

MT

2014 ___ ___ 1100

Seat No.

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MT - SCIENCE & TECHNOLOGY (72) - PRELIM II - PAPER - 1

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 :**

- (i) Ammeter, Ampere, Volt, Coulomb.
- (ii) Li, Sr, K, Na.

(2) **State whether the following statements are true or false :**

- (i) Cigarette smoke is bad for health of not only the smoker but also others.
- (ii) Camphor sublimes on heating.

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

..... are major contributors to air pollution.

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

5

- (1) The direction of the magnetic field around a straight conductor carrying current is given by
(a) right hand rule (b) Fleming's left hand rule
(c) Fleming's right hand rule (d) none of these
- (2) A ray of light incident from a denser medium passes through a rarer medium in a straight line. What should be angle of incidence?
(a) 0° (b) 30°
(c) 60° (d) 90°
- (3) Which of the following represents the mirror formula ?
(a) $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ (b) $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$
(c) $\frac{1}{v} + \frac{1}{u} = \frac{1}{R}$ (d) $\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$
- (4) The electronic configuration of sodium is
(a) (2, 8, 1) (b) (2, 8, 8)
(c) (2, 8, 2) (d) (2, 8, 3)
- (5) If the pH of a solution is one, the solution is
(a) a strong acid (b) a strong base
(c) a very weak acid (d) a very weak base

Q.2. Attempt any FIVE of the following :

10

- (1) Distinguish between : Convex mirror and Concave mirror.
- (2) Draw a ray diagram for object position beyond $2F_1$ for a convex lens.
- (3) The sun appears reddish early in morning. Why?

- (4) Explain the zig-zag line in the periodic table.
- (5) Edible oil is not allowed to stand for a long time in an iron or tin container. Why?
- (6) Explain the following chemical reactions with the help of balanced equations : Baking soda (sodium hydrogen carbonate) reacts with dilute hydrochloric acid.

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

- (1) Write short note on Eutrophication.
- (2) Define refraction and state the laws of refraction.
- (3) Take finely powdered zinc and allow it to react with CuSO_4 . Then take zinc granules and carry out the same reaction. Which reaction takes place faster ? (Explain with proper chemical reaction).
- (4) Write short note on dispersion of light.
- (5) Write a short note on neutralization reaction.
- (6) State the characteristics of magnetic lines of force.

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

- (1) Give the construction and working of D.C. generator or Dynamo.
- (2) Find the expression for the resistance connected in series.

SECTION - B

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

- (1) **Fill in the blank :**
..... artery takes the blood to the lungs for oxygenation.
Pulmonary
- (2) **State whether the following statement is true or false :**
Ethane is the first member of alkane family.
- (3) **Define :** Calcination.
- (4) Name an alloy of copper and zinc
- (5) **Write the correlated terms :**
Ethane : C_2H_6 :: Benzene :

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

5

- (1) Guard cells lose turgidity in
(a) light (b) day time
(c) sunshine (d) darkness

- (2) The utilized sugar is stored in the form of in plants.
(a) glucose (b) glycogen
(c) starch (d) iodine

- (3) A student soaked 5 g of raisins in beaker A containing 25 ml of ice cold water and another 5 g of raisins in beaker B containing 25 ml of tap water at room temperature. After one hour the student observed that
(a) the water absorbed by raisins in beaker A is more than the water absorbed by raisins in beaker B.
(b) the water absorbed by raisins in beaker B is more than the water absorbed by raisins in beaker A.
(c) amount of water absorbed by raisins in both beakers is the same.
(d) no water was absorbed by raisins in any beaker.

- (4) To observe stomata in a dicot leaf, we must prepare a slide by taking
(a) the crushed leaf
(b) the upper epidermis of the leaf
(c) the lower epidermis of the leaf
(d) the central part of the leaf

- (5) is the hardest substance and has the highest melting and boiling points.
(a) Iodine (b) Sulphur
(c) Diamond (d) Phosphorus

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

- (1) Write balanced chemical reaction : Zinc reacts with dilute hydrochloric acid.
- (2) What is mitosis ? Represent in diagrammatically.
- (3) Write a note on : Palaentological evidence.
- (4) State two functions of MPCB for prevention of water pollution.
- (5) Distinguish between : Toilet soap amd Laundry soap.
- (6) Sodium and chlorine are poisonous substances but sodium chloride is edible. Why?

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

- (1) How will you obtain alternative fuel?
- (2) Distinguish between : Voluntary movements and Involuntary movements.
- (3) Write short note on homologous series.
- (4) Describe the mechanism of breathing in human beings.
- (5) Sudha dipped a copper coin in a solution of silver nitrate. After some time she saw the silver shine on the coin. Why? Give the balanced chemical equation for the same.
- (6) Describe spore formation in mucor with a diagram.

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

- (1) Describe the double circulation of blood.
- (2) Describe Darwin's theory of evolution.

Best Of Luck 🍀

MT

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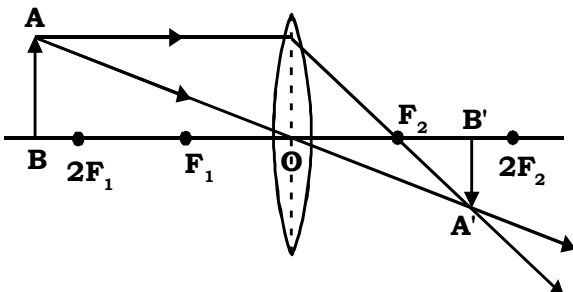
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Prelim II Model Answer Paper

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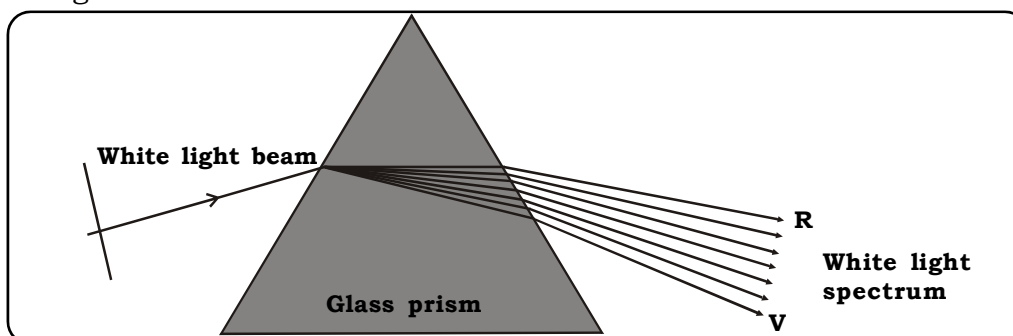
SECTION - A														
Q.1.	(A) Answer the following sub-questions :													
(1)	(i) Ammeter. It is a device used to measure electric current and the remaining are units.	1												
	(ii) Sr is an element of a different triad whereas Li, Na, K are elements of same triad.	1												
(2)	(i) True.	1												
	(ii) True.	1												
(3)	(i) Vehicles are major contributors to air pollution.	1												
Q.1.	(B) Rewrite the following statements by selecting the correct options :													
(1)	The direction of the magnetic field around a straight conductor carrying current is given by right hand rule.	1												
(2)	A ray of light incident from a denser medium passes through a rarer medium in a straight line. What should be angle of incidence? 60°	1												
(3)	Which of the following represents the mirror formula ? $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$	1												
(4)	The electronic configuration of sodium is (2, 8, 1).	1												
(5)	If the pH of a solution is one, the solution is a strong acid .	1												
Q.2.	Attempt any FIVE of the following :													
(1)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Convex mirror</th> <th style="width: 50%; text-align: center;">Concave mirror</th> </tr> </thead> <tbody> <tr> <td>1. In a convex mirror, the reflecting surface is on the outer side.</td> <td>1. In a concave mirror, the reflecting surface is on the inner side.</td> </tr> <tr> <td>2. It is called as diverging mirror.</td> <td>2. It is called as converging mirror.</td> </tr> <tr> <td>3. The focus of a convex mirror is virtual.</td> <td>3. The focus of a concave mirror is real.</td> </tr> <tr> <td>4. It can form only a virtual image</td> <td>4. It can form a real as well as a virtual image.</td> </tr> <tr> <td>5. It can form only a diminished image.</td> <td>5. It can form an enlarged, diminished as well as the same size image.</td> </tr> </tbody> </table>	Convex mirror	Concave mirror	1. In a convex mirror, the reflecting surface is on the outer side.	1. In a concave mirror, the reflecting surface is on the inner side.	2. It is called as diverging mirror.	2. It is called as converging mirror.	3. The focus of a convex mirror is virtual.	3. The focus of a concave mirror is real.	4. It can form only a virtual image	4. It can form a real as well as a virtual image.	5. It can form only a diminished image.	5. It can form an enlarged, diminished as well as the same size image.	2
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(2)	 <p>Image position : Between F_2 and $2F_2$. Nature : Real, inverted and diminished.</p>	2
(3)	<ol style="list-style-type: none"> 1. At the time of sunrise or sunset, the sun is very close to horizon. 2. Sunlight has to travel a longer path through the atmosphere to reach the observer. 3. The blue and violet colours are scattered in a greater amount than red colour. 4. The light that reaches to the observer is mostly red and yellow. Hence the sun appears reddish early in the morning. 	2
(4)	<ol style="list-style-type: none"> 1. On the basis of electronic configuration of elements, the periodic table is divided into four blocks namely, s-block, p-block, d-block and f-block. 2. The elements of s-block (except hydrogen), d-block and f-block are all metals. 3. In the p-block, all the three types of elements, i.e metals, non-metals and metalloids are present. 4. A zig-zag line separates the metals on the left side from the non-metals on the right side of the periodic table. 5. The bordering elements along the zig-zag line are the metalloids. These are Antimony (Sb), Germanium (Ge), Boron (B), Silicon (Si), Arsenic (As), Tellurium (Te), Polonium (Po), Astatine (At). They show intermediate properties and are called as metalloids or semi-metals. 	2
(5)	<ol style="list-style-type: none"> 1. Fats and edible oil when allowed to stand for a longer time in iron or tin container becomes rancid. 2. The condition produced by oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity. When the oil is heated, it starts frothing and smells foul. 3. If the food is cooked in rancid oil, it gives an unpleasant smell and taste, making it unfit for consumption. So, edible oil is not allowed to stand for a long time in an iron or tin container. 	2

(6)	<p>When sodium bicarbonate (sodium hydrogen carbonate) reacts with dilute hydrochloric acid to give sodium chloride, water and carbon dioxide gas is liberated.</p> $\text{NaHCO}_{3(s)} + \text{HCl}_{(aq)} \rightarrow \text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)} + \text{CO}_{2(g)}$ <p>Sodium bicarbonate Hydrochloric acid Sodium chloride Water carbon dioxide</p>	2
Q.3.	Attempt any FIVE of the subquestions :	
(1)	<p>(i) The enrichment of water bodies by inorganic plant nutrients like nitrate, phosphate occurring either naturally or due to human activity is called eutrophication.</p> <p>(ii) The process of eutrophication takes place due to introduction of nutrients and chemicals through discharge of domestic sewage, industrial effluents and fertilizers from agricultural fields.</p> <p>(iii) These promote excessive growth of phytoplankton and algae.</p> <p>(iv) When algae die, decomposition of organic substances use oxygen. This results is depletion of oxygen in water.</p> <p>(v) The bloom of algae blocks penetration of oxygen, light and heat into water body.</p> <p>(vi) As a result most of the organisms die below the surface of water.</p>	3
(2)	<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"> The incident ray and the refracted ray are on the opposite sides of the normal at the point of incidence and all three lie in the same plane. 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, $\frac{\sin i}{\sin r} = \text{Constant.}$ 	3
(3)	<p>1. The reaction is as follows :</p> <p>When zinc reacts with copper sulphate solution to give a water soluble compound zinc sulphate and reddish brown deposit of copper.</p> $\text{Zn}_{(s)} + \text{CuSO}_{4(aq)} \rightarrow \text{ZnSO}_{4(aq)} + \text{Cu}_{(s)}\downarrow$ <p>Zinc Copper sulphate Zinc sulphate Copper</p>	3

2. In solid reactants, the rate of a reaction depends upon size of particles. Smaller the size of particles, quicker is the reaction. This is because, in case of large solid reactants, only the molecules on surface are available for reaction. But if the reactants are finely powdered, the total surface area on all the smaller particles become much more and hence more number of molecules become available for reaction.
3. So, the reaction takes place faster with powdered zinc than zinc granules.

(4)



3

- The phenomenon of splitting of light into its component colours is dispersion.
- Sir Issac Newton was the first to use a glass prism to obtain the spectrum of sunlight.
- A prism is a transparent medium bounded by two plane surfaces inclined at an angle.
- When white light is dispersed into seven colours by a prism, different colours of light bend through different angles with respect to incident ray.
- 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.

(5)

- When a base reacts with acid, then a salt and water is formed. This is called as neutralization reaction.
- Eg. :
 - When hydrochloric acid reacts with sodium hydroxide, sodium chloride and water are formed.

HCl	+	NaOH	→	NaCl	+	H ₂ O
Acid		Base		Salt		Water
Hydrochloric acid		Sodium hydroxide		Sodium chloride		Water
 - When carbon dioxide is passed through lime water, it turns milky due to the formation of white precipitate of calcium carbonate.

Ca(OH) _{2(aq)}	+	CO _{2(g)}	→	CaCO ₃ ↓ _(s)	+	H ₂ O _(l)
Base		Acidic		Salt		
Water						
Calcium hydroxide		Carbon dioxide		Calcium carbonate		Water
- Thus this is a neutralization reaction where base reacts with acidic non-metallic oxide (CO₂) to form salt and water.

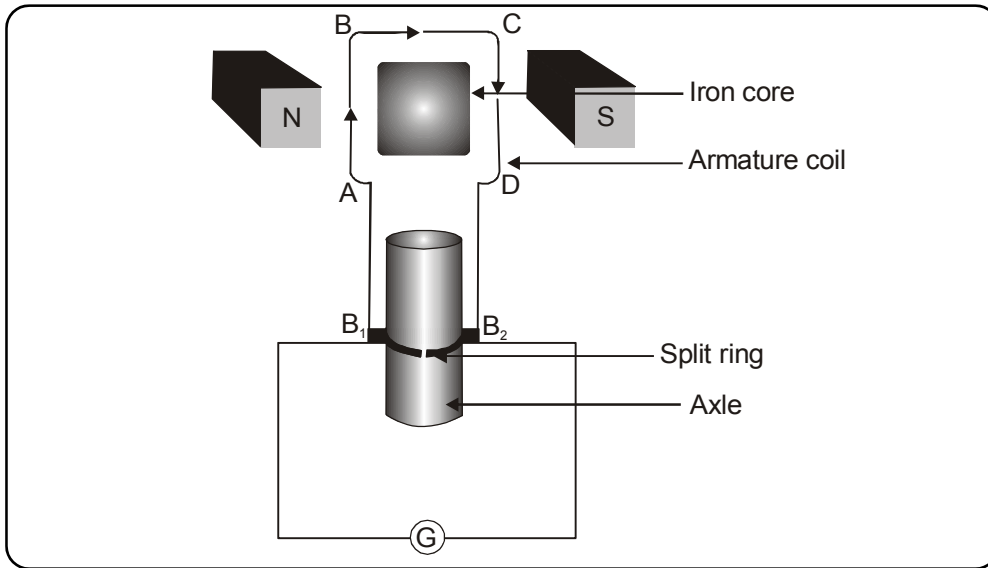
3

- (6)
1. Magnetic lines of force are closed continuous curves. They start from north pole and ends on south pole.
 2. The tangent at any point on the magnetic lines of force gives the direction of the magnetic field at that point.
 3. No two magnetic lines of force can intersect each other.
 4. Magnetic lines of force are crowded where the magnetic field is strong and far from each other where the field is weak.

3

Q.4. Attempt any ONE of the following :

(1)



5

Construction : The main components of D.C. generator are :

1. Armature coil
2. Strong magnets
3. Split rings or commutator
4. Brushes
5. Bulb.

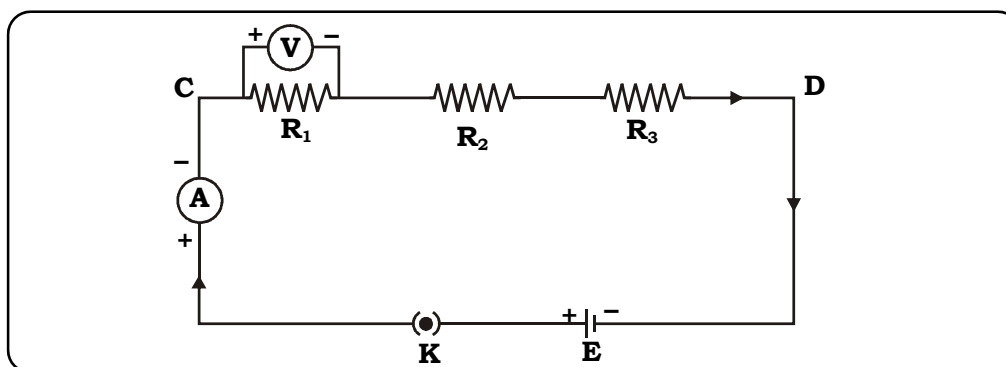
The components such as armature coil, strong magnet, brushes are the same which are used for AC generators.

Split rings or commutator is the same as used in electric motor.

Working of DC generator :

- (a) When the coil of DC generator rotates in the magnetic field, potential difference is produced in the coil. This gives rise to the flow of current. This is shown by glowing of the bulb.
- (b) In D.C. generator, the flow of current in the circuit is in the same direction as long as the coil rotates in the magnetic field.
- (c) This is because one brush is always in contact with the arm of the armature moving up and other brush is in contact with the arm of the armature moving downward in the magnetic field.

(2)



5

- Let R_1 , R_2 and R_3 be three resistances connected in series between C and D.
- Let R_s be the effective resistance in circuit and V_1 , V_2 and V_3 be the potential difference across R_1 , R_2 and R_3 respectively.
- Let the potential difference across CD be V .
- In series combination.

$$V = V_1 + V_2 + V_3 \quad \dots \text{ (i)}$$

By using Ohm's law

$$V = IR_s$$

$$\therefore V_1 = IR_1, V_2 = IR_2 \text{ and } V_3 = IR_3$$

Substituting these values in equation (i) we get

$$IR_s = IR_1 + IR_2 + IR_3$$

$$\therefore R_s = R_1 + R_2 + R_3$$

For 'n' number of resistors connected in series we get

$$R_s = R_1 + R_2 + R_3 + R_4 + R_5 + R_6 + \dots + R_n$$

Hence effective resistance in series is the sum of the individual resistances.

SECTION - B

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

- Pulmonary** artery takes the blood to the lungs for oxygenation. 1
- False.** Methane is the first member of alkane family. 1
- The process of converting carbonate ore into oxides by heating strongly in limited supply of air is called as calcination. 1
- Brass is an alloy of copper and zinc. 1
- C_6H_6 1

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

- Guard cells lose turgidity in **darkness**. 1
- The utilized sugar is stored in the form of **starch** in plants. 1
- A student soaked 5 g of raisins in beaker A containing 25 ml of ice cold water and another 5 g of raisins in beaker B containing 25 ml of tap water at room temperature. After one hour the student 1

(5)	<table border="1"> <thead> <tr> <th data-bbox="288 331 802 376">Toilet soap</th> <th data-bbox="802 331 1316 376">Laundry soap</th> </tr> </thead> <tbody> <tr> <td data-bbox="288 376 802 454">1. High quality of fats and oils used as raw material.</td> <td data-bbox="802 376 1316 454">1. Cheaper quality of fats and oil are used.</td> </tr> <tr> <td data-bbox="288 454 802 510">2. Expensive perfumes added.</td> <td data-bbox="802 454 1316 510">2. Cheaper perfumes added.</td> </tr> <tr> <td data-bbox="288 510 802 600">3. No free alkali content present to prevent injuries to skin.</td> <td data-bbox="802 510 1316 600">3. Free alkali present for cleaning action.</td> </tr> </tbody> </table>	Toilet soap	Laundry soap	1. High quality of fats and oils used as raw material.	1. Cheaper quality of fats and oil are used.	2. Expensive perfumes added.	2. Cheaper perfumes added.	3. No free alkali content present to prevent injuries to skin.	3. Free alkali present for cleaning action.	2		
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(6)	<p>1. Sodium chloride is a compound of sodium and chlorine.</p> <p>2. Physical and chemical properties of constituent elements are not retained in a compound (i.e. properties of sodium and chlorine are different as compared to sodium chloride.)</p> <p>3. When chemically bonded, these two poisonous substances form a compound sodium chloride so safe that we eat it every day.</p>	2										
Q.7.	Attempt any FIVE of the following :											
(1)	<p>(i) Alternative fuels are obtained through research.</p> <p>(ii) The organic waste from agriculture, factories and domestic use is utilized to produce alternative fuels. Biogas, bagasse and ethanol are some of the examples.</p> <p>(iii) Biogas is obtained by the fermentation of organic waste and animal dung in the biogas plant.</p> <p>(iv) Bagasse is the biomass left behind when sugarcane stalks are crushed to extract juice. This bagasse is used as fuel for boilers, and for manufacture of paper and production of ethanol.</p> <p>(v) Ethanol is produced by fermentation of wheat, maize, potatoes or sugarcane. This ethanol is mixed with petrol or diesel. Hence it is an alternative source of fuel.</p> <p>(vi) Solar power, wind power, tidal power, hydropower, geothermal power, etc. are also alternate sources of energy which are non polluting and inexhaustible.</p>	3										
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(3)	<p>A group of organic compounds containing same functional group, which can be represented by the same general formula and which more or less shows similar trends in their properties is known as Homologous series. Some important characteristics of homologous series are -</p> <ol style="list-style-type: none"> 1. The general formula of all compounds in the series is the same. 2. They have the same functional group. 3. Physical properties like melting point, boiling point, density, generally show a gradual change with increase of molecular formula in the series. 4. On the other hand, chemical properties of the member shown close resemblance because of the presence of the same functional group in them. 5. Consecutive members of the series differ from one another by - CH₂- group which is known as the methylene group and their molecular weight differs by 14 units. <p>Example : The alkane family is a homologous series and characterized by the general formula : C_nH_{2n + 2}</p>	3									
<table border="1"> <tbody> <tr> <td>Methane - CH₄</td> <td rowspan="2">- these differ by - CH₂ units.</td> </tr> <tr> <td>Ethane - C₂H₆</td> </tr> <tr> <td>Ethane - C₂H₆</td> <td rowspan="2">- these differ by - CH₂ units.</td> </tr> <tr> <td>Propane - C₃H₈</td> </tr> <tr> <td>Butane - C₄H₁₀</td> <td rowspan="2">- these differ by - CH₂ units.</td> </tr> <tr> <td>Pentane - C₅H₁₂</td> </tr> </tbody> </table>			Methane - CH ₄	- these differ by - CH ₂ units.	Ethane - C ₂ H ₆	Ethane - C ₂ H ₆	- these differ by - CH ₂ units.	Propane - C ₃ H ₈	Butane - C ₄ H ₁₀	- these differ by - CH ₂ units.	Pentane - C ₅ H ₁₂
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Pentane - C ₅ H ₁₂											
(4)	<p>A human adult at rest, on an average breathes about 12-20 times per minute i.e. 28800 times per day. The mechanism of breathing in human beings involves two processes : Inhalation and Exhalation.</p> <ol style="list-style-type: none"> 1. Inhalation : When the muscular diaphragm of the body contracts, volume of the thoracic cavity increases and air pressure inside the cavity decreases. The air from outside enters the lungs through the nostrils and the alveolar sacs are filled with air rich in oxygen. 2. Exhalation : When the diaphragm relaxes or becomes convex, the thoracic cavity decreases in volume. Lungs come to their original size, forcing the air outside the lungs through the same path but in the opposite direction. 	3									
(5)	<p>When a copper coin is dipped in silver nitrate solution, the solution becomes blue and shining white deposit of silver metal is deposited on the copper coin. In this reaction, copper displaces silver forming copper nitrate and silver metal.</p> $\text{Cu}_{(s)} + 2\text{AgNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_{2(aq)} + 2\text{Ag}_{(s)}$ <p>Copper Silver nitrate Copper nitrate Silver</p>	3									

<p>(6)</p>	<ol style="list-style-type: none"> 1. The hyphae of bread mould (Mucor) are thread like structures. 2. The mould forms spores inside the sporangium. 3. When the spores are ready to leave the sporangium, it breaks open. 4. If they land in a moist place, they germinate to form new mould. 		<p>3</p>
<p>Q.8. (1)</p>	<p>Attempt any ONE of the following :</p> <ol style="list-style-type: none"> 1. The muscles of the atria are relaxed. 2. The right atrium receives deoxygenated blood collected from different organs of the body via large veins called venacava. The left atrium receives oxygen rich blood from the lungs simultaneously through the four pulmonary veins. 3. The atria contract and pour the blood into respective ventricles which expand to receive the blood. Left ventricle gets filled with oxygenated blood and right ventricle gets filled with deoxygenated blood. 4. Now both the thick walled ventricles contract resulting in pumping out the oxygenated blood to all the parts of the body through the aorta (the largest artery) and the deoxygenated blood from the right ventricle enters the lungs through the pulmonary artery for oxygenation. 5. The valves between the atria and ventricles ensure that the blood does not flow backwards. 6. Thus the deoxygenated blood enters the right part of the heart and again after oxygenation it enters the left part of the heart so the blood goes through the heart twice during each cycle. This is known as double circulation. 		<p>5</p>
<p>(2)</p>	<ol style="list-style-type: none"> 1. Darwin's theory of evolution is based on natural selection. 2. On the basis of observations, Darwin suggested that only the fittest survive. All those plants and animals which are not fit, die. 		<p>5</p>

3. These fit species reproduce and pass on the relevant characteristics to the following generation which in turn would make them fit for survival.
4. The process of selection of characteristics that contribute to the fitness for survival was called natural selection by Darwin.
5. Only those factors which help any individual to survive are retained and others are lost.
6. This process continues from generation after generations. The total effect is that after several generations, the number of individuals having the relevant factors, that are better adapted to their surroundings, is much more than in the previous generations. These adapted individuals may also be very different from the original species.
7. This process is described as a natural selection of these individuals which have characteristics best adapted for survival.
8. Selection by nature is not deliberate but is natural. The criterion for the natural selection is only one i.e. successful adaptation for growth and reproduction in the given environment.
9. The theory of natural selection which was proposed by Charles Darwin helped to explain the process of development of living things.
10. However, the theory did not explain how an individual plant or animal acquired factors that made it better adapted to its surroundings.
11. In the course of time these questions were answered by the discovery of the laws governing heredity and mutation and thus Darwin's theory came to be universally accepted.

