

MT

2014 ___ ___ 1100

Seat No.

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MT - SCIENCE & TECHNOLOGY (72) - PRELIM II - PAPER - 2

Time : 3 Hours

(Pages 5)

Max. Marks : 80

Note :

- (i) All questions are compulsory.
- (ii) All questions carry equal marks.
- (iii) Draw neat and labelled diagrams wherever necessary.

SECTION - A

Q.1. (A) Answer the following sub-questions :

5

(1) **Find the odd man out :**

Brown, Blue, Green, Red.

(2) **Fill in the blank :**

(i) The arrangement of elements in a group of three is called

(ii) When acids and alkalis react together, and are formed.

(3) **State whether the following statements are true or false.**

- (i) Ecosystem can get severely disturbed due to natural disasters.
- (ii) The unit of potential difference is ampere.

Q.1. (B) Rewrite the following statements by selecting the correct options : **5**

- (1) Which colour of light deviates the least in the spectrum obtained with a prism ?
(a) Red (b) Yellow
(c) Violet (d) Blue

- (2) When the resistance of the conductor increases then the current will;
(a) increase (b) decrease
(c) remain same (d) None of these

- (3) I am connected always in parallel with the electric circuit.
(a) ammeter (b) voltmeter
(c) resistance (d) None of these

- (4) The period is the longest period in the modern periodic table.
(a) 1st (b) 5th
(c) 6th (d) 7th

- (5) is liberated when bleaching powder comes in contact with atmospheric CO₂ gas.
(a) H₂ (b) CO
(c) Cl₂ (d) NH₃

Q.2. Attempt any FIVE of the following : **10**

- (1) State the function of iris and ciliary muscles.
- (2) Distinguish between : Electric motor and generator.
- (3) State Fleming's left hand rule.

- (4) What is the speed of light in diamond if absolute refractive index of diamond is 2.4 and velocity of light in vacuum is 3×10^8 m/s ?
- (5) Distinguish between : Periods and Groups.
- (6) Explain the following chemical reaction with the help of balanced equation : Sugar (sucrose) is heated strongly.

Q.3. Attempt any FIVE of the subquestions : 15

- (1) What are the different laws to prevent pollution?
- (2) Write a note on dispersion of light.
- (3) Define refraction and state the laws of refraction.
- (4) Find the expression for resistivity of a material.
- (5) State the neutralization reaction with an example.
- (6) Explain the demerits of Mendeleevs periodic table.

Q.4. Attempt any ONE of the following : 5

- (1) Explain hypermetropia with its correction.
- (2) Write the physical properties and uses of washing soda and bleaching powder.

SECTION - B

Q.5. (A) Answer the following sub-questions : 5

- (1) **Find the odd man out :**
Methane, Ethane, Ethene, Butane.
- (2) Draw electron dot and cross structure of methane.
- (3) **Fill in the blank :**
..... give rise to variety and diversity.

- (4) **State whether the following statement is true or false. If false write the corrected statement :**

Almost all metals react with oxygen to form metal oxide, but the reactivity differs for different metals.

- (5) **Complete the co-relation :**

MPCB : For Maharashtra : : CPCB :

Q.5. (B) Rewrite the following statements by selecting the correct options : 5

- (1) Brass is an alloy of
(a) Cu and Sn (b) Cu and Zn
(c) Fe and C (d) Cu and Ni
- (2) is a metalloid.
(a) Aluminium (b) Antimony
(c) Zinc (d) Mercury
- (3) Some acetic acid is treated with solid NaHCO_3 . The resulting solution will be
(a) colourless (b) blue
(c) green (d) turbid
- (4) is a mode of asexual reproduction.
(a) Fission (b) Budding
(c) Spore formation (d) All of these
- (5) De-starching of the plant is done for the experiment on
(a) transpiration (b) photosynthesis
(c) respiration (d) diffusion

Q.6. Attempt any FIVE of the following : **10**

- (1) Distinguish between : Calcination and Roasting.
- (2) Write short note on alkanes.
- (3) How are neurons classified ? State their functions.
- (4) What are analogous organs ? Give examples.
- (5) Roots of plants go away from light. Why?
- (6) Explain the following chemical reaction with the help of balanced equations : Aluminium reacts with steam.

Q.7. Attempt any FIVE of the following : **15**

- (1) Explain the extraction of mercury using Cinnabar with suitable reactions.
- (2) Complete the following chemical reaction :
 - (a) $\text{CH}_4 + \text{Cl}_2 \xrightarrow{\text{UV Rays}} \dots\dots\dots + \text{HCl}$
 - (b) $\text{CH}_3\text{CH}_2\text{I} + \dots\dots\dots \xrightarrow{\Delta} \text{CH}_3\text{CH}_2\text{OH} + \text{KI}$
 - (c) $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \longrightarrow 2\dots\dots\dots + \text{H}_2 \uparrow$
- (3) Write short note on Lamarckism.
- (4) State work of WBCSD.
- (5) Write short note on reflex action.
- (6) How are fats digested in the human body ?

Q.8. Attempt any ONE of the following : **5**

- (1) Explain the structure and function of a nephron.
- (2) Describe the reproductive parts of a flower.

Best Of Luck 

MT

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MT - SCIENCE & TECHNOLOGY (72) - PRELIM II - PAPER - 2

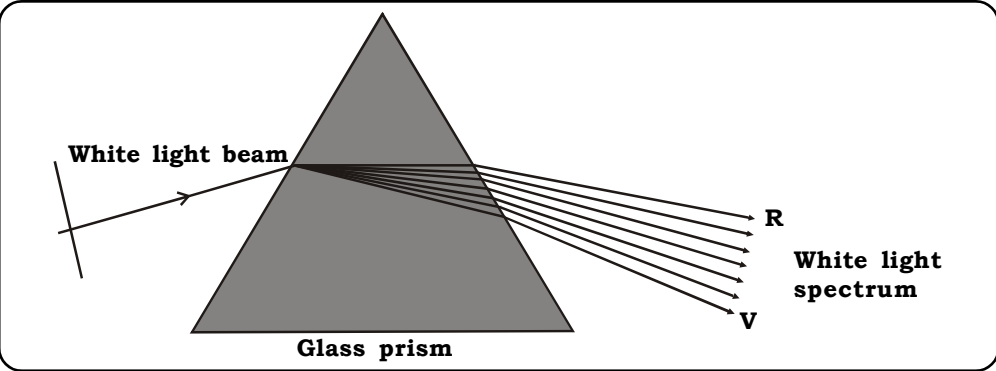
Time : 3 Hours

Prelim II Model Answer Paper

Max. Marks : 80

SECTION - A		
Q.1.	(A) Answer the following sub-questions :	
(1)	Brown. It is not the component of white light. Blue, red and green are components of white light.	1
(2)	(i) The arrangement of elements in a group of three is called triad .	1
	(ii) When acids and alkalis react together, salt and water are formed.	1
(3)	(i) True.	1
	(ii) False. The unit of potential difference is volt.	1
Q.1.	(B) Rewrite the following statements by selecting the correct options :	
(1)	Which colour of light deviates the least in the spectrum obtained with a prism ? Red	1
(2)	When the resistance of the conductor increases then the current will; decrease	1
(3)	I am connected always in parallel with the electric circuit. voltmeter	1
(4)	The 6th period is the longest period in the modern periodic table.	1
(5)	Cl₂ is liberated when bleaching powder comes in contact with atmospheric CO ₂ gas.	1
Q.2.	Attempt any FIVE of the following :	
(1)	1. Iris in human eye controls and regulates the amount of light entering the eye by contracting and dialating the pupil. 2. Ciliary muscles adjusts the focal length of eye lens by contracting and relaxing.	2

(2)	Electric motor	Electric generator	2
	1. A device which converts electrical energy into mechanical energy is called an electric motor. 2. Electric motor is based on a principle, when current carrying conductor is placed in a magnetic field a force acts on it. 3. It uses electricity.	1. An electric device which converts mechanical energy into electrical energy is called an electric generator. 2. It works on the principle of electromagnetic induction. 3. It generates electricity.	
(3)	Stretch the forefinger, the central finger and the thumb of your left hand mutually perpendicular to each other. If the forefinger shows the direction of the field and the central finger shows the direction of the current, then the thumb will point towards the direction of the motion of the conductor.		2
(4)	<p>Given : Velocity of light in vacuum (V_{vac}) = 3×10^8 m/s Refractive index of diamond (${}_{\text{vac}}\eta_{\text{dia}}$) = 2.4</p> <p>To find : Speed of light in diamond (V_{dia})</p> <p>Formula : ${}_{\text{vac}}\eta_{\text{dia}} = \frac{V_{\text{vac}}}{V_{\text{dia}}}$</p> <p>Solution : ${}_{\text{vac}}\eta_{\text{dia}} = \frac{V_{\text{vac}}}{V_{\text{dia}}}$</p> $\therefore V_{\text{dia}} = \frac{V_{\text{vac}}}{{}_{\text{vac}}\eta_{\text{dia}}}$ $\therefore V_{\text{dia}} = \frac{3 \times 10^8}{2.4}$ $\therefore V_{\text{dia}} = 1.25 \times 10^8 \text{ m/s}$ <p>The speed of light in diamond is 1.25×10^8 m/s.</p>		2
(5)	Periods	Groups	2
	1. Modern periodic table has 7 horizontal rows called as periods. 2. The number of shells present in the atom of an element determines the period number. 3. Elements show gradual variation in chemical properties along a period.	1. Modern periodic table has 18 vertical columns of elements called groups. 2. The number of electrons present in the outermost shell of an atom of the element determines the group number. 3. Elements belonging to a particular group show strong resemblance in their chemical properties like valency, formulae of compounds and chemical reactions.	

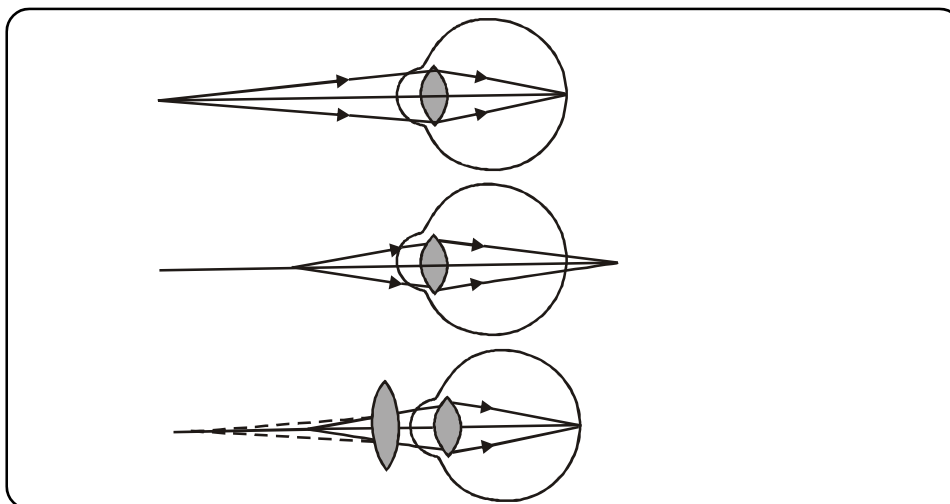
(6)	<p>When sucrose is heated strongly, it breaks down to give black coloured carbon and water. As heat is absorbed, it is an endothermic reaction. Since the decomposition is brought by heat, it is a thermal decomposition.</p> $\text{C}_{12}\text{H}_{22}\text{O}_{11(s)} \xrightarrow{\text{Heat}} 12\text{C}_{(s)} + 11\text{H}_2\text{O}_{(g)}$ <p style="text-align: center;">Sugar Carbon Water</p>	2
Q.3.	Attempt any FIVE of the subquestions :	
(1)	<p>Following are some of the laws related to pollution control:</p> <p>(i) Water (Prevention and Control of Pollution) Act, 1974. (ii) Air (Prevention and Control of Pollution) Act, 1981. (iii) Environment (Protection) Act, 1986. (iv) Various Laws and Rules have been made for hazardous waste, biomedical waste, solid waste, prevention of Noise pollution etc.</p>	3
(2)	 <p style="text-align: center;">Glass prism</p>	3
	<ol style="list-style-type: none"> 1. The phenomenon of splitting of light into its component colours is dispersion. 2. Sir Issac Newton was the first to use a glass prism to obtain the spectrum of sunlight. 3. A prism is a transparent medium bounded by two plane surfaces inclined at an angle. 4. When white light is dispersed into seven colours by a prism, different colours of light bend through different angles with respect to incident ray. 5. Out of these seven colours, red light bends the least while violet light bends the most, as each colour bends in different angle all colours become separate and we get a spectrum of seven different colours. 	
(3)	<p>Refraction : The phenomenon of change in the direction of light when it passes from one transparent medium to another is called refraction.</p> <p>Laws of refraction :</p> <ol style="list-style-type: none"> 1. The incident ray and the refracted ray are on the opposite sides 	3

	<p>of the normal at the point of incidence and all three lie in the same plane.</p> <p>2. For a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. If 'i' is the angle of incidence and 'r' is angle of refraction then,</p> $\frac{\sin i}{\sin r} = \text{Constant.}$	
(4)	<p>1. Resistance of a conductor depends on the length 'ℓ' and area of cross section 'A' of the conductor</p> $R \propto \ell$ <p>and $R \propto \frac{1}{A}$</p> $\therefore R \propto \frac{\ell}{A}$ $\therefore R = \rho \frac{\ell}{A}$ <p>2. Where ρ is called resistivity of the conductor. It is also called as specific resistance. If we put $\ell = 1\text{m}$ and $A = 1\text{m}^2$ then $\therefore R = \rho$</p> <p>3. Thus resistivity of a conductor is defined as the resistance of a conductor of unit length and unit area of cross - section.</p> <p>4. The S.I. unit of resistivity is ohm - metre ($\Omega\text{-m}$).</p>	3
(5)	<p>1. The reaction between acid and base to form salt and water is called as neutralization reaction. Acid + Base \rightarrow Salt + Water</p> <p>2. When an acid is treated with base, the base neutralizes the acid and destroys its acidity. Since an acid and base neutralize each other's effect, it is called as neutralization reaction.</p> <p>3. Eg.: When hydrochloric acid reacts with sodium hydroxide, then a neutralization reaction takes place to give salt and water. $\text{NaOH}_{(\text{aq})} + \text{HCl}_{(\text{aq})} \rightarrow \text{NaCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$</p>	3
(6)	<p>1. Hydrogen resembles alkali metals as well as halogens. Therefore, no fixed position could be given to hydrogen in the periodic table.</p> <p>2. Isotopes of same elements have different atomic masses; therefore each one of them should be given different position. On the other hand as isotopes are chemically similar, they had to be given same position.</p> <p>3. At certain places, an element of higher atomic mass has been placed before an element of lower atomic mass. For eg, cobalt (Co = 58.93) is placed before nickel (Ni = 58.71)</p>	3

4. Some elements placed in the same sub-group had different properties. Eg. Manganese (Mn) is placed with halogens which totally differs in the properties.

Q.4. Attempt any ONE of the following :

- (1)
1. It is the defect in which human eye can see distant objects clearly but is unable to see nearby objects clearly.
 - (a) Weak action of ciliary muscles causes low converging power of eye lens.
 - (b) The distance between eye lens and retina decreases on account of either shortening of eyeball or flattening of lens. In this case focal length of the eye lens is too long.
 3. A convex lens of suitable focal length can correct this defect.
 4. The rays coming from nearby object are first converged by convex lens and then converged by eye lens to retina.



(2) **Physical properties of washing soda.**

1. It is a white crystalline solid.
2. It is readily soluble in water.
3. On heating or exposure to air, it loses its water of crystallization and forms a white amorphous powder.
4. It turns red litmus blue indicating its basic nature.

Uses of washing soda.

1. It is used in washing clothes as a cleansing agent.
2. It is used for softening of hard water to soft water.
3. It is used in refining of petroleum.
4. It is used in manufacturing detergent powder, paper and glass.

Physical properties of bleaching powder.

1. It is a white powder and has a strong smell of chlorine.
2. It is fairly soluble in water.

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Uses of bleaching powder.

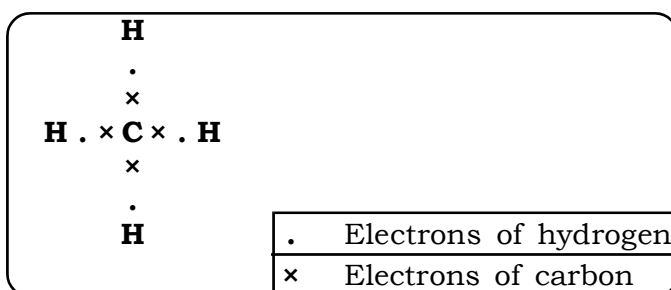
1. It is used to disinfect water.
2. It is used for bleaching cotton and linen in textile industry and bleaching wood pulp in paper industry. It is also used for bleaching washed clothes in laundry, the bleaching action is due to chlorine released by it.
3. It is used as an oxidizing agent in many chemical industries.
4. It is used to prepare organic solvent chloroform which is also used as an anaesthetic.

SECTION - B

Q.5. (A) Answer the following sub-questions :

(1) **Ethene.** It is an alkene while the rest are alkanes. 1

(2)



1

(3) **Variations** give rise to variety and diversity. 1

(4) **True.** 1

(5) **For India.** 1

Q.5. (B) Rewrite the following statements by selecting the correct options :

(1) Brass is an alloy of **Cu and Zn.** 1

(2) **Antimony** is a metalloid. 1

(3) Some acetic acid is treated with solid NaHCO₃. The resulting solution will be **colourless.** 1

(4) **All of these** is a mode of asexual reproduction. 1

(5) De-starching of the plant is done for the experiment on **photosynthesis.** 1

Q.6. Attempt any FIVE of the following :

(1)

Calcination	Roasting
1. In calcination, ore is heated in limited supply of air at high temperature. 2. It is generally used for carbonate ores. Eg. : $\text{ZnCO}_3 \xrightarrow{\Delta} \text{ZnO} + \text{CO}_2\uparrow$	1. In roasting, the ore is heated in excess supply of air at a high temperature. 2. It is generally used for sulphide ores. Eg. : $2\text{ZnS} + 3\text{O}_2 \xrightarrow{\Delta} 2\text{ZnO} + 2\text{SO}_2\uparrow$

2

(2)	<p>1. Alkanes are saturated hydrocarbons containing carbon-carbon (C–C) single covalent bonds.</p> <p>2. Alkanes have general formula of C_nH_{2n+2}.</p> <p>3. Examples : CH_4 (Methane), C_2H_6 (Ethane) etc.</p> <p>4. Alkanes can be straight chain and branched chain.</p> <p>Eg. $CH_3-CH_2-CH_2-CH_3$ $CH_3-CH-CH_2-CH_3$</p> <p style="text-align: center;"> </p> <p style="text-align: center;">CH_3</p> <p style="text-align: center;">Straight Chain Branched chain.</p>	2
(3)	<p>1. Neurons are of three types i.e. sensory neuron, motor neuron and association neuron.</p> <p>2. Sensory neurons conduct impulses from the sense organs to the brain and spinal cord.</p> <p>3. Motor neurons conduct impulses from the brain and spinal cord to the effector organs like muscles and glands.</p> <p>4. Association neurons perform integrative functions of the nervous system.</p>	2
(4)	<p>Organs which are fundamentally unlike but similar in function are termed as analogous organs. Eg. :</p> <ol style="list-style-type: none"> 1. Tail fin of lobster and flukes of whale. 2. Wings of fly and wings of a bird. 3. Eyes of arthropods and vertebrates. 	2
(5)	<ol style="list-style-type: none"> 1. The roots of plants respond to the stimulus of gravity and water. 2. These responses are called gravitropic and hydrotropic movements respectively. 3. Plants absorb water in which minerals are dissolved, from the soil with the help of their roots. 4. Therefore, roots of plants go away from light. 	2
(6)	<p>When aluminium reacts with steam to form aluminium oxide and hydrogen gas. Aluminium does not react with water under ordinary conditions because of a thin and tough layer of aluminium oxide on its surface.</p> $2Al_{(s)} + 3H_2O_{(g)} \rightarrow Al_2O_{3(s)} + 3H_{2(g)}$ <p style="text-align: center;">Aluminium Water Aluminium oxide Hydrogen</p>	2
Q.7.	Attempt any FIVE of the following :	
(1)	<p>Cinnabar (HgS) is an ore of mercury. When it is heated in air in excess of air (roasting), it is first converted into mercuric oxide(HgO). Mercuric oxide is then reduced to mercury on further heating.</p>	3

	$2\text{HgS} + 3\text{O}_2 \xrightarrow{\Delta} 2\text{HgO} + 2\text{SO}_2 \uparrow$ $2\text{HgO} \xrightarrow{\Delta} 2\text{Hg} + \text{O}_2 \uparrow$	
(2)	<p>(a) $\text{CH}_4 + \text{Cl}_2 \xrightarrow{\text{UV Rays}} \text{CH}_3\text{Cl} + \text{HCl}$</p> <p>(b) $\text{CH}_3\text{CH}_2\text{I} + \text{KOH} \xrightarrow{\Delta} \text{CH}_3\text{CH}_2\text{OH} + \text{KI}$</p> <p>(c) $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \longrightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2 \uparrow$</p>	3
(3)	<ol style="list-style-type: none"> 1. Lamarckism (Lamarckian inheritance) is the idea than an organism can pass on characteristics that it acquired during its lifetime to its offspring (also known as heritability of acquired characteristics or soft inheritance). 2. It is named after the French biologist Jean-Baptiste Lamarck (1744 - 1829), who incorporated the action of soft inheritance into his evolutionary theories. 3. He is often incorrectly cited as the founder of soft inheritance, which proposes that individual efforts during the lifetime of the organisms were the main mechanism driving species to adaptation as they supposedly would acquire adaptive changes and pass them on to their offspring. 	3
(4)	<p>(i) The World Business Council for Sustainable Development (WBCSD) is a global association of about 200 international companies.</p> <p>(ii) The term eco-efficiency was coined by WBCSD.</p> <p>(iii) It works on variety of issues related to sustainable development.</p> <p>(iv) The Council provides platform for companies to explore sustainable development, share knowledge, experiences and best practices and to advocate business positions on these issues in a variety of forums, working with governments, non-governmental organizations.</p> <p>(v) It focuses on areas such as energy and climate, development, ecosystems and role of business in society.</p> <p>(vi) It also looks after specific projects on cement, urban infrastructure initiative, tires, corporate reporting, water, energy efficiency in buildings, forest solutions, and electricity utilities.</p>	3
(5)	<ol style="list-style-type: none"> 1. Any sudden change in response to some happening in the environment, is called as reflex action. 2. We react to such a situation without thinking about it or without feeling in control of our reactions. 	3

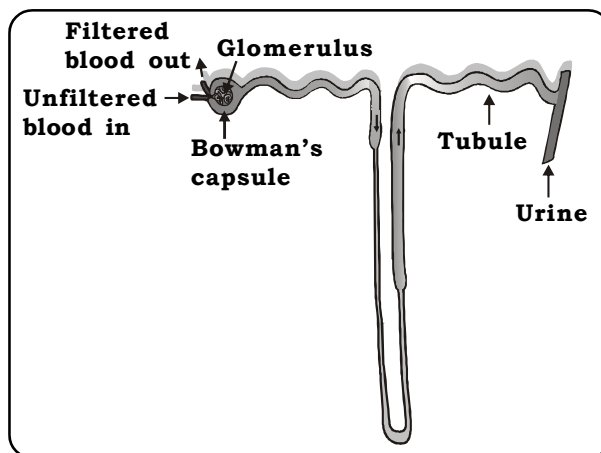
3. Example : When we touch a vessel containing very hot tea, immediately the hand is withdrawn.
4. In this case, the nerves that detect pain are connected to the nerves that bring about the action of the muscle, hence the action is completed quickly.
5. Nerves from all over the body meeting in a bundle in such a connection is called as the spinal cord.
6. Hence reflex arcs are formed in the spinal cord, although the messages reach the brain.

- (6)
1. Liver, the largest gland in the body secretes bile juice which is stored in the gall bladder.
 2. Whenever food enters the small intestine, the gall bladder releases bile into it through a duct.
 3. Bile makes the food alkaline and breaks the large fat globules into smaller ones, this increases the enzyme action.
 4. Pancreas secretes digestive juice. It has digestive enzymes like lipase which help to break down fats.
 5. Various intestinal juices are also secreted by the walls of the small intestine to complete the digestion process of converting fats into fatty acids.

3

Q.8. Attempt any ONE of the following :

- (1)
1. The basic filtration unit in the kidney is a cluster of thin walled blood capillaries called as a Nephron. Each kidney has approximately a million nephrons. Each nephron has a cup shaped thin walled upper end called Bowman's capsule which contains a bundle of blood capillaries called glomerulus.

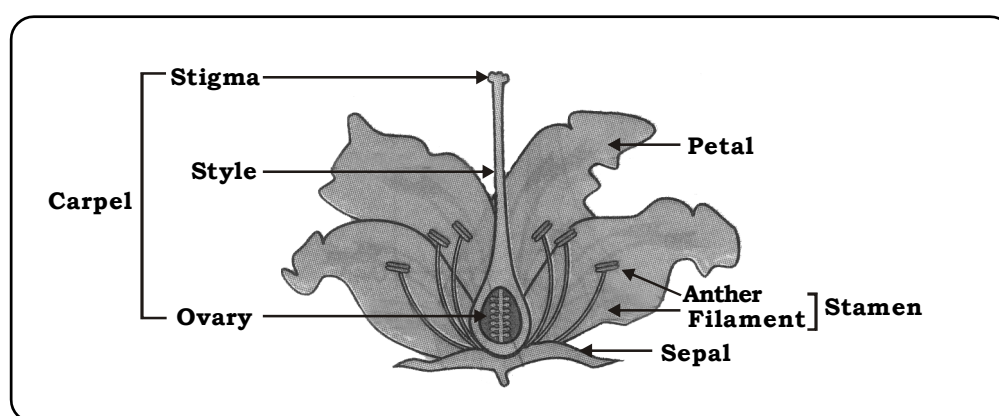


2. Urea formed in the liver enters the blood. When blood containing urea enters the glomerulus, it gets filtered through glomerular capillaries.
3. The selectively permeable wall of the Bowman's capsule allows the water molecules and small molecules of other substances to pass through them and forms glomerular filtrate.

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4. The glomerular filtrate collected in the Bowman's capsule further passes through the nephron tubule where reabsorption of water and useful molecules takes place.
5. The remaining fluid containing the waste, forms the urine which eventually enters long tube called the ureter. It is further stored in the urinary bladder and from there it is thrown out through the urethra.
6. As the bladder is muscular, it is under the control of nerves. As a result, we can usually control the urge to urinate.

(2)



5

In plants, flower is the functional unit concerned with sexual reproduction. The parts of the flower which are involved in reproduction are :

1. **Carpel** : Female reproductive part of a flower present in the centre. It is made up of three parts : stigma, style and ovary.
2. **Stigma** : It is the sticky terminal part of the style. It is the receptive organ on which pollen germinates.
3. **Style** : It is the elongated part of carpel bearing stigma at its tip.
4. **Ovary** : The swollen lower part of carpel containing one or more ovules. Each ovule has an egg cell (female germ cell).
5. **Stamen** : Male reproductive part of a flower made up of two parts anther and filament.
6. **Anther** : Usually bilobed and produces pollen grains.
7. **Filament** : Stalk of anther.

