

Questions from the “PAL Prüfungsbuch”
Thematic Framework for a bound task

Analogous synthesis instruction:

Preparation of pentan-2-ol from chloromethane and butanal

0.1 mol magnesium turnings are stirred in 300 mL diethyl ether in an appropriate stirring apparatus. Then gaseous chloromethane is passed into the mixture until the reaction is finished. It may be necessary to pass an excess into the mixture.

Whilst cooling 0.1 mol butanal are carefully added dropwise to the formed Grignard-reagent.

After the reaction the formed product is isolated and identified by determination of its refractive index.

M (butanal)	= 72.1 g/mol	$R = 0.08314 \frac{\text{L} \cdot \text{bar}}{\text{mol} \cdot \text{K}}$
M (Mg)	= 24.3 g/mol	
M (pentan-2-ol)	= 88.2 g/mol	$V_{\text{mn}} = 22.4 \text{ L}$
M (CH ₃ Cl)	= 50.5 g/mol	
θ (diethyl ether)	= 34°C	
θ (butanal)	= 75°C	
θ (pentan-2-ol)	= 119°C	

297: Why is it, that a glass funnel with a long tube must not be used when filling up the ether?

- 1) Because friction causes electrostatic charging and sparks may induce an ignition
- 2) Because too much heat is created by friction and the vapours may ignite
- 3) Because funnels with long tubes are prone to material afflux and the flammable liquid may spurt out
- 4) Because it is not possible to quickly pull out a long funnel when the filled container spills over
- 5) Because the liquid transfer takes too much time

298: How can peroxides that may be present in ether be removed?

- 1) By using peroxide test paper
- 2) By strong boiling the ether
- 3) By a rectification with a long column
- 4) By shaking out with a ferrous(II)sulphate solution
- 5) Peroxides can not be removed

299: Which measure influences positively the start of the reaction to produce the Grignard reagent?

- 1) The magnesium turnings are dried in a drying oven
- 2) The solvent is liberated from peroxides
- 3) The ether/ magnesium suspension is heated until boiling
- 4) A few iodine crystals are added to activate the magnesium surface
- 5) As a catalyst a bit of sulphuric acid is added

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300: What indicates that the reaction for the production of the Grignard reagent has started?

- 1) The solvent begins to boil
- 2) The magnesium turnings coat with an oxide layer
- 3) The temperature drops quickly
- 4) A change of colour occurs
- 5) A production of hydrogen occurs

301: Which equipment can be used for the preparation of the Grignard reagent?

- 1) Open stirring apparatus with beaker glass, cooling bath, stirrer, dropping funnel, thermometer
- 2) Stirring apparatus with flask, gas-entry tube, cooling bath, stirrer, gas outlet, thermometer
- 3) Autoclave (pressure vessel), thermometer, heating bath
- 4) Apparatus with flask, dropping funnel, cooling bath, thermometer
- 5) Open apparatus with beaker glass, gas-entry tube, cooling bath, thermometer

302: Which cleaning step suitable to isolate the alcohol after the reaction of the Grignard reagent with butanal?

- 1) Extraction with water, alcohol is the only reactant that is water soluble
- 2) Extraction with ether and evaporation of the ether in a rotary evaporator
- 3) Distillation of the mixture, alcohol is the first fraction that passes over
- 4) Evaporation of the ether in a rotary evaporator, followed by a distillation of the residue. Then alcohol passes over as the second fraction
- 5) Vacuum distillation in which step by step ether, alkanal and alcohol pass over

303: What is an alternative method to produce pentan-2-ol?

- 1) Oxidation of pentan-2-one
- 2) Conversion of methanol with 1-chlorobutan
- 3) Addition of water to pent-1-ene
- 4) Hydrolysis of butanoic acid methyl ester
- 5) Hydrogenation of pentanal

304: The alcohol is to be identified by means of its refractive index. Which statement about the refractive index of transparent substances is correct?

- 1) The refractive index must be specified together with the wavelength of light by which it was determined
- 2) The refractive index is always specified for white light (daylight)
- 3) The refractive index for red light is higher than that for blue light
- 4) The refractive index is always determined for yellow sodium light
- 5) The refractive index depends on the angle of incidence of the upcoming light ray



