

AUTO MECHANICS 2

1. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Majority of the candidates were able to list the hand tools used in cutting metals.
- (2) Most of the candidates provided good explanation for bleeding compression ignition engine.
- (3) Majority of the candidates correctly stated the advantages of the radial-ply tyres over the cross-ply tyres.

2. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Majority of the candidates failed to identify the type of drive shown in figure 1.
- (2) Majority of the candidates were unable to explain splash feed.
- (3) The sketch of the bellows type thermostat was poorly done by most of the candidates

3. SUGGESTED REMEDIES

- (1) Teachers must guide students to understand what it entails in drawing line diagrams and also making good sketches of vehicle components.
- (2) Candidates should ensure they cover every aspect of the syllabus in order to be well prepared for the examination.

4. DETAILED COMMENTS

QUESTION 1

a. List three hand tools used in cutting metals in the workshop.

Generally, most candidates provided good answers. However, some of them wrote answers that were incorrect e.g., circular saw, hand saw, angle grinder and hack saw blade.

The expected answers are; hack saw, snips, bolt cutter, file, shears, cutting pliers, chisels, hand drill, tap and dies.

b. Figure 1 shows a type of drive and engine position in a motor vehicle.

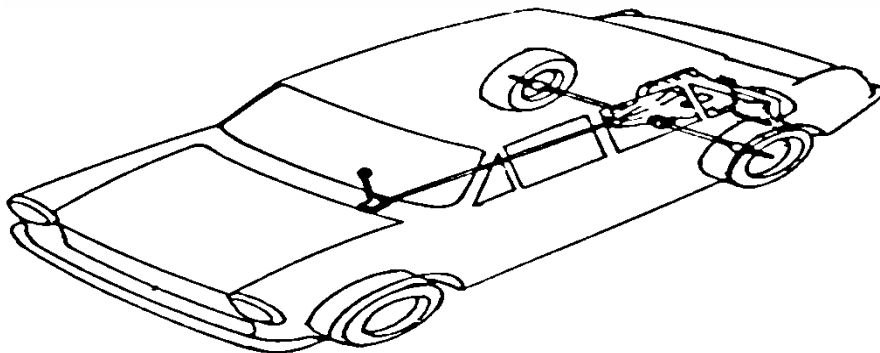


Figure 1

i. State the type of drive.

A large number of the candidates could not answer this question successfully.

Most of the answers provided were; front wheel drive, rear wheel drive.

The expected answer is rear engine rear wheel drive.

ii. State two merits of this type of drive.

Some incorrect answers stated by the candidates are:

It uses propeller shaft to transfer torques;

It balances the weight of the vehicle.

A few candidates who were obviously confused, stated the advantages of computer drives e.g. solid-state drives (SSD) are faster than the hard disk drive (HDD).

Solid state drives (SSD) have no moving parts, making them more durable and less prone to mechanical failure.

Some of the answers captured in the marking scheme were:

- Large lead on driving wheels gives good grip;
- More efficient and simpler drive layout;
- Front wheels are used solely for steering;
- The front of the vehicle can be designed to give good visibility;
- Noise, heat and fumes are taken away from the passengers.

c. Explain the reason for the inward-tapering of the side frames of a conventional vehicle layout at the front.

Some candidates stated answers that are similar to the expected answers.

However other candidates wrote incorrect answers such as;

- Inward tapering of the side frames reduces the impact of frontal collision.
- Inward tapering of the front is to make the vehicle aerodynamic to penetrate air easily.

The expected answers include;

- It allows for adequate movement of the steered wheel hence the front wheels can be maneuvered easily in confined spaces.
- It allows a greater steering lock and therefore a smaller turning radius.

d. Name the tool used to check the following in an automobile workshop:

- (i) valve clearance;**
- (ii) engine compression;**
- (iii) oil in the engine sump.**

Most candidates stated answers which were close to the expected responses. However, some incorrect answers were also written by some candidate's e.g.

valve clearance – torque gauge

engine compression – vacuum/ compression gauge

oil in the sump – oil gauge / gauge rod.

The expected responses are;

- i. valve clearance – feeler gauge;
- ii. engine compression – compression gauge;
- iii. oil in the sump – dip stick.

QUESTION 2

a. The sketch in Figure 2 shows a type of cylinder block.

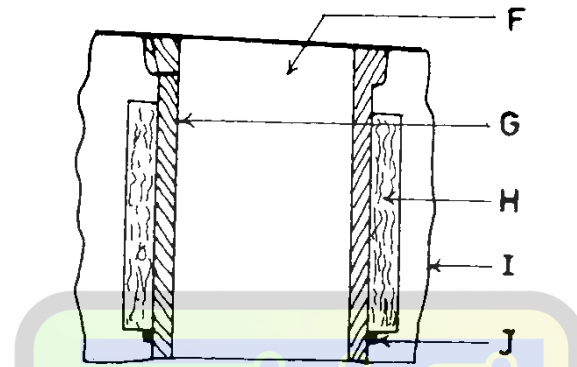


Figure 2

i. Identify the type of cylinder block shown.

The question was properly answered by most candidates but there were also poorly stated answers such as monoblock, integral cylinder block.

The expected response is;

Cylinder block with wet liner or water-cooled cylinder block.

ii. Name the parts labelled F, G, H, I and J.

Although some candidates provided correct answers, a section of them listed some wrong responses such as;

F – piston;

G – connecting rod;

H – crankshaft;

I – camshaft;

J – cylinder.

The expected responses are;

F – Cylinder bore/ bore;

G – cylinder wall/liner;

H – water jacket;

I – cylinder block;

J – rubber seal/ seal.

iii. State the purpose of the part labelled U.

Since there is no part labelled U on the sketch, any reasonable response was accepted.

b i. Explain the following terms in relation to the lubrication system:

- i. pressure feed;**
- ii. Splash feed.**

In explaining pressure feed, most candidates stated that the oil pump is used to force oil under pressure to lubricate engine parts without mention of the gallery pipe and the crankshaft and camshaft bearing.

On the other hand, others provided answers that are unacceptable e.g. Pressure feed uses pump to circulate air to the various Parts of the engine

The pressure feed is a pump that supplies oil to the engine by splashing.

The expected response is;

The oil pump delivers oil under pressure into the gallery pipe.

Each main journal bearing is connected to the gallery pipe by drilled holes in the crankcase web. These holes enable oil under pressure to lubricate the crankshaft and camshaft bearings.

Explaining splash feed:

The answer recorded in the marking is;

The oil which escapes from the big end bearings is splashed all around the inside of the crankcase and cylinder walls. Adequate quantity of oil is also supplied to the tappets, the distributor driving gears, the pistons and gudgeon pins.

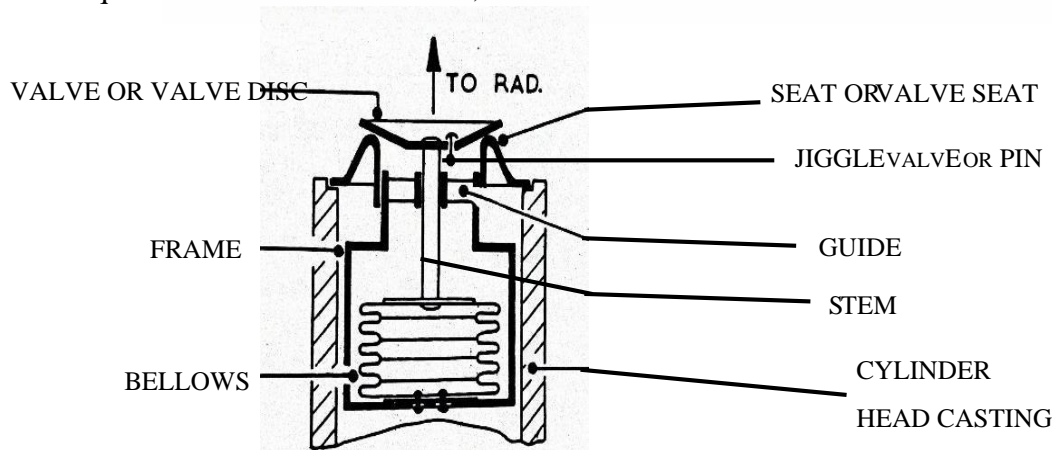
A few candidates provided answers that were acceptable but in contrast, others were incorrect e.g. Splash feed uses pumps that splash oil to the rings in the engine.

Splash feed works under the principles of hydraulics to lubricate the walls to reduce friction.

QUESTION 3

a. Sketch the bellows type thermostat used in the watercooling system and label three parts.

Generally, the sketch was poorly done. A few candidates however had acceptable sketches. The required sketch is shown below;



b. Explain how a two-stroke ignition engine is lubricated.

Lubrication of two stroke spark ignition engine.

Most candidates wrote about the mixing of the engine oil and the petrol and ended their response.

An example of an incorrect answer stated by a few candidates is;

The two-stroke engine is lubricated by pressure feed to run the system smoothly.

The expected response is;

In the two-stroke spark ignition engine, a small quantity of engine oil is mixed with petrol by ratio. Lubrication of the working parts occur as the mixture flows through the engine to lubricate the piston, cylinder walls, crankshaft and other parts.

c. Explain why bleeding is necessary in a compression ignition engine.

The response indicated by most of the candidates is;

Bleeding is the removal of air trapped in the fuel system of the compression ignition engine. One disturbing answer written by a candidate is bleeding is necessary to avoid bouncing of the brake pedal.

Some expected responses are;

Air trapped in the compression ignition engine fuel system may lead to air lock, difficulty in starting, engine stalling and rough engine operation.

QUESTION 4

a. State three advantages of the radial-ply tyres over the cross-ply tyres.

Many candidates wrote good answers in response to the question.

A few of the incorrect answers stated by the candidates are:

It provides more limited form of suspension;

It helps the vehicle to encounter irregularity;

It has a speeding rate.

A few of the advantages that were expected are:

The side walls are much more flexible;

They hold the road better (grip);

About 80% longer life span;

Lower rolling resistance, so improved fuel consumption;

Full width of the thread is held on the ground.

b. State three defects in the braking system that cause excessive brake-pedal travel.

Although most of the candidates provided correct answers, others also stated incorrect answers such as:

- Worn brake pedal;
- Brake drag;
- Brake slip;
- Brake fade.

Some of the expected responses are:

- Air in the braking system;
- Excessive push-rod clearance;
- Leakage in the brake system;
- Badly worn brake linings;
- Low fluid level in the reservoir.

c. List three types of wheel rims.

Only a few candidates had that question correct. Mainly the rest of the candidates stated the answers for the three types of wheels as pressed steel wheels, alloyed wheels, spoked wheels.

The expected responses are;

- Well-base rim, Semi-drop-centre rim, Three-piece rim/flat base, divided rim, wide base rim.

QUESTION 5

a. The sketch shown in Figure 3 is an electrical component.

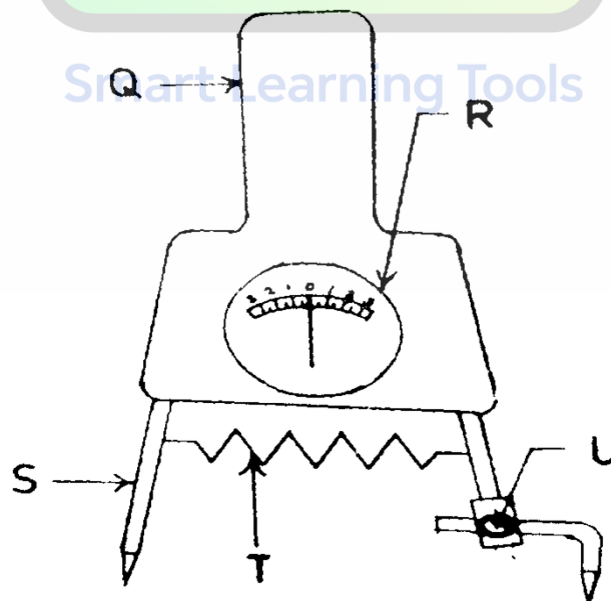


Figure 3

i. Identify the component.

Unfortunately, many candidates stated incorrect answers such as; Hydrometer and electrical component.

The expected response is
The high-rate discharge tester.

ii. Identify the parts labelled Q, R, S, T and U:

Some incorrect answers to the labelled parts which radiated through a group of the candidates are as shown below;

Q – resistor, R – diode, S – capacitor T – inductor, U – transistor

The expected responses are;

Q – insulated handle, R – voltmeter, S – fixed prod, T – resistor, U – clamp screw

b(i). State one function of the hydrometer.

Many candidates provided good answers to the question. In a few cases, some candidates gave the following incorrect answers.

The hydrometer is used to check the amount of fuel in the tank.

The hydrometer is used to increase the specific gravity of a liquid.

The expected response is;

The hydrometer is an instrument used to determine the specific gravity or relative density of the electrolyte.

(ii). State two safety precautions to be observed when diluting electrolyte.

A considerable number of the candidates provided diverse precautions to answer the question successfully.

It is important however to draw attention to these incorrect answers provided by a few candidates.

Eye gloves must be worn.

The use of google to prevent electric shock.

Pour the water gently into the acid to prevent splashing.

Some expected responses are:

The mixing must be done in a large acid-proof vessel;

It is extremely important to add acid to the water, but not the reversed way round;

The mixing must be done slowly as the acid is added in small quantities;

During the mixing the solution must be stirred with a glass or plastic rod;

The eye and face must be protected with goggles or face shield;

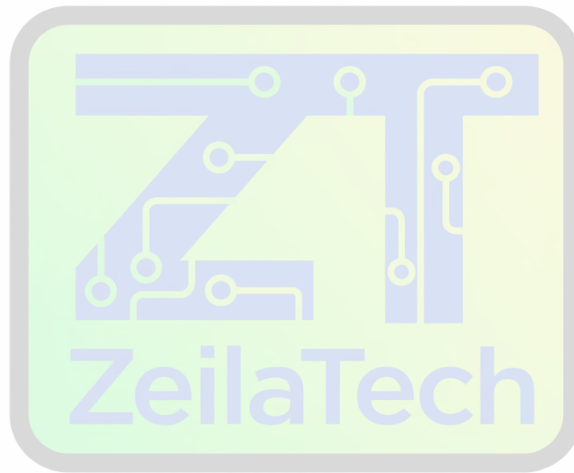
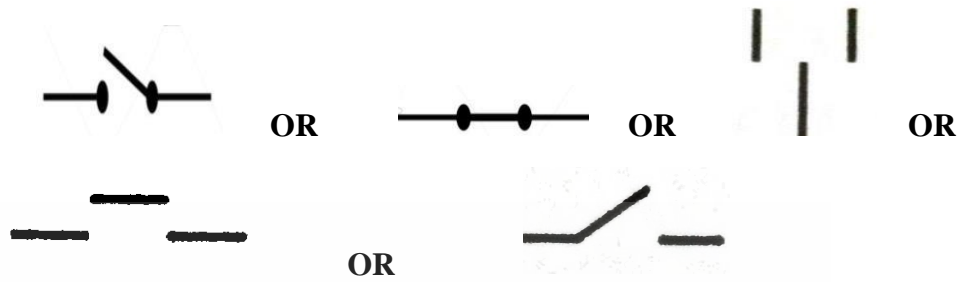
Acid proof clothes and personal protective equipment must be worn.

(c). Sketch the electrical symbol of a switch.

Generally, the sketch of the electrical symbol of a switch posed no challenge to the candidates.

However, some candidates drew sketches that were drastically out of proportion.

The required sketches are shown below;



Smart Learning Tools

AUTO MECHANICS 3

1. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) The candidates were suitably dressed in appropriate safety outfits.
- (2) The candidates had clean pieces of cloth for cleaning their hands and tools.
- (3) The candidates observed a good measure of safety practices during the practical exercise.

2. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Majority of the candidates had no in-depth knowledge of the names of engine parts and components.
- (2) There were noticeable challenges in handling of the tools during loosening of parts and components.
- (3) Some candidates were timid in answering questions posed to them.

3. SUGGESTED REMEDIES

- (1) Teachers must assist candidates to learn the names of parts and components of a vehicle.
- (2) Students must make time to visit garages frequently to learn the correct use of basic tools.

4. DETAILED COMMENTS

QUESTION 1

From the vehicle provided:

- a. **remove the lens and bulb of the trafficator light indicated by the Examiner. Report to the Examiner;**
- b. **check the condition of the lens and bulb. Report to the examiner;**
- c. **measure the current flow. Report to the Examiner;**
- d. **check the condition of the trafficator light assembly. Report to the examiner;**
- e. **refit the bulb and lens. Report to the examiner**
- f. **test the trafficator. Report to the Examiner;**
- g. **answer two relevant questions from the Examiner.**

(a) Removal of the lens and bulb of trafficator light.

Remove one battery lead from the terminal. Select a suitable screw driver and unscrew the trafficator lens and remove the lens, shield and the bulbs.

Only a few candidates exhibited the precautionary measures involved in the removal of one lead from the battery before working on the electrical system. However, the candidates removed the lens and bulbs easily.

(b) The lens is examined for any physical damage and the bulb is also examined for turning blackish or partly burnt. Burnt bulbs must be replaced. In case the lens is broken, the light unit must also be replaced.

The candidates had no difficulty checking the conditions of the lens and the bulb.

(c) To measure current flow to the trafficator light.

Reconnect the battery lead to its terminal and turn on the ignition switch. Turn the knob of the multimeter to ammeter and connect one lead to the centre terminal of the bulb and the other lead to its socket. The instrument must indicate the amount of current flow in amperes.

Although many candidates measured the current flow successfully, others had challenges with connecting the instrument and selecting of ammeter on the instrument.

(d) Checking condition of the trafficator light.

With one terminal of the battery disconnected, examine the trafficator light socket for corrosion and clean it with emery cloth. Examine the terminal of the bulb for wear. The light socket must be replaced when faulty.

The candidates remarkably examined and also cleaned the trafficator light housing with ease.

(e) Refitting bulb and lens

Refit the bulb in its socket and lock it to its position and refit the lens and its shield, tightening the screws firmly.

(f) Testing the trafficator light

Reconnect the cable to the battery terminal and turn on the ignition key. Engage the trafficator light and observe its performance. The light unit must function correctly if there is no hidden fault.

The candidates had a satisfactory performance.

(g) Examiner's Questions

These were sampled questions posed by the examiner.

i. Name one major part of a light unit.

Expected response: Reflector, bulb or lens

The majority of the candidates responded favourably, however others gave wrong responses such as fog light, headlamp.

ii. The part of the light unit which concentrates the beam in the desired direction is known as?

Expected response: Reflector

Many candidates gave poor answers e.g., Direction indicator and trafficator.

QUESTION 2

From the engine provided:

- a. remove the sump. Report to the Examiner;**
- b. remove one big end cap specified by the Examiner. Report to the Examiner;**
- c. identify four parts specified by the Examiner. Report to the Examiner;**
- d. examine the condition of the bearings. Report to the Examiner;**
- e. refit the bearings and the big end cap. Report to the Examiner;**
- f. refit the sump. Report to the Examiner;**
- g. answer two relevant questions from the examiner.**

Warm the engine to its normal operating temperature.

Position the vehicle over a pit on a solid and levelled ground and wedge the wheels.

Alternatively, the vehicle can be raised with a lift.

a. Remove the oil filler cap, place an oil collecting bowl under the sump and remove the drain plug to drain the engine oil. Take steps to avoid hot oil burns. Clean the drain plug and its washer, inspect the thread and refit it to its position.

Most candidates drained the engine oil with ease but only a few had the knowledge of removing the oil filter cap. Sequentially remove the sump securing bolts and tap it gently with a mallet hammer to remove it from the engine block.

b. To remove the specified big-end cap, select the right spanner or sockets to slack and remove the bolts and washers. Tap on the big-end cap with a mallet hammer to remove it.

The candidates performed the task creditably.

c. The candidates were tasked to identify the big-end bearing, the crankpin, the main journal and main journal cap.

Surprisingly, the candidates could not easily identify those parts correctly. Similarly, many candidates could not establish the difference the crank pins and the main journals.

d. To determine the condition of the bearings, critically examine its inside surface, having removed it from the cap and rub the fingers on the surface.

Clearly, most candidates correctly stated the condition of the big-end bearing which had worn tracks inside its surface and was also rusted.

e. The refitting of the big-end bearings involved cleaning it thoroughly of any dirt, applying engine oil to it lightly, then pressing it to sit and align properly in big-end cap. The cap and

bearing assembly are mounted over the appropriate crankpins and then tightened. A torque wrench must be employed in the final tightening.

Most candidates had a satisfactory performance in refitting the big-end bearings.

f. To refit the sump, it must be thoroughly cleaned including the flange and also the mating face on the engine block. Observe the condition of the gasket and refit the sump to its position correctly, ensuring the gasket has not shifted. An approved gasket adhesive may be used. The bolts must be given a crisscross tightening and a torque wrench must be used to correctly load the bolts.

Majority of the candidates did a good job in the refitting of the sump to the engine block.

g. Examiner's Questions

These were sampled questions posed by the examiner.

1. State the main purpose of the engine lubrication system.

Expected response:

Its main purpose is to reduce friction and wear between components in relative motion.

2. State ONE reason which warrants the removal of the sump.

Expected response:

- a. To service engine bearings
- b. To service or replace oil pump
- c. When carrying out the engine overhaul.
- d. When replacing a damaged sump.

About half the number of the candidates struggled in coming out with the right responses.

The candidates had a good knowledge of positioning the vehicle on a levelled ground and wedging the wheels.