

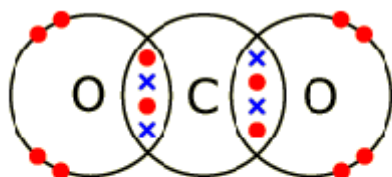


Suggested answers to 2016 PURE CHEMISTRY Paper 2 5074

- 1 a
- Number of shells changes down a group
 - Valency changes across a period
 - Number of protons changes down a group and across a period
 - Metallic to non-metallic character changes across a period
- b Going down the elements in Group I, the melting point and reactivity decreases and increases respectively. Conversely, going down the elements in Group VII, the melting point and reactivity increases and decreases respectively
- c Transition elements have variable oxidation states and can interchange between the different oxidation states. They can easily lose and accept electrons from other molecules, thus providing an alternative pathway with lower activation energy for the reaction to occur.
- 2 a $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ --- ①
 $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$ --- ②
- ①: Iron is reduced as the oxidation state of iron decreased from +3 in Fe_2O_3 to 0 in Fe. On the other hand, carbon is oxidised as the oxidation state of carbon increased from +2 in CO to +4 in CO_2 .
- ②: Iron is oxidised as the oxidation state of iron increased from 0 in Fe to +3 in Fe_2O_3 . On the other hand, oxygen is reduced as the oxidation state of oxygen decreased from 0 in O_2 to -2 in Fe_2O_3 .
- b Alloy is a mixture of a metal with other metals or non-metals.
- c They act as barriers to prevent water and oxygen in air from being in contact with the iron.
- d Zinc is more reactive than iron. In the case of the paint peeling and exposing the iron to the surroundings, the iron will not rust as zinc will oxidise in place of iron. This is known as sacrificial protection.
- 3 a The presence of a high percentage of carbon dioxide in the atmosphere of Venus will trap more heat, causing the actual temperature to be much higher than predicted by the distance from the sun.
- bi It could be due to the presence of a large number of volcanoes, as volcanic eruption produces sulphur dioxide.
- bii Sulphur dioxide will react with oxygen and water vapour in the air to form sulphuric acid, which will dissolve in rainwater to form acid rain, thereby corroding buildings and killing aquatic lives.
- c Venus's actual surface temperature is 462°C , which is much higher than the boiling point of water (at 100°C). Thus, the rainwater will evaporate before it falls to the ground.
- d Plants undergo photosynthesis by absorbing carbon dioxide and producing oxygen instead. Thus, the percentage of carbon dioxide and oxygen in the air will decrease and increase respectively.



e



Legend:

X: electrons from carbon atom

•: electrons from oxygen atom

- 4 a Potassium phosphate & ammonium nitrate
 b Calcium phosphate, as it contains phosphate ions but not nitrogen and potassium ions.
 c Mr of $K_3PO_4 = 3(39) + 31 + 4(16) = 212$
 $\% \text{ of P in } K_3PO_4 = \frac{31}{212} \times 100 = 14.62\% \approx 15\%$
 $\% \text{ of K in } K_3PO_4 = \frac{3(39)}{212} \times 100 = 55.19\% \approx 55\%$
 N : P : K = 0 : 15 : 55
- 5 a **FULL QUESTION WAS NOT RECEIVED. IF YOU REMEMBER THE QUESTION, WRITE IT DOWN ON A PIECE OF PAPER AND EMAIL A PICTURE OF IT TO ADMIN@PENCILTUTOR.COM OR SMS 91272788.**
 b
 - Bitumen is used to build roads
 - Sulphuric Acid \Rightarrow detergent
 - Ethene \Rightarrow Plastics
 - Ethyl ethanoate \Rightarrow ink solvent
 - Calcium carbonate \Rightarrow desulphurisation
- 6 a All the listed compounds have the same functional group, CHO.
 Each successive member in the group differs in composition by $-CH_2$.
 b C_3H_7CHO
 Boiling point = $75^\circ C$
 c Isomers are compounds that have the same molecular formula but different chemical structures.
 d $2CH_3CHO + 5O_2 \rightarrow 4CO_2 + 4H_2O$
 e $2CH_3CHO + O_2 \rightarrow 2CH_3COOH$

QUESTIONS 7 TO 10 WERE NOT RECEIVED. IF YOU REMEMBER THE QUESTIONS, WRITE IT DOWN ON A PIECE OF PAPER AND EMAIL A PICTURE OF IT TO ADMIN@PENCILTUTOR.COM OR SMS 91272788.