

General Instructions

1. Give numbering to headings
2. Do not write lengthy paragraphs. Write medium sized paragraphs with headings
3. Do not use table for comparison and contrast questions.
4. Draw figures/diagram/flowchart where needed.
5. Start new question from fresh page.
6. Write unit of the answer in ability section.
7. Explain mathematical steps and the reasoning for better score.

REASONING: Since price for references rose to 80, it means whereas he had to lower price by 20% he increases it by 20%.

8. Change colour scheme for references to give them more visibility.

9. Manage time well.

10. Wide page borders are discouraged. Should be reasonable.

COROLLARY: 20% of original price is 40 Rs.

11. Avoid writing wrong references.
12. Give more weightage to expressly asked part/s of the question.

$$20\% \text{ of } x = 40$$

(\checkmark $x = \text{original price}$)

$$\frac{20}{100} \times x = 40 \Rightarrow x = \frac{40 \times 100}{20}$$

$$x = 200 \text{ Rs} \quad \text{ANS}$$

ORIGINAL PRICE

(6)

DECODING PATTERN:

Reversing Code for brother

A
Q
N
S
G
D
Q
(Reversed)

B
R
O
T
H
E
R

Pattern: In each sphere, above code precedes below

alphabets.

Pattern not explained properly.

ENCODING 'SISTER':

Q R H R S D Q
S I S T E R

Since we reversed the code,

SISTER = Q D S R H R

ANS

(c.)

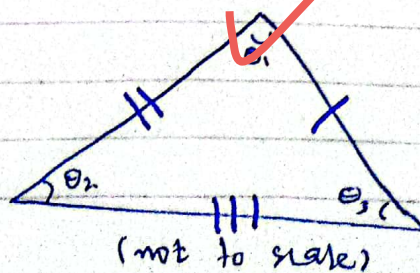
i. SCALENE TRIANGLE:

Definition:

↳ A triangle whose all three sides are incongruent with each other ^{is} called as SCALENE TRIANGLE. ??

Since no side is equal in length, by corollary their angles of their vertices also differ.

Diagram:

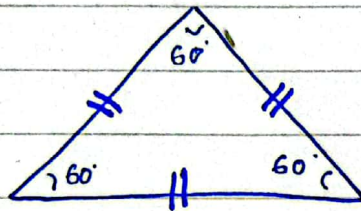


ii. EQUILATERAL TRIANGLE

Definition:

"A triangle whose all three sides are congruent in length and angle is called as an equilateral triangle."

Diagram:

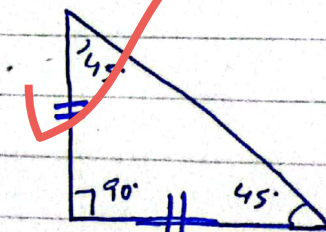


iii. RIGHT ISOSCELES TRIANGLE:

Definition

"A triangle having one vertex of 90° degree with its base and perpendicular equal in length is called as right, isosceles triangle."

Diagram:



(d.)

$n(S)$ Total number of events : 8
 $n(R)$ Total number of favourable outcomes : 3

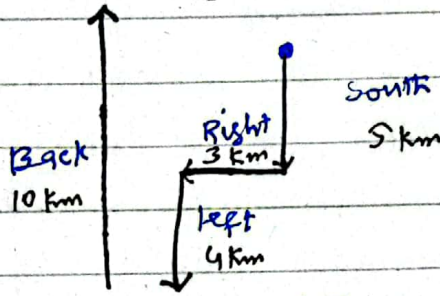
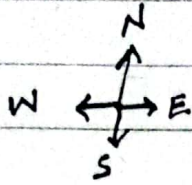
The probability of her picking raisin slice:

$$= \frac{3}{8} \approx 0.37 \text{ or } 37\% \quad \text{ANS}$$

3.

Q # 8

(a.)



(Figure: TRAVE STINERARY)

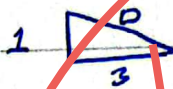
DIRECTION FROM ORIGIN

The man is facing north and has travelled beyond origin point.

DISTANCE FROM ORIGIN

In North west direction from the starting point.

From the above figure,



D represents this distance in this right triangle.

Using Pythagoras Theorem:

$$P^2 + B^2 = H^2 \Rightarrow 1^2 + 3^2 = D^2$$

$$D^2 = 10 \Rightarrow D = \sqrt{10} \approx 3.3 \text{ km}$$

Ans

(b.)

Cubes of first five prime numbers:

$$2^3, 3^3, 5^3, 7^3, 11^3$$

$$= 8, 27, 125, 343, 1331$$

$$\text{Sum} = 1834$$

What is the formula for mean? Write it.

$$\text{Arithmetic mean} = \frac{1834}{5} = 366.8$$

ANS

(c.)

| Men | Days |
|-----|------|
| 50 | 40 |
| 70 | D |

Since Men and Days are inversely proportional,

$$50 \times 40 = 70 \times D \Rightarrow D = \frac{40 \times 50}{70}$$

$$D = 28.5 \approx 29 \text{ Days}$$

ANS.

Explain the working in more detail

(d.)

Debt: Rs 150,000

Minus Debt: 1,750,000 - 150,000

Remaining Amount: 1,600,000

How son is $\frac{2}{3}$ and daughter is $\frac{1}{3}$?
Explain.

Share of son :

$$= \frac{2}{3} \times 1,600,000 =$$

$$= \boxed{1,066,666.7 \text{ Rs}} \text{ ANS}$$

Share of daughter

$$= \frac{1}{3} \times 1,600,000$$

$$= \boxed{533,333 \text{ Rs}} \text{ ANS}$$

SECTION - I

Q #03

(A)

CAUSES of a CYCLONE:

When the following conditions are met, a cyclone is caused:

1. Warm Temperature:

Warm temperatures at sea surface causes moist air to rise. When heat transfer through convection fails to meet the rate of huge heat exchange, a low pressure zone is created.

2. Pressure Difference:

Due to warm seas and rising moist air, the low pressure zone results over the surface of the sea. Above it, a cloud formation is born due to rising moist air and high pressure above. This tension in pressure difference determines intensity of the cyclone.

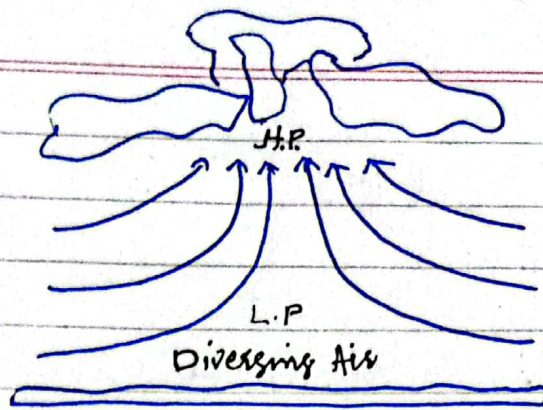


Figure: Low Pressure, Rising Warm Air, Cloudy Weather.

3. Coriolis Effect:

The swirling of a cyclone is caused by Coriolis effect. It gives cyclone rotating moment of inertia.

For this reason, cyclones are intense and frequent in sub-tropical regions of waters. Also, they form at a certain distance from shore where Coriolis effect can take effect.

STRONGEST WINDS: THE EYEWALL

The most destructive part of a cyclone is its eyewall. Here winds are strongest, rain heaviest and violent and chaotic as convective clouds rise from the sea surface.

Whenever it reaches the shore, it is said to make landfall. Its wake is dangerous but landfall can be a calamity for littoral regions.

(6.)

1. SHALLOW FOCUS:

Focus is the origin of an earthquake and when focus is close to the ground, it is called to have shallow focus.

Shallow focus earthquakes are particularly notorious as they tend to send destructive trembles over the surface. Here, ground does not stand a chance to absorb those shock waves and warning time, is drastically reduced.

Diagram?

2. DEEP FOCUS:

When focus is deeper in the ground, the earthquake is said to have a deep focus.

Although deep focus exists after shocks, these are usually less intense.

3. CAUSE OF EARTHQUAKE

Crust of earth is not a whole unit. It is divided into components, according to the Tectonic Theory. These components are called tectonic plates and they are constantly moving, even if stationary.

ground betrays this view. For, this movement is imperceptible relative to their huge landmass.

When these plates are in friction against one another, either diverging or converging plates, earthquakes result.

The boundaries where these plates meet are constantly at risk and are termed as SEISMIC FAULT LINES. One example of this is Los Angeles fault which has seen worst tremors in recent human history.

⇒ The Engineering Principle of ELASTIC DEFORMATION

Because most rock is strong (unlike sand) it can withstand a significant amount of deformation (caused by moving plates).

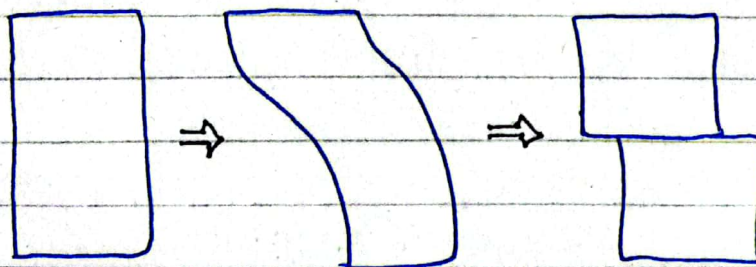


Figure: Depiction of the concept of elastic deformations and rupture, looking down

The magnitude of the quake depends on the extent of area that breaks.

4. MOROCCO QUAKE

At the start of September, Morocco suffered devastating earthquake of 6.8 magnitude on RITCHER SCALE.

(C.)

1. DENGUE

Dengue is a viral infection. It is caused by one of 4 types of dengue viruses. These viruses transmit and spread through mosquito vector. Regarding its regional specifics, it is common in tropical and sub-tropical regions.

Name of mosquito?

It cause high fever and flu-like symptoms. The severe form of dengue fever, also known as dengue hemorrhagic fever, can be mortal due to colossal internal bleeding.

2. PRIMARY CAUSE.

Dengue fever is caused by any one of four types of dengue viruses. It transmits by mosquito bites. It is not a contagious disease; rather, it is vector-borne.

SECONDARILY, a person can be infected by a mosquito which first bit a patient of dengue fever. The infected mosquito serves as a carrier of ^{the} disease, a pathogen.

Once recovered, one can still contract disease from another variant of the virus whereas one develops immunity against the previous pathogen.

3. PREVENTIVE MEASURES:

1. Reduce Mosquito Habitat:

The breed of mosquitoes, *Aedes aegypti* thrives in stagnant ponds and swamps of water. These habitats should be removed from around human lodgings.

2. Fumigation:

Frequent fumigation of a dengue risk-prone areas is a good preventive measure. It can drastically eliminate risks of even other mosquito-borne (or, flies-borne) illnesses.

3. Screening of Houses

Houses should be properly closed to prevent mosquitoes. From dawn to dusk, screening should be.

observed.

4. Use of Mosquito nets:

Sleeping under mosquito is another possible preventive measure. It should be undertaken for the already infected patient to remove possibility of more infections from mosquito bites.

5. Protective Clothing

To avoid mosquito bites, one should prefer long-sleeved, full-covered clothes with socks and covered foot-wears.

Do not use table for comparison.

(d.)

Ionic Bonds

It is a complete transfer of electron

It results in polar bonds with distinct polarities

They can realize dipole moment

Strong in their bondings

Covalent Bonds

It is a mutual sharing of electron pair

They are either neutral or partially charged

No dipole moment without polarities

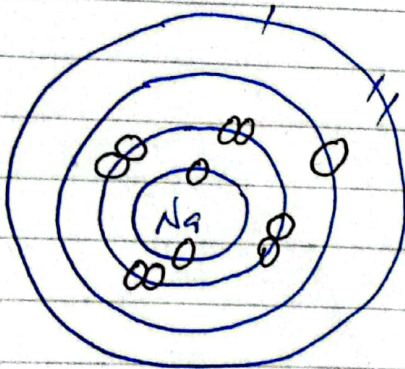
Covalent bonds are usually

weak with exceptions such as graphene and diamond.

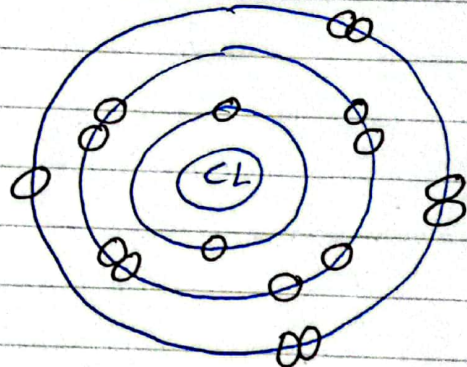
Ionic bonds have high boiling and melting points

They usually have lower thresholds for boiling and melting

Example of Ionic Bond: Sodium Chloride (Table Salt) NaCl.



Atomic No. = 11



Atomic no. = 17

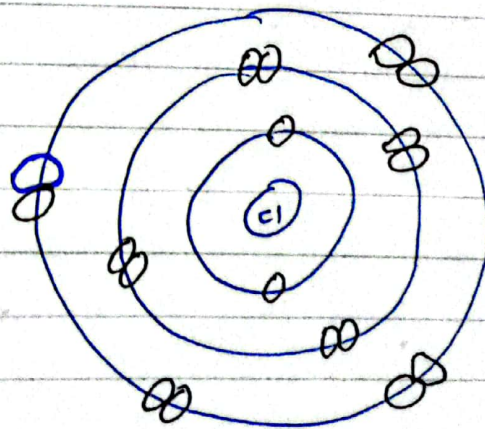
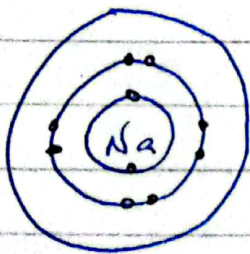


Figure: Complete transfer of electron from Na to Cl

Example of COVALENT BOND: Methane (CH_4)

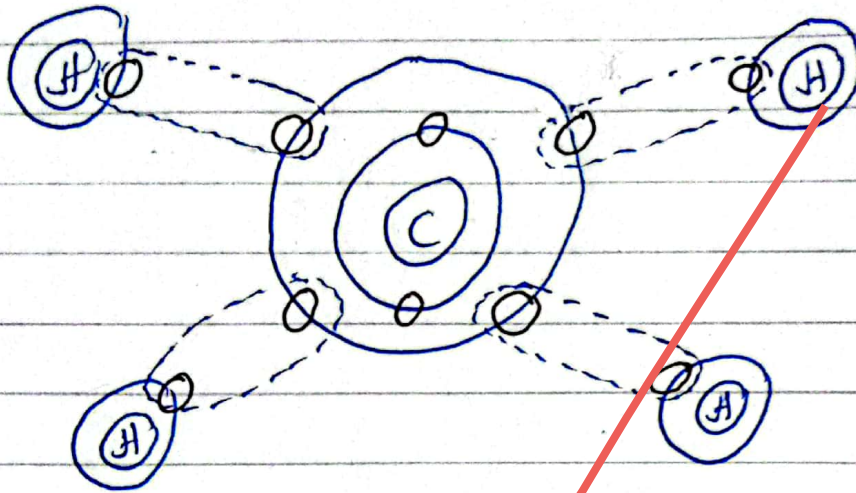


Figure. Depiction of Covalent Bond's Mutual Transfer in methane gas.

Q #05

(9.)

HUMAN EAR:

1. STRUCTURE

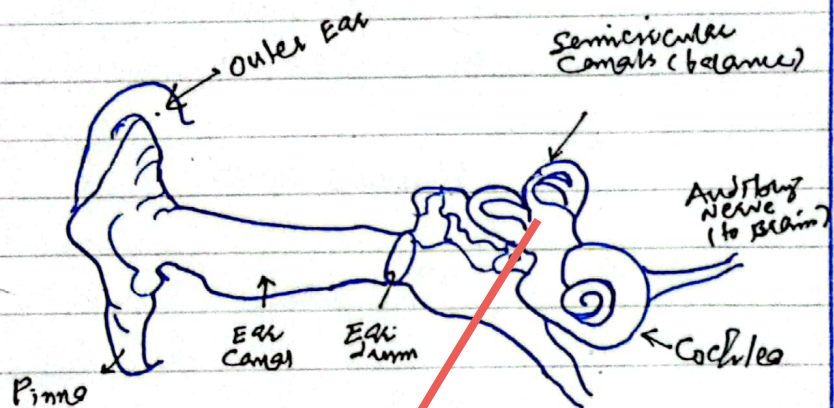


Figure: A schematic diagram of human ear

Structurally, human ear consists of three parts:

1. External Ear
2. Middle Ear
3. Inner Ear

1. EXTERNAL EAR

1. Auricles (Pinna)

It consists of funnel-like structure and curves that serves to collect sound waves (input)

It comprises a thin layer of elastic cartilage covered by skin.

2. External Auditory Meatus:

It is a curved canal supported by bones and cartilages. It is lined with wax glands.

3. Tympanic Membrane:

It is its boundary with the middle ear. It receives and amplifies the sound waves.

2. MIDDLE EAR:

1. Tympanic Cavity:

It is a narrow, air-filled cavity. It has an auditory tube known as the EUSTACHIAN TUBE.

2. Eustachian Tube:

It is 4 cm long. It serves to equalize pressure on either side of Tympanic membrane (body and atmospheric pressures).

3. INNER EAR

1. Bony Labyrinth

It comprises a vestibule and is based on several canals.

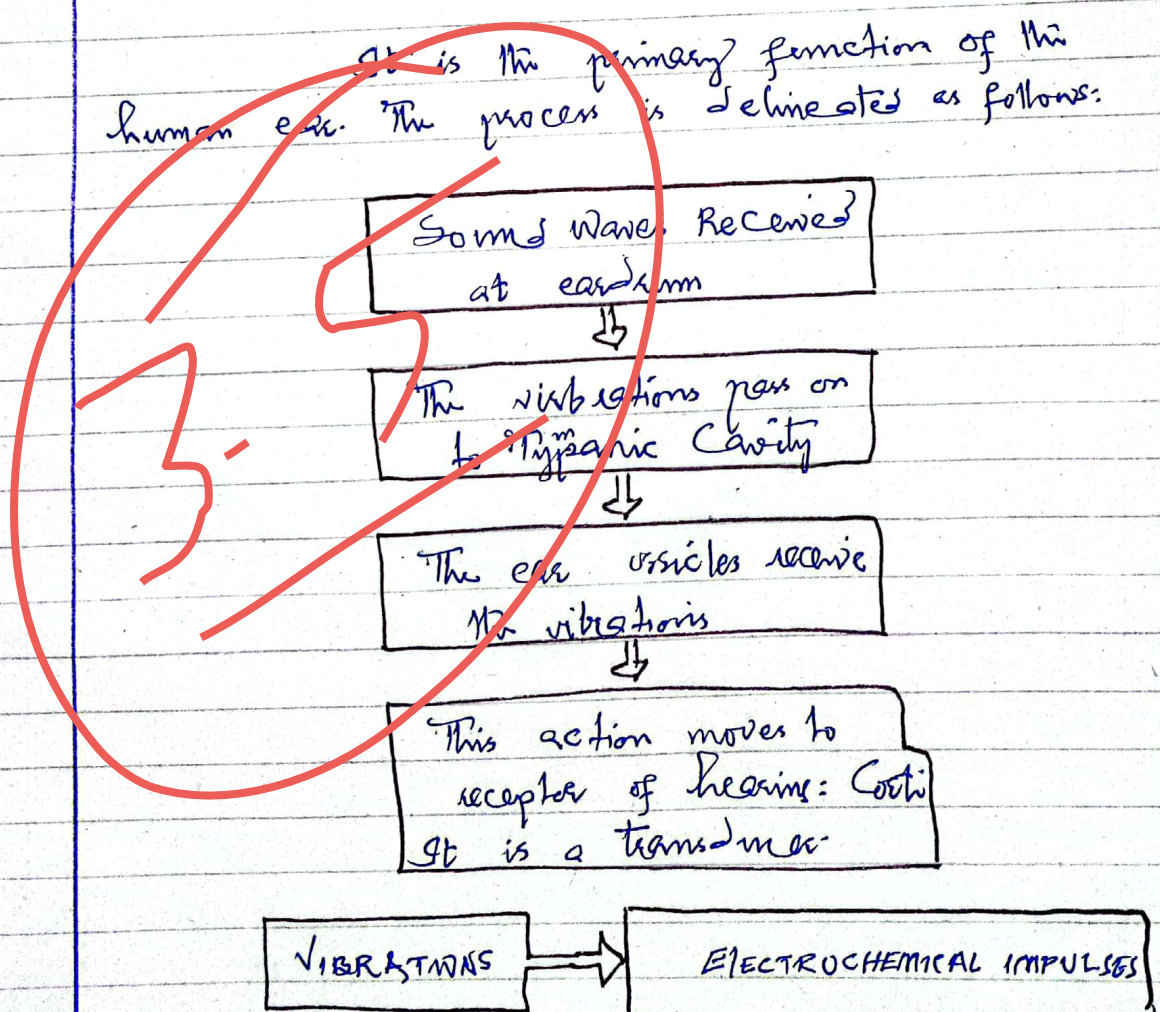
2. Membranous Labyrinth:

Surrounded by bony labyrinth, it is the final destination of ear. It is responsible for balance and hearing as it contains sensory receptors.

2. FUNCTIONS OF EAR

1. Hearing

It is the primary function of the human ear. The process is delineated as follows:



2. Balance:

The eustachian tube and vestibular complex help maintain balance by equalizing pressure and orienting body, respectively.