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ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

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)

Fifteenth session
Geneva, 24-28 August 2009
Item 5 of the provisional agenda

CATALOGUE OF QUESTIONS

Gas - knowledge of physics and chemistry and emergency measures

Transmitted by the Central Commission for the Navigation of the Rhine (CCNR)¹

1. At its fourteenth session, the ADN Safety Committee, recalling that, under 8.2.2.7.2.3 of the Regulations annexed to ADN, the ADN Administrative Committee was required to prepare a catalogue of questions for the ADN examinations, decided that the item should be put on the agenda for future sessions, in order to enable lists of questions to be translated and adopted progressively (ECE/TRANS/WP.15/AC.2/30, paras. 38 and 40).

¹ Distributed in German by the Central Commission for the Navigation of the Rhine under the symbol CCNR/ZKR/ADN/WP.15/AC.2/2009/23.

2. This document contains the lists of questions proposed by CCNR in respect of:

Knowledge of physics and chemistry

- Examination objective 1.1: Law of ideal gases, Boyle - Gay-Lussac
- Examination objective 1.2: Law of ideal gases, fundamental laws

Steps to be taken in the event of an emergency - personal injury

- Examination objective 1.1: Personal injury - Liquefied gas on skin
- Examination objective 1.2: Personal injury - Breathing in gas
- Examination objective 1.3: Personal injury - Emergency assistance, general

Steps to be taken in the event of an emergency - dangerous incidents relating to the cargo

- Examination objective 2.1: Irregularities relating to the cargo - Leak in a connection
- Examination objective 2.2: Irregularities relating to the cargo - Fire in the engine room
- Examination objective 2.3: Irregularities relating to the cargo - Hazards in the vicinity of the vessel
- Examination objective 2.4: Irregularities relating to the cargo - Over-filling
- Examination objective 2.5: Irregularities relating to the cargo - Polymerization

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.1: Law of ideal gases, Boyle - Gay-Lussac

Number	Source	Correct answer
G 1101	Boyle-Mariotte law: $pV=\text{constant}$ A quantity of nitrogen subject to an absolute pressure of 100 kPa takes up a volume of 60 m^3 . At a constant temperature of 10°C , the nitrogen is compressed to 5 bars absolute pressure. What is the resulting volume? A 1 m^3 B 11 m^3 C 12 m^3 D 20 m^3	C
G 1102	Boyle-Mariotte law: $pV=\text{constant}$ Some propane vapour is in a cargo tank of 250 m^3 at ambient temperature and at 4 bars absolute pressure. Through a hole in the piping, enough propane escapes for the cargo tank to be at atmospheric pressure. What is the volume of the propane cloud if it does not mix with the air? A 250 m^3 B 500 m^3 C 750 m^3 D $1,000\text{ m}^3$	C
G 1103	Boyle-Mariotte law: $pV=\text{constant}$ A given quantity of nitrogen has a volume of 50 m^3 at an overpressure of 0.6 bar. The nitrogen is compressed to a volume of 20 m^3 . The temperature remains constant. What is the resulting pressure of the nitrogen? A 1.5 bars absolute pressure B 3.0 bars absolute pressure C 4.0 bars absolute pressure D 5.0 bars absolute pressure	B

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.1: Law of ideal gases, Boyle - Gay-Lussac

Number	Source	Correct answer
G 1104	Boyle-Mariotte law: $pV=\text{constant}$ There is nitrogen in a cargo tank of 250 m^3 . The pressure gauge indicates a pressure of 1.2 bars. What amount of nitrogen is required to bring the pressure in the tank to 3 bars? A 450 m^3 B 700 m^3 C 950 m^3 D $1,200\text{ m}^3$	A
G 1105	Boyle-Mariotte law: $pV=\text{constant}$ A quantity of nitrogen takes up a volume of 50 m^3 at 3.2 bars absolute pressure. At a constant temperature, the volume is reduced to 10 m^3 . What is the resulting pressure of the nitrogen? A 11 bars absolute pressure B 16 bars absolute pressure C 20 bars absolute pressure D 21 bars absolute pressure	B
G 1106	Gay-Lussac law: $p/T=\text{constant}$ In a closed tank there is propane vapour at 1.2 bars absolute pressure and at a temperature of $+10^\circ\text{C}$. With the volume of the tank remaining constant, the temperature is increased until the pressure reaches 1.4 bars absolute pressure. What is the resulting temperature of the gas? A 12°C B 20°C C 57°C D 293°C	C

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.1: Law of ideal gases, Boyle - Gay-Lussac

Number	Source	Correct answer
G 1107	Gay-Lussac law: $p/T=\text{constant}$ A cargo tank contains propane gas at 5.0 bars absolute pressure and a temperature of 40° C. The propane gas cools to 10° C. What is the pressure in the cargo tank? A 1.0 bar absolute pressure B 1.2 bars absolute pressure C 3.6 bars absolute pressure D 4.5 bars absolute pressure	D
G 1108	Gay-Lussac law: $p/T=\text{constant}$ A cargo tank contains nitrogen at 1.5 bars absolute pressure and at -10° C. The temperature of the nitrogen increases to +30° C. What is the resulting pressure? A 1.8 bars absolute pressure B 2.9 bars absolute pressure C 4.5 bars absolute pressure D 7.5 bars absolute pressure	B
G 1109	Gay-Lussac law: $p/T=\text{constant}$ A drum of 10 m ³ filled with nitrogen is under 10 bars absolute pressure at a temperature of 100° C. With the drum volume remaining constant, the drum and its contents are cooled to -10° C. What is the resulting pressure? A 1 bar absolute pressure B 6 bars absolute pressure C 7 bars absolute pressure D 8 bars absolute pressure	C

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.1: Law of ideal gases, Boyle - Gay-Lussac

Number	Source	Correct answer
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G 1110	Gay-Lussac law: $p/T = \text{constant}$	B
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In a cargo tank there is nitrogen at a temperature of 40° C. The pressure, 5 bars absolute pressure, has to be reduced to 4 bars absolute pressure. The nitrogen must be cooled to what temperature?

- A -22.6° C
- B -12.2° C
- C +33.3° C
- D +32° C

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.2: Law of ideal gases, fundamental laws

Number	Source	Correct answer
G 1201	Fundamental law of gases: $pV/T=\text{constant}$ The temperature of a volume of gas of 40 m^3 at 1 bar absolute pressure is increased from 20°C to 50°C . The pressure increases to 2 bars absolute pressure. What is the resulting volume? A 22 m^3 B 29 m^3 C 33 m^3 D 50 m^3	A
G 1202	Fundamental law of gases: $pV/T=\text{constant}$ A gas takes up a volume of 9 m^3 at 1 bar absolute pressure and a temperature of 10°C . The temperature is increased to 50°C and at the same time the volume is reduced to 1 m^3 . What is the resulting pressure? A 9.3 bars absolute pressure B 10.3 bars absolute pressure C 11.3 bars absolute pressure D 20.5 bars absolute pressure	B
G 1203	Fundamental law of gases: $pV/T=\text{constant}$ A gas takes up a volume of 40 m^3 at a temperature of 50°C and at 2 bars absolute pressure. With the temperature reduced to 10°C , the gas is at 1 bar absolute pressure. What is the resulting volume? A 12 m^3 B 16 m^3 C 52 m^3 D 70 m^3	D

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.2: Law of ideal gases, fundamental laws

Number	Source	Correct answer
G 1204	<p>Fundamental law of gases: $pV/T=\text{constant}$</p> <p>A gas takes up a volume of 20 m^3 at a temperature of 50°C and at 2 bars absolute pressure.</p> <p>The temperature of the gas is reduced to 20°C and the volume is increased to 40 m^3.</p> <p>What is the resulting pressure of the gas?</p> <p>A 0.4 bar absolute pressure B 0.6 bar absolute pressure C 0.9 bar absolute pressure D 1.4 bars absolute pressure</p>	C
G 1205	<p>Fundamental law of gases: $pV/T=\text{constant}$</p> <p>A gas takes up a volume of 10 m^3 at 3.0°C and at 1.0 bar absolute pressure. To what temperature must the gas be brought so that at 1.1 bars absolute pressure it takes up a volume of 11 m^3?</p> <p>A 3.5°C B 3.6°C C 46°C D 61°C</p>	D
G 1206	<p>Fundamental law of gases: $pV/T=\text{constant}$</p> <p>A gas takes up a volume of 20 m^3 at a temperature of 77°C and 1 bar absolute pressure. To what temperature should the gas be cooled so that it occupies a volume of 8 m^3 at 2 bars absolute pressure?</p> <p>A -63°C B 7°C C 46°C D 62°C</p>	B

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.2: Law of ideal gases, fundamental laws

Number	Source	Correct answer
G 1207	Fundamental law of gases: $pV/T=\text{constant}$ At a temperature of 10° C and 1 bar absolute pressure, a gas occupies a volume of 70 m ³ . What is the volume when the pressure is brought to 2 bars absolute pressure and the temperature to 50° C? A 40 m ³ B 53 m ³ C 117 m ³ D 175 m ³	A
G 1208	Fundamental law of gases: $pV/T=\text{constant}$ At a temperature of 10° C and 1 bar absolute pressure, a gas takes up 5 m ³ . What is the volume when the pressure is brought to 2 bars absolute pressure and the temperature is 170° C? A 2.0 m ³ B 3.9 m ³ C 5.3 m ³ D 42.5 m ³	B
G 1209	Fundamental law of gases: $pV/T=\text{constant}$ A gas takes up 8 m ³ at a temperature of 7° C and at 2 bars absolute pressure. What is the pressure when the volume is brought to 20 m ³ and the temperature to 77° C? A 1.0 bar absolute pressure B 1.5 bars absolute pressure C 8.8 bars absolute pressure D 13.2 bars absolute pressure	A

GAS - KNOWLEDGE OF PHYSICS AND CHEMISTRY
Examination objective 1.2: Law of ideal gases, fundamental laws

Number	Source	Correct answer
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G 1210 Fundamental law of gases: $pV/T = \text{constant}$ C

A gas takes up 8 m^3 at a temperature of 7°C and at 2 bars absolute pressure.

What should the temperature be for the gas to take up a volume of 20 m^3 at 1 bar absolute pressure?

- A 9°C
- B 12°C
- C 77°C
- D 194°C

EMERGENCY MEASURES**Examination objective 1.1: Personal injury - Liquefied gas on skin**

Number	Source	Correct answer
GM 1101	Liquefied gas on skin	B
<p>A crew member has had liquefied butane spilled on the hands. What first aid should be administered?</p> <p>A Briefly rinse the hands B Rinse the hands with water for at least 15 minutes C Treat the hands with an anti-burn ointment D Wrap the hands so that they are kept warm</p>		
GM 1102	Liquefied gas on skin	A
<p>A crew member has had liquefied butane spilled on the hands. You rinse the victim's hands with water for at least 15 minutes. If after the rinsing the hands do not recover their natural colour, what else do you have to do?</p> <p>A Call a doctor B Call the victim's family so that they can retrieve the victim C Put the victim to bed to keep the person warm D Treat the hands with an anti-burn ointment and wrap them</p>		
GM 1103	Liquefied gas on skin	C
<p>What do you do if a crew member has had liquefied butane spilled on his or her body?</p> <p>A Immediately remove the clothing and pad the body with water and sterile cotton B Immediately remove the clothing and shower the person C Put the person in a shower, then remove clothing in the shower D Have the person sit, clothed, in a warm bath for at least 15 minutes</p>		

EMERGENCY MEASURES**Examination objective 1.1: Personal injury - Liquefied gas on skin**

Number	Source	Correct answer
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GM 1104 Liquefied gas on skin D

A crew member has had liquefied ammonia spilled on the hands. What is the first thing for you to do?

- A Call a doctor
- B Have the person taken as quickly as possible to a burn centre
- C Apply an anti-burn cream copiously on the hands
- D Rinse the hands with water for at least 15 minutes

EMERGENCY MEASURES
Examination objective 1.2: Personal injury - Breathing in gas

Number	Source	Correct answer
GM 1201	Breathing in gas	C
<p>A member of the vessel's crew has breathed in a large quantity of propane but has not lost consciousness.</p> <p>What is the first thing for you to do?</p> <p>A. Have the person breathe freely</p> <p>B. Give the person oxygen</p> <p>C. Bring the person away from the danger zone and keep the person under surveillance</p> <p>D. Bring the person away from the danger zone and lie the person down in a stable position</p>		
GM 1202	Breathing in gas	D
<p>A member of the vessel's crew has breathed in propane and has lost consciousness but is still breathing.</p> <p>What is the first thing for you to do?</p> <p>A. Mouth-to-mouth resuscitation</p> <p>B. Give the person oxygen</p> <p>C. Bring the person away from the danger zone and keep the person under surveillance</p> <p>D. Bring the person away from the danger zone and lie the person down in a stable position</p>		
GM 1203	Breathing in gas	A
<p>A member of the vessel's crew has breathed in propane, has lost consciousness and is not breathing.</p> <p>What is the first thing for you to do?</p> <p>A. Bring the person away from the danger zone and apply mouth-to-mouth resuscitation</p> <p>B. Give the person oxygen</p> <p>C. Bring the person away from the danger zone and keep the person under surveillance</p> <p>D. Bring the person away from the danger zone and lie the person down in a stable position</p>		

EMERGENCY MEASURES**Examination objective 1.2: Personal injury - Breathing in gas**

Number	Source	Correct answer
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GM 1204 Breathing in gas B

A member of the vessel's crew has breathed in ammonia. The person is coughing and has trouble breathing.

What is the first thing for you to do?

- A. Give the person oxygen until there is no more coughing, then have the person lie down on a bed
- B. Bring the person away from the danger zone, keep the person under surveillance and call a doctor
- C. Shower the person and remove clothing
- D. Apply mouth-to-mouth resuscitation and inform a doctor

GM 1205 Breathing in gas B

A member of the vessel's crew has breathed in some propane gas. When do you apply mouth-to-mouth resuscitation?

- A. If the victim has lost consciousness and is breathing
- B. If the victim has lost consciousness and is not breathing
- C. If the victim has not lost consciousness and is breathing
- D. If the victim has not lost consciousness and is not breathing

EMERGENCY MEASURES

Examination objective 1.3: Personal injury - Emergency assistance, general

Number	Source	Correct answer
GM 1301	Emergency assistance, general	A
<p>During an inspection, a member of the vessel's crew feels sick in a hold space. What is the first thing for you to do?</p> <p>A. Inform the master and provide first aid</p> <p>B. Enter the hold space and find out what happened to the victim</p> <p>C. Immediately remove the victim from the hold space with the help of a colleague</p> <p>D. Activate the "do not approach" signal</p>		
GM 1302	Emergency assistance, general	C
<p>A member of the vessel's crew trips on piping and has a serious fall. What is the first thing for you to do?</p> <p>A. Apply mouth-to-mouth resuscitation</p> <p>B. Put the victim to bed</p> <p>C. Check if the victim has lost consciousness</p> <p>D. Inform a doctor</p>		
GM 1303	Emergency assistance, general	C
<p>How do you check if a victim has lost consciousness as a result of an accident?</p> <p>A. Check if you can feel a pulse</p> <p>B. Check if the thorax is moving and whether the victim is breathing</p> <p>C. Check if the victim reacts to your words or other stimuli</p> <p>D. Check if the victim reacts to the smell of ether</p>		
GM 1304	Emergency assistance, general	D
<p>A member of the vessel's crew has breathed in a dangerous gas and has to be transported to hospital. What is the most important information to send with the victim?</p> <p>A. The victim's service record</p> <p>B. The telephone number of the victim's family</p> <p>C. The victim's passport</p> <p>D. Information on the cargo</p>		

EMERGENCY MEASURES**Examination objective 2.1: Irregularities relating to the cargo - Leak in a connection**

Number	Source	Correct answer
GM 2101	Leak in a connection	A
	<p>During unloading, liquid drips from a connection between the pipes for loading and unloading and the loading facility. What do you do?</p> <p>A. Stop the pumps and close the corresponding blocking valves</p> <p>B. Place a receptacle under the connection to collect the leak</p> <p>C. Pump slowly</p> <p>D. Place a wet towel around the connection and continue the unloading</p>	
GM 2102	Leak in a connection	B
	<p>During loading, a connection between the pipes for loading and unloading and the loading facility develops a leak. What do you do?</p> <p>A. Load more slowly</p> <p>B. Stop the loading after consultation with the loading facility</p> <p>C. Continue to load</p> <p>D. Place a receptacle under the connection</p>	
GM 2103	Leak in a connection	C
	<p>During navigation with a loaded vessel, a place is found in the loading and unloading piping that is not leak-proof. All shut-off valves are closed. What do you do?</p> <p>A. Activate the “do not approach” signal, moor the vessel and alert the authorities</p> <p>B. Activate the “do not approach” signal and continue the voyage</p> <p>C. Depressurize the piping</p> <p>D. Continue the voyage without taking any additional measures</p>	

EMERGENCY MEASURES

Examination objective 2.2: Irregularities relating to the cargo - Fire in the engine room

Number	Source	Correct answer
GM 2201	<p>Fire in the engine room</p> <p>During loading, a fire breaks out in the engine room.</p> <p>What do you do, apart from extinguishing the fire?</p> <p>A. Continue to load, but inform the shore facility</p> <p>B. Just inform the shore facility</p> <p>C. Activate the rapid blocking system and inform the shore facility</p> <p>D. Call the shipping police</p>	C
GM 2202	<p>Fire in the engine room</p> <p>You have a cargo of UN No. 1011 BUTANE. A fire breaks out in the machine room while the vessel is under way.</p> <p>What do you do, apart from extinguishing the fire?</p> <p>A. Inform the competent authority</p> <p>B. Inform the consignee</p> <p>C. Continue the voyage and activate the “do not approach” signal</p> <p>D. Activate the water-spray system</p>	A
GM 2203	<p>Fire in the engine room</p> <p>During unloading a fire breaks out in the engine room. What do you do, apart from extinguishing the fire?</p> <p>A. Simply continue the voyage</p> <p>B. Just inform the shore facility</p> <p>C. Activate the rapid blocking system and inform the shore facility</p> <p>D. Activate the “do not approach” signal</p>	C

EMERGENCY MEASURES**Examination objective 2.3: Irregularities relating to the cargo - Hazards in the vicinity of the vessel**

Number	Source	Correct answer
GM 2301	Hazards in the vicinity of the vessel	B
<p>Your vessel is moored at a shore facility and is ready to be unloaded. A fire alarm is activated at the shore facility. On the dock and in the vicinity you see no fire. What do you do?</p> <p>A. Disconnect the connections and depart with the vessel B. Await instructions from the shore facility C. Activate the water-spray system D. Activate the “do not approach” signal</p>		
GM 2302	Hazards in the vicinity of the vessel	A
<p>During unloading a fire breaks out on the dock.</p> <p>What do you do?</p> <p>A. Activate the rapid blocking system, disconnect the connections and depart with the vessel B. Call the shipping police C. Activate the water-spray system D. Await instructions from the shore facility</p>		
GM 2303	Hazards in the vicinity of the vessel	B
<p>While propane is being unloaded, there is a gas leak at the shore facility. The alarm is activated. What do you do?</p> <p>A. Activate the water-spray system B. Await instructions from the shore facility C. Continue to unload, but wear a breathing apparatus D. Constantly measure the gas concentration on deck</p>		

EMERGENCY MEASURES

Examination objective 2.4: Irregularities relating to the cargo - Over-filling

Number	Source	Correct answer
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GM 2401 Over-filling A

During loading with propane, you regularly check the level gauges. There is a cargo tank that contains more than the amount permitted by the admissible maximum degree of filling.

What do you do?

- A. Have the loading stopped by the shore facility and pump the overflow into another cargo tank
- B. Activate the rapid blocking system and pump the overflow into another cargo tank
- C. Ensure that the admissible total quantity is not exceeded
- D. During the rest of the loading, allow the overflow to flow into another cargo tank

GM 2402 Over-filling A

During loading with butane, you regularly check the level gauges. A cargo tank contains more than the amount permitted by the admissible maximum degree of filling.

What do you do?

- A. Have the loading stopped by the shore facility and pump the overflow into another cargo tank
- B. Separate this cargo tank and another of the cargo tanks, and using the compressor, you force liquid into the other cargo tank while continuing to load
- C. Ensure that the admissible total quantity is not exceeded
- D. Do nothing, as in specific circumstances you can take a little more cargo in **one** cargo tank

EMERGENCY MEASURES**Examination objective 2.4: Irregularities relating to the cargo - Over-filling**

Number	Source	Correct answer
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GM 2403 Over-filling

D

During loading with propane, the facility against overflowing is actuated. You are supposed to make a short voyage, in winter. How do you proceed?

- A. You disconnect the facility against overflowing and you continue to load
- B. You depart with the vessel, without undertaking any other action
- C. As you are able to carry more cargo, there is no problem
- D. You pump back some of the cargo until the admissible maximum degree of filling is reached

EMERGENCY MEASURES

Examination objective 2.5: Irregularities relating to the cargo - Polymerization

Number	Source	Correct answer
GM 2501	Polymerization	C
<p>During carriage of UN No. 1010 1,2-BUTADIENE, STABILIZED, the temperature rises in one of the cargo tanks. You assume the cargo has started polymerizing. What do you do?</p> <p>A. Activate the water-spray system to cool the cargo B. Fill the hold space with water to cool the cargo C. Inform the consignee of the cargo D. Release vapour from time to time</p>		
GM 2502	Polymerization	B
<p>During carriage of UN No. 1010 1,3-BUTADIENE, STABILIZED, the temperature rises in one of the cargo tanks. You assume the cargo has started polymerizing. What do you do?</p> <p>A. Add the accompanying inhibitor B. Inform the consignee of the cargo C. Moor the vessel and inform the competent authority D. Fill the hold space with water to cool the cargo</p>		
GM 2503	Polymerization	D
<p>During carriage of UN No. 1010 1,3-BUTADIENE, STABILIZED, the temperature rises in one of the cargo tanks. You assume the cargo has started polymerizing. What do you do?</p> <p>A. Release vapour from time to time to cool the cargo B. Activate the water-spray system to cool the cargo C. Pump the product out of the cargo tank in question and mix it with the contents of the other cargo tanks D. Inform the consignee of the cargo</p>		
