MOTOR VEHICLE MECHANICS 2016 - NECTA FORM FOUR

Solutions from: Maktaba by TETEA

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1.

i	ii	iii	iv	v	vi	vii	viii	ix	x
D	C	A	E	A	C	D	A	A	C

2.(a)(i) puller

(i)plier.

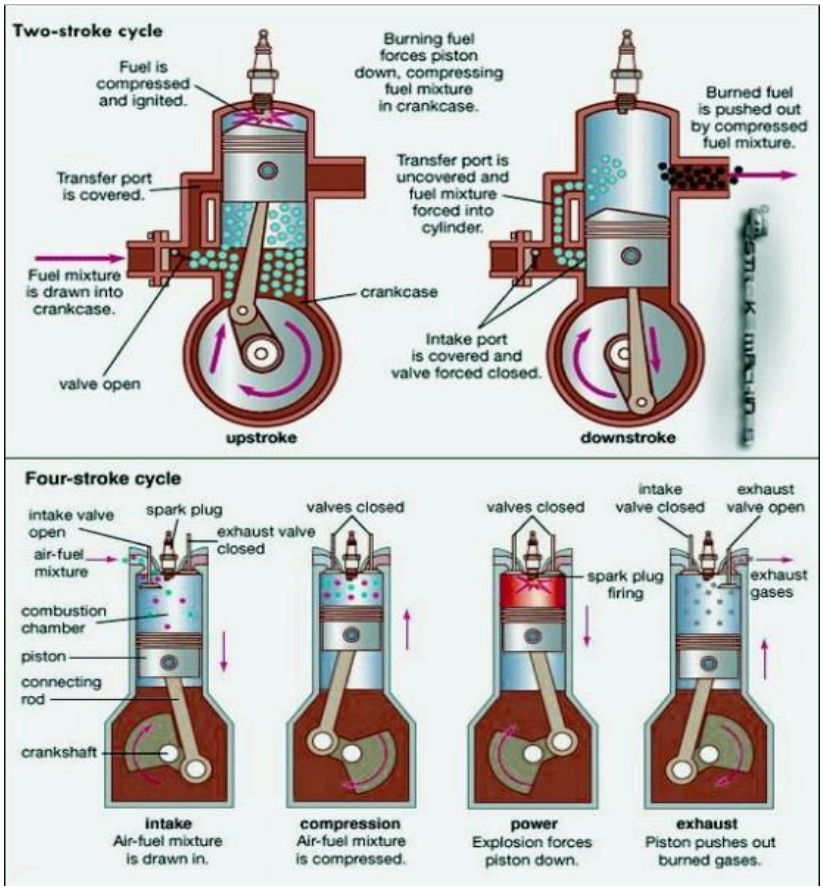
(b)-puller is used to remove parts like bearings and pulleys from the shafts.

-plier is used to hold objects firmly and also bending and compressing the materials.

3.

Comparison of four stroke and two-stroke engine

Four StrokeEngine	**TwoStroke engine**
TheCycleiscompletd in four strokesof	TheCycleiscompleted the piston in twostrokes of the piston
It has one power stroke in two revolutions of crankshaft	It has oen power stroke in one revolution of cranshaft
Heavier flywheel is needed	Ligheter flywheelis required
For the same power heavier engineisrequired	For the same power lighter engine is required
Lesser requirement of Cooling and lubrication	Greater Cooling and Lubrication are required
It contains valves and valve mechanisms so higher in cost	It contain parts so cheaper in cost
More volumetric and thermal efficiency	Less volumetric and thermal efficiency
Used in high effciency motor cycles, cars,buses, trucks.aeroplanes, powergeneretion	Used in lawn mover,scooters,motorcycles,mopedsships



4(a) Cylinder head gasket Its purpose is to seal the combustion gases within the cylinders and to avoid coolant or engine oil leaking into the cylinder.

(b)cylinder head bolt washers ensure the good tighten if bolts on the cylinder head.

5.(a)valve timing is the exact timing of the opening and closing of the valves in a piston engine.

(b)Valve overlap is the period during engine operation when both intake and exhaust valves are open at the same time. Valve overlap occurs when the piston nears TDC between the exhaust event and the intake event. Duration of valve overlap is between 10° - 20° of crankshaft rotation, depending on the engine design. The intake valve is opened during the exhaust event just before TDC, initiating the flow of the new charge into the combustion chamber.

6.Phases of combustion in CI engine are;-

-ignition delay period

-Flame spread

-direct burning.

7.methods to hold during drilling

- Step Blocks
- Clamps
- V-Blocks
- Angles
- Jigs
- T- Slots Bolt

8.(a)(i)camshaft

(ii) crankshaft

(b).

S. No.	Crankshaft	Camshaft
1.	Generally made by alloy steel by forging	It is made by cast iron or steel by casting.
2.	This shaft is situated below the cylinder	It is generally situated above the cylinder.
3.	Crankshaft is used to convert reciprocating motion of piston into rotary motion	Camshaft is used to open and close the inlet and outlet valve at correct timing.
4.	This shaft is rotate by the piston.	Camshaft is rotate by the timing belt attached with the crankshaft.

9.The gear pump and the gear-rotor pump.

10.Crossflow radiators have several advantages:

They remove more heat.

They usually have a larger core area.

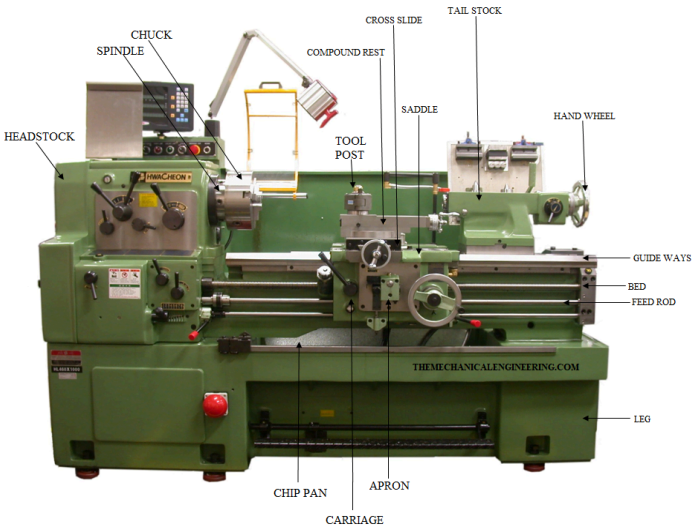
Fluid flows slower through the core and spends more time in the air stream.

Coolant can make Multiple Passes across the core.

The Radiator Cap can be on the low-pressure side.

Increased pressure (like from a high-volume pump) is less likely to force fluid past the cap.

11.



12.Lubrication System Maintenance Check List

Clean lubrication reservoir periodically but do NOT use cotton or fiber rags.

Inspect suction filter and screens: filter should be replaced and screens should be cleaned annually.

Remove and clean strainer regularly.

Change line filter (pressure filter) annually.

Inspect flexible hoses for cracks, punctures and wear.

Check tubing/pipe for flattening or breaks.

Check for leaking or “weeping” at all connections; check tightness of connections but avoid over-tightening.

Monitor system for unusual drops or increases in operating pressure.

Only recommended lubricants should be used. Lubricants with additives that could clog filters or flow apportioning devices should be avoided.

To avoid introducing air and contaminants into the system, follow recommended lubricant storage and filling procedures. Lubricant should be stored in a sealed container at all times. A permanently sealed container with a sump pump to pump out lubricant as needed is recommended. Contaminated lubricant will certainly cause problems.

13.(a)(i)-puller is used to remove parts like bearings and pulleys from the shafts.

a pulley on a car, is slightly different, it is commonly used to transmit power from one point on the engine to another, as it is lighter and quieter than using a chain or a pile of gears.

(ii).

CHASSIS

- When engine , transmission system , steering & wheels are fitted on the frame , the assembly known as the "chassis".
- It is the backbone of the vehicle.
- It is the vehicle without body.
- It contains all the major units necessary to propel the vehicle.
- Vehicle can be driven after placing the driver seat on the chassis.

Integral and chassisless construction

The terms *integral and chassisless construction are often confused, but the* difference is simple. Integral construction is that in which a chassis frame is welded to, or integrated with, the body. It was the first stage in the evolution of the chassisless form of construction, in which no chassis frame can be discerned. The first two quantity-produced vehicles in the latter category

(b)

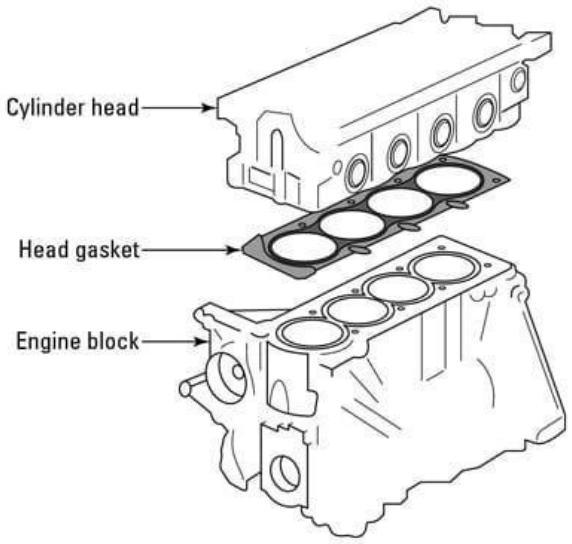
3.Rear engine RWD

- The engine is placed at the rear and the rear wheels are the driven wheels
- Advantages are:
  i. Better tractive forces up the grade
  ii. Front axle construction is simplified
  iii. Absence of propeller shaft allows decrease in chassis height
- The disadvantages are:
  i. May lose balance at high speeds.
  ii. Complicated linkage is required between the engine, clutch and gearbox.
  iii. Rear position of engine, cooling effect is reduced.

14.(a)-The cylinder block is one of your engine's central components. It plays a key role in the lubrication, temperature control and stability of the engine and it has to be of the highest quality so there is no room for short cuts.

-the cylinder head (often informally abbreviated to just head) sits above the cylinders on top of the cylinder block. It closes in the top of the cylinder, forming the combustion chamber.

the head also provides space for the passages that feed air and fuel to the cylinder, and that allow the exhaust to escape.



(b). Piston

A piston is a cylindrical engine component that slides back and forth in the cylinder bore by forces produced during the combustion process. The piston acts as a movable end of the combustion chamber. The stationary end of the combustion chamber is the cylinder head. Pistons are commonly made of a cast aluminum alloy for excellent and lightweight thermal conductivity. Thermal conductivity is the ability of a material to conduct and transfer heat. Aluminum expands when heated, and proper clearance must be provided to maintain free piston movement in the cylinder bore. Insufficient clearance can cause the piston to seize in the cylinder. Excessive clearance can cause a loss of compression and an increase in piston noise.

Piston features include the piston head, piston pin bore, piston pin, skirt, ring grooves, ring lands, and piston rings. The piston head is the top surface (closest to the cylinder head) of the piston which is subjected to tremendous forces and heat during normal engine operation.

A piston pin bore is a through hole in the side of the piston perpendicular to piston travel that receives the piston pin. A piston pin is a hollow shaft that connects the small end of the connecting rod to the piston. The skirt of a piston is the portion of the piston closest to the crankshaft that helps align the piston as it moves in the cylinder bore. Some skirts have profiles cut into them to reduce piston mass and to provide clearance for the rotating crankshaft counterweights.

A ring groove is a recessed area located around the perimeter of the piston that is used to retain a piston ring. Ring lands are the two parallel surfaces of the ring groove which function as the sealing surface for the piston ring. A piston ring is an expandable split ring used to provide a seal between the piston an the cylinder wall. Piston rings are commonly made from cast iron. Cast iron retains the integrity of its original shape under heat, load, and other dynamic forces. Piston rings seal the combustion chamber, conduct heat from the piston to the cylinder wall, and return oil to the crankcase. Piston ring size and configuration vary depending on engine design and cylinder material.

Piston rings commonly used on small engines include the compression ring, wiper ring, and oil ring. A compression ring is the piston ring located in the ring groove closest to the piston head. The compression ring seals the combustion chamber from any leakage during the combustion process. When the air-fuel mixture is ignited, pressure from combustion gases is applied to the piston head, forcing the piston toward the crankshaft. The pressurized gases travel through the gap between the cylinder wall and the piston and into the piston ring groove. Combustion gas pressure forces the piston ring against the cylinder wall to form a seal. Pressure applied to the piston ring is approximately proportional to the combustion gas pressure.

A wiper ring is the piston ring with a tapered face located in the ring groove between the compression ring and the oil ring. The wiper ring is used to further seal the combustion chamber and to wipe the cylinder wall clean of excess oil. Combustion gases that pass by the compression ring are stopped by the wiper ring.

An oil ring is the piston ring located in the ring groove closest to the crankcase. The oil ring is used to wipe excess oil from the cylinder wall during piston movement. Excess oil is returned through ring openings to the oil reservoir in the engine block. Two-stroke cycle engines do not require oil rings because lubrication is supplied by mixing oil in the gasoline, and an oil reservoir is not required.

15(a)

	Internal Combustion Engine	External Combustion Engine
1	Name it self says that, combustion take place inside the cylinder.	Name it self says that, combustion take place outside the cylinder.
2	Temperature is higher.	Temperature is lower.
3	Pressure is higher.	Pressure is lower.
4	In IC engine, piston and connecting rod is use.	In EC engine, stuffing box is use.
5	Efficiency is higher.	Efficiency is lower.
6	Lighter in weight.	Heavy in weight.
7	IC engine is costly.	EC engine is cheaper compared to IC engine.
8	Less time required to start.	More time required to start.
9	Pressure generated inside the engine is due to combustion of fuel.	Pressure generated inside the engine is due to steam of water.
10	Fuel tank required to store fuel.	Boiler and water storage required to generate steam.

(b)

Volume of one cylinder= $\pi r^2 h$

$= \pi \times (40 \times 10^{-3})^2 \times 70 \times 10^{-3}$

$= 28\pi \times 10^{-4}\ m^3$

Then, engine capacity = volume x no. Of cylinders

$= 28\pi \times 10^{-4}\ m^3 \times 4$

$=112\pi \times 10^{-4}\ m^3$

Also, swept volume = volume of the cylinder

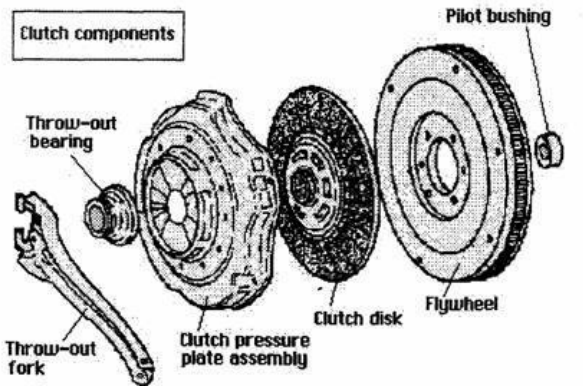
$= 28\pi \times 10^{-4}\ m^3$

From compression ratio = (CV + sv)/sv

$10 = (CV + 28\pi)/28\pi$

Clearance volume is 252π cc.

16.(a).



(b)

Flywheels-Function need and Operation

A flywheel is a mechanical energy storage/delivery device that stores energy in the form of kinetic energy.

If the source of the driving torque or load torque is fluctuating in nature, then a flywheel is usually called for.

The main function of a fly wheel is to smoothen out variations in the speed of a shaft caused by torque fluctuations.

Internal combustion engines with one or two cylinders are a typical example. Piston compressors, punch presses, riveting machine, rock crushers etc. are the other systems that have fly wheel.

In case of steam engines, internal combustion engines, reciprocating compressors and pumps, the energy is developed during one stroke and the engine is to run for the whole cycle on the energy produced during this one ,stroke.

Flywheel absorbs mechanical energy by increasing its angular velocity and delivers the stored energy by decreasing its velocity

- An universal joint or Hooke's joint is used to connect non parallel and intersecting shafts having small intersecting angle.
- It is mainly used to transmit power from gear box to rear axle in automobile vehicles.
- The motion is transmitted from one shaft to another by the centre piece.
- The driving shaft rotates at uniform angular speed but the driven shaft rotates at continuously varying angular speed.

A clutch disc is a rotating circular metal plate splined to the transmission input shaft that's covered with friction material on both sides. The disc is located between the engine flywheel and the clutch pressure plate, and is clamped tightly between these two members when the clutch is engaged. Clutch discs may also be described as friction discs.

The clutch pressure plate is a spring-loaded metal plate that spins with the flywheel and applies pressure to clamp the clutch disc firmly between itself and the flywheel. When the clutch is engaged, springs in the pressure plate force the clutch disc against the flywheel.