**2023 III 17 1100 - N934 - SCIENCE AND TECHNOLOGY(72) - PART I (E)**
**(REVISED COURSE)**

**Time : 2 Hours** **Max. Marks : 40**

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Note :-

I. All questions are compulsory
II. Use of calculators is not allowed.
III. The number to the right of the questions indicates full marks.
IV. In case of MCQs (Q. No. 1(A)) only the first attempt will be evaluated and will be given credit.
V. For every MCQs the correct alternatives (A), (B), (C) or (D) with subquestion number is to be written as an answer.
For Eg. : (i) (A), (i) (B), (i) (C)
VI. Scientifically correct, labelled diagrams should be drawn wherever necessary.

Q.1 (A) Choose the correct alternative:

(i) The device used for producing current is called_____.

(A) A voltmeter
(B) An ammeter
(C) A galvanometer
(D) A generator

Answer: Option D: **A Generator**
The device used for producing electric current is called generator. Electric current is produced by electric generator which converts mechanical energy into electricity.

(ii) If a ray of light passes from a denser medium to rarer medium in a straight line, the angle of incidence must be_____.

(A) $0^0$
(B) $30^0$
(C) $60^0$
(D) $90^0$

Answer: Option A **$0^0$**
If a ray of light passes from a denser medium to a rarer medium in a straight line, the angle of incidence must be $0^0$

(iii) The power of convex lens of focal length 20 cm is _____.

(A) +5.0 D
(B) 0.20 D
(C) - 5.0 D
(D) 0.5 D

Answer: Option A **+5.0 D**
We know that,
$P = \frac{1}{f} = \frac{1}{20\times10^{-2}} = \frac{100}{20} = 5\ D$

(iv) Good conductor of electricity_____

(A) Bromine
(B) Iodine
(C) Graphite
(D) Sulphur

Answer: Option C **Graphite**
Graphite is a good conductor of electricity because it has delocalised electrons

**(v)** The height of medium earth orbit above the surface of the earth is:

(A) 1500 km
(B) 250 km
(C) 45000 km
(D) 25000 km

Answer: Option D **25000 km**

Q. 1 (B) Answer the following questions:

(i). Find the odd man out

Loudspeaker, Microphone, Electric motor, Magnet.

Answer: **Magnet.**
The odd one out is magnet. Loud speaker, microphone and electric motor are based on the phenomenon of electromagnetism.

(ii). Complete the Co-relation:

$CuI_2$ : Brown : : Agcl :

Answer: **White**
The colour of AgCl is white

(iii). Match the pair

| **Group A** Substance | **Group B** Refractive Index |
|---|---|

| | |
|---|---|
| Air | (a) 1.33 |
| | (b) 1.46 |
| | (c) 1.0003 |

Answer:

| **Group A** Substance | **Group B** Refractive Index |
|---|---|
| Air | (c) 1.0003 |

(iv) State true or false
“Wavelength of red light is close to 700 nm”

Answer: The given statement is **True**

(v) Write the name of small satellite made by a group of students from COEP (College of engineering, Pune) sent to the space through ISRO in 2016
Answer:SWAYAM

Q.2 (A) Give scientific reasons (Any Two):

(i) For electric power transmission, copper or aluminium wire is used.

Answer:

- Copper and aluminium contain a large number of free electrons.
- These free electrons can move through the conductor easily.
- This results in copper and aluminium having low values of resistivity.
- Thus, copper and aluminium are good conductors of electricity and offer low resistance to the flow of current. Hence, copper or aluminium are used for electric power transmission.

(ii). Lemon or tamarind is used for cleaning copper vessels turned greenish.

Answer:
Copper vessels turned greenish due to the formation of copper carbonate layer.
The citric acid present in the lemon or tamarind neutralizes the basic copper carbonate and dissolves the layer. That is why tarnished copper vessels are cleaned with lemon or tamarind juice to give the surface of the copper vessel its characteristic lustre.

(iii). Elements Belonging to the same group have the same valency.

Answer:
The valency of an element is determined by the number of valence electrons present in the outermost shell of an atom. The electronic configuration of the outermost shell is same for all the elements belonging to the same group. So, the number of valence electrons for all the elements in a group is the same. Therefore, elements belonging to the same group have the same valency.

Q.2 (B) Answer the following questions (Any Three)

(i) How do we feel about air in each of the following conditions ?
(a) Relative humidity is more than 60%.
(b) Relative humidity is less than 60%.

Answer:
(a) If the relative humidity is more than 60% then the air is humid.
(b) And when the relative humidity is less than 60% then the air is dry.

(ii). Complete the following reaction

$C_{12}H_{22}O_{11} \xrightarrow{Heat}$ _____ + _____.

Answer: $C_{12}H_{22}O_{11} \xrightarrow{Heat}$ **$12C + 11H_2O$**

(iii). Distinguish between mass and weight.
Answer:

| Mass | Weight |
|---|---|

| | |
|---|---|
| Mass is simply the measure of the amount of matter in a body. | Weight is the measure of the amount of force acting on a mass due to acceleration due to gravity. |
| Mass is denoted by “M”. | Weight is denoted by “W”. |
| Mass is always constant for a body and there are several formulas to calculate mass.One way to calculate mass is:<br>Mass = volume × density | Weight is the measure of the gravitational force acting on a body.<br>Weight can be calculated from the following formula:<br>Weight = mass × acceleration due to gravity |
| Mass is a base quantity.<br>Mass only has magnitude and so, it is a scalar quantity. | Weight is a derived quantity.<br>Weight has both magnitude and direction (towards the centre of gravity) and so, it is a vector quantity. |
| The SI unit of mass is Kilogram (Kg). | The SI unit of weight is Newton (N). |
| Mass does not depend upon gravity and is constant everywhere.<br>Mass can never be zero. | Weight is dependent on gravity and so, it varies from place to place.<br>Weight can be zero where there is no gravity (like space). |
| Mass can be easily measured using any ordinary balance like beam balance, lever balance, pan balance, etc. | Weight can be measured by a spring balance or by using its formula. |

(iv). Complete the following table:

| Type of Satellite | The names of indian satellite and and launcher |
|---|---|
| 1. Navigational Satellite | Satellite - _____<br>Launcher - _____ |
| 2. Earth Observation satellite | Satellite - _____<br>Launcher - _____ |

Answer:

| Type of Satellite | The names of indian satellite and and launcher |
|---|---|
| 1. Navigational Satellite | Satellite - IRNSS<br>Launcher - PSLV |
| 2. Earth Observation satellite | Satellite - IRS<br>Launcher - PSLV |

(v). Define periods and groups of modern periodic table.

Answer: The vertical columns in the modern periodic table are called 'groups' and horizontal rows in the modern periodic table are called ‘periods’.

3. Answer the following questions (any five)

(i) Calculate the escape velocity on the surface of the moon given the mass and radius of the moon to be 7.34 x $10^{22}$ kg and 1.74 x $10^{6}$ m respectively.
(Given G = 6.67 x $10^{-11}$ $Nm^2/ kg^2$)

Answer:
Mass (m)=7.34 x $10^{22}$ kg
Radius (R)= 1.74 x $10^{6}$ m

escape velocity = $(V_e)=\sqrt{\frac{2GM}{R}}$

$(V_e)=\sqrt{\frac{2GM}{R}}=\sqrt{\frac{2\times6.67\ x\ 10^{-11}\times7.34\ x\ 10^{22}}{1.74\ x\ 10^{6}}}$

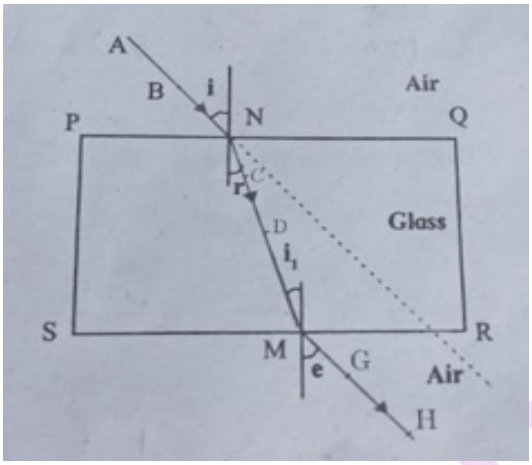
$(V_e)$= 2.37 km/s

(ii) An element has its electron configuration as 2,8,1. Now answer the following questions:
(a) What is the atomic number of the element?
(b) What is the group of this element?
(c) To which period does the element belong?

Answer:
Name of the element is Sodium

(a) Atomic number is 11.
(b) This element belongs to the 1st group, i.e. alkali metals.
(c) This element belongs to the 3rd period.

(iii) Observe the figure and name the ray AB, ray CD, ray GH:




Answer:
Ray AB is the incident ray.
Ray CD is the refracted ray
Ray GH is the emergent ray

(iv) Read the following sentence and answer the questions:
"NaCl is an ionic compound"

(a) Why is NaCl is an ionic compound?
(b) State any two properties of ionic compound.

Answer:

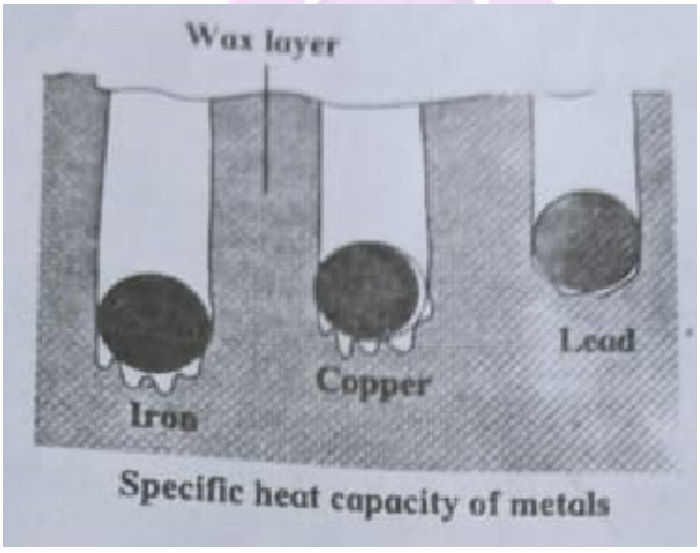
(a) The electronic configuration of sodium is 2, 8, 1 and the electronic configuration of chlorine is 2, 8, 7.
In pursuit of stability, the sodium atom loses its one electron to chlorine and the chlorine atom gains it which causes the formation of the sodium chloride compound.
Since sodium chloride is formed by the transfer of electrons between the elements, therefore, it is an ionic compound.

(b) The properties of ionic compounds are as follows:
1. They are crystalline solids and are brittle in nature.
2. They have high melting and boiling points.
3. They are soluble in water.
4. They conduct electricity in their aqueous solution and molten states.

(v) Identify the physical and chemical changes from the following phenomena:
(a) Transformation of ice into water.
(b) Ripening of fruit
(c) Milk turned into curd
(d) Evaporation of water
(e) Digestion of food in the stomach.
(f) Iron filling get attracted towards the magnet.

Answer:
(a) Physical change
(b) Chemical change
(c) Chemical change
(d) Physical Change
(e) Chemical change
(f) Physical change

(vi) Observe the following figure and answer the questions:




(a) Which element has maximum specific heat capacity? Justify.

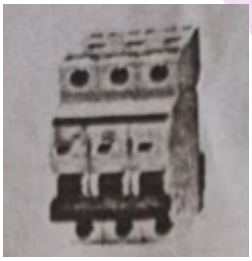
(b) Which element has minimum specific heat capacity? Justify.
(c) Define specific heat of object.

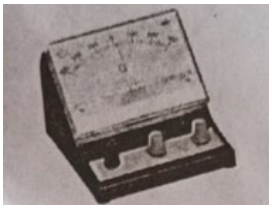
Answer:
(a)Depth that each of the ball goes into the wax. The ball which absorbs more heat from the water will give more heat to wax. More wax will thus melt and the ball will go deeper in the wax. It will be observed that the iron ball goes deepest into the wax.hence iron has maximum heat capacity.
(b)Depth that each of the ball goes into the wax. The ball which absorbs more heat from the water will give more heat to wax. More wax will thus melt and the ball will go deeper in the wax. It will be observed Lead ball goes the least into the wax.hence lead has minimum heat capacity.
(c)This means that the property which determines the amount of heat absorbed by a ball is different for the three balls. This property is called the specific heat capacity.
Specific heat capacity of a body is the amount of heat energy required to raise the temperature of unit mass of that body through 1℃ (or 1 K). It is given as

$s = \frac{\Delta Q}{\Delta T \times M}$

(vii) Identify figure A, B, C and give their uses:

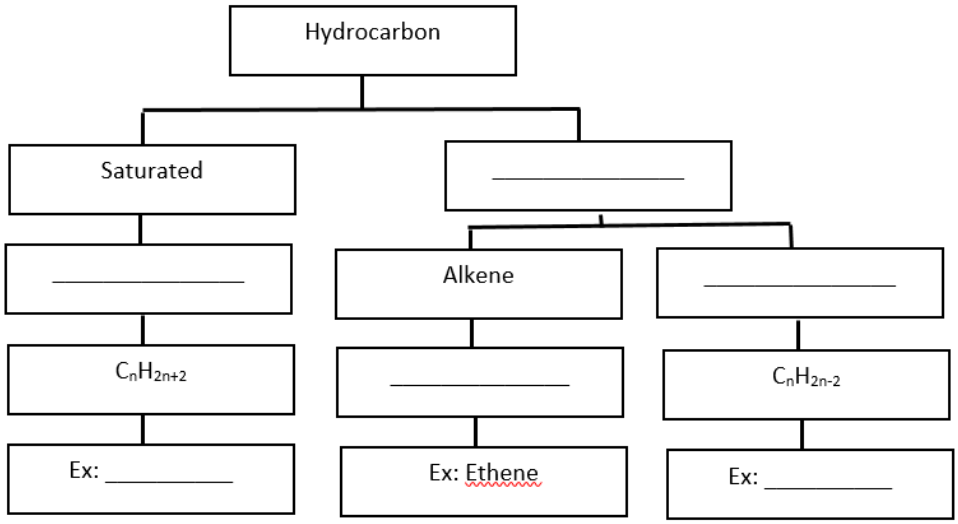
(A) 

(B) 

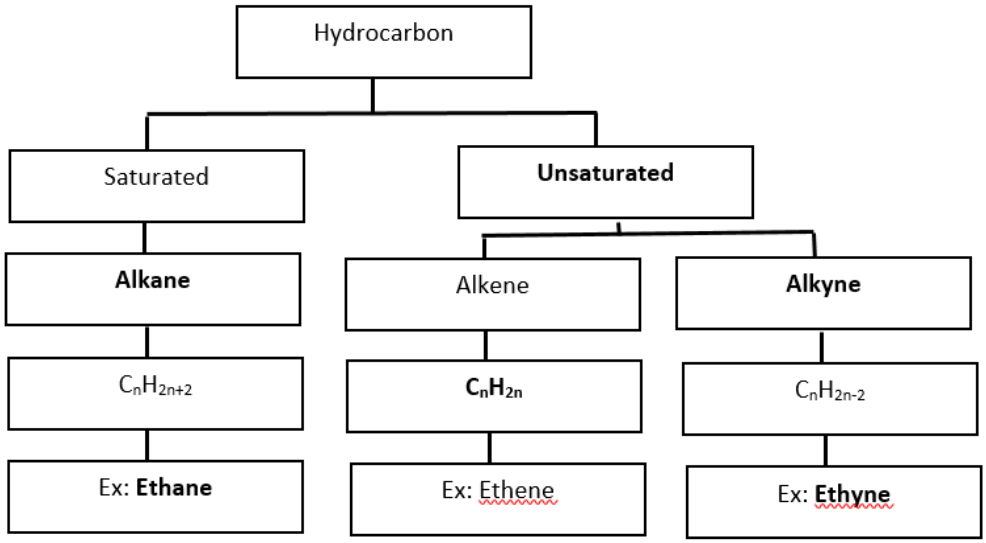
(C) 

Answer:
Figure (a) represents a fuse. An electric fuse is a safety device that protects the wiring against excessive heating caused by an excess supply of current. It melts when heavy current flows through the circuit, thereby causing the circuit to become open.
Figure (b)represents an MCB. An MCB is a device which functions as a fuse, but does not require replacement. MCB falls down to break the circuit when heavy amount of current flows through it. Once the fault is rectified, the MCB is reset.
Figure (c)represents a galvanometer. This device is used on electrical circuits to know and measure the intensity and direction of electrical current.

(viii) Complete the following flow chart:

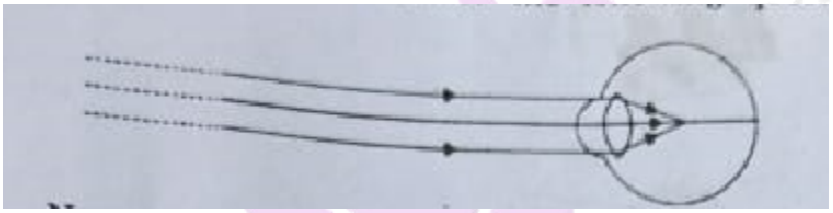



Answer:




4. Answer any of the following questions:

(i) Observe the figure and answer the following questions :



(a) Name the defect of vision represented in the above figure.
(b) State the reasons for this defect.
(c) How is it corrected?
(d) Draw the diagram to show the correction of defect.

Answer:

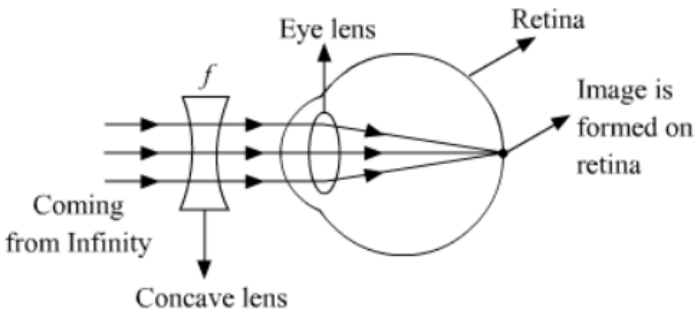
(a)Nearsightedness: This defect is also known as Myopia. It is a defect of vision in which a person clearly sees all the nearby objects, but is unable to see the distant objects comfortably and his eye is known as a myopic eye. A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of its retina as shown in the figure.

(b)It is caused by

I. increase in curvature of the lens
II. increase in length of the eyeball

(c)Since a concave lens has an ability to diverge incoming rays, it is used to correct this defect of vision. The image is allowed to form at the retina by using a concave lens of suitable power as shown in the given figure.

(d)




(ii) Complete the following table:

| S.N. | Common Name | Structural Formula | IUPAC Name |
|---|---|---|---|
| 1. | Ethylene | $CH_2=CH_2$ | _____ |
| 2. | Acetylene | _____ | Ethyne |
| 3. | Acetic acid | $CH_3$—COOH | _____ |
| 4. | Methyl alcohol | _____ | Methanol |
| 5. | _____ | $CH_3$—-CO—$CH_3$ | Propane-2-one |

Answer:

| S.N. | Common Name | Structural Formula | IUPAC Name |
|---|---|---|---|
| 1. | Ethylene | $CH_2=CH_2$ | **Ethene** |
| 2. | Acetylene | **HC≡CH** | Ethyne |
| 3. | Acetic acid | $CH_3$—COOH | **Ethanoic acid** |
| 4. | Methyl alcohol | **$CH_3$ - OH** | Methanol |
| 5. | **Acetone** | $CH_3$—CO—$CH_3$ | Propane-2-one |