MCA Yacht 3/2 – Chief Engineer Statutory and Operational Requirements – Examination January 2007.

1. With reference to MARPOL 73/78 Annex VI that legislates for the prevention of air pollution:-
   a) list FIVE types of pollutant that are listed in this Annex; (5)
   b) list THREE examples of pollutant that are thought to affect the ozone layer; (3)
   c) state the maximum worldwide percentage sulphur content that is now allowable in bunker fuels. (2)

   a) i) Ozone depleting substances;
      ii) Nitrogen Oxides;
      iii) Sulphur Oxides;
      iv) Volatile Organic Compounds;
      v) Shipboard Incineration.

   b) i) Refrigerant 12 – CFC 12 - dichlorodifluoromethane;
      ii) Halon 1211 - bromochlorodifluoromethane;
      iii) Carbon Tetrachloride – used as a cleaning chemical for electrical contacts.

   c) 4.5%

2. With reference to the safe storage and handling of materials on Board ship:-

a) list FIVE categories of safety information that can be obtained from a **Material Safety Data Sheet**; (5)

b) state the recommended colour coding for EACH of the following types of gas cylinder:-

i) Oxygen; (1)
ii) Propane; (1)
iii) Acetylene; (1)
iv) Nitrogen; (1)
v) Compressed Air. (1)

a) Five categories of safety information that can be obtained from a Material Safety Data Sheet are:-
i) summary of hazards;
ii) hazardous ingredients;
iii) fire and explosion hazard data;
iv) health hazard information;
v) emergency first aid.

b) The recommended colour codes for each of the following types of gas cylinder are:-
i) Oxygen – black;
ii) Propane – signal red;
iii) Acetylene – maroon;
iv) Nitrogen – french grey;
v) Compressed Air – french grey

3. With reference to the classification of a vessel:-

a) i) state what is meant by the term **special hull survey**; (3)

ii) state the time intervals over which the special hull surveys take place; (2)

b) describe how the **continuous survey of machinery** may be applied. (5)

a) i) special hull survey is the term given to an inspection of all the vessel's compartments, internal structure, masts and rigging, anchors and cables, etc.

ii) all the special hull surveys have to be completed within a period of five years. These days it is common place to operate a continuous survey of the hull whereby 20% of the items are surveyed by a Classification Surveyor each year.

b) a continuous survey of machinery is carried out as part of a five year program, where 20% of the machinery items are opened up, inspected and re-assembled each year with no single item having more than 60 months between surveys. Certain items are required to be surveyed more frequently, for example steam generating boilers have a 30 month interval.

4. With reference to a vessel having no previous record of machinery maintenance:-
a) list FOUR sources of guidance that could be used in establishing a new maintenance routine; (4)
b) list SIX reasons for keeping records of all maintenance carried out on board. (6)

a) Four sources of guidance that could be used in establishing a new maintenance routine are:-
i) Manufacturers manual displaying service intervals;
ii) Using experience gained on previous vessels;
iii) Owners standard policies;
iv) Running parameter monitoring.

b) Six reasons for keeping records of all maintenance carried out on board are:-
i) to build up a service history of the equipment and highlight any problems that may re-occur;
ii) to assess results and assist forward planning;
iii) improved budgetary control – realistic budgets can be formulated and controlled;
iv) improved stock control of spares – realistic quantities of spares are stocked and re-ordered;
v) provision of information upon which management can make realistic forecasts and decisions;
vi) to assist in the classification society approval so that the continuous survey of machinery can be met without physical inspection of items at the time of survey.

5. With reference to the periodical dry-docking of a vessel:-
a) state FIVE items of information that may be obtained from a **docking plan**; (5)
b) state FIVE preparations/precautions that should be undertaken before docking. (5)

a) Five items of information that may be obtained from a docking plan are:-
i) location of appendages (bilge keel, stabilizers, underwater exhausts, etc.);
ii) location of sea chests;
iii) location of tank drain plugs;
iv) location of depth sounder;
v) location of thrusters.

b) Five preparations/precautions that should be undertaken before docking are:-
i) a detailed work list including docking survey requirements;
ii) plan of tanks that require cleaning and are due to be surveyed;
iii) gas free certificates to be obtained for any empty fuel tanks that are to be worked on in drydock;
iv) all tanks and bilges to be sounded and recorded;
v) any transferring between tanks to be carried out.

6. a) Describe the role of the International Maritime Organisation (IMO). (5)
b) Describe how an IMO draft convention can be brought into force as international law. (5)

a) The role of IMO is to facilitate inter-governmental co-operation on state regulation and practices relating to maritime technical matters. Also, to encourage and facilitate the adoption and highest practicable standards of maritime safety, efficiency of navigation, control of marine pollution from ships and keeping them up to date in line with advances in technology.

b) Any member may put forward a proposal for an international treaty and this is referred by the Assembly or the Council to the appropriate committee. The committee, using its machinery for meetings, working groups and consultations with expert organizations, prepares a draft convention that is submitted to a conference of all UN member states and relevant UN agencies. When the conference adopts a convention, governments are invited to ratify it within a specified time. Ratification imposes an obligation on a nation to be bound by the convention and to take national legislative action accordingly. When a specified number of countries have ratified the instrument, and in some cases if this represents a certain percentage of world tonnage, it enters into force from a date which allows sufficient time for measures to be taken to give it effect.

7. a) List FOUR factors that would need to be taken into consideration when calculating the required amount of fuel for an extended voyage. (4)

b) A motor yacht requires a power output of 3000 kW to achieve a speed of 20 knots. The quoted specific fuel consumption, at this power output, is 0.35 kg/kWh.
Calculate to TWO decimal places, the safe amount of fuel required for a voyage of 2500 nautical miles at 20knots. (6)

a) Four factors that would need to be taken into consideration when calculating the required amount of fuel for an extended voyage are:-

i) length of voyage;
ii) speed to be maintained during the voyage;
iii) availability of space for bunkers;
iv) safe minimum reserve required for the voyage over and above the voyage consumption quantity.

b) Amount of fuel consumed by yacht at 20 knots = 0.35 x 3000 kg/h
= 1050 kg/h.
2500 nm at 20 knots would take a total time of 2500 / 20
= 125 hrs.
Total amount of fuel consumed in 125 hrs steaming = 1050 x 125
= 131,250 kgs = 131.25 tonnes.
Factoring in an excess safety amount of 15% gives a fuel requirement of 131.25 x 1.15 = 150.94 tonnes

8. a) State the FOUR international recognized classes of fire. (4)
b) List THREE different types of fire fighting media, stating for which classes of fire EACH could be used. (6)

a) The four international recognized classes of fire are:-

i) class A – carbonaceous fires;
ii) class B – liquid fires;
iii) class C – gas fires;
iv) class D – metal fires.

b) Three different types of fire fighting media with corresponding classes of fire usage are:-

i) water – class A;
ii) foam – classes A and B;
iii) CO2 – classes B and C.

9. With reference to a vessel's damage stability:-

a) define EACH of the following terms:-

i) bilged; (2)

ii) bulkhead deck; (2)

iii) foundering. (2)

b) list FOUR reasons why it is important to isolate the flooded volume of a vessel. (4)

a) i) bilged – state of a ship when she runs aground and takes in water through her damaged hull;

ii) bulkhead deck – this is the watertight continuous deck to which the upper edges of all watertight bulkheads are attached. It is also known as the freeboard deck, and may coincide with the main deck;

iii) foundering – this is the bodily sinking of a vessel.

b) Four reasons why it is important to isolate the flooded volume of a vessel are;-

i) to minimize the reduction in stability;

ii) to minimize the possibility of capsizing and/or foundering;

iii) to minimize the loss of buoyancy;

iv) to minimize the angle of heel, so that life saving appliances can be launched satisfactorily.

10. With reference to the International Convention for the Safety of Life at Sea (SOLAS'74):-
a) list FOUR procedures that must be applied at each fire drill; (4)
b) list SIX procedures that must be applied at each abandon ship drill. (6)

a) Four procedures that must be applied at each fire drill are:-
   i) emergency fire pump and machinery space fire pumps to be prepared for operation, started and checked that full water pressure is on the fire main;
   ii) closing of all openings to be carried out (wherever practicable), such as ventilation fan flaps, fire doors, cabin doors, funnel doors (if fitted), to simulate the reduction of air supply to the fire;
   iii) two or three fire hoses and nozzles to be connected up to the fire main and charged on a selective basis, so that the vessel's total complement of hoses and nozzles is tested on, say, a monthly or three monthly basis, depending upon the size of the vessel;
   iv) at least one fire extinguisher (of a different type each time) should be discharged by a different crew member each time in order that all crew members become familiar in the use of each type of fire extinguisher.

b) Six procedures that must be applied at each abandon ship drill are:-
   i) reporting to stations and preparing for the duties described in the muster list;
   ii) checking that any passengers and all crew members are suitable dressed;
   iii) checking that lifejackets are correctly worn;
   iv) operation of davits used for launching liferafts;
   v) instruction in the use and checking the operation of communication equipment, namely handheld walkie talkies and VHF emergency radio equipment;
   vi) instructing all personnel in abandoning and evacuation procedures especially with regard to entering an inflated liferaft.