

GENERAL SCIENCE & Ability

SECTION - II

Question no. 6

(a)

Given numbers = 9, 8, 10, k, 12,

Arithmetic mean = 15

To find the value of k:

$$\text{Arithmetic mean} = \frac{\text{Sum of numbers}}{\text{total numbers}}$$

$$\therefore 15 = \frac{9+8+10+k+12}{5}$$

$$\Rightarrow 15 \times 5 = 39 + k$$

$$\Rightarrow 75 - 39 = k$$

$$\text{or } \boxed{k = 36}$$

hence the missing number k is equal to 36.

(b)

Let the quantity of sugar be = x
and the quantity of colored water = y

According to the given condition:

$$x : y = 4 : 3 \quad \text{--- ①}$$

$$\text{and } x : y + 10 = 4 : 5 \quad \text{--- ②}$$

From ① $x : y = 4 : 3$

as the product of means is equal to product of extremes

$$\therefore 3x = 4y$$

$$x = \frac{4y}{3} \quad \text{--- (3)}$$

from (2)

$$x : y + 10 = 4 : 5$$

$$\Rightarrow 5x = 4(y + 10)$$

$$5x = 4y + 40$$

Putting the value of x from (3)

$$5\left(\frac{4y}{3}\right) = 4y + 40$$

$$20y = 3(4y + 40)$$

$$20y = 12y + 120$$

$$20y - 12y = 120$$

$$8y = 120$$

$$y = \frac{120}{8}$$

$$\boxed{y = 15}$$

Putting the value of y in (3)

$$x = \frac{4}{3}(15)$$

$$x = \frac{60}{3}$$

$$\boxed{x = 20}$$

Therefore, the initial quantity of sugar solution in the given mixture is 20 litres.

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(C)

Radius of football = 12 cm

Volume of football = ?

Volume of a football (sphere) is given

by :

$$V = \frac{4}{3} \pi r^3$$

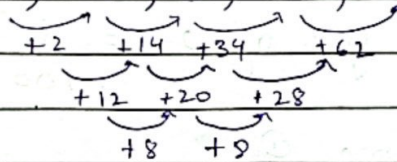
$$= \frac{4}{3} \pi (12)^3$$

$$V = 7238.23 \text{ cm}^3$$

hence the volume of the football is equal to 7238.23 cm^3 .

(2)

Series = -10, -8, 6, 40, 102, ?



In the above series, each consecutive number is increased by 2, 14, 34 and 62 respectively. If we analyze further, we will find that there is an increment of 12, 20 and 28 in the numbers 2, 14 and 34 respectively. Here we observe that there is a constant increment of 8 in each number. 8 is added to 12 to make it 20 and the 8 is added to 20 to make it 28. Similarly to find the next number,

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We add 8 to 28 which becomes 36. Now 36 is added to 62 which becomes 98. Finally, 98 is added to 102 and we get the desired number, that is, 200.

Therefore, the missing number in the series is 200.

Question no. 7

(a)

According to the question:

$$\begin{aligned} 20\% \text{ of } x &= y \\ y\% \text{ of } 20 \text{ in terms of } x &= ? \end{aligned}$$

$$\begin{aligned} \text{As } 20\% \text{ of } x &= y \\ \Rightarrow \frac{20}{100} \times x &= y \quad \text{--- (1)} \end{aligned}$$

$$\text{Now } y\% \text{ of } 20 = \frac{y}{100} \times 20$$

$$\begin{aligned} \text{from (1)} \\ y\% \text{ of } 20 &= \frac{20}{100} \left(\frac{20 \times x}{100} \right) \\ &= \frac{4}{100} x \end{aligned}$$

$$\text{or } y\% \text{ of } 20 = 4\% \text{ of } x$$

Therefore, $y\%$ of 20 is equal to 4% of x .

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(b)

Let the monthly salary of P, Q and R be x , y and z respectively

Monthly salary of P = ?

According to the conditions:

$$\frac{x+y}{2} = 5050$$

$$\frac{y+z}{2} = 6250$$

$$\frac{x+z}{2} = 5200$$

This implies:

$$x+y = 5050 \times 2$$

$$x+y = 10100 \text{ --- (1)}$$

$$y+z = 6250 \times 2$$

$$y+z = 12500 \text{ --- (2)}$$

$$x+z = 5200 \times 2$$

$$x+z = 10400 \text{ --- (3)}$$

Adding (1) and (3)

$$2x + y + z = 10100 + 10400$$

$$2x + y + z = 20500 \text{ --- (4)}$$

From eq (2) $y + z = 12500$

Putting the value in (4)

$$2x + 12500 = 20500$$

$$2x = 20500 - 12500$$

$$2x = 8000$$

$$x = 8000$$

2

$$\boxed{x = 4000}$$

hence, monthly salary of P is Rs. 4000

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(c)

Total number of times the coin was tossed = 500

Two heads = 105 times

One head = 275 times

No head = 120 times

Probability of each event is given by:

$$\begin{aligned}\text{Probability of two heads} &= \frac{105}{500} \\ &= 0.21\end{aligned}$$

$$\begin{aligned}\text{Probability of one head} &= \frac{275}{500} \\ &= 0.55\end{aligned}$$

$$\begin{aligned}\text{Probability of no head} &= \frac{120}{500} \\ &= 0.24\end{aligned}$$

Therefore, the probabilities of two heads, one head and no head are 0.21, 0.55 and 0.24 respectively.

(d)

Let age of Jamie's dad = x
age of Jamie = y

To find : $x + y = ?$

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According to given condition:

$$x = 4y \quad \text{--- (1)}$$

$$(x + 14) = 2(y + 14) \quad \text{--- (2)}$$

from eq (2):

$$x + 14 = 2y + 28$$

putting value of x from (1)

$$4y + 14 = 2y + 28$$

$$4y - 2y = 28 - 14$$

$$2y = 14$$

$$y = 7$$

Putting value of y in (1)

$$x = 4 \times 7$$

$$x = 28$$

$$\text{Now, } x + y = 28 + 7 = 35$$

Therefore, the sum of ages of Jamie and his dad, is 35.

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SECTION - I

Question no. 2

(a)

Dengue

Dengue is a virus spread through mosquitoes. These mosquitoes originate from stagnant fresh water. Any stagnant water body left unattended for long periods of time can become a breeding ground for dengue mosquitoes. Examples of water bodies may include water bucket lying outside, a pond or a lake.

Symptoms :

Symptoms of dengue may include:

- 1) high fever
- 2) headache
- 3) lethargy
- 4) pain in joints

(b)

Dark matter :

Our solar system consists of planets and space. Space consists of meteors, debris also known as space dust, etc but a huge portion of space consists of dark matter. More than 90% of space is occupied

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by dark matter. Its origin and properties are still a mystery.

Dark Energy

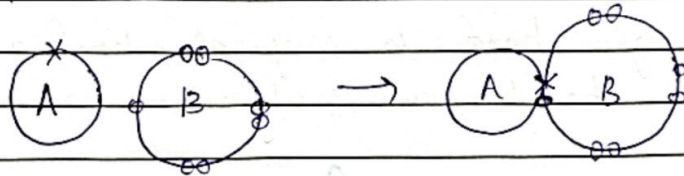
The energy keeping the dark matter together is known as dark energy.

(d)

Covalent Bonds

~~The bond in which an electropositive atom loses an electron while an electronegative atom gains an~~

The bond in which two atoms share electrons to complete their outermost shells.

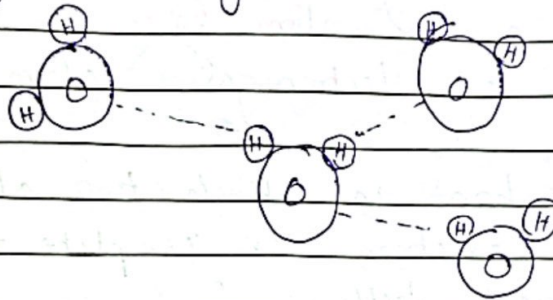


In the above example A needs one electron to complete its valence shell while B ^{also} requires one electron to complete its valence shell. So both atoms share their lone pairs to complete their valence shells.

There are different types of covalent bonds including hydrogen bonds, polar bonds and non polar bonds.

Hydrogen bonds

The bond in which highly electronegative atom is slightly attracted to hydrogen atom of another molecule. For example, the molecules of water are held together through hydrogen bonding.

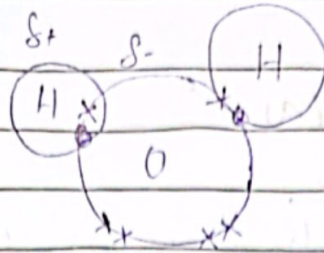


Hydrogen bond is a weak bond and can be broken easily.

Polar covalent bonds

In polar bonding, a highly slightly electronegative molecule is

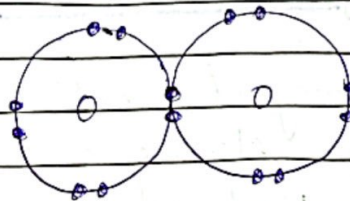
The bond in which a slightly electronegative atom is bonded to slightly electropositive atom. These bonds form strong linkages and are difficult to break. If we look at individual water molecules we will find that the atoms are bonded through polar bonding.



The more electronegative atom pull electrons with greater force and hence acquires a partial negative charge. On the other hand, the electropositive atom is mostly deprived of the electron, it acquires partial positive charge.

Non-polar bonds

Two bonds in which similar atoms are bonded together form non-polar bonds. For example, in an oxygen molecule, both atoms of oxygen are same hence they pull the electron with equal force. Resultantly, none of the atoms acquire any charge.



Oxygen molecule

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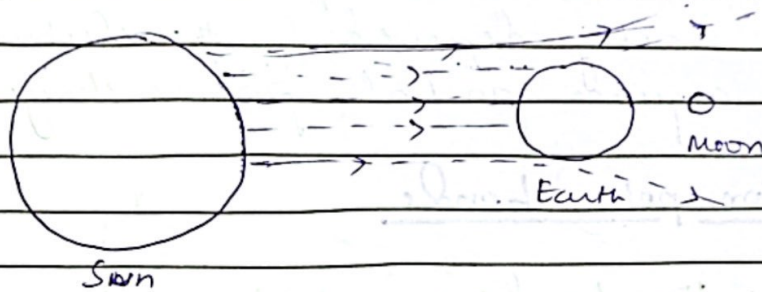
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Question no. 3

(a)

Lunar eclipse

Lunar eclipse refers to the phenomenon in which Earth ~~aligns~~ aligns in between the Sun and the Moon. In this way Earth casts a complete shadow on the Moon and it appears black.



The above diagram depicts the phenomenon of lunar eclipse. The Earth blocks all light coming from the Sun. Resultantly, no light falls on the moon.

(b)

Electromagnetic Radiations

Electromagnetic radiations consists of electric and magnetic radiations combined perpendicularly.



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The diagram shows how electric and magnetic waves propagate together but they are always perpendicular to each other. Electromagnetic radiations require no medium for their propagation. It is due to this reason that light, which is an electromagnetic wave, from the Sun reaches the Earth.

EMR Spectrum

In an Electromagnetic Radiation Spectrum, electromagnetic radiations are arranged with respect to their decreasing wavelengths. EMR Spectrum is given by:

1- Radiowaves

2- Microwaves

3- Infrared

4- Visible —

red
orange
yellow
green
blue
Indigo
violet

5- Ultraviolet

6- X-rays

7- Gamma rays

frequency
Energy

wavelength

The frequency and energy of radiations increases in the downwards order

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while the wavelength increases in the upwards order.

(d)

Earth's crust is made up of tectonic plates. These plates are always moving. When these plates overlap or when a crack appears in these plates, earthquakes occur. If the crack goes deep into Earth's surface and reaches the mantle, molten lava flows upwards due to pressure difference. That lava appears at the Earth's crust in the form of volcanoes. Therefore, it can be said that earthquakes and volcanic eruptions are interconnected as both appear as a result of same phenomenon.