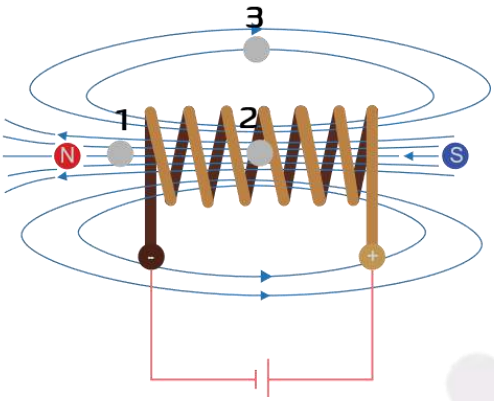
Mock Board Exam
Of SQP SCIENCE (086)
CLASS - X
Term 2 (2021-22)

	SECTION A	
1	a. The given compound has the formula CH3CH2COOH. The functional group –COOH represents a carboxylic acid. …(1) b. The next homologue of CH_3CH_2COOH: $CH_3CH_2\mathbf{CH_2}COOH$ …(1)	2
2	The electronic configuration of elements X, Y, and Z will be: X: 2, 1; Y: 2, 4; Z: 2, 8, 1 a. In the modern periodic table, the vertical columns represent groups. Elements having the same number of valence electrons are placed into the same group. As element X and element Z have one valence electron i.e. one, in the outermost shell. So both belong to the same group in the periodic table. ...(1) b. In the modern periodic table, the period represents the horizontal rows where atoms having the same number of shells containing electrons are present. As elements, Y and Z have two shells each both belonging to the same period in the periodic table. …(1)	2
3	The name of the different parts of the flower based on the statements given about them are: (a) Anther (b) Ovary (c) Stigma (d) Petals …(½ x 4)	2

4	Inherited trait is a particular feature/trait which is passed on from parents to their offspring, generation to generation. Such traits are a genetically determined feature that distinguishes a person. Example: Blue eye colour. …(1) Acquired trait is a particular feature/trait that is developed during the lifetime of an individual. Such features are not genetically controlled and cannot be passed on to the next generation. Example: Body weight …..(1)	2
5	a. Autotrophs: Organisms that produce their own food during the process of photosynthesis are known as autotrophs. Examples: Grass and trees ...(1) b. Decomposers: Organisms that get nutrients and energy from dead or decaying plants and animals are known as decomposers. Example: Bacteria and fungi ...(1) ***OR*** Gas G: Ozone ...(1) The Ozone layer present in the stratosphere protects us from harmful UV rays. The primary reason behind the depletion of the ozone layer is CFCs i.e. chlorofluorocarbons. These CFCs are released into our atmosphere due to the use of refrigerators, air conditions, aerosols, and more containing CFCs. When these CFCs rise up in the air and come in contact with UV rays, it breaks them to free chlorine atoms. The free chlorine atom reacts with O_3 to give molecular O_2 and chlorine monoxide (ClO). …..(1) The reaction involved: **$CFCl_3$ +** *UV rays* **→ Cl + $CFCl_2$** **Cl + O_3 → ClO + O_2**	2
6	Magnetic field will be strongest at point 2. ...(1) The magnetic field inside the solenoid is parallel and uniform while that of outside is non-uniform and distributed in a larger region. This means that the density of magnetic field lines is high inside the solenoid. Therefore, the magnetic field strength inside the solenoid is stronger than that of outside. …(1)	2

		
7	Methods of contraception are: (a) Mechanical barrier (b) Intrauterine devices (c) Surgical method ……(1) (a) **Mechanical barrier method:** Mechanical barriers like condoms prevent the sperms from reaching the egg. Thus, it is an effective method to avoid pregnancy. It also prevents transmission of infections during sexual act …(1) (b) **Intrauterine devices:** An intrauterine device (IUD) is a small sized, T-shaped birth control device used by females to prevent pregnancy. An IUD is also known as an intrauterine contraceptive device or coil inserted into a woman's uterus. This contraceptive device suppresses sperm motility for fertilisation by releasing copper ions within the uterus. Eg: Copper-T ….(1) (c) **Surgical method:** The surgical method of birth control for men is called vasectomy in which a small portion of the vas deferens is cut and their ends are sealed to prevent sperm from coming out. The surgical method of birth control for women is called tubectomy in which a portion of oviducts are cut and their ends are ligated to prevent the release of eggs. …..(1) Note : The students have to explain only one in detail.	2
	SECTION B	

8	a. As elements B and D belong to the same group, they will have the same valence electrons in their outermost shell. Hence, the electronic configurations of B and D are as follows: B (Atomic number = 4): 2, 2 D (Atomic number = 12): 2, 8, 2 …(1) b. <table><tr><th>Metal</th><th>Metalloid</th><th>Nonmetal</th></tr><tr><td>B and D</td><td>E</td><td>F and G</td></tr></table>….(1) c. Element D has a greater atomic radius than that of elements E and F because as the atomic number increases, the nuclear charge and the number of electrons also increase causing the electrons to be attracted more strongly towards the nucleus. …(1)	3
9	a. **Allotropy:** Allotropy is the phenomenon by which a single element is present in more than one physical form. Allotropes of carbon are as follows: ● Diamond ● Graphite ● Fullerene …(1) b. Diamond is one of the hardest substances which occurs naturally. The atoms in diamonds are organized in a rigid three-dimensional structure and are tightly bonded to each other. The absence of large empty spaces in the diamond structure makes it an extremely hard substance which compels it to be used as cutting tools such as glass cutters while graphite has a layered structure of carbon atoms and is very soft so it cannot be used for making cutting tools. In a graphite molecule, one valence electron of each carbon atom remains free in its two-dimensional structure. Due to the free electrons in its framework, graphite acts as a good conductor of electricity. While in the case of diamonds, they have no free mobile electrons in their rigid three-dimensional structure hence cannot perform electrical conductance through it. Therefore,	3

graphite can be used to make electrodes in dry cells but diamond cannot. …(2)

OR

a. The two characteristics of carbon that enable it to form a large number of compounds are:

Catenation: It is the property of carbon atoms to form covalent bonds with other carbon atoms and form long chains. These chains may be straight, branched, or may even result in the formation of rings. Carbon atoms may be linked to each other by single, double, or triple covalent bonds. …(1)

Tetravalency: The valency of a carbon atom is four. This enables the carbon atom to form four covalent bonds by sharing electrons with other atoms. These bonds formed by carbon are very strong. This can be attributed to the small size of the carbon atom. …(1)

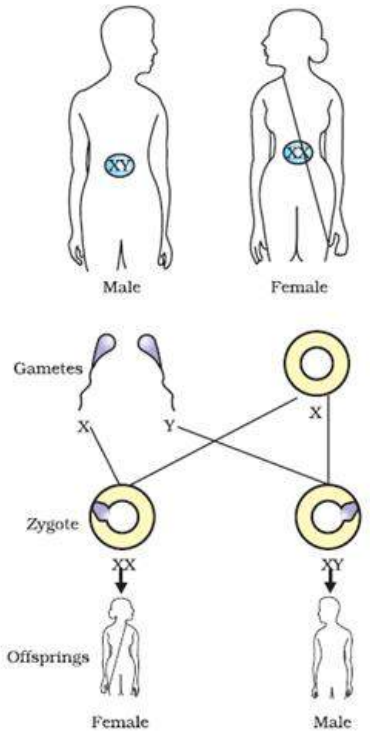
b.

Alkanes	Alkenes	Alkynes
They are saturated hydrocarbons.	They are unsaturated hydrocarbons.	They are unsaturated hydrocarbons.
They contain single bonds only.	They contain at least one double bond.	They contain at least one triple bond.
General formula - C_nH_{2n+2}	General formula - C_nH_{2n}	General formula - C_nH_{2n-2}

…(1)

10 In human beings, the sex of the individual is genetically determined.

- Sex determination is the process by which sex of a new born individual can be determined.
- In human beings, males have 1 unpaired sex chromosome and females have paired sex chromosome. Sex chromosome of male is XY and of female is XX.

	• Sex of a child depends on what happens at fertilisation. …(1)  ……(1) • During fertilisation if a sperm carrying X chromosome fertilises an egg, then the child born will be a girl. • If a sperm carrying Y chromosome fertilises an egg, then the child born will be a boy. • Thus, father is responsible for the determination of the sex of a child. ….(1)	
11	a. Tungsten is widely used in making filaments for incandescent bulbs as It has the highest melting point (approx 3500 degree celsius) among the usable metals for the given purpose and thus does not melt easily and glows even at very high temperatures. It also has some other desirable properties like resistance to corrosion , high density etc. …(1) b. Given, Rating of bulb = 100 W, 60 V Electricity cost = 5 rupees per unit	3

	Total bulbs = 10 Cost desired < 1000 per month Power dissipated in the chandelier: P = 10 x 100 W = 1000 W = 1 kW Let the bulb glow for 't hr' in a day. Energy consumed in one day = Pt = 1 x t = t kWh …(1) Energy consumed in one month = 30t kWh Total cost = Energy consumed x cost per unit C = Rs. 30t x 5= Rs. 150t But, the cost is less than Rs 1000. 150t < 1000 t < 20/3 h t < 6 h 20 min …(1)	
12	Let the equivalent resistance of R_1 and R_2 be R'. $$R' = \frac{R_1 R_2}{R_1 + R_2}$$ $R' = \frac{3 \times 12}{3 + 12} = \frac{36}{15}\ \Omega$ …(0.5) Let the equivalent resistance of R_3 and R_4 be R''. $$R'' = \frac{R_3 R_4}{R_3 + R_4}$$ $R'' = \frac{2 \times 8}{2 + 8} = \frac{16}{10}\ \Omega$ …(0.5) These two are obviously in series. So, the equivalent resistance of the circuit will be: $$R_{eq} = R' + R''$$ $$R_{eq} = \frac{36}{15} + \frac{16}{10} = \frac{72 + 48}{30}$$ $R_{eq} = \frac{120}{30} = 4\Omega$ …(0.5)	3

Using Ohm's Law, the current(I) in the circuit ,

$$I = \frac{V}{R}$$

$$I = \frac{4}{4} = 1\ A$$ …(0.5)

As R_3 and R_4 are connected in parallel , the potential drop across both resistors is the same and also equal to the potential drop across the equivalent of these two. Using Ohm's law again,

$$V = I\,R'' = 1 \times \frac{16}{10} = 1.6\ V$$ …(1)

Hence potential drop across 8 Ω resistor is 1.6 V.

OR

Given:

$$R_1 = 10\ \Omega$$
$$R_2 = 20\ \Omega$$

V = 60 V

The equivalent resistance (R_{eq}) of these two resistors:

$$R_{eq} = R_1 + R_2$$

$$R_{eq} = 10 + 20 = 30\ \Omega$$ …(0.5)

The current (I) in the circuit:

I = V/R = 60/30 = 2 A …(0.5)

Power across 20 Ω resistor:

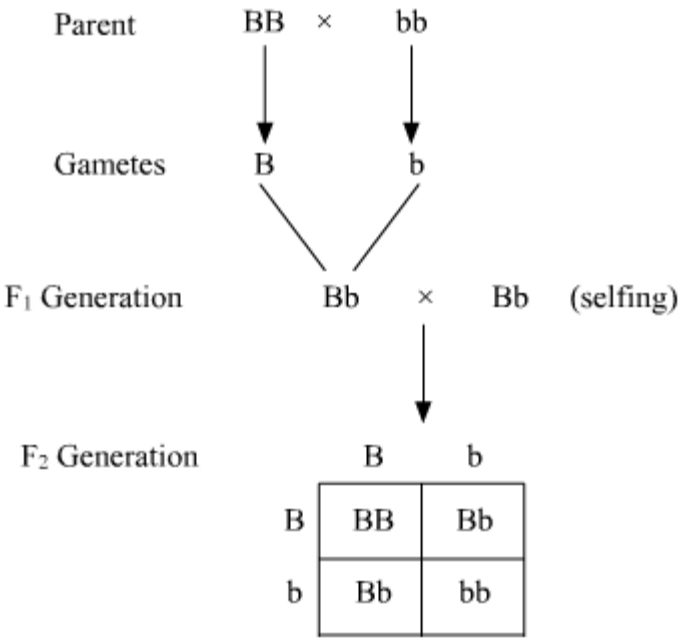
$$P = I^2R$$

$$P = 2^2 \times 20 = 4 \times 20 = 80\ W$$ …(1)

Energy consumed by it in 1 h:

$$E = P\,t = 80\ W \times 1\ h = 80\ Wh$$ …(1)

13	a. Burning plastic is not an eco-friendly method of waste disposal as it causes air pollution. Burning plastic releases many toxic gasses such as dioxins, acid gasses, and heavy metals which pose a threat to life on earth. …(1) b. If the wastes are disposed of as per the method suggested by Rakesh, different treatments can be given to the segregated wastes separately. Biodegradable waste like peels and leftover food can be used for compost formation and Non-biodegradable wastes like plastic, glass, tin, and more can be sent for recycling. …(1) c. Plastic items are non-biodegradable and remain in the environment for many hundreds of years without decomposing. The presence of plastic in the environment hurts ecosystems and human health. They also pose a threat to aquatic and terrestrial life. …(1)	3
	SECTION C	
14	Blue colour flower plant - BB White colour flower plant - bb The cross involved is as follows: Blue Colour Flower - BB White Colour Flower - bb	3

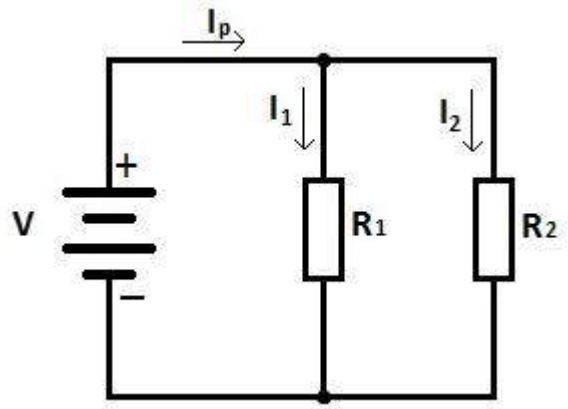


(a) In the F1 generation, all plants will have **blue flowers.** ….(1)
(b) In the F2 generation, **25%** of flowers are white in colour. ….(1)
(c) The ratio of the genotypes BB and Bb in the F2 generation would be **1(BB) : 2 (Bb).**

The number of homozygous progeny in the F2 generation will be 1(BB) and 1(bb) = **2.** …(1)

15	a. Faraday law of electromagnetic induction- When magnetic flux through a loop changes, an EMF is induced across it. …(½) At this position, the magnitude of current flowing through the wire is minimum (in fact, it is equal to zero). …(½) b. In every rotation of the coil, it reaches this configuration twice. Hence, the bulb will also switch off two times in a single rotation . …(1) c. If we alter the magnetic field strength through the coil, magnetic flux through the coil will change. Hence, an EMF will still be induced. …(1) ***OR***	3

Two resistors are said to be connected in parallel when they are connected in parallel branches, as shown.



…(1)

Here two resistors of resistance
R_1 and R_2 be connected in parallel to a battery of strength V.

Let, the equivalent resistance of the resistor be R_{eq}.
Using Ohm's law,
$V = I_p R_{eq}$ …(i)
$V_1 = I_1 R_1$ …(ii)
$V_2 = I_2 R_2$ …(iii)
…(0.5)

In parallel connection, the potential drop across R_1 and R_2 is the same. Here, they will be equal to the EMF of the battery.
$V_1 = V_2 = V$ …(iv) …(1)

Also, theV_ current flowing through the combination will be the sum of the individual currents.
$I = I_1 + I_2$ …(v) …(1)

Substituting, i, ii, and iii in v, we get:

$$\frac{V}{R_{eq}} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$$

Substituting iv in above, we get:

	$\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2}$ $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$ …(0.5)	