CBSE X	MT EDUCARE LTD.	Set - B
	SUBJECT : **SCIENCE**	Marks : 80
Date :	**QUEST - II (Semi Prelim II)**	Time : 3 hrs.
	MODEL ANSWER PAPER	

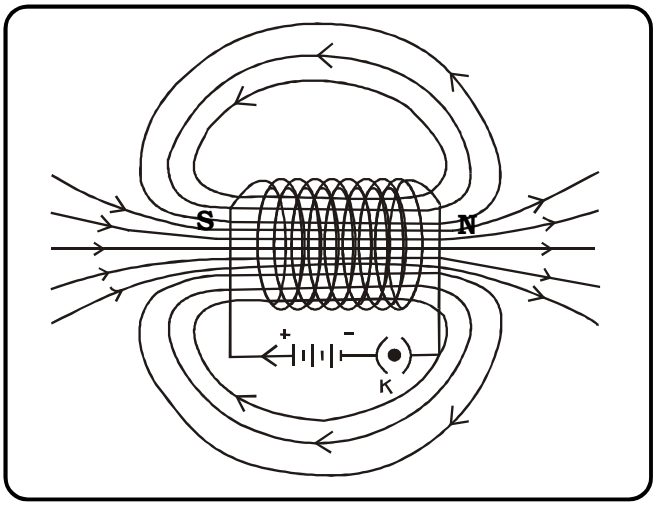
SECTION - A

1. Rain water harvesting is collecting the rain water, allowing it to percolate, discharge down the earth and increase the ground water level. **1**

2. Evolution is the sequence of gradual changes which take place in living organisms over millions of years to give rise to new species. **1**

SECTION - B

3. (a) pentanoic acid
(b) butyne
(c) heptanal
(d) pentanol **2**

4. 

2

5. (i) Tidal energy : The tidal energy can be harnessed by constructing dams across some narrow openings in the sea. Such sites are limited and the electricity generated is not high enough to be commercially viable.

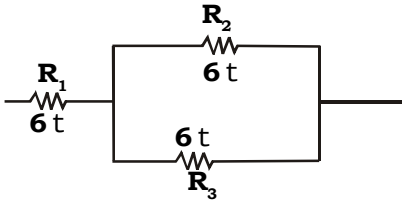
(ii) Wave energy: The movement of ocean waves is associated with kinetic energy. Such sites in the world are limited where the waves strike the shorelines with sufficient power. **2**

SECTION - C

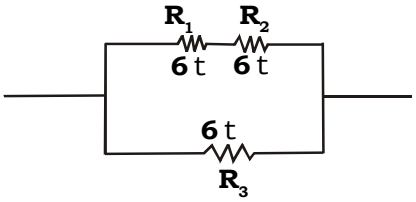
6. Here, $R_1 = R_2 = R_3 = 6\Omega$

(a) When we connect R_1 in series with the parallel combination of R_2 and R_3, as shown The equivalent resistance is

$$R = R_1 + \frac{R_2R_3}{R_2 + R_3} = 6 + \frac{6\times 6}{6+6} = 6 + 3 = 9\Omega$$



(b) When we connect a series combination of R_1 and R_2 in parallel with R_3, as shown $R = \frac{12\times 6}{12+6} = \frac{72}{18} = 4\,t$



3

OR

6. Given : $d = 0.5$ mm

$\therefore \quad r = \frac{d}{2} = \left(\frac{0.5}{2}\right) = 0.25$mm or 0.25×10^{-3} cm

$\rho = 1.6 \times 10^{-8}\ \Omega$m, $R = 10\Omega$

To find : l

Formula : $R = \rho\frac{l}{A}$

Solution : $R = \rho\frac{l}{A}$

or $R = \rho\frac{l}{\pi r^2}$ $[A = \pi r^2]$

or $l = \frac{R\pi r^2}{\rho}$

$= \frac{10 \times 22 \times (0.25 \times 10^{-3})^2}{7 \times 1.6 \times 10^{-8}}$

$= \frac{1.375 \times 10^{-5}}{11.2 \times 10^{-8}}$

$= 0.122 \times 10^{-5} \times 10^{8}$

$= 0.122 \times 10^{3}$

$= 122\text{m}$

$R = \rho \frac{l}{A}$

$= \rho \frac{l}{\pi r^2}$

$R = \rho \frac{l}{\pi\left(\frac{d}{2}\right)^2} \quad \left(r = \frac{d}{2}\right)$

i.e. $R \propto \frac{1}{d^2}$

Thus when the diameter of the wire is doubled the resistance becomes one fourth of the original value.

$\therefore$ New resistance $= \frac{10}{4} = 2.5 \ \Omega$

$\therefore$ Decrease in resistance = Final Resistance – Initial resistance
= (10 – 2.5)Ω
= 7.5Ω **3**

7. (i) As a bar magnet is pushed into the coil, a momentary deflection is observed in the galvanometer indicating the production of momentary current in the coil.
(ii) When the bar magnet is held stationary inside the coil, there is no deflection in galvanometer indicating that no current is produced in the coil.
(iii) When the bar magnet is withdrawn from inside the coil, the deflection of galvanometer is in the opposite direction showing the production of an opposite current. **3**

8. (a) D; the electronic configuration of D(19) is 2, 8, 8, 1. **1**
(b) A and E belong to the same group as both have the same number of valence electrons, i.e., 2. **1**
(c) A, B and D, E.
A has a bigger atomic radius than B and D has a bigger atomic radius than E. **1**

9. (i) Calcium is a metal since it has two electrons in its outermost shell which it can lose easily. **1**

(ii) K(19) is placed before Ca(20) in the same period (fourth period). Since the atomic radius decrease along a period, the atomic radius of calcium is smaller than that of potassium. **1**

(iii) The formula of oxide of calcium is CaO, because the valency of calcium as well as that of oxygen is 2. **1**

10.

Asexual	Sexual
1. Asexual reproduction involves a single parent.	1. Sexual reproduction involves two parents (male and female).
2. No gametes are formed during asexual reproduction.	2. Gamete formation takes place in sexual reproduction.
3. No or little variations occur during asexual reproduction.	3. Many variations occur during sexual reproduction.

3

OR

10. (i) The human male sex hormone testosterone regulates the formation of the male gamete, the sperms and brings about changes in appearance seen in boys at the time of puberty.

(ii) The human female sex hormone estrogen brings about the changes occurring in girls at puberty.

(iii) The human female sex hormone progesterone controls the changes occurrring during the menstrual cycle and also helps in maintaining the pregnancy. **3**

11. (i) This was shown by the help of fossil records of Homo erectus, according to which their cranial capacity had doubled.

(ii) Homo erectus were the first to leave Africa and spread through Africa, Asia, and Europe.

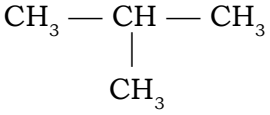
(iii) One population of H. erectus, stayed in Africa and evolved into Homo sapiens. **3**

12. (i) Hydrogen is a cleaner fuel than CNG. This is because the burning of hydrogen produces only water, which is totally harmless. On the other hand, burning of CNG produces carbon dioxide gas and water. This carbon dioxide can produce greenhouse effect in the atmosphere and lead to the excessive heating of the environment in the long run.

(ii) Characteristics of an ideal fuel are :
(i) It should have a high calorific value.
(ii) It should burn without creating pollution.
(iii) It should have a proper ignition temperature. **3**

13. (i) Open chain compound (n-pentane):
$CH_3 — CH_2 — CH_2 — CH_2 — CH_3$ **1**

(ii) Branched chain compound (isobutane):



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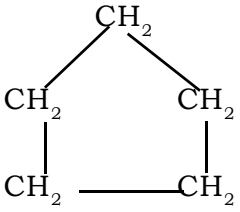
(iii) Ring (cyclopentane) :



1

OR

13. Physical properties of ethanol are :
(i) Ethanol is a colourless liquid having a pleasant smell and a burning taste.
(ii) Ethanol is a liquid at room temperature.
(iii) Ethanol is lighter than air.
(iv) Ethanol is miscible with water.
(v) Ethanol is a covalent compound.
(vi) Ethanol has no effect on litmus solution. **3**

14. (i) Air pollution is caused by burning of fossil fuels.
(ii) CO_2 produced by burning fossil fuels produces greenhouse effect.
(iii) They are non-renewable sources of energy.
(iv) The oxides of carbon, nitrogen and sulphur that are released on burning fossil fuels are acidic oxides which lead to acid rain. **3**

15. A gene is the section of DNA on a chromosome which codes for the formation of a protein controlling a specific characteristic of the organism.
Example :
A plant progeny has gene for the tallness. Now this gene will give instructions to the plant cells to make a lot of growth hormones. Due

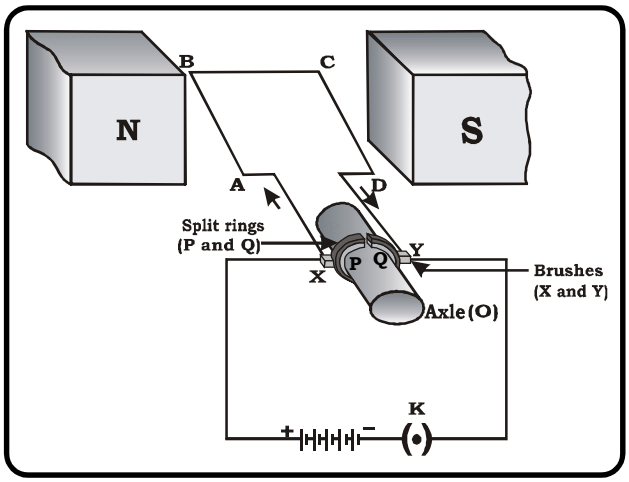
to the formation of this hormone, the plant will grow too much and hence become tall. **3**

SECTION - D

16. (i) An electric motor is a rotating device that converts electrical energy to mechanical energy.

(ii) An electric motor, consists of a rectangular coil ABCD of insulated copper wire.

(iii) The coil is placed between the two poles of a magnetic field such that the arm AB and CD are perpendicular to the direction of the magnetic field.



(iv) The ends of the coil are connected to the two halves P and Q of a split ring. The inner sides of these halves are insulated and attached to an axle.

(v) The external conducting edges of P and Q touch two conducting stationary brushes X and Y, respectively.

(vi) Current in the coil ABCD enters from the source battery through conducting brush X and flows back to the battery through brush Y.

(vii) Notice that the current in arm AB of the coil flows from A to B. In arm CD it flows from C to D, that is, opposite to the direction of current through arm AB.

(viii) On applying Fleming's left hand rule for the direction of force on a current carrying conductor in a magnetic field.

(ix) We find that the force acting on arm AB pushes it downwards while the force acting on arm CD pushes it upwards.

(x) Thus the coil and the axle O, mounted free to turn about an axis, rotate anticlockwise.

(xi) At half rotation, Q makes contact with the brush X and P with brush Y. Therefore the current in the coil gets reversed and flows along the path DCBA.

(xii) A device that reverses the direction of flow of current through a circuit is called a commutator.

(xiii) In electric motors, the split ring acts as a commutator.

(xiv) The reversal of current also reverses the direction of force acting on the two arms AB and CD. Thus the arm AB of the coil that was earlier pushed down is now pushed up and the arm CD previously pushed up is now pushed down.

(xv) Therefore the coil and the axle rotate half a turn more in the same direction. The reversing of the current is repeated at each half rotation, giving rise to continuous rotation of the coil and to the axle. **5**

17. With the adoption of atomic number as the basis of classification of elements, some of the anomalies in the Mendelèev's Periodic Table now disappear. These are :

(i) Position of hydrogen : The atomic number of hydrogen is 1 and hence, it should occupy the first position in group 1 of the Periodic Table. But, because of its chemical similarity with elements of group 1 and group 17, the position of hydrogen in the Periodic Table is still debated.

(ii) Position of isotopes : As the isotopes of an element have the same atomic number, they should occupy the same place in the Periodic Table.

(iii) Position of anomalous pair : The position of anomalous pair of elements, i.e., pair of elements in which the element with higher atomic mass precedes the element with lower atomic mass is also decided. When these element are arranged in order of their atomic numbers, they occupy their natural places in the Periodic Table as shown in following table.

Anomalous pair of elements

	Pair of elements	Atomic weight	Atomic number	Group
(i)	Cobalt	58.9	27	9
	Nickel	58.7	28	10
(ii)	Tellurium	127.6	52	16
	Iodine	126.9	53	17

5

OR

17. (a) (i) Tendency to lose electrons decreases.

(ii) Increases. **2**

(b) The three compounds are $X(NO_3)_2$, XSO_4 and $X_3(PO_4)_2$.
Valence electrons of element X is 2. Therefore, element X belongs to group 2. It will form ionic compounds because X loses 2 electrons to achieve the electronic configuration of inert gas and forms a positively charged ion. **3**

18. The theory of evolution proposed by Darwin is known as "The Theory of Natural Selection".
The important deductions of Darwin's theory are :

(a) Within any population, there is natural variation.

(b) Even though all species produce a large number of offspring, populations remain constant.

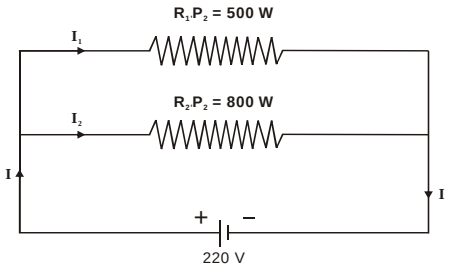
(c) This is due to the struggle between members of the same species and different species for food, space and mate.

(d) The struggle for survival within populations eliminates the unfit individuals and fit individuals survival and reproduce. This is called natural selection or survival of fittest.

(e) The individuals having favourable variations pass on these variations to their progeny from generation to generation.

(f) These variations when accumulated over a long period of time, lead to the origin of a new species. **5**

19.



Here v = 220 V, P_1 = 500 W, P_2 = 800 W

(i) current drawn by 500 W heater.

$$I_1 = \frac{P_1}{V} = \frac{500}{220} = \frac{25}{11} \text{ A} = 2.27 \text{ A.}$$

Current drawn by 800 W heater,

$$I_2 = \frac{P_2}{V} = \frac{800}{220} = \frac{40}{11} \text{ A} = 3.67 \text{ A.}$$

(ii) Resistance of 500 W heater,

$$R_1 = \frac{V^2}{P_1} = \frac{220 \times 220}{500} = 96.8\ \Omega.$$

Resistance of 800 W heater,

$$R_2 = \frac{V^2}{P_2} = \frac{220 \times 220}{800} = 60.5\ \Omega.$$

(iii) Total energy consumed in 2 hours

$= P \times t = (500\ W + 800\ W) \times 2\ h$

$= \frac{1300}{1000}\ kW \times 2\ h$

= **2.6 kWh.** **5**

20. (i) (a) We need to adjust air holes of gas burner so that sufficient oxygen-rich mixture is burnt to give a clean blue flame for complete combustion.

(b) Synthetic detergents are generally non-biodegradable, that is, they are not decomposed by microogranisms like bacteria. Hence, use of synthetic detergents causes water pollution in lakes and rivers.

(ii) (a) The molecules in covalent compounds are held by weak van der Waal's forces, hece they have low melting points and boiling points as compared to ionic compounds. **3**

(b) Carboxylic acids (like CH_3COOH) ionise to a very small extent in solution and give very small amount of H^+ ions. Thus, they are weak acids as compared to the mineral acids. **2**

21. Contraception is the method to avoid pregnancy. Various methods of contraception are as follows :

Physical Barrier Methods : Use of condoms, diaphragms, cervical caps can be used. These prevent the entry of sperms into the female genital tract by acting as a barrier between them.

Chemical Methods : Oral pills can be used which change the hormonal balance and stop release of egg. Vaginal pills kill the sperms.

Surgical Methods : This includes **vasectomy** (removal of small portion of sperm ducts) in males and **tubectomy** (removal of small portion of fallopian tubes) in females.

Intrauterine Contraceptive Devices (IUCDs) : A copper-T is placed safely in the uterus by a doctor or a skilled nurse that prevents implantation in the uterus. They may cause irritation of uterus. **5**

OR

21. Functions of the following in human male reproductive system:

(i) Testis: It produces male gametes, sperms and male sex hormone testosterone.

(ii) Epididymis: It is a site for sperm maturation. Sperms are temporarily stored in epididymis.

(iii) Vas deferens: Carry sperms, straight from epididymis to urethra.

(iv) Seminal vesicles: Secrete thick liquid rich in fructose to transport sperm.

(v) Urethra: It is a common passage for sperms and urine. **5**

SECTION - E

22.

Element	Group Number	Valency
A	13	3
B	14	4
C	2	2

If 'C' is Helium (He), then it's valency is '0' and it belongs to zero group. **2**

23. (i) Compound A – Ethanol (ethyl alcohol)

Compound B – Ethanoic acid (acetic acid)

(ii) $C_2H_5OH \xrightarrow{Alk.KMnO_4} CH_3COOH$ **2**

24. (i) Relative method: When we dig into the earth we find fossils at different depths, the fossils which are closer to the surface of the earth are more recent, whereas the fossils found in the deepest layers of earth are the oldest ones.

(ii) Carbon Dating method: The age of fossil is found by comparing the C-14 radioactivity left in fossils with C-14 radioactivity present in living objects today. **2**

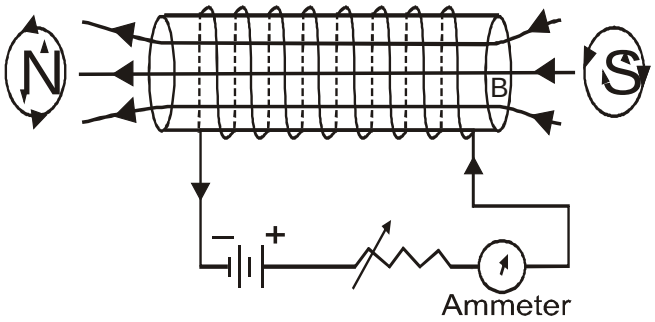
25. (i) The Government had to rethink their priorities, the use of forest produce and change their forest policies, this ensured a stable availability of the forest produce to the villagers.

(ii) It led to the efficient management of forest and also resulted in conservation of soil and water which ultimately benefitted the local people. **2**

26. The direction of earth's magnetic field is from geographical south to geographical north. According to Fleming's left hand rule, the current carrying straight conductor placed in east-west direction will be deflected downwards.
On reversing the direction, the conductor is deflected in the upward direction. **2**

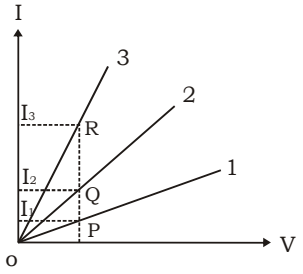
OR

26. (i)



(ii) Increase current, increase the number of turns in the coil, insert soft iron rod in the coil. **2**

27. Draw a vertical line from any point on the V axis such to cut the graphs. 1, 2 and 3 at points P, Q and R as shown in the graph below.



For the same potential, the current in each is different. we find that $I_1 < I_2 < I_3$. This means that $R_1 > R_2 > R_3$ Hence, graph 1 represents the series combination of other. **2**

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