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Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the
European Agreement concerning the International Carriage
of Dangerous Goods by Inland Waterways (ADN)
(ADN Safety Committee)

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Agenda item 5

Catalogue of questions

Models for the experts' examination

Transmitted by the Central Commission for the Navigation of the Rhine (CCNR)^{1, 2}

The Safety Committee will find hereunder a proposal for a foreword for the catalogue of questions for the experts' examination and for models for use in drawing up the examination questions.

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² In accordance with the programme of work of the Inland Transport Committee for 2006–2010 (ECE/TRANS/166/Add.1, programme activity 02.7 (b)).

Catalogue of questions and models for the experts' examination (ADN, Chapter 8.2)

Foreword

General

To improve safety during the transport of dangerous goods, an expert capable of proving specialized knowledge of the transport of dangerous goods must be on board the vessel.

Basing itself on Chapter 8.2 of the regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), the Safety Committee covered by article 18 of ADN has established the following instructions, according to which examinations must be held in all the Contracting Parties of ADN.

1. Examinations

1.1 Basic training

Examinations for basic training must be held in accordance with the requirements of section 8.2.2.7.1 of the regulations annexed to ADN.

For the examination on basic training, the candidate may choose among three options:

- Examination on general ADN questions and on ADN dry cargo vessels
- Examination on general ADN questions and on ADN tank vessels or
- Examination on general ADN questions and on ADN dry cargo and tank vessels

The matrix attached to the catalogue is for use in drawing up the examination questions.

1.1.1 Matrix for the examinations

Dry cargo transport

	<i>Number of questions in the catalogue</i>		<i>Number of questions to choose</i>		<i>Number of questions to choose</i>
	<i>General</i>	<i>Dry cargo</i>	<i>General</i>	<i>Dry cargo</i>	
<i>Objective</i>					<i>Total</i>
1 General	14	-	1	-	1
2 Construction and equipment	21	32	2	3	5
3 Treatment of holds and adjacent spaces	-	19	-	2	2
4 Measurement techniques	21	-	2	-	2
5 Knowledge of products	78	-	2	-	2
6 Loading, unloading and transport	19	70	2	5	7
7 Documents	31	22	3	2	5
8 Hazards and measures of prevention	72	27	3	3	6

<i>Objective</i>	<i>Number of questions in the catalogue</i>		<i>Number of questions to choose</i>	<i>Number of questions to choose</i>	<i>Number of questions to choose</i>
	<i>General</i>	<i>Dry cargo</i>	<i>General</i>	<i>Dry cargo</i>	<i>Total</i>
Total	256	170	15	15	30

Tank vessel transport

<i>Objective</i>	<i>Number of questions in the catalogue</i>		<i>Number of questions to choose</i>	<i>Number of questions to choose</i>	<i>Number of questions to choose</i>
	<i>General</i>	<i>Tank vessels</i>	<i>General</i>	<i>Tank vessels</i>	<i>Total</i>
1 General	14	-	1	-	1
2 Construction and equipment	21	50	2	2	4
3 Treatment of holds and adjacent spaces	-	33	-	3	3
4 Measurement techniques	21	13	2	1	3
5 Knowledge of products	78	-	2	-	2
6 Loading, unloading and transport	19	56	2	4	6
7 Documents	31	24	3	2	5
8 Hazards and measures of prevention	72	37	3	3	6
Total	256	213	15	15	30

Combined dry cargo and tank vessels

<i>Objective</i>	<i>Number of questions in the catalogue</i>			<i>Number of questions to choose</i>	<i>Number of questions to choose</i>	<i>Number of questions to choose</i>	<i>Number of questions to choose</i>	<i>Total</i>
	<i>General</i>	<i>Tank vessels</i>	<i>Dry cargo</i>	<i>General</i>	<i>Tank vessels</i>	<i>Dry cargo</i>		
1 General	14	-	-	1	-	-	-	1
2 Construction and equipment	21	50	32	2	1	1	1	4
3 Treatment of holds and adjacent spaces	-	33	19	-	2	1	1	3
4 Measurement techniques	21	13	-	2	1	-	-	3
5 Knowledge of products	78	-	-	2	-	-	-	2
6 Loading, unloading and transport	19	56	70	2	1	3	3	6
7 Documents	31	24	22	3	1	1	1	5
8 Hazards and measures of prevention	72	37	27	3	2	1	1	6
Total	256	213	170	15	8	7	7	30

1.2 Specialization on gases

Once a candidate passes the ADN basic training examination and takes part in a specialization course on gases, an examination may be required.

Such examinations must be held in accordance with the requirements of 8.2.2.7.2.5.

1.2.1 Model for the gas specialization examination

Knowledge of physics and chemistry

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
1 Law of ideal gases		1
1.1 Boyle, Gay-Lussac	10	
1.2 Fundamental law	10	
2 Partial pressures and gas mixtures		
2.1 Definitions and simple calculations	10	
2.2 Pressure increase and gas release from cargo tanks	10	1
3 Avogadro's number and calculation of masses of ideal gases		
3.1 Molecular mass, mass and pressure at 15° C	10	
3.2 Application of the mass formula	10	1
4 Density and volume of liquids		
4.1 Density and volume in terms of temperature increase	10	1
4.2 Maximum degree of filling	10	
5 Critical pressure and temperature	5	
6 Polymerization		1
6.1 Theoretical questions	5	
6.2 Practical questions, conditions of carriage	10	1
7 Vaporization and condensation		
7.1 Definitions, etc.	10	
7.2 Vapour pressure at saturation	10	1
8 Mixtures as opposed to pure substances		
8.1 Vapour pressure and composition of mixtures	10	
8.2 Chemical composition and hazard characteristics	10	1
9 Chemical bonds and formulae	10	1
Total		9

Practice

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
1 Flushing		
1.1 Flushing in the event of a change of cargo	5	
1.2 Addition of air to the cargo	5	1
1.3 Methods of flushing (degassing) before entering cargo tanks	10	2
2 Sampling	10	1
3 Danger of explosion	10	2
4 Health risks	10	1

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
5 Gas concentration measures		
5.1 Which devices to use	10	2
5.2 How to use them	10	2
6 Monitoring of closed spaces and entry to these spaces	10	1
7 Certificates for degassing and permitted work	10	1
8 Degree of filling and over-filling	10	1
9 Safety installations	10	2
10 Pumps and compressors	10	1
Total		17

Emergency measures

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
1 Physical injury		
1.1 Liquefied gases on the skin	5	
1.2 Breathing in gas	5	2*
1.3 General assistance	5	
2 Irregularities relating to the cargo		
2.1 Leak in a connection	3	
2.2 Fire in the engine room	3	
2.3 Hazards in the vicinity of the vessel	4	2*
2.4 Over-filling	2	
2.5 Polymerization	3	
Total		4

* The questions must be taken from two different sub-parts.

1.3 Specialization on chemicals

Once a candidate passes the ADN basic training examination and takes part in a specialization course on chemicals, an examination may be required.

Such examinations must be held in accordance with the requirements of 8.2.2.7.2.5.

1.3.1 Model for the chemicals specialization examination

Knowledge of physics and chemistry

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
General	8	1
Temperature, pressure, volume	23	1
Physical state	11	1
Fire, combustion	6	1

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
Density	16	1
Mixtures, chemical bonds	8	1
Molecules, atoms	15	1
Polymerization	17	1
Acids and bases	16	1
Oxidation	7	1
Knowledge of products	20	1
Chemical reactions	16	1
Total		12

Practical knowledge

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
1 Measurement	14	2
2 Sampling	12	1
3 Cleaning of tanks	27	3
4 Handling slops, residual cargo and residual cargo tanks	10	2
5 Gas-freeing	12	2
6 Loading, unloading	35	3
7 Heating	12	2
Total		15

Emergency measures

<i>Objective</i>	<i>Number of questions in the catalogue</i>	<i>Number of questions on the examination</i>
1 Physical injury	7	0 or 1
2 Material damage	6	0 or 1
3 Environmental damage	5	0 or 1
4 Damage-control plans	6	0 or 1
Total		3

2. Catalogue of examination questions: numbering of questions

The numbering of the questions in the catalogue is independent of language, continuous and straightforward.

In order to accommodate computer procedures, the numbering consists of a series of eight digits.

The first indicates whether the question relates to basic or specialized training (“gases” or “chemistry”).

The second indicates whether the question is part of the general training section or of the “dry cargo” or “tank navigation” parts.

The third indicates whether the question is based on “basic knowledge”, “knowledge of physics and chemistry”, “practical knowledge” or “emergency measures”.

The fourth, fifth and sixth indicate the examination objective. To make the numbering easier to understand, this code is taken from the current examination objectives (for example, 01.1 or 10.0).

The seventh and eighth digits indicate the number of the question. They are separated from the “objective” part by a hyphen.

<i>Row</i>	<i>Possible number codes</i>	<i>Subject</i>
1	1	Basic training
	2	Specialization on gases
	3	Specialization on chemistry
2	1	General
	2	Dry cargo vessels
	3	Tank vessels
3	0	Basic knowledge
	1	Knowledge of physics and chemistry
	2	Practical knowledge
	3	Emergency measures
4 to 6	0 to 9	Examination objective under 8.2.2.3.1
7 and 8	0 to 9	Continuous numbering – maximum 99 questions possible

231 01.111 Specialization “gases” – tank-vessel navigation – knowledge of physics and chemistry – examination objective 1.1 – question No. 11

332 12.016 Specialization “chemistry” – tank-vessel navigation – practical knowledge – examination objective 12 – question No. 16

- A Specialization “chemistry”
- B Tank vessels
- C Practical knowledge
- D Examination objective 12
- E Question No. 16

3. Catalogue of questions: Basic training

The questions in the catalogue are divided into three parts: general, dry cargo vessels and tank vessels.

Each of these parts is then divided into objectives. When the catalogue was drawn up, each objective was then subdivided, which limited the scope of each.

General

- The candidate has an understanding of the objective and structure of ADN.
 - What is the objective of ADN?
 - Where is ADN applicable?
 - ADN is divided into how many parts, and what is the content (in general) of each part?
 - What parts must be on board during the transport of dangerous goods?
 - What is the relationship between the different parts?
 - When (to what quantities) is ADN applicable?
 - Explain the numbering system of parts 7 and 9.
 - Where are the transitional provisions in ADN, and what is their purpose?
 - How should the transitional provisions be applied?

Construction and equipment

- The candidate has an understanding of the construction of ADN vessels.
 - What ADN equipment is required?
 - The ADN equipment is inspected by whom, and when?

Measurement techniques

- The candidate has an understanding of how to measure toxicity, oxygen content and explosivity.
 - When are measuring instruments required on board ADN vessels?
 - What measuring instruments may be required on board?
 - What requirements are applied to the measuring (monitoring) instruments?
 - Where, and from what location, must the measurements be taken?
 - When and how must the measurements be recorded?
 - What is the meaning of “upper explosive limit” and “lower explosive limit” and “explosivity range” during transport on board ADN vessels?
 - In what cases should oxygen content be measured?
 - How can the readings of an oxygen meter be interpreted?
 - In what cases should the risk of explosion be measured?
 - How can the readings of an explosimeter be interpreted?

Knowledge of products

- The candidate has an understanding of the risks and classification of dangerous goods.
 - What kind of risks may be posed by dangerous goods?
 - How are dangerous goods classified under ADN?
 - How can you find out about the risks of a given substance?

- What are the risks posed by acids, bases and hydrocarbons?
- What is the meaning of: flash point, boiling point, vapour pressure?
- What chemical reactions may occur during the transport of dangerous goods?

Loading, unloading and transport

- The candidate has an understanding of loading and unloading of vessels and the general requirements for operation and transport.
 - How can one determine, based on a vessel's construction or equipment, whether a given substance may be transported?
 - Where is loading, unloading and transloading possible?
 - When is the authorization of the competent local authority required for loading, unloading and transloading?
 - When and how must announcements be made in accordance with the obligation to report or the reporting and monitoring system?
 - When must reports be made in accordance with the obligation to report or the reporting and monitoring system?
 - For what goods is vessel marking required, and where can the requirement be found?
 - In what conditions can a marking be removed?
 - When is a "do not approach" signal required?
 - When may persons who are not crew members travel on board?
 - When and where is smoking permitted?

Documents

- The candidate has an understanding of the transport documents.
 - What is the objective of the instructions in writing? When must they be on board? Who draws them up and where must they be kept?
 - What are the duties and responsibilities of the master in respect of the instructions in writing?
 - What information must be included in a transport document?

Hazards and measures of prevention

- The candidate has an understanding of prevention and general safety measures.
 - How can the hazards of dangerous goods be foreseen?
 - How can the hazards of acids, bases and hydrocarbons be foreseen?
 - What noxious physical effects can result from a person coming into contact with a corrosive substance?
 - What is to be done in the event of contact with a corrosive substance?
 - When is it possible to enter a closed space?
 - How can it be determined that it is possible to enter a closed space?
 - What is to be done in the event of a leak of a dangerous substance?

- What noxious physical effects can result from a person inhaling a dangerous gas?
- What is to be done in the event of inhalation of a dangerous gas?
- In what conditions can liquids with a flash point under 55 °C be used?
- The candidate has an understanding of the formation of sparks.
 - What devices are authorized for use in and outside of, respectively, the protected area and the cargo area, and when?
 - What work is authorized in and outside of, respectively, the protected areas and the cargo area, and when?
- The candidate has an understanding of personal protective equipment.
 - What personal protection must be worn when measuring for toxicity, oxygen content and explosivity?
 - What personal protection may be required to enter a closed space?
- The candidate has an understanding of fire and fire-fighting techniques.
 - Explain the principles of the fire triangle.
 - What are the different kinds of fire? (solid, liquid or gas, electrical fires)
 - What are the main causes of fires? (for example, open flame, mechanical causes, electrical causes, chemical reactions, heat transmission)
 - What are the different kinds of fires, and when is this classification used?
 - What are the different kinds of fire extinguishers? (liquid, dry, gas)
 - What are the extinguishing agents (water, vapour, foam, AFFF, sand, powder, blankets, CO₂)? How do extinguishing agents work? What are the possible advantages and drawbacks of the various extinguishing agents?
 - What are the kinds of small extinguishers? (powder, carbon dioxide, foam, dry standpipe, integrated systems) and how do they work (in general)?
 - What are the most prevalently used extinguishing methods? (removal of the fuel source, blocking the oxygen supply, lowering the temperature)

Practical exercises

- Practical exercises, in particular for entry into spaces, the use of extinguishers and fire extinguishing facilities, use of personal protective equipment, gas detectors, oxygen meters and toximeters.

Dry cargo vessels

Construction and equipment

- The candidate has an understanding of the construction of dry cargo vessels.
 - What are the differences between a double-hull and a single-hull vessel?
 - What information is given by a stability calculation in the event of a leak?

Treatment of holds and adjacent spaces

- The candidate has an understanding of degassing, cleaning and maintenance.

- When is it necessary to degas a hold?
- When is it necessary to clean a hold?
- The candidate has an understanding of the ventilation of holds and spaces outside the protected area.
 - When is ventilation of holds required?
 - How often is ventilation required?

Loading, unloading and transport

- The candidate has an understanding of loading and unloading and of the general service requirements and requirements relating to transport.
 - When and how can containers be loaded under ADN?
 - What are the requirements for mixed loading of containers?
 - What are the restrictions applicable to transported quantities?
 - When (and as from what quantities) is ADN applicable?
 - When should loading or unloading be interrupted?
- The candidate has an understanding of the labelling of packages.
 - What colours and symbols can danger labels have, and what do they mean?

Documents

- The candidate has an understanding of the transport documents.
 - What documents are required for the transport of dangerous goods? Who issues them, when are they issued and what is their period of validity?
 - Explain the aim and function of the required documents.
 - Under ADN, what purpose is served and what needs are met by the stowage plan?
 - Under ADN, what must be included in a stowage plan?

Hazards and measures of prevention

- The candidate has an understanding of prevention and general safety measures.
 - What is to be done if there is a leak of the product?
- The candidate has an understanding of personal protective equipment.
 - What personal protective equipment is required by ADN to deal with emergencies on board dry cargo vessels?
 - What personal equipment mentioned by ADN must be used in what emergencies?

Tank vessels

Construction and equipment

- The candidate has an understanding of the construction of tank vessels.
 - Types C, G and N tank vessels are suitable for what kind of transport?

- What is the difference between open tank vessels and closed tank vessels?
- For type N vessels, what is the difference between single-hull and double-hull construction?
- The candidate has an understanding of ventilation and air extraction systems.
 - What kinds of ventilation and air extraction systems are mentioned in ADN?
 - What are the characteristics of the various kinds of ventilation and air extraction systems?
- The candidate has an understanding of the ADN loading and unloading system.
 - Under ADN, what requirements must be met by the loading and unloading system?

Treatment of holds and adjacent spaces

- The candidate has an understanding of degassing, cleaning and maintenance.
 - In what conditions can cargo tank hatches be opened?
 - In what conditions can flame-arresters be removed?
 - When must a cargo tank be degassed?
 - How is a cargo tank degassed, taking into consideration the safety measures?
 - What does a certificate attesting gas-free condition attest to?
 - What must be done, taking into consideration the safety measures, to be able to clean the cargo tanks?
 - What are the inherent dangers in cleaning cargo tanks?
 - How can the dangers inherent to cleaning of cargo tanks be avoided?
 - Describe existing cleaning techniques.
 - What are the requirements that must be met by an additional stripping system?
 - Who has to inspect the stripping system, and when?
- The candidate has an understanding of cargo heating.
 - What is the purpose of heating instructions?
 - Where in ADN can information be found on the boiling point and on cargo heating?
 - What are the errors that may be committed during cargo heating?
- The candidate has an understanding of the handling of residual cargo tanks.
 - How should a residual cargo tank be equipped?
 - What can a residual cargo tank be used for?
 - What safety measures are taken before a residual cargo tank can be used?

Measurement and sampling technique

- The candidate has an understanding of how to measure toxicity, oxygen content and explosivity.

- Limits of the term “measurement technique”, basic course on navigation with tanks.
- The candidate has an understanding of how to take samples.
 - What types of sampling devices exist under ADN?
 - Under ADN, why is it necessary to use a given type of sampling device?
 - Explain the way in which the various types of sampling devices operate.
 - What safety measures must be taken when samples are taken?
 - In what conditions is it possible to open a sampling opening?

Loading, unloading and transport

- The candidate has an understanding of the loading, unloading, general service requirements and transport requirements.
 - What is the influence of the following on loading and unloading: critical temperature, critical pressure, boiling point, solidification point, absolute zero, density?
 - How are Celsius degrees converted to kelvin and vice versa?
 - Describe, precisely in order, the actions required to prepare a vessel for loading.
 - Describe how the weight and distribution of the cargo can influence the stability of a vessel.
 - Explain the purposes during loading and unloading of vapour pipes, pipes for loading and unloading and discharging pumps.
 - What are the purposes and operating principles of pressure-relief valves, vacuum-relief valves, overfilling valves, level alarms, level indicating devices and flame-arresters?
 - What is the operating principle of a pressure pump and of a centrifugal pump, and what is the difference between these two systems?
 - When can a cavitation form, and what action should be taken if it does?
 - How is the interaction between temperature and degree of filling calculated?
 - What is the relationship between the weight of the cargo and the degree of filling?
 - How can it be determined whether a dangerous reaction has taken place between a substance and water?
 - What restrictions apply to quantities transported?
 - What measures must be taken outside the cargo area during loading and unloading?
 - In what conditions can the gaseous phase be rendered inert in cargo tanks?

Documents

- The candidate has an understanding of the transport documents.
 - What documents are required for the transport of dangerous goods? Who issues them, when are they issued and how long are they valid?

- Explain the purpose and function of the required documents.
- Explain the purpose and function of the lists of substances drawn up by the classification society.
- What is the purpose of the checklist? When must it be drawn up? Where can it be found, and who must fill it in?
- What is the purpose of the loading journal? When must it be drawn up? Who issues it and who must fill it in?

Hazards and measures of prevention

- The candidate has an understanding of prevention and general safety measures.
 - What is to be done if there is a leak of the product?
 - When can static electricity be produced?
 - How can static electricity be discharged?
 - The candidate has an understanding of the formation of sparks.
 - What installations are authorized in and outside the cargo area and when can they be used?
 - What works can be done in and outside a hold, and in what conditions?
 - The candidate has an understanding of personal protective equipment and safety equipment.
 - What personal protective equipment is required under ADN?
 - What personal protective equipment required under ADN must be worn during which kinds of works?
 - What personal protective equipment mentioned in ADN must be used in an emergency?
 - The candidate has an understanding of fires and fire-fighting techniques.
 - What is the meaning of the following terms in the context of the transport of dangerous goods on tank vessels: detonation, deflagration, explosion, temperature, combustion and ignition?
-