

**Q.1. (A) Choose the *correct* option.**

[5]

i. The minimum velocity of the spacecraft to escape from Earth's gravitational force must be \_\_\_\_\_ .

- a. 112km/s  
b. 11.2 km/s  
c. 1.12 km/s  
d. 0.112 km/s

**Ans. b**

ii. The melting point of pure ethanoic acid is \_\_\_\_\_ .

- a. 17°C  
b. 19°C  
c. 15°C  
d. 27°C

**Ans. a**

iii. The process of separation of light into its component colours while it is passing through a medium is called \_\_\_\_\_ .

- a. reflection  
b. refraction  
c. dispersion  
d. internal reflection

**Ans. c.**

iv. The conversion of ferrous sulphate into ferric sulphate is \_\_\_\_\_ reaction.

- a. oxidation  
b. displacement  
c. electrolysis  
d. reduction

**Ans. a.**

v. Lithium (Li), \_\_\_\_\_ and Potassium (K) is Dobereiner's triad.

- a. Magnesium (Mg)  
b. Aluminium (Al)  
c. Sodium (Na)  
d. Calcium (Ca)

**Ans. c.**

**(B) Solve the following subquestions.**

[5]

i. **State true or false.**

The refractive index depends upon the velocity of light in medium.

**Ans. True**

ii. **Write the correlated answer.**

Torch : Concave lens :: Camera : \_\_\_\_\_

**Ans.** Convex lens

iii. **Find the odd one out.**

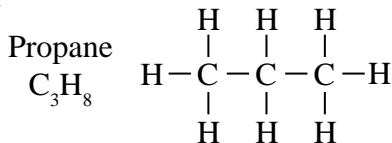
Zinc, Iron, Phosphorus, Sodium

**Ans.** Phosphorus.

Phosphorus is a non-metal, while the rest are metals.

iv. **Draw the structural formula of  $C_3H_8$ .**

**Ans.**



v. Which satellite is used in educational field among INSAT and GSAT series?

**Ans.** GSAT series of satellites are used in the field of education. (GSAT-3, known as EDUSAT, is used specifically in the field of education.)

**Q.2. (A) Give scientific reasons. (Any two) [4]**

i. Stars appear to be twinkling at night.

**Ans.**

(a) Stars are self-luminous. They appear to be point sources as they are at a large distance from us.

(b) So, the light coming from the stars undergoes refraction many number of times due to the changes in refractive index caused by the changes in atmospheric conditions like density of the air, and temperature.

(c) Because of this, the position and brightness of the stars change continuously and the stars appear to be twinkling.

ii. Simple microscope is used for watch repairs.

**Ans.**

(a) A simple microscope is made of a convex lens with a small focal length.

- (b) It produces a virtual, erect, and bigger image of an object.
- (c) Thus, it enables small parts of a watch to be magnified and seen clearly. Therefore, watch repairers use simple microscope.
- iii. Copper vessels turn greenish and silver articles turn blackish when kept open in air for a long time.

**Ans.**

- (a) Copper reacts with carbon dioxide in the air to form greenish coloured copper carbonate.
- (b) Hence, copper vessels turn greenish when kept in air for a long time.
- (c) When kept in the open, silver articles turn blackish.
- (d) This is because silver reacts with hydrogen sulphide in the air to form black-coloured silver sulphide, which forms a layer on the silver articles. Hence, the silver articles turn blackish when kept in air for a long time.

**(B) Answer the following questions. (Any three) [6]**

- i. An object takes 5 seconds to reach the ground from a height of 5 m on a planet. What is the value of 'g' on that planet?

**Solution:**

**Given:** Distance travelled by the object (s) = 5 m

Time taken (t) = 5 s

Initial velocity of the object (u) = 0

Acceleration (a) = g

**To find:** g = ?

**Working:** According to Newton's second law of motion,

$$s = ut + \frac{1}{2} at^2$$

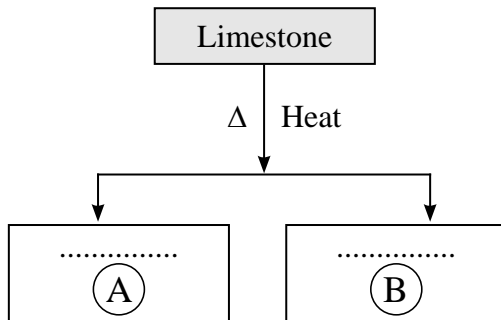
$$s = 0 + \frac{1}{2} gt^2$$

$$g = \frac{2s}{t^2}$$

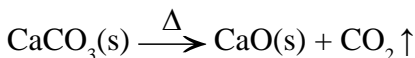
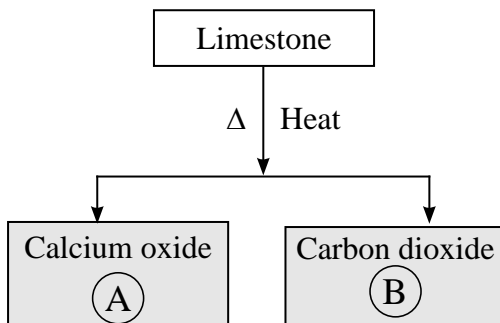
$$\therefore g = \frac{2 \times 5}{5^2} = \frac{10}{25} = 0.4 \text{ m/s}^2$$

**Ans.** The value of the 'g' on the planet = 0.4 m/s<sup>2</sup>

- ii. Identify 'A' & 'B' from the following table and complete the table. Write the chemical equation.



**Ans.**



- iii. Write the modern periodic law and also give the names of 'blocks' in the modern periodic table.

**Ans.**

- (a) The modern periodic law states that 'Properties of elements are a periodic function of their atomic numbers'.
- (b) Names of blocks in the modern periodic table are: s-block, p-block, d-block, and f-block.

- iv. Distinguish between 'Alternating current' and 'Direct current'.

**Ans.**

Alternating current	Direct current
1. Alternating current (AC) is oscillatory.	1. Direct current (DC) is non-oscillatory.
2. Its direction changes at equal intervals of time.	2. It flows in one direction.

3. The magnitude of AC current changes with time.	3. The magnitude of DC current is constant.
4. The frequency of AC is 50 Hz.	4. The frequency of DC is zero.
5. The voltage of AC can be increased or decreased using transformers.	5. The voltage of DC cannot be increased or decreased using transformers.

v. Define specific heat capacity. Write its S.I. unit.

**Ans.**

- (1) The amount of heat energy required to raise the temperature of a unit mass of an object by 1 °C is called the specific heat capacity of that object.
- (2) Its SI unit is J/°C kg.

**Q.3. Answer the following questions. (Any five) [15]**

- i. An iron ball of mass 3 kg is released from a height of 125 m and falls freely to the ground. Assuming that the value of 'g' is 10 m/s<sup>2</sup>, calculate:
  - a. time taken by the ball to reach the ground
  - b. velocity of the ball on reaching the ground

**Ans.** m = 3kg, distance travelled by the ball = s = 125 m, initial velocity of the ball = u = 0 and acceleration a = g = 10 m/s<sup>2</sup>.

a. Newton's second equation of motion gives:

$$s = ut + \frac{1}{2} at^2$$

$$\therefore 125 = 0 \times t + \frac{1}{2} \times 10 \times t^2 = 5 t^2$$

$$t^2 = \frac{125}{5} = 25, \quad t = 5s$$

$\therefore$  The ball takes 5 seconds to reach the ground.

b. According to Newton's first equation of motion,

$$\text{final velocity} = v = u + a t$$

$$= 0 + 10 \times 5$$

$$= 50 \text{ m/s}$$

∴ The velocity of the ball on reaching the ground is 50 m/s.

**Ans.** The ball takes 5 seconds to reach the ground and the velocity of the ball on reaching the ground is 50 m/s.

ii. An element has its electron configuration as (2, 8, 2). Answer the following.

a. What is the 'atomic number' of this element?

b. What is the 'group' of this element?

c. To which period does this element belong?

**Ans.**

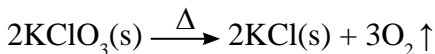
a. The atomic number of this element is 12. This element is Magnesium (Mg).

b. The group of this element is 2.

c. This element belongs to third period.

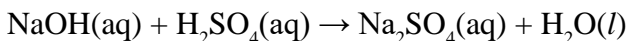
iii.

a. Write the 'endothermic' or 'exothermic' nature of the reaction.

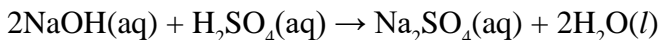


**Ans.** This is an endothermic reaction. (Heat is absorbed.)

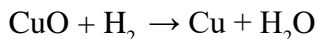
b. Balance the given chemical equation.



**Ans.** Balanced equation is



c. From the given reaction, identify 'oxidant' and 'reductant'.



**Ans.** Oxidant is CuO. Reductant is H<sub>2</sub>

iv. A copper sphere of 100 g mass is heated to raise its temperature to 100°C and is released in water of mass 195 g and temperature 20°C in a copper calorimeter. If the mass of the calorimeter is 50 g, what will be the maximum temperature of water?

(Specific heat of copper = 0.1 cal/g°C)

**Solution:**

**Given:** Specific heat of copper =  $0.1 \text{ cal/g } ^\circ\text{C}$

And so specific heat of calorimeter =  $0.1 \text{ cal/ g } ^\circ\text{C}$

Suppose the copper ball, water and the calorimeter attain final temperature T.

Heat lost by solid object = heat gained by water in calorimeter + heat gained by the calorimeter

Here, heat lost by the copper ball = mass of the copper  $\times$  specific heat of copper  $\times$  decrease in temperature of the ball

$$Q = 100 \times 0.1 \times (100 - T)$$

Similarly,

Heat gained by the water = mass of the water  $\times$  its specific heat  $\times$  increase in its temperature

$$Q_1 = 195 \times 1 \times (T - 20)$$

Heat gained by the calorimeter = mass of the calorimeter  $\times$  its specific heat  $\times$  increase in its temperature

$$Q_2 = 50 \times 0.1 \times (T - 20)$$

$$Q = Q_1 + Q_2$$

$$100 \times 0.1 \times (100 - T) = 195 \times 1 \times (T - 20) + 50 \times 0.1 \times (T - 20)$$

$$10 (100 - T) = 195 (T - 20) + 5 (T - 20)$$

$$10 (100 - T) = 200 (T - 20)$$

$$210 T = 5000$$

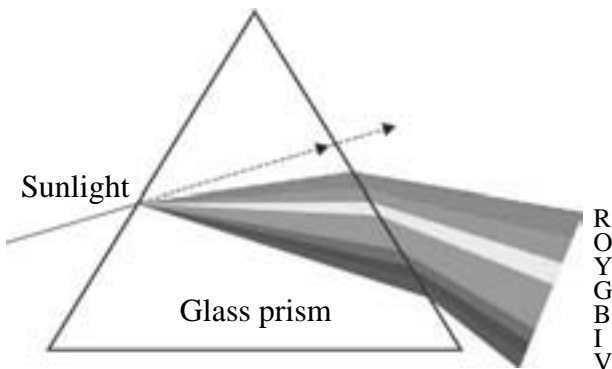
$$\therefore T = 23.8 \text{ } ^\circ\text{C}$$

**Ans.** The maximum temperature of water will be  $23.8 \text{ } ^\circ\text{C}$ .

v.

- a. Draw a neat labelled diagram of 'dispersion of white light through glass prism'.

**Ans.**



- b. Which coloured ray is the least deviated?

**Ans.** Red coloured ray is the least deviated.

- c. Which coloured ray is the most deviated?

**Ans.** Violet coloured ray is the most deviated.

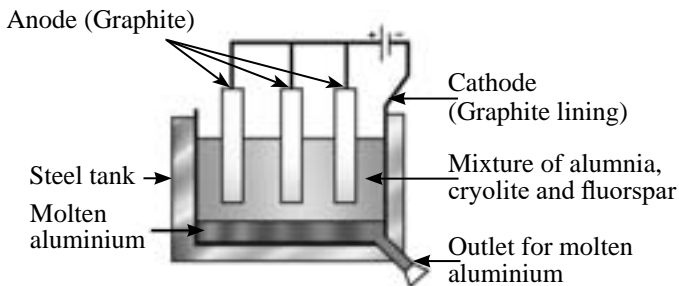
- vi. Complete the following table for convex lens.

**Ans.**

	<b>Position of object</b>	<b>Position of image</b>	<b>Size of image</b>	<b>Nature of image</b>
a.	At infinity	At focus $F_2$	Point Image	Real and inverted
b.	At $2F_1$	At $2F_2$	Same size	Real and inverted
c.	Between $F_1$ & O (within focal length)	On the same side (object side)	Very large	Virtual and erect

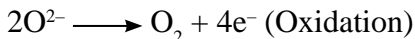


vii. Observe the following diagram and answer the questions.



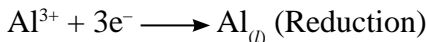
a. Write the 'anode reaction'.

**Ans.** Anode reaction:



b. Write the 'cathode reaction'.

**Ans.** Cathode reaction:



c. What is the purpose of mixing 'cryolite' and 'fluorspar' with 'alumina' in the electrolytic reduction of alumina?

**Ans.** The melting point of aluminium is greater than  $2000^\circ\text{C}$ . Therefore, cryolite ( $\text{Na}_3\text{AlF}_6$ ) and fluorspar ( $\text{CaF}_2$ ) are added to the mixture to lower its melting point up to  $1000^\circ\text{C}$ .

viii.

a. What is the principle behind the working of a satellite launch vehicle?

**Ans.**

- (1) The functioning of a satellite launch vehicle is based on Newton's third law of motion.
- (2) The launch vehicle uses a specific type of fuel.
- (3) The gas produced due to the combustion of the fuel expands due to its high temperature and it is expelled forcefully through the nozzles at the rear end of the launch vehicle.
- (4) As a reaction to this, a thrust acts on the vehicle, which drives the vehicle high into space.

b. Write the formula for 'escape velocity'.

**Ans.** 
$$V_{\text{esc}} = \sqrt{\frac{2GM}{R}}$$

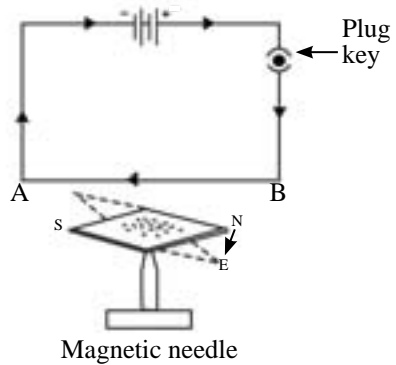
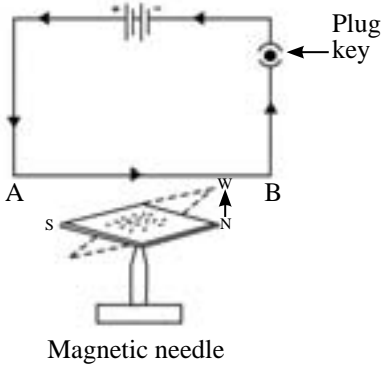
c. Write the long form of 'ISRO'.

**Ans.** Long form of ISRO is Indian Space Research Organisation.

**Q.4. Solve the following questions. (Any one)**

**[5]**

i. Observe the diagrams and answer the questions.



a. Which effect of electric current is shown in the above figures?

**Ans.** Magnetic effect of electric current is shown in the given figures.

b. What will happen if the number of electric cells is increased on the magnetic needle?

**Ans.**

(1) If the number of electric cells is increased, the current will also increase.

(2) Therefore, the deflection of the magnetic needle will also increase.

c. If the distance between the conductor and magnetic needle is increased, what will be the effect on the intensity of the magnetic field?

**Ans.** If the distance between the conductor and magnetic needle is increased, the intensity of the magnetic field will decrease.

d. If the ends of electric cell are interchanged, what will be the effect on the magnetic needle?

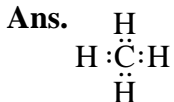
**Ans.** If the ends of electric cell are interchanged, the magnetic needle will be deflected in the opposite direction.

e. Write the names of any *two* instruments which work on magnetic effect of electric current.

**Ans.** Electric motor and galvanometer work on the principle of magnetic effect of electric current.

**ii. Answer the following.**

a. Draw the electron-dot structure of Methane.



b. Define homologous series.

**Ans.** A series of compounds formed by joining the same functional group in the place of a particular hydrogen atom on the chains having sequentially increasing length is called a homologous series.

c. Write the IUPAC names of the following.

(i)  $\text{CH}_3\text{--CH}_2\text{--COOH}$

**Ans.** Propanoic acid

(ii)  $\text{CH}_3\text{--CHOH--CH}_3$

**Ans.** Propan-2-ol

(iii)  $\text{CH}_3\text{--CO--CH}_2\text{--CH}_3$

**Ans.** Butan-2-one