Ship Knowledge Questions

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1 Principal dimensions

1.1 Definitions

1. What is Length over all?
2. What means length between perpendiculars?
3. What means Loadline?
4. What means Construction Waterline?
5. What means 'moulded dimensions'?
6. What is freeboard?
7. What is a perpendicular?
8. What is the fore perpendicular (F_{PP})?
9. What is the aft perpendicular (A_{PP})?
10. What is the load line?
11. What is the light(ship) waterline?
12. What is the deep-water load line?
13. What is the (summer) waterline?
14. What is the design waterline?
15. What is the construction waterline (C_{WL})?
16. What is the deck line?
17. What do 'moulded dimensions' mean?
18. What is the base line?
19. What is the load line or Plimsoll line?
20. What information does the Plimsoll mark give? (2 answers)
21. What information does the load line give? (2 answers)
22. What determines the value of the minimal freeboard?
23. Why does the minimal freeboard depend on the length/depth ratio?
24. Draw the Plimsoll line, Plimsoll mark and the deck line and assign the names; give a description of each of these.
25. What happens to the Plimsoll mark when a ship carries a deck cargo of timber?
26. Draw the Plimsoll line, Plimsoll mark and the deck line in such a condition, assign the names and give a description of each of these.
27. If a ship has permission to forward until TS, is the maximum allowed draught more or less than S?
28. How are the Plimsoll marks, the Plimsoll line, and the deck line fixed to the ship and why is this so?

1.2 Dimensions

29. What is the length between the perpendiculars (L_{pp})?
30. What is the length over all (L_{oa})?
31. What is the length on the waterline (L_{wl})?
32. What is the breadth?
33. What is the breadth over all?
34. What is the draught amidships?
35. What is the draught at the stem (T_{fwd})?
36. What is the draught at the stern (T_a)?
37. Why must the draught marks be welded onto the ship?
38. 'The ship has trim' What does this mean?
39. What does 'down by the head' mean?
40. What does 'down by the stern' mean?
41. What is the meaning of 'on even keel'?
42. What is the Depth?
43. How is the Depth measured?
44. What is meant by Freeboard?
45. What is the difference between Summer Freeboard and freeboard?
46. What is the airdraft of a vessel?
47. Does the freeboard become larger or smaller when ballast is added?
48. What is the sheer?
49. Why does the sheer in fore and aft ship give the vessel extra reserve buoyancy?
50. What is the camber?
51. What is the rise of floor?
52. What is the bilge radius?

1.3 Proportions

53. Name a number of ship's proportions related to the ratio of vessel main dimensions.
54. What is a usual L/B-ratio for a freighter?
55. Why is a small L/B-ratio unfavourable for the manoeuvrability?
56. Which value for the L/D-ratio is better for the strength, a value of 10 or a value of 15? Explain why.
57. Which value for the B/T-ratio is more favourable for the initial stability, a value of 3 or a value of 4? Explain why.
58. At which B/D-ratio is the deck more likely to flood: 1 or 2? Explain.

1.4 Volumes and Weights

59. The dimensions of a ship can be expressed by using terms that describe the characteristics of the ship. Explain this and give some examples thereof.
60. What new units describing some characteristics of a ship were introduced at the IMO conference in 1969?
61. What is a Register Ton (RT)?
62. What spaces are included in GT?
63. What does it mean when a value is dimensionless?
64. Why does an owner want to keep the GT as low as possible?
65. What strategies are adopted to keep the GT as low as possible?
66. Why can a small GT have an unfavourable effect on the safety of a vessel?
67. Explain the difference between GT and NT?
68. What is the lowest allowable value of NT in relationship to GT?
69. What is the displacement volume?
70. What is the meaning of the underwater- body (moulded) volume?
71. What is the meaning of the difference between displacement volume and the underwater-body (moulded) volume?
72. What is the displacement (in tons) of a vessel?
73. What is the relationship between displacement volume and displacement weight?
74. What is light (ship) weight?
75. Name some parts of the regular inventory of a ship.
76. What is the deadweight?
77. What is the cargo carrying capacity or deadweight capacity?
78. Why is the deadweight at a given draught a fixed number, while the cargo capacity is not a fixed number?
79. How can you calculate the cargo capacity?

2 Form coefficients

80. Name four form coefficients related to the underwater part of a ship.
81. Of what part of the ship do the form (lines) coefficients give information?

2.1 Waterplane coefficient

82. What ratio is indicated by the waterplane coefficient?
83. What is the relation between stability and the waterplane coefficient?

2.2 Midship Section Coefficient

84. What ratio gives the midship coefficient?

2.3 Block coefficient, coefficient of fineness, C_b.

85. What is the formula for the block coefficient (or buoyancy coefficient, coefficient of fineness, C_b)?
86. If one wants to build a 'fast' ship, does the C_b have to be large or small? Explain your answer.
87. What is a typical value for the block-coefficient of a containership?

2.4 Prismatic coefficient, C_p.

88. What is the formula for the prismatic coefficient?
89. How can you calculate the prismatic coefficient?
90. When are the block-coefficient and the prismatic coefficient equal?

3 Hull Form (Lines Plan)

91. What general information is in a lines plan?
92. What information is in a waterline model?
93. Make a simple sketch of a waterline model.
94. What are ordinates?
95. Where are the ordinates 0 and 20?
96. Make a simple sketch of a body plan?
97. What are the verticals?
98. Make a simple sketch of a longitudinal plan.
99. What are sent lines?
100. What is the 'modification' of waterlines, ordinates and verticals?
101. What can be checked using the sent lines (or diagonals)?
102. What does 'transforming ship's shape' mean?
103. What part of the ship is drawn on the right side in a body plan?
104. What part of the ship is drawn on the left side in a body plan?
105. Draw the lines plan of a rectangular forecastle.
106. Sketch the body plan for a heavy-cargo ship and name the different line types and explain what these lines represent.
107. Sketch the buttocks for a heavy-cargo ship and name the different line types and explain what these lines represent.
108. Sketch the waterline plan for a heavy-cargo ship and name the different line types and explain what these lines represent.

4 Drawings

109. Give some plans that have to be submitted for approval to the flag state
110. Give some plans that have to be submitted for approval to a classification bureau.

4.1 Drawing List

111. Name the drawings which have to be submitted Class and/or Flag state?

4.2 General Arrangement Plan

112. What views can be seen on the general arrangement (plan)?
113. What information can be extracted from the general arrangement plan?
114. What main data are mentioned in the general plan?

4.3 Construction Plan

115. What important section is shown on the construction plan?
116. Is plate thickness and material quality of decks etc. indicated on the Construction Plan?

4.4 Shell Expansion

117. What is a shell-expansion plan, and what does this show?
118. Why does the shape of a ship seem somewhat distorted in a shell expansion drawing?

4.5 Midship Section

119. What drawings are shown in a mid ship section or mainframe drawing?
120. What important data are mentioned in the mid ship section, apart from material thickness etc.?

4.6 Various other drawings

121. What is indicated in a safety plan?
122. What is indicated in a dock plan?
123. What is indicated in a capacity plan?

4.7 Bulkheads

124. What are the watertight bulkheads what every ship must be provided with?
125. What is the number of bulkheads related to?

5 Important data on various ships

126. Why are ship-owners interested in promoting their ships as much as possible and how can they do this?
127. What is meant by a (ship) data sheet (i.e. important data) and what kind of information may one find there?
128. Give a simple data sheet for a refrigerated vessel.
129. Give a simple data sheet for a general-cargo ship.
130. Give a simple data sheet for a chemical tanker.
131. Give a simple data sheet for a gas tanker.

1 Classification of ships in types

1. Give a classification of ships in types; in doing so, make use of two main categories.
2. What ship types are used for the transport of cargo and passengers?

2 Brief discussion of several Types of Ships

3. What ship types may be found under the classification 'other ships' and what are these used for?

1.1 Multi-purpose ships

4. What is a multi-purpose ship?
5. Which types of cargo can a multi-purpose ship transport.
6. The presence of pontoons on multi-purpose ships increases the versatility of the holds. Explain why.
7. Name and explain some main characteristics of a multi-purpose ship.
8. What are the disadvantages of cargo gear on a ship?
9. What are the advantages of cargo gear on a ship?
10. What is the difference between a coastal trade liner and other multi-purpose ships?
11. What is meant by the 'air draft' of a vessel?
12. Given the air draft is approximately 6.5 meters. Is this a maximum or a minimum?

1.2 Container ships

13. The transport of containers by ship is only a small part of the transport chain. Explain and elaborate on this.
14. What do TEU and FEU mean?
15. Name and explain some characteristics of a container ship.
16. There are two main types of container ships; name these two and explain the main differences between these types.
17. Container ships can be equipped with or without hatches. Give a disadvantage and an advantage of ships without hatches.
18. Give an advantage and a disadvantage of a guide rail on container ships.
19. What are cellular ships?
20. What are Panamax ships?
21. What are container feeders?
22. Container feeders are used for what purpose?

1.3 Roll-on Roll-off Ships

23. What is the main characteristic of a ro-ro carrier?
24. Why is a layer of water on a car deck dangerous?
25. What measures are obligatory against water spreading over an entire car deck?
26. Why is often the combination made between ro-ro and passenger trade
27. What cargoes are transported?
28. What decides the height of a car deck space
29. What does the abbreviation RoRo-vessel stand for?
30. Why are the tween decks in RoRo-vessels adjustable in height?
31. RoRo-vessels are always equipped with an anti-heeling system. Explain: a. How does such a system work?
    b. Why is the system used?
32. What is the usual cargo of a RoRo-vessel?
33. What is shipped by car and passenger ferries?
34. Give some characteristics of car and passenger ferries.

1.4 Heavy-Lift ships

35. What are heavy-cargo ships?
36. Heavy-cargo ships are used for what purpose?
37. Name possible cargo(es) carried by a heavy-lift ship.
38. Name and explain some characteristics of a heavy-cargo ship.
39. How is a semi-submersible heavy-cargo ship loaded?

1.5 Refrigerated ships (reefers)

40. What are reefer ships?
41. Reefer ships are used for what purpose?
42. Name and explain some characteristics of a reefer ship.
43. What makes a reefer ship different from a general-purpose cargo ship?
44. What is the difference in the layout of the holds of a multi-purpose ship and a refrigerated vessel?
45. Name possible cargo(es) carried by a reefer ship.
46. What characteristic makes container ships a competitor of refrigerated vessels?

1.6 Cattle Ships

47. What is the main cargo of cattle ships?
48. Why is the sheep trade extensive?
49. Why is ventilation very important
50. Why are many conveyor belts needed
51. Why is a low stability an advantage for cattle ships?
52. Describe how cattle and sheep etc. are cared for on board of a cattle carrier.
53. Why are cattle ships slender vessels with a slender foreship?
54. Name possible cargo(es) carried by a cattle ship.
55. Name and explain some characteristics of a cattle ship.

1.7 Bulk Carriers

56. What are bulk carriers?
57. Name three types of bulk carriers. Explain their functions.
58. What is a Handy-Size bulk carrier?
59. How are bulk carriers usually loaded and discharged?
60. What is the difference between the holds of 'regular' bulk ships and ore ships?
61. Why is it unprofitable to transport grain in an ore ship?
62. What is the danger of too much stability of an ore ship?
63. How can a ship gain too much stability too quickly upon loading cargo (especially if the cargo is ore)?
64. Name possible cargo(es) carried by a bulk carrier.
65. Name and explain some characteristics of a bulk carrier.

2.1 Crude Oil Tankers

66. What type of crude-oil tankers are there?
67. What does the abbreviation ULCC stand for?
68. What does the abbreviation VLCC stand for?
69. What does the abbreviation Suez Max. stand for?
70. What does the abbreviation AFRA Max. stand for?
71. Name some piping systems that can be present on a VLCC.
72. What is a crude-oil tanker and how is the cargo loaded, transported (give the cargo conditions) and discharged?
73. In what places in the world is the cargo of crude-oil tankers loaded? And where is it discharged?
74. Apart from the cargo pipeline system on board of a crude oil tanker, what other cargo related pipeline systems might be found on deck and in the tanks? Discuss these and their function(s).

75. What is the tank layout of a crude-oil tanker?
76. Name possible cargo(es) carried by a crude-oil tanker.
77. Name and explain some characteristics of a crude-oil tanker.

2.2 Product Carriers

78. What types of product tankers are there?
79. What is a product tanker and how is the cargo loaded, transported (give the cargo conditions) and discharged?
80. What is the main difference in the cargo piping system of a product tanker when compared to that of a crude-oil tanker and why is this so?
81. Name possible cargo(es) carried by a product tanker.
82. For what flows of transport are product tankers used?
83. Name and explain some characteristics of a product tanker.
84. What makes a product tanker different from a crude-oil tanker?
85. What is the difference in the arrangement of the tanks on a VLCC and a product tanker?
86. What is a bitumen tanker and what is so particular about her cargo?
87. What is a chemical tanker and what is so particular about her cargo?
88. What is the set-up around the cargo tanks of a chemical tanker and why is this so?
89. What is the difference between a product carrier and a chemical tanker?
90. What are the classes of toxicity of the possible cargoes?
91. How are the ships defined in connection with toxicity?
92. What is the difference in size between product carriers and chemical carriers?
93. What types of chemical tankers are there?
94. Give some demands that are made on chemical tankers to protect the environment and the crew.
95. What is a cofferdam?
96. Name possible cargo(es) carried by a chemical tanker.

2.3 LPG / LNG tankers

97. What is the meaning of the abbreviations LPG and LNG?
98. What is an LPG gas tanker and how is the cargo transported (give the cargo conditions)?
99. What is an LNG gas tanker and how is the cargo transported (give the cargo conditions)?
100. Why is the cargo gas on a gas tanker kept at very low temperatures?
101. Often gas tankers are steam turbine driven ships. Why is this so?
102. Why do the tanks of a gas tanker have to be well insulated? Give two reasons.
103. Name possible cargo(es) carried by a gas tanker.
104. Name and explain some characteristics of a gas tanker.
105. What means fully pressurized?
106. What means Fully Refrigerated?
107. What means Semi Pressurized / Semi Refrigerated?
108. What is boil-off and what is it used for?

3. Cruise ships

109. What purpose do modern cruise liners serve and where can you find them?
110. Give some characteristics of modern cruise liners and explain the purpose thereof.
111. What is the passenger/crew ratio on a passenger liner?

4 Navy Ships

112. What is a navy vessel?

4.1 Aircraft Carriers

113. Give a brief description of an aircraft carrier.
114. Why is the landing strip usually laid under and angle with the ships centreline?
115. Why has a ship equipped for 'Short Take-Off and -Landing craft' no such arrangement?
116. What does a helicopter carrier look like?
117. Give the order, in size, of the various types of Aircraft carriers.

4.2 Amphibious support vessel

118. Give a brief description of a amphibious support vessel.

4.3 Logistic support vessels

119. Give a brief description of a logistic support vessel.

4.4 Frigates

120. Give a brief description of a frigate.
121. For what tasks can frigates be used?
122. What is the speed of a frigate?

4.5 Patrol vessels

123. Give a brief description of a corvette.
124. What is the task of a patrol vessel?

4.6 Mine Counter-measure Vessels

125. Give a brief description of a Mine Counter Vessel.
126. What is the difference between a mine-sweeper and a mine hunter?
127. Give some tasks of mine hunters.
128. How are mines located at present times? And how are they located in the future?

4.7 Submarines

129. Give a brief description of a submarine.
130. Name the various types of Submarines.
131. How are submarines used in peacetime?
132. Why is the propulsion of a submarine diesel-electric?

4.8 Landing Craft

133. Give a brief description of a Landing Craft.
134. What is meant with Landing Craft

5.1 Fishing Ships

135. Name the main types of fishing ships
136. Name two ways of trawler fishing.
137. Name two types of trawlers.
138. Name possible cargo(es) carried by a trawler.
139. Name and explain some characteristics of a trawler.

5.2 Trawlers

140. What is the difference between a derrick trawler and a stern trawler?
141. What is pelagic fishing?
142. How is bottom fishing done?
143. Why do trawlers have similarity with tugboats?

5.3 Other Fishing Vessels

144. What are other types of fishing ships?

6.1 Trailing Hopper Suction Dredger

145. Why are the holds called hoppers?
146. What is the maximum depth a suction dredger can work?
147. What are the characteristics to define the size of a hopper suction dredger?
148. What is 'Rainbowing'?
149. What kinds of soil (cargo) can it handle?
150. What is a trailing hopper suction dredger?
151. Describe briefly how a trailing hopper suction dredger dredges.
152. Name possible cargo(es) carried by a trailing hopper suction dredger.
153. Name and explain some characteristics of a trailing hopper suction dredger.

6.2 Cutter Suction Dredgers

154. For what soil a cutter suction dredger is needed?
155. How is the progress of cutting controlled?
156. How is the sucked soil/water mixture transported to its destination?
157. What is a spud pole?
158. What is a cutter suction dredger?
159. How does a cutter suction dredger work?
160. Name possible materials dredged by a cutter suction dredger.
161. Name and explain some characteristics of a cutter suction dredger.

6.3 Backhoe Dredgers

162. What is a Backhoe dredger?
163. How does a Backhoe dredger work?

6.4 Barge

164. What is a Barge?

7.1 Cable Laying Ship

165. What is a cable laying ship?
166. Describe briefly how a cable laying ship works.
167. What is crucial in the cable laying process?
168. What is DP and DT and what has this got to do with the working of a cable layer?
169. Why is accurate navigation important for repairs to a cable?
170. Why are cable ships equipped with a DP-system?
171. Name possible cargo(es) carried by a cable laying ship.
172. Name and explain some characteristics of a cable laying ship.

7.2 Buoy Positioners

173. Why is a beacon vessel equipped with a heavy crane?
174. Why are accurate navigation and positioning crucial?

8.1 Tugs

175. What is a tug?
176. Describe a seagoing tug.
177. Describe a single propeller driven tug.
178. Describe a twin propeller tug.
179. Describe a combi tug.
180. Describe an ASD tug.
181. Describe a tractor tug.
182. Describe an azimuth tractor drive tug.
183. Describe a harbour tug.
184. Describe a reverse tractor tug.
185. Describe a rotor tug.
186. Why should the force of the towing line of a tugboat preferably be located at mid length of the tug?
187. Tugboats are used for what duties?
188. For what purposes do coastal states charter tugboats?
189. Give some characteristics of a tugboat.
190. What are the tasks of a harbour tug?

8.2 Icebreakers

191. What is an icebreaker and how does it break the ice.
192. What is the characteristic bow shape of an icebreaker?
193. What is the main difference between an icebreaker and a tugboat?
194. Give some characteristics of an icebreaker.

8.3 Pilot Boats

195. With what kinds of craft a pilot can be brought on board?
196. What kind of pilot-boat is used when the boarding station is close to the harbour?

9 Yachts

197. How can yachts be classified?
198. Who are yachts purchased by and what are they used for?
199. What is meant when a yacht is used for representative purposes?
200. What is the difference between the building of a commercial ship and the building of a yacht?
201. Name possible cargoes carried by a yacht.
202. Name and explain some characteristics of a yacht.

10.1 Hovercraft

203. Has a hovercraft displacement?
204. What is the economical speed of a hovercraft?
205. How is the aircushion of the hovercraft maintained?

10.2 Catamaran

206. For what kind of transport is it economical to use a catamaran?
207. Name the characteristics for a Catamaran, a Trimaran and a Low-wash ship.

11 Offshore equipment

11.1 Definition

208. Give a definition of 'Offshore'.

11.2 Stages of Offshore Activities

209. Give the different stages of Offshore Activities.

11.3 Description of Offshore Units

210. Name a number of different types of offshore units
211. Give a brief description of a Seismic Survey Vessel.
212. What is the main purpose of a seismic survey vessel?
213. What is 'seismic research'?
214. Survey vessels gather hydrographical data; for what purpose?
215. Give a brief description of a Jack-Up Rig.
216. Give a brief description of a Drilling Ship.
217. Give a brief description of a Semi-Submersible Drilling Unit.
218. What are the advantages of a drilling ship compared to a drilling rig?

3

219. Give a brief description of an Offshore Crane Vessel.
220. Give a brief description of a Tension Leg Platform (TLP).
221. Give a brief description of a Floating Production Storage and Offloading Vessel (FPSO).
222. How does a DP-system operate?
223. Which types of vessels are equipped with a DP-system? And why?
224. Give a brief description of a Fixed Production Platform.
225. Give a brief description of a Shuttle Tanker.
226. Give a brief description of a Pipe-laying Vessel.
227. What are the most important differences between cable ships and pipe-laying ships?
228. What procedure is followed in the joining of the pipes?
229. Give a brief description of a Platform Supply Vessel (PSV).
230. Name some products that can be transported to a drilling rig by a supplier.
231. What tasks can also be carried out by a supplier?
232. Give a brief description of an Anchor Handling Tug (AHT).
233. Give a brief description of a Multipurpose Support Vessel (MSV).
234. Give a brief description of a Standby Vessel.
235. Give a brief description of a Chase Vessel.
236. Give some tasks of chase vessels / support vessels.

4

1. Preliminary work

1. What is meant by the standardising of a ship design?
2. What are the advantages in the building of a standardised ship?
3. What are the disadvantages in the building of a standardised ship?
4. Why does the shipping company have less say in the building of a standardised ship when compared to the building of a non-standardised ship?

1.1 Owners Requirements

5. Name at least 10 different Owners Requirements.
6. Give some design demands that are made in this list of Requirements.
7. After the shipping company has submitted a list of demands, the shipyard can respond by submitting an offer without engagement.
   What is an offer without engagement?

1.2 The preliminary sketch

8. What do the terms 'outline specification' and 'General Arrangement plan' mean?
9. The outline specification presented by the shipyard usually includes a list of deviations. What is the meaning of this list?
10. If a small shipyard does not have a design department, how is this problem solved?
11. Name a number of design tasks that must be undertaken in order to make a preliminary design (sketch).
12. Give a few design related tasks in the preliminary sketch that can be calculated by a computer.
13. Sketch a side view of an oil tanker or a chemical tanker.
14. Sketch a cross section of the cargo tank an oil tanker or a chemical tanker.
15. Sketch a deck view of an oil tanker or a chemical tanker.
16. Sketch a tanktop view of an oil tanker or a chemical tanker.
17. Sketch a general arrangement plan of an oil tanker or a chemical tanker.
18. What are hydrostatic calculations?

1.3 The tender

19. What is the tender?
20. What is tendering?
21. What is an open tender?
22. What can the shipping company expect back from the shipyard after the tender is submitted?
23. What is meant by a 'preliminary estimate of construction' or 'preliminary building plan'?
24. What is the final building contract?
25. Which things are agreed upon in the final building contract?
26. What is the approximate estimate in a building contract?
27. What factors play a role in the choice of the shipping company to let a shipyard build their ship?

1.4 The estimate of construction

28. At what stage of the design/building process does a shipyard start getting paid for their work?
29. What is the 'time of construction' of a ship?
30. What is the normal range for the building time of a ship?
31. When does the clock start ticking for the time of construction of a ship?

1.5 Specialist knowledge

32. For which parts of the design does the shipyard sometimes use the expertise of outside research and engineering firms?
33. Why does a shipyard sometimes use the expertise of outside research and engineering firms?
34. What is the optimisation of the ship's shape?
35. Name a number of design topics, which may be the subject of optimisation before the ship design process is deemed complete?
36. What does 'optimisation reduces the wave resistance' mean?

2 Design and construction

37. Part of the building contract is the estimate of construction. What is in the estimate of construction?
38. Which phases make up the building period?

2.1 The design department (engineering)

39. Which people from the shipyard are involved in the building of a ship?
40. Which people from the shipping company are involved in the building of a ship?
41. Which people from the classification society are involved in the building of a ship?
42. Which people from the flagstate are involved in the building of a ship?
43. Which different parties are involved in the building of a ship?
44. Where lie the responsibilities for the different parties involved in the building of a ship?

45. The estimate of construction made in the design department. What is the estimate of construction?
46. What does the design department of a shipyard do?
47. Why do some drawings made by the shipyard have to be approved by others before they are applied/put into practice?
48. Some drawings have to be approved before they are applied/put into practice. Who are the approvers?
49. Give an indication of the time range involved in making a complete ship design.
50. Why does the design sometimes cost 10% of the total building price?

2.2 Production Preparation (Planning)

51. What does the planning department of a shipyard do?
52. Why are all steel parts of a ship given a number code?
53. What is nesting?
54. What is the purpose of nesting?
55. What type of cutting torch may be used for the cutting of building components out of steel plates?
56. Why is it important to drain excess heat quickly after the cutting process?
57. What else does the cutting machine do besides cutting?
58. Make a sketch of panels and sections of a ship
59. How are the different pieces of equipment on the working floor controlled

2.3 The production

60. Which stages make up for the total building-process of a ship?
61. Why are some parts of the ship, for instance a double walled section, welded while lying upside down on the working floor?
62. What are the advantages of ship production using welding robots?
63. Why are sections completed (pre-outfitted) as much as possible prior to joining them?
64. What type of systems, components etc. are built in to the sections during pre-outfitting?
65. Why do shipyards use pre-painted steel plates?
66. What considerations are taken into account when the decision is made whether the ship is finished either inside or outside?
67. Give some examples of building by section.

2.4 Launching and Outfitting

68. What is meant by side launching of a ship?
69. What problems can occur in a side-launch?
70. What is meant by end launching of a ship?
71. What problems can occur in an end-launch?

2.5 Commissioning

72. When and where are systems and/or components tested during the building process of a ship?
73. Which parties are involved in the testing of systems and/or components during the building process of a ship?
74. What is the aim of the technical trials?
75. What are sea trials and how much time is generally involved for an average sized container vessel?
76. When are the sea trials carried out?
77. Sea trials are usually successful, when not and what happens if they are not?
78. How is the light-ship-weight determined?
79. Why is an inclining experiment necessary?
80. How is an inclining experiment carried out?

2.6 The logistics

81. Why is the hull of a ship sometimes built in other countries?
82. Why is it important for the shipyard to have the ability to control the building process at any particular moment?

3.1 Sea trials

83. Who is the owners of the ship during sea trials?
84. When does the ship owner really know how his ship behaves at sea in a fully loaded and operational condition?
85. Shorter delivery periods are often advertised by shipyards and shipping companies also often stipulate this, what does this mean for the building process/shipyard?
86. When does the ship fly the shipping company's flag instead of the shipyard's flag?
87. When does the financer pay the last building costs instalment to the shipyard?

3.2 Period of Guarantee

88. Why does the shipping company demand a bank guarantee from the shipyard for the entire period of guarantee?
89. What is the usual period of guarantee for a ship?
90. Can repairs be done in the period of guarantee if the ship is in another country? Explain your answer.
91. Is the crew of the ship allowed to repair the ship during the period of guarantee? Explain your answer.
92. Which parties involved in the building of a ship give guarantees and to whom?
93. What two periods of guaranties do suppliers sometimes give concerning their product?
94. Why do suppliers sometimes give two periods of guarantee?

1 General

1. What forces and strains act on a ship?
2. What is the reaction of the ship's construction to the forces that act on it?
3. What is the reaction of the ship's construction after the forces that act on it are gone?
4. What is the flexibility of a ship in relation to the forces acting on it?
5. What happens if a certain threshold of tension is exceeded?
6. Explain the concepts Static and Dynamic.
7. Give an example of both static and dynamic concepts.

2.1 Shearing forces

8. Why are there sometimes big local differences in local upward pressure and the weight acting on a section of a ship?
9. Explain what buoyancy force is.
10. Explain what weight force is.
11. Explain what a sheer force is and how this is generated.
12. Explain when and why sheer force acting on the aft bulkhead of the hold may be directed downwards.
13. What causes longitudinal tensions in a ship?

2.2 Explaining bending moments

14. What determines the magnitude of a bending moment?
15. What moment is caused by longitudinal stress?
16. The bending moment of a ship in calm water is determined in a number of steps (see below). Elaborate on these steps.
    - buoyancy
    - weight
    - resultant
    - load curve
    - sheering stress
    - bending moment
17. What is a 'neutral zone' in ship construction terms?
18. Where is the 'neutral zone' of a ship approximately to be found?
19. A ship sailing in calm water or in waves has in both cases a different bending moment, explain this.
20. Sketch the situation amidships when a ship is sailing in a wave trough (wave length approx. equal to ship length).
21. Sketch the resulting ship deflection when she is sailing on a wave trough (wave length approx. equal to ship length)
22. Sketch the situation amidships when a ship is sailing in a wave crest (wave length approx. equal to ship length).
23. Sketch the resulting ship deflection when she is sailing on a wave crest (wave length approx. equal to ship length)

2.3 Longitudinal reinforcements

24. Sketch and name some construction components of a ship that are responsible for absorbing tension in the extremes of the ship.
25. What is taper applied to a construction component and when and why is this applied?
26. What is narrowing?
27. Why is the narrowing visible in the wing tank, but not in the hold?

2.4 The Loading Program

28. What is a loading (computer) program that can be found on board of modern cargo ships?
29. What calculations can the ship's officer perform with the loading program?
30. What is approximately the required input for the loading (computer) program calculation?
31. What is the output data of the loading (computer) program calculations?
32. Regarding the results of the loading program calculations, what criteria must not be exceeded for the safety of ship, cargo, crew and environment?
33. Where along the length of a ship is the bending moment generally largest and why?
34. Where along the length of a ship is the sheer force generally largest and why?

3 Torsion of the Hull

35. What is meant by torsion in a ship?
36. What may be the results of torsion in a ship?
37. What may cause torsion in a ship?
38. A ship sailing in calm water or in waves may have in both cases a different torsion moment, explain this.
39. What visible effects can (too much) torsion have on a ship?

4.1 Panting stresses

40. What is meant by local stresses?
41. Give a number of examples of different loads on a ship that may each make a contribution to the total local stresses found?
42. What points in a ship may be of particular interest with regard to local stress magnitudes and why?
43. What is meant by panting of a ship?
44. When does panting in a ship occur?
45. In what part/section of a ship does panting occur?
46. What is the cause of panting strain?
47. What construction components are found in a ship in order to reduce panting?

4.2 Pounding

48. What is the cause of pitching tensions?
49. What construction components are found in a ship in order to reduce pitching tensions?

4.3 Diagonal loads

50. What is the cause of diagonal stress?
51. What construction components are found in a ship in order to reduce diagonal stresses?

4.4 Vibration Stresses

52. What is meant by vibration stresses?

4.5 Dry docking loads

53. What is meant by docking loads?
54. What additional forces occur during docking?

5

5.1 Purpose of stiffeners

55. What different planes may be found in a ship's construction?
56. Why is it necessary to stiffen a loaded plane?
57. Why is it necessary to support a stiffener of a loaded plane?
58. How are the different planes stiffened in a ship's construction?
59. How are tension stresses in the different planes in a ship absorbed?
60. Why are reinforcements perpendicular to the direction of the frames on ships?
61. The following reinforcements are placed where and why?
62. web framestringer
63. Name some kinds of stiffening of the following planes.
    - skin
    - deck
    - bulkhead
    - bottom-plating

5.2 Shell Plating

64. What is the primary task of shell plating?

5.3 Decks

65. What can be the loads on a weather deck

5.4 Bulkheads

66. What are the tasks of transverse bulkheads?
67. What kinds of forces can work on a transverse bulkhead?

5.5 Tank top

68. What are the reasons to fit a tank top?
69. Has it part in longitudinal strength?

5.6 Panel

70. What decides the thickness of the plate in a panel?
71. The actual stiffener is up-graded in strength by the plate it is welded on. Why?

5.7 Longitudinal framing system and transverse framing system

72. What types of frame systems may be applied in the construction of ships?
73. When and why is a ship built according to the longitudinal framing system?
74. When and why is a ship built according to the transverse framing system?
75. Sketch a ship's longitudinal framing system.
76. Make a sketch of a ship's transverse framing system.

6

1.1 General

1. What is IMO and what is its main objective?
2. To what end was the basis laid for IMO in 1948?
3. What other issue has been of great importance for IMO from the beginning onwards?
4. What is the result of SOLAS and MARPOL conventions in terms of ship certificates?
5. Name a number of Conventions.
6. Name a number of Codes.

1.2 Assembly / Committees

7. What body governs the IMO?
8. What is an IMO committee? Give an example of one such IMO committee.
9. What is the MEPC and what does it deal with?
10. What is SOLAS?
11. What is MARPOL?

2.1 Certificates For SOLAS

12. Which certificates are in compulsory for SOLAS?
13. In SOLAS the ship's construction is also regulated. Explain this.
14. Why are rules and regulations more stringent for passenger ships than for cargo ships?

2.2.1 Loadline

15. What did Mr Plimsoll introduce that became compulsory in 1876?
16. What is the Loadline Certificate?

2.2.2 Tonnage

17. What means GT?
18. What means NT?
19. Where are above notations used for?
20. Why is the International Tonnage Certificate so important?
21. What is the IMO-Number?

2.2.3 Marpol

22. What is an IOPP certificate and for what ships is it meant?
23. What does MARPOL Annex I deal with?
24. What does MARPOL Annex II deal with?
25. What does MARPOL Annex III deal with?
26. What does MARPOL Annex IV deal with?
27. What does MARPOL Annex V deal with?
28. What does MARPOL Annex VI deal with?
29. What does MARPOL Annex VII deal with?

2.3 Certificates dealing with the type of ship and cargo

30. What is a Certificate of Fitness?
31. Name a number of examples of dangerous goods and the kind of certificate covering the transport of these goods.
32. Why is there a 'certificate for minimum safe manning?

3. CLASSIFICATION

33. What is a Classification Society?
34. What does a Classification Society do?
35. What is an annual survey?
36. What is IACS?
37. Name a number of Classification Societies.
38. Which Classification Societies are grouped under IACS?
39. What is the Certificate of Class a basis for?
40. What is a Flag state?
41. What are the differences between a Classification Society and a Flag state?
42. Are there any connections between a Classification Society and a Flag state? Explain your answer.
43. What is a statutory certificate and by whom is it issued?
44. What has to be marked on the stern of a ship regarding Flag-state registration?
45. What certificate is issued by the Flag state as a proof of the

registration of a ship?
46. What official details of a ship are issued on the International Tonnage Certificate of a ship?
47. What are harbour dues in most ports based on?
48. What other tonnage certificates are there besides the International Tonnage Certificate?
49. What is the connection between IMO and the Classification Societies?
50. What is the Classification Society Special Survey and what is its relation to all compulsory certificates?

3.1 EMSA

51. What is EMSA?
52. What does a EMSA do?

4.1 Introduction ISM code

53. The ISM Code basically concerns the management system on board. What does this management system comprise?
54. What underlines the importance of good management for safety on board?

4.2 Objectives

55. What are the objectives of the ISM code?

– **The shipping companies**

56. What is a Document of Compliance (DOC)?
57. What is one of the demands of the Document of Compliance?
58. What body issues the DOC and when is this done?
59. What is the validity period of the DOC and what is this validity subject to?

– **The ships**

60. What is an SMC?
61. When is an SMC issued?
62. What body issues the SMC and when is this done?
63. What is the validity period of the SMC and what this validity subject to?

4.4 The audits

64. What is SMS and how is this inspected?
65. What is an audit?
66. What types of audits are there?
67. What is an internal audit and who performs this?
68. What can an internal audit comprise?
69. What actions result from an internal audit?
70. What is an external audit and who performs this?
71. What is issued to whom when the external audit lives up to standards?

6. ISO

72. What matters does ISO 9000 standard set for an organisation and why?
73. What is QMS?
74. What is the connection between ISO 9000 standard, ISM code and QMS?

7. ISPS - Code

75. Why is the ISPS-code developed?
76. To what ship-categories ISPS is applicable?
77. Why also harbour facilities?
78. What are the 3 threat levels?

8. Marine Pollution (MARPOL)

79. What is the International Convention for the Prevention of Pollution from Ships?
80. What does MEPC stand for and what does this committee do?
81. What are "Annexes" and what is their function?
82. All MARPOL annex regulations are guided by the size of the ship. Explain what this statement means.

8.1 Annex I

83. What does MARPOL Annex I deal with?
84. Under what circumstances can a ship, larger than 10.000 ton, pump overboard and oily mixture from the engine room?
85. What oils does MARPOL Annex I deal with?
86. What happens to oil mixtures on board in accordance with MARPOL Annex I?
87. When and where is a ship allowed to pump an oil mixture into the sea?
88. What criteria are applied to an oil mixture before it may be pumped into the sea?
89. Why are extensive and accurate records to be kept on board of all handling of oils in the engine room?
90. Why should equipment regarding oil handling/record keeping on board be type approved?
91. What extra problems do oil tankers have besides the engine room oil handling problem?
92. How is tank washing carried out on a tanker?
93. What is a slop tank and on what ship type(s) is this to be found?
94. What criteria apply to the discharging of slop tank contents of oil tankers at sea?
95. What is crude oil washing (COW) and why is this done?
96. What problem related to electricity is connected to the COW process and what has to be undertaken to allow tank washing to be carried out anyway?
97. Why is Inert Gas legislated via SOLAS?
98. What is SBT?
99. All handling of oils and ballast water has to be accurately administered and entries are to be kept on board for three years. Explain these MARPOL requirements.
100. MARPOL regulations first dealt with minimising oil pollution and have now grown out to stopping pollution completely. Explain how this shift in objective has been realized by MARPOL on board.
101. What are governments obliged to do regarding contents of sludge and slop tanks and their port (reception) facilities?

8.2 Annex II

102. What does MARPOL Annex II deal with?
103. What cargoes does MARPOL Annex II deal with?
104. What cargo categories may be found within the MARPOL Annex II?
105. What requirements do ship's tanks have to meet in accordance with MARPOL Annex II?
106. How is the handling of cargoes regulated within MARPOL Annex II?
107. Why have ship types I, II and III been introduced within MARPOL Annex II?
108. What is the BHC code?
109. What special construction and stability features have chemical tankers to prevent marine pollution?
110. What important requirement regarding residue on board

after discharging is demanded from chemical tankers?
111. Describe the discharging of a chemical from a tank and the steps undertaken to keep residue in the tank to a minimum after discharging has taken place?
112. What is a cargo record book and what is its function?
113. What is a certificate of fitness?
114. What is the validity of a certificate of fitness?
115. Why is annual survey of cargo equipment on board of chemical tankers mandatory and what happens to the certificate of fitness if this part of the annual survey is overdue?

8.3 Annex III

116. What does MARPOL Annex III deal with?
117. When is the carriage of harmful substances not prohibited?
118. Which requirements must the packing of harmful substances meet and why?
119. When may a harmful substance be discharged overboard?
120. Why must harmful-substance cargo be reported to harbour authorities in each port the ship calls at?
121. What exactly has to be reported to harbour authorities regarding harmful-substance cargo carried by a ship and when?
122. For what ships is the discharge of sewage regulated by MARPOL Annex III?
123. When is the discharge of sewage from a ship not prohibited?
124. What demands are placed on ships navigating in special areas regarding the discharge of sewage?
125. What MARPOL Annex regulates the discharge of contents from the ship's hospital and what certificate is required in this respect?

8.4 Annex IV

126. What does MARPOL Annex IV deal with?
127. For what ships is the discharge of sewage regulated by MARPOL Annex IV?

8.5 Annex V

128. What does MARPOL Annex V deal with?
129. What type of garbage is defined under MARPOL Annex V?
130. What type of garbage substances may be discharged into the sea and under what conditions?
131. What type of garbage may never be discharged into the sea and why?
132. Under MARPOL Annex V, a garbage record must be kept. What is meant by this and how is this done?
133. When may a harmful substance be thrown overboard?
134. What is an incinerator and when is it used on board?
135. What is done with the ashes of an incinerator?

8.6 Annex VI

136. What does MARPOL Annex VI deal with?
137. What are Noxes and Soxes and how do they harm environment?
138. How can pollution by Noxes and Soxes be reduced?
139. Name some compulsory documents that are to be found on board of a ship in operational condition.

10. Documents

140. Give an example of the layout of an International Tonnage Certificate.
141. Give a layout of an International Loadline Certificate
142. Give an example of the layout of a Cargo Ship Safety Construction Certificate.
143. Give an example of the layout of an International Load Line Certificate.
144. Give an example of the layout of a Cargo Ship Safety Radio Certificate.
145. Give an example of the layout of an International Oil Pollution Prevention Certificate.
146. Give an example of the layout of a Cargo Ship Safety Equipment Certificate.
147. Give an example of the layout of a Suez Canal Special Tonnage Certificate.
148. Give an example of the layout of a Safety Management Certificate.

7

1 Cargo Holds

1. What is a hold?
2. Why is a hold important to the ship owner?
3. What demands may be placed on a hold and why?
4. What is a bulkhead?
5. Why does a cargo ship require bulkhead(s)?
6. What parts of a hold of a bulk carrier are sloped and why?
7. Why does a bulk carrier often have an increased tank top plate thickness?

1.1 Multi-Purpose Ships

8. Why do ship owners of multi-purpose ships prefer just one very large hold?
9. How can a very large hold of a vessel be divided into smaller cargo compartments?
10. Why should a ship's crew wish to subdivide a very large hold of a vessel into smaller compartments?
11. What are manholes and why and where are they required?
12. What are wing tanks and what are they used for?
13. What is a double bottom tank and what can such a tank be used for?
14. How can containers be secured in a cargo hold?
15. How can heavy cargo be secured in a long cargo hold?
16. When is welding on the tank top for securing heavy cargo prohibited?
17. How is the humidity in a cargo hold controlled?

1.2 Container-Feeder-Ships

18. How are the holds on cellular containerships divided in order to carry containers?
19. How are containers guided into the hold during loading and discharging?
20. How are containers secured in the holds of a cellular container ship?
21. What is meant by a "box shaped" hold?
22. Why does a ship owner prefer a "box shaped" hold instead of a curved one?

23. When do we call a hold "container fitted"?
24. Sketch the construction of the box hold of a container vessel and name the main components.

1.3 Tankers

25. When is a ship designated as a "tanker"?
26. Name a number of items that each tank of a tanker has to be fitted with?
27. How are tanks of a tanker cleaned and why?
28. What are tanks of a tanker coated with and why?
29. What material are uncoated tanks on a tanker made of?
30. What are deep-well pumps used for?
31. What is the use of radar in a tank?
32. Depending on the size of the ship, additional spaces on deck may be created during the design phase. For what purpose?
33. Why is a cargo tank preferably free of stiffeners etc. on the inside?
34. When a tank is free of stiffeners etc. inside, where may the stiffeners be found?
35. What kind of construction can be used for a bulkhead etc. instead of plating with stiffeners and still be just as effective?
36. Sketch the construction of the tanks of a double-hull tanker and name the main components.

2 Stern / Aft ship

37. What is the aft peak of a ship?
38. Sketch the aft peak of a ship and name some of the components.
39. What is the stern section of a ship?
40. What is the steering gear room of a ship?
41. What large parts are located under the steering engine and what are their functions?
42. What is the purpose of the skeg?
43. What is the rudder carrier and where is it positioned?
44. What is a rudder stock and where is it positioned?
45. Sketch the rudder and its support and name some of the components.
46. What is the stern of a ship and where does it border?
47. What text is found welded on the stern?
48. Sketch the stern of a ship and name some of the components.
49. What is meant by an (main) engine foundation and where is this generally located?
50. Sketch an (main) engine foundation and name some of the components.
51. What is the skeg of a ship and name a number of its functions
52. Sketch the assembly of the skeg of a ship and name some of the components.
53. Sketch the stern post with shafting assembly and name some of the components.

3 Engine room

54. What is the engine room of a ship and name the most important components to be found there.
55. What bulkheads form the outer ends of an engine room?
56. What is the engine-room casing and what is its function?
57. What is the purpose of the travelling hoists in the engine room?
58. Why are (extra) web frames in combination with web beams and pillars often necessary in the engine room?
59. What are the functions of main engine and auxiliary engine foundations in the engine room?
60. Why is the double bottom in the engine room often higher than the double bottom in other sections of the ship?
61. What is an alternative to raising the double bottom height in the engine room in order to accommodate the propeller shaft?
62. Sketch an engine room with underlying construction and name some of the main components.

4 Double bottom tanks and wing tanks

63. Where are double bottom and wing tanks located?
64. What is a cross-over between two tanks and what is its function?
65. What are the functions of double bottom and wing tanks?
66. How is the separation of two tanks realised in terms of construction?
67. What is a cofferdam and when is this required?
68. How are wing tanks separated?
69. How is the separation of two wing tanks realised in terms of construction?
70. What type of framing system may be found in the double bottom and what determines this in general?
71. Why do containerships need reinforcement in the double bottom and where exactly?
72. What are floor plates and how may these be subdivided in the double bottom?
73. Why are vents and openings installed in every double-bottom tank?
74. If a venting pipe is not present in a double-bottom tank, what problems may arise?
75. Why are there vents and openings in internals in a double bottom?
76. What is a sounding pipe and what is it used for?
77. What is a vent pipe and what is it used for?
78. Why are bolted manholes fitted in the tank top?
79. What determines the number of bolted manholes fitted in a tank top?
80. Why must a heavy-fuel tank be fitted with heating coils?
81. Sketch the double-bottom construction of a vessel with a transverse framing system and name the most important components.
82. Sketch the double-bottom construction with a longitudinal framing system and name the most important components.
83. What is a bilge keel and what is its function?
84. Why is a bilge keel welded onto a flat bar, which is welded to the bilge plate?
85. Sketch the construction of a bilge keel and name the most important components.

5 Fore ship / Bow

86. What is the forepeak of a ship?
87. What is the forepeak of a ship generally used for?
88. What is a wash bulkhead in the forepeak of a ship and what is its function?
89. Sketch the forepeak of a ship and name some of the components.
90. What is the forward section of a ship?

91. What is the bow-thruster room of a ship?
92. What is a deep tank?
93. What is a chain locker and where is it situated?
94. How many chain lockers are there in a normal ship?
95. What is the forecastle and what is its function?
96. Name the different spaces one may normally find in the forecastle and give their function(s).
97. What is a breakwater, what is its function and where is it normally situated?
98. What causes extra large forces and stresses in the fore ship?
99. Where is a vessel
100. Sketch a foreship of a container ship and name the most important components and spaces.
101. What is a bulbous bow and what is its function?
102. How does a bulbous bow
103. Is a bulbous bow suitable for every vessel draft? Explain your answer.
104. When is a bulbous bow most effective?
105. When a ship is equipped with more than one bow thrusters, what does this generally imply for the ship
106. What is the sheer strake of a ship and where is it situated?
107. Where is the ice belt located and what is its function?
108. Sketch the construction of a ship with an ice belt and name the most important components.

6.1 Accommodation

109. What is the accommodation and where is it situated?
110. Why is the quality of accommodations today much better than around 1970?
111. For this question, study the drawing of the accommodation deck of a coastal trader:
    - How many crew cabins are there?
    - Do these have a bathroom?
    - Why are the doors of the steering gear room and the galley of different quality than the doors of the cabins?

6.2 Safety

112. What is the main objective and function of safety equipment in accommodations and why?
113. What 4 parts as stated in SOLAS resolution, chapter II-2, deal with demands on safety equipment on board?

6.3 Environment

114. What are the principal sources of vibration on a ship?
115. How may vibration on board of ships be reduced?
116. Sketch a flexible support of a main engine and name the components.
117. What is the aim of the flexible floor on which the engine is placed?
118. What are the main sources of noise on a ship?
119. How may noise on board of ships be reduced?
120. Sketch noise reduction steps taken on board of ships and name the components.
121. What is the maximum amount of decibels that is acceptable in a cabin?
122. When and why is climate control installed in the accommodation and in what spaces?
123. What factors are important in the climate control of a cabin?
124. Sketch a porthole construction and name the components.
125. Give some demands made for the portholes.

6.4 Methods of insulation

126. What is thermal insulation?
127. How can thermal insulation be realised and with what material(s)?
128. Why are the walls of the accommodation free from contact with insulating material?
129. Sketch an accommodation wall fitted with fire and thermal installation, name the components and give their functions.
130. The floor insulation can be made from several materials. Name some and give their functions.
131. Why are the floors in the accommodation often
132. From what can spray insulation-protect the ship?

6.5 Communication

133. What means of communication should be present in all cabins?

6.6 Maintenance

134. What is a laundry and where is it located?
135. Which demands are put to cabins on today
136. What is a mess room and where is it situated?
137. What is a duty deck and where is it situated?
138. What is a duty mess where is it situated?
139. What is a day room and where is it situated?
140. What is meant by a space on board for stores and where is it situated?

6.7 Overview of the different spaces

141. Why is the bridge located at the highest deck
142. What has ships length to do with the level of the bridge?
143. What kinds of ships have a cargo control room?
144. Galley, mess room and duty-mess are close to each other. Why?
145. What is the function of an 'Owners Cabin'?
146. What is the Suez-cabin?
147. What is the function and location of a 'duty-deck'?
148. Why are storerooms and -spaces found all over the ship?

8

1 Introduction

1. What was for ages the closing of hatches?
2. What were the first steel hatch covers?
3. What is the normal sealing method nowadays?
4. How are the hatches of a containership opened and closed?
5. How are the hatches of a bulk carrier mostly opened and closed?

2.1 Weather Deck Hatch covers

6. What is MacGregor Single Pull?
7. What was the major step forward using this type of hatch covers?
8. What is the most common type of hatch covers for ships up to 10.000 tons?
9. How is the cargo hold of these ships arranged?
10. What is a Hatch Cradle?
11. Sketch a pontoon hatch with hatch cradle and name the components.
12. Sketch a set of pontoon hatch covers for a given hold and name the components.

13. In what order should the pontoon hatch covers be closed? Explain this.
14. What is a beam in a pontoon hatch cover system and what are its functions?
15. What are the minimum and maximum weights of a pontoon hatch cover?
16. How are folding hatch covers opened and closed?
17. In what ways can a bulkhead / pontoon be used on a multi-purpose ship?
18. What is a separation bulkhead?

2.2 Hydraulic Folding Hatch Covers

19. What are hydraulic folding hatch covers? Sketch one such system (in open and closed condition), explain the working and name the components.
20. Where can the cylinders of hydraulic folding hatches be located? Give sketches along with your answer, name the components and explain the working of those systems during both opening and closing operations.
21. Show a number of ways in which pontoon hatches may be secured safely in open position while loading or discharging cargo from a hold. Give sketches along with your answers, name the components and explain the working of those systems during operations.
22. What considerations would lead a shipping company to buying hydraulic folding hatches?
23. Why do most shipping companies prefer pontoon hatch covers instead of hydraulic folding hatches?
24. What safety measures does the hydraulic folding hatch have? Make a sketch of them, explain their working and name the components.
25. What are the advantages of folding covers?
26. What are the disadvantages of folding covers?
27. Mention the various safety devices against falling down (collapsing).
28. How is the compression of the rubber gaskets adjusted?

2.3 Side Rolling Hatch Covers

29. What are side rolling hatch covers? Sketch one such system (in open and closed condition), explain the working and name the components.
30. How are the pontoon hatch covers of large bulk carriers opened and closed?
31. What is the advantage of Side Rolling Covers?
32. What are the disadvantages?

2.4 Open Cargo Holds

33. What is the advantage of having no hatch covers at all?
34. How is water kept out of the holds?
35. What is the largest quantity of water to be dealt with?

3 Distortions of the ship

36. What is harbour-deformation?
37. What is the reason that a ship's hatch coaming etc. may deform/deflect/distort during loading and/or unloading of the vessel?
38. Why need gaskets to be greased?
39. What is a normal compression of gasket rubber?
40. What is taking the weight of a hatch cover?
41. What is the result of torsion of the ships hull?
42. How can distortions of the ship during loading and discharging be prevented?
43. What is a sliding block and where is it used?
44. Sketch a sliding block and name the components.
45. There are two reasons for the use of gliding blocks. Name them.
46. Are the hatches part of the transverse framing system of a ship, or part of the longitudinal framing system? Explain your answer.

4 Weathertightness

47. How is the weathertightness of the pontoon hatch covers achieved?
48. Sketch the watertight sealing system used with pontoon hatch covers and name the components.
49. What is a compression strip, what is its function and where can it be found?
50. Sketch a compression strip and explain how it works.
51. What is a cleat, where is it located and what is its function?
52. Sketch a number of buttoning-down (clamping) systems, name the components, tell how they work and where they are located.
53. What is a wedge, where is it to be found and what is its function?
54. Sketch a number of wedges on a (pontoon) hatch cover and name the components.
55. How is the watertightness of the hatches tested by the crew?

5 Hatch cradle

56. Sketch a cradle and name its components.
57. There are two ways in which the hatch cradle can lower and lift the pontoons. Describe both ways.
58. What is the storage crane (on the hatch cradle) used for and what are its limitations?
59. A working tray can be attached to the hatch cradle. What is its function?

6 Tween deck hatches

60. What types of ships have pontoon hatches as tween decks?
61. What types of ships have hydraulic folding hatches as tween decks?

7.1 Side doors

62. Where is a side door and where can this generally be found?
63. What two purposes do side doors serve?
64. What are the disadvantages of a side door and how can these be dealt with?

7.2 Stern Doors and Ramps

65. Why are Ro-Ro vessels provided with stern doors and ramps?

7.3 Bow Doors

66. What ships are fitted with bow doors?
67. Describe the various possibilities.
68. Why is second door fitted?

7.4 Companion hatches

69. Make sketch of a companion hatch of a cargo tank.
70. Why is there a small hatch in a companion hatch? Sketch this, name the components and give three reasons for its existence.

7.5 Accommodation doors

71. What is the difference between 'watertight' and 'weathertight'?
72. What does weathertight mean in relation to an outside door and how is this constructively realised? Make a sketch, name the components and explain your answer.
73. How should a steel outside door be opened? Make a sketch, name the components and explain the working of the mechanisms.
74. Why is it important to install fireproof inside doors?

7.6 Watertight doors

75. Watertight doors are mostly installed in bulkheads. Why are they fitted with signal lights on the bridge (open / closed), and are they operated from the bridge, as well as locally?
76. What water pressure is the design pressure of a watertight door?
77. What demands must be met by a watertight door?

8.1 Ventilation grills (louvres)

78. What are ventilation grills, what is their function and how are they used?
79. In what circumstances is it necessary to close the ventilation grills with a hatch?

8.2 Manhole covers

80. Why should every (liquid) tank have a manhole?
81. Sketch a manhole, give the normal dimensions and name the components.

8.3 De-aeration devices

82. What is the general purpose of a venting pipe with tank bleeders?
83. Sketch the inside of a vent, name the components and explain its working.
84. Sketch a venting pipe.
85. How do modern tank bleeders prevent seawater from entering the tank?
86. What can tank bleeders be provided with and to what purpose?
87. What purpose does a discharge pipe serve in a tank bleeder?
88. Why are tank bleeders sometimes equipped with a fireproof grill?
89. What is the function of mushroom shaped vents?
90. Mushroom shaped vents serve as a mechanical back-up. What does that mean?
91. Why are mushroom shaped vents usually closed?
92. How can mushroom shaped vents be opened or closed?
93. What is a high-speed pressure valve and how does it work?
94. Sketch a high-speed pressure valve and show how it allows gas to escape.
95. Sketch a high-speed pressure valve and show how it allows gas to flow in.
96. How is it possible that gas escaping from a high-speed pressure valve cannot catch fire?
97. Why is the fireproof wire mesh only in the suction of the high-speed pressure valve?
98. The bureau of classification decides what type of material is to be used for the valves in this section. Name some materials used and elaborate on your statement.

9 Coming on board / Access to the ship

99. What is an accommodation ladder and what is its function?
100. Why is an accommodation ladder generally constructed of aluminium?
101. Why is the top of an accommodation ladder attached to a slewing platform?
102. What problem can occur if the bottom side of the accommodation ladder does not have a roller?
103. Sketch an accommodation ladder, name the components and explain their working.
104. What compulsory safety measures must be taken when using an accommodation ladder and why?
105. How is an accommodation ladder stored on board (and where), lowered onto the quay for use, secured for use as an accommodation ladder and finally lifted on board again. Explain these situations with the aid of sketches of the various stages of use.
106. What is a gangway?
107. When is a gangway used instead of an accommodation ladder?
108. Why is a gangway often constructed of aluminium?
109. Sketch a gangway, name the components and explain its working.
110. How is a gangway ladder stored on board (and where), lowered onto the quay for use, secured for use as a gangway and finally lifted on board again. Explain these situations with the aid of sketches of the various stages of use.
111. What problem can occur if the bottom side of the gangway does not have a roller?
112. What safety means are present when the accommodation ladder is in use and why?
113. Give a situation in which the gangway is used instead of the accommodation ladder?
114. What is understood by the pilot ladder?
115. Sketch a pilot ladder, give the dimensions, name the components and explain its use.
116. What is the maximum recommended height of the pilot ladder?
117. What is the aim of a spreader on the pilot ladder?
118. What has to be present at the side where the pilot boards the ship and why?

9

1 Onboard loading gear

1. What two auxiliaries can be used in the loading and discharging of a ship?
2. Name two types of shore-based cranes.

1.1 The choice for on-board loading gear

3. What may be the reasons for equipping a ship with its own loading gear?
4. What is "special cargo"?
5. Why are the ship's stability and carrying capacity reduced by a ship's crane?

6. Approximately how many % can cranes make up of the complete building costs of a ship? Give two examples that support the two figures you give.
7. Give a table with an overview of ship's cranes including type of ship, deadweight, crane capacity and number of cranes.

1.2 Statutory demands

8. In what convention are the statutory demands for loading gear laid down?
9. Name the bodies that undertake supervision of compliance with the regulations for loading/discharging gear.
10. Classification of loading gear may take place according to what law and regulations?
11. What does the National law state regarding classification of loading gear?
12. What do the International regulations state regarding classification of loading gear?
13. How are the inspections, certification and responsibilities divided in the case of loading gear etc.?
14. What items (and when) should be checked by the Classification Bureau in order to have a certificate issued for the loading gear?
15. What should be present on the certificate?
16. What should be indicated on the bottom side of a crane jib?
17. What is the range of a crane?

2 Revolving cranes

18. Sketch a revolving crane and name its main components.
19. How is a revolving crane revolved?
20. What main components are present in the crane cabin?
21. What are the two most important demands that should be satisfied in a crane jib?
22. Sketch a jib crane on a ship and name its main components.
23. What types of revolving cranes can be distinguished?

2.1 The position of cranes on the ship

24. Give an advantage and a disadvantage of the crane's position on deck if that position is:
    - at the middle of the ship
    - at the side of the ship.

2.2 Securing the cranes

25. Give some examples of how cranes can be secured.

2.3 Load control

26. What does it mean if the load has freedom of turn?
27. What is an objection to this freedom of turn?
28. Why is the angular velocity of a crane automatically reduced if it exceeds a certain value?
29. Why is the maximum allowed weight of the load dependent on the range of the crane?
30. In a double-block system, why does the maximum lifting capacity increase and why does the lifting speed decrease by the same amount?

2.4 The ship stability

31. When a crane is carrying a load, why may the list not exceed 5°?
32. When a crane is carrying a load, why may the trim not exceed 5° or in some cases 2°?
33. How can be avoided that the list becomes too large during or prior to cargo handling by the ship

2.5 Safeguards

34. What is the purpose of:
    - a zero-voltage machine?
    - an overload safety?
    - a limit switch?
    - a hoist-limit switch?
    - an empty-drum safety?
    - limit switches for the highest and lowest position of the crane jib?

2.6 Crane Drives

35. What is the difference between an electrically and a hydraulically driven crane?

3 Conventional type crane

36. Describe two ways of topping and slacking in a conventional crane.

3.1 Topping with a steel cable (runner)

37. Explain why, in conventional cranes:
    - the force in the runner reduces when the distance between top block and fulcrum increases.
    - the centre of gravity moves to a lower position when the distance mentioned in the (a) part of this question increases.
38. Under what circumstances can the jib fall back against the crane cabin?

3.2 Topping with hydraulic cylinders

39. How does the hydraulic cylinder facilitate a smaller range of the crane?
40. When is a hook block used?

3.3 The crane cabin

41. Sketch a crane cabin showing the arrangement of the crane winch, electric-hydraulic motor drive etc. Name the main components and state their functions.

3.4 The Bulk Crane

42. What ships are equipped with bulk-cranes?
43. What is a bulk crane and what is it used for?
44. Sketch a bulk crane, name the most important components and explain their functions.

3.5 Tanker Manifold Crane.

45. Why does a tanker need a crane?
46. Why is the lifting capacity a function of the ship

4 The revolving crane of the low type

47. What is the most obvious difference between a conventional crane and a low crane?

4.1 The crane

48. Why should a crane jib, when in use, be topped at least 15°?
49. Why is it important that the hook is connected to the cable with an axial bearing?
50. When is a hook swivel used?

4.2 The advantages and disadvantages of a low crane

51. Give an advantage and a disadvantage of the low crane.

5 Cranes for heavy Cargo

52. When is a crane called a 'crane for heavy cargo'?
53. What is the principle of a mast crane?
54. Why is stability an important item in connection with heavy cargo?
55. What additional facilities are present on heavy-lift ships?

5.1 Hoisting Diagram

56. What is a hoisting diagram, what is it used for and how?

5.2 Stabilizing Pontoons

57. When (and if so, then why?) do heavy-lift ships use a heeling system?
58. What is the difference between the revolving of the mast or jib in revolving cranes and in derricks, support your answer with sketches?
59. What factors determine the maximum lifting capacity of a crane?
60. What is the relation between the angle of the crane and its range?
61. What is the purpose of employing stabilizing pontoons on heavy-lift ships?
62. Why must the stabilizing pontoon attached to the side of a heavy-lift ship, become one with the ship in order to work properly?

7 Gantry Cranes

63. What is a gantry crane?
64. What is the limitation of a gantry crane, moving in the fore and aft direction?
65. For what type of cargo are gantry cranes usually used?
66. Why do gantry cranes have a better load control as compared to revolving cranes?
67. What is a parallel-swinger?

7.1 U-Gantry with a cable trolley without a fixed jib.

68. Briefly explain how gantry cranes with and without folding beams work, explain your answer and support this with sketches.
69. Give an advantage of a portal crane with two fixed beams (U-gantry).
70. Can a gantry crane tip over when there is too much list? Explain your answer and support this with sketches.

8 Side Loaders

71. What types of cargo are suitable for side loaders?
72. What are the advantages of a side-load system?
73. What are the disadvantages of a side-load system?

9 Ramps

74. What is a RoRo-vessel?

9.1 Several types of ramps

75. What different types of ramp are used in a RoRo-vessel? Briefly explain how the various types of ramp work in a RoRo-vessel, explain your answer and support this with sketches.
76. Sketch a straight ramp in the foreship of a RoRo-vessel, name the main components and explain how the system works.
77. Why does a ship with a straight ramp need a lengthy quay?
78. A ship with a straight ramp in the bow needs a compulsory second door. When can this door not be used as a ramp?
79. What is important when building a ship with a straight ramp in the side?
80. What is a slewing ramp and how does it work? Explain your answer and support this with sketches.
81. What is the difference between a hoistable ramp and hoistable car-decks?
82. Give the main contents of the front page of a registration certificate of lifting appliances and cargo handling gear.
83. Give the main contents of a registration certificate showing a method of testing of lifting appliances and cargo handling gear.
84. Give the main contents of a registration certificate showing a method of testing of lifting appliances and cargo handling gear.

9.2 Inboard Ramps

85. When can the weathertightness of a ramp be part of load line survey?

10 Registers and Certificates

86. Why are Offshore Cranes subjected to heavier requirements than normal cargo-gear?
87. Cargo gear is subject to testing and inspections by Class. Why?

11 Load Testing Equipment

88. Why is a load test compulsory at regular intervals?
89. Test weights can be found in various forms. Name two.

10

1 Overview

1. Sketch a forecastle deck with an overview of anchor equipment. Name the main components and explain their function(s).
2. Sketch an anchor winch and name the main components; explain the function(s) of each of these.
3. Sketch a longitudinal cross section of the foreship and show the anchor system as a whole; name the main components; explain the function(s) of each of these.
4. Sketch a forecastle deck with anchor equipment; name the main components; explain the function(s) of each of these.

2.1 Purpose

5. What is the purpose of the anchor gear?
6. In what situations can the anchor gear aid in the manoeuvring of the ship?

2.2 Legal demands on Anchor and Mooring Gear.

7. Where can the statutory demands for anchor gear be found?
8. Name the statutory article that deals with the anchor gear.
9. What is the role of the bureau of classification in the certification of the anchor gear?
10. What is the equipment number and state its formula? Explain the parameters in the formula.
11. Why are the width (i.e. breadth), height and lateral surface of the ship in the formula for the equipment number?

2.3 Anchors

12. What is an anchor to a ship in terms of safety resource? Explain your answer.
13. What type is a HHP pool anchor and how does it work? Sketch this anchor and name the main components.
14. What causes the total holding force when a ship is anchored in shallow water? Explain your answer (make a sketch showing such a situation and name the main components).
15. What type is a hall (conventional) anchor and how does it work? Sketch this anchor and name the main components.
16. What is a cast anchor?
17. Give an advantage of a welded anchor.
18. What types of anchors can be distinguished? Sketch each anchor and name the main components.
19. What is a fully balanced anchor?
20. What is the advantage of an anchor with a low centre of gravity?
21. What problem can occur if the anchor does not have a crown plate?
22. What do the letters SHHP stand for?
23. What is the difference between an HHP-anchor and an SHHP-anchor on the one hand and a conventional anchor on the other hand?

2.4 Anchor chain

24. How are the length and the strength of an anchor chain determined?
25. Why do the links of an anchor chain have studs?
26. What two qualities of material for anchor chains can be distinguished?
27. For what purpose is the material quality type U4 used?
28. What is meant by a shackle and how can this be used to define the length of an anchor chain?
29. How is an anchor chain marked?
30. What are the various ways to connect the anchor to the chain? Sketch these and name the various links and give their function.
31. What is the advantage of electronic counting of the length of the anchor chain that passes the gypsy wheel?
32. What is a die-lock link?
33. What is the purpose of a swivel between the anchor and the chain?

2.5 Hawse-Pipes and Anchor Pockets

34. Why is there a spray installation in the hawse pipe?
35. What is an anchor recess or -pocket? Sketch a recess.
36. What are the advantages of an anchor pocket / recess?

2.6 Chain Stopper / Cable Stopper

37. What is the function of a chain stopper?
38. Why should the pulling force of the chain stopper and the windlass be less than the pulling force of the anchor chain?
39. What is the purpose of a strong eye or lug on a chain stopper?
40. What is another purpose of the chain stopper?

2.7 Winches

41. What is the function of the anchor windlass?
42. What other function does the anchor windlass have?
43. What is the function of the clutch on the anchor winch?
44. What does it mean when the windlass is clutched in?
45. What does it mean when the windlass is clutched out?
46. Is the gypsy wheel clutched in or out when the warping drum is used?
47. How can anchor winches be powered?
48. In what way can the anchor winch be powered by an electromotor?
49. What is the difference between hydraulically driven and electric-hydraulically driven winches? Give an advantage of both hydraulically driven and electric-hydraulically driven winches.

2.8 Chain Locker

50. Why is a chain locker high and narrow?
51. Why does the chain in a chain locker rest on a grill?
52. What is the function of the chain slipping device?
53. Describe two versions of the chain slipping device, sketch each one and name the main components.

3.1 Winches

54. What are the two functions of a drum that consists of two parts?
55. A steel wire rope is suitable for use on a drum that consists of one part. Why?
56. How does a drum with a pulling part and a storage part operate?
57. What is the relation between the MBF of a rope and the break-and- pulling force of a drum?
58. What is the function of the warping drum?
59. A rope stiffened by a warping drum may be utilised to keep the ship in moored position when it stays on the drum. Why?
60. What additional part is present on 'self-tension' winches?
61. What is a capstan?

3.2 Mooring gear auxiliaries

62. What is a panama-chock? Sketch this and explain why there should be reinforcements around such an item?
63. What is a roller-fairlead? Sketch this, name the components and give their functions.
64. What is the function of a bollard? Sketch this, name the components and give their functions.
65. How can be prevented that the first windings of a rope on a bollard shoot upwards?
66. What is the function of the wire stopper connected to the bollard?

3.3 Emergency towing systems for tankers

67. Why is an emergency towing system for tankers demanded by IMO?
68. For what size of tankers is an emergency towing system compulsory?
69. Describe briefly the emergency towing system on tankers.

4.1 Cables and ropes

70. What are a ship's cables used for?
71. In general, how is a rope constructed?
72. Why are the threads laid in an opposite direction to that of the strands?
73. Name some types of ropes that can be distinguished on the basis of how they have been laid?
74. What is the foremost reason for making a rope with a mantle?
75. A mantle allows the threads to lie parallel. What is the advantage of this?
76. Why is it important that the wear resistance of the mantle is sufficiently high?
77. What does MBF mean?
78. Why is it important to know the density of a rope?
79. What does it mean if a rope is UV-resistant?
80. Are synthetic ropes resistant to chemicals?
81. How is the water absorption of a rope expressed?
82. What does the TCLL-value stand for?
83. What aspects are important in determining the TCLL-value?
84. Why is knowledge of the backlash of a rope important?
85. What is indicated by the stretch limit of a rope?

4.2 Description of common Cables and Ropes

86. Name some differences between Aramide and HMPE.
87. Name some advantages of high-grade cables.
88. The density of polyamide (nylon) is more than one. Why can this be a disadvantage?
89. Many polyamide ropes have a large elasticity. What danger is inherent to this characteristic?
90. If polyamide has been in contact with water over a period of a few days, the rope tends to absorb water. Why is this a disadvantage? Explain your answer.
91. What is the difference between a polyester rope and a nylon rope?
92. Why is nylon used as a stretcher?
93. Polyolefin cables may be subdivided into high performance ropes and standard ropes. What is the difference?
94. Give some advantages and some disadvantages of polyprop ropes.
95. What is manila rope made of?
96. What is manila still used for in shipping?
97. Give two advantages of manila rope over synthetic rope.
98. Why is steel wire rope still in use in shipping?
99. Give an advantage and a disadvantage of using steel cables on tankers.
100. How is steel wire rope constructed?
101. What is the difference in use between steel wire ropes made from thick threads and wires made from thin threads?

4.3 Various parts

102. What is a turnbuckle? Sketch this, name the main components and explain their functions.
103. Give some requirements that apply to a bottle screw?
104. What is the function of a final joint?
105. Give an advantage and a disadvantage of a talurit-clamp.
106. What is the difference between a safety hook and a hook lacking a safety pin?
107. What types of shackles are used on ships?
108. Why do most shackles have a set pin?
109. What does a bottle screw consist of?
110. What is the purpose of a socket?
111. What are wire clamps used for?
112. What is the dead part of a cable with an eye?
113. On what part of the cable should the bolts of the wire clamp be attached? Make a sketch of such a cable with eye system, name the components and explain their function.
114. For what action must a cable with an eye, made with use of a wire clamp never be used?

4.4 Forces and stresses

115. What is the definition of the Safe Working Load (SWL)?
116. What is the definition of the Working Load Limit (WLL)?
117. What is the definition of the Minimum Breaking Load (MBL)
118. What is the load stretch diagram and what does it show?
119. What is the normal WLL/MBL or SWL/MBL ratio for chains?
120. What is the normal WLL/MBL or SWL/MBL ratio for steel wires and shackles?
121. What is the normal WLL/MBL or SWL/MBL ratio for ropes?
122. Show in a figure how the force in a two wires, together lifting a weight (for example, 1000 N), are dependent on the angle between the two wires. What is the ultimate wire load and what is the angle between the two lifting wires?
123. What body (bodies) is (are) involved in checking the condition of ropes, anchors, chains etc. and determination of the SWL values etc.? Explain your answer.
124. How exactly is proof loading executed after production?
125. How exactly is the proof load executed when the material is submitted for re-examination?

11

1. Propulsion

1. What is the most common way of propelling a ship?
2. What is the consequence of a fixed pitch propeller?
3. What is a reason to fit two propellers?
4. Why is an engine room mostly found at the after end of a ship?

1.2 Engine Types

5. Name the three main groups of diesel engines used for ship propulsion.
6. What is the RPM range of a high-speed diesel?
7. What is the RPM range of a medium speed diesel?
8. What is the RPM range of a low-speed (crosshead) engine?
9. Where are the fast running engines used?
10. In what ships are the medium speed engines normally used?
11. What ships have slow speed engines?
12. Estimate the height of a slow speed engine, 800 mm bore.
13. When is reduction in RPM necessary?

1.3 Fuel

14. What is the main difference between MDO and Heavy Fuel?
15. Which fuel can be burnt is which engine?
16. What must be done before heavy fuel can be used?
17. Where is untreated fuel stored in a ship?
18. Where is treated fuel stored?

19. What is the task of the separators?
20. What is the principle of 'common rail technique'?

1.4 Cooling

21. Why is direct cooling only used in fresh water?
22. Why is the cooling system double installed?
23. Why saves a fresh-water cooler in a sea-chest a pump?

1.5 Lubrication

24. Why is the quality of the filtering of the lubricating oil of significant importance?
25. Why is a lubricating oil pump usually a gear-pump?
26. What are the different lubrication systems in large engines?
27. What is a sump tank?
28. Where is the sump tank located?

1.6 Starting

29. What is a normal pressure in a starting air vessel?
30. Why is there a stop valve on the starting air vessel?
31. What other valves are fitted on a starting air vessel?
32. There are usually two starting air compressors. Why?
33. Why is there a main starting air stop valve?
34. What is the function of the distributor?
35. What makes the distributor turning at the right RPM?

1.7 Exhaust Gas

36. How is the available heat in the exhaust gas used?
37. What are the contents of exhaust gas?
38. Why are NOx and SOx harmful?
39. What is the difference between an exhaust gas boiler and an exhaust gas economiser?

1.8 Combustion Air

40. How can the quantity of combustion air be boosted?
41. Why is positive ventilation important in an engine room?
42. Why is the air, coming from the rotary compressor cooled before being led into the cylinders?
43. What limits the output of a diesel engine?

1.9 Shafting

44. Why is there always an intermediate shaft fitted in a 'normal' configuration?
45. How is the aft most shaft called?
46. What is a rope-guard?
47. What is the function of the seals around the propeller shaft?
48. How is a propeller fitted to the tail shaft?
49. Why are couplings sometimes part of the shafting?
50. Why are gearboxes often necessary?
51. What is the function of flexible elements in the shafting?
52. How is a shaft generator fitted in, and driven?
53. What means PTO?

1.11 Electricity

54. What is the main supplier of electricity onboard?
55. What is the normal kind of current on ships?
56. How many diesel generators are normal?
57. What is the minimal number of generators?
58. Why should each generator be capable of taking the whole electrical load?
59. What is the function of an emergency generator?
60. Which consumers are normally fed by the emergency switchboard?
61. What is a black-out?
62. Why are diesel generators fitted with a governor?
63. What is parallel-running?

1.12 Heating

64. Why does a normal motor ship have a small boiler?
65. Why has a tanker often large boilers?
66. What is thermal oil?
67. What are the advantages and disadvantages of steam?

1.13 Heat Exchangers

68. What is a heat-exchanger?
69. What are the different types heat exchangers?
70. In what systems are they used?

1.14 Pumps

71. Name the different types of pumps, and in what systems are they used?
72. Why are membrane pumps often used for dirty water?

1.15 Safeguarding

73. What is the reason of safeguarding?
74. What is the simplest safeguarding on a small diesel?

1.17 Fresh Water

75. Why is drinking water only made far from shore?
76. How can drinking water be made using hot cooling water?
77. Describe the working of an evaporator.

2.1 Gate Valves

78. Describe a gate valve.
79. What are the advantages and disadvantages of a Gate valve?

2.2 Globe Valves

80. Describe a Globe Valve.
81. What are the advantages and disadvantages of a globe valve

2.4 Butterfly Valves

82. Describe a butterfly Valve
83. What are the advantages and the disadvantages of a butterfly valve?

2.3 Ball Valves

84. Describe a Ball Valve.
85. What are the advantages and disadvantages of a Ball Valve.

3.3 Bilge Pumps

86. Name the various compulsory bilge pumps
87. What is the main task of a bilge pump?
88. Why is a bilge pump self-priming?
89. In case of an 'open' containership, what is the largest quantity of water normally to be dealt with?
90. What is a bilge-manifold. Describe.
91. Why must the three systems be independent from each other?
92. Why is it a one way system?
93. Where is the main suction line situated?
94. Where is the water in cargo holds collected?
95. How many bilge wells are fitted in a large, normal engine room?

11

96. Why are bilge wells fitted with an alarm system in a unmanned engine room?
97. How many bilge wells are installed in a cargo hold?
98. To use a bilge-ejector, what is normally the driving water?
99. Describe the pipeline system and the working a the bilge water separator.
100. Why is the bilge water separator fitted with a oil content meter?
101. What is the function of the 15 ppm alarm in the system?

4 The Ballast Arrangement

102. Who decides the total ballast capacity in a ship?
103. Mention the reasons to take ballast water on board.
104. Anti-heeling is a transverse ballast system. Where is the capacity and pumping rate related to?
105. What decides the capacity of the main ballast pumps?
106. Mention advantages for synthetic pipes for ballast systems.

5 Fire-Fighting Arrangement

107. Mention the three required fire pumps.
108. What is a normal pressure of a main fire line?
109. What is a fire hydrant?
110. What decides the number of fire hydrants and firehouses?
111. Why are synthetic pipes (unprotected) not allowed for fire lines?

12

1 Ship Resistance

1. What factors determine the force needed to give a ship its speed?
2. What are the various kinds of resistance?
3. What is frictional resistance?
4. What is wave resistance?
5. What is air resistance?
6. What is the result of ships movements (rolling, pitching) on the resistance?

2.1. Propellers

7. When are the forces that move a ship and the resistance in equilibrium?
8. Name some external forces, i.e. forces that do not come from the ship itself.
9. Sketch a propulsion system of a ship and name the main components; explain the function(s) of each of these.
10. What factors determine the efficiency of a propeller?
11. What is the propeller pitch?
12. What is the rpm of a propeller?
13. What is the relation between the diameter of the propeller and the revolutions per minute (rpm)?
14. What is the effect of the relation mentioned in question 8 on the fuel consumption?
15. In theory, how large should the propeller blades be?
16. How does a propeller maintain the speed of a ship?
17. What is the most common number of blades per propeller?
18. What is the cause of frictional resistance?
19. What in particular influences the boundary layer of the wake?
20. Where on the ship is the pressure resistance largest?
21. What causes the wave-system around a ship?
22. Why are some ships fitted with a bulbous bow (bulb)?
23. Describe how a bulbous bow works in order to cause a reduction in the resistance of a ship.
24. Briefly explain what causes the increase in depth and height of the troughs and crests of waves around a ship.
25. What causes low and high-pressure areas around a revolving propeller?
26. Explain (with the aid of sketches showing velocity and forces etc.) how a propulsive force arises that acts on the propeller and therefore also on the ship.
27. What causes the formation of water vapour bubbles on the front side of the propeller?
28. What is the cause of cavitations of the propeller?
29. What are the consequences of this cavitations?
30. How can a right-handed propeller be recognised?
31. In what direction does a right-handed propeller rotate when the ship is moving ahead?
32. In what circumstances is the effect of the propeller maximal?

2.2 Fixed propellers

33. What is a fixed (pitch) propeller?
34. Why do fixed propellers in combination with small diesel engines require a reversing clutch between the engine and the propeller?
35. What is a controllable pitch propeller?
36. Sketch a controllable pitch propeller and name the main components; explain the function(s) of each of these.
37. What determines the choice for a fixed- or an adjustable (controllable)- pitch propeller?
38. Give some advantages of the fixed propeller.
39. What are propeller tip plates?
40. What are the consequences of placing tip plates on the propeller blades?
41. What are the advantages of propellers with tip plates?
42. Sketch a contra-rotating propeller system and name the main components; explain the function(s) of each of these.
43. What is the principle of the contra-rotating propeller?

2.3 Controllable-pitch propellers (adjustable-pitch propellers)

44. What is the difference between a fixed-pitch propeller and a controllable-pitch propeller?
45. What is effected when the blades of a propeller change position?
46. If the engine shaft has an rpm of 600, and the reduction is 1:2.5, what is the rpm of the propeller?
47. Briefly explain (with the aid of a sketch showing forces and blade positions) how propulsive forces are generated in a controllable-pitch propeller in both the ahead and reverse position.
48. Why is the resulting propulsive force zero (explain with the aid of a sketch showing forces and blade positions) with a controllable-pitch propeller, when the telegraph is set to stop?
49. Give some safety measures that are built into the controllable-pitch propeller.
50. Why can a controllable-pitch propeller and a shaft generator be combined?
51. Why is the direction of the propulsive force easier to control in a controllable-pitch propeller than in a fixed-pitch propeller?

52. Give some advantages and a disadvantage of the controllable-pitch propeller.
53. Sketch a propulsion system with a shaft generator and name the main components; explain the function(s) of each of these.
54. What other application can the shaft generator have?
55. How can the shaft generator be used for emergency propulsion?

2.4 Nozzles

56. What are the reasons that a nozzle gives extra propulsive force (explain with the aid of a sketch showing forces etc.)?
57. How is the lift generated in a nozzle?
58. In what cases does the nozzle lose all its advantages?
59. What ship types generally use nozzles?

2.5 Rudder Propellers

60. Sketch a rudder propeller system and name the main components; explain the function(s) of each of these.
61. What is the most recognisable characteristic of a rudder propeller?
62. How is the rotation of the engine shaft transferred vertically to the rudder propeller?
63. What is the advantage of a rudder propeller with an adjustable-depth mechanism?
64. What is a Retractable Thruster?
65. What advantage is there in placing the diesel-drive unit on deck?
66. How can the bow be positioned with a bow thruster (explain with the aid of sketches)?
67. What is the main advantage of the rudder propeller?
68. What does DP stand for?
69. How is DP used in relation to the rudder propeller?
70. Why are the costs of building in a rudder propeller lower than the costs of building in a conventional propeller?

2.6 Electrical Rudder Propellers

71. Sketch an electrical rudder system (Azipod etc.) and name the main components; explain the function(s) of each of these.
72. How does the electrical rudder propeller (Azipod etc.) work?
73. What does push or pull mean in electrical rudder propellers?
74. Explain (with the aid of sketches) how the electrical rudder propeller saves space as compared to a conventional propeller.
75. What is the difference between a direct diesel drive and a diesel-electric drive?
76. What are the advantages of combining the diesel-electric drive and a rudder propeller (Azipod etc.)?

2.9 Water-jet propulsion

77. Sketch a water-jet propulsion system and name the main components; explain the function(s) of each of these.
78. Briefly explain (with sketches etc.) the principle of water-jet propulsion.
79. How can a ship go astern (explain with sketches etc.) with water-jet propulsion?
80. The steering system of the water jet is electric. What does this mean?
81. Give some advantages of water-jet propulsion.

2.10 Propeller Shafting

82. Sketch a propeller shafting system for a fixed pitch propeller and name the main components; explain the function(s) of each of these.
83. What is the purpose of the propeller shafting?
84. What determines the length of the propeller shaft and the intermediate shaft(s)?
85. What is a bearing?
86. What demands should the sealing system of the propeller-shaft satisfy?
87. If the shafting is lubricated with oil, how is the oil in the stern tube kept under overpressure?
88. Describe the sealing in an oil-lubricated shafting:
    - at the front end of the stern tube to prevent oil leaking into the ship
    - at the after end of the stern tube to prevent oil from leaking out of the ship
    - at the after end of the stern tube to prevent seawater from entering the ship
89. What are the advantages of a chrome steel liner in an oil-lubricated shafting?
90. What two methods are there for water-lubrication in a shafting?
91. Why is water as a lubricant compulsory in some countries?
92. During dry-docking, why should the wear down of the propeller shaft be measured?

3 Stabilisers

93. At what location in the ship stabilisers are normally fitted?
94. What ships are normally fitted with stabilisers?
95. Is there similarity between rudders and stabilisers?
96. Why do they need to be retractable?

4 Rudders

97. What is the main function of a rudder?
98. Approximately how large is the rudder area in percentage to the lateral surface?
99. What demands should be satisfied by the shape of a rudder?
100. Make a sketch of the side view showing the after part of a ship, with the rudder arrangement, name the main components, and explain the functions.
101. Make a sketch of the horizontal cross-section of the rudder blade and use this to explain how the rudder works.
102. What is the magnitude of the torque that rotates the ship?
103. What is the magnitude of the torque that the steering engine must supply to the rudder system in order to rotate the ship?
104. What are the consequences for the rudder moment and the steering engine if the rudder-stock would be located at the point of application of the resultant rudder force (instead of 25-30% from the front side of the rudder)?
105. What means 'supported by the heel' mean?
106. How is the rudder supported nowadays?
107. Name 4 rudder types most common nowadays for use in large and smaller vessels.
108. Briefly describe the spade rudder (with the aid of a sketch) and name the main components; explain the function(s) of each of these.

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109. Briefly describe the working of a spade rudder (with the aid of a sketch showing forces, moments etc.).
110. Briefly describe the flap rudder (with the aid of a sketch) and name the main components; explain the function(s) of each of these.
111. Briefly describe the working of a flap rudder (with the aid of a sketch showing forces, moments etc.).
112. How much larger is the rudder angle of the rudder flap compared to the rudder angle of the main rudder blade?
113. How can a ship navigate at right angles (in a transverse direction) with a flap rudder?
114. Give some advantages of the flap rudder.
115. Give some disadvantages of the flap rudder.
116. Briefly describe the Mariner Rudder (with the aid of a sketch) and name the main components; explain the function(s) of each of these.
117. Briefly describe the working of a Mariner Rudder (with the aid of a sketch showing forces, moments etc.).
118. Why can the rudder-stock of a Mariner Rudder be smaller than that of a spade rudder?
119. What are the disadvantages of the construction needed for the Mariner Rudder?
120. Briefly describe the fish-tail rudder (with the aid of a sketch) and name the main components; explain the function(s) of each of these.
121. What types of ships use the fish-tail rudder?

5 Steering Gear

122. The rudder bearing is part of the rudder carrier. Explain this with appropriate sketches, name the components and their functions.
123. What are the demands made by SOLAS for a steering engine?
124. Why do most steering engines have a lot of parts double?
125. Briefly describe how a ram steering engine operates. Explain this with appropriate sketches, name the components and their functions.
126. Briefly describe how a rotary-vane steering engine operates. Explain this with appropriate sketches, name the components and their functions.
127. Compare the advantages and disadvantages of the ram steering engine and the rotary-vane steering engine.

13

1.1 Direct Current

1. What are the basic types of electric current?
2. What is the difference between current and voltage?
3. What can be the sources of direct current?
4. What is the ultimate downpour of direct current?
5. What is an UPS?

1.2 Alternating Current

6. What is the simplest generator developing alternating current?
7. What decides the level of the voltage and the frequency?
8. In what steps can the performance of that simple generator be upgraded, i.e. more electric power produced?
9. Why are slip rings necessary?
10. Why can alternating current be switched with simple switchgear, contrary to DC?
11. How can the starting direction in an AC motor be decided?

1.3 Rotating Alternating Current

12. How is rotary alternating current created?
13. What is a squirrel-cage motor?
14. What is the advantage of a squirrel-cage motor?
15. How can the turning direction be reversed in a 3-phase motor?
16. Why can the starpoint-conductor be reduced or even deleted?

2 Electrical Installations in Ships

17. Why must electrical systems in ships be complete?
18. What is redundancy?
19. What decides the level of redundancy?
20. In what state of the installation design starts redundancy?
21. Name examples of redundancy?
22. Name examples of common duplications?
23. What is EMC?

3 Insulated and Earthed Distribution Systems

24. What is the danger of a first single earth fault?
25. Why is it advised to use a 3 phase, 4 wire, and neutral earthed distribution system?
26. What is prevented using such system?
27. What is the basic difference of equipment for marine use in the past and what is at present available on the market?
28. What are the reasons that equipment for marine use has to different from equipment for shore installations?

4 Basic Design Criteria

29. What are the main design criteria for ships installations?
30. Why does it have to be approved by the Classification Society?
31. What has to be submitted together with the basic design?
32. What is the value of a clear 'one-line diagram'?
33. What is a load balance?
34. Making a load balance, what conditions have to be taken into consideration?
35. How is the rating of the generators, i.e. the necessary power, decided?
36. What means 'selectivity'?
37. What means 'plant maintenance'?

4.1 Type of Service

38. Mention the three types of service, and what doe they mean?

4.2 Type of Operation

39. Mention the types of operation.
40. What means 'manned'?
41. What means 'unmanned'?
42. What equipment requires an unmanned engine room in addition to a manned engine room?

43. What parameters are important for the decision manned vs. unmanned?
44. What is a 'dead-man' alarm?
45. What means the 'NAV1' Notation?
46. What comprises an 'Integrated Navigation Bridge'?

5 Electro Magnetic Compatibility

47. What means Electro Magnetic Compatibility (EMC)?
48. For what equipment on board ships this is a requirement?

7.1 Generators

49. What is a simple device to convert mechanical energy into electrical energy?
50. What is the usual source of mechanical energy?
51. What is a power-take-off-generator?
52. What is the main advantage of such a generator?

7.2 Electric Motors

53. What is a simple device to convert electrical energy into mechanical energy?
54. What are protection classes (IP Code) for electric motors?

7.3 Cables

55. What is the means of transport of electric power between the various components?
56. What is the largest cost in a ships electric installation?
57. What are the various kinds of cables?
58. Why is PVC, however cheap, not advisable?

7.4 Switchboards and Switchgear

59. What is the function of switchgear and switchboards?
60. What is the function of a circuit breaker?
61. What is the difference between shore switchboards and marine switchboards?
62. Mention the special protection required for marine switchboards.
63. Mention the main panels in a normal ships switchboard.
64. What is the main component of a generator panel?
65. Why are the bus bars provided with removable sections?
66. What is the function of the synchronising panel?
67. What is load-sharing?
68. What is the function of a reverse-power-relay?

7.5 Circuit breakers

69. What is the difference between a circuit breaker and a contactor?

7.6 Type Approved Equipment

70. What means 'Type-Approval'?
71. Which bodies can issue a 'Type-Approval' certificate?
72. What means 'Marine Environment'?
73. Mention a number of definitions belonging to the Marine Environment.

7.7 Starting devices

74. What is the reason to use starting devices?
75. What means 'star-delta' starting?
76. Why is a frequency-converter giving a smooth start?

7.8 Emergency Electric Supply

77. What are the possibilities for emergency electric supply?
78. What has to be installed in the emergency generator room, together with the emergency generator?
79. What is the normal power supply of the emergency switchboard?
80. What triggers the automatic starting of the emergency generator?

8.1 Alarm, Monitoring and Control Systems

81. What are the purposes of automation?
82. What decides the level of automation?
83. What means Redundancy?
84. What are the systems at present (2005) available?
85. What is Dynamic Positioning (or DP)?
86. Describe an alarm and monitoring system.

8.2 Voyage Data Recorder (VDR)

87. What is a Voyage Data Recorder?

9.1 Internal Communication

88. Mention the common internal Communication systems, and describe same in short.

9.2 External Communication

89. Mention the normal external communication systems, and describe same in short.

10 Navigation and Nautical Equipment

90. Mention the normal equipment is the wheelhouse.
91. What is the difference between X-band and S-band radars?
92. What are the extra requirements for one-man-operation and -watch keeping?

11 Dangerous Zones

93. What are 'dangerous zones'?
94. What is the cheapest way to deal with explosion danger in a certain space?
95. Define the various danger zones.
96. What means 'intrinsically safe'?

12.1 Factory Acceptance Test

97. Why are official tests necessary?
98. Who have to attend the tests?
99. What equipment has to go through a factory acceptance test?

12.2 Harbour Acceptance Test

100. What tests are done alongside?

12.3 Sea Trials

101. What test are carried out when the ship is at sea?

1.1 Wood

1. Where is wood used on ships nowadays and for what purpose(s)
2. Some vessels even today are constructed wholly from wood, why and for what purpose?
3. Why is wood used as an overlay on a steel deck?
4. What are the advantages of using wood as an overlay on a steel deck compared to a steel deck alone?

1.2 Steel

5. What are the advantages of using steel in the construction of ships?
6. Describe the steel making process (in which an ore is converted to metal) in broad outline and give the name of the general process.
7. What is meant by the refining process within the process of making steel and what is the general purpose thereof?
8. How is the differences in strength, toughness, hardness and weldability brought about within the process of making steel?
9. Name a number of additives that may be supplemented to the steel during the steel making process.
10. What is a disadvantage of steel?
11. What happens if a metal corrodes?
12. Steel used as a construction material for ships may be subdivided into four groups, name each group and give a short description of each one.
13. Name the three main steel types utilised as plate materials and profiles and give their respective yield strength value or ranges thereof.
14. What is meant by the yield strength of steel? Give the yield values of the common steel types used in ships.
15. Name a number of ship- and engine components that can be fabricated using forged steel.
16. Name a number of ship and engine components that can be fabricated using cast steel.
17. Name a number of ship components that can be fabricated using stainless steel.
18. What is the main difference of cast steel compared to other steel types?
19. Why does corrosion not have a negative effect on stainless steel?

1.3 Aluminium and its alloys

20. What are the main differences between aluminium and steel as a construction material for ships?
21. What are some advantages of aluminium compared to steel for use as a construction material for ships?
22. What are some disadvantages of aluminium compared to steel for use as a construction material for ships?
23. Why does corrosion hardly affect aluminium?
24. If an aluminium part corrodes away completely, what can be the reason?
25. What are the practical objections to the use of aluminium?

1.4 Copper and its alloys

26. Name some copper alloys and name their most important alloy components.
27. Name some application(s) of copper alloys in the construction of ships.

1.5 Synthetic materials

28. Give an example of a number of synthetic materials.
29. What important parts of a ship can be made of synthetics?
30. What is GRP and where is this material used in the shipbuilding industry?

2.1 The corrosion process

31. Give a brief description of the corrosion process of a metal (steel for example).
32. What can cause acceleration of the corrosion process on a metal surface?
33. What measures can be taken to counteract corrosion?

2.2 Protective layers

34. What is meant by a protective layer to counteract, stop or reduce the extent of the corrosion process? Name three methods, which produce such a protective layer.

3.1 General

35. What is paint?
36. Describe the hardening process of paint.
37. On what grounds can different paint types be distinguished?
38. How does a single-pot or conventional paint harden?
39. Can a single-pot paint be used again after the can has been opened once before?
40. Name a conventional paint.
41. Can a conventional paint be used again after the can has been opened once before? Explain your answer.
42. What are generally the components of conventional paint?
43. What is the purpose of the binding agent?
44. What can binding agents be composed of?
45. What is the function of pigment in the paint?
46. What is the function of the solvent in a paint?
47. What is the function of a thinner in a paint?
48. Why should breathing protection be used when painting in a closed space?
49. What characteristics can additives and fillings add to the paint?

3.2 Two pack paint

50. Binary paint or dual component paint.

- How does the paint harden?
- What are the main components?
- Why does the chemical reaction in the paint start?
- Can the paint be used again after it has already been used before?
- Give one advantage binary paints have over a conventional paint?

3.3 Comparing the two paint systems

51. Why should a ship use:
    - a binary paint?
    - a conventional paint?
52. What considerations are important when choosing a paint system?
53. Give an advantage that a one-component paint system has over a binary paint system.

4.1 Pre-treatment

54. Why is pre-treatment of a surface so important?
55. How can a material be cleaned for painting?
56. Cleaning with hand-tools:
57. What tools can be used?
58. What is an objection to manual cleaning?
59. What means are available for the mechanical cleaning of a material?
60. What is the difference in cleaning-result between a needle scaling hammer and a revolving brush?
61. What means of safety must be used in mechanical cleaning?
62. What are the disadvantages of thermal cleaning?
63. What is an advantage of sandblasting?
64. Why must a layer of paint be applied immediately after sandblasting?
65. Why is sandblasting not suitable to be done by the crew of the ship?
66. What is meant by hydro jetting of a ship's surface, when and where is this done?
67. Give an advantage and a disadvantage of sandblasting compared to hydro jetting?

4.2 Applying the paint layer

68. Prior to the painting, what aspects of the surface should be looked at?
69. Give the approximate minimum and maximum temperatures of the surrounding air.
70. What is the advantage of paint spraying compared to painting with a roller or brush?
71. What is the dew point?
72. Why is there condensation on cold surfaces when the temperature drops below the dew point?
73. Describe a simple test to check whether condensation will take place on a surface.

4.3 Thickness of the layer

74. What is the theoretical usage (coverage) of paint?
75. What is the difference between the wet-layer thickness and the dry-layer thickness?
76. The layer thickness is expressed in what unit?
77. How can the paint layer thickness be measured?
78. What, approximately, is the loss of paint if the spray-method is used?

4.4 Types of paint

79. What is the difference between one-component and two-component paints?
80. What does 'physically drying' mean?
81. What does 'chemically drying' mean?
82. How do binary paints dry?
83. Shop primers:
    - What are shop primers?
    - When are they applied?
    - Why are they applied?
    - How long does it give protection?
84. Zinc-containing ethyl silicate or zinc epoxy
    - When is zinc-containing ethyl silicate or zinc epoxy used?
    - How does zinc react if the paint layer is damaged?
    - Where are they used?

4.5 Painting systems

85. What are the components of the steel conserving (paint) system?
86. What is passive corrosion protection?
87. The permeability of a paint-system depends on what?
88. What relation is there between the layer thickness and the number of layers?

5.1 Fouling

89. What is the main purpose of anti-fouling?

5.2 The ships shell, the ideal surface for fouling

90. What conditions make the shell of a ship an ideal base for fouling?
91. What can cause 'roughness' of the shell?
92. What is the relation between fouling and fuel consumption?
93. What is meant by anti-fouling?
94. Why do we use anti-fouling?
95. What does fouling consist of?
96. Fouling is distinguished into two groups. Which ones?

5.3 The purpose of anti-fouling

97. What reasons are there for the use of anti-fouling?
98. How can anti-fouling cause corrosion?

5.4 Types of anti-fouling

99. How does self-polishing anti-fouling prevent fouling?
100. What is the purpose of toxic compounds in anti-fouling?
101. Why need the durability of an anti-fouling layer not exceed five years?
102. Why are TBT and copper containing anti-fouling (going to be) banned?

5.5 Economy

103. The choice of the type of anti-fouling is often done through the answer of the question that is paying for the fuel. Why?

6 Cathodic protection

104. The corrosion process may be subdivided into which two reaction types?

6.1 Chemical reactions

105. Give a brief and clear description of chemical corrosion.
106. Why are the characteristics of the first corroded layer so important?
107. Rusting is a continuous process in some metals, while in other metals the corrosion stops early. Explain why.

6.2 Electrochemical reactions

108. What is the consequence of generating ions for the metal?
109. In what direction does the current between a precious and a less precious metal run?
110. What are the risks when an object is made from several different metals?
111. In what places on the ship can chemical corrosion between two metals occur?
112. Give a brief and clear description of electrochemical corrosion.

6.3 Sacrificial element (galvanic corrosion)

113. How can an electro-chemical reaction be counteracted?
114. Briefly explain how passive cathodic protection (with anodes) works.
115. Why do anodes dissolve faster if the paint-layer has been damaged?

6.4 Sacrificial anodes

116. What are the advantages and disadvantages of using sacrificial anodes in ships?

6.5 Impressed current

117. What is meant by the ICCP system?
118. How does the ICCP-system work?
119. What are the advantages of the ICCP-system?
120. What are the disadvantages of the ICCP-system?
121. Why do they place a current collector on oil-lubricated propeller shaftings?
122. What is the consequence of a damaged oxide layer in stainless steel?

7.1 Why dry-docking

123. Why are ships dry-docked?
124. What demands do the classification societies make for dry-docking?

7.2 Methods of dry-docking

125. What methods of dry-docking are used?
126. What is a floating dock?
127. Give a brief description of a floating dock (give important components).
128. Give a brief description of an excavated (graving) dock and its working.
129. What is the difference between a floating dock and an excavated (graving) dock?
130. Give a brief description of a patent slip and the working thereof.
131. Give a brief description of a lift-system and the working thereof.

7.3 Preparing for dry-docking

132. What is the function of the keel blocks?
133. What is the function of the side blocks?
134. What factors are important when determining the positions of the side blocks?
135. Why should side blocks be adjustable in height?
136. What is a dock plan of a ship?
137. What important information should be in the dock plan?

7.4 Dry docking

138. Describe, step by step, the process involved in the docking of a ship in a floating dock.
139. What is on top of the water headers?
140. What is in the water headers?
141. How does a dock master determine the positions of the side blocks and keel blocks?
142. Describe, step by step, the process involved in the docking of a ship in an excavated dock.
143. Describe, step by step, the process involved in the docking of a ship on a patent slip.
144. Describe, step by step, the process involved in the docking of a ship on a lift system.
145. What are the dangers when a dry-docking ship still has cargo in the holds?
146. What are the advantages of a floating dock if the ship has trim?
147. How is the ship positioned during the dry-docking?
148. At what moment will the ship touch the dock blocks in dry-docking?
149. What does it mean if the ship is buoyed (or 'has bit')?
150. What is the cause of the decrease in stability when the ship is buoyed?
151. What is so critical about the point where the stability becomes zero (GM=0)?
152. Why should the (ballast) tanks of the ship be emptied?
153. What equipment on board should be turned off? And what equipment shouldn't?
154. Why must the fire-piping of the ship be connected to the shore when dry-docking?
155. What is a critical moment for the dock itself?

7.5 Refloating

156. What has to be checked before the ship is launched again?
157. The ship has to be launched in the same condition as it entered the dock.
    - What is meant by this statement?
    - What is the danger if this is not the case?
    - How is this accomplished?
158. Why should the fluid levels of all tanks and bilge wells be checked after launching?

8.1 Maintenance

159. What check-ups, maintenance and work is typically done in dry-dock?
160. What ships are required to have their steel thickness measured?
161. Ship maintenance is usually divided into what two sub-sections and why?
162. What is meant by hull maintenance and who carries this out and when?
163. What is meant by deck maintenance and who carries this out and when?
164. What is meant by 'the roughness of the underwater hull has become too high'?
165. What measure is advised to be carried out (and where and why) when 'the roughness of the underwater hull has become too high'?
166. What factors determine the paint system used for the underwater hull of a ship?
167. After preparation of the underwater hull of a ship, who inspects the surface condition prior to painting and why?
168. Why are no defects to be neglected during surface condition underwater hull inspection prior to painting?
169. Name a number of possible defects of the underwater hull of a ship that must be immediately dealt with prior to painting.
170. What kind of defects of the underwater hull of a ship can be left as are, as per owner's choice?
171. Name a number of components that must be examined (inspected, measured etc.) when the vessel is having her five yearly Special Survey dry docking. Elaborate on your answer there where necessary.
172. Why is most engine maintenance done on board while the ship is in operation?

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173. Why is some engine maintenance done in port?
174. Why are classification surveys carried out on board of ships?
175. Classification surveys can be carried out in two main ways. Explain this statement.
176. What engine parts need more (classification survey) attention than once in five years?

8.2 Repairs

177. Mention the main differences between repair yards and new-building yards.

8.3 Computerised Shape Techniques

178. Mention some differences between a modern ship repair yard and the older repair yards?

8.4 Conversion

179. Why is ship conversion work more linked with ship repair work than ship new-building work?

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1.1 General

1. What is the cause of most accidents on a ship?
2. What does ISM stand for?
3. What relation is there between the ISM-certificate of a ship and the safety on that ship?
4. Why are regular drills with the safety means necessary?
5. What precautions can be taken to prevent people from panicking in case of an emergency (e.g. a fire)?
6. What can happen when people panic in the case of fire on board of a ship and what could be the consequence for them?

1.2 Regulations

7. How is the safety on ships regulated by the IMO?
8. What is meant by MSC?
9. What are the consequences of the SOLAS 1974-conference for National law?
10. To what ships do the SOLAS regulations apply?
11. Ships smaller than 500 GT do not fall within the SOLAS-rules. What regulations do these ships follow?
12. What does SOLAS Chapter I deal with?
13. What does SOLAS Chapter II deal with?

2.1 Purpose

14. What is the most important issue regarding fire?
15. How can fire protection be realized through (ship) construction?

2.2 Combustion Process

16. What are the basic three elements required for combustion?
17. What happens if a compound oxidises?
18. Give an example of a slow oxidation process.
19. What is fire prevention based on?
20. What is the main principle of fire fighting?
21. Give the components of the fire triangle and explain the connection between these?
22. What components are necessary to start a process of combustion?
23. What is the flashpoint?
24. How is it possible that when the flashpoint is reached, the combustion may cease after ignition?
25. What is the ignition temperature?
26. What is necessary for sustaining combustion after ignition?
27. How can combustion occur without ignition from outside?
28. What is the (self) combustion temperature?
29. Show by means of a sketch how a solid combusts and give an explanation.
30. Show by means of a sketch how a liquid combusts and give an explanation.
31. What is a catalyst?
32. Give an everyday example of a catalyst that catalyses combustion.
33. The fire triangle alone does not suffice in order to sustain a fire. Explain this statement.
34. What two factors are added to the fire triangle in order to produce the fire pentacle?
35. Give the five constituents of the fire pentacle.
36. Why is knowledge of the fire pentacle important in fire fighting?
37. What is the function of fire classes?
38. What is a fire class used for?
39. Give an overview in table form of fire classes and types of fuels.
40. What fuels are in fire classes A, B and C?
41. What metals are in fire classes D?

2.3 Fire Fighting

42. In case of fire, what should be done?
43. Name different means of fire fighting and explain the objective(s) of each.
44. Sand is an excellent fire extinguishing medium, but nowadays not on ships. Why not?
45. What has replaced the sand extinguisher on board of ships?
46. A controlled explosion can extinguish oil fires when oil blows out of a hole at great pressure. Why is this not a suitable fire-fighting method on board?

2.4.1 Portable fire extinguishers

47. What is usually the first line of defence on board in case of fire?
48. Where are dry-powder extinguishers found on board and what capacities are found there?
49. What three categories of powder are available for use in dry-powder extinguishers and for what types of fires?
50. How does a dry-powder extinguisher work?
51. For what types of fire is the dry-powder extinguisher suitable?
52. Why are CO_2-extinguishers only present in rooms with a lot of electrical equipment?
53. Why does CO_2 expand upon leaving the CO_2-fire extinguisher?
54. What types of fire can be extinguished with CO_2?
55. What are portable foam extinguishers?
56. Where are portable foam extinguishers to be found on board and why?
57. Sketch a CO_2-extinguisher, name the components and explain the function(s).
58. Sketch a portable foam extinguisher, name the components and explain the function(s).
59. What must be undertaken when a fire is too big to be dealt with by portable extinguishers?

2.4.2 Water

60. How does water put out a fire?
61. Give two disadvantages of using water as a fire extinguisher on a ship.
62. Describe a water fire-fighting system (pumps, pipelines and hydrants) on board of a ship.
63. What are the demands placed on (compulsory) fire pump(s) on a ship?
64. What is an emergency fire pump, where is it located and what demands are placed on this pump?
65. What demands are placed on the construction of the hydrants?
66. What must be placed near each hydrant?
67. Name three attachment systems for hydrants and hoses.
68. What is an international shore connection and what is its purpose?
69. For each fire pump, explain how it must be started.
70. In what way is the fire-fighting piping system built into the ship?
71. Apart from the fire hose, what else is in the red lockers?
72. Can the fire-fighting piping system also be used to clean the deck? Explain your answer.

- Drenching

73. What is meant by a drenching system and how is it used on board a RoRo vessel for example?
74. What is a deluge system?
75. What is a disadvantage of a sprinkler drenching system?

- Foam

76. What is the basic idea behind foam fire-fighting systems?
77. What three systems are used for foam fire-fighting?
78. What is the foam-forming chemical normally used in foam systems?
79. What is the mixing rate for foam-forming chemicals with water?
80. What is the advantage of using foam to fight a fire in, for example, the engine room?
81. Explain how foam closes a fire from the air and thus extinguishes the fire.
82. Explain how foam may be used in small quantities to stop an engine-room fire.

- Sprinklers

83. Sketch a sprinkler and name the components and explain the function(s).
84. Where are sprinklers to be found on board?
85. How does a sprinkler with water detection work?
86. Sketch a sprinkler system, name the components and explain the function(s).
87. What fire-extinguishing compound is found in the sprinkler foam-extinguisher?
88. What are the advantages of the sprinkler foam-extinguisher?
89. Why can the sprinkler foam-extinguisher only be used for fires of types A and B?

- Fog

90. What is the reason for the enhancement of the fire extinguishing power of water when it is used in a water-mist/fog system?
91. How is the water-mist/fog system activated?
92. What are the advantages of the water-mist system in case of a fire?

2.4.3 Fixed Gas Systems

93. What is a fixed gas fire-fighting system?
94. How does a fixed gas fire-fighting system work?
95. What fixed gas fire-fighting system is mostly used in ships and for what space(s) on board and why?
96. Sketch a CO_2 total flooding system, name the components and explain the function(s).
97. Why are the openings of the CO_2 bottles and necessary valves in pipelines protected by a number of safety measures on board?
98. What type of alarm is given when the control cabinet for the CO_2 total flooding system is opened?
99. What gas was used on board instead of CO_2 in order to combat the disadvantage(s) of using CO_2?
100. Why was Halon banned from use as a gas in a total flooding system for fire fighting?
101. On what ships the Halon replacement FM200 can be used?
102. What is the difference with Halon?
103. What is the necessary percentage of FM200 in order to be successful?
104. Mention the advantages.
105. Mention the disadvantages.

2.5 Detection

106. Why is early detection of a fire on board important for successful fire fighting?

2.5.1 Engine room

107. In what space(s) does a fire detection system have to be installed on board?
108. Where are fire detectors placed, for example, in the engine room and why in that exact location in the E.R.?
109. What type of detectors are used in a fire-fighting system?
110. How does a smoke detector work?
111. What is the alarm cabinet and where is this generally placed?
112. What does the alarm cabinet do in case of detection of fire?
113. What is meant by 'which loop is active'?
114. How does a heat detector work?
115. How does a flame detector work?
116. What is the advantage of smoke detection over heat detection?
117. How often should a (manually activated) fire detector be tested?
118. How can a (manually activated) fire detector be tested?
119. What happens if the fire detector has been activated in a certain zone?

2.5.2 Cargo Holds

120. How can fire be detected in cargo holds?
121. How does the smoke indicating system of the CO2-installation work?
122. Give a schematic representation of a fire-alarm system and a fire-fighting system, name the components and explain the function(s).

2.7 Fire Fighting

123. How many firemen's outfits complete with breathing apparatus are required by law on board of a cargo ship, not being a tanker?
124. What components make up a fireman's outfit on board?

125. What is a BA set?
126. What further action can be taken against an engine-room fire?
127. What is a quick closing valve, what do they close, where are they to be found on board and how do they work?
128. Who activates a quick closing valve, when, where and why?
129. What is a fire-control station, where is this to be found on board and what does it contain?
130. What is a fire control plan and where may this be found on board?

2.9 Fire Alarm

131. What types of fire alarms are there on a ship and why are these different types used on board?
132. Give a schematic representation of a fire-alarm system and a fire-fighting system, name the components and explain the function(s).

2.10 Muster list

133. What is a muster list and what its function?

3.1 Regulations

134. In what IMO-Issue are the regulations for life saving appliances laid down?
135. Which Committee is involved?

3.2 Lifeboats

136. What are the rules regarding capacity and position of lifeboats on board of a ship?
137. What are the rules regarding capacity and position of free-fall lifeboats on board of a ship?
138. What is a man-over-board boat and where is it positioned?
139. What are the contents of the inventory of a lifeboat?
140. How often should the inventory of a lifeboat be checked?
141. Since a number of years, lifeboats have to be totally closed, why is this so?
142. What additional demands are made on lifeboats of oil, gas or chemical tankers?
143. Under what extreme conditions of list and trim must a lifeboat be able to be launched?
144. What is the stability demand on a lifeboat?
145. Why should the fuel of a lifeboat-engine never run on gasoline?
146. What measures are taken to ensure that a lifeboat-engine can operate under any circumstances?
147. What information should be on the outside skin of the lifeboat?
148. What is typical of lifeboats and davits regarding energy required to launch them?
149. In case the ship sinks suddenly, how is the lifeboat launched/detached from the ship?
150. Why are davits working on gravity?
151. Why is the free-fall lifeboat always placed at the aft of the ship?
152. Sketch a free-fall lifeboat and show the position of the crew on board.
153. What does the mate have to do prior to the launching of a free-fall lifeboat?
154. How can a free-fall lifeboat be lifted back on board? Sketch this retrieval system and show how it works.
155. Under what circumstances does a free-fall boat undergo a controlled launch?
156. What happens to the free-fall lifeboat if the ship keels over?
157. Why are stored-power davits often present on passenger liners?
158. What are stored-power davits and how do they work? Sketch such a system and show how it works.
159. What is the advantage of placing the free-fall boat on the aft of the ship?
160. What is the most common way of bringing the lifeboat back on board?

3.3 Man-over-board boat/Rescue boat

161. When does a ship have to have an MOB boat?
162. Give an example of a ship's lifeboat configuration and state where the MOB is.
163. How is an MOB generally launched and retrieved? Sketch such a system and show how it works.
164. What is the compulsory inventory of an MOB?
165. For what tasks is the MOB-boat suitable?
166. What conditions are MOB-boats required to satisfy?
167. What auxiliary is used to launch an MOB-boat?

3.4 Life rafts

168. What are the rules regarding capacity and position of life rafts on board of a ship?
169. How are life rafts to be launched?
170. In case the ship sinks suddenly, how is the life raft launched/detached from the ship?
171. What are the demands for large ships regarding capacity and position of life rafts?
172. What is the demand regarding one life raft on board when the vessel is equipped with a free-fall lifeboat?
173. Sketch a life raft in stowed position and in inflated condition.
174. How is a life raft inflated?
175. How is a life raft secured to the ship in stowed condition?
176. What is a hydrostatic release system?
Sketch such a system and name the components and explain the function(s).

3.5 Life Jackets

177. What are the rules regarding capacity and position of life jackets on board of a ship?
178. What are the demands placed on life jackets regarding buoyancy, material, ability to preserve life in the water?
179. What components should a life jacket be provided with and why?
180. Sketch a life jacket with necessary equipment. Name the components and explain the function(s).

3.6 Life Buoys

181. What are the rules regarding capacity and position of life buoys on board of a ship?
182. What are the demands placed on life buoys regarding buoyancy, material, ability to preserve life in the water?
183. What components should a life buoys be provided with and why?
184. Sketch a life buoy with necessary equipment. Name the components and explain the function(s).

3.7 Immersion suits (Survival Suits)

185. What are the rules regarding capacity and position of survival suits on board of a ship?
186. What are the demands placed on survival suits regarding preservation of life in the water or in a lifeboat?
187. What components should a survival suit be provided with and why?
188. What is a TPA and what is its function?
189. What is demand placed on the insulating quality of immersion suits?
190. Sketch a survival suit with necessary equipment. Name the components and explain the function(s).

4.1 Training

191. What are the demands for obtaining a certificate of competence?
192. How can one obtain a certificate of competence?
193. Reproduce the training matrix in accordance with 1995 STCW treaty.
194. What are the additional courses that the crew of a passenger liner has to follow?

4.2 Tests and drills

195. Why are regular safety-drills on a ship a necessity?
196. What should happen after the drill?
197. Why are drills on board with life rafts difficult to realize?
198. Where are drills with life rafts usually carried out and why?
199. Reproduce a table with test and drill exercises and the frequency of these exercises on board.
200. What is a boat drill?
201. What is a fire drill?

4.3 Personal safety gear

202. What safety measures should be taken during normal daily work and why?
203. Name a number of personal safety items for normal work.
204. What is the purpose of wearing protective clothing?
205. What does 'a false sense of security' mean in relation to protective clothing?
206. When are dust and filter masks used?
207. Under what conditions can a ship have only one type of dust or filter mask on board?
208. When can dust or filter masks NOT be used?
209. In what three situations is a respirator necessary?
210. Why is foot protection necessary?
211. Of what material is a lifebelt made?
212. What demands are there for lifebelts?
213. To attract attention, what is attached to the lifebelt?
214. What demands are made on the thermal insulation of a survival suit?

4.4 Tankers

215. What special safety measures are found on board tankers and why?

5 Markings

216. What is the purpose of the markings in and on a ship?
217. What colour should the escape route markings have according to IMO?
218. Why do the pipes have a colour-code?

6.1 GMDSS

219. What does GMDSS stand for?
220. What is in GMDSS?
221. What book has all the information regarding GMDSS?

6.2 SART (Search and Rescue Transponder)

222. What does SART stand for?
223. What is the aim of SART?
224. Who is responsible for bringing the SART from the bridge to the life raft or lifeboat?
225. On what list can a crew member see who is responsible for the SART transport on board?
226. What is the range of the SART?
227. Where is the SART positioned on board the ship?

6.3 EPIRB (Emergency Position Indicating Radio Beacon)

228. What does EPIRB stand for?
229. What is the goal of EPIRB?
230. Where is the EPIRB stored on board and why?
231. How is the EPIRB activated?
232. What happens between the activation of EPIRB and determining its position?
233. How can the position of the EPIRB be determined and by whom?
234. Sketch an EPIRB in stored position on board.

6.4 Voyage Data Recorder

235. What is the function of the Voyage Data Recorder
236. What values and data does it store?

7 Pyrotechnics

237. Name a number of visual means of communication in case of distress signals.
238. How does the parachute rocket signal work and when should it be used?
239. What demands are placed on parachute signals on board?
240. When should the hand torch flares be used?
241. What demands are placed on hand torch flares on board?
242. In what circumstances should the smoke signal be used?
243. What is a line throwing apparatus and what is it used for?
244. Where is a line throwing apparatus to be found on board and how many?

16

1 Introduction

1. Why does a ship float in spite of being constructed from heavy materials like steel?
2. What is a prerequisite for the fact that a ship floats in spite of being constructed from heavy materials like steel?
3. What is Archimedes' Law?
4. What is reserve buoyancy and where may this be found?
5. What demand must be met by a space in order to contribute to the reserve buoyancy of the ship?
6. Why is it very important that a ship has reserve buoyancy?

2 Intact stability

7. What is meant by the stability of a ship?
8. Name two different types of stability of a ship?
9. What is meant by initial (transverse) stability?
10. Till what list angle is spoken of initial stability?
11. What is the buoyancy wedge? Make a sketch showing this wedge in the case of a ship with a list.
12. What is the centre of buoyancy (KB) of a ship?
13. What happens to the centre of buoyancy (KB) of a ship when she gets a list angle (say 5 °)?
    Explain your answer with the aid of the buoyancy wedge.
14. What is the Metacentre (M)?
15. How is the Metacentre Point (M) determined? Explain your answer with the aid of a sketch of a ship with a list.
16. For each angle of list there is a Metacentre Point. Explain this with the aid of a number of sketches of a ship with different list angles.
17. What is the name of a Metacentre Point for a large angle?
18. Show the forces working on a vessel with a list angle. Name these forces and explain what causes them. How do these forces work together to form a turning moment acting on the ship?
19. What is the centre of gravity (G_0) of a ship? Show this (in a sketch) in relation to centre of buoyancy (B_0), the keel (K) and the metacentre point (M).
20. What happens if G_0 is below M in terms of ship's stability? Explain your answer with an appropriate sketch.
21. What happens if G_0 is above M in terms of ship's stability? Explain your answer with an appropriate sketch.
22. What happens if G_0 and M coincide in terms of ship's stability? Explain your answer with an appropriate sketch.
23. Give the formula for MG and explain the components therein.
24. Give the formula for MB and explain the components therein.
25. What is It and what are the dimensions thereof?
26. What is 'Vol' and what are the dimensions thereof?
27. What is the static lever of initial stability? Explain your answer with an appropriate sketch.
28. What is the curve of static (stability) levers? Explain your answer with an appropriate sketch.
29. Explain (showing formulae and sketches) what happens to GZ when a vessel starts to achieve a list due to the exertion of an external force on the system?
30. Higher ships (both having the same initial GM value) have higher stability. Explain this with the aid of formulae, GZ graphs and sketches.
31. Why does a vessel with an initial negative stability value not necessarily have to capsize? Explain your answer with the aid of formulae, sketches showing forces and moments, etc.
32. What is a normal GM value for a passenger ship and why is this value so low?
33. Why have bulk carriers loaded with ore a very high GM?
34. Why is GM for tankers quite high before correction has taken place for free surface effects?
35. What happens to the stability of a wide ship if her deck becomes immersed in water (due to large rolling angles or low freeboard etc.)?
36. Why is it very important to check the stability of the ship for all the possible cargo and ballast conditions (i.e. loading scenarios) that the ship might meet during her lifetime?
37. What is a normal GM value for a passenger ship and why is this value so low?

Positive influences on stability

38. Whichctors have a positive influence on stability?
    Explain your answer with the aid of formulae and a number of sketches.
39. Which actions are usually undertaken when a ship has a lack of stability? Explain how the stability is hereby affected in your answer with the aid of formulae and a number of sketches.

Negative influences on stability

40. Which factors have a negative influence on stability? Explain your answer with the aid of formulae and a number of sketches.
41. What can happen to a vessel (fitted out with masts and booms etc.) sailing in ice condition regarding transverse stability?
42. How can a relatively thin layer of seawater on the deck of a RoRo vessel have strong negative influence on the stability? Explain how the stability is hereby affected in your answer with the aid of formulae and a number of sketches.
43. What is the cause of the free surface effect?
    Explain your answer with the aid of formulae and sketches.
44. What is free surface effect and how does this affect the stability of a ship? Explain how the stability is hereby affected in your answer with the aid of formulae and a number of sketches.
45. How can the effect of free surface on stability be reduced in the design stage of a ship? Explain your answer.

3 Stability of damaged ships

46. Besides for strength purposes, longitudinal and transverse bulkheads give extra protection to the ship in damaged (leaking) condition. Explain this statement.
47. Why is the assumption mostly incorrect that a vessel when leaking will sink slowly upright and not take on any trim or list. Explain you answer with the aid of sketches etc. showing forces, moments etc.
48. What is meant by permeability?
49. What is meant by free surface effect and what can the effect thereof be in stability terms for the ship?
50. How can one reduce the free surface effect during the design stage of a ship?
51. What may be the result of the flooding of one or more compartments in a ship?
52. Which influences the choice of (not) placing bulkheads in a ship to reduce free surface moment effects? Gives some examples in this respect of ship types in your answer.

4 Rules and regulations

53. Why is the size of a damaged (leaking) compartment subject to SOLAS and IMO regulations?
54. Which three types of damage stability calculations are included within the regulations of SOLAS and IMO?

4.1 Calculations of submersion and trim

55. What is the purpose of the 'calculations of submersion and trim check'?
56. What assumption is made in the calculation of submersion and trim check?
57. Why were calculations of submersion and trim check found to be inadequate for the given purpose after the Second World War?
58. What is the maximum immersion line? Support your answer with a sketch.
59. What is meant by 'floodable length'?
60. What is a bulkhead graph and what is its function? Support your answer with a sketch.
61. What is a one-compartment damage?
62. What is a two-compartment damage?
63. What is the connection between a two-compartment damage scenario and the graph of floodable length? Support your answer with an appropriate sketch showing floodable length curve etc.

4.2 Damage stability

64. What is a drawback of the calculation of submersion and trim check method?
65. How does the calculation of floodable length method take this drawback into account?
66. What is the deterministic damage stability calculation?
67. What is a drawback of the deterministic damage stability calculation?

4.3 Probabilistic damage stability

68. What does the probabilistic damage calculation method try to capture?
69. A probability is assigned to every type of damage? Explain this statement.
70. What is done with the sum of all the damage probabilities calculated and what can be derived from this value regarding vessel survival in case of leakage?
71. The probabilistic damage calculation currently applies to what ship types?
72. What uncertain (but very important) parameters are there regarding estimation of the centre of gravity in damaged condition?

5 How to take damage stability into account on board

73. Why must the intact stability be calculated for each voyage that a ship makes in her life?
74. Which factors are important when calculating the damage stability?
75. It is advised to carry out probabilistic damage stability calculations as well, why?
76. Why is it impossible to carry out these stability calculations without the aid of a computer?
77. Why is a computer with a loading programme required on board and what does this calculate?
78. What is counter flooding and when (and on what ship types) may this be utilised?
79. What is the maximum KG?
80. Which factors determine the maximum KG value?