

### 3.5 POWER MECHANICS (447)

The 2019 KCSE examinations for Power Mechanics consisted of two papers namely: Paper 1 (theory) and Paper 2 (Practical). There was no change in the format and weighting of the papers.

#### General Candidates Performance

The candidate's performance statistics since the year 2014 are as shown in the table below.

Table 12: Candidates' overall performance in the last six years

Year	Paper	Candidature	Maximum scores	Mean Score	Standard deviation
2014	1	166	60	41.14	7.93
	2		40	30.21	2.91
	Overall		100	71.35	9.81
2015	1	160	60	40.00	8.05
	2		40	29.51	4.11
	Overall		100	69.51	11.06
2016	1	162	60	37.30	8.25
	2		40	27.57	3.55
	Overall		100	64.87	9.95
2017	1	166	60	31.42	9.86
	2		40	30.10	3.99
	Overall		100	61.52	12.42
2018	1	219	60	27.46	11.48
	2		40	25.23	4.63
	Overall		100	52.69	16.11
2019	1	254	60	30.00	11.09
	2		40	25.00	6.01
	Overall		100	55.00	17.10

From the table, it can be observed that:

- The mean score improved from **52.69** in the year 2018 to **55.00** in the year 2019.
- The candidature increased from **219** in the year 2018 to **254** in the year 2019, which is about 13.78% increase.
- The mean score has improved this year after a consistent drop for the last four years.

#### 3.5.1 Power Mechanics Paper 1 (447/1)

Questions 7 (b), 8 (a), 9(a) & (b) and 12 (a) & (b) were reported to have been poorly performed. They have been analyzed with a view to pointing out candidate's weakness and propose suggestions on some remedial measures that would be taken in order to improve the performance in future.

#### Question 7 (b)

- (b) State two methods used by motor vehicle designers to reduce crankshaft whip. (2 marks)

### Weakness

Most of the candidates could not state the two methods used to reduce the crankshaft whip. The term “*whip*” was not familiar to most of the candidates.

### Advice to teachers

Teachers are advised to expose the learners to various terminologies used in power mechanics.

### Expected response

- Making the crankshaft heavier.
- Using more support bearings.

### Question 8 (a)

- (a) Outline two causes of excessive *sulphation* of a vehicle battery. (2 marks)

### Weakness

Majority of the candidates were unable to identify the causes of excessive *sulphation* in a vehicle battery. This could be due to the usage of the term *sulphation* which appeared not to be very familiar with majority of the candidates.

### Advice to teachers

Teachers are advised to cover the operation of engine system adequately.

### Expected responses

- Prolonged discharging.
- Local chemical action in the cell due to dirt particles.
- Insufficient or infrequent charging.
- Frequent low electrolyte level.
- Low specific gravity of electrolyte.

### Question 9 (a) & (b)

- (a) Explain the following terms as used in braking systems

(i) brake fade (1mark)

(ii) primary shoe (1mark)

- (b) State the purpose of the safety ridge near the lips of a tyre rim. (1mark)

### Weakness

Majority of the candidates were not familiar with the given terminologies;  
“*brake fade*” which simply *means loss of stopping power*,  
“*primary shoe*” which also means *leading shoe* and  
“*lips of a tyre rim*” which also means *outer edge of a tyre rim*.

### Advice to teachers

Teachers are advised to be using synonyms of important terms used in power mechanics as they teach.

### Expected responses

- (a) (i) Brake fade – refers to loss of frictional properties of the brake lining due to overheating.  
(ii) Primary shoe: refers to the forward or leading brake shoe that moves in the direction of rotation of the drum  
(b) Its purpose is to prevent the tyres from moving into the drop center of the rim when the tyre blows and thus coming off the wheel.

### Question 12 (a) & (b)

12. (a) Figure 2 shows a component of a vehicle system.

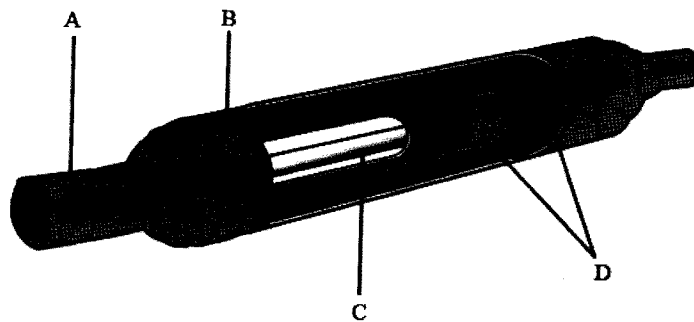


Figure 2

- (i) State the name and type of the component. (1 mark)  
(ii) Name the parts labelled A, B, C and D. (2 marks)  
(iii) Explain how the component works. (3 marks)
- (b) Interpret the meaning of each of the following types of smoky exhausts and in each case, state two possible causes. Complete the table. (9 marks)

### Weakness

Most of the students were unable to identify the correct name and the type of the component hence could not explain how the component works. It was also noted that the majority of the learners had difficulties in identifying the correct types of smoky exhausts and their possible causes.

### Advice to teachers

Teachers are advised to extensively teach vehicle systems such as exhaust with the construction, operation and fault diagnosis. Candidates should also be exposed to more *practical* cases of identifications of smoky exhausts.

### Expected responses

(a) (i) Straight through muffler

(b) (ii) A - inlet

B - shell (body)

C - perforated pipe

D - fibre glass

(iii) - Hot exhaust gases enter through the inlet into the silencer.

- As they pass through the packed fibre glass material, their noise is muffled or reduced and the flow is such that back pressure is impeded.
- The gas go out through the outlet.

(b)

Type of smoke	Meaning	Possible causes
Blue	Water in the system	<ul style="list-style-type: none"><li>- Worn piston</li><li>- Bad valve seal</li><li>- Damaged glow plug</li><li>- Stuck PVC valve</li><li>- Worn Engine</li><li>- Blown turbo</li></ul>
Black	Mixture is too rich	<ul style="list-style-type: none"><li>- High speed driving</li><li>- Fuel pump leakage/faulty</li><li>- Clogged air cleaner</li><li>- Stuck jets/fuel needle</li></ul>
White	There is steam in exhaust	<ul style="list-style-type: none"><li>- coolant leaking into exhaust</li><li>- worn cylinder head gasket</li><li>- loose cylinder head bolts</li></ul>

### 3.5.2 Power Mechanics Paper 2 (447/2)

The paper had 10 equally weighted compulsory exercises. It tested competencies in the following areas:

- a) Sketching in good proportion an exploded double-piston wheel cylinder braking system.
- b) Fabricating a *metal bracket*.
- c) Identifying, naming and stating the purpose of selected vehicle parts
- d) Determining the primary and secondary resistance of the ignition coil using multimeter and testing for ground.
- e) Connecting the horn circuit and adjusting the horn to attain a smooth medium hooting.
- f) Identifying and stating the defect and effect of the selected vehicle parts.
- g) Servicing the air cleaner and checking the quality of the sparks produced by the spark plug.
- h) Checking on the service condition of the needle valve of the carburetor, determining the float level and float drop and reassembling of the carburetor.
- i) Identifying the type of the selected tools and stating one use of each in a motor vehicle.
- j) Identifying four parts driven by fan belt and part of the system it belongs to and conducting visual checks on radiator cap, radiator hose and the radiator of the cooling system

**NB:** Most of the competencies were well exhibited by the candidates during the exam. However, the candidates showed inadequacies in demonstrating the competencies in *(a) and (b)*.

#### **Advice to teachers**

Emphasize on a sketching in good proportion an exploded view of various parts/objects and let the candidates do a lot of practice on fabrications.