
- (i) State the law of dominance.
- (ii) What is the dominant allele?
- (iii) Define the term phenotype.

**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?

**Solution**  
**SCIENCE - 086**  
**Class 10 - Science**

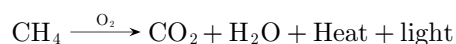
**Time: 2 Hours**

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**General Instructions:**

- All questions are compulsory.
- The question paper has three sections and 15 questions. All questions are compulsory.
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**Section A**

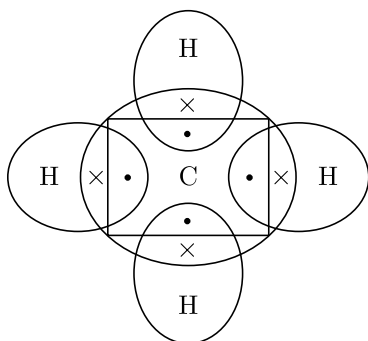


1. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds:
- poor conductors of electricity? and
  - have low melting and boiling points? What happens when this compound burns in oxygen?

**Ans :**

Methane is a hydrocarbon formed by the combination of carbon with hydrogen. Its molecular formula is  $\text{CH}_4$ . It is a main green house gas. The type of bond formed in methane is covalent bond.

Electron dot structure of methane ( $\text{CH}_4$ ) :



- 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.
- 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.

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

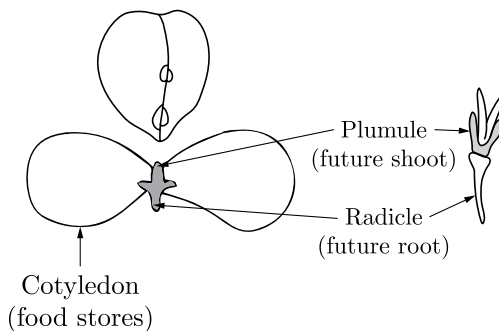
**Ans :**

- Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.
- 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 :**

- Leishmania
- 



4. Define the following processes of asexual reproduction.

- Spore formation
- Regeneration
- Multiple fission

Ans :

- Minute, Single celled, thin or thick walled spores produced by sporangia develop into new life under suitable conditions.
- Organisms are cut into any number of pieces and each piece grows into a complete organism.
- 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

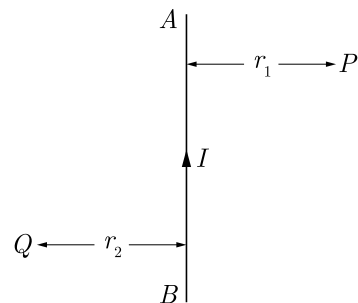
Protozoans reproduce by binary fission as well as by multiple fission. In your opinion, which process is better and why?

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.

- What are the directions of magnetic fields produced by it at points  $P$  and  $Q$ ? Given  $r_1 > r_2$ ,
- Where will the strength of the magnetic field be larger ?



Ans :

- 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.
- 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 :

- the degree of deflection of the magnetic compass increases when the compass is moved away from the conductor.
- 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.

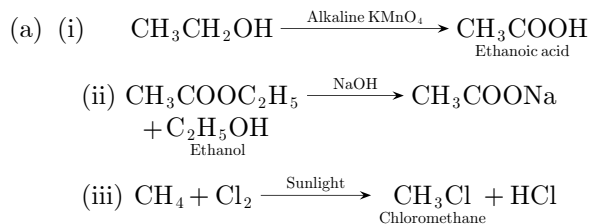
Y is a metal.

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 :



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.

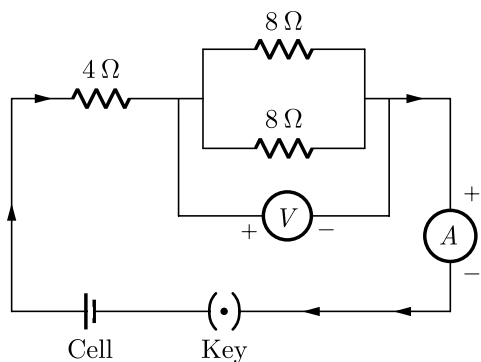
	Tall		Dwarf	
	TT	×	tt	
$F_1 \rightarrow$	All Tall (Tt)			
	Tt	×	Tt	
		↓		
$F_2 \rightarrow$	TT	Tt	Tt	tt
	Tall	Tall	Tall	Dwarf

11. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of  $4\Omega$  in series with a combination of two resistors ( $8\Omega$  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, 
$$I = \sqrt{\frac{P}{R}}$$

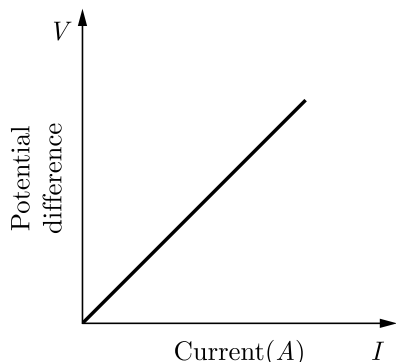
So, maximum Current of  $4 \Omega$  resistor,

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

So, current through each  $8 \Omega$  resistor will be,

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

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



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

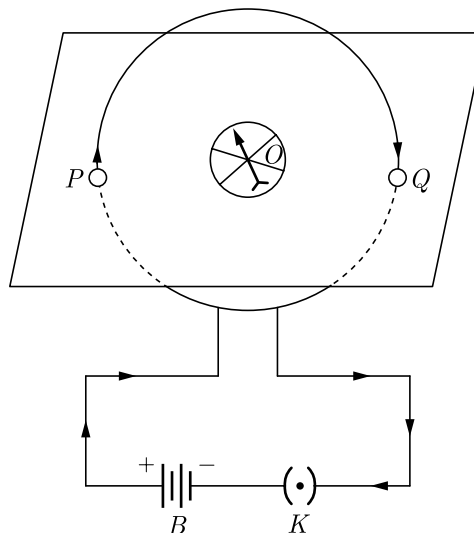
Ans :

- Inference from graph  $V \propto I$
- 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.
- 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 many 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 following table and answer the following questions.

Table-A

S. No.	Generation	Phenotypic ratio
1.	F <sub>1</sub> generation	23 pairs
2.	F <sub>2</sub> generation	22 pairs

- State the law of dominance.
- What is the dominant allele?
- Define the term phenotype.

or

What is the meaning of genotype?

Ans :

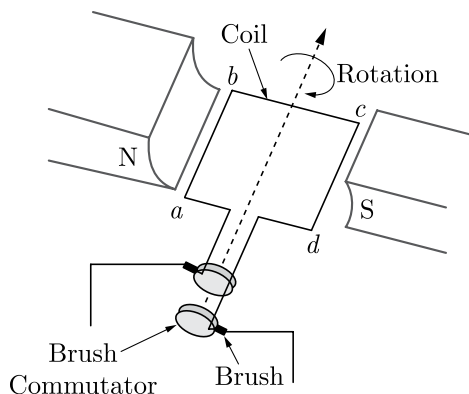
- According to the law of dominance, the parent contains two alleles out of which one is the dominant allele while the other is the recessive allele.
- The allele that expresses itself and reduces the expression of other alleles is termed as the dominant allele.
- The set of the morphological characteristics 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 genotype. 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.



- What is the main difference in structure of AC and DC generator ?
- What is the frequency of D.C.?
- 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 :

- A.C. generator has slip rings while the D.C. generator has a commutator.
- Zero
- 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.