MARCH-2014 : PAPER SOLUTION

PART-B : MARCH 2014

Time : 2 Hours] *[Total Marks : 50*

Instructions : As per Question Paper-1

SECTION-A

◆ **Question from 1 to 5 are short answer type question. Write answer to each using maximum 30 words. Each question carries 2 marks.**

1. How will nanotechnology help to face the future challenges? 2

Ans. Future challenges help to Nanotechnology :

→ Environmental problems can be solved.

→ Efficiency of renewable sources can be greatly improved.

→ It may help to grow life in outer space or planet.

→ It helps in sustaining the planet for future generation.

OR

1. Discuss any two properties of carbon nanotubes.

The properties of carbon nanotubes are as follows :

(i) **Tensile and Compressive Strength :** The tensile strength of carbon nanotube is enormously large compared to many bulky materials including steel A MWNT has tensile strength of 63×10^9 pascal (Pa) which is equivalent to having a weight of 6422 kg on a wire with 1 mm^2 of cross-section. However, under excessive tensile strain nanotubes show permanent deformation. Compared to their tensile strength, compressive strength is low. Also, along the radial direction nanotubes are much softer, can be bent like a rubber-tube.

(ii) **Hardness** : Hardness of a standard SWNT is about 25×10^9 Pa. The C_{60} fullerenes in crystalline form, known as "Fullerites" are prepared under high-pressure and high temperature conditions. They are also named as "Ultrahard Fullerites."

(iii) **Electrical Conductivity :** Metallic nanotubes can carry electric current of 10^9 ampere per 1 cm^2 cross-section of the tube, which is 1000 times more than conducting copper metal. MWNT also shows superconductivity up to the temperature of 12 K.

(iv) **Thermal Conductivity :** The carbon nanotubes have good thermal conductivity along its length. For example, SWNT has thermal conductivity of $3500 \frac{\text{watt}}{\text{m} \cdot \text{K}}$. While the same for copper is only $385 \frac{\text{watt}}{\text{m} \cdot \text{K}}$ at room temperature. Along the axis of the tube, nanotubes are good insulators. The thermal stability in vacuum is upto 3100K but only 1000 K in air.

2. Give definition of electric current and define it's unit. 2

Ans. Please Refer to July 2015 Q.2.

3. Briefly explain: Coal tar and Coal gas.

Ans. Coal tar :

→ It is a dark black coloured liquid.

→ Mostly, it contains variety of organic compounds.

→ In early days, coal tar was used in manufacture of organic substances like dyes, explosives, artificial fibres, insecticide, drugs, etc.

→ Now a days, these products are manufactured from petroleum products instead of coal tar.

Coal Gas :

→ Coal gas mainly contains carbon monoxide and some gascous hydrocarbons.

→ It is a mixture of combustible gases and so it is used as a fuel.

OR

3. Distinguish between L.P.G. and C.N.G.

Ans. Please Refer to July 2015 Q. 3.

4. Draw the diagram of human excretory system and label it. 2

Ans. Please Refer to July 2015 Q. 4.

5. What does global problems mean? Which are the global problems organisms facing today? 2

Ans. Please Refer to July 2015 Q. 5.

SECTION-B

❖ **Question from 6 to 10 are short answer type questions. Use maximum 30 words to answer them. Each question carries 2 marks.**

6. What are terrestrial planets? Mention the common characteristics of them. 2

Ans. After the sun, other important members of the solar family are the planets.

→ Our solar system has nine planets.

→ They can be classified in two.

(i) Terrestrial planets and (ii) Jovian planets

(1) Planets which are found inside the orbit of Mars are known as terrestrial planets. While the planets which are found outside the orbit of Mars are known as Jovian planets.

(2) Planets which are found outside the orbit of mars, known as Jovin plants.

→ Mercury, Venus, Earth and Mars are the terrestrial planets.

→ Structure of these planets resemble to earth.

→ These planets have fewer number of natural satellites and have thin atmosphere.

7. What is reflection? Give its two examples. 2

Ans. Please Refer to March 2015 Q. 7.

8. What is Neutralisation? Explain 2

Ans. Neutralisation :

→ Salt and water are formed by reaction of acid with base or base with acid. This reaction is known as neutralisation.

→ With the help of the experiment based on this reaction, the concentration of unknown acid or base can be known. This experiment is called neutralisation titration.

→ **Neutralisation reaction :**

(1)	$HCl_{(aq)}$ Strong acid	+	$NaOH_{(aq)}$ Strong base	→	$NaCl_{(aq)}$ Salt	+ $H_2O(l)$ Water
(2)	[illegible]		$KOH_{(aq)}$	→	[illegible]	+ $H_2O(l)$

9. Will geographical isolation be a major factor in the speciation of an organism that reproduces sexually? Give reason for your answer. 2

Ans. Specification :

→ The process of originating one or more new species of living organisms from the pre-existing species is called speciation.

→ When a population of a single species is split into two or more groups and large rivers, oceans, mountains, etc., may act as such barriers.

→ Cause the isolation of members of a single species into a few unapproachable groups.

→ The members of these isolated groups show gradual development of variations by natural selection.

→ The genetic drift being a random process these organisms become incapable to reproducing among themselves.

→ Thus, the gene flow ceases to exist between the isolated members of the same species. Thus, the geographical isolation, in long run, leads to reproductive isolation.

→ In such population several different types of changes such as the constitution of DNA (gene), the number of chromosomes in the cells. The structural changes in chromosomes, etc., occur.

→ The gametes of such isolated members of organisms are unable to join with each other for the process of fertilization. Due to such reasons the phenomenon of speciation occurs.

OR

9. Explain classification of living organisms on the basis of evolution.

Ans. Evolution and Classification :

→ Among organisms we find similarities that will allow us to classify them in to groups and study in detail.

→ The main characteristic of plant is that they can do photosynthesis while animal cannot do.

→ The cell is the basic fundamental unit of life.

→ The next characteristic of classification is that not all the organisms possess cells.

→ Among various organisms the basic characteristic of cell design is also different.

→ Some organisms like bacterial cell do not have nucleus. Organisms with nucleated cells are of two types, unicellular and multi-cellular. And there is a basic difference in body design, because of specialization of cells and tissues.

→ Among the multi-cellular organisms the skeleton around the body or inside the body will mark another basic design difference.

→ The more closely related two species have a common ancestor. For example a brother and sister are closely related and they have a common ancestor.

10. Give some approaches to water management. 2

Ans. Water Management :

→ Water management means a program to provide an adequate supply of good quality of water for different purposes without causing any harm to the source of water.

Some of the approaches to water management are as under :

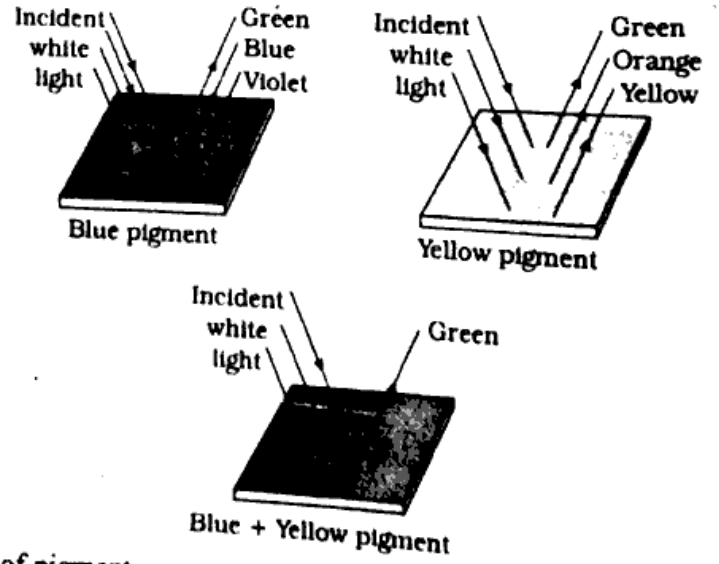
1. In hilly areas or flood prone areas, big water reservoir, ponds or dams should be constructed so that rain water and used water may be stored. This water percolates gradually and becomes ground water.
2. Canals should be constructed from the areas of excess water to the desert areas.
3. Domestic used water or municipal water should be recycled and should be used for irrigation.
4. By distillation, salt contents of sea water should be removed so that it may become drinkable. This is being adopted in Bhavnagar.
5. Excess use of water and wastage should be prevented as far as possible.

SECTION-C

❖ **Questions from 11 to 15 are short answer type question. Write answer to each using maximum 50 words. Each question carries 3 marks.**

11. Explain the subtractive method for mixing the pigments. 3

Ans. The method by which various pigments are produced due to mixture of different pigments is called **subtractive method**.



→ The colours of pigments are not pure. So, when white light is incident over them more than one coloured light gets reflected.

e.g., When white light is incident on blue pigment, only violet, blue and **green** colours of light are reflected and the remaining colours are absorbed.

→ If white light is incident on yellow pigment, only yellow, orange and **green** colours of light are reflected and remaining colours are absorbed.

→ Thus, green colour is commonly reflected by the two pigments, i.e., blue and yellow. Hence, if we 'combine yellow and blue pigments, only the **green** colour is reflected and the remaining colours are absorbed.

→ In this way one can obtain **green pigment by combining blue and yellow pigments.** This type of method of mixing of pigments is known as subtractive method.

→ Cyan, magenta and yellow are three primary pigments. By, mixing these primary pigments in proper proportion various coloured pigments can be produced.

12. State the characteristics of magnetic field lines. 3

Ans. Magnetic Field Lines : The magnetic field lines are the pictorial representation of a magnetic field.

Characteristics of Magnetic Field Lines :

→ Please Refer to July 2014 Paper Q. 12 (a)

OR

12. What precautions should be taken during the use of electricity?

Ans. Precautions should be taken during the use of Electricity :

(i) All connections must be light.

(ii) Switch off an switches including main switch whenever there is a sparking or fire.

(iii) Wires must be covered with proper insulation and of proper thickness.

(iv) All joints must be covered with insulating tape.

(v) Defective switches should be immediately replaced.

(vi) Fuses should be used in the circuit of proper rating.

(vii) The earth wire must be connected to the body of electric appliances.

(viii) Always put dry rubber shoes while repairing the circuit.

(ix) Do not touch switches with wet hands.

(x) Use always good quality wires.

13. Discuss Haber's process for industrial manufacture of ammonia. 3

Ans. Ammonia :

→ Ammonia is a very important chemical. It is used in production of nitric acid, polymers and in production of artificial fertilisers. Ammonia was synthesized by German Chemist Haber. Hence, this method of production of ammonia is known as Haber's process.

Industrial Manufacture of Ammonia :

→ Industrial production of ammonia is carried out by Haber's process.

→ In this method dihydrogen and dinitrogen gases are mixed in 3 : 1 proportion by volume and then passed over iron catalyst at 200-300 bar pressure.

→ Temperature about 773 K is maintained during this reaction.

→ Substances like Al_2O_3, K_2O are added to increase the efficiency of the catalyst. Hence, they are called promoters.

→ By cooling the reaction mixture at temperature lower than 273 K, ammonia can be separated from the unreacted N_2 and H_2 gases.

→ Thus, ammonia is obtained in the liquid form and N_2 and H_2 remained without reaction can be used again to take part in the reaction.

$$N_2(g) + 3H_2(g) \xrightarrow[200-300 \text{ bar [Fe]}]{773 \text{ K}} 2NH_3(g) + \text{Heat}$$

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14. What is soap? Describe its preparation. 3

Ans. Please Refer to March 2015 Q. 14.

OR

14. Describe the method of production of ethanol by fermentation reaction.

Ans. Ethanol (CH_3CH_2OH) :

→ Ethanol is also known as alcohol. It is present in some toxic drinks like whiskey, wine, beer, as well as certain syrups.

→ It also exists as component in dense liquid medicines for cough and for digestion.

Industrial Production of Ethanol by Fermentation Reaction :

→ First glucose and fructose are formed by the fermentation reaction of sugarcane juice, juice of fruits or grapes, molasses (the waste which is without sugar after removal of sugar from sugarcane is called molasses), etc in presence enzyme invertase.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{Invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$$

→ Ethanol and carbon dioxide are formed by fermentation of this glucose or fructose in presence of enzyme zymase. Both the enzymes invertase (sucrase) and zymase are present in yeast (which is in the skin of the grapes).

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2CO_2(g)$$

→ Ethanol is obtained as a mixture of 95% ethanol and 5% water which cannot be further concentrated.

→ But pure ethanol is obtained by membrane technology.

15. Explain female reproductive organs. 3

Ans. Female Reproductive System :

→ Female reproductive system is more complicated than that of male, because in female reproductive system those organs are included which are responsible for fertilization, implantation of embryo and development of embryo till birth occur.

Organs of Female Reproductive System :

→ Ovaries, oviduct, uterus, cervix, vagina and vaginal opening.

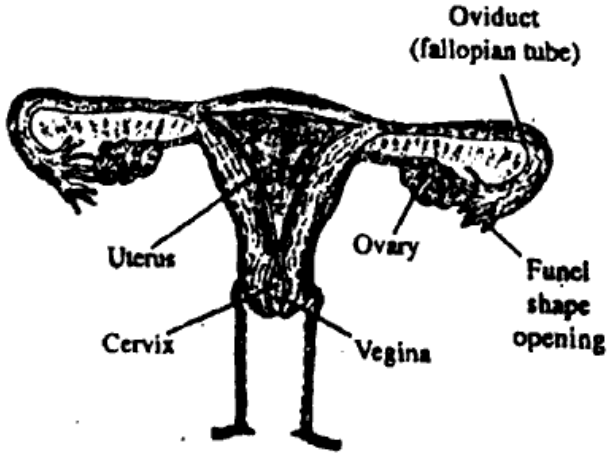

Figure : Female Reproductive System

→ **Ovary :** One pair of ovaries are oval in shape and lie inside the abdominal cavity. The ovary releases ovum. When a girl attains puberty ovarian follicle of ovary starts maturing and than release ovum. One of the ovaries produces one ovum every month.

→ The ovary also secretes female sex hormones - estrogen and progesterone.

→ **Oviduct (Fallopian tubule) :** One pair of oviducts are present which are not attached to ovaries. But their anterior ends are funnel-shaped and fimbricated, which are known as oviducal funnel. The released ova enters in the oviduct through it.

→ The fertilization of ovum by a sperm takes place in the initial part of the oviduct.

→ **Uterus :** The oviducts of both sides unite in middle to form a hollow pear-shaped muscular organ known as uterus. The implantation and development of embryo occurs here. The distal narrow end of uterus is called cervix.

→ **Vagina :** Through the cervix uterus opens in to tabular structure vagina. Vagina opens outside through the vaginal opening.

→ Vagina receives sperms by penis.

→ Child birth also occurs through it.

→ Accessary reproductive organs are labia majora, labia minora and clitoris.

SECTION-D

❖ **Questions number 16 to 18 are to be answered in details using nearly 100 words. Each question carries 5 marks.**

16. Derive the relation between focal length and radius of curvature for spherical mirrors. 5

Ans. Please Refer to July 2017 Q. 16 Ans.

17. Explain the method of obtaining pure aluminium from alumina. 5

Ans. Please Refer to July 2014 Q. 17 Ans.

OR

17. What is concentration of ore? Give the method of concentrating sulphide containing ore and describe it with figure.

Ans. Please Refer to July 2015 Q. 17 OR Ans.

18. Draw the labelled diagram of human digestive system and explain it. 5

Ans. Human Digestive System :

→ Human digestive system of human consists of alimentary canal and associated accessory digestive glands.

→ The human digestive organs comprise mouth, pharynx, oesophagus, stomach, small intestine, large intestine and associated glands like salivary gland, liver and pancreas.

→ The accessory digestive glands associated with the alimentary canal include salivary glands, liver and pancreas.

Organs of alimentary canal :

Mouth :

→ Digestion of food starts as soon as the food is placed in mouth. The mouth is the special origin for ingestion of food. There are teeth in the jaws, a muscular tongue and a few pairs of salivary glands in the mouth.

→ The teeth are useful for cutting, chewing and grinding the solid food components.

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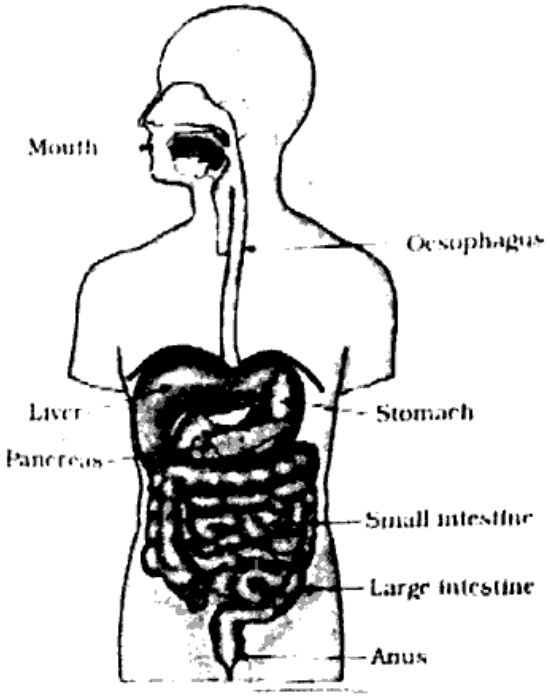
→ The tongue turns and moves the food in the mouth and mixes it with saliva from the salivary glands. The saliva moistens and lubricates the food.



The Human Digestive System

Pharynx :

→ The posterior part of the mouth (buccal cavity) is called pharynx. It opens in oesophagus and larynx (sound box) opens in pharynx.

Oesophagus :

→ It is a tube that starts from behind the pharynx, below the neck, passes through the thoracic region and diaphragm, to open in the stomach. It transports food from the mouth to the stomach.

Stomach :

→ Now the food is carried from oesophagus to stomach. The stomach is present on the left side of the abdomen. It inner lining (mucosa) consists of a large number of tabular glands - called gastric glands. These glands are formed of three types of cells which together secrete gastric juice. The posterior end of the stomach opens in the carliest part of the small intestine (duodenum) and the opening is guarded by sphincter muscles.

Small intestine :

→ The small intestine is man is the site of complete digestion of carbohydrates, proteins and fats. It is the longest part of the alimentary canal which is about 6.5 metres long in an adult man. It is the narrowest tabular organ of the alimentary canal and comprises of the earliest part - the duodenum, - a long middle part - the jejunum and a long hinder part - the ileum. The ileum opens in large intestine.

→ Liver and pancreas are the digestive glands from which bile and pancreatic juice respectively are poured in the duodenum by a common aperture. The inner lining of the small intestine possesses intestinal glands that secrete juice called intestinal juice.

→ The inner lining of the small intestine is projected towards the lumen to form a very large number of finger-like processes called villi. The villi are of great importance as

they greatly increase the surface area for absorption of digested food.

Large Intestine :

→ It is relatively thin walled and wider in diameter and about 1.5 m in length. It absorbs water and useful mineral salts from the undigested food remains. The residual contents form faeces.

Rectum :

→ It is the posterior part of the large intestine and stores faecal matter called faeces. The rectum opens externally as anus through which the faeces is discharged out of the body.

Accessory Digestive Glands :

→ **Salivary Glands :** There are three pairs of salivary glands associated with the mouth. A slimy, watery saliva, secreted from the salivary glands, moistens the food in the mouth, makes it slimy for being palatable and starts the digestion of food.

→ **Liver :** Slightly on the upper side of stomach, in the upper right part of the abdominal cavity, there lies a large gland called liver. It secretes greenish yellow alkaline fluid called bile which is stored in an oblong sac, called gall bladder.

→ **Pancreas :** In the U-shaped gap formed between the stomach and the duodenum, the pancreas is located. It secretes pancreatic juice which is also poured in the duodenum.

OR

18. What is Nutrition? What is the mode of nutrition in Amoeba known as? Draw diagram and explain.

Ans. Please Refer to July 2015 Q. 18.

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