Sample Question Paper - 26
Science (086)
Class- X, Session: 2021-22
TERM II

Time allowed : 2 hours ***Maximum marks : 40***

General Instructions :

(i) All questions are compulsory.

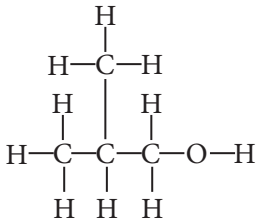
(ii) The question paper has three sections and 15 questions. All questions are compulsory.

(iii) 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.

(iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION - A

1. An organic molecule has the following structure :



(i) To which homologous series does this molecule belong ?

(ii) What is the general formula of this homologous series?

2. The electronic configuration of an element is 2, 8, 7.

(a) State its group and period in the Modern Periodic Table.

(b) Identify the element and predict the nature of oxide of the element.

3. Ovaries are primary sex organs of human female which are located in the lower part of abdominal cavity near the kidneys. Name the hormones secreted by human female ovaries. Write down their roles.

4. Write two differences between binary fission and multiple fission.

5. Explain briefly about ZW-ZZ type of sex determination.

OR

Does genetic combination of mother play a significant role in determining the sex of the new born? Give reason to support your answer.

6. How can you show that the magnetic field produced by a given electric current in the wire decreases as the distance from the wire increases?

OR

A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is *B*. It is then bent into a circular coil of *n* turns. Find the magnetic field at the centre of this coil of *n* turns.

7. Grass → Grasshopper → Frog → Snake → Eagle

In the above food chain, which of the organism will have

(a) maximum available energy?

(b) minimum available energy?

OR

Differentiate between biodegradable and non-biodegradable wastes.

SECTION - B

8. Potassium, bromine and krypton are elements in period 4 of the Periodic Table.

(a) In which group of the periodic table can these elements be found?

(b) Bromine exists as a molecule. Draw a 'dot-and-cross' diagram to show the bonding in a molecule of bromine.

(c) Krypton does not react with either potassium or bromine. Explain the unreactive nature of krypton.

9. (a) Why two carbon atoms cannot be linked by more than three covalent bonds?

(b) Give three differences between diamond and graphite.

OR

The table given below shows some information about four organic compounds *P*, *Q*, *R* and *S*.

Organic compound	Molecular formula	Melting point (°C)	Boiling point (°C)
P	C_3H_8	–188	–42
Q	C_4H_{10}	–138	–1
R	C_5H_{12}	–130	36
S	C_6H_{12}	6	80

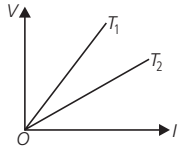
(a) Which homologous series does C_3H_8 belong to? Why are *P*, *Q*, *R* and *S* classified as hydrocarbons?

(b) Which of these organic compounds belong to the alkane series?

(c) Based on the information given above, state one characteristic of the alkane series.

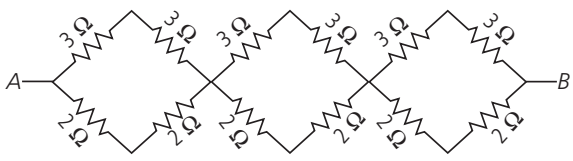
10. Where can we find greater variations in individuals – during asexual reproduction or sexual reproduction? Justify your answer.

11. (a) The voltage *V* and current *I* graphs for a conductor at two different temperatures T_1 and T_2 are shown in the figure. What will be the relation between T_1 and T_2 ?



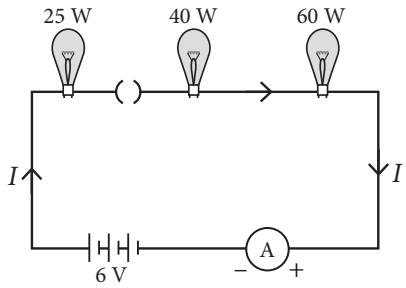
(b) A 2 m long wire with a cross-sectional area of 1 mm^2 has a resistance of 16 Ω. What is the resistance of the wire if it has a cross-sectional area of 2 mm^2?

12. Find the equivalent resistance of the given network between points *A* and *B*.



OR

In the circuit given below,



(a) Would any bulb glow when plug key is in open position?

(b) Write the order of brightness of the bulb when key is closed. Give reason.

13. Study the figure based on the biogmagnification of pesticides and answer the questions that follows :

Water	→	(A)	→	Zooplankton	→	(B)	→	Large Fish	→	(C)

(a) Name the given figure and identify the labelled parts 'A', B' and 'C'.

(b) Mention harmful non-biodegradable chemicals that enter in the bodies of organisms shown here.

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. A cross was carried out between a pure breed of tall pea plant and a pure breed of dwarf pea plant and F_1 progeny was obtained. F_1 progeny was selfed to obtain F_2 progeny.

(a) Write the phenotype of the F_1 progeny with reason?

(b) What will be the phenotypic ratio of the F_2 progeny?

(c) Why F_2 progeny is different from the F_1 progeny?

OR

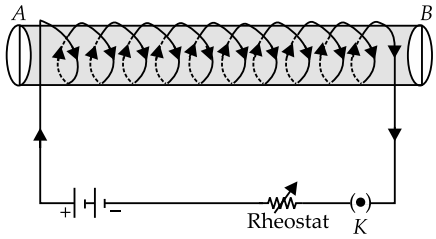
What would be the ratio of progenies when F_1 progeny and dwarf parent plant are crossed? Work out the cross.

15. An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the solenoid. The strength of magnetic field produced by a current carrying solenoid is directly proportional to the number of turns and strength of current in the solenoid.

(a) What is the strength of magnetic field inside a long current-carrying straight solenoid ?

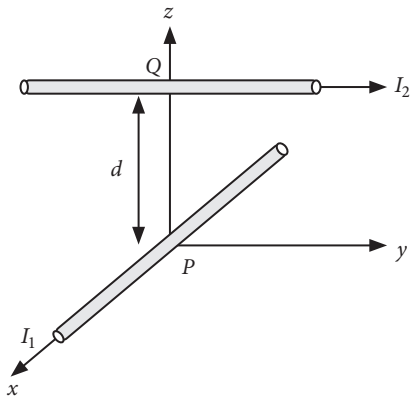
(b) A long solenoid carrying a current produces a magnetic field *B* along its axis. If the current is double and the number of turns per cm is halved then what will be new value of magnetic field ?

(c) A soft iron bar is enclosed by a coil of insulated copper wire as shown in figure. When the plug of the key is closed, which face of iron bar marked as *N*-pole ?



OR

Two long wires P and Q carrying current I_1 and I_2 are arranged as shown in figure.



Wire P carrying current I_1 along x-axis. Wire Q carrying current I_2 along a line parallel to y-axis given by $x = 0$ and $z = d$. Find the force exerted by wire P on wire Q.

Solution

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Class 10 - Science

1. (i) Alcohols
(ii) $C_nH_{2n+1}OH$

2. (a) The element belongs to group 17 and 3rd period of the Modern Periodic Table. (Halogen family)
(b) The element is chlorine (Cl). Since it is a non-metal, it forms acidic oxide.

3. Hormones secreted by human female ovaries are:
(i) Estrogen : Responsible for development of secondary sexual characters in females.
(ii) Progesterone : Prepares the uterus for the reception of fertilized ovum.

4. Differences between binary fission and multiple fission are as follows :
(i) Binary fission of the parent cell results in the formation of two small, nearly equal sized daughter individuals whereas multiple fission results in the formation of several daughter individuals.
(ii) In binary fission, the parent nucleus divides only once into two daughter nuclei, while in multiple fission the parent nucleus divides repeatedly into a number of daughter nuclei.

5. Birds have ZW-ZZ type of sex determination mechanism. In this type, male has two homomorphic sex chromosomes (ZZ) and is homogametic while female has two heteromorphic sex chromosome (ZW) and is heterogametic.

OR

Mothers have the combination of XX chromosomes while father have XY chromosomes. So, mother is homogametic and produces only one type of gametes having X chromosomes whereas father is heterogametic and produces two types of gametes X and Y. All children (boy or girl), thus inherit X sex chromosome from mother while boy inherits Y chromosome from the father and girl inherits X chromosome from father. Hence, mother does not play any role in determination of sex of the new born.

6. If we take a magnetic compass slowly away from the current-carrying conductor, the deflection of the compass decreases. This shows that the magnetic field decreases as we move away from the current-carrying conductor.

OR

As we know, magnetic field due to a current carrying loop at the centre is

$$B \propto I,\ B \propto n, B \propto \frac{1}{r}$$

$$\therefore \quad B \propto \frac{nI}{r} \quad \text{or} \quad B = \frac{knI}{r}$$

where k is proportionality constant.

when there is only one turn, $B_1 = \frac{kI}{R_1}$;

where $R_1 = \frac{l}{2\pi}$, l is the length of wire.

when there are n turns, $B_2 = \frac{knI}{R_2}$;

where $R_2 = \frac{l}{2\pi n}$

$$\therefore \quad \frac{B_1}{B_2} = \frac{R_2}{nR_1} = \frac{\left(\frac{I}{2\pi n}\right)}{n\left(\frac{I}{2\pi}\right)} = \frac{1}{n^2}$$

or $B_2 = n^2 B_1$

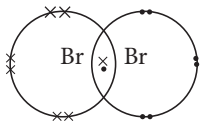
or $B_2 = n^2 B$ $\quad (\because \ B_1 = B)$

7. (a) Grass will have the maximum available energy as it is a producer *i.e.*, first trophic level.
(b) Eagle will have the minimum available energy as it is a top consumer, *i.e.*, fifth trophic level.

OR

S.No.	Biodegradable wastes	Non-biodegradable wastes
(i)	These are biological in origin.	These are mostly man-made.
(ii)	These are degraded by microorganisms such as bacteria and fungi.	These are not degraded by microorganisms.
(iii)	These cannot be biologically magnified.	Some of these can enter into the food chains and get biologically magnified.
(iv)	These can be converted into resources. Examples : Sewage, cattle dung, household garbage, etc.	Some of these can be recycled. Examples : Plastic objects, synthetic fibres, glass objects, pesticides, heavy metals, etc.

8. (a) Potassium is found is group 1, bromine in group 17 and krypton in group 18.

(b) 

(c) Krypton has a stable electronic configuration, with 8 electrons in its valence shell. Hence, it does not lose, gain or share electron(s) with another atom.

9. (a) Since the maximum angle strain is obtained when the two carbon atoms are linked by three covalent bonds, therefore, two carbon atoms cannot be linked to each other by more than three covalent bonds.

(b) Differences between diamond and graphite :

	Diamond	**Graphite**
1.	Three dimensional rigid	Two dimensional layered structure
2.	Bad conductor of electricity	Good conductor of electricity
3.	Diamond is hard and used in cutting or drilling	Graphite is soft and greasy. It is used as a lubricant

OR

(a) As C_3H_8 has general formula C_nH_{2n+2} thus it belongs to alkane series.

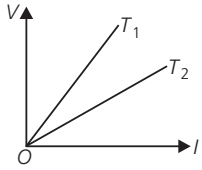
P, *Q*, *R* and *S* are classified as hydrocarbons because these compounds are made up of carbon and hydrogen only.

(b) C_3H_8, C_4H_{10} and C_5H_{12} all have general formula C_nH_{2n+2} thus, all of these belong to alkanes.

(c) They have general formula C_nH_{2n+2} and their melting points and boiling points increase with increase in molecular mass.

10. In sexual reproduction, greater variations are generated. This is because of exchange of DNA segments during crossing over in gamete formation and union of traits from two different parents during fertilisation generates greater variation. In asexually reproducing organisms, the progenies would be very similar to parents. There would be minor difference between them due to small inaccuracies in copying DNA or mutation or environmental factors.

11. (a) : The slope of *V*-*I* graph gives the resistance of a conductor at a given temperature. From the graph, it follows that resistance of a conductor at temperature T_1 is greater than at temperature T_2. As the resistance of a conductor is more at higher temperature and less at lower temperature, hence $T_1 > T_2$.



(b) The resistance of wire $(R) = \rho\frac{l}{A}$, where ρ is the resistivity of the wire which is material dependent, *l* is the length of the wire and *A* is the cross-sectional area of the wire.

It can be seen from the formula, that the resistance of the wire is inversely proportional to the cross-sectional area of the wire. This implies that the thicker the wire the lower the resistance of the wire will be. So,

Resistance with area 1 mm^2 is 16 Ω.

Resistance with area 2 mm^2 is 8 Ω.

12. In each segment of the combination 3 Ω and 2 Ω resistances are connected in series separately.

$\therefore$ $R' = 3 + 3 = 6\ \Omega$ and $R'' = 2 + 2 = 4\ \Omega$

R' and R'' are connected in parallel

$\therefore$ For first segment $\frac{1}{R_{eq_1}} = \frac{1}{6} + \frac{1}{4} = \frac{2+3}{12} = \frac{5}{12}$

$R_{eq_1} = \frac{12}{5}\Omega$ similarly for second and third segment

$R_{eq_2} = \frac{12}{5}\Omega$ and $R_{eq_3} = \frac{12}{5}\Omega$

Now segments are connected in series then the total resistance of combination is

$$R_{eq} = R_{eq_1} + R_{eq_2} + R_{eq_3} = \frac{12}{5} + \frac{12}{5} + \frac{12}{5} = \frac{36}{5}\Omega$$

OR

(a) No bulb will glow when plug key is in open position as no current would flow through the circuit.

(b) Power of bulb, $P = I^2 R$

For the same current, $P \propto R$

but for the same voltage, $P \propto \frac{1}{R}$ or $R \propto \frac{1}{P}$

So, resistance order of all bulb is, $R_{25} > R_{40} > R_{60}$

According to Joule's law of heating, $H \propto R$ (for the same current and time)

Hence, order of heating produced is

$H_{25} > H_{40} > H_{60}$

which is order of brightness of the bulb when key is closed.

13. (a) The given figure is of biomagnification of DDT in which parts 'A', 'B' and 'C' are phytoplankton, small fish and fish-eating bird or human being respectively.

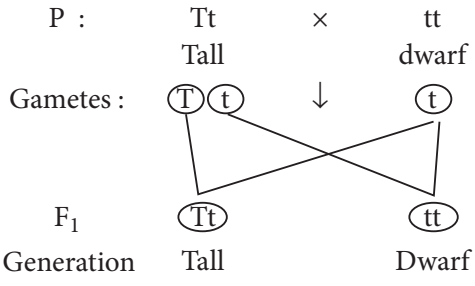
(b) Some harmful non-biodegradable chemicals such as pesticides, *e.g.*, DDT and heavy metals *e.g.*, mercury, arsenic, cadmium, etc., enter the bodies of organisms through the food chains and go on concentrating at each trophic level.

14. (a) The phenotype of F_1 progeny will be tall (Tt) hybrid. They resembled only one parent. In a cross between tall (TT) and dwarf (tt) breeds of pea plants, the F_1 plants will be all tall because alleles for dwarfness (t) is unable to express itself in the presence of allele of tallness (T). The alleles for tallness is dominant over the factor for dwarfness and the allele for dwarfness is recessive.

(b) The phenotypic ratio of F_2 progeny will be 3 (Tall) : 1 (Dwarf).

(c) F_1 progeny resembled only one parent which is dominant in nature but in F_2 progeny phenotypically three plants are tall in which one plant is pure tall (TT), two are hybrid tall (Tt) and one plant is pure dwarf (tt).

OR



Phenotypic ratio : 1 : 1

Genotypic ratio : 1 : 1

15. (a) Magnetic field inside infinite solenoid is uniform. Hence it is same at all points.

(b) For a long solenoid, magnetic field $B \propto In$; where I is the flowing current and n is number of turns per unit length in the solenoid. Therefore, in the given case magnetic field will remain unchanged.

(c) When the plug of the key is closed, the face B of the iron bar marked as N-pole

OR

According to right hand thumb rule, the magnetic field at Q due to wire P is along negative y-axis.

$\therefore$ Magnetic field at Q is antiparallel to current I_2.

Hence, there is no force on wire Q due to wire P.