

SAMPLE PAPER TEST 06 FOR TERM-2 EXAM (2021-22)
(ANSWERS)

SUBJECT: SCIENCE (086)

MAX. MARKS : 40

CLASS : X

DURATION: 2 HRS

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

Questions 1 to 7 carry 2 marks each.

1. (a) What is meant by vegetative propagation?
(b) How will a plant be benefitted if it reproduces by this method?
Ans: (a) Vegetative propagation is a form of asexual reproduction that occur in plants in which new plants are produced by vegetative parts such as the roots, stems and leaves.
(b) Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds. Such method also makes possible the propagation of plants that have lost the capacity to produce seeds.
 2. Consider a metal M with electronic configuration: 2, 8, 3.
(a) To which group and period of periodic table does M belong?
(b) Write the formulae of its sulphate and phosphate.
Ans: (a) As, there are 3 electrons in valence shell hence M belongs to group 13. Also, as electrons are filled in 3 shells, (K, L, M) thus 'M' belongs to 3rd period.
(b) As, 'M' has 3 electrons in its valence shell, thus it contributes 3 electrons in bonding. Formulae for sulphate and phosphate are $M_2(SO_4)_3$ and MPO_4 respectively.
 3. A functional group is a group of atoms in a molecule with distinctive chemical properties, regardless of the other atoms in the molecule. The atoms in a functional group are linked to each other and to the rest of the molecule by covalent bonds. Write the names of functional group of the compounds given below:
(a) CH_3-COOH
(b) $CH_3-CH_2-CH_2-OH$
Ans: (a) $-COOH$ group: Carboxylic acid 1
(b) $-OH$ group: Alcohol
 4. Colonies of yeast fail to multiply in water, but multiply in sugar solution. Give one reason for this.
Ans: Yeast multiplies by the process of budding. It requires energy for sustaining all its life activities. Sugar provides energy to yeast whereas water does not provide energy, so it fails to multiply in water because of inadequate energy.
 5. The following organisms form a food chain.
Insect, Hawk, Grass, Snake, Frog
Which of these organisms will have the highest concentration of non-biodegradable chemicals?
Name the phenomenon.
Ans: Highest concentration of harmful nonbiodegradable chemicals are found in top consumer hawk. The phenomenon exhibited here is biomagnification.
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OR

From the following groups of living things:

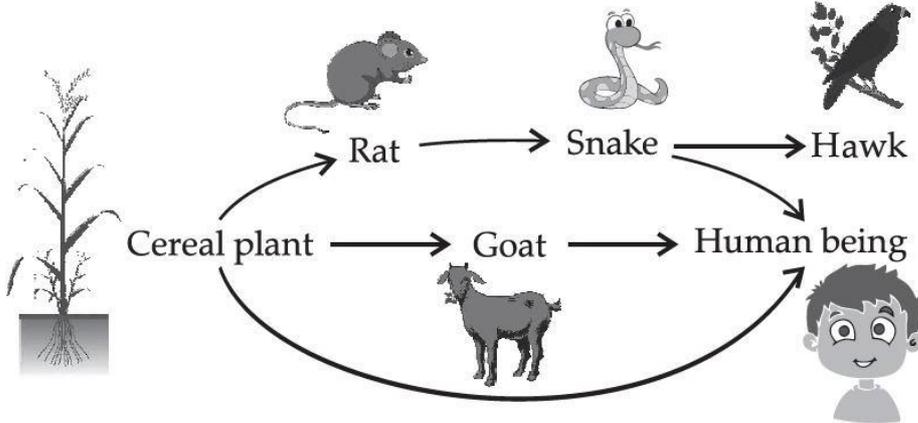
(a) Create a food chain which is the most advantageous for human being in terms of energy.

(b) Construct a food web using the living things mentioned above.

Ans: (a) Short food chains are more efficient in terms of energy. The shorter the food chain is, more is the available amount of energy for human beings to utilize.

Cereal plant → Human being

(b)



6. Can you think of magnetic field configuration with three poles?

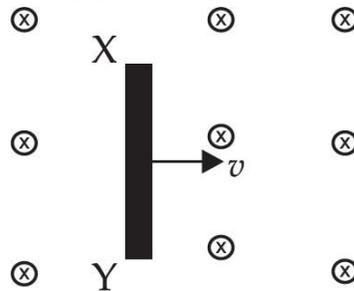
Ans: Magnetic poles always exist in pairs. However one can imagine magnetic field configuration with three poles - when North poles of two magnets are glued together or South poles of two magnets are glued together to provide three field configuration.

OR

In the given diagram, crosses \otimes represent a uniform magnetic field directed into the paper. A conductor XY moves in the field toward right side.

(a) Find the direction of induced current in the conductor.

(b) Name the rule applicable here. Justify your answer.



Ans: (a) The direction will be from Y to X. By Fleming's right hand rule the current will be induced in the upward direction (Y to X).

(b) Fleming's right hand rule: Hold the thumb, the fore finger and the middle finger of right hand at right angles to each other. If the forefinger is in the direction of magnetic field and the thumb points in the direction of motion of conductor, then the direction of induced current is indicated by middle finger.

7. In human beings, the statistical probability of getting either a male or female child is 50 : 50. Justify.

Ans: Human females are homogametic (44 + XX), that is they produce only one type of ova (22 + X). Human males are heterogametic. They produce two types of sperms : (22 + X) and (22 + Y) in equal proportion that is 50 : 50 ratio. The chance of getting male or female child is also 50 : 50, as there is equal chance of androsperm (22 + Y) or gynospem (22 + X) fertilising an ovum.

OR

How do Mendel's experiment show that traits are inherited independently?

Ans: (i) When a cross was made between a tall pea plant with round seeds and a short pea plant with wrinkled seeds, the F1 progeny plants were all tall with round seeds. This indicates that tall and round seeds are the dominant traits.

(ii) When the F1 plants are self-pollinated, the F2 progeny consist of some tall plants with round seeds and some short plants with wrinkled seeds which are the parental traits.

(iii) There were also some new combinations like tall plants with wrinkled seeds and short plants with round seeds.

(iv) Thus, it may be concluded that tall and short traits and round and wrinkled seed traits have been inherited independently.

SECTION – B

Questions 8 to 13 carry 3 marks each.

8. An element 'M' has atomic number 12.

(a) Write its electronic configuration and valency.

(b) Is 'M' a metal or a non-metal? Give reason in support of your answer.

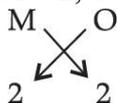
(c) Write the formula and nature (acidic/basic) of the oxide of M.

Ans: (a) Electronic Configuration – 2, 8, 2

Valency – 2

(b) There are two electrons in the outermost shell of M and it easily loses them to form a positive ion. Thus, element M is a metal.

(c) $M = 2, O = 2$



Chemical formula $M_2O_2 = MO$

It is a basic oxide.

OR

Four elements A, B, C and D along with their configurations are given below :

Element A – 2, 1; Element B – 2, 8; Element C – 2, 8, 1; Element D – 2, 8, 8.

(i) Which two elements belong to the same period?

(ii) Which two elements belong to the same group?

(iii) Which element out of A and C is more reactive and why?

(iv) Which element out of A and B forms more number of compounds?

Ans: (i) Elements in a period have same number of shells. Thus, elements A and B belong to the second period while C and D belong to the third period.

(ii) Elements in a group have same number of valence electrons. Thus, elements A and C belong to the same group 1, and elements B and D belong to the same group 18.

(iii) Element C is more reactive than element A due to its bigger size and weaker force of attraction of the nucleus on the valence electrons.

(iv) Elements B, being a noble gas does not form compounds. Hence, element A forms more number of compounds than element B.

9. Define the following compounds:

(a) Alkanes

(b) Alkenes

(c) Alkynes

Ans: (a) Alkane: Saturated hydrocarbon with C – C single bond with molecular formula C_nH_{2n+2} .

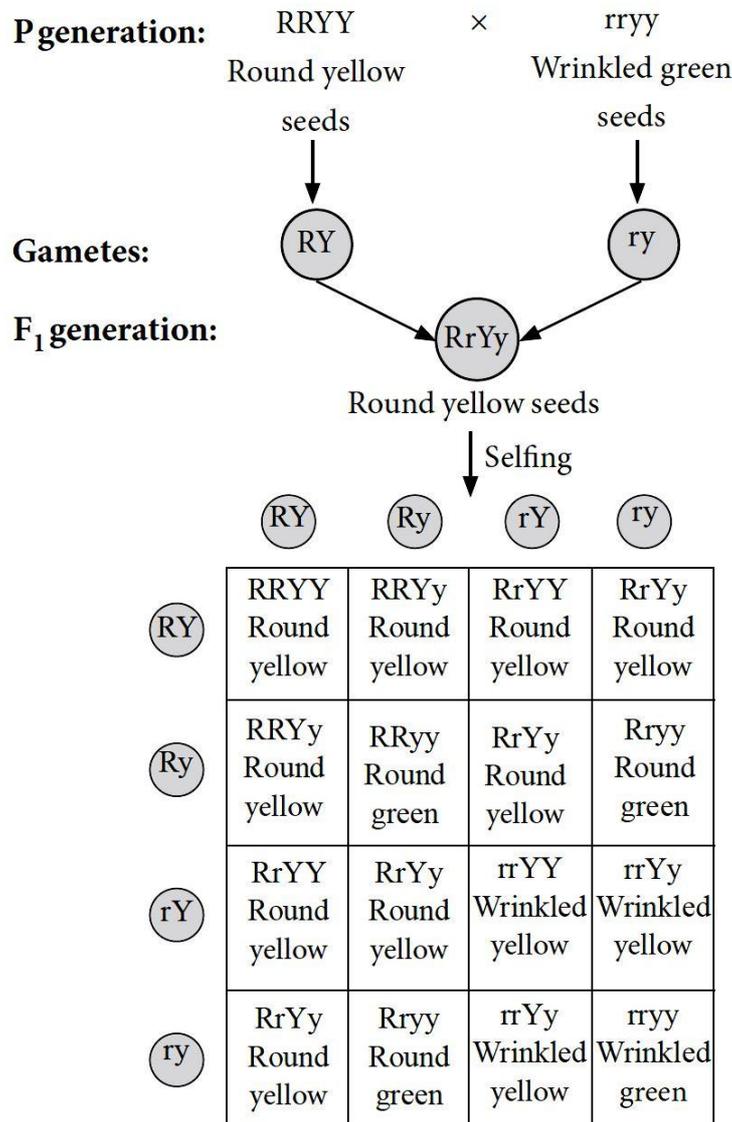
(b) Alkene: Unsaturated hydrocarbon with double bond in $C = C$ with molecular formula C_nH_{2n} .

(c) Alkyne: Unsaturated hydrocarbon with triple bond in $C \equiv C$ with molecular formula C_nH_{2n-2} .

10. Mendel performed several experiments that include monohybrid, dihybrid and trihybrid crosses.

On the basis of these experiments, Mendel formulated laws of heredity. How do Mendel's experiment shows that traits are inherited independently?

Ans: In a dihybrid cross given by Mendel, it was observed that when two pairs of traits or characters were considered, each trait expressed independent of the other. Thus, Mendel was able to propose the Law of Independent Assortment, which states that pairs of genes separate independently of each other during gamete formation. This could be explained clearly from the given cross:



F₂ generation ratio : 9 (Round-yellow) : 3 (Round-green) : 3 (Wrinkled-yellow) : 1 (Wrinkled-green)

11. In a house 4 bulbs of 100 watt each are lighted for 5 hours daily, 2 fans of 50 watt each are used for 10 hours daily and a refrigerator of 1.00 kW is used for half an hour daily. Calculate the total energy consumed in a month of January and its cost at the rate of ` 3.60 per kWh.

Ans: Power of each bulb = 100 watt

Total power of 4 bulbs, $P_1 = 4 \times 100 = 400$ watt

Energy consumed by bulbs in 1 day, $E_1 = P_1 \times t = 400 \text{ watt} \times 5 \text{ hours} = 2000 \text{ Wh} = 2 \text{ kWh}$

Power of each fan = 50 watt

Total power of 2 fans = $2 \times 50 \text{ watt}$ $P_2 = 100$ watt

Energy consumed by fans in 1 day, $E_2 = P_2 \times t = 100 \text{ watt} \times 10 \text{ hours} = 1000 \text{ watt hour} = 1 \text{ kWh}$

Energy consumed by refrigerator, $E_3 = 1 \text{ kW} \times 1/2 \text{ h} = 0.5 \text{ kWh}$

Total energy consumed in one day

$E = E_1 + E_2 + E_3 = (2 + 1 + 0.5) \text{ kWh} = 3.5 \text{ kWh}$

Total energy consumed in a month of January (31 days)

$= E \times 31 = (3.5 \times 31) \text{ kWh} = 108.5 \text{ kWh}$

Cost of energy consumed = Rs. $(108.5 \times 3.60) = \text{Rs. } 390.6$

OR

(a) Define electrical resistivity.

(b) Calculate the resistance of 1 km long copper wire of cross-section area $2 \times 10^{-2} \text{ cm}^2$.

[Resistivity of copper = $1.62 \times 10^{-8} \Omega \text{ m}$]

Ans: (a) Electrical resistivity of the material of a conductor is the resistance offered by the conductor of length 1 m and area of cross-section 1 m^2 .

(b) Resistance, $R = \frac{\rho l}{A}$ where, ρ = resistivity of copper = $1.62 \times 10^{-8} \Omega \text{ m}$

l = length of wire = $1 \times 10^3 \text{ m}$

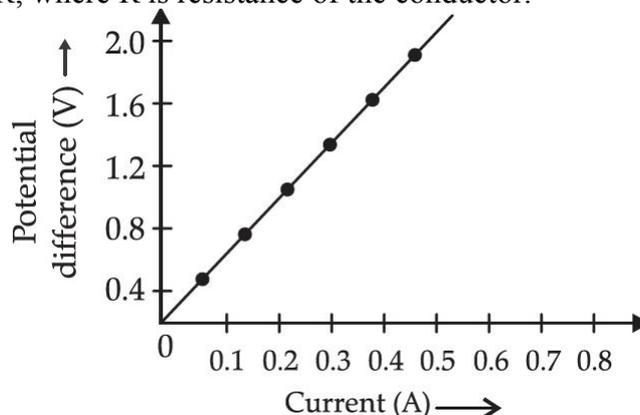
A = Area of cross-section = $2 \times 10^{-2} \text{ cm}^2$

$$\therefore R = \frac{1.62 \times 10^{-8} \times 1000}{2 \times 10^{-2} \times 10^{-4}} \Rightarrow R = 0.81 \times 10 \Omega = 8.1 \Omega$$

12. (a) State the relation correlating the electric current flowing in a conductor and the voltage applied across it. Also, draw a graph to show this relationship.

(b) Find the resistance of a conductor if the electric current flowing through it is 0.35 A when the potential difference across it is 1.4 V.

Ans: (a) The flow of current (I) in the conductor is directly proportional to the potential difference (V) established across the conductor provided the physical conditions remain same. Mathematically, $V = IR$, where R is resistance of the conductor.



(b) Given: Potential Difference (V) = 1.4 V

Current (I) = 0.35 A

As per Ohm's law, $V = IR$

$$\text{So, } R = \frac{V}{I} = \frac{1.4}{0.35} = 4 \Omega$$

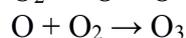
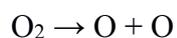
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13. The ozone layer is the common term for the high concentration of ozone that is found in the stratosphere around 15–30 km above the earth's surface. It covers the entire planet and protects life on earth.

(a) Explain the role of UV radiation in producing ozone layer. Mention the reaction involved.

(b) Why the amount of ozone in the atmosphere dropped sharply in the 1980's ?

Ans: (a) Ozone is formed in the upper atmosphere when solar UV radiation dissociate molecules of oxygen (O_2) and then this oxygen atom (O) combines with an oxygen molecule. Reaction involved:



(b) The amount of Ozone in the atmosphere began to drop sharply in the 1980s. This is due to the increased use of synthetic chemicals like chlorofluorocarbons which are used as refrigerants and in fire extinguishers.

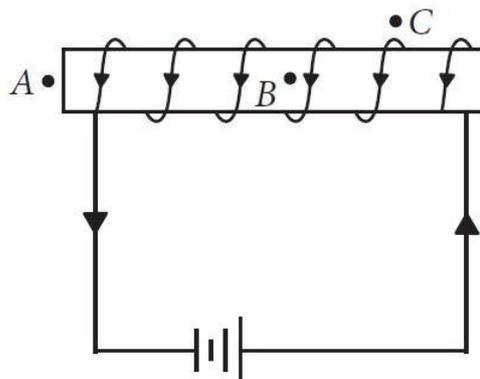
SECTION – C

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. When current is flowing through the solenoid, the magnetic field line pattern resembles exactly with those of a bar magnet with the fixed polarity, i.e., North and South pole at its ends and it acquires the repulsive and attractive properties similar to bar magnet. Hence, the current carrying solenoid behaves as a bar magnet.

(a) What are the uses of solenoid?

(b) Draw magnetic field lines for the current carrying solenoid as shown in figure and explain that out of three points A, B and C, at which point, magnetic field strength is maximum.

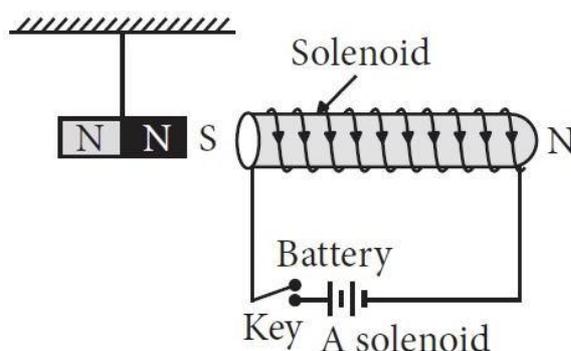


(c) How does a solenoid behave like a magnet? Can you determine the North and South poles of a current carrying solenoid with the help of a bar magnet? Explain.

Ans: (a) Solenoid are used to form temporary magnet called electromagnet. The electromagnet has more advantages over permanent bar magnet as electromagnets can be turned on and off making them effective as controls and switches.

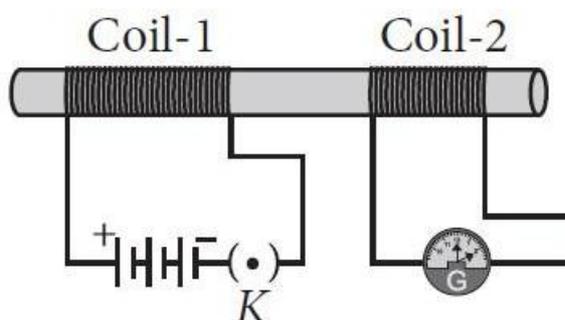
(b) Outside the solenoid magnetic field is minimum. At the ends of solenoid, magnetic field strength is half to that inside. So maximum field strength is at point B.

(c) When current is passed through a solenoid, it acts as a bar magnet. Suspend a bar magnet from a support. Bring a current-carrying solenoid near the North pole of the bar magnet. Observe if it gets attracted or repelled.



Now, perform the same action for south pole of the bar magnet.

Following the rule that opposite poles attract each other, one can identify the poles of the solenoid.



OR

Explain the phenomenon of electromagnetic induction briefly.

Ans: To explain electromagnetic induction take two different coils of copper wire having large number of turns (say 100 and 50 turns respectively). Insert them over a non-conducting cylindrical roll, as shown in figure. Connect the coil-1, having large number of turns, in series with a battery and a plug key. Also connect the other coil-2 with a galvanometer as shown.

Plug in the key. Observe the galvanometer. You will observe that the needle of the galvanometer instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil-2.

Hence, the change in magnetic field lines associated with the coil-2 is the cause of induced electric current in it.

15. Seema crossed pure breed pea plants having round-yellow seeds with wrinkled green seeds and found that only A-B type of seeds were produced in the F₁ generation. When F₁ generation pea plants having A-B type of seeds were cross-breed by self-pollination, then in addition to the original round yellow and wrinkled green seeds, two new varieties A-D and C-B types of seeds were also obtained.

(a) What type of seeds are A-B type of seeds?

(b) Which types of traits are A and B. Dominant or recessive?

(c) What type of cross is the above cross? Define the type of cross.

Ans: (a) A-B type of seeds are round in shape and yellow in colour.

(b) A-B type are dominant traits.

(c) Dihybrid cross. A cross between two plants, which differ in two pairs of contrasting characters are called dihybrid cross.

OR

Differentiate gene and allele.

Ans: Allele (allelomorphs) refers to the alternate form of a gene pair present on the same loci in the homologous chromosome, whereas gene is the smallest unit of an organism capable of transmitting genetic information and expressing the same.

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