Maharashtra Board Class 10 Science and Technology Part I

Solved Previous Year Questions-2019

1) (A) Answer the following Questions: (5)

1. Write the proper answer in the box:

If $F = Gm_1m_2/ d^2$, then F=

Answer: $Gm_1m_2/ 9d^2$

As given in the second figure, distance is 3d. So, replacing the value in the formula:

$F= Gm_1m_2/ (3d)^2 = Gm_1m_2/ 9d^2$.

2. In Dobereiner's triads Li, Na, K, the atomic masses of Lithium and Potassium are 6.9 and 39.1, respectively. What will be the atomic mass of sodium?

Answer: The Law of Dobereiner's Triads states that the atomic mass of Na is the average of the atomic masses of Li and K. Hence, Atomic mass of Sodium (Na) = (6.9 + 39.1)/ 2 = 23.

3. State whether the given statement is true or false:
A concave lens is a converging lens.

Answer: False.

When the refracted rays through the lens are converged at one point, it is called converging lens. However, concave lens spread the light that is refracting through it. Hence, a concave lens is a diverging lens.

4. By considering first correlation, complete the second correlation:
Hubble telescope: 569 km high from earth surface
Revolving orbit of Hubble telescope:

Answer: Low Earth Orbit

If the height of the satellite orbit above the earth's surface is in between 180 km and 2000 km, the orbits are called Low Earth Orbits. Hence, the revolving orbit of Hubble telescope is Low Earth Orbit.

5. Find the odd man out:
Tinning, Anodization, Alloying, Froth floatation

Answer: Froth Floatation

Tinning, Anodization and Alloying are the processes of coating a thin layer of metal on the surface of other metals. While, Froth flotation is a process for selectively separating hydrophobic materials from hydrophilic and is used in mineral processing, paper recycling and waste-water treatment industries.

(B) Choose the *correct* alternative: (5)

1. The reaction of iron nail with copper sulphate solution is _____ reaction.

(A) Combination
(B) Decomposition
(C) Displacement
(D) Double displacement

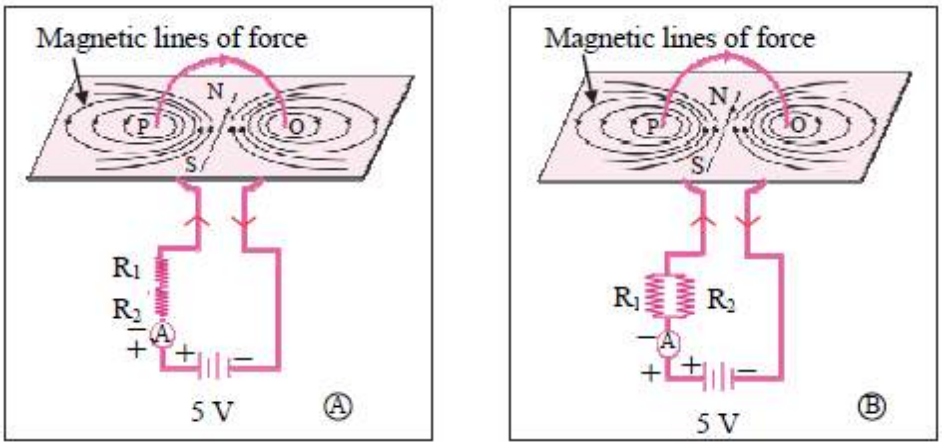
Answer: (C) Displacement

Iron being more reactive than copper can displace copper from its compounds/salts such as copper sulphate solution. Hence, the displacement reaction happens and blue colour of copper sulphate is altered to light green colour of iron sulphate.

Given below is the reaction :->

$Fe + CuSO_4$ (aqueous) --> $FeSO_4 + Cu$

2. Observe the following diagram and choose the correct alternative:



(A) The intensity of magnetic field in A is larger than in B.
(B) The intensity of magnetic field in B is less than in A.
(C) The intensity of magnetic field in A and B is the same.
(D) The intensity of magnetic field in A is less than in B.

Answer: (D) The intensity of a magnetic field in A is less than in B.

3. A ray of light makes an angle of 50° with the surface S_1 of the glass slab. Its angle of incidence will be _____.

(A) 50°
(B) 40°
(C) 140°
(D) 0°

Answer: (B) 40°

According to the second law of reflection, Angle of incidence (i) = Angle of Reflection (r).

The angle of a straight line is 180°.

Therefore, 50°+ i + r + 50° = 180°
=> 100°+i+i = 180° (since i=r)
=> 2i = 180°-100°
=> i = 80°÷2
=> i = 40°.

As a result, angle of incidence is 40°.

4. Water expands on reducing its temperature below _____°C.

(A) 0 **(B) 4**
(C) 8 **(D) 12**

Answer: (B) 4°C

4°C is the temperature (T) at which liquid water has a minimum volume, at atmospheric pressure. The expansion of water at lower T results from the water molecules arranging themselves to minimize the energy of their interactions.

5. The carbon compound used in daily life is _____.

(A) Edible oil **(B) Salt**
(C) Carbon dioxide **(D) Baking soda**

Answer: (A) Edible oil

Edible oil is a carbon compound containing unsaturated hydrocarbons. Even if Baking soda and Carbon dioxide also are carbon compounds, they are not as commonly used as edible oils. Hence, the answer is edible oils.

2. Attempt any *five* of the following questions: **[10]**

1. Two tungsten bulbs of power 50 W and 60 W work on 220 V potential difference. If they are connected in parallel, how much current will flow in the main conductor?

Answer: 0.5 A

If P_1= 50 W
P_2= 60 W and
V=220 V, then
To Find I=?
Formula P=VI
Solution =Total Power (P) = $P_1 + P_2 = 50+60 = 110W$
So, if P=VI
I= P/V= 110/220= 0.5 A.

2. Give scientific reason:

In the electric equipment producing heat e.g. iron, electric heater, boiler, toaster etc., an alloy such as Nichrome is used, not pure metals.

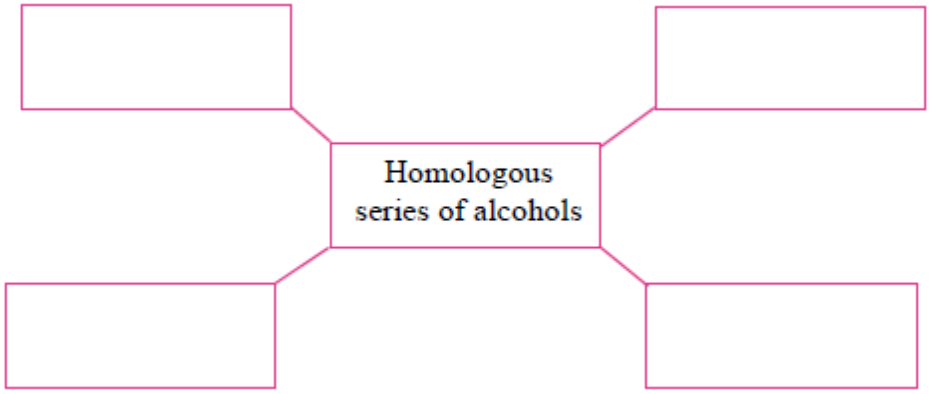
Answer: An Alloy such as Nichrome has a higher level of resistivity, so they will get heated easily on the passage of even a small amount of current. Also, electric equipment like iron, electric heater, boiler, toaster and so on work based on the heating effect of electric current. For this reason, nichrome is used in electric equipment producing heat, such as iron, electric heater, boiler and toaster.

3. A metal ball of mass 5 kg falls from a height of 490 m. How much time will it take to reach the ground? (g = 9.8 m/s2).

Answer: 10 Seconds

u (Initial velocity of the metal ball) = 0
s (displacement travelled by the metal ball) =490m
We know that $s= ut + 1/2at^2$
Replacing the values you get $490= 0 \times t + ½ \times g \times t^2$
(g is acceleration due to gravity)
Hence, $490= 0 \times t + ½ \times 9.8 \times t^2$
$490= 0 + 4.9 \times t^2= 4.9t^2$
$t^2= 490/4.9= 100$
So, t=10.

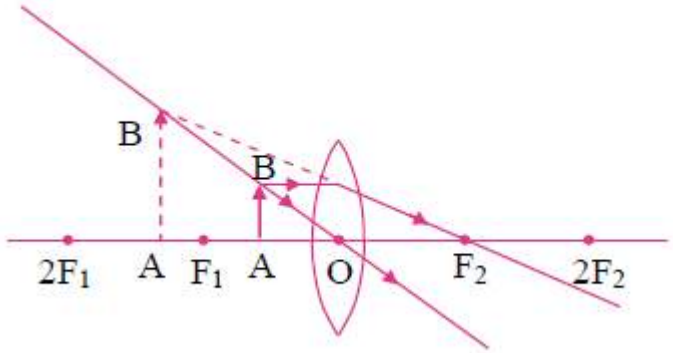
4. Write names of first four homologous series of alcohols:



Answer: Methanol (CH_3OH)
Ethanol (C_2H_5OH)
Propanol (C_3H_7OH)
Butanol (C_4H_9OH)
The general formula for the homologous series of alcohols is $C_nH_{(2n+1)}OH$. To get the answer, replace “n” with values.
n=1
Methanol (CH3OH)

n=2
Ethanol (C2H5OH)
n=3
Propanol (C3H7OH)
n=4
Butanol (C4H9OH).

5. Observe the following figure and complete the table:



	Points	**Answers**
(i)	Position of the object	
(ii)	Position of the image	
(iii)	Size of the image	
(iv)	Nature of the image	

Answer:

	Points	**Answers**
(i)	Position of the object	Between F1 and O
(ii)	Position of the image	On the same side of the lens as the object
(iii)	Size of the image	Very large
(iv)	Nature of the image	Virtual and erect

6. Out of sodium and sulphur, which is a metal? Explain its reaction with the oxygen.

Answer: Sodium is a metal.

Sulphur is a non-metal that when burned in air reacts with the oxygen in the air to form anacidic oxide called sulphur dioxide. Meanwhile, sodium reacts with oxygen at room temperature to form sodium oxide.

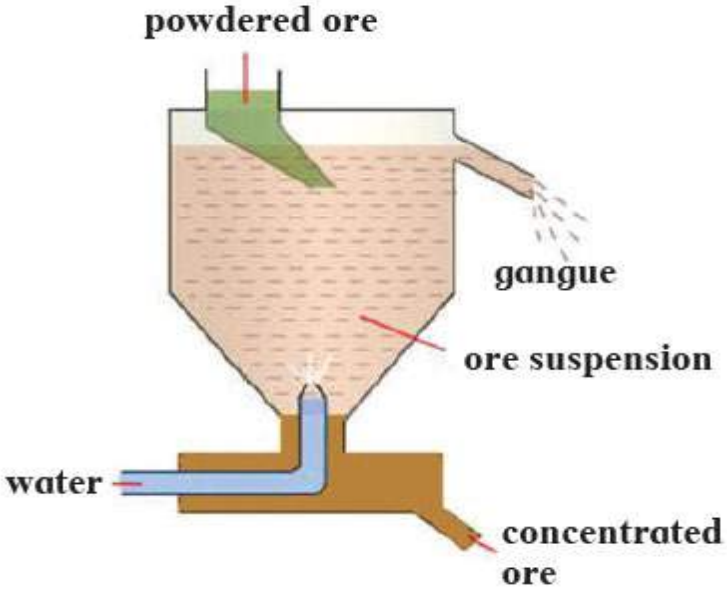
$4Na + O_2 \xrightarrow{\Delta} 2Na_20$
Sodium + Oxygen$\xrightarrow{\Delta}$Sodium Oxide.

7. A tapping vessel opens in a tank like container that is tapering on the lower side. The tank has an outlet for water on the upper side and a water inlet on the lower side. Finely ground ore is released in the tank. A forceful jet of water is introduced in the tank from lower side and gangue particles and pure ore are separated by this method.

i. The above description is of which gravitation separation method?
ii. Draw labelled diagram of this method.

Answer: (i) Hydraulic Separation Method

(ii)



Hydraulic Separation

3. Attempt any *five* of the following questions: **[15]**

1. What would be the value of 'g' on the surface of the earth if its mass was twice and its radius half of what it is now?

Answer: The formula is given $g=GM/R^2$
In this g is the acceleration due to gravity
M for mass of the earth
R is radius of the earth

G for universal gravitational constant
Now, according to the question
Mass is twice= 2M
Radius is half= R/2
g1 is considered as the new gravity.
When we substitute the formula we get
$g1= Gx2M/(R/2)^2$
$g1= 2GM / R^2/4$
$= 8(GM/ R^2)$
$= 8 \times g = 8 (9.8) =78.4 m/s^2$.

2. Write merits of Mendeleev's periodic table

Answer: Mendeleev's periodic table demonstrates the following merits:
1. Mendeleev classified the 63 elements known at the time.
2. Atomic masses of some elements were revised, so as to give them proper place in the periodic table, in accordance with their properties.
3. Mendeleev kept vacant places in the periodic table for elements not discovered till then. Three of these unknown elements were given the names eka-boron, eka-aluminium and eka-silicon from the known neighbours and their atomic masses were indicated as 44, 68 and 72, respectively. Their properties were also predicted.
4. Even though there was no place reserved for noble gases in Mendeleev's original periodic table, when noble gases such as helium, neon and argon were discovered towards the end of 19th century, Mendeleev created the 'zero' group without disturbing the original periodic table in which the noble gases were fitted very well.

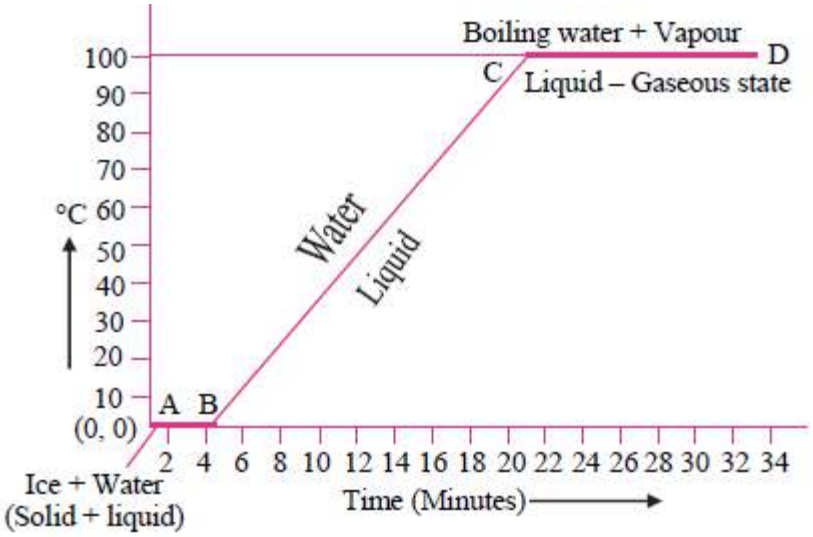
3. Study the following chemical reaction and answer the questions given below:

$$AgNO_{3(aq)} + NaCl_{(aq)} \longrightarrow \underset{\text{(Precipitate)}}{AgCl_{(s)}\downarrow} + NaNO_{3(aq)}$$

i. Identify and write the type of chemical reaction.
ii. Write the definition of the above type of chemical reaction.
iii. Write the names of reactants and products of the above reaction.

Answer: (i) It is a double replacement chemical reaction.
(ii) The reaction normally takes place in aqueous solutions and the ions in the reactants are exchanged to form a precipitate. These types of reactions are called double displacement reactions.
(iii) Silver Nitrate and Sodium Chloride are the reactants or products used in the above reaction.

4. Explain the following temperature vs. time graph:



Answer: See the graph given, which represents the changes occurring when a mixture of ice and water is heated. In this graph, the line AB signifies the conversion of ice into the water at a constant temperature. Heated ice melts at 0°C and converts to water even as it maintains the constant temperature at 0°C. This constant temperature is also known as the melting point of ice. Meanwhile, line BC represents the temperature rising from 0°C to 100°C, on further heating. At 100°C water converts to steam, and this is called a boiling point of water. After that, even on heating, the temperature of the water does not rise. Line CD represents this state when there is no change in temperature.

5. Surabhi from Std. X uses spectacles. The power of the lenses in her spectacles is 0.5 D.
Answer the following questions from the given information:
i. Identify the type of lenses used in her spectacles.
ii. Identify the defect of vision Surabhi is suffering from.
iii. Find the focal length of the lenses used in her spectacles.

Answer: (i) Since the power is positive, the lenses used in Surabhi's spectacle is convex lens
(ii) Surabhi is suffering from hypermetropia. Also, known as long-sightedness, it is a common eye condition, where nearby objects appear blurred. However, your vision is clearer when looking at things further away.
(iii) Power of the lens (P) =1/Focal length (F)
Given that Power = 0.5D
0.5=1/Focal length
Focal length= 1/0.5 =10/5
Hence, Focal length is 2m.

6. Complete the following table:

Sr. No.	Common Name	Structural Formula	IUPAC Name
1.	Ethylene	$CH_2=CH_2$	----------
2.	----------	CH3COOH	Ethanoic Acid
3.	Methyl alcohol	----------	Methanol

Answer:

Sr. No.	Common Name	Structural Formula	IUPAC Name
1.	Ethylene	$CH_2=CH_2$	Ethene
2.	Acetic Acid	CH_3COOH	Ethanoic Acid
3.	Methyl alcohol	CH_30H	Methanol

7. What is meant by space debris? Why is there a need to manage the debris?

Answer: In addition to the artificial satellite, there are some other objects revolving around the earth. These objects include, non-functional satellites, parts of the launcher detached during launching and debris generated due to collision of satellite with other satellites or any other object in the Space. Meanwhile, as per an estimation made in 2016, there are about 2 crore pieces of length more than 1 cm, revolving around the earth. All these are nothing but the debris in space. This debris can be harmful to the artificial satellites. It can collide with these satellites or space crafts and damage them. This debris is increasing day by day. Soon, it will be difficult to launch new space crafts. It is, therefore, very essential to manage the debris.

Q.4. Answer any *one* of the following questions: (5)

1. Taking into consideration the period of the elements given below, answer the following questions:

Elements	Atomic Radius (pm)
O	66
B	88
C	77
N	74
Be	111
Li	152

i. Arrange the above elements in a decreasing order of their atomic radii.
ii. State the period to which the above elements belong.
iii. Why is this arrangement of elements similar to the above period of modern periodic

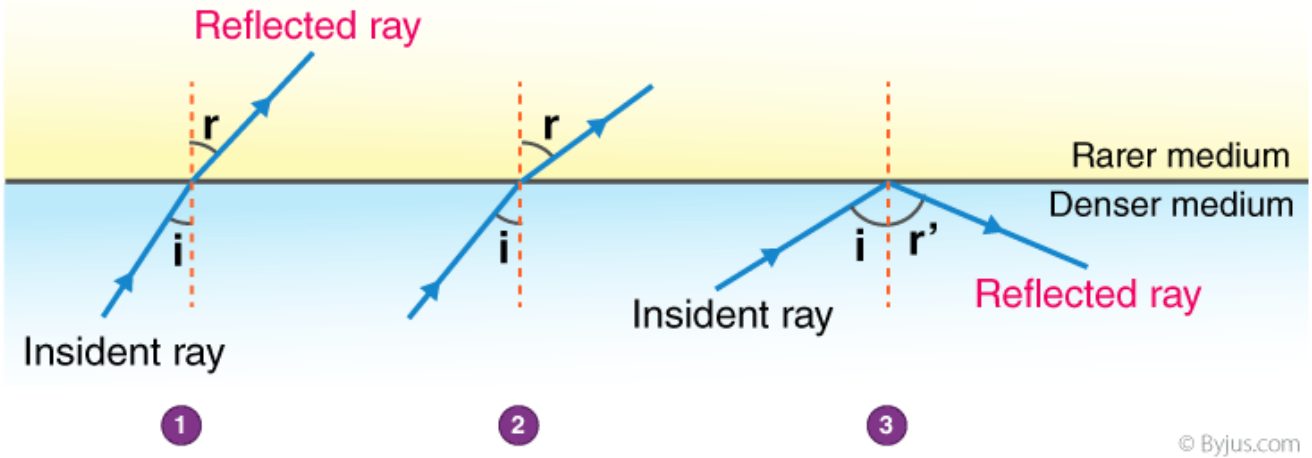
table?
iv. Which of the above elements have the biggest and the smallest atom?
v. What is the periodic trend observed in the variation of atomic radius while going from left to right, within a period?

Answer: (i) According to the decreasing order of atomic radii:
Li > Be > B > C > N > O.
(ii) The given elements belong to Period 2.
(iii) You will find that the atomic radius goes on decreasing while going from left to right, within a period. The reason behind this is as follows. While going from left to right, within a period, the atomic number increases one by one, meaning the positive charge on the nucleus increases by one unit at a time. However, the additional electron gets added to the same outermost shell. Due to the increased nuclear charge the electrons are pulled towards the nucleus to a greater extent and thereby the size of the atom decreases.
(iv) In these elements, Lithium has the biggest atom and Oxygen has the smallest atom.
(v) You will find that the atomic radius goes on decreasing while going from left to right within a period.

2. The observations made by Swarali while doing the experiment are given below. Based on these, write answers to the questions:
Swarali found that the light ray travelling from the denser medium to rarer medium goes away from the normal. If the angle of incidence (i) is raised by Swarali, the angle of refraction (r) went on increasing. However, after certain value of the angle of incidence the light ray is seen to return into the denser medium.
Questions:
i. What is the specific value of i called?
ii. What is the process of reflection of incident ray into denser medium called?
iii. Draw the diagrams of three observations made by Swarali.

Answers: (i) The specific value of ∠i is called critical angle.
(ii) The process of reflection of incident ray into denser medium is known as total internal reflection.

(iii)


Reflected ray
r
i
Insident ray
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i
Rarer medium
Denser medium
i
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Insident ray
Reflected ray
1
2
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