

Technische Universität München Analytical Research Group PD Dr. Thomas Letzel; PD Dr. Johanna Graßmann	<b>Exam Questions</b> <b>Characterizing Products and working materials</b>
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**Questions from the “PAL Prüfungsbuch”**  
**Characterizing Products and working materials**

**261:** Which answer lists only basic items?

- 1) Mass, time, length, voltage
- 2) Mass, velocity, length, force
- 3) Length, time, force, amperage
- 4) Length, time, mass, amperage
- 5) Time, length, density, mass

**262:** Which of the following items is *independent from* temperature?

- 1) Surface tension
- 2) Resistance of a wire
- 3) Viscosity
- 4) Weight force
- 5) Refractive index

**263:** The purity of substances that are applied in an apparatus are to be evaluated. To which substance an item is assigned that is improper for this purpose?

- 1) Liquid: boiling point
- 2) Liquid: density
- 3) Gas: mass
- 4) Oil: viscosity
- 5) Solid matter: melting point

**264:** Which statement regarding the location of a balance is *wrong*?

- 1) The location is to be selected in proximity to the laboratory doors
- 2) The balance table must not be located in proximity to radiators
- 3) Air humidity should be between 45 – 60 %
- 4) Direct solar radiation must be avoided
- 5) The balance table must be protected against vibration

**265:** Which statement about water is *wrong*?

- 1) Distilled water has a low electric conductivity
- 2) The ionic product of water at 24°C is  $1.0 \cdot 10^{-14} \text{ mol}^2 \cdot \text{L}^{-2}$
- 3) Ions in distilled water arose from auto-dissociation
- 4) In 1 mol water  $10^{-7}$  mol water are dissociated
- 5) In neutral water equal quantities of oxonium and hydronium ions are present



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**266:** Which statement about the dissolving of a salt in water is correct?

- 1) The solution has a lower boiling point than pure water
- 2) The saturation vapour pressure of pure water does not change due to the salt
- 3) The solution has a higher freezing point than pure water
- 4) The solution has a higher boiling point and a lower freezing point than pure water
- 5) The solution has a higher saturation vapour pressure than pure water

**267:** Which of the following liquids has the lowest viscosity at equal temperature?

- 1) Ethanol
- 2) Glycol
- 3) Glycerin
- 4) Concentrated sulphuric acid
- 5) Concentrated phosphoric acid

**268:** In a food laboratory the following measuring techniques are available: Refractometry, measurement of conductivity and determination of density. Which of the following items can *not* be analysed with this?

- 1) Sugar content in grape juice
- 2) SO<sub>2</sub>-content in sulphured wine
- 3) Alcohol content in wine
- 4) Salt content in seawater
- 5) Refractive index of flavourings

**269:** Which of the following measuring techniques is *unsuitable* for the determination of concentration of an aqueous glucose solution?

- 1) Pycnometry
- 2) Refractometry
- 3) Polarimetry
- 4) Determination of density
- 5) Determination of conductivity

**270:** Which unit does the dynamic viscosity have?

- 1) Pa·s
- 2) N/cm<sup>2</sup>
- 3) m<sup>2</sup>/s
- 4) N·m/s
- 5) kg/m

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**276:** Which statement about handling a pH-electrode is *wrong*?

- 1) A dried up glass electrode is watered in distilled water for at least 24 hours.
- 2) An electrode with gel electrolyte is more likely contaminated by substances from the measuring solution than an electrode with liquid electrolyte
- 3) A pH-electrode is very delicate and easily broken
- 4) A glass electrode fatigues, even if it is not used
- 5) A broken pH-electrode may not be disposed in the residual wastes because it contains precious metal

**277:** Which measurement produces distinct differences between measured and correct value when a pH-combined electrode is used?

- 1) Measuring acetic acid with  $w(\text{CH}_3\text{COOH}) = 20\%$
- 2) Measuring sodium hydroxide solution with  $w(\text{NaOH}) = 10\%$
- 3) Measuring ammonia solution with  $w(\text{NH}_3) = 20\%$
- 4) Measuring ammonium chloride solution with  $w(\text{NH}_4\text{Cl}) = 20\%$
- 5) Measuring hydrochloric acid with  $w(\text{HCl}) = 1\%$

**278:** What pH-value does a solution with a hydrogen ion concentration  $c(\text{H}^+) = 0.01 \text{ mol/L}$  have?

- 1) pH 0.1
- 2) pH 0.2
- 3) pH 1
- 4) pH 2
- 5) pH 10

**279:** What is the hydrogen ion concentration of a solution with the pH-value 5?

- 1)  $10^5 \text{ mol/L}$
- 2)  $0.5 \text{ mol/L}$
- 3)  $0.0001 \text{ mol/L}$
- 4)  $0.00005 \text{ mol/L}$
- 5)  $0.00001 \text{ mol/L}$

**280:** Which statement about the determination of the mixed melting point is *wrong*?

- 1) With the method of the mixed melting point the identity of a substance can be verified
- 2) The melting points of the studied, the suspected and the mixed substance must be determined individually
- 3) If the melting point of the mixture is to be found lower than the melting points of studied and suspected substance, both substances are identical
- 4) If all three melting points are identical, studied and suspected substance are the same matter
- 5) Adding a foreign matter to a substance will normally cause a lowering of the melting point



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**284:** Two substances A and B have the same melting point. The mixed melting point is identical. Which statement is correct?

- 1) The mixing ratio of A and B has to be changed
- 2) The melting behaviour does not allow a conclusion
- 3) The substances A and B are identical
- 4) A and B are different substances
- 5) A new substance has formed from A and B

**285:** Which statement about polarized light is correct?

- 1) Polarized light is created by sodium-vapour discharged lamps
- 2) Polarized light can emerge from boundary surface reflexion of transparent substances, for example in the Nicol prism
- 3) Polarized light can be created by a prism of gypsum
- 4) Polarized light can be created by a photometer
- 5) By using polarized light polar substances can be verified

**286:** Which statement about the characterization of linear polarized light is correct?

- 1) It is pulsed light of high energy
- 2) It is light that is scattered by a surface
- 3) It is light that is diffracted by a grid
- 4) It has only one plane of oscillation
- 5) It has only one fixed wavelength

**287:** Which device uses the critical angle of total reflexion for measuring?

- 1) Polarimeter
- 2) Colorimeter
- 3) Refractometer
- 4) Spectrophotometer
- 5) Photometer

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**293:** What is the definition of the  $R_f$ -value in chromatography?

1)  $R_f = \frac{\text{substance migration distance}}{\text{solvent migration distance}}$

2)  $R_f = \frac{\text{solvent migration distance}}{\text{substance migration distance}}$

3)  $R_f = \text{substance migration distance} + \frac{\text{solvent migration distance}}{\text{substance migration distance}}$

4)  $R_f = \frac{\text{solvent migration distance}}{\text{solvent migration distance} - \text{substance migration distance}}$

5)  $R_f = \frac{\text{solvent migration distance} - \text{substance migration distance}}{\text{solvent migration distance}}$

**294:** A thin-layer chromatographic separation is performed on an alumina plate. Which of the given answers shows the correct order of functional groups regarding their increasing adsorption affinity?

- 1) Carboxyl-, carbonyl-, amino- and hydroxyl group
- 2) Carbonyl-, ether-, sulfonic acid- and hydroxyl group
- 3) Ether-, carbonyl-, hydroxyl- and sulfonic acid group
- 4) Sulfonic acid-, amino-, hydroxyl- and ether group
- 5) Amino-, carboxyl-, ether- and hydroxyl group