General Science And Ability
Mock: 3

Q4

a. **Main causes of floods:**

Def:

Flood is the high water stage in which water overflows its natural or artificial banks onto normally dry land, such as river inundating its flood plain.

Causes of flooding:

There are three major causes of flooding:

1) **Meteorological Cause:**

* Prolonged and intense rainfall.
* Cyclones
* Typhoons, storms and tidal surges.

2) **Hydrological cause:**

Floods can be caused due to excessive run off due to:

* Ice and snow melt
* Impermeable surfaces
* Saturated land.
* Poor infiltration rates
* Land erosion.

3) **Anthropogenic causes:**

It is the human activities in water catchments which drastically intensifies floods. These include:

* Population growth
* Land use change, deforestration, and intensified

agriculture.
* Socio-economic and development activities.
* Urbanization.
* Climate change
* Global warming.

Comparison between floods of 2010 and 2022:

1. Scale and ~~front~~ extent:

Floods of 2010 were one of the most extensive natural disasters in Pakistan affecting around 20 million people and submerging one-fifth of the country. while the floods of 2022, were less extensive than 2010 but still impacted millions. Sindh and Balochistan were affected the most.

2- Causes:

2010's flooding was triggered by heavy monsoon rains, which led to rivers overflowing and widespread flooding. On the other hand flood of 2022 were caused by combination of record breaking monsoon rains and glacier melt in northern areas contributed to severe flooding.

3- Impact:

Flood of 2010, impacted in the form of massive displacements, destruction of infrastructure, agriculture losses, and

long-term humanitarian crises. While floods of 2022, impacted severe damage to crops and infrastructure, exacerbated by on-going economic and political challenges.

Role of NDMA:

In 2010, NDMA faced challenges with inadequate early warnings systems and coordination, struggling to manage the vast scale of the disaster. Efforts included mobilizing resources and coordinating relief, but the response was overwhelmed by the magnitude of the floods.

While In 2022, NDMA improved its response capabilities with enhanced early warnings systems, better flood forecasting, and stronger coordination. The approach included effective coordination with authorities and international aid, focusing on immediate relief and long-term recovery, and addressing climate change impacts.

b- Star and Planet:

Differentiating Star & Planet:

1- Nature:

Star is a luminous celestial body that produces light and heat through nuclear fusion. While planet is a non-luminous body that orbits a star and reflects

its light.

2- **Formation:**
Star is formed from collapsing gas and dust, initiating nuclear fusion in its core. While planet forms from leftover material around a young star through acceration.

3- **Energy generation:**
Star generates energy via nuclear fusion while planet does not generate its own energy; reflects light from its star.

How a star becomes a blackhole:

1. **Stellar Evolution:**
Massive stars (over 20 times the Sun's mass) end their lifecycles with a supernova.

2. **Supernova:**
The star's core collapses after exhausting its nuclear fuel, ejecting its outer layers.

3. **Core collapse:**
The remaining core compresses into an extremely dense state.

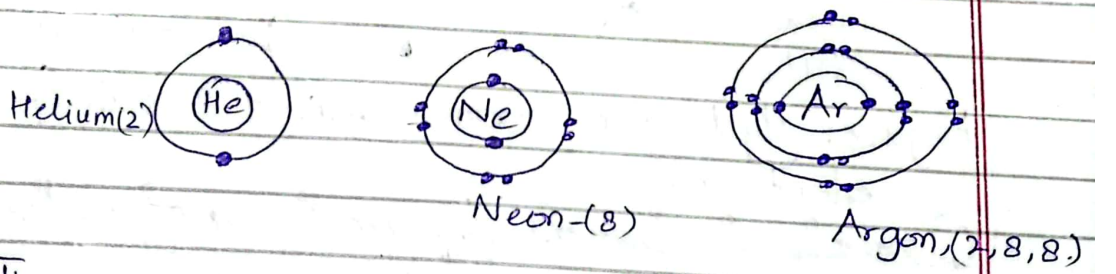
4. **Blackhole formation:**
If the core is sufficiently massive, it creates a blackhole, a region with gravity so strong that nothing can escape it.

c. Chemical bonds:

Chemical bonds refers to strong electric force of attraction between the atoms or ions in the structure.

Why do atoms forms bonds:

Atoms form a chemical bond in order to make their outer electron shells more stable. An ionic bond, where one atom essentially donates an electron to another, forms when one atom becomes stable by loosing its outer electrons and the other atoms become stable by gaining the electrons. Covalent bonds form when sharing electrons result in the highest stability. Some atoms are very reluctant to combine with other atoms and exist in the air around us as single atoms. These are noble gases and have very stable electron arrangements e.g because their outer shells are full.



Neon-(8)

Argon,(2,8,8)

The octet rule states that elements gain or lose electrons to attain an electron configuration of the nearest noblegas.

Bonds and valence electrons:

The first electron shell only holds two electrons, a hydrogen atom (at no 1) has one proton

and a lone electron, so it can readily share its electrons with the outer shell of the other atom. A helium atom (at no. 2), has two protons and two electrons. The two electrons complete its outer electron shell (the only electron shell it has), plus atom is electrically neutral this way. This makes helium stable and unlikely to form a chemical bond.

Covalent Bond:

When two non-metal atoms combine, they share one, ore more, pairs of electrons. A shared pair of electron is called a single covalent bond, or a bond pair. A single covalent bond is represented by a single line between the atoms. For-example H-H, Hydrogen gas forms the simplest covalent bond in diatomic hydrogen molecule.

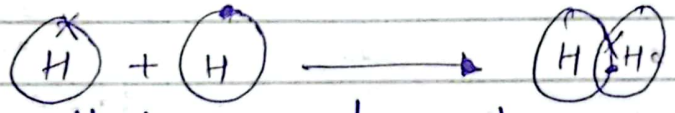
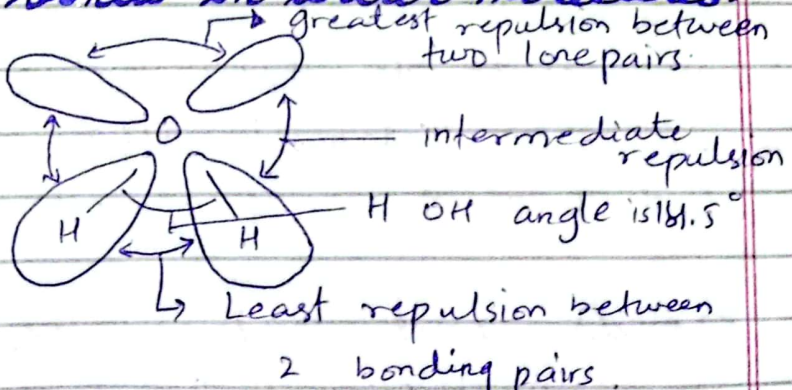


Figure: Hydrogen atoms sharing a pair of electrons.

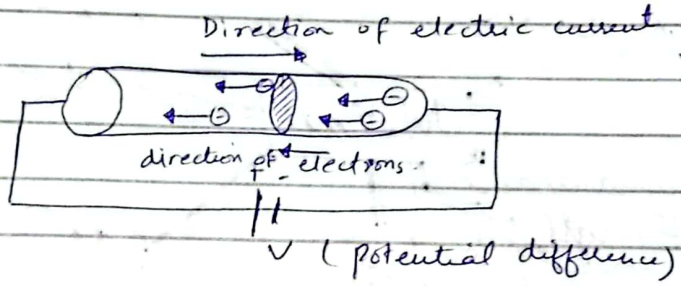
Covalent bonds in water molecules:



Water has two bonding pairs of electrons and two lone pairs of electrons. The greatest electron pair repulsion is between the two lone pairs. This results in bonds between being pushed even close together. The shape of the water molecule is non-linear, V shape. The H-O-H bond angle is 104.5°.

D- i) **Conductors:**

Conductors are materials that allow electric current or heat to pass through easily. They facilitate the movement of electrons or thermal energy easily due to their free moving charge carriers.



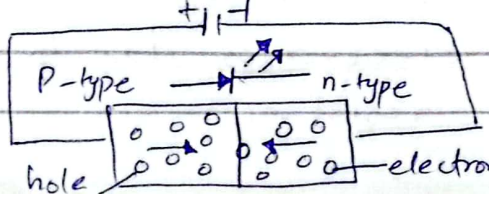
Examples:

1- Metals: Copper, Aluminium, gold, silver

2- Graphite: Used in batteries.

ii) **Semi-conductors:**

Semiconductors are materials with electrical conductivity between conductors and insulators. Their conductivity can be altered by adding impurities (doping) or by changing conditions like temperature.

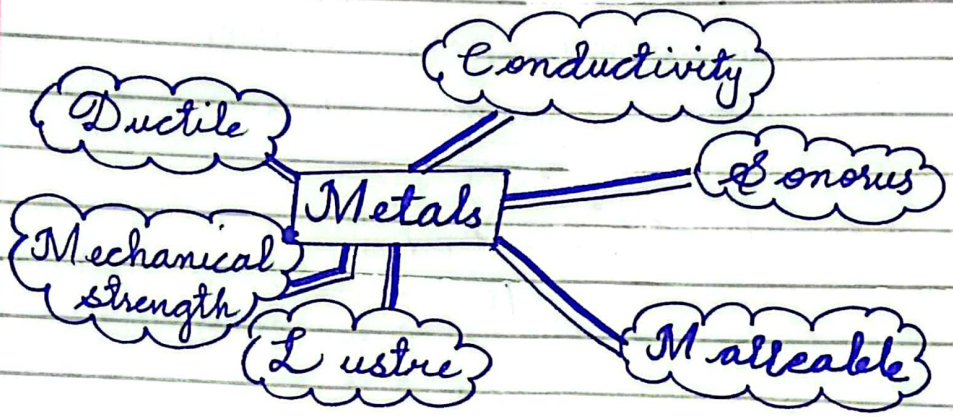


Examples:

1. Silicon (Si): Used in most electronic devices.
2. Germanium (Ge): Used in some transistors and diodes.

iii) **Metals:**

Metals are the elements that are typically shiny, malleable, ductile, and good conductors of heat and electricity. They have a high density and are often solid at room temperature (except mercury).



Examples:

1. Iron (Fe): Used in construction and manufacturing.
2. Copper (Cu): Commonly used in electrical wiring and plumbing.
3. Aluminium (Al): Light weight and used in packaging, transportation, and construction.
4. Gold (Au): Valued for jewelry and electronics due to its corrosion resistance.

iv) **Plastics:**

They are synthetic materials made from polymers, known for being light weight, versatile, and moldable.

Examples:

1- Polyethylene (PE): Plastic bags, bottles.
2- PVC : Pipes, medical devices.
3- Polystyrene (Ps): Disposable cultery, insulation.
4- Polycarbonate (PC): Eyewear lenses, electronic plates.
5- Acrylic (PMMA) : lenses, displays.

v) **Ceramics:**

They are inorganic, non-metallic materials typically made by heating and cooling minerals. They are hard, brittle, heat-resistant, and electrically insulated. These are used in various applications due to their durability and resistance to high temperatures and corrosion.

Examples:

1- Porcelain: Used in fine dishware and tiles.
2- Brick : Common in building construction.
3- Alumina (Al_2O_3): Used in abrasives and electrical insulators.
4- Silicon Carbide (SiC): Used in high-performance abrasives and heat resistant applications.

Qs:

a- **Radioactivity:**

It is a spontaneous emission of radiation from unstable atomic nuclie as they decay to achieve a more stable state. This proces releases energy in the form of alpha particles, beta particles or gamma rays.

Natural radioactivity:

Source:

It occurs naturally in the environment due to the presence of radioactive elements such as uranium, thorium, and radon.

Examples:

Uranium decaying into radon, radon gas emanating from the ground, and potassium-40 in bananas.

Occurence:

It is found in natural minerals, rocks, and cosmic rays, and does not require human intervention.

Artificial radioactivity:

Source:

It is created through human activities such as nuclear reactors, or the use of radioactive materials in medicine and industry.

Examples:
Cobalt-60 used in cancer treatment, technetium-99m used in medical imaging, and isotopes produced in reactors.

Occurence:
It is Generated by altering stable nuclie or through nuclear reactions, and often used for specific applications.

b) **Polio:**
Polio is a highly infectious viral disease, which mainly affects young children. Polio cases have decreased by over 99% since 1908, from estimated 350000 cases then, to 74 reported cases in 2015.

Symptoms:
It is highly infectious disease caused by a virus. It invades the nervous system and can cause total paralysis in a matter of hours. Initial symptoms are:

* fever
* fatigue
* headache
* vomiting
* stiffness in the neck.
* Pain in the limbs.

How polio spreads and develops:

It spreads in human faeces. People become infected due to contaminated food and water especially in the areas where sanitation is poor. Improper sewage disposal, for example can contaminate a water supply. It usually enters the mouth and proceeds through digestive tract to intestines. Then it comes out of the body in the form of faeces and it further contaminates.

Prevention:

There is no cure for polio, it can only be prevented. Immunization with polio vaccine is the best way to fight it. Vaccine works by pre exposing the body's immune system to a microbial infection that is strong enough to provoke an immune response. In response the immune system produces antibodies to fight the infectious agent.

Polio Vaccine:

There are two types of polio vaccines:

1) Inactivated Polio Vaccine (IPV)
2) Oral polio Vaccine (OPV)

'IPV' is given by injecting it into the leg or arm and 'OPV' is given orally. Children are vaccinated at a

very young age.
The dozes of 'IPV' are given at the following ages:

*) A doze at two months.
*) A doze at four months.
*) A doze at 6-18 months.
*) A booster dose at 4-6 years.

C. Solid Waste Management:

Def:

"Solid waste management refers to the systematic management of generation, collection, transfer, treatment, recycling, recovery and disposal of solid waste."

Steps in Solid Waste Management:

There are certain steps involved in the solid waste management. These are as follows:

a) Waste generation:
Waste material gathered or thrown for disposal.
b) Waste handling and sorting, storage, and processing at the source.
c) collection.
d) Sorting, processing and transformation.
e) transfer and transport.
f) disposal.

Key issues of Solid Waste Management in Pakistan:

a) **Global Municipal Solid waste generation:**

- Current levels : 1.3 billion tonnes/year.
- Expected increase by 2025 : 2.2 billion tonnes/year.

b) **Solid waste generation in Pakistan:**

Annually Pakistan generates 20.024 million tonnes. The daily waste generation is 59000 tonnes.

c) **Major cities and household impacts:**

The cities like Karachi, Hyderabad, Faisalabad, Rawalpindi and Peshawar are effected. Increase in household size leading to more waste generation. The collection rates are 51% to 69% in major cities.

d) **Lack of Scientific Solid Waste Management Systems:**

No city in Pakistan has a proper scientific solid waste material management system.

e) **Casestudies of major cities:**

Karachi:

Its Solid wastemanagement system is severely bad. It has open burning and dumping.

Lahore:

It has smooth collection in centeal

areas but poor waste collection and transportation in outskirts.

f) **Environmental and health impacts:**

- Environmental degration.
- Threats to environmental sustainability
- Health risks due to improper waste management

g) **Need for Government action:**

- Development and implementation of a standardized solid waste management system.
- Focus on collection, transportation, and disposal improvements.

D) **Population Planning:**

The current world population of 7.3 billion is expected to reach 8.5 billion by 2030, 9.7 billion in 2050 and 11.2 billion in 2100, according to a UN report. The population of Pakistan was 32.5 million in 1951, and it is 184.5 million in 2012-2013. Its growth rate is 2%.

Def: "Population planning is a structured way of thinking and taking action to improve the lives of children, families and communities as a whole."

Human population control is the artificial alteration of the rate of growth of human population and

involve measures that improve people's lives by giving them greater control of their reproduction.

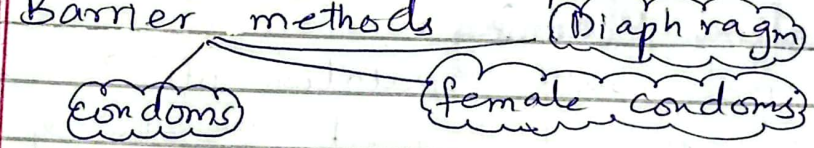
Family planning & Contraceptions:

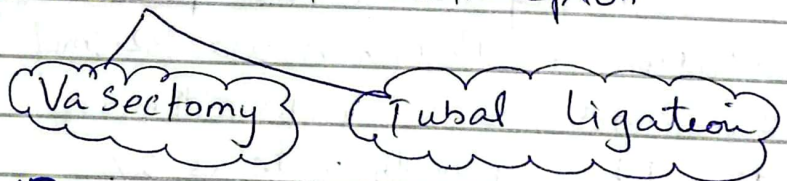
As defined by WHO, family planning allows individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births.

Methods of Contraceptions:

There are different methods of contraception. These are stated below:

a) Long-acting Reversible Contraception.
b) Harmonal Contraceptives.
c) Emergency contraceptives
d) Barrier methods
e) Fertility awareness.
f) Permanent contraception





Benefits:

Promotion of family planning - and ensuring access to preferred contraceptive methods for women and couples - is essential to securing the well being and autonomy of women, while supporting

the health and development of communities.

a) Preventing pregnancy-related health risks in women.
b) Reducing infant mortality.
c) Helping to prevent HIV/AIDS.
d) Empowering people and enhancing education.
e) Reducing adolescent pregnancies
f) Slowing population growth.

Q7 a-

Sol:

Let the no. be 'x'. According to the problem, when 'x' is divided by '6' and then '50' is added, the result is '60'. We can write this as an equation.

$$\frac{x}{6} + 50 = 60.$$

To find 'x', First subtract 50 from bothsides of the equations

$$\frac{x}{6} = 60 - 50$$

$$\frac{x}{6} = 10$$

Now, solve for 'x' by multiplying bothsides of the equation by '6'.

$$\frac{6}{6} \times \frac{x}{6} = 10 \times 6$$

$$x = 10 \times 6$$

$$x = 60.$$

Thus, the no. is '60'.

To verify, divide '60' by '6'

$$\frac{60}{6} = 10.$$

Then, add 50:

$$10 + 50 = 60.$$

Hence, the no. is '60'.

b) We check if numbers are divisible by common factor

- 8 is divisible by 2, 4, 8
- 16 is divisible by 2, 4, 8 and 16.
- 24 is divisible by 2, 3, 4, 6, 8, 12 and 24.
- 34 is divisible by 2 and 17.
- 40 is divisible by 2, 4, 5, 8, 10 and 20.
- 48 is divisible by 2, 3, 4, 6, 8, 12, 16 and 24.

As, we see that '34' is the only no. which is not divisible by 8. So, '34' is the odd one out.

C-

Sol. To find the aerial distance from where you are standing to the top of the tower, you need to use the Pythagorean theorem. The problem describes a right-angled triangle where:

- The height of the tower is = 15 meters.
- The distance from you to the base of tower = 20 meters.

Let's denote the aerial distance as 'd'

According to the Pathagorean Theorem:

$d^2 = (\text{height of the tower})^2 + (\text{horizontal distance})^2$

Substitute the values in the equation:

$d^2 = 15^2 + 20^2$

Calculate 15^2 and 20^2:

$15^2 = 225$

$20^2 = 400$

By adding the values:

$d^2 = 225 + 400$

$d^2 = 625$

To find 'd' take the square root of 625:

$d = \sqrt{625}$

$= 25$

So, the aerial distance is '25' meters.

d- To determine the number of days the man stayed in the hotel:

* Rates:
  - odd dates: Rs 1000/-
  - Even dates: Rs 2000/-
* Total amount paid: Rs 30,000/-
* Calculate for even d:

⇒ For 'd' days, $\frac{d}{2}$ are odd and $\frac{d}{2}$ are even.

⇒ Cost equation:

$$1000 \times \frac{d}{2} + 2000 \times \frac{d}{2} = 30000$$

$$1000 \times \frac{d}{2} + 2000 \times \frac{d}{2} = 30000$$

$$1500 \times d = 30000$$

$$d = \frac{30000}{1500} = 20$$

Verification:
- odd dates: 10
- Even dates: 10

Total cost: $1000 \times 10 + 2000 \times 10 =$
$10000 + 20000 = 30000/-$

So,
The man stayed for '20' days

Q8:

a)

Sol: The worship halls of faisal mosque are designed as triangular prisms. For such a prism, the formula for total surface area is:

$$\text{Total Surface Area} = 2 \times \text{Area of triangular Base} + \text{lateral surface area}$$

where,

- Area of the Triangular Base:
  $$\text{Area}_{(\text{Base})} = \frac{1}{2} \times b \times h.$$
- Lateral Surface Area
  $$\text{Lateral Surface Area} = (a+b+c) \times l$$
- Total surface area:
  $$\text{Total Surface area} = b \times h + (a+b+c) \times l$$

Here, a, b and c are the sides of the triangular base, 'h' is the height of the triangle, and 'l' is the length of the prism.

b)

Sol: Initial quantities in '60' liters (ratio 2:1)

- Milk : $\frac{2}{3} \times 60 = 40$ liters.
- Water : $\frac{1}{3} \times 60 = 20$ liters.

• Desired ratio 1:2

New quantity of water
$= 20 + x$

Set up the ratio equation:

$$\frac{40}{20+x} = \frac{1}{2}$$

Solving for x:

$$40 \times 2 = 20 + x$$

$$80 = 20 + x.$$

$$x = 60.$$

Quantity of water to be added is '60' liters.

C-

Sol: Lets analyze the relationships step by step:

1. 'A' is the brother of 'B':
   a) 'A' and 'B' are siblings.
   b) 'A' is a male.

2. 'B' is a sister of C:
   a) 'B' and 'C' are siblings.
   b) 'B' is a female.

3. 'C' is a father of 'D':
   a) 'C' is 'D''s father.

To determine the relationship between 'D' and 'A' - Follow these steps:

* Since 'B' is the sister of 'C' and 'A' is the brother of 'B', A and C must also be siblings. Therefore, 'A' is also C's brother.

* 'C' is the father of 'D', so 'D' is C's child.

Given that 'A' and 'C' are siblings, A is D's uncle.

Relationship: 'D' is the nephew of 'A'.

d- To encode "URDU" using the same pattern as "ROAR" to "URDU" (shifting each letter 3 positions forward):

- U → X
- R → U
- D → G
- U → X

Result: "URDU" is written as "XUGX".