

**MERCHANT MARINE ACADEMY OF MACEDONIA
SCHOOL OF ENGINEERS**

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FINAL EXAM

A. Provide the right derivative of the word in the parentheses. (15 p.)

- The _____ (**condense**) cools down the _____ (**refrigerate**) in the system.
- The valve to starting air _____ (**distribute**) is closed.
- _____ (**abrade**) wear is sometimes caused by _____ (**catalyst**) fines.
- Cold corrosion is an _____ (**normal**) type of corrosion.
- The systematic variation in _____ (**alkaline**) may cause uneven _____ (**corrode**) wear on the cylinder liner.
- Sulphuric acid is formed due to _____ (**absorb**) of condensate or _____ (**moist**) present in the combustion chamber.
- In reefer ships, the temperature of the _____ (**perish**) cargo is controlled by the refrigeration plant.
- To prevent cold corrosion, one _____ (**solve**) is to insulate the outside of the liner so that there is a _____ (**reduce**) in the cooling effect.
- _____ (**friction**) wear takes place between the cylinder liner and piston rings.
- _____ (**align**) may cause cylinder oil film deficiencies.

B. Put an appropriate word from the list in the gaps that follow. There are two extra words. (15 p.)

quills pressures finish ingress alloy particles layers clover dew point

scavenge welding comply scuffing temperatures pour point water abrasion

- Cylinder liners are fabricated from a cast iron _____.
- _____ leafing, which is a form of cylinder liner wear, takes place between each pair of lubricating _____.
- On the latest engines, the liner is only cooled by _____ at the very top, relying on the air in the _____ space to cool the lower part of the liner.
- _____ of water inside the liner should be avoided.
- To _____ with the Tier II NOx regulations, engine cylinders must operate under increased _____ and reduced operating _____.
- Temperatures below the _____ allow steam to condense.
- _____ is due to insufficient lubrication, which results in localised _____ between points on the piston rings and the liner surface with subsequent tearing of microscopic _____.
- Noise can be reduced by using dense membranes in composite _____.
- Scuffing causes polishing of the surface, which gives liners a mirror _____.

C. IMO SMCP: Handling liquid goods, bunkers and ballast pollution prevention.

Fill in the missing words in the following questions. (10 p.)

*connect operational maximum washing stripping
disconnected inerted receiving available pressure*

- What is the backpressure for _____?
- Is the Oil Pollution Prevention Plan _____?
- What is the _____ loading rate?
- Are your tanks _____?
- What is the pumping _____?
- Can we _____ the loading arm?
- Is the inert gas system _____?
- When will crude oil _____ start?
- Are the cargo hoses _____?
- Are you _____?

D. Choose the correct answer. (15 p.)

- Diesel engine lube oil diluted with diesel fuel oil is indicated by ___
a. decreased viscosity b. decreased pour point c. increased flash point
d. increased viscosity

- If the analysis of used lube oil indicates a high content of iron particles, this could indicate ___
a. excessive ring and liner wear b. excessive cooling of lubricating oil
c. corrosive deterioration of a bearing d. inadequate air filtration

- “Loop”, “uniflow”, “cross flow” are terms used to describe various types of ___
a. scavenging b. turbochargers c. control air circuits d. supercharging

- The possibility of damage from operating a diesel engine at critical speeds is reduced by the use of ___
a. a vibration damper b. an isochronous governor c. elastic engine mounts
d. a cast iron bedplate with good flexible qualities

- What occurs in the combustion space of a diesel engine cylinder shortly after ignition and before the piston reaches TDC?
a. rapid increase in pressure and temperature
b. rapid increase in volume and decrease in pressure
c. rapid increase in temperature with constant pressure
d. rapid increase in pressure with constant temperature

- Which of the following operations will have a direct impact on the rate of wear in a cylinder liner?
a. temperature of the scavenging air b. compression ratio of the piston
c. quality of fuel injected d. amount of scavenge air in the cylinder

- Whether using a centrifuge or a simple filter, oil cleaning and filtration will be the most effective when the oil is at a ___
a. low temperature and a high viscosity b. low temperature and a low viscosity
c. high temperature and a high viscosity d. high temperature and a low viscosity

- In a diesel engine, the function of lubricating oil is to ___

- a. provide a film between the shafts and bearings
- b. cool the pistons and bearings
- c. remove metal or dirt particles resulting from wear
- d. all of the above

-- A diesel engine is supercharged in order to ____

- a. increase the no-load rpm's
- b. provide more fuel for combining with the air
- c. lower the no-load rpm's
- d. provide more air for combining with the fuel

-- Combustion knock will most likely occur as a result of using a fuel with ____

- a. low ignition quality
- b. high volatility
- c. low ignition delay
- d. a high cetane number

-- A diesel engine which is rated for normal operation at a crankshaft speed of 800 rpm is commonly classed as ____

- a. slow-speed
- b. medium-speed
- c. high-speed
- d. constant-speed

-- A centrifuge will satisfactorily remove ____ from fuel oil.

- a. gasoline
- b. water
- c. lube oil
- d. sulphur compounds

-- A scored diesel engine cylinder liner will cause ____

- a. rapid wear of piston rings
- b. combustion gases in the cooling water
- c. high firing pressure
- d. abnormally high cooling water temperature

-- Burning fuel with a high sulphur content in a diesel engine will ____

- a. cause clogging of the fuel system
- b. increase thermal efficiency
- c. increase the ability of the engine to start in cold weather
- d. produce corrosion in the cylinder and exhaust systems at low loads

-- Combustion knock can occur in the cylinders of a diesel engine under any condition permitting ____

- a. a shortened ignition delay period
- b. a lean fuel/air mixture
- c. excess fuel in the combustion chamber
- d. rapid vaporisation of injected fuel droplets

E. Match the words from the list to their synonyms/definitions below. There is one extra word. (10 p.)

*sluggishness alloy dilute faltering implement stalling
deformation neutralise cladding fouled vital*

- apply, put into force.....
- dirty.....
- slow motion, idleness.....
- make ineffective, with no result.....
- make a liquid thinner by adding water or other solvent.....
- a covering of hard material, used as protection.....
- extremely important.....
- change of shape.....
- irregular running of the engine.....
- metal consisting of two or more different metals mixed together.....

F. Complete the following sentences with an appropriate word. (15 p.)

-- In order to fight cold corrosion, you must identify the best lube oil and **f**_____ rate.

- Onboard cylinder oil analysis tests the following two key parameters: **i** _____ content and **B** _____ Number.
- Generally, while taking the measurements, the temperature of the liner and **m** _____ should be the same.
- When coal is burnt, sulphuric acid is produced due to the **o** _____ of sulphur.
- Different **s** _____ valves control the flow of the refrigerant into the hold.
- The **d** _____ removes any moisture from the refrigerant.
- The **b** _____ of a diesel engine cylinder describes the inside diameter of the cylinder.
- Wear **r** _____ is a measurement of the speed at which wear happens.
- The evaporator unit acts as a heat **e** _____ by transferring heat to the refrigerant.

G. Complete the sentences with an appropriate preposition. There are 2 extra prepositions. You can choose from the following: (10 p.)

in, at, on, to, out, with, before, between, by, below, up

- When the engine runs unevenly and will not pick _____ rpm, we have a serious problem.
- Spill waste has been contained _____ save-alls.
- You have to keep contact _____ the oil terminal _____ VHF Ch.14.
- The liner should be gauged _____ regular intervals.
- The liner has to be cleaned and inspected _____ gauging.
- Pump _____ ballast tank No 2.
- If lube oil is diluted _____ fuel oil, we have a decrease in its flash point.
- HFO has to be heated prior _____ centrifuging.
- Excessive liner wear will cause increased blow-_____.

H. Read the following article and answer the questions that follow. (10 p.)

ExxonMobil has issued fuel-switching tips for vessels entering and leaving ECAs

ExxonMobil has compiled five ‘top tips’ to help vessel operators switch fuels effectively when entering and leaving emission control areas (ECAs) without introducing maintenance problems.

Typically, inadequate management of the fuel switch-over process can increase the risk of thermal shock to engine components, which can result in fuel pump seizures and engine shut-downs.

ExxonMobil advises marine operators to consider the following key tips:

- Have a clear switch-over procedure. It is important to ensure that the crew is familiar with the process. As an additional safety measure, the procedure should be tested prior to entering crowded and restricted channels where there is a higher risk of grounding or collision.
- Outline the best time to switch over. The optimal switch-over period is different for each vessel and operators must allow sufficient time for the fuel system to be flushed of all non-compliant fuel before arriving at an ECA limit.
- Avoid hazards; know the correct temperature and viscosity. The viscosity of heavy fuel oil (HFO), ECA fuels and marine gas oil (MGO) are very different. The appropriate

temperature must be achieved to ensure that the optimum viscosity at the injectors is reached. HFO is injected at ~130°C and MGO needs to be cooled to ~30°C in order to reach the correct viscosity. Major engine manufacturers typically recommend a maximum temperature change of 2°C per minute to help avoid thermal shock.

- Understand compatibility. There is a risk of fuel incompatibility during the switching process where fuels may mix. This may clog filters, causing engine starvation and possible shut-down. In order to understand if fuels are compatible, an industry-standard spot test can be carried out on board or a more thorough compatibility test can be requested from a reputable testing laboratory.
- Choose the correct lubricant. Cylinder oils need to be sufficiently alkaline to neutralise any corrosive acidic sulphur in the fuel. However, when less sulphur is present, less sulphuric acid is produced. Too much alkalinity in the cylinder oil can lead to liner wear, while too little increases the risk of acid corrosion. When burning low sulphur fuels in slow speed engines, it is recommended that a lower base number (BN) lubricant be used.

(Retrieved: 23 June, 2016 from www.mpropulsion.com)

1. What problems can arise if the fuel switch-over process is not carried out adequately?
2. Why should the crew know the correct temperature and viscosity of the different fuels?
3. What problems can be caused due to fuel incompatibility?
4. How can one check if fuels are compatible?
5. Why is it of paramount importance to choose the correct lubricant?

GOOD LUCK!!!