(NOA)

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General Science and Ability

(Mock Exam #01)

(PART-II)
(SECTION-I)

Q₂-NO(03)

(a) why atoms form chemical bonds? Discuss covalent bond in a water molecule.

Ans: Atoms form covalent bond to achieve a stable electronic configuration, typically the noble gas configuration (completing their outer electron shell). There are several types of covalent bonds, but covalent bonds are particularly relevant to water molecules

In a water molecule (H_2O), each hydrogen atom (H) share a pair of electron with the oxygen atom (O). This sharing of electrons forms two covalent bonds, one between each hydrogen atom and the oxygen atom. Oxygen has 6 electrons in its outer shell and needs 2 more to complete its octet (8 electrons), while hydrogen has 1 electron and needs 1 more to complete its duet (2 electrons. By sharing electrons, oxygen and hydrogen achieve stable electron configuration, forming a polar molecule due to unequal sharing of electrons.

types of Ceramics.

Ans:- Doping:

Doping refers to intentionally introducing impurities into a semiconductor material to modify its electrical properties. This process is crucial in semiconductor manufacturing for controlling conductivity.

TYPES OF CERAMICS:-

01) Oxide Ceramics:

These ceramics are composed of metallic elements bonded with oxygen, such as alumina (Al_2O_3) and zirconia (ZrO_3). They are known for their high thermal and chemical stability.

02) Nitride Ceramics:

These ceramics are formed by bonding metallic elements with nitrogen, such as silicon nitride (Si_3N_4). They are valued for their hardness and excellent thermal shock resistance.

03) Carbide Ceramics:

Carbide ceramics are composed of metallic elements bonded with carbon, such as silicon carbide (SiC) and tungsten carbide (WC). They exhibit high

often used in cutting tools and abrasives.

04) **Silicate Ceramics:**

These ceramics contain silicon and oxygen as their primary components such as porcelain and traditional pottery. They are widely used in everyday application due to their versatility and ease of manufacturing.

(c) State some of the merits and demerits of global warming.

Ans:- **Merits of Global warming:**

• **Increased agricultural productivity:**

Warmer temperatures and higher CO_2 levels can enhance plant growth in some regions.

• **Open up new shipping routes:**

Melting ice caps may create new navigational routes in Arctic region.

• **Access to new resources:**

Melting ice can potentially unlock new reserves of oil, gas and minerals.

Demerits of global warming:

Sea level rise:
Melting ice caps and glaciers lead to higher sea levels, threatening coastal communities.

Extreme weather events:
Increased frequency and intensity of hurricanes, droughts, floods and heatwaves.

Biodiversity loss:
Disruption of ecosystems, loss of habitat and extinction of species due to changing climate.

Health impact:
Spread of diseases, heat-related illnesses and food insecurity.

(d) What is polio? What are challenges in eradication of polio in Pakistan?

Ans:- **Polio:**
Polio (poliomyelitis) is a highly infectious viral disease caused by poliovirus, primarily affecting young children. It spreads from one person to person and can lead to paralysis or even death.

Challenges in Eradication of Polio in Pakistan:

- **Insecurity and conflict:**
  Certain regions, particularly along Afghanistan-Pakistan border, are difficult to access due to security concerns, hindering vaccination campaigns.

- **Resistance and misinformation:**
  Some communities resist vaccination due to misconceptions about vaccine's safety and effectiveness, leading to low immunization coverage.

- **Infrastructure and logistics:**
  Pakistan's large population and diverse geography pose challenges in reaching remote and rural areas with vaccines that require cold chain storage.

- **Health System Weaknesses:**
  Limited healthcare resources, including trained personnel and adequate facilities, can impact effectiveness of vaccination campaigns.

  Efforts by government, international organizations, and local communities to address these challenges

to achieve polio eradication in Pakistan and globally.

Q:-04) (a) write a note on liver juice "Bile".

Ans:- Bile is a digestive fluid produced by liver and stored in gallbladder. It plays a crucial role in digestion and absorption of fats in small intestine. Bile is composed of bile salts, cholestrol, bilirubin (a breakdown product of henoglobin), electrolytes and water. Its main functions include:

· **Emulsification of fats:**
　　　　　Bile salts help break down large fat globules into smaller droplets, increasing surface area for digestive enzymes to act upon.

· **Aiding in digestion:**
　　　　　Bile acids facilitates digestion and absorption of fats and fat-soluble vitamins (A, D, E, K) in intestine.

· **Excretion of waste:**
　　　　　Bilirubin, a waste product from breakdown of old red blood cells, gives bile its yellowish-green color and is excreted in feces.

Bile is released into small intestine in response to presence of fats and aids in overall digestion and absorption of nutrients.

(b) Describe role of Kidney in excretion.

Ans:-

The kidneys play a vital role in excretory system, which involves filtering blood to remove waste products and regulating fluid balance. Key functions of Kidney in excretion include:

- **Filtration:** Blood enters Kidneys through renal artery, where it is filtered to remove waste products, excess ions (like potassium and sodium) and excess water. This forms urine.

- **Reabsorption:** Essential substances such as glucose, amino acids and water are reabsorbed back into bloodstream from renal tubules.

- **Secretion:** Additional waste products and excess substances (e.g drugs, urea) are actively transported from blood into renal tubules to be excreted in urine.

- **Regulation of blood pressure:**
  The kidneys help regulate blood pressure by adjusting volume of blood plasma and concentrations of electrolytes in body.

- **Production of hormones:**
  The kidneys produces hormones such as erythropoietin (regulates RBC production) and renin (involved in blood pressure regulation).

  Overall, kidneys maintain homeostasis by filtering blood, regulating fluid and electrolyte balance and eliminating metabolic waste products through urine.

(c) Discuss different methods of Solid Waste Management.

Ans: Solid waste management involves various methods to collect, treat and dispose of solid waste in an environmentally friendly manner. Some common methods include:

- **Landfill:** Waste is deposited and compacted in engineered landfills with liners and leachate collection systems to prevent contamination of soil and groundwater. Modern landfills also capture methane for energy generation.

- **Incineration:** Solid waste is combusted at high temperatures in waste-to-energy plants, producing heat or electricity. Advanced incineration technologies minimize emissions and recover energy from waste.

- **Recycling:** Materials such as paper, glass, metals and plastics are sorted, cleaned and processed into new products. Recycling reduces consumption of raw materials and energy and minimizes waste generations.

- **Composting:** Organic waste such as food scraps and yard waste is decomposed by microorganisms into nutrient-rich compost. Composting reduces methane emissions from landfills and enriches soil fertility.

- **Bioremediation:** Biological processes are used to degrade or detoxify contaminants in waste materials. This method is often used for treating hazardous wastes or contaminated soils.

- **Waste Minimization:** Strategies such as source reduction, product reuse and adopting eco-friendly products aim to reduce amount of waste products generated in first place.

(d) Define the terms:

(i) Anaemia: Anaemia is a medical condition characterized by a deficiency of red blood cells or hemoglobin in blood, leading to reduced oxygen transport to body tissues. Symptoms may include fatigue, weakness, pale skin and shortness of breath.

(ii) Appendicitis: Appendicitis is the inflammation of appendix, a small pouch located near the junction of small and large intestines. It is typically caused by blockage of appendix due to infection or stool, leading to pain, tenderness, nausea and fever.

(iii) **Spleen:** The spleen is an organ located in upper left part of abdomen. It acts as blood filter, removing old or damaged red blood cells and storing platelets and white blood cells. The spleen also plays a role in immune responses.

(iv) **Myopia:** Myopia, commonly known as nearsightedness, is a refractive error of eye where close objects are seen clearly, but distant objects appear blurred. It occurs when eyeball is too large/long or cornea is too curved, causing light rays to focus infront of retina -

(v) **Isotones:** Isotones are atoms of different elements that have same number of neutrons but different number of protons. As a result, they have different atomic numbers and belong to different elements, but they have same mass number.

(SECTION - II)

Q:-06) (a) In a bag, there are a certain number of toy - blocks with alphabets A, B, C and D written on them.

The ratio of blocks $A:B:C:D$ is in ratio $4:7:3:1$. If number of 'A' blocks is 50 more than number of 'C' blocks, what is number of 'B' blocks?

Ans:-

let number of blocks for A, B, C and D be represented as:

$A = 4x$

$B = 7x$

$C = 3x$

$D = x$

It's given that number of 'A' blocks is 50 more than number of 'C' blocks?

$4x = 3x + 50.$

Subtracting "$3x$" from b/s.

$4x - 3x = 3\!\!\!/x - 3\!\!\!/x + 50.$

$x = 50.$

Now, substituting 'x' back into expressions for A, B, C and D:

$A = 4x = 4(50) = 200$, $D = x = 50.$

$B = 7x = 7(50) = 350$

$C = 3x = 3(50) = 150$

number of 'B' blocks is 350.

(b) A pair of shoes originally cost is 80 $. If there is a 15% discount and 10% sale tax applied. What is final price?

Ans:-

Original cost of shoes = 80 $

Applying 15% discount.

Discount amount = $0.15 \times 80 = 12$ $

Price after discount = $80 - 12 = 68$ $

Now, applying a 10% sales tax on discounted price :

Tax amount = $0.10 \times 68 = 6.80$ $.

Final price = $68 + 6.80 = 74.80$ $.

So, final price of shoes is 74.80 $.

(c) A train travels 42 km between two stops at average of 36 km/hr. If train departs at 4pm. When does train arive?

Ans:

Distance travelled by train = 42 km.

Average speed of train = 36 km/hr.

Time taken = Distance / Speed

$$= \frac{42 \text{ km}}{36 \text{ km/hr}} = 1.1667 \text{ hrs} -$$

Convert hours to minutes

1 hr = 60 min
0.1667 hr × 60 min/hr = 10 min.

Therefore, total time taken is approximately 1hr and 10 min.

Train departs at 4 pm, so it arrive at.

4:00pm + 1 hr + 10 min = 5:10pm.

So, train arrives at 5:10 pm.

(·d) Rearrange the jumbled words.

(i) teninsuperted

" Uninterrupted.

(ii) hweti

" white

Q:NO (07)

(a) Find volume of cylinder with radius 30cm and height 1m.

Ans:- Given:

Radius $(r) = 30$ cm.

Height $(h) = 1m = 100$ cm.

volume of cylinder

$$V = \pi r^2 h.$$

putting values:

$$V = \pi (30)^2 \times 100$$

$$V = \pi \times 900 \times 100$$

$$V = 90000\pi.$$

Therefore volume of cylinder is

90000π cm^3 or $282,600$ cm^3.

(b) The average age of three boys is 15 years. If their ages are in ratio 3:5:7, what is age of youngest boy?

Ans:

Given:

Average age of 3 boys = 15 years

Ages are in ratio 3:5:7

Let ages be $3x, 5x, 7x.$

Average age formula:

$$\frac{3x + 5x + 7x}{3} = 15$$

Combine like -terms

$$\frac{15x}{3} = 15.$$

$$5x = 15$$
$$x = 3$$

Now,

Youngest boy's age $= 3x = 3 \times 3 =$
$$= 9 \text{ years.}$$

Therefore, age of youngest boy
is 9 years.

(C) Identify the Series:

(i) 8, 19, 52, 151, 447, ____ (what is
the wrong number in this series?)

Ans.   19 - 8 = 11
        52 - 19 = 33
        151 - 52 = 99
        447 - 151 = 296.

Difference b/w terms are increasing.
So,
        $447 + 296 = 743.$

So, next term in series is 743.

(ii) 11, 13, 17, 19, 23 ___

Ans. This series consist of prime numbers:

- 11 (prime)
- 13 (prime)
- 17 (prime)
- 19 (prime)
- 23 (prime)

The next prime no after 23 is 29.

Therefore, next term in series is 29.

(d) If a triangle has sides of 5cm, 4cm and 6cm. What will be each angle?

Ans

Using cosine rule.

$a = 5cm$ (opposite angle A)
$b = 4cm$ (opposite angle B)
$c = 6cm$ (opposite angle C).

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{4^2 + 6^2 - 5^2}{2(4)(6)}$$

$$\cos A = \frac{27}{48} = 0.5625$$

·Now,

$$A = \cos^{-1}(0.5625)$$
$$A \approx 55.3°$$

Therfore,

Angle $A \approx 55.3°$

Angle $B \approx 36.9°$

Angle $C \approx 87.8°$

$\longleftarrow \quad x \quad \longrightarrow$