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2002

XVIII

1583

Time allowed
84 Minutes

Score

/70

Percentage

%

CHEMISTRY

**OCR
AS & A LEVEL**

Mark Schemes

Module 2: Foundations in chemistry

1.

The correct answer is **D** because:

- Silver chloride is a white precipitate formed with acidified silver nitrate solution when chloride ions are present
- The ionic equation for the formation of the precipitate is
 - $\text{Ag}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) \rightarrow \text{AgCl} (\text{s})$

A is incorrect as carbonate ions are tested with dilute acid and produce effervescence but no white precipitate

B is incorrect as sulfate ions are tested with barium chloride solution to produce a white precipitate of barium sulfate

C is incorrect as hydroxide ions would precipitate with silver nitrate, the acid would have removed them before the addition of silver nitrate and silver hydroxide is a dark-coloured precipitate

2.

The correct answer is **C** because:

- The test described produces a cream precipitate which is the colour of silver bromide
- The halogenoalkane must be a bromoalkane

A is incorrect as fluoroalkanes do not produce precipitates with silver nitrate (not needed for the exam)

B is incorrect as chloroalkanes produce a white precipitate

D is incorrect as iodoalkanes produce a yellow precipitate

3.

The correct answer is **B** because:

- Group II elements get more reactive as you go down the group
- Strontium will react more readily with cold water forming hydrogen gas and a soluble solution of strontium hydroxide
- Strontium will show rapid effervescence as it reacts with cold water

A is incorrect as strontium will produce bubbles rapidly

C is incorrect as strontium will not float on the surface of the water due to higher densities

D is incorrect as when placed in cold water strontium does not burn, and strontium hydroxide is soluble

4.

The correct answer is **C** because:

- Acidified potassium dichromate will change from orange to green when warmed with an alcohol

A is incorrect as Tollens' reagent is used to distinguish between aldehydes and ketones

B is incorrect as bromine water is used to test for alkenes

D is incorrect as Fehling's reagent is used to test for aldehydes

5.

The correct answer is **B** because:

- The purpose of recrystallisation is to purify an organic solid
- A solvent is chosen in which the solid does not dissolve at room temperature, but dissolves in the hot solvent
- The impurities are more soluble in the solvent than the desired product
- The minimum volume of hot solvent is used to slowly dissolve the solute
- When the solute has completely dissolved it is then allowed to cool and slowly crystallise
- If solid impurities remain they can be hot filtered
- The solid crystals are filtered out, rinsed in fresh cold solvent and allowed to dry

A is incorrect as the organic solid must dissolve in the hot solvent but be insoluble in the cold solvent

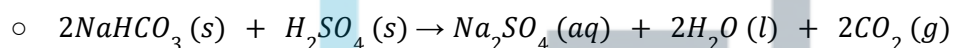
C is incorrect as the yield decreases as some of the product is lost to the solvent

D is incorrect as the melting point is raised after recrystallisation as the melting point is usually lowered when impurities are present

6.

The correct answer is **C** because:

- This is an important step in the preparation of the haloalkane
- Concentrated acid must be added to the reaction mixture to act as a catalyst
- The acid was added to the reaction mixture, therefore you must state that the sodium hydrogen carbonate will remove the unreacted acid
- The unreacted acid will be neutralised by an acid-base reaction which will form the gas carbon dioxide



A is incorrect as magnesium sulfate is used as a drying agent to remove water, not sodium hydrogen carbonate

B is incorrect as the removal of impurities is too general a statement and not specific enough to acid

D is incorrect as improving the solubility of the alcohol is not required

7.

The correct answer is **C** because:

- Water is a product of the reaction as well as being present in the concentrated phosphoric acid
- This relative closeness in boiling points means that the distillate is likely to be a mixture of cyclohexene and water
- Cyclohexene and water are immiscible liquids so a separating funnel is used to remove the aqueous layer (lower in this case)

A is incorrect as the phosphoric acid acts as a dehydrating or elimination reagent in this reaction

B is incorrect as cyclohexanol is not soluble in water. Although there is a hydroxyl group present, the bulky hydrocarbon ring would be non-polar and prevent the molecule from dissolving in water

D is incorrect as the distillate is likely to contain a mixture of only one organic liquid (cyclohexene) and water. The boiling point of cyclohexanol is so high that it is unlikely to be present in the distillate

8.

The correct answer is **C**

- The iodine will not displace the bromine
- Bromine is higher up in Group 7, therefore, more reactive and only halogens that are higher up will displace halogens that are lower in the group

A is incorrect as iodine cannot displace bromine and if it did, iodine would gain electrons and be reduced to iodide ions

B is incorrect as iodine cannot displace bromine and if it did, bromide ions would lose electrons and be oxidised not reduced to bromine

D is incorrect as bromide ions cannot be oxidised to bromine by iodine

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9.

The correct answer is **A** because:

- Anhydrous calcium chloride is a very suitable drying agent and absorbs a relatively large amount of water per unit mass
- It tends to clump together and makes it easier to decant (or filter) an organic liquid and separate it from the drying agent

B is incorrect as saturated sodium carbonate solution is not a drying agent, but is used to neutralise any residual acids present in the impure sample

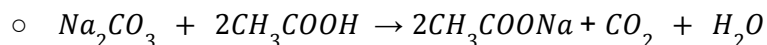
C is incorrect as aluminium oxide is a dehydrating agent (when a hot vapour is passed over it). A dehydrating agent chemically removes water from a molecule, whereas a drying agent simply absorbs traces of water present

D is incorrect as porcelain chips can be used in the cracking of alkanes

10.

The correct answer is **B** because:

- The overall equation for this reaction is:



- Carbon dioxide is a gas, therefore bubbles of gas will be seen
- When an acid reacts with a carbonate carbon dioxide gas will be produced
- In order to test for a carbonate dilute HCl is used
- If a carbonate is present, then bubbles of gas will be seen

A is incorrect as the reaction will be: $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

C is incorrect as AgBr is soluble in concentrated NH_3

D is incorrect as $MgCO_3$ contains the Mg^{2+} ion which will form a white precipitate if excess NaOH is added