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CSS 2016 USA.

Q2

9) Clean Development Mechanism (CDM)

Clean Development Mechanism (CDM), defined in article 12 of the Kyoto Protocol to allow developed countries to offset their greenhouse gas emissions by investing in ~~reduction~~ emission-reducing projects in developing countries.

Objectives of Clean Development Mechanism:

The main objective of CDM is to reduce overall global emissions while also promoting sustainable development in developing countries. This mechanism aids developed countries to fulfill their commitments to reduce emissions through trade of saleable Certified Emission Reduction (CER) credits in return for climate mitigation projects in developing countries.

Kyoto Protocol

Kyoto Protocol is an international treaty adopted in 1997 that sets binding emission reduction targets for developed countries.

It operationalises the United Nations Framework Convention on Climate Change (UNFCCC) to limit and reduce greenhouse gases emissions in accordance to agreed and ^{individually} set targets.

Criticism on Kyoto Protocol by Developed Countries:

The Kyoto Protocol has been criticised by some developed countries for a number of reasons. It has been criticised by United States for exempting developing countries like China and India, even though these are major emitters of greenhouse gases. This has led to accusations that the Protocol is unfair and places undue burden on developed nations.

Another criticism is that Kyoto Protocol does not set stringent enough targets. It does not pay attention to other pollutants such as sulphur dioxide and nitrogen oxide. This has led to the concerns by developed nations that the Kyoto Protocol is not doing enough to address the global climate change problem.

Furthermore, many developed states have criticised the carbon trading mechanism to control climate change. It is argued that the mechanism is prone to fraud and abuse due to limited check and balance to credit transfer. As a result, it has been argued that the tool is not effective to combat climate change.

To conclude, the legal weakness due to non-binding nature of Kyoto Protocol has resulted in the initiative to be a failure but it was an important first step for global climate diplomacy.

b) Introduction:

A landfill is a control measure for waste disposal, also known as dumping grounds. There are multiple types of landfills including sanitary, industrial, and municipal solid waste landfills.

Difference between Sanitary and Industrial Landfills:

Sanitary landfills are used for disposal of waste from homes and roads.

Whereas, industrial landfills are used for disposal of industrial waste produced by factories, mines, etc.

For sanitary landfills, layers of clay are used to separate the layers of waste.

However, ~~in~~ industrial landfills do not use such layers.

Moreover, methane is extracted from sanitary landfills which is used for ~~electric~~ electricity production. Industrial landfills also work as material reusable facilities in which reusable items are extracted and sold.

Lastly, pipelines are constructed to extract gas from sanitary landfills but ~~none~~ pipeline connections are used in industry landfills.

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Land Selection Criteria for Landfills:

Landfill site for solid wastes are selected on the following criteria:

Land area and volume should be sufficient enough to provide landfill capacity for several years to contain waste.

The area should not be close to water bodies like dams or in close vicinity of population as it could result in a potential risk of contamination that can be hazardous to aquatic and human life.

The landfill site should instead be near waste recycling site facility or a facility should be planned as an integral part of landfill.

The selection of landfill site should be based upon the proper assessment of environmental issues as instructed by Pakistan's Ministry of Environment.

No major power transmission or other infrastructure such as water supply lines should be crossing through landfill development areas.

Q3.9

a) Short note on Artificial Intelligence

Answer(a)

Definition:

Artificial Intelligence (AI) is the study and engineering of intelligent machines capable of performing the same kind of functions ~~and~~ that characterize human thinking ~~capabilities~~ capabilities.

Example:

Sophia, the humanoid robot developed in Hong Kong based company Hanson Robotics is a renowned example of AI.

Advantages:

AI is highly accurate and reduces human error. Hence, it is capable of achieving better results.

AI systems can minimize the risk involved for humans in carrying out ^{risky} tasks such as mining and assisting in rescue operations.

AI can work indefinitely without need of breaks or being distracted. Unlike humans, it does not require time off to maintain healthy life.

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Disadvantages:

Automation in tasks and increased availability of digital assistance increases humans dependency on AI, making them lazy.

Set up for AI requires high investment as companies not only require latest hardware and software but also incur training costs for workers.

Conventional jobs are likely to be completely replaced by AI in the future leading to unemployment of individuals who perform them.

Conclusion:

Artificial Intelligence has massive potential to create a better place to live in. The important thing is to ensure it is not used excessively. Despite having multiple pros and cons, the impact AI has on the global industry is undeniable.

b) i. Short note on Fibre Optics:

Fibre Optics is a medium of transmission of light information as light pulses along a long distance of glass tube, fiber or plastic wire.

Types:

There are many types of fibre optics, chief among those are:

1. Single Mode Optical Fibre

It is designed to carry a single signal at a time.

2. Multiple Mode Optical Fibre

It is designed to carry multiple signals at a time.

Uses:

Fiber optic cables are widely used in telecommunications, internet connectivity and other applications where high speed data transmission is required.

3b) ii. Global Positioning System (GPS)

Definition:

GPS is a global navigation satellite system that provides location, time information anywhere on the Earth.

How GPS works:

GPS works by receiving signals from satellites orbiting around the earth. These signals contain information on time

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and location which are used by GPS receiver to calculate its own location.

Uses:

GPS is used for a wide range of applications such as navigation of cars, boats, planes for tracking purposes, mapping, etc.

Q7a) Tsunami

Tsunami are large ocean waves that can grow in size and reach shore. It can cause major damage as they are very powerful and large waves capable of destroying cities and homes. Sumatra, Indonesia was one of the most destructive tsunami which occurred in 2004.

Generation of Tsunami:

Tsunami is an underwater earthquake which occurs when two tectonic plates shift and cause the seafloor to move. This movement creates a large wave, called a seismic sea wave, which travels through oceans at high speeds. As the waves approach the coast, it begins to slow down and the heights of waves increase creating a tsunami.

Characteristics of Tsunami:

Tsunamis are characterised as shallow-water waves that can range from ten minutes to two hours.

Tsunamis can cause significant damage to coastal communities and infrastructure. It can also cause destruction to coastal habitat and marine life.

Tsunamis are Earth's most infrequent hazard that cannot be predicted (no season for tsunamis).

b) Earthquake:

Earthquake is a sudden ~~and~~ rapid shaking of ground caused by movement of tectonic plates. Earthquakes occur when there is a release of energy stored in Earth's crust. These waves can often result in violent shaking that can cause damage and destruction to human life and infrastructure.

Richter Scale:

Richter scales are used to measure the magnitude of earthquakes. It is a logarithmic scale measuring from value ~~to~~ 0 to 10 on basis of the intensity of shocks.

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Magnitude of Richter Scale	Description	Effects of the Earthquake
Less than 2.0	Micro-earthquake	The earthquake is not felt.
2.0 to 3.9	Minor-earthquake	Normally felt and recorded with rare occurrence of damage
4.0 to 4.9	Light earthquake	Often felt outdoors with shaking of items
5.0 to 5.9	Moderate earthquake	major damage caused to poor constructed buildings
6.0 to 6.9	Strong earthquake	very destructive and large in magnitude of area
7.0 to 7.9	Major earthquake	Causes severe damage over large areas
8.0 to 9	Great earthquake	Devastation in areas with several miles of damage.

Earthquake in Pakistan on 26 October 2015

Intensity:

8.0 on the Richter Scale with magnitude of 8.1. Around 150 miles below the earth's surface.

Locus:

Affected areas of India, Pakistan and Afghanistan.

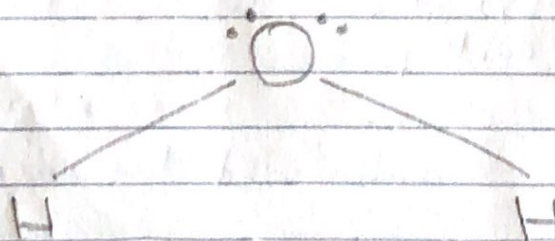
Q8a) Shape of water with Molecular Orbital Theory using diagram.

Answer

Molecular Orbital Theory

According to this theory, the electrons in a molecule are not associated with a specific atom, but instead exist in a cloud-like distribution around the entire molecule.

Molecular Orbital Structure of Water:



In case of a water molecule (H_2O), it

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consists of two hydrogen and one oxygen atom. The bond is formed by overlap of oxygen's and hydrogen atoms. The water has a bent shape between hydrogen atoms due to presence of unshared electron pairs on the oxygen atom.

b) Gamma Rays:

Gamma rays are type of electromagnetic radiation with highest energy and shortest wavelength. Gamma radiation has high levels of ionizing meaning they have the ability to strip electrons from atoms and molecules.

It is produced in the decay of certain subatomic particles and in the disintegration of radioactive atomic nuclei.

Application of Gamma Rays

Medical:

It is used in cancer treatment through 'radiation therapy'. Moreover, they are also used to sterilize medical equipment.

Industrial:

It is used to inspect quality and thickness of materials such as metal and plastic to detect cracks and defects.

Nuclear:

It is used in the development of bombs and nuclear reactors

Conclusion:

It is important to note that gamma rays are highly dangerous and precautions should be taken to limit exposure.

Q9a) Importance of preservatives and antioxidants in food.

Answer

Preservatives:

Food preservatives are chemicals or substances used to preserve food from getting spoiled by bacteria, fungi, mould, etc.

Example:

Tetracycline is an antibiotic used to prevent the growth of harmful bacteria in poultry, fish and canned food.

Importance of Preservatives:

They add variety to food choices as with preservatives seasonal fruit is available throughout the year.

Moreover, it stabilises the pricing of

food ^{as} & there is no risk of food shortage.

Antioxidants:

Antioxidants are substances added to food to prevent or slow down oxidation process which can cause food to lose its nutritional value or spoil.

Examples:

Vitamins A, C and E, Citric acid and melatonin hormones are commonly used antioxidants in daily life.

Importance:

They help keep the food fresh by slowing down the deterioration process when exposed.

Food is able to keep its taste and vibrancy in colour if antioxidants are used.

It prevents food from rancidity and spoilage increasing the lifespan of food.

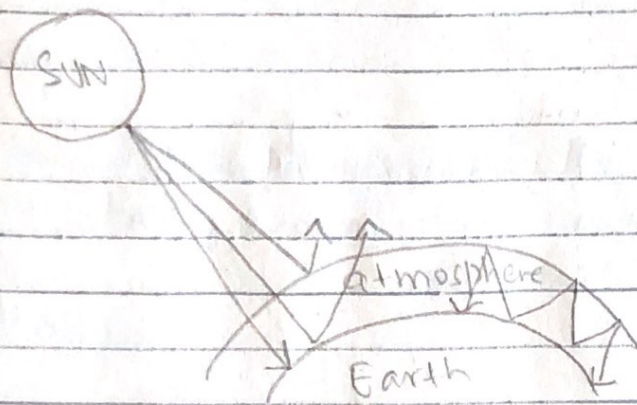
b) Greenhouse effect, its relation to global warming. Comment if it is a blessing.

Answer

Greenhouse effect is a blessing as it makes the earth warm enough to make

How it works

It is a process in which some gases like CO_2 trap the heat while it radiates back into the atmosphere. The heat is then released at night time. Other than the greenhouse effect, earth's atmosphere absorbs ~~all the~~ ^{some} heat.

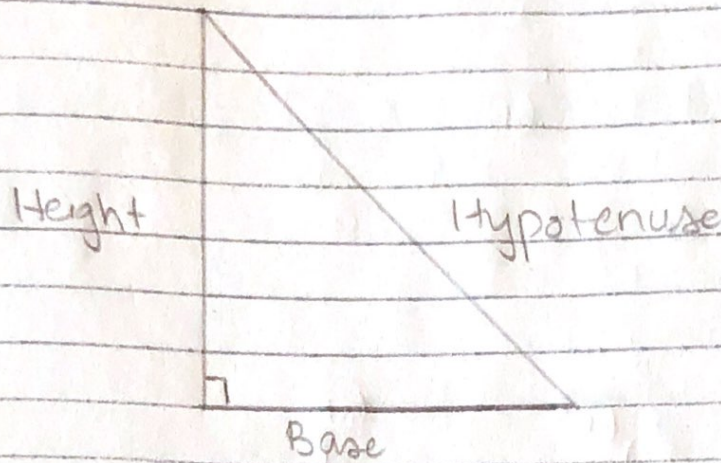


Enhanced greenhouse effects and relation to global warming:

Enhanced greenhouse effect is also known as climate change or global warming. This increased warming happens due to increased level of carbon dioxide and other heat-absorbing gases in atmosphere. Such gases increase the earth's temperature from the natural greenhouse effects to enhanced greenhouse effects.

Q10

a) i. Right-angle triangle



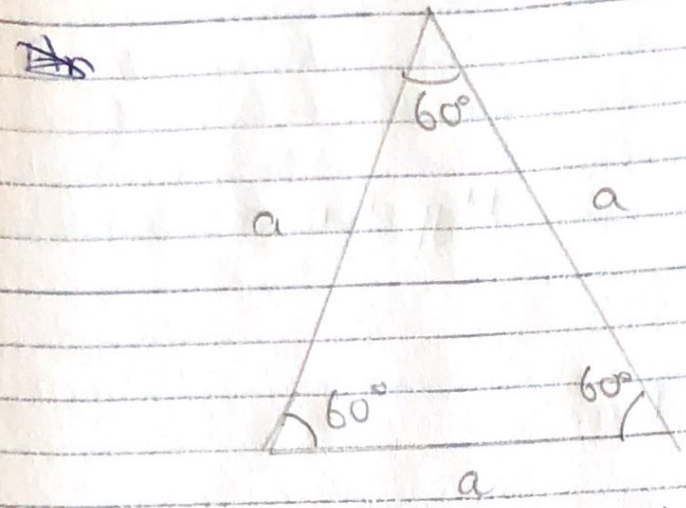
A right angled triangle is a type of triangle that has one angle equal to 90 degrees.

It has three sides: height, base and hypotenuse. Height is the perpendicular line to the line containing base. Base is the bottom line adjoining height and hypotenuse. Hypotenuse is the longest line. Its area is measured using the following formula:

$$\text{Area} = \frac{1}{2} \times \text{height} \times \text{base}.$$

ii) ~~Equilateral~~

ii. Equilateral Triangle



An equilateral triangle has all three sides equal in length. The angles of the triangle are also the same measuring 60 degrees each. Therefore, it is also known as equiangular triangle.

b) $n = 9$ students

ages = 15, 15, 16, 16, 16, 17, 17, 18, 19

Mean

Since mean is the sum of all values divided by total number of values, it can be calculated using the following formula:

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$$\text{Mean} = \frac{\text{Sum of values}}{\text{total number of values}}$$

$$= \frac{15+15+16+16+16+17+17+18+19}{9}$$

$$= \frac{149}{9}$$

$$= 16.55 \text{ years}$$

Median

As median is the middle value of the arranged data, it can be found using the following formula

$$\text{Median} = \frac{n+1}{2}$$

$$= \frac{9+1}{2}$$

$$= \frac{10}{2}$$

$$= 5^{\text{th}} \text{ value}$$

The 5th value in the data is 16. Hence,

$$\text{Median} = 16 \text{ years.}$$

Mode

Mode is the most frequently used value in the data. If the data provided, 16 is used the most, three times.

Thus,
mode = 16 years.

Range

Range refers to the difference between maximum and minimum value of the data. In the given data, the largest value is 19 and lowest value is 15. Hence,

$$\begin{aligned} \text{Range} &= 19 - 15 \\ &= 4 \end{aligned}$$

Q11 a)

i. To calculate how many stores the company has, one adds all the number of stores:

$$\begin{aligned} \text{Number of Stores} &= 3 + 15 + 26 + 20 + 16 \\ &= 80 \end{aligned}$$

Company serves 80 stores.

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ii. The most common distance of the stores from the company godown is the one in which maximum number of stores are present. Hence, the most common distance is 21 to 30 kilometers

iii. There are 16 stores which are 41 km or more from the godown, 20 stores which are between 31 to 40 km from the godown. From the table, it is not definite how many of those 20 stores are 35 km or more from the godown. However, it is certain that there are more than ~~3~~ 16 stores that are 35 km or more from the godown.

iv.

Total number of stores = 80
Number of stores 31 km or more from godown = 36

$$\begin{aligned}\text{Amount in percentage} &= \frac{\text{Given stores}}{\text{Total stores}} \times 100 \\ &= \frac{36}{80} \times 100 \\ &= 45\%\end{aligned}$$

45% of stores are 31 km or more from godown

b) Let weight of Shebaz = 50 kg.
Assuming this, the weight of remaining are.

Shebaz = 50 kg

Nasir = half weight of Shebaz = 25 kg

Akbar = half weight of Nasir = 12.5 kg

Ali = 5 times weight of Akbar = 62.5 kg

Ahmed = 3 times " " Ali = 187.5 kg

i.

Ali is the heaviest in weight

ii.

Akbar is the lightest in weight

iii.

Shebaz weighs lighter than Ali and Ahmed

iv.

Shebaz weighs more than Nasir and Akbar

v.

In descending order it is as follows:

Ahmed, Ali, Shebaz, Nasir, Akbar

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Q12.a) Total people = 1000

Blood Group A = 300

" " B = 325

" " O = 250

" " AB = 125

Probability of random selected person having blood group AB:

As probability showcases the chances of an event to occur, the probability that a randomly selected individual from the group has blood group AB can be calculated as follows:

$$\text{Probability} = \frac{\text{number of desired outcome}}{\text{number of total outcomes}}$$

$$= \frac{\text{number of people with AB blood}}{\text{total people}}$$

$$= \frac{125}{1000}$$

$$\text{Probability} = \frac{1}{8}$$

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b) Given data

Friends = Ahmed, Ali, Akbar, Nasir,
Shebaz

Cities = V, W, X, Y, Z

Transport = Bus, Train, Plane, Car, Boat

Akbar went to V by car

Ali went to X by plane

Nasir went via boat

Shebaz went via train

As there is no bus in W and person
who went to X did not use boat,

i.

Ahmed travelled by bus and
went to city V or Z

ii.

The person who went to city X
used the plane.