

# GENERAL SCIENCE AND ABILITIES

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## PART - II

### SECTION - I

## Q 2

(a) **VOLCANO**

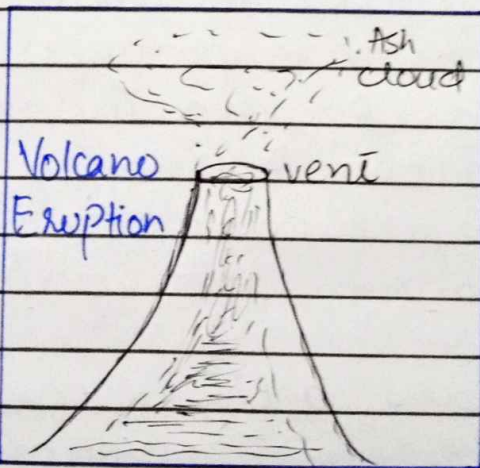
It is a sudden outburst of ashes, smoke and lava from a mountainous region.

**VOLCANO**

**ERUPTION**

**MAGMA**

In mantle of Earth, due to extremely high temperature, molten rocks become molten, known as magma. These

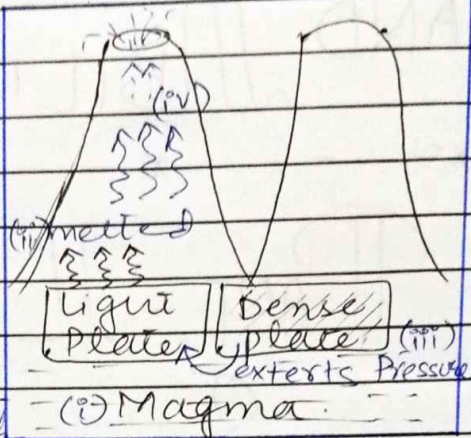


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molten rocks are responsible for heating the tectonic plates.

## MOVEMENTS OF TECTONIC PLATES

When magma meets the less denser rocks, a pressure from denser rocks is exerted. As a result



of which the lighter one is pushed upward, where it makes its way to come out of vent in form of lava.

## EARTHQUAKE AND VOLCANO

Both disasters are interlinked. Movements of tectonic plates known as Earthquake, gives way to magma so that it can come closer to crust, where it can easily make its path to the troposphere in form of ashes and lava. The volcano erupted in Iceland is after some small earthquakes, thus paving the way for magma to come up and erupted as volcano. Volcanoes of Iceland are active volcanoes, having frequent eruptions.



## (b) BIG BANG

The theory claims about the origin of universe. It says that universe came into being as a result of a sudden huge explosion billions of years ago, after which conditions change continuously till date.

Some modern scholars relate the idea of Big Bang from the Quranic verse of Kun Fayakun, which indicates in accomplishing of any task in general and making of universe in particular in sudden blow.

## BIG CRUNCH

The theory elaborates that the whole universe was not created in the Big Bang, instead a major part of it was created then and from that time till now it is expanding. Universe is composed of 67% dark energy which is responsible for its expansion, while 27% dark matter works as cosmological cement to keep it in contact. Humans have only

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explored the rest normal matter and energy till date (Stephen Hopkins, Beginning of the Universe).

## Q AGE OF UNIVERSE

Age of universe is calculated through estimating the rate of its expansion. Keeping an eye on its expansion rate, going back to the point from where it started, estimates its age nearly 150 billion years.

(c)

## RENEWABLE ENERGY

Energy obtained from a source which is not replenishable. Its sources are available without a fear of their extinction. Moreover these sources give environmental friendly energy.

### Q HYDEL ENERGY

Energy obtained from water sources such as a running river or a dam. When water moves from a turbine, it will rotate to generate



electricity. Pakistan is getting thousands of megawatts from Tarbela & Mangla dams.

## ii) SOLAR ENERGY

Sun is the source of solar energy. Photovoltaic cells are used to convert solar energy to electrical energy. These cells are painted with black color, which is a good absorber of light energy. Pakistan has Quaid-e-Azam Solar Park under CPEC producing 5-6% of total energy capacity of the country.

## iii) TIDAL ENERGY

Gravitational pull of Moon, raises tides in sea. These tides are used to convert their kinetic and potential energies into electrical energy using Salter's Duck.

## iv) WIND ENERGY

Wind Mills are used to convert kinetic energy of air, the wind, into electrical energy. Coastal belt of Sindh and Balochistan are the best sites for installation of wind mills. CPEC has a number of energy projects using the wind energy.

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## ↳ GEOTHERMAL ENERGY

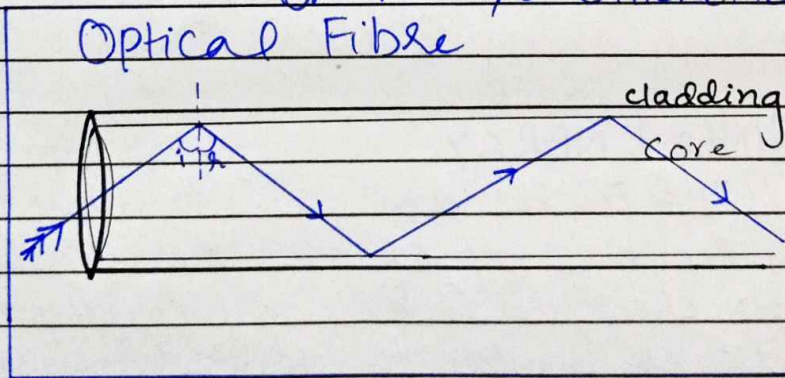
It is the thermal energy beneath the Earth in form of magma. To utilize this energy, wells are drilled till the depth of magma and (H<sub>2</sub>O) water is poured which come out as steam from the other opening. There have been installed turbines, which will convert thermal energy into electrical energy.

(d)

## OPTICAL FIBRE

It is a pipe like structure made up of glass, to pass light without any loss due to total internal reflection.

### WORKING OF OPTICAL FIBRE



Optical fibre is made up of two types of glass having different refractive indices, such that light



from core cannot enter into cladding. For such purpose the angle of incidence ( $\angle i$ ) also matters which must be greater than the critical angle of cladding. So that the light totally reflected internally into the core again. Secondly, the speed of light i.e.  $3 \times 10^8$  ~~m/s~~ m/s will transfer the information in no time.

## Q 4

### (a) SOLID WASTE MANAGEMENT

Solid waste management is a system of disposing solid waste from the generation point through a recovery process (IPCC).

### STEPS OF SWM

There are three steps of solid waste management system.

- i- Collection
- ii- Separation or Recovery Process
- iii- Disposal.

## COLLECTION PHASE

It is the first and most expensive phase of SWM. It needs

- i - proper staff  $\Rightarrow$  well trained and motivated
- ii - proper vehicles  $\Rightarrow$  fuel and cost efficient.



In collection phase, staff will collect solid waste from generation points and bring it to the recovery station.

## RECOVERY PHASE

This composes a central station in every city, where waste of city is separated and classified into

Biodegradable wastes

Electronic wastes

Inert waste

Recyclable waste.

From where it is further sent to the disposal stations in few hours.



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## DISPOSAL PHASE

Following disposal methods and sites are used

### Open Dumping

Collecting waste in an open area is discouraged by Rio declaration of environment and development (1992)

### Incineration

Heating institutional waste and using heat to generate electricity.

### Composting

Converting biodegradable material into compost through decomposition, in special digesters.

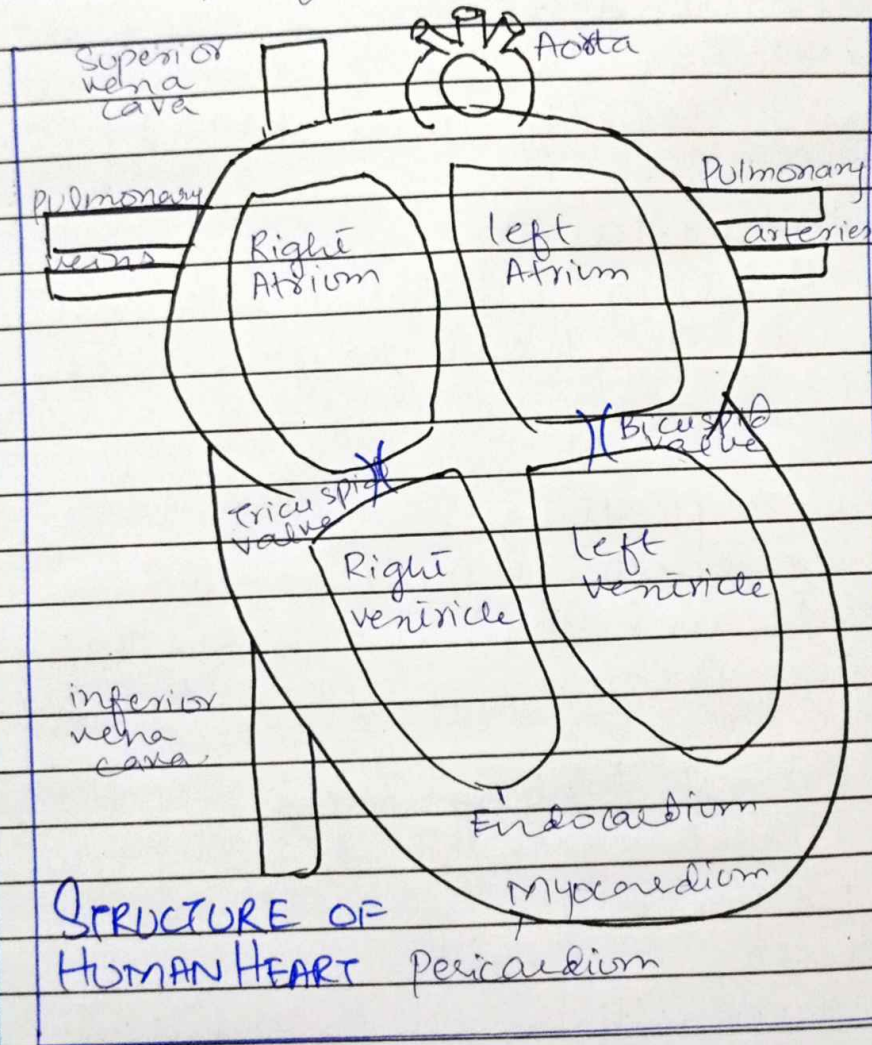
### Land Filling Sites

Searching and digging special sites for disposing waste while covering it with a layer of soil so that neither air is polluted nor water table get polluted.

Town planning is very critical in establishing land filling sites, otherwise it will have similar effects as of open dumping.

# (b) HUMAN HEART

It is the pumping organ, a part of circulatory system, made up of cardiac muscles.



## STRUCTURE OF HUMAN HEART

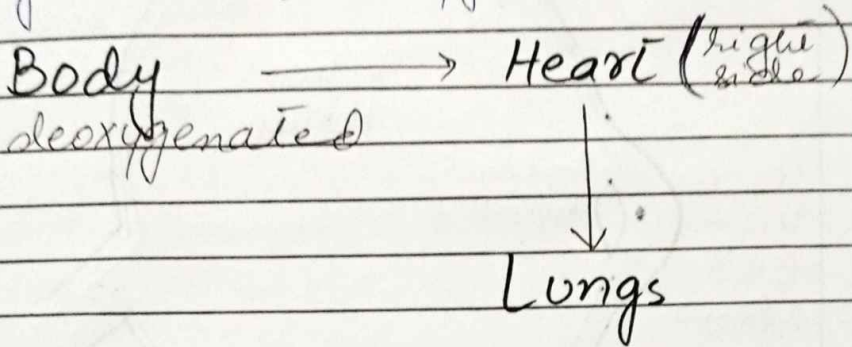
Human blood heart pumps blood to ~~heart~~ body and the lungs at a time. It receives and gives oxygenated and deoxygenated blood at the same time.



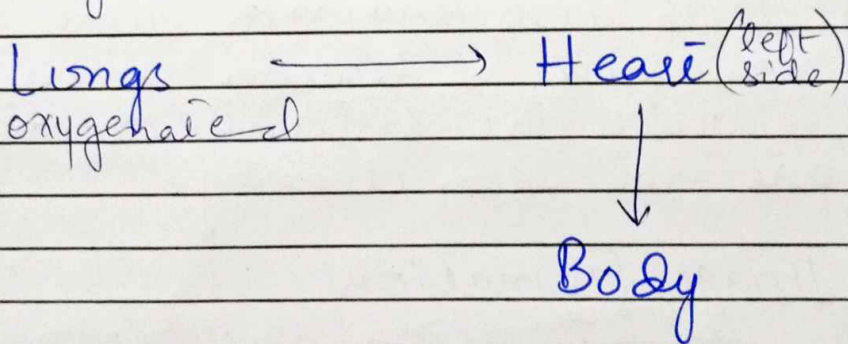
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## DOUBLE CIRCULATION MECHANISM

Heart receives blood, deoxygenated one from whole body via superior and inferior venacava. Then passes it to lungs via pulmonary arteries for oxygenation.



From lungs after oxygenation, purified blood again comes to heart via pulmonary veins and then transferred to whole body via aorta.

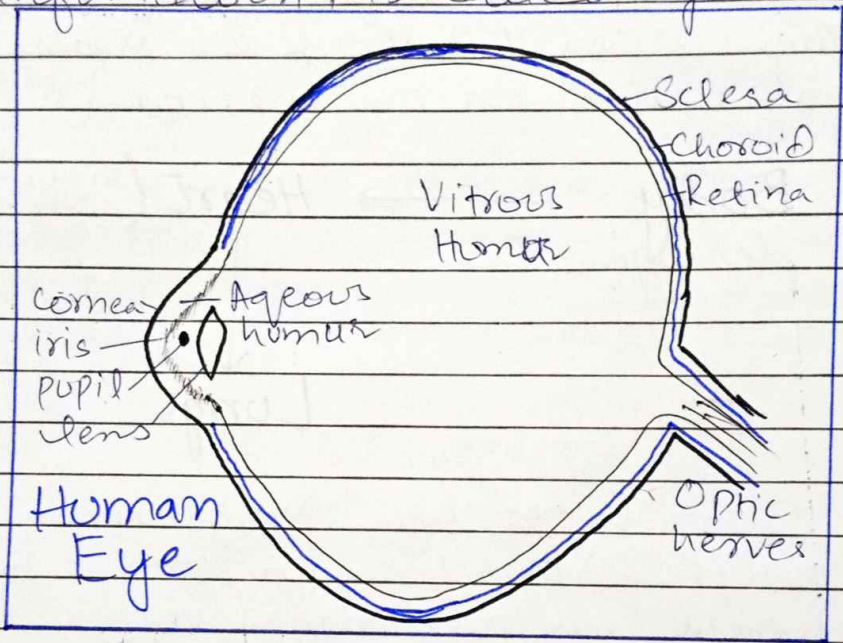


Human heart have tricuspid and bicuspid valves, to prevent the backflow and mixing of oxygenated and deoxygenated blood.

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## c) HUMAN EYE

A sensory organ receiving visual information, is called eye.



## MYOPIA

It is also known as short sightedness, a disorder of eye in which the distant objects are not seen clearly.

### Image Formation

~~Refractive~~ <sup>Infractive</sup> defect due to elongated eye, steep cornea or muscle spasm.

### Signs and Symptoms

Eye strain, headache, unable



to see distant objects clearly, etc.

### Treatment

Contact concave lenses, LASIK, LASIK, CRT, PRK, muscle exercises for eye etc.

### HYPEROPIA

A disorder of eye in which person is unable to see close objects clearly.

### Image Formation

Behind retina because of short eye ball or flattened cornea.

### Signs and Symptoms

Inability to see close objects, eye strain, dizziness etc.

### Treatment

Contact convex lens or surgery

### (d) MICROWAVES

For cooking food

For speed checking on roads

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## ULTRA VIOLET

For SONAR

In high lights.

At border areas for navigation.

## X-RAYS

For looking anatomy of body

To check any damage to the human skeleton

## SECTION-II

Q6

(a)

GIVEN DATA

No of candidates = 3

Let candidates be  $x, y, z$ .

No of votes received by  $x = 15000$

$y = 10000$

$z = 8000$

TO FIND

Percentage of votes of winning candidates = ?



## FORMULA USED

$$\text{Percentage} = \frac{\text{Votes of winning candidate}}{\text{Total votes}} \times 100$$

## SOLUTION

$x$  is winning candidate, as got maximum number of votes.

So its percentage is:

$$x = \frac{15000}{15000 + 10000 + 8000} \times 100$$

$$x = \frac{15000 \times 100}{33000}$$

$$x = \frac{1500}{33}$$

$$x = \frac{500}{11}$$

$$x = 45.4\%$$

The winning candidate  $x$  got 45.4% of votes.

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(b)

## GIVEN DATA

Ratio of angles of a triangle = 3:4:5

TO FIND

$\angle i$ ,  $\angle ii$ ,  $\angle iii = ?$

FORMULA

$$\angle i + \angle ii + \angle iii = 180^\circ, \text{ share} = \frac{\text{Parts}}{\text{Total}} \times \text{To be distributed}$$

SOLUTION

Let  $\angle i = x$ ,  $\angle ii = y$ ,  $\angle iii = z$ .

$$x + y + z = 180^\circ$$

$$x : y : z = 3 : 4 : 5$$

$$\text{Total parts} = 3 + 4 + 5 = 12$$

$$x = \frac{3}{12} \times 180 = \frac{1}{4} \times 180 = 45^\circ$$

$$y = \frac{4}{12} \times 180 = \frac{1}{3} \times 180 = 60^\circ$$

$$z = \frac{5}{12} \times 180 = \frac{5}{2} \times 30 = 75^\circ$$



$$45^\circ + 60^\circ + 75^\circ = 180^\circ$$

Angles of a triangle are  $45^\circ$ ,  $60^\circ$  and  $75^\circ$  respectively.

(c)

GIVEN DATA

Girls available = 102

Group consists of 4 boys & 6 girls

TO FIND

No of <sup>boys to</sup> groups with 102 girls = ?

FORMULA

$$\frac{\text{Total girls} \times \text{No of boys in a group}}{\text{No of girls in a group}}$$

SOLUTION

$$\text{Total no of groups} = \frac{\text{Total girls}}{\text{Girls in group}}$$

$$= \frac{102}{6}$$

$$6$$

$$= 17 \text{ groups}$$

No of boys for 17 groups = No of groups  $\times$  No of boys

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$$\begin{aligned} &= 17 \times 4 \\ \text{No of boys} &= 68 \end{aligned}$$

102 girls will make 17 groups for which 68 boys are required.

(d)

GIVEN DATA

Ratio of Present ages of A and B = 6 : 7

After 5 years : A : B = 7 : 8

TO FIND

Present ages of A & B

SOLUTION

Let present age of A is  $x$  & of B is  $y$ , then

$$x : y = 6 : 7$$

After 5 years age of A will be  $x+5$  & that of B will be  $y+5$ , so

$$x+5 : y+5 = 7 : 8$$



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$$\frac{x+5}{y+5} = \frac{7}{8}$$

$$8(x+5) = 7(y+5)$$

$$8x + 40 = 7y + 35$$

$$8x - 7y = 35 - 40$$

$$8x - 7y = -5 \quad \text{--- (1)}$$

while

$$\frac{x}{y} = \frac{6}{7}$$

$$7x = 6y$$

$$y = \frac{7x}{6} \quad \text{--- (2)}$$

Put (2) in (1)

$$8x - 7\left(\frac{7x}{6}\right) = -5$$

$$\frac{8x - 49x}{6} = -5$$

$$\frac{48x - 49x}{6} = -5$$

$$-x = -30$$

$$x = 30 \quad \text{--- (3)}$$

putting (3) in (2)

$$y = \frac{7}{6}(30)$$

$$y = 35$$

Present ages of A is 30 and  
that of B is 35.

Q 8

(a)

GIVEN DATA

$$x + y + z = 273$$

where  $x, y, z$  are consecutive  
odd numbers.

TO FIND

$$x, y, z = ?$$

SOLUTION

1, 3, 5, 7, 9 are odd numbers



out of which a unit of 3 is obtained if 1, 5 & 7 are added so,

273 can be obtained from adding 81, 95 and 97

(b)

i - 4, 16, 36, 64, 100, 144

The series goes on like squares of even numbers from 2 to 12.

ii - 30, 29, 27, 24, 20, 15

Subtracting 1 to 5 consecutively from 30 i.e.  $30 - 1 = 29 - 2 = 27 - 3 = 24 - 4 = 20 - 5 = 15$ .

iii - 1, 7, 15, 25, 37, 51

Adding even numbers consecutively from 6 to 14 in given series.

iv - 0, 2, 6, 12, 20, 30, 42

Adding even numbers from 2 to 12 consecutively in the given series.

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v- 48, 24, 72, 35, 108, 143

Adding 48 & 24 gives 72.  
So adding 35 & 108 gives 143.

(c)

i- THRSI Shirt

ii- GNDREA Garden

iii- SCHAMOT Tachoms

iv- ONLNDO London

v- HIODALY Holiday

(d)

GIVEN DATA

Let

Sara's age =  $x$

Sara's Mother's age =  $6x$ .

Ali's age =  $2x$ .

After 3 years

$$(x+3) + (6x+3) + (2x+3) = 72$$

TO FIND

Sara's age = ?

Mother's age = ?

Ali's age = ?



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# SOLUTION

$$x + 3 + 6x + 3 + 2x + 3 = 72.$$

$$9x + 9 = 72$$

$$9x = 72 - 9$$

$$9x = 63$$

$$x = \frac{63}{9}$$

$$x = 7$$

So

$$6x = 6 \times 7 = 42$$

$$2x = 2 \times 7 = 14$$

Sara is 7 years old, her mother is 42 years old while his brother Ali is 14 years old.

