

MT

2017 ____ 1100

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

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

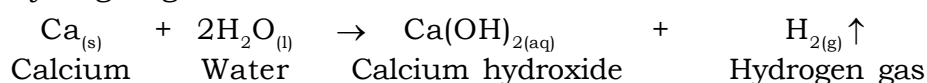
A.1. (A) Fill in the blanks :	
(1) Reproduction is necessary to maintain the number of individuals of a species.	1
(2) Both the parents contribute equal amount of genetic material to the off-spring.	1
(3) Corrosion is degradation of materials due to reaction with its environment.	1
A.1. (B) Match the items in column 'A' with those of column 'B' :	
(1) Planaria : regeneration :: Rhizopus spore formation .	1
(2) Na : Na ₂ O :: Al : Al₂O₃ .	1
A.2. Rewrite the following statements by selecting the correct alternative:	
(1) In Hydra the type of reproduction is Budding .	1
(2) The quantity of hormones produced by the plants depends upon the efficiency of the concerned enzyme .	1
(3) (c)Cu < Fe < Zn < Al	1
(4) H₂ gas is liberated when acetic acid reacts with sodium metal.	1
(5) A solution of Al ₂ (SO ₄) ₃ in water is colourless .	1

A.3. Answer the following in short : (Any 5)

- (1) (i) Winter is very severe at Siberia in Russia.
 (ii) Siberian cranes cannot tolerate such extremely low temperatures.
 (iii) In Bharatpur, India, the climate is comparatively warmer and food is available in plenty.
 (iv) Therefore, to escape from the unfavourable climatic conditions, Siberian cranes migrate to Bharatpur during winter.

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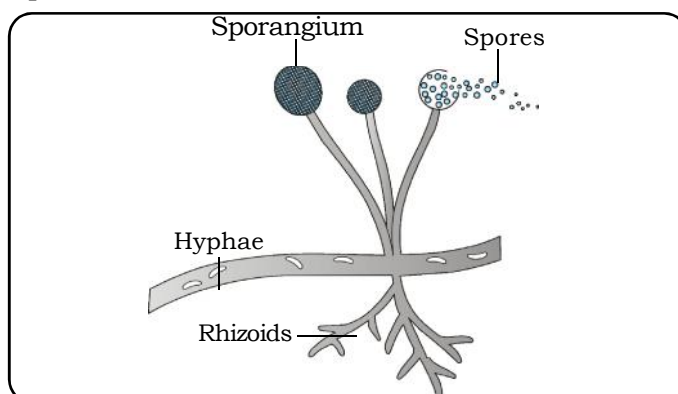
- (2) (i) Calcium reacts with cold water to form calcium hydroxide and hydrogen gas.



- (ii) The heat produced is less which is not sufficient to burn the hydrogen gas. The piece of calcium metal starts floating in water as bubbles of hydrogen gas formed during the reaction stick to its surface. This reaction is less violent.

2

- (3) Spore formation in Mucor :



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- (4)

Diamond	Graphite
(i) It is a hard, beautiful crystalline substance.	(i) It is a soft, greyish black crystalline substance.
(ii) Each carbon atom is linked to four other neighbouring carbon atoms.	(ii) Each carbon atom is attached to three other carbon atoms.
(iii) Shape is regular tetrahedron.	(iii) Shape is hexagonal planar.
(iv) No mobile electrons in the system and hence it is a non-conductor of electricity.	(iv) Free electrons move throughout the layers and hence it is a good conductor of electricity.

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(5)	<p>Organs which are fundamentally unlike but similar in function are termed as analogous organs. e.g.:</p> <p>(i) Tail fin of a lobster and flukes of a whale. (ii) Wings of fly and wings of a bird. (iii) Eyes of arthropods and vertebrates.</p>	2
(6)	<p>When zinc sulphide is heated in excess of air, it decomposes to give zinc oxide and sulphur dioxide gas is liberated.</p> $2\text{ZnS}_{(s)} + 3\text{O}_{2(g)} \xrightarrow[\text{Roasting}]{\Delta} 2\text{ZnO}_{(s)} + 2\text{SO}_{2(g)}$ <p style="text-align: center;"> Zinc Oxygen Zinc Sulphur sulphide oxide dioxide </p>	2
(7)	(a) Minerals : The naturally occurring compounds of metals along with other impurities are known as minerals.	1
	(b) Homologous series : A group of organic compounds containing same functional group, which can be represented by the same general formula and which more or less show similar trends in their properties is known as homologous series.	1
A.4.	Answer the following in brief : (Any 5)	
(1)	<p>Connecting links :</p> <p>(i) Organisms referred to as ‘connecting links’ are those which are structurally intermediate between two different groups. (ii) Connecting links can be found among organisms that are still living. (iii) e.g.:</p> <p>(a) ‘Peripatus’ has segmental nephridia, thin cuticle and parapodia - like appendages as in Annelida. At the same time it has trachea and open circulation as in Arthropoda. (b) The duck-billed platypus lays eggs like reptiles and has hair and mammary glands like mammals. (c) Lung fish, though a fish, breathes air through its lungs. (iv) These organisms point strongly to the fact that mammals have evolved from reptiles and amphibia from fishes.</p>	3
(2)	<p>Functional groups :</p> <p>(i) The atom or group of atoms present in the molecule which determines characteristic property of organic compound is called</p>	3

the functional group.

(ii) All organic compounds are considered as derivatives of hydrocarbons, it is formed by replacing one or more hydrogen atom in a molecule by some other atom.

(iii) In methane CH_4 , if one hydrogen is replaced by an $-\text{OH}$ group, then compound methyl alcohol, CH_3OH is formed. The $-\text{OH}$ group is the alcoholic functional group.

(iv) After replacement, a new compound has functions i.e. properties different from the parent hydrocarbon.

Type of compound	General formula $\text{R} = \text{C}_n\text{H}_{2n+1}$ $\text{R} = \text{alkyl group}$	Functional group	Compounds containing functional group	
			Name	Formula
1. Alcohols	$\text{R} - \text{OH}$	$-\text{OH}$	Ethyl alcohol	$\text{C}_2\text{H}_5 - \text{OH}$
2. Aldehydes	$\text{R} - \text{CHO}$	$\begin{array}{c} \text{H} \\ \\ (-\text{C} = \text{O}) \end{array}$	Acetaldehyde	$\begin{array}{c} \text{H} \\ \\ \text{CH}_3 - \text{C} = \text{O} \end{array}$
3. Ketones	$\begin{array}{c} \text{O} \\ \\ \text{R} - \text{C} - \text{R}' \end{array}$	$\begin{array}{c} \text{O} \\ \\ -\text{C}- \end{array}$	Acetone (Dimethyl ketone)	$\begin{array}{c} \text{O} \\ \\ \text{CH}_3 - \text{C} - \text{CH}_3 \end{array}$
4. Carboxylic acid	$\text{R} - \text{COOH}$	$-\text{COOH}$	Acetic acid	CH_3COOH

- (3) (i) There is a strong relation between high national fertility rate and measures of poverty.
(ii) As the population density increases, decrease in per capita income and natural resources takes place.
(iii) General health also goes down.
(iv) It creates an economic burden on the nation.
(v) Large families affect both the individual as well as the community life.
(vi) Economic pressure, mother's poor health, children neglected at home, poor housing, malnutrition, insufficient medical care, lack of better education are some of the disadvantages of large family size.

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- (4) (i) The most common ore of aluminium is bauxite ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$).
(ii) Bauxite contains only 30-70% Al_2O_3 and the remaining portion

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	<p>is gangue containing sand, iron oxide (Fe_2O_3), silica (SiO_2). These impurities are removed by Bayer's process.</p> <p>(iii) In this process, the ore is first crushed and then treated with hot concentrated caustic soda (NaOH) solution under high pressure for 2 to 8 hours at 140°C to 150°C in a tank called digester. Aluminium oxide being amphoteric in nature dissolves in aqueous sodium hydroxide to form water soluble sodium aluminate.</p> $\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$ <p style="text-align: center;">sodium aluminate</p> <p>(iv) The iron oxide in the gangue does not dissolve in aqueous sodium hydroxide and is removed by filtration.</p> <p>(v) However silica from the gangue dissolves in aqueous sodium hydroxide forming water soluble sodium silicate.</p> <p>(vi) Diluting sodium aluminate with water and then cooling to 50°C, it is hydrolysed to give aluminium hydroxide as a precipitate.</p> $\text{NaAlO}_2 + 2\text{H}_2\text{O} \rightarrow \text{Al}(\text{OH})_3 \downarrow + \text{NaOH}$ <p>(viii) The precipitate is filtered, washed, dried and ignited at 1000°C to get alumina (Al_2O_3).</p> $2\text{Al}(\text{OH})_3 \xrightarrow[1000^\circ\text{C}]{\Delta} \text{Al}_2\text{O}_3 + 3\text{H}_2\text{O} \uparrow$ <p style="text-align: center;">alumina</p>	
(5)	<p>(i) Aqua regia is a freshly prepared mixture of 1 part of concentrated nitric acid and 3 parts of concentrated hydrochloric acid. Thus the ratio of conc HCl and conc HNO_3 in aqua regia is 3:1.</p> <p>(ii) It is a highly corrosive and fuming liquid.</p> <p>(iii) It can dissolve gold and platinum metals.</p>	3
(6)	<p>Lamarckism (Lamarckian inheritance) :</p> <p>(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).</p> <p>(ii) It is named after the French biologist Jean-Baptiste Lamarck (1744 - 1829), who incorporated the action of soft inheritance into his evolutionary theories.</p> <p>(iii) He is often incorrectly cited as the founder of soft inheritance, which proposes that individual efforts during the lifetime of the</p>	3

organisms were the main mechanism driving species to adaptation as they supposedly would acquire adaptive changes and pass them on to their offspring.

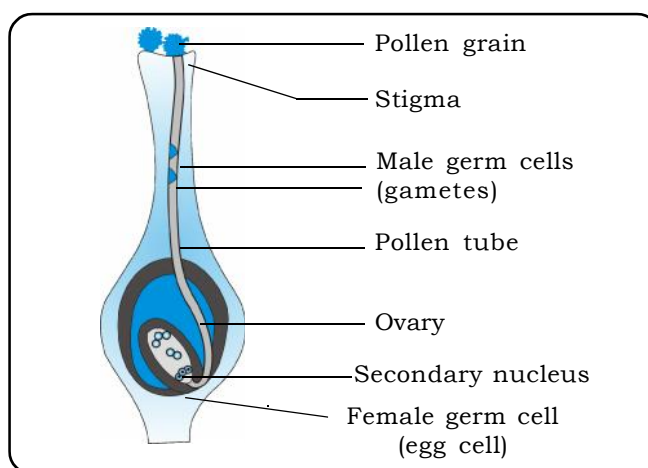
- (7) (a) methanoic acid
(b) ethanol
(c) 1, 2 dibromo ethane

1
1
1

A.5. Answer in detail: (Any 1)

- (1) The process of sexual reproduction in plants involves three processes:
(1) Pollination (2) Fertilization (3) Germination

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(i) Pollination:

- (a) The process of transfer of pollen grains from the anther to the stigma is called pollination.

(ii) Fertilization:

- (a) After the pollen grain lands on the stigma, it germinates.
(b) The pollen tube grows out from a pollen grain. It travels through the style to reach the ovary.
(c) Each pollen tube contains two male gametes and releases them near the egg.
(d) One male gamete fuses with the egg cell to form zygote.
(e) The second male gamete fuses with the secondary nucleus in the embryo sac to form endosperm. This is called as double fertilization.
(f) The zygote develops into embryo and the endosperm serves as nutritive tissue for the growing embryo. This embryo is capable of growing into a new plant.

(iii) Germination:

- (a) After fertilization, the zygote divides several times to form an embryo within the ovule.
- (b) The ovule develops into a seed and ovary develops into the fruit.
- (c) The seed contains the future plant. It develops into the seedling under appropriate conditions. This process is known as germination.

- (2) (i) In this process a molten mixture of pure alumina (M.P is > 2000°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 molten₃.3NaF) and fluorspar(CaF₂) is also added to the mixture to reduce the melting point to about 1000°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 :
- Anode : $2O^{-2} - 4e^{-} \rightarrow O_2$
- Cathode : $Al^{+3} + 3e^{-} \rightarrow Al$
- (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.
- $C + O_2 \rightarrow CO_2 \uparrow$

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