15. CHEMICAL SUBSTANCES- NATURE AND BEHAVIOUR

<table>
<tr><th>Q. No</th><th>Question</th><th>Marks</th></tr>
<tr><td colspan="3">Multiple Choice Question</td></tr>
<tr><td>Q.48</td><td>Manav found an unknown solid substance on a riverbank. To check its nature, he carried out some tests on the substance and recorded his observations in the table shown below.
<table>
<tr><th></th><th></th></tr>
<tr><td>Effect of heat</td><td>melts on heating</td></tr>
<tr><td>Ductility</td><td>can be stretched into a thin strand</td></tr>
<tr><td>Malleability</td><td>can be beaten into a thin sheet</td></tr>
<tr><td>Electrical conductivity</td><td>does not conduct electricity</td></tr>
</table>
Which of the following could the substance be?

A. It is a polymer.
B. It is a metal.
C. It is glass.
D. It is wax.</td><td>1</td></tr>
<tr><td>Q.49</td><td>Trupti has given the following reasons for Gold being the most abundantly used metal for jewellery:

(i) It has high ductility.

(ii) It has high malleability.

(iii) It shines more than other metals.

(iv) It reacts quickly with oxygen to form a protective layer of oxide.

(v) It does not react with water & oxygen even at high temperatures.

Which of the reasons given is/are INCORRECT?

A. only (iii)
B. only (iv)
C. only (iv) & (v)
D. only (i), (ii) & (iii)</td><td>1</td></tr>
</table>

Q.50	Sheetal has two test tubes, one containing dilute hydrochloric acid and the other dilute sulphuric acid but they are not labelled. Adding which of the following to the test tubes will help her to find out which test tube contains hydrochloric acid and which contains sulphuric acid? A. Blue litmus paper B. Zinc metal strips C. Sodium carbonate D. Barium carbonate	1
Q.51	Two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements A and R. Assertion (A): An alloy may be a compound consisting of a metal and a non-metal. Reason (R): An alloy is made by melting a metal and then dissolving other elements in it in definite proportions. A. Both A and R are true and R is the correct explanation for A. B. Both A and R are true but R is not the correct explanation for A. C. A is true but R is false. D. A is false but R is true.	1
Q.52	Freshly cut pieces of iron are stored in three closed containers P, Q and R containing dry air, oxygen and nitrogen respectively. In which of the containers is the Iron likely to rust? A. Only P B. Only P and Q C. All - P, Q and R D. In none of them	1
Q.53	Gautam has to courier a sample of silver bromide powder to a laboratory for analysis. Which of the following containers can he use to pack the sample? P) Transparent glass bottle Q) Opaque plastic bottle R) Black paper packet A. Only P B. Only P or Q	1

<table>
<tr><td></td><td>C. Only Q or R
D. Any of P, Q or R</td><td></td></tr>
<tr><td>Q.54</td><td>Two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements A and R.

Assertion (A): Potassium metal burns and produces a flame when thrown in water..

Reason (R): The reaction of potassium with water is highly exothermic and violent.

A. Both A and R are true and R is the correct explanation for A.
B. Both A and R are true but R is not the correct explanation for A.
C. A is true but R is false.
D. A is false but R is true.</td><td>1</td></tr>
<tr><td>Q.55</td><td>Doing which of the following will break the bonds in a crystal of sodium chloride?

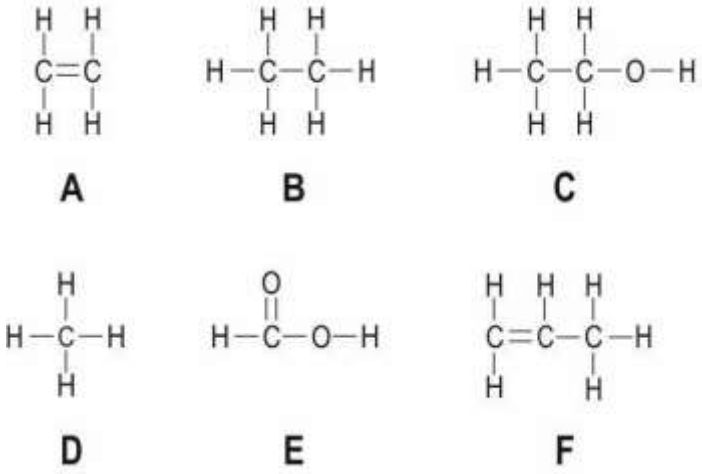
A. Passing an electric current through it
B. Crushing it into a fine powder
C. Mixing it with kerosene
D. Mixing it with water</td><td>1</td></tr>
<tr><td>Q.56</td><td>In the list given below, a metal to the right is more reactive than a metal that is to its left.

<table><tr><td>Copper</td><td>Tin</td><td>Nickel</td><td>Cobalt</td><td>Iron</td><td>Zinc</td></tr></table>
The table below gives the colour of the metal sulphate salt solutions.

<table><tr><th>Metal salt solution</th><th>Colour of aqueous metal salt solution</th></tr><tr><td>Copper sulphate</td><td>blue</td></tr><tr><td>Tin sulphate</td><td>yellow</td></tr><tr><td>Nickel sulphate</td><td>green</td></tr><tr><td>Cobalt sulphate</td><td>pink</td></tr><tr><td>Iron sulphate</td><td>green</td></tr><tr><td>Zinc sulphate</td><td>colourless</td></tr></table></td><td>1</td></tr>
</table>

	Adding nickel and iron metal to which of the following solutions will show that iron is more reactive than nickel? A. Copper sulphate B. Tin sulphate C. Cobalt sulphate D. Zinc sulphate	
Q.57	Carbon compounds undergo combustion in oxygen to give carbon dioxide along with heat and light. The same number of molecules of each of the following carbon compounds undergo complete combustion. P) CH_3COOH Q) CH_3CH_2COOH R) $CH_3CH=CH_2$ S) $CH_3CH_2CH_2OH$ Which of them will produce the same amount of carbon dioxide? A. Only P and Q B. Only Q and S C. Only P, Q and R D. Only Q, R and S	1
Free response question/Subjective Question		
Q.58	A redox reaction is defined as a type of chemical reaction that involves transfer of electrons between reacting atoms, molecules or ions - one gains and the other loses electrons. Study the equation given below that shows the reaction between zinc oxide and hydrochloric acid. $ZnO + 2\ HCl \rightarrow ZnCl_2 + H_2O$ (a) Is this a double displacement reaction? Justify your answer. (b) Is this a redox reaction? Justify your answer. (c) Name another type of reaction that this is an example of.	4
Q.59	A metal oxide XO on being heated with carbon does NOT produce carbon dioxide.	1

<table>
<tr><td></td><td>Give a possible explanation for this behaviour of the metal oxide.</td><td></td></tr>
<tr><td>Q.60</td><td>Farida checks the pH of a bottle of milk at 10:00 AM and finds it to be 6.0. She leaves the milk bottle on the table at room temperature (30 °C). She checks the pH of the milk again at 4:00 PM.
How is the pH of the milk at 4:00 PM likely to compare with the pH of milk at 10:00 AM? Justify your answer.</td><td>2</td></tr>
<tr><td>Q.61</td><td>On opening a bottle of soda, Nishchal observed that there was a lot of effervescence and some of the soda water bubbled out of the bottle.
(a) Write the equation for the chemical reaction taking place.
(b) Identify the type of reaction.</td><td>2</td></tr>
<tr><td>Q.62</td><td>The molecular formulae of three carbon compounds are:
CH_2O, C_2H_4O, C_3H_6O
(a) Identify the compound that can exist as two isomers having different functional groups.
(b) Write the structures of the two isomers.</td><td>2</td></tr>
<tr><td>Q.63</td><td>Uzma peeled and cut some potatoes and left them in an open bowl. After a few minutes, she observed that the cut potato pieces had turned brown.
Radhika also peeled and cut some potatoes. She kept the cut potato pieces immersed in a bowl of water. The potato pieces in water did NOT turn brown.
Explain the difference in the reaction of the cut potato pieces in the two cases.</td><td>1</td></tr>
<tr><td>Q.64</td><td>The densities of water and magnesium metal at different temperatures are given in the table below.
<table>
<tr><th>Temperature</th><th>Density of magnesium metal</th><th>Density of water</th></tr>
<tr><td>25 °C (room temperature)</td><td>1.738</td><td>0.99</td></tr>
<tr><td>100 °C (boiling point of water)</td><td>-</td><td>0.958</td></tr>
<tr><td>650 °C (melting point of magnesium)</td><td>1.64</td><td>-</td></tr>
</table>
'Magnesium floats in boiling water because its density decreases on heating.'
Is the statement above true or false? If true, give a reason. If false, correct it.</td><td>1</td></tr>
<tr><td>Q.65</td><td>Bala was monitoring the pH of the reaction mixture of ethanoic acid and ethanol in the presence of an acid.</td><td>2</td></tr>
</table>

	What change is he likely to observe in the pH of the mixture as the reaction proceeds? Explain why.	
Q.66	A red litmus paper and a blue litmus paper are added to distilled water in a test tube. A small piece of calcium metal is now added to the water. What will be the change in the colour of the litmus papers? Justify your answer.	2
Q.67	Sugar free chewing gum, as shown below, have baking soda as one of their key ingredients and are considered to be good to keep teeth healthy.  What is likely to be the function of baking soda in the chewing gum?	1
Q.68	Study the compounds displayed below:  A B C D E F (a) Identify all the compounds that are the first members of their respective homologous series. (b) Which of the above compounds are likely to undergo non-catalytic hydrogenation reaction? (c) Which TWO compounds will combine to form an ester? Justify with an equation for the reaction.	4
Q.69	The reactants of two reactions are given below.	3

<table>
<tr><td></td><td>1) Ca + 2 H_2O ------>
2) CaO + H_2O------ >
(a) Write the chemical formula of the common product formed in the two reactions.
(b) Identify the type of reaction that will occur in (1) and (2)</td><td></td></tr>
<tr><td>Q.70</td><td>Excess carbon dioxide gas is continuously bubbled through a solution of slaked lime.
(a) Describe how the appearance of the solution will change.
(b) Write balanced chemical equations to explain the change described in the answer to part (a). Also mention the states of the reactants and products for each reaction.</td><td>5</td></tr>
<tr><td>Q.71</td><td>The list given here is known as the Electrochemical Series of metals. A metal to the right is more reactive than a metal that is to its left in the list.
<table><tr><td>Copper</td><td>Tin</td><td>Nickel</td><td>Cobalt</td><td>Iron</td><td>Zinc</td></tr></table>
The table below gives the colour of a few metal sulphate salt solutions.
<table><tr><th></th><th></th></tr><tr><td>Copper sulphate</td><td>blue</td></tr><tr><td>Tin sulphate</td><td>yellow</td></tr><tr><td>Nickel sulphate</td><td>green</td></tr><tr><td>Cobalt sulphate</td><td>pink</td></tr><tr><td>Iron sulphate</td><td>green</td></tr><tr><td>Zinc sulphate</td><td>colourless</td></tr></table>
To show that iron is more reactive than nickel, Smita adds nickel metal and iron metal to copper sulphate solution in separate test tubes.
Will her test show which is more reactive? Justify your answer.</td><td>2</td></tr>
<tr><td>Q.72</td><td>To compare the reactivity of magnesium and aluminium two friends carried out the following tests.
- Shardul reacted the metals with hydrochloric acid.
- Ashwin reacted the metals with boiling water.
Whose test will differentiate between the two metals based on their reactivity? Explain why.</td><td>3</td></tr>
</table>

Answer Key and Marking Scheme

Q.No	Answers	Marks
Q.48	A. It is a polymer.	1
Q.49	B. Only (iv)	1
Q.50	D. BArium carbonate	1
Q.51	D. A is false but R is true.	1
Q.52	D. (in none of them)	1
Q.53	C. Only Q or R	1
Q.54	D. A is false but R is true.	1
Q.55	D. mixing it with water	1
Q.56	C. Cobalt sulphate	1
Q.57	D. Only Q, R and S	1
Q.58	(a) Yes, it is. [0.5 marks] Since there is an exchange of ions between the reactants. [1 mark] (No marks to be given if justification not given.) (b) No, it is not. [0.5 marks] Since none of the reactants have gained or lost an electron. [1 mark] (No marks to be given if justification not given.) (c) neutralisation reaction	4
Q.59	(a) The metal is more reactive than carbon.	1
Q.60	- The pH will be below 6.0. [1 mark] - The bacteria in the milk will change the lactose in the milk to lactic acid. [1 mark] (no marks to ge given without justification.)	2
Q.61	(a) H_2CO_3 -----> $H_2O + CO_2$ (b) decomposition reaction	2
Q.62	(a) C_3H_6O (b) $CH_3 - CO - CH_3$ [0.5 marks] $CH_3 - CH_2 - CHO$ [0.5 marks]	2

Q.63	The browning of the potato pieces kept in the open bowl is likely to be due to an oxidation reaction between the potato and air. The oxidation is prevented by keeping the potato under water as it is not in contact with air.	1
Q.64	- False. - Magnesium floats when placed in boiling water because of the bubbles of hydrogen gas forming on its surface as it reacts with hot water.	1
Q.65	- He will observe an increase in the pH of the reaction mixture. [1 mark] - The amount of acid in the reaction mixture keeps decreasing as ethanoic acid gets converted to the ester. [1 mark]	2
Q.66	- The red litmus paper will turn blue. [0.5 marks] - The blue litmus paper will remain blue. [0.5 marks] - Calcium reacts with water to form calcium hydroxide which is basic in nature. [1 mark] (no marks to be given if justification is not given or is incorrect)	2
Q.67	The baking soda neutralises the acids that form in the plaque between the teeth.	1
Q.68	(a) A,D,E (1 mark for all three correct answers, 0.5 marks for any two correct answers.) (b) 0.5 marks each for both correct names: compound A and compound F (c) compound E and compound C [0.5 marks each] $HCOOH + CH_3CH_2OH \rightarrow CH_3CH_2OCOH + H_2O$ [1 mark]	4
Q.69	(a) $Ca(OH)_2$ (b) 1 mark each for the following: - (1) displacement reaction - (2) combination reaction (Accept any other correct answer.)	3
Q.70	(a) The clear solution of slaked lime will first turn milky (whitish in colour), due to the formation of a precipitate of calcium carbonate. [1 mark] On passing excess carbon dioxide, the solution will slowly become clear again due to formation of calcium bicarbonate which is water soluble. [1 mark] (b) 1 mark for each balanced equation, and 0.5 marks for writing the states of the substances in each equation. $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$ [1.5 marks] $CaCO_3(s) + H_2O(l) + CO_2(g) \rightarrow Ca(HCO_3)_2(aq)$ [1.5 marks]	5

Q.71	The test will not be able to tell which is more reactive. Both nickel and iron are more reactive than copper and will displace copper from the copper sulphate solution turning it green in colour.	2
Q.72	Only Ashwin's test 1 mark each for the following: - Only magnesium reacts with boiling water releasing hydrogen gas. Aluminium does not react with boiling water, but reacts only with steam. [1 mark] $Mg + 2\ H_2O\ (l)$---------> $Mg(OH)_2 + H_2$ $Al + H_2O\ (l)$--- > no reaction - Both magnesium and aluminium react with hydrochloric acid producing salt and hydrogen gas. [1 mark] $Mg + 2\ HCl$ ---> $MgCl_2 + H_2$ $2\ \ Al + 6\ HCl$-> $2\ AlCl_3 + 3\ H_2$	3