

## Operate propulsion questions

### SECTION 1 - Mechanical

From the list below, identify the fourth internal combustion engine operation.

'Combustion', 'Exhaust', 'Induction' and:

- 'Suction'
- 'Expansion'
- 'Compression'
- 'Suppression'

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'Induction', 'Compression', 'Combustion', and:

- 'Suction'
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- 'Suppression'
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'Exhaust', 'Induction', 'Compression', and:

- 'Combustion'
- 'Expansion'
- 'Suction'
- 'Suppression'

In a diesel engine, the fuel/ air mixture is ignited at the correct instant by:

- An electrical spark from a spark plug
- The heat of compression in the cylinder
- An electronic ignition system
- The glow plug

In a petrol engine, the fuel/ air mixture is ignited at the correct time by:

- Electric pre-heaters
- The heat of compression in the cylinder
- An electrical spark from a spark plug
- A glow plug

Select the correct statement from the list below:

- “In a four-stroke engine, the camshaft spins at four times the crankshaft speed!”
- “In a four-stroke engine, the camshaft spins at twice the crankshaft speed!”
- “In a four-stroke engine, the camshaft spins at the crankshaft speed!”
- “In a four-stroke engine, the camshaft spins at half the crankshaft speed!”

“In a four-stroke engine, if the camshaft timing gear has 40 teeth on it, how many teeth will the crankshaft timing gear have?” Select the correct answer from the list below:

- 20 teeth
- 25 teeth
- 30 teeth
- 40 teeth

“In a two-stroke engine, if the camshaft timing gear has 40 teeth on it, how many teeth will the crankshaft timing gear have?” Select the correct answer from the list below:

- 20 teeth
- 25 teeth
- 30 teeth
- 40 teeth

“In a four-stroke engine, how many turns will the crankshaft have to do to open the exhaust valve once?” Select the correct answer from the list below:

- one turn
- two turns
- three turns
- four turns

“In a two-stroke engine, , how many turns will the crankshaft have to do to open the exhaust valve once?” Select the correct answer from the list below:

- one turn
- two turns
- three turns
- four turns

“In a four-stroke engine, if the engine has just started the Exhaust stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has just started the Combustion stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has started the Compression stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has just started the Induction stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has started the Induction stroke, the piston will be?”

Select the correct answer from the list below:

- Rising in the cylinder
- Uncovering the transfer port in the cylinder wall
- Falling in the cylinder
- At bottom dead centre (BDC)

“In a four-stroke engine, if the engine has started the Exhaust stroke, the piston will be?”

Select the correct answer from the list below:

- Rising in the cylinder
- Uncovering the exhaust port in the cylinder wall
- Falling in the cylinder
- At top dead centre (TDC)

In a diesel engine, how is the moment of ignition timed with respect to the position of the crankshaft? Select the best answer from the list below:

- The valves both close to lock the fuel/air mix in the cylinder
- Compression finally develops enough heat to ignite the fuel/air mixture
- The ‘breaker points’ are opened by a cam driven by the camshaft
- The injector pump timed by the camshaft, injects fuel into the cylinder

In an outboard petrol engine, how is the moment of ignition timed with respect to the position of the crankshaft? Select the best answer from the list below:

- The ‘breaker points’ are closed by a cam driven by the crankshaft
- Compression finally generates enough heat to ignite the fuel/air mixture

- The 'breaker points' are opened by a cam driven by the crankshaft
- The injector pump is driven by the camshaft

In a four-stroke diesel engine, when is fuel is introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the open transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a two-stroke diesel engine, when is fuel is introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the open transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a two-stroke petrol engine, when is fuel is introduced into the *cylinder*? Select the best answer from the list below.

- The fuel/air mix is delivered through the transfer port opened by the piston
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a four-stroke petrol engine, when is fuel is introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the opened transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

What keeps the engine turning between power strokes? Select the correct answer from the list below.

- The pressure of combustion
- The pressure of compression
- The mass of the flywheel and engine components
- The turning action of the propeller

“In a four-stroke diesel engine, induction of fresh air into the cylinder is through.....!”  
(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened by the descending piston
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall opened by the descending piston

“In a two-stroke diesel engine, induction of fresh air into the cylinder is through.....!”

(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened by the descending piston
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall which are opened by the descending piston

“In a two-stroke petrol engine, induction of fuel/air into the cylinder is through.....!”

(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened at bdc
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall opened by the descending piston

How is the opening and closing of the valves timed with respect to the position and movement of the piston?

- By ignition timing marks which set the position of the valves
- By cams on the camshaft which are driven by gears from the crankshaft
- By connecting rods on the crankshaft
- They are timed by the injector pump

Complete the statement, “A four-stroke engine cycle takes (a)...*two*... complete turn/s of the crankshaft, while a cycle for a two-stroke engine takes (b)..*one*... complete turn/s of the crankshaft.”

Identify the condition of the valves/ports and the position of the piston during *Induction* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve open
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Compression* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve closed
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve open
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Exhaust* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve open
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Induction* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Compression* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Exhaust* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the ports and the position of the piston during *Induction into the crankcase* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston rising—intake port open—exhaust and transfer ports closed

Identify the condition of the ports and the position of the piston during *Compression* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston rising—intake and transfer ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston around bdc—inlet ports open—exhaust port open

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a petrol two-stroke:

- Piston around tdc and descending—transfer port closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston around bdc—inlet ports open—exhaust port open

Identify the condition of the valves/ports and the position of the piston during *Exhaust and Induction into the cylinder* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston descending—intake port closed—exhaust and transfer ports open
- Piston around bdc—inlet ports open—exhaust port open

Select True or False. “The cylinder of a two-stroke petrol engine is charged with fuel/air mix in two stages. When the piston rises in the cylinder the intake port is opened and fuel/air is drawn into the crankcase. When the piston descends, the fuel air is compressed in the crankcase, and when the exhaust and transfer ports are opened by the piston, the charge of fuel air is transferred into the cylinder ready for compression

- TRUE
- FALSE

After running at high speed, a diesel engine with a turbo-charger should be allowed to idle for several minutes before shutting it down, to ensure: (select the correct answer from the list below

- that the engine and turbo warm-up before the engine is shut off
- that the lubricating oil has warmed right through
- that all ship's machinery has reached operating temperature
- that the engine and turbo cool down before the engine is shut off

A 'blower' is needed for a diesel two-stroke to operate, but not needed for a petrol two-stroke. This is because: (Select the best answer from the list below.)

- diesel two-strokes always operate at a higher speeds
- diesel two strokes use a blower to deliver more power
- a diesel uses a blower to force air directly into the cylinder, but a petrol two-stroke uses compression in the crankcase to forces fuel/air into the cylinder
- petrol two-strokes use ram-tubes to force air into the cylinders

How can a two-stroke *diesel* engine use an oil filled 'wet-sump' for lubrication, but a two-stroke petrol engine must have a 'dry sump' and use other methods to lubricate the engine?

- diesels do not add fuel to the air charge until the moment of ignition
- diesel two strokes the crankcase as part of the induction path
- a diesel uses a blower to force air directly into the cylinder, but a petrol two-stroke uses the crankcase as part of the induction path
- a petrol two-stroke uses a blower to force air directly into the cylinder

From the list below, select the problems associated with using raw sea-water to cool a marine engine.

- Sea-water is highly corrosive and special materials must be used
- Sea-weed and marine animals can block the intake
- Electrolytic action corrodes metals in sea-water
- All of the above

From the list below, select the problems associated with using keel cooling pipes to cool a marine engine.

- They may be damaged but striking underwater objects
- Marine growth reduces cooling efficiency
- Cooling pipes penetrate the hull and introduce a weakness in the vessel
- All of the above

From the list below, select the statements which are true in relation to skin tank cooling of a marine engine.

- Marine growth on the hull reduces the efficiency of skin tank cooling
- Pipes penetrate the hull and introduce a weakness in the vessel
- Exposed pipes outside the hull may be damaged by underwater objects
- Corrosion in the skin tanks must be reduced using anti-corrosive coolants

From the list below, select the statements which are true in relation to heat exchanger cooling of a marine engine.

- Marine growth on the hull reduces the efficiency of heat exchanger cooling
- The raw water path must be kept clean using strainers and weed-traps
- Exposed pipes outside the hull may be damaged by underwater objects
- Corrosion in the engine may be reduced using anti-corrosive coolants

With heat-exchanger cooling, what precautions must be taken in relation to the raw water path? (Select the correct answer from the list below.)

- The hull must be kept clean and free of marine growth
- Exposed piping underneath the hull must be protected from underwater objects
- Strainers and weed-traps must be regularly checked and cleaned
- All of the above

In relation to heat exchanger cooling, select the correct statement from the list below:

- During warm up, a thermostat will temporarily bypass the heat exchanger
- During warm up, a thermostat will switch off the raw water pump
- During warm up, a thermostat will stop the flow of coolant through the engine
- During warm up, a thermostat will restrict the flow of raw water

In relation to 'wet-sump' four-stroke diesel marine engine lubrication systems, select *two* correct statements from the list below.

- The oil reserve is held in an external tank
- The scavenge pump is used to deliver oil to engine oil galleries
- The oil reserve is held in an enclosed sump below the engine
- Oil pressure from the delivery pump is limited to a safe value by a relief valve

In relation to 'dry-sump' four-stroke diesel marine engine lubrication systems, select *two* correct statements from the list below.

- The oil reserve is held in an external tank
- Two oil pumps are needed for a dry-sump system
- The oil reserve is held in an enclosed sump below the engine
- Oil pressure is limited to a safe value by a filter bypass valve

If you start an engine and the oil pressure gauge reads very high, select possible causes of the problem from the list below.

- Lubricating oil grade (SAE) too thick or viscous
- The oil pressure relief valve has stuck
- The filter is blocked and the filter bypass valve is open
- The lube oil level is too high

If the lubricating oil filter should become blocked, from the list below identify the likely results:

- A fail-safe system will immediately stop the engine until the filter is replaced
- Low oil pressure on the oil gauge or an oil warning light will show
- The oil flow will stop and the engine will be severely damaged
- The filter bypass valve will pass unfiltered oil to the engine to keep it lubricated

Select the correct answer. "A sediment bowl or sludge trap in the fuel system:

- will separate water and heavy sediment particles from the fuel by gravity!"
- uses a fine paper filter element!"
- is placed after the injector pump to protect the injectors!"
- All of the above

Select the correct answer. "In a diaphragm fuel pump, fuel is forced through the outlet by:

- pressure generated by the pump plunger!"
- pressure generated by the spinning rotor assembly
- pressure from the diaphragm and diaphragm spring!"
- pressure applied to the diaphragm by the cam and operating lever!"

Answer True or False. "If a hole or split occurs in the diaphragm of a fuel lift pump, the lubricating and fuel oil systems may contaminate each other.

- TRUE  FALSE

If you suspect that water and muck may have got into the vessel fuel tank through a bad drum of fuel, what action would you take first?

- Call for tankers to receive the entire fuel load and refill the vessel fuel tanks
- See if the engine gives trouble before doing anything at all
- Check the tank drains and the sludge filter for the presence of water
- Check and replace the secondary fuel filter—no other checks are necessary

The engine appears to be starving for fuel. From the list below, identify the *first* thing you would check:

- Disconnect the fuel line, install a gauge, and check fuel pump outlet pressure
- Check the level of fuel in the tank
- Check pipes and unions for kinks, damage, leakage and tightness
- Check filters and strainers

Select True or False. "The high pressure output from gear type lubrication pumps is limited to a maximum value by increasing gear clearances!"

- TRUE  FALSE

Tick the most correct statement from the list below:

- "Filters are changed when they begin to show signs of blockage!"
- "Filters are changed if a batch of contaminated fuel or oil has been used!"
- "Filters are changed when specified by periodic service schedules!"
- "Filters are changed for all of the above conditions!"

Select True or False. "Bleeding of diesel fuel systems, involves the removal of air from all lines and components starting at the tank end, and ending at the injectors!"

- TRUE  FALSE

Select the most likely answer. "If a petrol outboard engine stops because sea-water has found it's way into the carburettor, what will you most likely have to do?"

- Clean the filters and re-start the engine
- Drain and re-fill the tank
- Drain water from the tank, filters and carburettor, and remove and clean all jets

Select the best answer to complete the following statement. "The needle valve and float in the carburettor bowl, is used to:"

- Maintain a relatively constant level of fuel in the carburettor
- To provide a warning light if the fuel level runs low
- To increase the amount of fuel in the fuel/air mix when the engine is cold
- To prevent water getting into the carburettor

The engine won't turn over when you attempt to start it. From the list below, identify possible check to find out whether it is a flat battery or leads, or another problem.

- Try switching over to an alternate battery with the master switch
- Try switching on other high power equipment to see if it works
- Use a voltmeter or do a hydrometer test
- Any of the above

The engine cranks but won't start. From the statements below, identify the first thing you would check:

- Remove and replace starting aids (glow plugs etc)
- Check fuel filters
- Check fuel level, and that the main fuel cock is ON
- Undo the fuel line at the fuel pump outlet, and check the flow

The diesel engine starts, but runs poorly and produces black smoke from the exhaust. From the list below, select the most likely cause of the problem:

- The engine is worn and has poor compression
- Injectors and injector pump may need repair
- The engine is worn and is burning oil
- Nothing is wrong, this is normal for diesels

The engine starts running hotter than normal. Identify the *first* thing you would check from the statements below:

- Remove and check the thermostat
- Stop the engine and let it cool, then check the coolant level
- Quickly check the raw water discharge for flow where it's visible
- Stop the engine and check the raw water strainer and weed trap

The engine lube oil pressure drops. From the list below, identify the *first* thing you would check:

- Engine bearings
- Oil pump relief valve
- Oil filter
- Oil level

An outboard engine fails to start. From the list below, identify what faults you might be able to recognise by removing and inspecting a spark plug:

- Faulty plugs or ignition system may be identified by checking plugs and spark
- Very wet plugs may indicate a 'flooded' engine
- Bone dry plugs may indicate a fuel blockage
- Any of the above

From the list below select the answer which identifies what checks and maintenance need to be carried out, to keep a heat-exchanger marine cooling system in good working condition.

- Coolant level OK
- Pumps, seals, impellers, and thermostat working OK
- Raw water intake, strainers, and heat exchanger clean and clear
- All of the above

From the list below, select the answer which identifies the condition/s which could cause low oil pressure in a force feed marine engine lubrication system:

- Low oil level
- Oil viscosity grade too light
- Relief valve stuck open, worn bearings, or faulty pump or connections
- All of the above

## SECTION 2 - Low Voltage DC Electrical Systems

The deck lights of a vessel connect to a 12 volt electrical system by means of wiring with a maximum current rating of 10 amps. Select the total maximum wattage of deck lights which can be used.

- 120 Watts
- 80 Watts
- 60 Watts
- 24 Watts

An electric winch connected to a 12 volt electrical system draws 60 amps under load. From the list below, select the Wattage rating of the winch.

- 960 Watts
- 720 Watts
- 600 Watts
- 240 Watts

A 12 Volt alternator can charge 30 Amperes. From the list below, select the Wattage rating of the alternator.

- 960 Watts
- 720 Watts
- 600 Watts
- 360 Watts

Match the following electrical terms with their description.

- |      |    |  |
|------|----|--|
| Volt | A. | Unit of electrical resistance                      |
| Amp  | B. | Unit of electrical power                           |
| Ohm  | C. | Unit of electrical current flow                    |
| Watt | D. | Unit of electrical pressure (electro-motive force) |

Select True or False. "An open-circuit is a break in an electrical circuit. It will cause the circuit current to increase, usually blowing a fuse!"

- TRUE  FALSE

Select True or False. "An open-circuit is a break in an electrical circuit. It will cause the circuit current to decrease or stop!"

- TRUE  FALSE

Select True or False. "An open-circuit increases the circuit resistance to a very high level, and reduces the circuit current to practically zero. It usually stops the circuit operating correctly."

- TRUE  FALSE

Select the correct answer from the list below: "In a series circuit, the total current:

- splits, and flows separately through each sub-circuit!"
- remains the same as it flows through each component in turn!"
- will flow through some components if others are open-circuited!"
- is different for each of the circuit components!"

Select the correct answer. "To increase the capacity of batteries, but keep the output voltage the same, they are connected in:

- SERIES
- PARALLEL

Select the correct answer below. "What could happen if a battery is put in with the polarity reversed?"

- Nothing! The electrical circuits will always adjust for the polarity of the battery.
- Radios and electrical instruments will work OK, but some lights may not.
- Reversing the battery may cause electrical system damage and personal injury.

Select True or False. "Battery electrolyte should be kept to about 9mm above the top of the plates by topping up each cell with distilled water!"

- TRUE
- FALSE

Select True or False. "If no distilled water is available to top up a battery, salt water will do as a standby!"

- TRUE
- FALSE

Select True or False. "The need for frequent 'topping-up' of electrolyte could be caused by an excessive charging rate, or an internal battery fault!"

- TRUE
- FALSE

Select True or False. "Corrosion can be easily removed from battery terminals with hot water

- TRUE
- FALSE

Select the correct answer from the list below. "What is the first aid treatment for battery electrolyte burns to the eyes?"

- Cover the eyes and get help as soon as possible
- Place eye drops from the chemist in the eyes and seek help
- Gently flush the eyes with clean fresh water for at least 20 minutes and urgently seek medical aid
- Don't do anything—just head for shore as quickly as possible

Select the correct answer from the list below: "For identical batteries connected in Series:

- the output Voltage will double but the Capacity will stay the same!"
- the output Capacity will double but the Voltage will stay the same!"
- the output Voltage and Capacity will double!"
- the output Voltage and Capacity will stay the same but the battery lasts longer!"

Select the correct answer form the list below: "For identical batteries connected in Parallel:

- the output Voltage will double but the Capacity will stay the same!"
- the output Capacity will double but the Voltage will stay the same!"
- the output Voltage and Capacity will double!"
- the output Voltage and Capacity will stay the same but the battery lasts longer!"

Select the correct answer form the list below: "For identical batteries connected in Parallel:

- All the negative battery terminals are linked to all the positive terminals.
- The negative terminal on one battery is linked to the positive terminal of the next. The output is taken from the negative and positive of the end batteries.
- The batteries are used separately at different times.
- All the negative terminals are linked together to the output, and all the positive terminals are linked together to the output.

Select the correct answer form the list below: "For identical batteries connected in Series:

- All the negative battery terminals are linked to all the positive terminals.
- The negative terminal on one battery is linked to the positive terminal of the next, and the output is taken from the negative and positive of the end batteries.
- The batteries are used separately at different times.
- All the negative terminals are linked together to the output, and all the positive terminals are linked together to the output.

If a generator stops adequately charging, select the *first* thing you would check from the list below.

- Check the regulator for correct operation (especially mechanical types).
- Check that the brushes and commutator are not sticking or worn.
- Dismantle the generator to check field and armature windings.
- Make sure the drive belt is not slipping.

If an alternator stops adequately charging, select the *first* thing you would check from the list below.

- Check the regulator and cutout for correct operation.
- Check that the brushes and slip rings are not sticking or worn.
- Make sure the drive belt is not slipping.
- Dismantle the alternator to check the diodes.

Match each generator regulator component, with its function

Cut-out	A	Prevents the generator burning out due to an excessive charge rate
Voltage Regulator	B	Stops the battery discharging through the generator, when the engine is stopped.
Current Regulator	C	Prevents the battery being overcharged and damaged.

Select the correct answer from the list below. "If a diode in an alternator should fail, it is most likely to cause:

- The alternator will have a very low charge rate
- No output at all from the alternator
- The alternator polarity will be reversed
- The alternator will produce an alternating current (AC) output

Select True or False. "Alternators are capable of operating on either polarity, by simply reversing the battery!"

- TRUE
- FALSE

Select True or False. "Generators are capable of operating on either polarity, by simply reversing the battery!"

- TRUE
- FALSE

Select True or False. "Although alternators have a long, reliable service life, the alternator diodes are easily damaged by high or reversed voltages, or stray currents due to welding. The battery, and alternator should be disconnected when welding!"

- TRUE
- FALSE

Select True or False. "Short circuits are most likely to be found where there is exposed wiring or connections, or where wiring may be cut or damaged as it passes through metal casings, bulkheads etc.!"

- TRUE
- FALSE

Open circuits are best found by checking the most likely causes first. Select the first thing you would check when looking for an open circuit

- Plugs and sockets, and flexible cords and cables
- Screwed connectors
- Fuses and circuit breakers
- Wiring looms

Select the correct answer from the list below. "If the Wattage of a vessel's deck lights are doubled, the electrical wiring will have to carry:

- four times as many amperes
- twice as many amperes
- one half the amperes
- one quarter the amperes

Select the correct answer from the list below. "If the Wattage of a vessel's deck lights are halved, the electrical wiring will have to carry:

- four times as many amperes
- twice as many amperes
- one half the amperes
- one quarter the amperes

Select the best answer from the list below. "Circuit breakers and fuses are used to stop:

- excessive electrical current flowing in a circuit!"
- excessive voltages being accidentally applied to the circuit!"
- 'flashes' due to lightning strikes getting into the ship's wiring!"
- fatalities caused by severe electric shocks

From the list below, select the most likely causes of an electric *OPEN* circuit.

- Damaged insulation due to the rubbing of cables against bulkheads etc
- Fuses, plugs and sockets, flexible cords and exposed connections
- Cables packed too tightly into ducts and through openings
- Conductors accidentally contacting the ship's hull

From the list below, select the most likely causes of an electric *SHORT* circuit.

- Damaged insulation due to the rubbing of cables against bulkheads etc
- Fuses, circuit breakers, plugs and sockets, and flexible cords
- Cables inside ducts and conduits
- Soldered connections becoming corroded and 'dry'

From the list below, identify the statement which indicates the precautions you should take with a vessel's batteries.

- No sparks, flames or welding while charging or servicing batteries
- Use protective goggles, gloves and apron while working with battery electrolyte
- Keep clean water on hand to flush the skin and eyes if chemical burns occur
- All of the above

Select True or False. "Storage batteries should be placed in a sealed cabinet which is vented at the bottom to get rid of gases!"

- TRUE  FALSE

Select True or False. "Storage batteries should be placed in a cabinet which is well ventilated at the top to get rid of gases!"

- TRUE  FALSE

From the list below, select the first things you would check if the DC electrical feed to a single piece of equipment fails.

- Wiring loom to the equipment
- Main battery terminals and leads
- Fuses, circuit breakers, plugs and electrical connectors
- Cables packed in ducts and through openings

Select the correct answer from the list below. "If a piece of equipment develops a fault, the best way to temporarily disconnect it from electrical power is to:

- Remove fuses or open the circuit at the circuit breaker
- Disconnect DC power at the main battery switch
- Disconnect DC power wiring at the equipment
- Disconnect DC power wiring at the main switchboard

### SECTION 3 - Bilge and Steering Systems

Select the correct answer. "Bilge pumps in a surveyed vessel must:

- be protected by strums, strainers or mud-boxes!"
- be of a type, size and number as specified for the vessel!"
- have a separate power source when more than one pump is specified!"
- all of the above.

Select True or False. "A mud box is similar to a strainer, but has a dam at the base of the strainer plate to catch solids dropping off the strainer plate and prevent them falling back down the suction pipe into the bilge!"

- TRUE
- FALSE

Select True or False. "A strum must be placed low in the bilge at the end of the suction pipe, but a strainer may be mounted higher where it is more accessible!"

- TRUE
- FALSE

Select the correct answer from the list below. "What would happen to the bilge pumping system if a strainer was leaking around the lid?"

- The lid would leak, and some of the bilge water would run back into the bilges.
- Air would leak into the pump suction line which would slow or stop it pumping.
- The strainer would not work, resulting in rubbish being drawn into the pump.
- Nothing! The leak would have no effect at all.

4. The most appropriate valve used singly in a bilge suction line would be:

- A gate valve, as it will open the entire suction line without restriction
- A butterfly valve, as it is very quick to operate
- A screw-down non-return valve, as it will prevent back-flooding into the bilges
- A sleeve-packed cock, as it will withstand very high pressures

A small leak occurs in the suction side seal or suction lines of a bilge pump. From the list below, select the most likely effects of this leak.

- The leak will have no effect as it is a fairly minor one
- Bilge-water will escape from the suction line while the pump is operating
- Air will be sucked into the suction line. This will break the suction and stop or reduce the flow from the pump
- Air entering the suction line will help to increase the flow of water from the pump

A small leak occurs in the pressure side seal or outlet lines of a bilge pump. From the list below, select the most likely effects of this leak.

- The leak will have no effect as it is a fairly minor one
- Bilge-water will escape from the pressure line while the pump is operating
- Air will be sucked into the pressure line. This will stop or reduce the flow from the pump
- Air entering the pressure line will increase the flow of water from the pump

A centrifugal pump is full of air, due to maintenance on the strainers and suction pipes. From the list below, identify what will happen when the pump motor is started?

- Nothing! The pump will need priming with water before it will pump.
- The pump will take a few minutes to create suction and start pumping
- The pump will quickly fill and begin pumping almost immediately
- The pump will begin pumping almost immediately, but it's flow will be reduced

Select the best answer from the list below. "In a *flexible impeller* pump, water flows to the outlet because:

- centrifugal force flings water to the outside discharge!"
- the impeller lobes are bent by the offset plate, squeezing the water out!"
- a steel rotor distorts the rubber stator, forcing water from the pump!"
- one-way flap-valves ensure the water only goes to the outlet!"

A vessel's bilge system uses strainers and centrifugal pumps. From the list below, select the maintenance checks which should be regularly carried out.

- Strainers to be kept clean
- Pumps and seals to be kept in good working condition
- Strainers and suction lines must be well sealed
- All of the above

"Strums must be mounted in the bottom of the vessel to protect the end of a suction pipe, but strainers may be mounted higher where they are easier to reach!" From the list below, identify how a pump can draw bilge through the strainer without sucking air at the strainer?

- The end of the suction pipe is mounted high in the bilge inside the strainer.
- The strainer is mounted in the delivery side of the pump.
- The strainer is rigid and sealed, and forms part of the suction pipe.
- The strainer is mounted where gravity will deliver bilge-water to it.

From the list below, identify the component which is not part of a bilge pumping system:

- Strums, strainers or mud boxes
- Non-return valves
- Centrifugal or impeller pumps
- Sump scavenge pump

Match the following hydraulic steering systems with their descriptions:

Direct System	A	The movement of the steering wheel serves only to control the power hydraulics
Power Assisted System	B	The movement of the steering wheel supplies the hydraulic power to move the rudder.
Indirect System	C	Manual effort on the steering wheel is aided by supporting power hydraulics

Select True or False. "All twin ram steering systems eliminate side-force on the rudder stem!"

- TRUE  FALSE

From the list below, select the hydraulic steering system which will almost eliminate side-force on the rudder stem.

- Single ram system-fixed cylinder
- Single ram system-moving cylinder
- Dual ram system, rams on each side
- Dual ram system, both rams on one side

Select True or False. "Cable steering systems may use either a multi-strand flexible steel cable in a 'pull-pull' system using guiding pulleys on each side of the vessel, or use a semi-rigid steel cable inside a sheath to provide a 'push-pull' steering system from one side of the vessel!"

- TRUE  FALSE

From the list below, identify the *disadvantage* of using flexible multi-stand steel cable for vessel steering systems?

- The system cannot be automated using a auto-pilot system
- The system cannot be made as strong as semi-rigid cable systems
- The system requires guide pulleys to be mounted around the vessel, with straight clear spaces between the pulleys

Select True or False. "Dual ram steering systems can be used to increase steering force, and at the same time may be arranged to reduce side thrust on the rudder post!"

- TRUE  FALSE

Select True or False. "With direct hydraulic steering, the movement of the steering wheel supplies the hydraulic power to move the rudder!"

- TRUE  FALSE

Select True or False. "With indirect hydraulic steering, the movement of the steering wheel supplies the hydraulic power to move the rudder!"

- TRUE  FALSE

Select True or False. "With indirect hydraulic steering, the movement of the steering wheel serves only to control the hydraulic power used to move the rudder!"

- TRUE  FALSE

From the list below, select the method used to protect hydraulic components against contaminants in the hydraulic oil?

- By the use of abrasion resistant rubber components
- By making tolerances large enough to reduce damage
- By using appropriate strainers and filters
- As hydraulic systems use sealed chambers, contaminants will not cause any damage, so no protection is necessary

## SECTION 4 - Fire and Explosion Emergency

From the list below, select the correct answer. "Petrol will ignite if exposed to a spark or flame:

- only if the temperature is above boiling!"
- only on a hot day!"
- only if the temperature is above freezing!"
- even if the temperature is below zero!"

Select True or False. "Diesel fuel will spontaneously burst into flames at a lower temperature than petrol!"

- TRUE
- FALSE

Select True or False. "Although LPG and hydrogen gas from charging batteries are both very explosive, hydrogen gas floats away, and is therefore easier to get rid of from a vessel!"

- TRUE
- FALSE

Select True or False. "Plastic fuel lines are best in commercial vessels because they are less likely to be cracked by the movement and vibration of the ship!"

- TRUE
- FALSE

"LPG tanks and regulators must be mounted outside the deckhouse above decks, or in a sealed fireproof box with a drain vent from the bottom through the hull to the outside above the waterline!" From the list below, select the reason.

- LPG naturally has a sickening smell, and this is unpleasant in a closed space
- LPG will form a heavy explosive mix which will collect inside the vessel if the gas is not properly handled and stored
- The moisture and fumes inside a vessel will corrode the LPG fittings
- LPG tanks collect moisture on the outside which must be drained from the vessel

From the list below, select the best answer. "The LPG tank is turned off at the valve:

- when the vessel is not in use!"
- during vessel re-fuelling operations!"
- in the event of a fire, emergency, or gas leak!"
- for all of the above situations

From the list below, select the correct statement. "Battery cabinets and LPG Lockers are vented differently because:

- LPG gas is present all the time, but batteries only produce gas while they are working!"
- LPG is more explosive than hydrogen gas!"
- LPG produces much more gas than batteries!"
- LPG drains to the lowest point, but battery gas floats to the highest point!"

From the list below, select the statement which is *NOT* true when charging batteries.

- Don't operate the cells with vent caps removed
- Welding is no problem near charging batteries as long as the engine room is ventilated
- keep sparks and flames away from batteries
- remove all electrical load from batteries before disconnecting them

Select True or False. "Care should be taken to keep sparks, flame, and 'hot work' away from the re-fuelling area during vessel re-fuelling operations!".

- TRUE  FALSE

On the list below, number the *ORDER* of the actions you would take in the event of a serious fire onboard ship. Assume that you cannot do them all at once.

- Attempt procedures to save the lives of injured crew if safe to do so.
- Send emergency calls and prepare lifebuoys if assessed as necessary.
- Raise the alarm, stop engines and close fuel and LPG cut-off valves.
- Start attacking the fire with fire extinguishers, and equipment.

From the list below, identify the precautions you would take during re-fuelling operations.

- Use correct (earthed) fuel delivery systems, to minimise the risk of static
- Shut-off LPG systems at the tank during re-fuelling operations, and keep cigarettes, sparks, flame, and 'hot work' away from re-fuelling area
- Avoid spills and clean up after re-fuelling
- All of the above precautions

Select True or False. "To prevent explosive LPG slowly filling the vessel, all LPG appliances must be fitted with a flame failure shut-off to automatically shut-off the appliance if the pilot flame or main burner flame goes out!"

- TRUE  FALSE

Select True or False. "In the event of a fire or explosion on board a vessel, you would take the time to raise the alarm to warn others of the danger, and to get help in fighting the emergency!"

- TRUE  FALSE

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to determine the type and extent of the fire

- To make sure your insurance will cover the damage
- To make sure your valuable cargo is not going to be lost
- To allow you to make a better assessment of the potential danger, to help you determine the next action to be taken.
- To make sure your personal possessions are safe

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to shut doors and close the ventilation system

- To minimise pollution of the environment
- To minimise passenger smoke inhalation
- To stop the fire travelling
- To help starve the fire of oxygen

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to check the compartments next to the fire

- To look for extra fire fighting and emergency equipment
- To ensure valuable items are removed
- To check the extent of the fire, and help to assess the danger
- To remove heat sensitive items

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time constantly assess the situation

- To make sure your insurance will cover the damage
- To allow you to decide if your present action is best, and what the next action should be.
- To ensure valuable cargo is not being lost
- To ensure valuable personal possessions are not being lost

## Operate propulsion answers

From the list below, identify the fourth internal combustion engine operation.

'Combustion', 'Exhaust', 'Induction' and:

- 'Suction'
- 'Expansion'
- 'Compression'
- 'Suppression'

From the list below, identify the fourth internal combustion engine operation:

'Compression', 'Combustion', 'Exhaust', and:

- 'Suction'
- 'Induction'
- 'Expansion'
- 'Suppression'

From the list below, identify the fourth internal combustion engine operation:

'Induction', 'Compression', 'Combustion', and:

- 'Suction'
- 'Expansion'
- 'Suppression'
- 'Exhaust'

From the list below, identify the fourth internal combustion engine operation:

'Exhaust', 'Induction', 'Compression', and:

- 'Combustion'
- 'Expansion'
- 'Suction'
- 'Suppression'

In a diesel engine, the fuel/ air mixture is ignited at the correct instant by:

- An electrical spark from a spark plug
- The heat of compression in the cylinder
- An electronic ignition system
- The glow plug

In a petrol engine, the fuel/ air mixture is ignited at the correct time by:

- Electric pre-heaters
- The heat of compression in the cylinder
- An electrical spark from a spark plug
- A glow plug

Select the correct statement from the list below:

- "In a four-stroke engine, the camshaft spins at four times the crankshaft speed!"
- "In a four-stroke engine, the camshaft spins at twice the crankshaft speed!"
- "In a four-stroke engine, the camshaft spins at the crankshaft speed!"
- "In a four-stroke engine, the camshaft spins at half the crankshaft speed!"

"In a four-stroke engine, if the camshaft timing gear has 40 teeth on it, how many teeth will the crankshaft timing gear have?" Select the correct answer from the list below:

- 20 teeth
- 25 teeth
- 30 teeth
- 40 teeth

"In a two-stroke engine, if the camshaft timing gear has 40 teeth on it, how many teeth will the crankshaft timing gear have?" Select the correct answer from the list below:

- 20 teeth
- 25 teeth
- 30 teeth
- 40 teeth

"In a four-stroke engine, how many turns will the crankshaft have to do to open the exhaust valve once?" Select the correct answer from the list below:

- one turn
- two turns
- three turns
- four turns

"In a two-stroke engine, , how many turns will the crankshaft have to do to open the exhaust valve once?" Select the correct answer from the list below:

- one turn
- two turns
- three turns
- four turns

"In a four-stroke engine, if the engine has just started the Exhaust stroke, the valves will be in the following states?" Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has just started the Combustion stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has started the Compression stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has just started the Induction stroke, the valves will be in the following states?” Select the correct answer from the list below:

- Exhaust valve open, Inlet valve open
- Exhaust valve closed, Inlet valve open
- Exhaust valve closed, Inlet valve closed
- Exhaust valve open, Inlet valve closed

“In a four-stroke engine, if the engine has started the Induction stroke, the piston will be?”

Select the correct answer from the list below:

- Rising in the cylinder
- Uncovering the transfer port in the cylinder wall
- Falling in the cylinder
- At bottom dead centre (BDC)

“In a four-stroke engine, if the engine has started the Exhaust stroke, the piston will be?”

Select the correct answer from the list below:

- Rising in the cylinder
- Uncovering the exhaust port in the cylinder wall
- Falling in the cylinder
- At top dead centre (TDC)

In a diesel engine, how is the moment of ignition timed with respect to the position of the crankshaft? Select the best answer from the list below:

- The valves both close to lock the fuel/air mix in the cylinder
- Compression finally develops enough heat to ignite the fuel/air mixture
- The ‘breaker points’ are opened by a cam driven by the camshaft
- The injector pump timed by the camshaft, injects fuel into the cylinder

In an outboard petrol engine, how is the moment of ignition timed with respect to the position of the crankshaft? Select the best answer from the list below:

- The 'breaker points' are closed by a cam driven by the crankshaft
- Compression finally generates enough heat to ignite the fuel/air mixture
- The 'breaker points' are opened by a cam driven by the crankshaft
- The injector pump is driven by the camshaft

In a four-stroke diesel engine, when is fuel introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the open transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a two-stroke diesel engine, when is fuel introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the open transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a two-stroke petrol engine, when is fuel introduced into the *cylinder*? Select the best answer from the list below.

- The fuel/air mix is delivered through the transfer port opened by the piston
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

In a four-stroke petrol engine, when is fuel introduced into the cylinder? Select the correct answer from the list below.

- When the fuel/air mix is delivered through the opened transfer port
- It is injected into the hot air in the cylinder at the end of the compression stroke
- It is mixed with the air before the induction stroke
- It is injected into the crankcase on the induction stroke

What keeps the engine turning between power strokes? Select the correct answer from the list below.

- The pressure of combustion
- The pressure of compression
- The mass of the flywheel and engine components
- The turning action of the propeller

“In a four-stroke diesel engine, induction of fresh air into the cylinder is through.....!”

(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened by the descending piston
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall opened by the descending piston

“In a two-stroke diesel engine, induction of fresh air into the cylinder is through.....!”

(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened by the descending piston
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall which are opened by the descending piston

“In a two-stroke petrol engine, induction of fuel/air into the cylinder is through.....!”

(Select the best answer from the list below.)

- Inlet ports in the cylinder wall which are opened by the descending piston
- Inlet ports in the crankcase which are opened at bdc
- An inlet valve which is opened by a cam on the camshaft
- Transfer ports in the cylinder wall opened by the descending piston

How is the opening and closing of the valves timed with respect to the position and movement of the piston?

- By ignition timing marks which set the position of the valves
- By cams on the camshaft which are driven by gears from the crankshaft
- By connecting rods on the crankshaft
- They are timed by the injector pump

Complete the statement, “A four-stroke engine cycle takes

(a)...*two*... complete turn/s of the crankshaft, while a cycle for a two-stroke engine takes(b)..*one*... complete turn/s of the crankshaft.”

Identify the condition of the valves/ports and the position of the piston during *Induction* in a diesel four-stroke:

- Piston around tdc and descending–inlet valve closed–exhaust valve closed
- Piston around bdc and rising–inlet valve closed–exhaust valve open
- Piston around tdc and descending–inlet valve open–exhaust valve closed
- Piston around bdc and rising–inlet valve open–exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Compression* in a diesel four-stroke:

- Piston around tdc and descending–inlet valve closed–exhaust valve closed
- Piston around bdc and rising–inlet valve closed–exhaust valve closed
- Piston around tdc and descending–inlet valve open–exhaust valve closed
- Piston around bdc and rising–inlet valve open–exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve open
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Exhaust* in a diesel four-stroke:

- Piston around tdc and descending—inlet valve closed—exhaust valve closed
- Piston around bdc and rising—inlet valve closed—exhaust valve open
- Piston around tdc and descending—inlet valve open—exhaust valve closed
- Piston around bdc and rising—inlet valve open—exhaust valve closed

Identify the condition of the valves/ports and the position of the piston during *Induction* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Compression* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the valves/ports and the position of the piston during *Exhaust* in a diesel two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust valve closed
- Piston around bdc and rising—inlet ports closed—exhaust valve closed
- Piston around tdc and descending—inlet ports open—exhaust valve closed
- Piston around bdc—inlet ports open—exhaust valve open

Identify the condition of the ports and the position of the piston during *Induction into the crankcase* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston rising—intake port open—exhaust and transfer ports closed

Identify the condition of the ports and the position of the piston during *Compression* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston rising—intake and transfer ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston around bdc—inlet ports open—exhaust port open

Identify the condition of the valves/ports and the position of the piston during *Combustion* in a petrol two-stroke:

- Piston around tdc and descending—transfer port closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston around tdc and descending—inlet ports open—exhaust port closed
- Piston around bdc—inlet ports open—exhaust port open

Identify the condition of the valves/ports and the position of the piston during *Exhaust and Induction into the cylinder* in a petrol two-stroke:

- Piston around tdc and descending—inlet ports closed—exhaust port closed
- Piston around bdc and rising—inlet ports closed—exhaust port closed
- Piston descending—intake port closed—exhaust and transfer ports open
- Piston around bdc—inlet ports open—exhaust port open

Select True or False. "The cylinder of a two-stroke petrol engine is charged with fuel/air mix in two stages. When the piston rises in the cylinder the intake port is opened and fuel/air is drawn into the crankcase. When the piston descends, the fuel air is compressed in the crankcase, and when the exhaust and transfer ports are opened by the piston, the charge of fuel air is transferred into the cylinder ready for compression

- TRUE**
- FALSE**

After running at high speed, a diesel engine with a turbo-charger should be allowed to idle for several minutes before shutting it down, to ensure: (select the correct answer from the list below)

- that the engine and turbo warm-up before the engine is shut off
- that the lubricating oil has warmed right through
- that all ship's machinery has reached operating temperature
- that the engine and turbo cool down before the engine is shut off

A 'blower' is needed for a diesel two-stroke to operate, but not needed for a petrol two-stroke. This is because: (Select the best answer from the list below.)

- diesel two-strokes always operate at a higher speeds
- diesel two strokes use a blower to deliver more power
- a diesel uses a blower to force air directly into the cylinder, but a petrol two-stroke uses compression in the crankcase to forces fuel/air into the cylinder
- petrol two-strokes use ram-tubes to force air into the cylinders

How can a two-stroke *diesel* engine use an oil filled 'wet-sump' for lubrication, but a two-stroke petrol engine must have a 'dry sump' and use other methods to lubricate the engine?

- diesels do not add fuel to the air charge until the moment of ignition
- diesel two strokes the crankcase as part of the induction path
- a diesel uses a blower to force air directly into the cylinder, but a petrol two-stroke uses the crankcase as part of the induction path
- a petrol two-stroke uses a blower to force air directly into the cylinder

From the list below, select the problems associated with using raw sea-water to cool a marine engine.

- Sea-water is highly corrosive and special materials must be used
- Sea-weed and marine animals can block the intake
- Electrolytic action corrodes metals in sea-water
- All of the above

From the list below, select the problems associated with using keel cooling pipes to cool a marine engine.

- They may be damaged but striking underwater objects
- Marine growth reduces cooling efficiency
- Cooling pipes penetrate the hull and introduce a weakness in the vessel
- All of the above

From the list below, select the statements which are true in relation to skin tank cooling of a marine engine.

- Marine growth on the hull reduces the efficiency of skin tank cooling
- Pipes penetrate the hull and introduce a weakness in the vessel
- Exposed pipes outside the hull may be damaged by underwater objects
- Corrosion in the skin tanks must be reduced using anti-corrosive coolants

From the list below, select the statements which are true in relation to heat exchanger cooling of a marine engine.

- Marine growth on the hull reduces the efficiency of heat exchanger cooling
- The raw water path must be kept clean using strainers and weed-traps
- Exposed pipes outside the hull may be damaged by underwater objects
- Corrosion in the engine may be reduced using anti-corrosive coolants

With heat-exchanger cooling, what precautions must be taken in relation to the raw water path? (Select the correct answer from the list below.)

- The hull must be kept clean and free of marine growth
- Exposed piping underneath the hull must be protected from underwater objects
- Strainers and weed-traps must be regularly checked and cleaned
- All of the above

In relation to heat exchanger cooling, select the correct statement from the list below:

- During warm up, a thermostat will temporarily bypass the heat exchanger
- During warm up, a thermostat will switch off the raw water pump
- During warm up, a thermostat will stop the flow of coolant through the engine
- During warm up, a thermostat will restrict the flow of raw water

In relation to 'wet-sump' four-stroke diesel marine engine lubrication systems, select *two* correct statements from the list below.

- The oil reserve is held in an external tank
- The scavenge pump is used to deliver oil to engine oil galleries
- The oil reserve is held in an enclosed sump below the engine
- Oil pressure from the delivery pump is limited to a safe value by a relief valve

In relation to 'dry-sump' four-stroke diesel marine engine lubrication systems, select *two* correct statements from the list below.

- The oil reserve is held in an external tank
- Two oil pumps are needed for a dry-sump system
- The oil reserve is held in an enclosed sump below the engine
- Oil pressure is limited to a safe value by a filter bypass valve

If you start an engine and the oil pressure gauge reads very high, select possible causes of the problem from the list below.

- Lubricating oil grade (SAE) too thick or viscous
- The oil pressure relief valve has stuck
- The filter is blocked and the filter bypass valve is open
- The lube oil level is too high

If the lubricating oil filter should become blocked, from the list below identify the likely results:

- A fail-safe system will immediately stop the engine until the filter is replaced
- Low oil pressure on the oil gauge or an oil warning light will show
- The oil flow will stop and the engine will be severely damaged
- The filter bypass valve will pass unfiltered oil to the engine to keep it lubricated

Select the correct answer. "A sediment bowl or sludge trap in the fuel system:

- will separate water and heavy sediment particles from the fuel by gravity!"
- uses a fine paper filter element!"
- is placed after the injector pump to protect the injectors!"
- All of the above

Select the correct answer. "In a diaphragm fuel pump, fuel is forced through the outlet by:

- pressure generated by the pump plunger!"
- pressure generated by the spinning rotor assembly
- pressure from the diaphragm and diaphragm spring!"
- pressure applied to the diaphragm by the cam and operating lever!"

Answer True or False. "If a hole or split occurs in the diaphragm of a fuel lift pump, the lubricating and fuel oil systems may contaminate each other.

- TRUE**                       **FALSE**

If you suspect that water and muck may have got into the vessel fuel tank through a bad drum of fuel, what action would you take first?

- Call for tankers to receive the entire fuel load and refill the vessel fuel tanks  
 See if the engine gives trouble before doing anything at all  
 Check the tank drains and the sludge filter for the presence of water  
 Check and replace the secondary fuel filter—no other checks are necessary

The engine appears to be starving for fuel. From the list below, identify the *first* thing you would check:

- Disconnect the fuel line, install a gauge, and check fuel pump outlet pressure  
 Check the level of fuel in the tank  
 Check pipes and unions for kinks, damage, leakage and tightness  
 Check filters and strainers

Select True or False. "The high pressure output from gear type lubrication pumps is limited to a maximum value by increasing gear clearances!"

- TRUE**                       **FALSE**

Tick the most correct statement from the list below:

- "Filters are changed when they begin to show signs of blockage!"  
 "Filters are changed if a batch of contaminated fuel or oil has been used!"  
 "Filters are changed when specified by periodic service schedules!"  
 "Filters are changed for all of the above conditions!"

Select True or False. "Bleeding of diesel fuel systems, involves the removal of air from all lines and components starting at the tank end, and ending at the injectors!"

- TRUE**                       **FALSE**

Select the most likely answer. "If a petrol outboard engine stops because sea-water has found it's way into the carburettor, what will you most likely have to do?"

- Clean the filters and re-start the engine  
 Drain and re-fill the tank  
 Drain water from the tank, filters and carburettor, and remove and clean all jets

Select the best answer to complete the following statement. "The needle valve and float in the carburettor bowl, is used to:

- Maintain a relatively constant level of fuel in the carburettor  
 To provide a warning light if the fuel level runs low  
 To increase the amount of fuel in the fuel/air mix when the engine is cold  
 To prevent water getting into the carburettor

The engine won't turn over when you attempt to start it. From the list below, identify possible check to find out whether it is a flat battery or leads, or another problem.

- Try switching over to an alternate battery with the master switch
- Try switching on other high power equipment to see if it works
- Use a voltmeter or do a hydrometer test
- Any of the above

The engine cranks but won't start. From the statements below, identify the first thing you would check:

- Remove and replace starting aids (glow plugs etc)
- Check fuel filters
- Check fuel level, and that the main fuel cock is ON
- Undo the fuel line at the fuel pump outlet, and check the flow

The diesel engine starts, but runs poorly and produces black smoke from the exhaust. From the list below, select the most likely cause of the problem:

- The engine is worn and has poor compression
- Injectors and injector pump may need repair
- The engine is worn and is burning oil
- Nothing is wrong, this is normal for diesels

The engine starts running hotter than normal. Identify the *first* thing you would check from the statements below:

- Remove and check the thermostat
- Stop the engine and let it cool, then check the coolant level
- Quickly check the raw water discharge for flow where it's visible
- Stop the engine and check the raw water strainer and weed trap

The engine lube oil pressure drops. From the list below, identify the *first* thing you would check:

- Engine bearings
- Oil pump relief valve
- Oil filter
- Oil level

An outboard engine fails to start. From the list below, identify what faults you might be able to recognise by removing and inspecting a spark plug:

- Faulty plugs or ignition system may be identified by checking plugs and spark
- Very wet plugs may indicate a 'flooded' engine
- Bone dry plugs may indicate a fuel blockage
- Any of the above

From the list below select the answer which identifies what checks and maintenance need to be carried out, to keep a heat-exchanger marine cooling system in good working condition.

- Coolant level OK
- Pumps, seals, impellers, and thermostat working OK
- Raw water intake, strainers, and heat exchanger clean and clear
- All of the above

From the list below, select the answer which identifies the condition/s which could cause low oil pressure in a force feed marine engine lubrication system:

- Low oil level
- Oil viscosity grade too light
- Relief valve stuck open, worn bearings, or faulty pump or connections
- All of the above

**SECTION 2 - Low Voltage DC Electrical Systems (10% of Questions)**

The deck lights of a vessel connect to a 12 volt electrical system by means of wiring with a maximum current rating of 10 amps. Select the total maximum wattage of deck lights which can be used.

- 120 Watts
- 80 Watts
- 60 Watts
- 24 Watts

An electric winch connected to a 12 volt electrical system draws 60 amps under load. From the list below, select the Wattage rating of the winch.

- 960 Watts
- 720 Watts
- 600 Watts
- 240 Watts

A 12 Volt alternator can charge 30 Amperes. From the list below ,select the Wattage rating of the alternator.

- 960 Watts
- 720 Watts
- 600 Watts
- 360 Watts

Match the following electrical terms with their description.

Volt	....(D).... A.	Unit of electrical resistance
Amp	....(C).... B.	Unit of electrical power
Ohm	....(A).... C.	Unit of electrical current flow
Watt	....(B).... D.	Unit of electrical pressure (electro-motive force)

Select True or False. "An open-circuit is a break in an electrical circuit. It will cause the circuit current to increase, usually blowing a fuse!"

- TRUE
- FALSE

Select True or False. "An open-circuit s a break in an electrical circuit. It will cause the circuit current to decrease or stop!"

- TRUE
- FALSE

Select True or False. "An open-circuit increases the circuit resistance to a very high level, and reduces the circuit current to practically zero. It usually stops the circuit operating correctly."

- TRUE
- FALSE

Select the correct answer from the list below: "In a series circuit, the total current:

- splits, and flows separately through each sub-circuit!"
- remains the same as it flows through each component in turn!"
- will flow through some components if others are open-circuited!"
- is different for each of the circuit components!"

Select the correct answer. "To increase the capacity of batteries, but keep the output voltage the same, they are connected in:

- SERIES**
- PARALLEL**

Select the correct answer below. "What could happen if a battery is put in with the polarity reversed?"

- Nothing! The electrical circuits will always adjust for the polarity of the battery.
- Radios and electrical instruments will work OK, but some lights may not.
- Reversing the battery may cause electrical system damage and personal injury.

Select True or False. "Battery electrolyte should be kept to about 9mm above the top of the plates by topping up each cell with distilled water!"

- TRUE**
- FALSE**

Select True or False. "If no distilled water is available to top up a battery, salt water will do as a standby!"

- TRUE**
- FALSE**

Select True or False. "The need for frequent 'topping-up' of electrolyte could be caused by an excessive charging rate, or an internal battery fault!"

- TRUE**
- FALSE**

Select True or False. "Corrosion can be easily removed from battery terminals with hot water

- TRUE**
- FALSE**

Select the correct answer from the list below. "What is the first aid treatment for battery electrolyte burns to the eyes?"

- Cover the eyes and get help as soon as possible
- Place eye drops from the chemist in the eyes and seek help
- Gently flush the eyes with clean fresh water for at least 20 minutes and urgently seek medical aid
- Don't do anything—just head for shore as quickly as possible

Select the correct answer form the list below: "For identical batteries connected in Series:

- the output Voltage will double but the Capacity will stay the same!"
- the output Capacity will double but the Voltage will stay the same!"
- the output Voltage and Capacity will double!"
- the output Voltage and Capacity will stay the same but the battery lasts longer!"

Select the correct answer form the list below: "For identical batteries connected in Parallel:

- the output Voltage will double but the Capacity will stay the same!"
- the output Capacity will double but the Voltage will stay the same!"
- the output Voltage and Capacity will double!"
- the output Voltage and Capacity will stay the same but the battery lasts longer!"

Select the correct answer form the list below: "For identical batteries connected in Parallel:

- All the negative battery terminals are linked to all the positive terminals.
- The negative terminal on one battery is linked to the positive terminal of the next. The output is taken from the negative and positive of the end batteries.
- The batteries are used separately at different times.
- All the negative terminals are linked together to the output, and all the positive terminals are linked together to the output.

Select the correct answer form the list below: "For identical batteries connected in Series:

- All the negative battery terminals are linked to all the positive terminals.
- The negative terminal on one battery is linked to the positive terminal of the next, and the output is taken from the negative and positive of the end batteries.
- The batteries are used separately at different times.
- All the negative terminals are linked together to the output, and all the positive terminals are linked together to the output.

If a generator stops adequately charging, select the *first* thing you would check from the list below.

- Check the regulator for correct operation (especially mechanical types).
- Check that the brushes and commutator are not sticking or worn.
- Dismantle the generator to check field and armature windings.
- Make sure the drive belt is not slipping.

If an alternator stops adequately charging, select the *first* thing you would check from the list below.

- Check the regulator and cutout for correct operation.
- Check that the brushes and slip rings are not sticking or worn.
- Make sure the drive belt is not slipping.
- Dismantle the alternator to check the diodes.

Match each generator regulator component, with its function

Cut-out	....(B)...	A	Prevents the generator burning out due to an excessive charge rate
Voltage Regulator	....(C)..	B	Stops the battery discharging through the generator, when the engine is stopped.
Current Regulator	....(A)...	C	Prevents the battery being overcharged and damaged.

Select the correct answer from the list below. "If a diode in an alternator should fail, it is most likely to cause:

- The alternator will have a very low charge rate
- No output at all from the alternator
- The alternator polarity will be reversed
- The alternator will produce an alternating current (AC) output

Select True or False. "Alternators are capable of operating on either polarity, by simply reversing the battery!"

- TRUE  **FALSE**

Select True or False. "Generators are capable of operating on either polarity, by simply reversing the battery!"

- TRUE  **FALSE**

Select True or False. "Although alternators have a long, reliable service life, the alternator diodes are easily damaged by high or reversed voltages, or stray currents due to welding. The battery, and alternator should be disconnected when welding!"

- TRUE**  FALSE

Select True or False. "Short circuits are most likely to be found where there is exposed wiring or connections, or where wiring may be cut or damaged as it passes through metal casings, bulkheads etc.!"

- TRUE**  FALSE

Open circuits are best found by checking the most likely causes first. Select the first thing you would check when looking for an open circuit

- Plugs and sockets, and flexible cords and cables
- Screwed connectors
- Fuses and circuit breakers
- Wiring looms

Select the correct answer from the list below. "If the Wattage of a vessel's deck lights are doubled, the electrical wiring will have to carry:

- four times as many amperes
- twice as many amperes
- one half the amperes
- one quarter the amperes

Select the correct answer from the list below. "If the Wattage of a vessel's deck lights are halved, the electrical wiring will have to carry:

- four times as many amperes
- twice as many amperes
- one half the amperes
- one quarter the amperes

Select the best answer from the list below. "Circuit breakers and fuses are used to stop:

- excessive electrical current flowing in a circuit!"
- excessive voltages being accidentally applied to the circuit!"
- 'flashes' due to lightning strikes getting into the ship's wiring!"
- fatalities caused by severe electric shocks

From the list below, select the most likely causes of an electric *OPEN* circuit.

- Damaged insulation due to the rubbing of cables against bulkheads etc
- Fuses, plugs and sockets, flexible cords and exposed connections
- Cables packed too tightly into ducts and through openings
- Conductors accidentally contacting the ship's hull

From the list below, select the most likely causes of an electric *SHORT* circuit.

- Damaged insulation due to the rubbing of cables against bulkheads etc
- Fuses, circuit breakers, plugs and sockets, and flexible cords
- Cables inside ducts and conduits
- Soldered connections becoming corroded and 'dry'

From the list below, identify the statement which indicates the precautions you should take with a vessel's batteries.

- No sparks, flames or welding while charging or servicing batteries
- Use protective goggles, gloves and apron while working with battery electrolyte
- Keep clean water on hand to flush the skin and eyes if chemical burns occur
- All of the above

Select True or False. "Storage batteries should be placed in a sealed cabinet which is vented at the bottom to get rid of gases!"

- TRUE
- FALSE**

Select True or False. "Storage batteries should be placed in a cabinet which is well ventilated at the top to get rid of gases!"

- TRUE**
- FALSE

From the list below, select the first things you would check if the DC electrical feed to a single piece of equipment fails.

- Wiring loom to the equipment
- Main battery terminals and leads
- Fuses, circuit breakers, plugs and electrical connectors
- Cables packed in ducts and through openings

Select the correct answer from the list below. "If a piece of equipment develops a fault, the best way to temporarily disconnect it from electrical power is to:

- Remove fuses or open the circuit at the circuit breaker
- Disconnect DC power at the main battery switch
- Disconnect DC power wiring at the equipment
- Disconnect DC power wiring at the main switchboard

### SECTION 3 - Bilge and Steering Systems

Select the correct answer. "Bilge pumps in a surveyed vessel must:

- be protected by strums, strainers or mud-boxes!"
- be of a type, size and number as specified for the vessel!"
- have a separate power source when more than one pump is specified!"
- all of the above.

Select True or False. "A mud box is similar to a strainer, but has a dam at the base of the strainer plate to catch solids dropping off the strainer plate and prevent them falling back down the suction pipe into the bilge!"

- TRUE**
- FALSE**

Select True or False. "A strum must be placed low in the bilge at the end of the suction pipe, but a strainer may be mounted higher where it is more accessible!"

- TRUE**
- FALSE**

Select the correct answer from the list below. "What would happen to the bilge pumping system if a strainer was leaking around the lid?"

- The lid would leak, and some of the bilge water would run back into the bilges.
- Air would leak into the pump suction line which would slow or stop it pumping.
- The strainer would not work, resulting in rubbish being drawn into the pump.
- Nothing! The leak would have no effect at all.

4. The most appropriate valve used singly in a bilge suction line would be:

- A gate valve, as it will open the entire suction line without restriction
- A butterfly valve, as it is very quick to operate
- A screw-down non-return valve, as it will prevent back-flooding into the bilges
- A sleeve-packed cock, as it will withstand very high pressures

A small leak occurs in the suction side seal or suction lines of a bilge pump. From the list below, select the most likely effects of this leak.

- The leak will have no effect as it is a fairly minor one
- Bilge-water will escape from the suction line while the pump is operating
- Air will be sucked into the suction line. This will break the suction and stop or reduce the flow from the pump
- Air entering the suction line will help to increase the flow of water from the pump

A small leak occurs in the pressure side seal or outlet lines of a bilge pump. From the list below, select the most likely effects of this leak.

- The leak will have no effect as it is a fairly minor one
- Bilge-water will escape from the pressure line while the pump is operating
- Air will be sucked into the pressure line. This will stop or reduce the flow from the pump
- Air entering the pressure line will increase the flow of water from the pump

A centrifugal pump is full of air, due to maintenance on the strainers and suction pipes. From the list below, identify what will happen when the pump motor is started?

- Nothing! The pump will need priming with water before it will pump.
- The pump will take a few minutes to create suction and start pumping
- The pump will quickly fill and begin pumping almost immediately
- The pump will begin pumping almost immediately, but it's flow will be reduced

Select the best answer from the list below. "In a *flexible impeller* pump, water flows to the outlet because:

- centrifugal force flings water to the outside discharge!"
- the impeller lobes are bent by the offset plate, squeezing the water out!"
- a steel rotor distorts the rubber stator, forcing water from the pump!"
- one-way flap-valves ensure the water only goes to the outlet!"

A vessel's bilge system uses strainers and centrifugal pumps. From the list below, select the maintenance checks which should be regularly carried out.

- Strainers to be kept clean
- Pumps and seals to be kept in good working condition
- Strainers and suction lines must be well sealed
- All of the above

"Strums must be mounted in the bottom of the vessel to protect the end of a suction pipe, but strainers may be mounted higher where they are easier to reach!" From the list below, identify how a pump can draw bilge through the strainer without sucking air at the strainer?

- The end of the suction pipe is mounted high in the bilge inside the strainer.
- The strainer is mounted in the delivery side of the pump.
- The strainer is rigid and sealed, and forms part of the suction pipe.
- The strainer is mounted where gravity will deliver bilge-water to it.

From the list below, identify the component which is not part of a bilge pumping system:

- Strums, strainers or mud boxes
- Non-return valves
- Centrifugal or impeller pumps
- Sump scavenge pump

Match the following hydraulic steering systems with their descriptions:

Direct System	..(B)..	A	The movement of the steering wheel serves only to control the power hydraulics
Power Assisted System	..(C)..	B	The movement of the steering wheel supplies the hydraulic power to move the rudder.
Indirect System	..(A)..	C	Manual effort on the steering wheel is aided by supporting power hydraulics

Select True or False. “*All* twin ram steering systems eliminate side-force on the rudder stem!”

TRUE

FALSE

From the list below, select the hydraulic steering system which will almost eliminate side-force on the rudder stem.

- Single ram system-fixed cylinder
- Single ram system-moving cylinder
- Dual ram system, rams on each side
- Dual ram system, both rams on one side

Select True or False. “Cable steering systems may use either a multi-strand flexible steel cable in a ‘pull-pull’ system using guiding pulleys on each side of the vessel, or use a semi-rigid steel cable inside a sheath to provide a ‘push-pull’ steering system from one side of the vessel!”

TRUE

FALSE

From the list below, identify the *disadvantage* of using flexible multi-strand steel cable for vessel steering systems?

- The system cannot be automated using a auto-pilot system
- The system cannot be made as strong as semi-rigid cable systems
- The system requires guide pulleys to be mounted around the vessel, with straight clear spaces between the pulleys

Select True or False. “Dual ram steering systems can be used to increase steering force, and at the same time may be arranged to reduce side thrust on the rudder post!”

TRUE

FALSE

Select True or False. “With direct hydraulic steering, the movement of the steering wheel supplies the hydraulic power to move the rudder!”.

TRUE

FALSE

Select True or False. “With indirect hydraulic steering, the movement of the steering wheel supplies the hydraulic power to move the rudder!”.

TRUE

FALSE

Select True or False. “With indirect hydraulic steering, the movement of the steering wheel serves only to control the hydraulic power used to move the rudder!”.

TRUE

FALSE

From the list below, select the method used to protect hydraulic components against contaminants in the hydraulic oil?

- By the use of abrasion resistant rubber components
- By making tolerances large enough to reduce damage
- By using appropriate strainers and filters
- As hydraulic systems use sealed chambers, contaminants will not cause any damage, so no protection is necessary

## SECTION 4 - Fire and Explosion Emergency (10% of Questions)

From the list below, select the correct answer. "Petrol will ignite if exposed to a spark or flame:

- only if the temperature is above boiling!"
- only on a hot day!"
- only if the temperature is above freezing!"
- even if the temperature is below zero!"

Select True or False. "Diesel fuel will spontaneously burst into flames at a lower temperature than petrol!".

- TRUE**
- FALSE**

Select True or False. "Although LPG and hydrogen gas from charging batteries are both very explosive, hydrogen gas floats away, and is therefore easier to get rid of from a vessel!".

- TRUE**
- FALSE**

Select True or False. "Plastic fuel lines are best in commercial vessels because they are less likely to be cracked by the movement and vibration of the ship!".

- TRUE**
- FALSE**

"LPG tanks and regulators must be mounted outside the deckhouse above decks, or in a sealed fireproof box with a drain vent from the bottom through the hull to the outside above the waterline!" From the list below, select the reason.

- LPG naturally has a sickening smell, and this is unpleasant in a closed space
- LPG will form a heavy explosive mix which will collect inside the vessel if the gas is not properly handled and stored
- The moisture and fumes inside a vessel will corrode the LPG fittings
- LPG tanks collect moisture on the outside which must be drained from the vessel

From the list below, select the best answer. "The LPG tank is turned off at the valve:

- when the vessel is not in use!"
- during vessel re-fuelling operations!"
- in the event of a fire, emergency, or gas leak!"
- for all of the above situations

From the list below, select the correct statement. "Battery cabinets and LPG Lockers are vented differently because:

- LPG gas is present all the time, but batteries only produce gas while they are working!"
- LPG is more explosive than hydrogen gas!"
- LPG produces much more gas than batteries!"
- LPG drains to the lowest point, but battery gas floats to the highest point!"

From the list below, select the statement which is *NOT* true when charging batteries.

- Don't operate the cells with vent caps removed
- Welding is no problem near charging batteries as long as the engine room is ventilated
- keep sparks and flames away from batteries
- remove all electrical load from batteries before disconnecting them

Select True or False. "Care should be taken to keep sparks, flame, and 'hot work' away from the re-fuelling area during vessel re-fuelling operations!".

- TRUE**
- FALSE

On the list below, number the *ORDER* of the actions you would take in the event of a serious fire onboard ship. Assume that you cannot do them all at once.

- (2)  Attempt procedures to save the lives of injured crew if safe to do so.
- (3)  Send emergency calls and prepare lifebuoys if assessed as necessary.
- (1)  Raise the alarm, stop engines and close fuel and LPG cut-off valves.
- (4)  Start attacking the fire with fire extinguishers, and equipment.

From the list below, identify the precautions you would take during re-fuelling operations.

- Use correct (earthed) fuel delivery systems, to minimise the risk of static
- Shut-off LPG systems at the tank during re-fuelling operations, and keep cigarettes, sparks, flame, and 'hot work' away from re-fuelling area
- Avoid spills and clean up after re-fuelling
- All of the above precautions

Select True or False. "To prevent explosive LPG slowly filling the vessel, all LPG appliances must be fitted with a flame failure shut-off to automatically shut-off the appliance if the pilot flame or main burner flame goes out!"

- TRUE**
- FALSE

Select True or False. "In the event of a fire or explosion on board a vessel, you would take the time to raise the alarm to warn others of the danger, and to get help in fighting the emergency!"

- TRUE**
- FALSE

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to determine the type and extent of the fire

- To make sure your insurance will cover the damage
- To make sure your valuable cargo is not going to be lost
- To allow you to make a better assessment of the potential danger, to help you determine the next action to be taken.
- To make sure your personal possessions are safe

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to shut doors and close the ventilation system

- To minimise pollution of the environment
- To minimise passenger smoke inhalation
- To stop the fire travelling
- To help starve the fire of oxygen

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time to check the compartments next to the fire

- To look for extra fire fighting and emergency equipment
- To ensure valuable items are removed
- To check the extent of the fire, and help to assess the danger
- To remove heat sensitive items

In the event of a fire or explosion on board a vessel, identify from the list below why you would take the time constantly assess the situation

- To make sure your insurance will cover the damage
- To allow you to decide if your present action is best, and what the next action should be.
- To ensure valuable cargo is not being lost
- To ensure valuable personal possessions are not being lost