

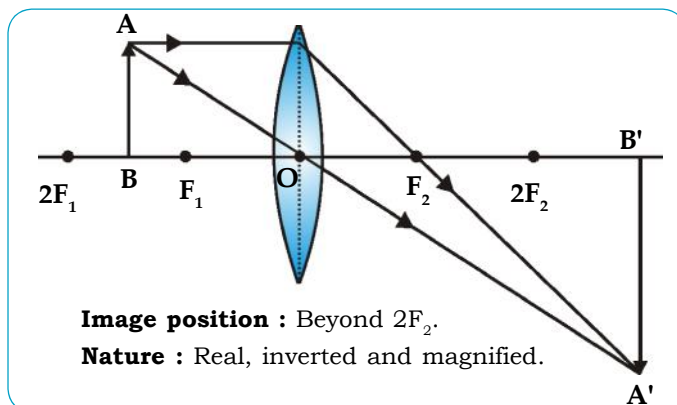
A.P. SET CODE
B

MT - X2017 __ __ 1100 - **MT - X** - SCIENCE & TECHNOLOGY (72) - I - SET - B (E)**Time : 2 Hours****Preliminary Model Answer Paper****Max. Marks : 40**

A.1.	(A) Answer the following sub-questions :	
	(1) Fill in the blanks and rewrite the complete statements :	
	(i) The ohm is the SI unit of electric resistance .	1
	(ii) An electric motor converts electrical energy into mechanical energy .	1
	(2) State whether the following statements are true or false and if false, write the correct statement:	
	(i) False : The pH of rainwater is less than 7.	1
	(ii) False : According to the law of conservation of mass, the total mass of the reactants is equal to the total mass of the products.	1
	(3) Find the odd man out :	
	(i) Wood - It is an insulator while copper, silver and aluminium are conductors.	1
A.1.	(B) Rewrite the following statements by selecting the correct options :	
	(1) When a ray of light travels from air to glass and strikes the surface of separation at 90°, then it passes without bending .	1
	(2) The reaction $\text{KNO}_{3(s)} + \text{H}_2\text{O}_{(l)} + \text{Heat} \rightarrow \text{KNO}_{3(aq)}$ is a/an endothermic reaction.	1
	(3) When the resistance of the conductor increases then the current. decreases .	1
	(4) Dilute NaOH can be tested with red litmus paper .	1
	(5) The mirror formula is $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$	1

A.2. Answer the following subquestions : (any five)

(1)



2

(2)

- (i) The blue colour of the sky is due to scattering of light by the atmosphere.
- (ii) At higher altitudes, there is no atmosphere, hence, the scattering of light does not take place at all. Hence, in space the sky appears dark instead of blue.

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(3)

Flemming's Right Hand Rule :

The direction of induced current in a coil moving perpendicular to the magnetic field can be obtained by Fleming's Right Hand Rule.

It states that "Stretch the forefinger, the middle finger and the thumb of your right hand mutually perpendicular to each other. If the thumb represents the direction of motion of conductor and forefinger, the direction of magnetic field then the middle finger gives the direction of induced current".

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(4)

s-block	p-block elements
(i) The group IA (1) and IIA (2) elements together with hydrogen constitute the s-block (ii) They have one or two electrons in the outermost shell. (iii) The elements of the s-block, except hydrogen, are all metals.	(i) The group IIIA (13) - VIIA (17) and the zero group (18) elements constitute the p-block (ii) They have three to eight electrons in the outermost shell. (iii) The elements of the p-block include a few metals, all metalloids and all non metals.

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	<p>(ii) OR ${}_w\eta_g = \frac{1}{{}_g\eta_w}$</p> $= \frac{2.2}{2}$ $= 1.1$ <p>The refractive index of glass w.r.t. water = 1.1</p>	
(2)	<p>(i) The Modern Periodic Table was classified on the basis of atomic number. All isotopes of the same elements have different masses but same atomic number. Therefore, they occupy the same position in the modern periodic table.</p> <p>(ii) When elements are arranged according to their atomic numbers, the anomaly regarding certain pairs of elements in Mendeleev's Periodic Table disappears eg. atomic number of cobalt and nickel are 27 and 28 respectively. Therefore, cobalt will come first and then nickel, although atomic mass of cobalt is greater.</p> <p>(iii) Elements are classified according to their electronic configuration into different blocks.</p>	3
(3)	<p>(i) Resistance of a conductor depends on the length 'l' and area of cross section 'A' of the conductor</p> $R \propto l$ <p>and $R \propto \frac{1}{A}$</p> $\therefore R \propto \frac{l}{A}$ $\therefore R = \rho l \frac{l}{A}$ <p>(ii) Where ρ is called resistivity of the conductor. It is also called as specific resistance. If we put $l = 1\text{m}$ and $A = 1\text{m}^2$ then $\therefore R = \rho$</p> <p>(iii) Thus resistivity of a conductor is defined as the resistance of a conductor of unit length and unit area of cross-section.</p> <p>(iv) The S.I. unit of resistivity is ohm-metre ($\Omega\text{-m}$).</p>	3
(4)	<p>(a) Refraction : The phenomenon of change in the direction of light when it passes from one transparent medium to another is called refraction.</p> <p>(b) The Laws of refraction are :</p> <p>(i) The incident ray and refracted ray are on the opposite sides of the normal at the point of incidence and all three lie in</p>	3

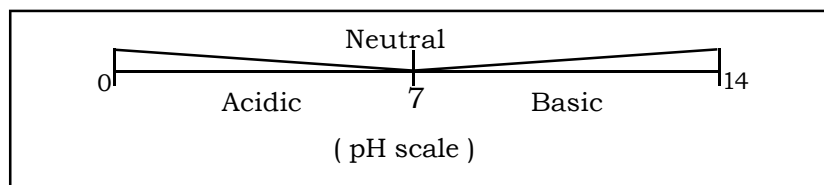
the same plane.

- (ii) For a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. If 'i' is the angle of incidence and 'r' is the angle of refraction,

$$\text{then } \frac{\sin i}{\sin r} = \text{constant}$$

The constant is called refractive index and it is denoted by η .

- (5) (i) The strength of an acid or base is measured on a scale of numbers called pH scale that has values from 0 to 14. pH scale helps in measuring hydrogen ion concentration in solutions. In pH, p stands for "potenz" (means "strength" in German). The scale reads from 0 (zero) (most acidic) to 14 (most basic). The value of pH indicates acidic or basic nature of a solution. The strength of base is represented by pOH.
- (ii) When the pH value is in between 0 to 7, the solution is acidic in nature.
- (iii) At value 7, the solution is neutral and between 7 to 14 the nature of the solution becomes alkaline/basic.
- (iv) The pH of a solution is inversely proportional to the concentration of hydrogen ions in it. i.e. a solution having a high concentration of hydrogen ions has a low pH value.



- (6) (i) Ozone layer present above the stratosphere, the second layer of atmosphere (almost 48km above the earth), absorbs the harmful UV rays from the sun and protects both plant and animal life.
- (ii) Ozone is formed when oxygen combines with free radical of oxygen which is formed due to UV radiation above the stratosphere as shown below :
- $$\text{O}_2 \xrightarrow{\text{radiation}} \text{O}^{-2} + \text{O}^{-2}$$
- $$2\text{O}_2 + 2\text{O}^{-2} \xrightarrow{\text{radiation}} 2\text{O}_3$$
- (iii) The chlorofluorocarbon (CFC) molecules when exposed to UV radiation are broken to release chlorine and bromine which further demolish ozone at an alarming rate. This has resulted in a hole in the ozone layer near Antarctica.

- (iv) The hole allows the UV rays of the sun to reach the earth directly. These UV rays cause skin cancer, cataract in the eyes of human beings. It also affects plants and animals as well.

A.4. Answer the following subquestion : (any one)

(1) **Expression for the resistance connected in series:**

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- (1) When a number of resistance are connected one after the other they are said to be connected in series,
- (2)
- (i) Let R_1 , R_2 and R_3 be three resistances connected in series between C and D.
- (ii) Let R_s be the effective resistance in circuit and V_1 , V_2 and V_3 be the potential difference across R_1 , R_2 and R_3 respectively.
- (iii) Let the potential difference across CD be V .
- (iv) In series combination.

$$V = V_1 + V_2 + V_3 \quad \dots (i)$$

By using Ohm's law

$$V = IR_s$$

$$\therefore V_1 = IR_1, V_2 = IR_2 \text{ and } V_3 = IR_3$$

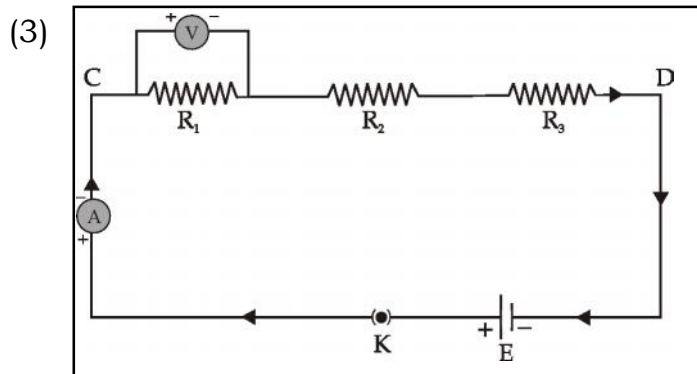
Substituting these values in equation (i) we get

$$IR_s = IR_1 + IR_2 + IR_3$$

$$\therefore R_s = R_1 + R_2 + R_3$$

For 'n' number of resistors connected in series we get

$$R_s = R_1 + R_2 + R_3 + R_4 + R_5 + R_6 + \dots + R_n$$

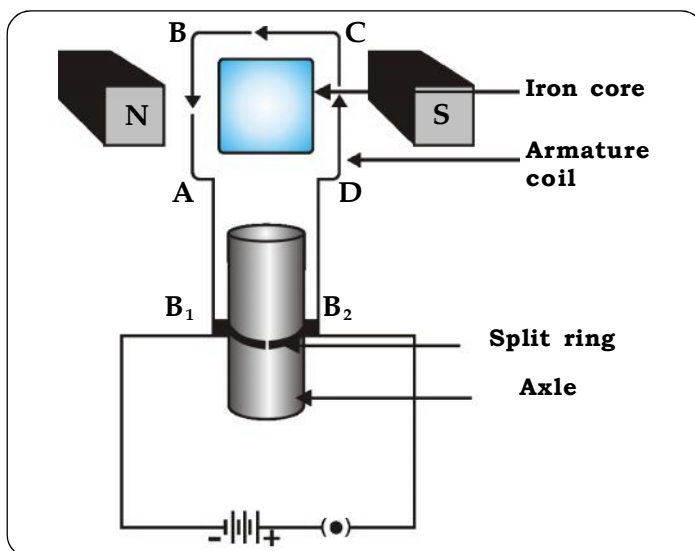


- (2) (i) A device which converts electrical energy into mechanical energy is called an electric motor.
- (ii) Electric motor works on the principle that a current carrying conductor placed in a magnetic field experiences a force.

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Construction :

- (i) Armature coil : A large number of turns of insulated copper wire wound on iron core in rectangular shape forms an armature coil ABCD as shown in the figure.



- (ii) Strong magnet : The armature coil is placed in between two pole pieces (N and S) of a strong magnet. This provides a strong magnetic field.
- (iii) Split ring commutator : It consists of two halves (R_1 and R_2) of a metallic ring. The ends of the armature coil are connected to these rings. Commutator reverses the direction of current in the armature coil.
- (iv) Brushes : Two carbon brushes B_1 and B_2 are used to press the commutator.
- (v) Battery : The battery supplies the current to the armature coil.
- Working of the electric motor :
- (a) When current is passed through the coil ABCD, arms AB and CD experience force.
- (b) According to Fleming's left hand rule the force experienced by arm AB is in the upward direction and arm CD in the downward direction. Both these forces are equal and opposite.
- (c) This force rotates the coil in clockwise direction until the coil is vertical. At this position, the contact between commutator and brushes break. So the supply to the coil is cut off. Thus no force acts on the coil.

- (d) But the coil does not stop due to inertia. It goes on rotating until the commutator again comes in contact with the brushes B_1 and B_2 . Again the current starts passing through the coil and the arm AB rotates through 90° , 180° , 270° and 360° degrees.
- (e) Now the force acting on arm AB is upward and CD is downward. Again this force moves the coil in clockwise direction.
- (f) Thus, the coil rotates with the help of electrical energy. The coil of DC motor continues to rotate in the same direction.

