

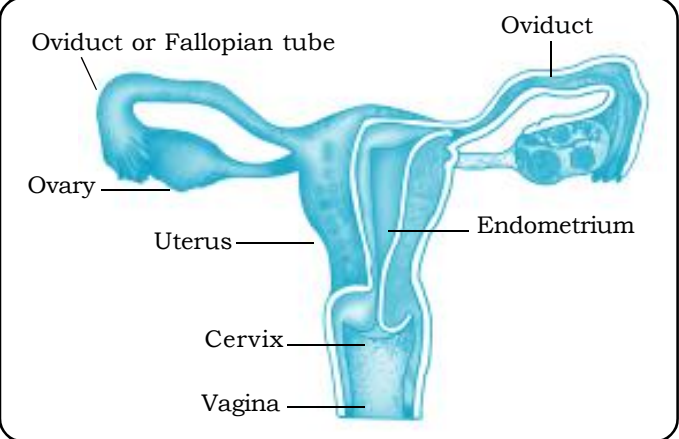
# MT

2017 \_\_\_ \_\_\_ 1100

MT - SCIENCE & TECHNOLOGY - II (72) - SEMI PRELIM - I : PAPER - 5

Time : 2 Hours      Semi Prelim - I : Model Answer Paper      Max. Marks : 40

<b>A.1. (A) Fill in the blanks :</b>	
(1) <b>Variation</b> gives rise to variety and diversity.	1
(2) Mendel's experiments were based on a number of visible contrasting characters of the garden peas <b>Pisum sativum</b> .	1
(3) <b>Chlorine</b> , a greenish coloured gas was used as a weapon in World War I.	1
<b>A.1. (B) Find the odd man out :</b>	
(1) <b>Malaria</b> - It is not a sexually transmitted disease whereas the others are sexually transmitted diseases.	1
(2) Antimony is a metalloid and rest are alloys.	1
<b>A.2. Rewrite the following statements by selecting the correct alternative:</b>	
(1) To observe the Hydra bud clearly, Raju should see it first under the low power lens and then under the high power lens in order to <b>Lessen the area</b> .	1
(2) The theory of natural selection was proposed by <b>Charles Darwin</b> .	1
(3) <b>CuSO<sub>4</sub></b> solution in water is blue in colour.	1
(4) Ethanoic acid <b>has a vinegar like odour</b> .	1
(5) <b>Cu &lt; Fe &lt; Zn &lt; Al</b> is correct according to the reactivity of metals.	1
<b>A.3. Answer the following in short : (Any 5)</b>	
(1) (i) During sexual reproduction, a male and a female gametes fuse to form a zygote which then develops into an individual species. (ii) Since there is fusion of two germ cells, the offspring produced by sexual reproduction is different from parents. (iii) Thus sexual reproduction brings about variation in species.	2

(2)	<p>(i) Hard water contains salts of calcium and magnesium.                  (ii) The soaps react with these salts and precipitate out forming a scum which sticks to the clothes.                  (iii) This leads to wastage of soaps and hence they are not effective in hard water.</p>	2								
(3)	<p>Human female reproductive system</p>  <p>The diagram illustrates the human female reproductive system. It shows a central pear-shaped organ called the uterus, which is lined with a layer of tissue called the endometrium. Two fallopian tubes, also known as oviducts, extend from the upper corners of the uterus to the ovaries. The ovaries are located on either side of the uterus. Below the uterus is the cervix, which leads into the vagina.</p>	2								
(4)	<p><b>Cations and Anions :</b></p> <table border="1" data-bbox="300 1142 1300 1523"> <thead> <tr> <th data-bbox="300 1142 774 1187" style="text-align: center;">Cations</th> <th data-bbox="774 1142 1300 1187" style="text-align: center;">Anions</th> </tr> </thead> <tbody> <tr> <td data-bbox="300 1187 774 1265">(i) Cations are positively charged ions.</td> <td data-bbox="774 1187 1300 1265">(i) Anions are negatively charged ions.</td> </tr> <tr> <td data-bbox="300 1265 774 1422">(ii) Generally, metals produce cations. Eg. : Na<sup>+</sup> (sodium ion), K<sup>+</sup> (potassium ion).</td> <td data-bbox="774 1265 1300 1422">(ii) Generally non-metals produce anions. Eg. : Cl<sup>-</sup> (chloride ion), Br<sup>-</sup> (bromide ion).</td> </tr> <tr> <td data-bbox="300 1422 774 1523">(iii) During electrolysis cations are discharged at cathode.</td> <td data-bbox="774 1422 1300 1523">(iii) During electrolysis anions are discharged at anode.</td> </tr> </tbody> </table>	Cations	Anions	(i) Cations are positively charged ions.	(i) Anions are negatively charged ions.	(ii) Generally, metals produce cations. Eg. : Na <sup>+</sup> (sodium ion), K <sup>+</sup> (potassium ion).	(ii) Generally non-metals produce anions. Eg. : Cl <sup>-</sup> (chloride ion), Br <sup>-</sup> (bromide ion).	(iii) During electrolysis cations are discharged at cathode.	(iii) During electrolysis anions are discharged at anode.	2
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(5)	<p>(a) <b>Heredity</b> : Heredity is defined as the transmission of traits, physical or mental, from parents to offspring.</p>	1								
	<p>(b) <b>Phenotype</b> : The phenotype is the appearance of any detectable characteristic feature of an individual.</p>	1								
(6)	<p>When aluminium reacts with steam, it forms 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</p>	3								

	its surface. $2\text{Al}_{(s)} + 3\text{H}_2\text{O}_{(g)} \rightarrow \text{Al}_2\text{O}_{3(s)} + 3\text{H}_{2(g)}$ <p style="text-align: center;">Aluminium                  Water                  Aluminium                  Hydrogen (steam)                                  oxide</p>	
(7)	(a) <b>Galvanising</b> : It is a process of giving a thin coating of zinc on iron or steel to protect it from corrosion.	1
	(b) <b>Unsaturated hydrocarbons</b> : Hydrocarbons in which carbon atoms are linked to each other by double or triple covalent bonds are known as unsaturated hydrocarbons.	1
<b>Q.4.</b>	<b>Answer the following in brief : (Any 5)</b>	
(1)	<b>Lamarckism (Lamarckian inheritance) :</b> (i) Lamarckism (Lamarckian inheritance) is the idea that 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). (ii) It is named after the French biologist Jean-Baptiste Lamarck (1744 - 1829), who incorporated the action of soft inheritance into his evolutionary theories. (iii) 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
(2)	(i) When sodium metal comes in contact with ethanol it liberates hydrogen gas. $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \rightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2 \uparrow$ <p style="text-align: center;">Ethanol                  Sodium                  Sodium                  Hydrogen                                  metal                  ethoxide                  gas</p> (ii) When ethanol reacts with $\text{PCl}_3$ (Phosphorous trichloride) it forms ethylchloride and phosphorous acid. $3\text{C}_2\text{H}_5\text{OH} + \text{PCl}_3 \rightarrow 3\text{C}_2\text{H}_5\text{Cl} + \text{H}_3\text{PO}_3$ <p style="text-align: center;">Ethanol                  Phosphorous                  Ethyl                  phosphorous                                  trichloride                  chloride                  acid</p>	3
(3)	(a) <b>Reproduction</b> : The process of production of new individuals of the same species, that is a new generation of the species from an existing individual is called as reproduction.	3

	<p>(b) <b>Asexual reproduction and Sexual reproduction</b></p> <table border="1" data-bbox="308 383 1305 831"> <thead> <tr> <th data-bbox="308 383 786 427"><b>Asexual reproduction</b></th> <th data-bbox="786 383 1305 427"><b>Sexual reproduction</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="308 427 786 517">(i) Only one parent is involved in asexual reproduction.</td> <td data-bbox="786 427 1305 517">(i) Two parents are involved in sexual reproduction, one male and the other female.</td> </tr> <tr> <td data-bbox="308 517 786 607">(ii) There is no fusion of two different cells.</td> <td data-bbox="786 517 1305 607">(ii) There is fusion of two germ cells.</td> </tr> <tr> <td data-bbox="308 607 786 651">(iii) It occurs in somatic cells.</td> <td data-bbox="786 607 1305 651">(iii) It occurs in germ cells.</td> </tr> <tr> <td data-bbox="308 651 786 741">(iv) Offsprings are identical to the parent.</td> <td data-bbox="786 651 1305 741">(iv) Offsprings are different from parents.</td> </tr> <tr> <td data-bbox="308 741 786 831">(v) It is a rapid method of reproduction.</td> <td data-bbox="786 741 1305 831">(v) It is a slow method of reproduction.</td> </tr> </tbody> </table> <p>(4) (i) The most common ore of aluminium is bauxite (<math>\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}</math>).  (ii) Bauxite contains only 30-70% <math>\text{Al}_2\text{O}_3</math> and the remaining portion is gangue containing sand, iron oxide (<math>\text{Fe}_2\text{O}_3</math>), silica (<math>\text{SiO}_2</math>). These impurities are removed by Bayer's process.  (iii) In this process, the ore is first crushed and then treated with hot concentrated caustic soda (<math>\text{NaOH}</math>) solution under high pressure for 2 to 8 hours at <math>140^\circ\text{C}</math> to <math>150^\circ\text{C}</math> in a tank called digester. Aluminium oxide being amphoteric in nature dissolves in aqueous sodium hydroxide to form water soluble sodium aluminate.  <math display="block">\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}</math> <div style="text-align: center;">sodium aluminate</div> (iv) The iron oxide in the gangue does not dissolve in aqueous sodium hydroxide and is removed by filtration.  (v) However silica from the gangue dissolves in aqueous sodium hydroxide forming water soluble sodium silicate.  (vi) Diluting sodium aluminate with water and then cooling to <math>50^\circ\text{C}</math>, it is hydrolysed to give aluminium hydroxide as a precipitate.  <math display="block">\text{NaAlO}_2 + 2\text{H}_2\text{O} \rightarrow \text{Al}(\text{OH})_3 \downarrow + \text{NaOH}</math> (viii) The precipitate is filtered, washed, dried and ignited at <math>1000^\circ\text{C}</math> to get alumina (<math>\text{Al}_2\text{O}_3</math>).  <math display="block">2\text{Al}(\text{OH})_3 \xrightarrow[1000^\circ\text{C}]{\Delta} \text{Al}_2\text{O}_3 + 3\text{H}_2\text{O} \uparrow</math> <div style="text-align: center;">alumina</div></p> <p>(5) An alloy is a homogenous mixture of two or more metals or a metal and a non-metal in a definite proportion. The resultant metals called alloys do not corrode easily,</p>	<b>Asexual reproduction</b>	<b>Sexual reproduction</b>	(i) Only one parent is involved in asexual reproduction.	(i) Two parents are involved in sexual reproduction, one male and the other female.	(ii) There is no fusion of two different cells.	(ii) There is fusion of two germ cells.	(iii) It occurs in somatic cells.	(iii) It occurs in germ cells.	(iv) Offsprings are identical to the parent.	(iv) Offsprings are different from parents.	(v) It is a rapid method of reproduction.	(v) It is a slow method of reproduction.	<p><b>3</b></p> <p><b>3</b></p> <p><b>3</b></p>
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	<p>Eg. :</p> <p>(i) Brass (copper and zinc)  (ii) Bronze (copper and tin)  (iii) Stainless steel (iron, nickel and chromium)  If one of the metal is mercury, then the alloy is known as an amalgam.</p> <p>(6) <b>Budding in Hydra :</b>  (i) Hydra uses regenerative cells for reproduction in the process of budding.  (ii) When Hydra reaches maturity, its body wall begins to form a rounded growth.  (iii) This growth is called bud which later develops into a miniature Hydra.  (iv) The body layers and body cavity of the young Hydra are continuous with that of the parent hydra.  (v) When the young Hydra is sufficiently developed to take independent existence, the base of the new Hydra is sealed off. Thus the Hydra breaks off from the parent Hydra.</p> <p>(7) (a) but - 2 - ene  (b) ethyne  (c) 1, 2 dibromo ethane</p> <p><b>A.5. Answer in detail: (Any 1)</b>  (1) <b>Darwin's theory of evolution :</b>  (i) Darwin's theory explains the process of how evolution took place. He suggested that only the fittest survive and the others die.  (ii) The species then pass on these characteristics to the next generation which in turn helps them to survive.  (iii) Only those factors which help any individual to survive are retained and others are lost.  (iv) This process continues from generation to generation and in the struggle for survival among individuals, only those possessing the factors at greater levels survive.  (v) These adapted individuals may be very different from the original species. This process is described as natural selection.  (vi) Selection by nature is not deliberate but natural.  (vii) The criterion for natural selection is only one i.e. successful adaptation for growth and reproduction in the given environment.  (viii) The theory of natural selection helped to explain the process of development in living things. However, the theory did not</p>	<p><b>3</b></p> <p><b>1</b> <b>1</b> <b>1</b></p> <p><b>5</b></p>
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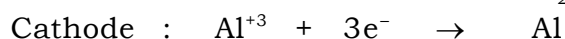
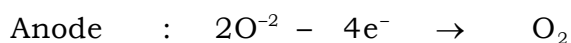
explain how an individual plant or animal acquired factors that made it better adapted to its surrounding.

(ix) Later the discovery of the laws governing heredity and mutation explained these findings and thus Darwin's theory came to be universally accepted.

(2) (i) In this process a molten mixture of pure alumina (M.P is  $> 2000^{\circ}\text{C}$ ) is electrolysed in a steel tank.

(ii) This tank is lined inside with carbon (graphite) which acts as a cathode, and a set of carbon (graphite) rods dipped in the molten electrolyte act as anode. Cryolite ( $\text{AlF}_3 \cdot 3\text{NaF}$ ) and fluorspar ( $\text{CaF}_2$ ) is also added to the mixture to reduce the melting point to about  $1000^{\circ}\text{C}$ .

(iii) On passing the current, aluminium is formed at the cathode. The molten aluminium being heavier than the electrolyte used, sinks to the bottom of the tank from where it is removed periodically. On the other hand oxygen is liberated at the anode. The electrode reactions are shown below :



(iv) The oxygen gas liberated, reacts with carbon anode and forms carbon dioxide. As the anode gets oxidized during the electrolysis of alumina, it has to be replaced from time to time.

