

## GENERAL SCIENCE AND ABILITY

### NOA MOCK

#### QUESTION NO: 03

(a)

#### Global Warming:

Global warming refers to the gradual increase in the Earth's temperature according to the Intergovernmental Panel on Climate Change (IPCC).

The UN Secretary General, Antonio Guterres said:

"The era of Global warming is over, it is now the era of Global boiling"

This shows that Global warming is indeed a wild beast but we are poking at it with sticks and taking no effective measures to reduce global warming. This is evident through the number of harmful activities that humans are still engaged in despite knowing the irreversible consequences. Some of such irresponsible acts on behalf of human population include:

#### → Burning of fossil fuels:

Fossil fuels are non-renewable sources of energy that are constantly burned to generate energy. They include coal, oil, natural gas etc but their burning releases harmful pollutants in the atmosphere like  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{SO}_2$  etc.

According to IPCC, 35% of the pollutants in the atmosphere come from the energy sector.

### → Deforestation:

Deforestation is done to make land clear for buildings, housing societies, flyovers, industries etc. without realizing the fact that these trees (plants) act as carbon sinks and absorb  $\text{CO}_2$  from atmosphere to generate food through their process of photosynthesis.

Cutting down the trees ultimately leads to higher concentration of  $\text{CO}_2$  in atmosphere leading to enhanced greenhouse effect, which will be discussed below.

According to Global Forest Watch  
"More than 10 million hectares of land has been deforested in the last 4 years".

### → Enhanced Greenhouse Effect:

Greenhouse effect is a natural process which traps the heat of the Earth and prevents it from escaping in order to preserve life on Earth. However, certain gases responsible for this effect called as the GHGs (Greenhouse Gases) increase way beyond in concentration than required due to burning of fossil fuels etc. leading to global warming. Thus the Earth gets hotter than optimum level which presents a grave issue.

### → Use of CFCs:

People are still using refrigerators and deodorants as well as other appliances which release CFCs (chlorofluorocarbons) that are extremely harmful



and contribute to holes in the ozone layer present in the stratosphere.

Thus, from the above discussion we can see how people are still being ignorant about global warming & its impacts despite knowing the severe consequences of their actions. We all should stop turning a blind eye towards this grave issue of Global warming and take actions to limit it.

(b)

### Origin of the Universe:

The origin of the universe is explained by different theories which are explained below:

#### → Old Theory:

Universe is unchanging, infinite and static according to the old theory in 17<sup>th</sup> century.

#### → New Theory:

Universe is changing, dynamic and finite according to the new theory which emerged after the discovery of telescope.

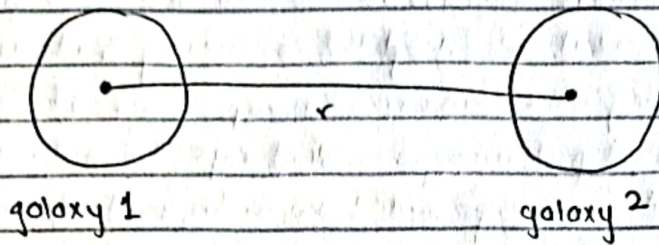
#### → Big Bang Theory:

The Big Bang theory proposes that universe originated around 13 billion years ago as a result of a big explosion. There was no time or space before then.

According to this theory objects move away from each other with receding speed. & the universe continues to expand (Hubble's Law). Red Shift evidences the expansion.

Since wavelength is inversely proportional to energy

$$E = \frac{hc}{\lambda}$$

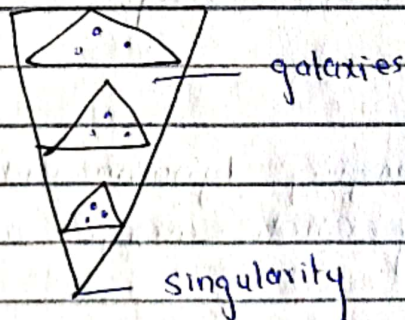


This suggests that as two galaxies start moving away from each other the distance between the center of the two galaxies i.e 'r' increases and thus  $V_0$  increases as the gravitational pull b/w them decreases.

$$V_0 \propto r$$

$$V_0 = Hr \quad (H = \text{Hubble's constant})$$

Big Crunch is said to be the ultimate fate of the universe after maximum expansion.



(continuous expansion of universe)

## Calculation of Age of Universe:

Age of Universe can be calculated by the following ways:

- 1) searching for the oldest stars.



2) Tracing the age back to the big bang explosion to calculate age of Earth, like in modern times tracing the case of a bullet can identify from where it was shot.

(C)

### Semi-Conductors:

Semi conductors are materials that conduct electricity to some extent, meaning that they conduct electricity less ~~more~~ than conductors but more than insulators.

### Doping:

The method through which certain impurities are added to the semiconductor to improve its conducting properties is called as 'doping'.

### Examples:

Examples of Semi-conductors include silicon, germanium etc.

### Types of Semi-conductors:

There are two types of semiconductors:

→ N-type semi-conductor.

→ P-type semi-conductor.

#### • N-type semiconductor:

When in the process of doping, pentavalent electron donor is used like arsenic in silicon, then those semiconductors are called N-type semiconductors.

#### • P-type semiconductor:

When in the process of doping, trivalent electron

donor is used like indium in the germanium semiconductor it is called as P-type semiconductors.

### Uses of Semi-conductors :

Semiconductors are extremely useful and some common semiconductor devices are thermistors, diodes and transistors which have completely revolutionized electronics today.

(d)

### Eclipse:

The obscuring of an object due to the presence of another object in its path is called as "eclipse".

### Difference between Solar and Lunar eclipse:

Lunar <del>Solar</del> Eclipse	Solar Eclipse
"when the earth comes between the sun and the moon, it is called as 'lunar eclipse'"	"when the moon comes between the sun and the Earth, it is called as 'solar eclipse'"
<u>Total lunar eclipse</u> → when the earth is exactly aligned on the same line joining the center of the sun and the moon.	<u>Total solar eclipse</u> → when the moon is exactly aligned on the same line joining the center of sun and the earth.
<u>Partial Lunar eclipse.</u> → when the earth is above or below the central line	<u>Partial Solar eclipse.</u> → when the moon is above or below the central line.



### → Annular Solar Eclipse

In, solar eclipse there is a phenomenon called as the 'Bailey beads' or the 'Lovely Diamond Ring Effect.'

which occurs when due to smaller size of the moon, some light escapes from sun and falls on the Earth making a bead like pattern. It occurs before or after a few seconds of the total solar eclipse.

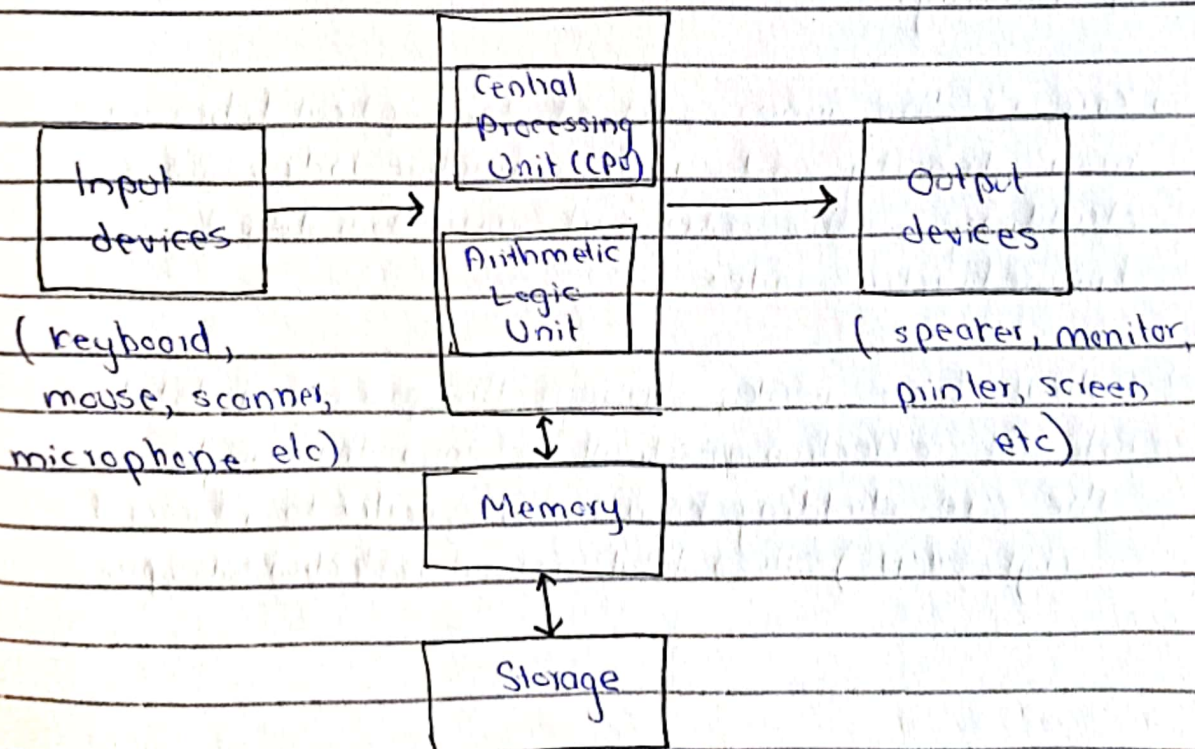
→ This is not observed in lunar eclipse.

Question no: 5

(a)

— • Answer • —

### Block Diagram of Input and Output Devices of Computer :



(b)

— • Answer • —

### Optics:

Optics is the study of properties of light as well as its propagation.

### Optical fibre:

Optical fibre consists of thin glass strands (thin as hair) that transmit information from one point to another in telecommunication. Photons are packets of energy and they carry data/information within the optical fibre as well.

### Working of an optical fibre:

An optical fibre consists of two main parts:

- a) core
- b) cladding.

→ Core is the inner part of the optical fiber with high density and high refractive index whereas cladding is the outer part with low density and low refractive index.

→ Optical fibre works through the process of total internal reflection of light. When the angle between the core-cladding boundary is greater than the refract angle ( $90^\circ$ ) then total internal reflection takes place.



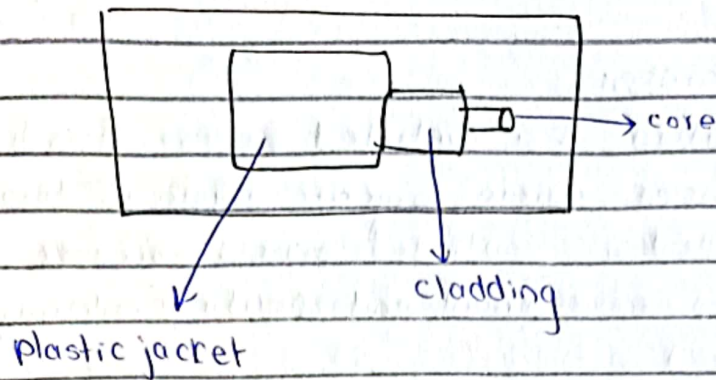


Diagram of an Optical fibre

(c)

Answer:

### ways of Solid waste management:

There are different ways of solid waste management such as:

- Open dumping
- Decomposition
- Incineration
- Land-fills

### Open Dumping:

- In this method, solid waste is dumped openly on the ground anywhere whether in urban areas or away from population.
- It is an extremely unhygienic method as it also leads to spread of diseases due to improper waste disposal.
- Therefore, other methods should be preferred over open dumping which is the easiest but the most ineffective.

### → Decomposition:

- Decomposition is a controlled process of solid waste management where organic waste is decomposed.
- It is called a controlled process because it needs a certain environment and specific conditions to be carried out.
- Usually biological microorganisms like bacteria, worms, earthworms etc are used for the decomposition process.
- The organic waste is thus converted into compost which can be used as a fertilizer.

### → Incineration:

- Incineration is the process of burning of waste.
- It releases quite a large amount of heat and thus is harmful for the environment as it contributes to Global warming.
- However, the generated heat can be directed towards hospitals and industries to be used as an energy source.

### → Land-fill method:

- Land fill method of solid waste management involves digging a hole in the ground and then dumping the waste in layers with clay between them to avoid mixing of layers.
- Plastic sheets are added/placed at the bottom of the pit so that the waste does not seep into soil.
- These land fill sites are made far away from urban areas and thus are the safest way to manage solid waste.



(d)

— • Answer • —

### GPS:

- Global Positioning System (GPS) refers to a system of minimum 24 satellites in space which have been deployed by the US.
- These satellites can pinpoint the exact location and time of any object anywhere on Earth.
- The GPS sends information back to Earth where the receiver collects it. GPS can also depict 2D and 3D location of any object.

### GIS:

- Geographic Information system on the other hand are computer based tools that visualize, analyze and interpret the geographic data.
- It collects data from GPS <sup>receivers</sup> and then analyzes and maps that data e.g. Google Maps.

Therefore, we can say that GPS is a satellite navigation system that is used to find the exact location of things, whereas GIS visualizes & interprets geographic information onto maps.

# SECTION II

Question no: 06

(a)

length of fence = 300ft.

let the longer piece be  $x$

let the shorter piece be  $y$

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

$$x + y = 300 \quad \text{--- (2)}$$

putting value of eq (1) in eq (2)

$$4y + y = 300$$

$$5y = 300$$

$$y = \frac{300}{5}$$

$$\boxed{y = 60} \quad \text{--- (3)}$$

putting eq (3) in eq (1)

$$x = 4y$$

$$x = 4(60)$$

$$\boxed{x = 240}$$

Thus, the length of longer piece is 240ft while the length of shorter piece is 60ft.



(b)

let the length of the rectangle be  $x$

let the width of the rectangle be  $y$

$$\text{Perimeter} = 20 \text{ inches}$$

$$x = 2y + 3 \quad \text{--- (1)}$$

$$\text{Perimeter} = 2(l + w)$$

$$20 = 2(x + y)$$

$$20 = 2x + 2y \quad \text{--- (2)}$$

putting (1) in eq (2)

$$20 = 2(2y + 3) + 2y$$

$$20 = 4y + 6 + 2y$$

$$20 = 6y + 6$$

$$20 - 6 = 6y$$

$$14 = 6y$$

$$y = \frac{14}{6}$$

$$y = 2.3 \text{ inches}$$

putting value of  $y$  in eq (1)

$$x = 2(2.3) + 3$$

$$= 4.6 + 3$$

$$x = 7.6 \text{ inches}$$

Thus, the dimensions of the rectangle are

$L = 7.6$  inches and  $w = 2.3$  inches respectively.

(C)

Percentage of matches won = 60%

no. of matches lost = 24

no. of matches drawn = none

no. of matches played = ?

let the total no. of matches played =  $x$

$$x = 60\% \text{ of } x + 24$$

$$x = \frac{3}{5}x + 24$$

$$x = \frac{3x + 24}{5}$$

$$x - \frac{3x}{5} = 24$$

$$\cancel{5x} - 3x = 24$$

$$\frac{5x - 3x}{5} = 24$$

$$\frac{2x}{5} = 24$$

$$2x = 24(5)$$

$$2x = 120$$

$$x = \frac{120}{2} = 60$$

$$\boxed{x = 60 \text{ matches}}$$

So the number of matches played during that year are 60.



(d)

let the two numbers be  $x$  and  $y$

$$x : y = 3 : 2$$

$$\frac{x+2}{y+6} = \frac{4}{5}$$

$$5(x+2) = 4(y+6)$$

$$5x+10 = 4y+24$$

$$5x - 4y = 14$$

$$5x - 4y = 14$$

(d)

let the two numbers be  $3x$  and  $2x$

$$\frac{3x+2}{2x+6} = \frac{4}{5}$$

$$5(3x+2) = 4(2x+6)$$

$$15x+10 = 8x+24$$

$$15x - 8x = 24 - 10$$

$$7x = 14$$

$$x = \frac{14}{7}$$

$$x = 2$$

$$x = 2$$

$$\boxed{x = 2} \text{ --- (1)}$$

put value of  $x$  in  $3x$  and  $2x$

$$3(2) = 6$$

$$2(2) = 4$$

Thus the two numbers are 6 and 4 respectively.

## Question no. 7

(a)

total seats in concert hall = 400.

occupied seats = 325.

Expressing attendance as a percentage of capacity:

$$= \frac{325}{400} \times 100$$

$$= 81.25\%$$

$$= \frac{325}{400} \times 100$$

$$= \frac{13}{16} \times 100$$

$$= \frac{1300}{16}$$

$$= 81.25\% \text{ Ans}$$

$$\begin{array}{r} 81.25 \\ 8 \overline{) 650} \\ \underline{640} \\ 10 \\ \underline{8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \\ \times \end{array}$$

(b)

Persons	Sugar	Days
30 ↓	↑ 40	10 ↑
80 ↓	↑ 320	x ↑

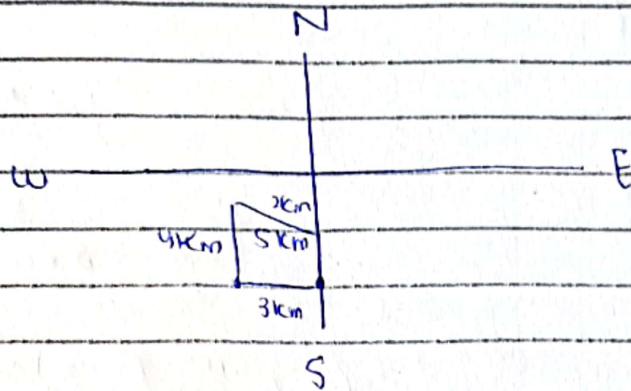
$$\frac{x}{10} = \frac{320}{140} \times \frac{30}{20}$$

$$x = \frac{24}{81} \times 10$$

$$x = 30 \text{ days}$$



(c)



(d)

$$\text{Volume of cylinder} = \pi r^2 h$$

$$\text{radius} = 10 \text{ cm}$$

$$\text{height} = 36 \text{ cm}$$

$$\text{Volume} = (3.14) (10)^2 (36)$$

$$= (3.14) (100) (36)$$

$$= 3168 (36)$$

$$= 11366 \text{ cm}^3$$

$$\begin{array}{r} 316 \\ \times 100 \\ \hline 000 \\ 0000 \\ 31600 \\ \hline 31600 \\ \textcircled{1} \\ \textcircled{2} \\ 316 \\ \times 36 \\ \hline 1896 \\ 9480 \\ \hline 11366 \end{array}$$