

3.5 POWER MECHANICS (447)

The **2022 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.

3.5.1 General candidates performance

The candidate's performance statistics since the year 2017 are as shown in the table below.

Table 14: Candidates overall performance in the year 2017 to 2022

Year	Paper	Candidature	Maximum scores	Mean Score	Standard deviation
2017	1		60	31.42	9.86
	2		40	30.10	3.99
	Overall	166	100	61.52	12.42
2018	1		60	27.46	11.48
	2		40	25.23	4.63
	Overall	219	100	52.69	16.11
2019	1		60	30.00	11.09
	2		40	25.00	6.01
	Overall	254	100	55.00	17.10
2020	1		60	34.77	11.03
	2		40	28.34	4.66
	Overall	276	100	63.12	14.4
2021	1		60	34.52	11.76
	2		40	28.57	5.59
	Overall	255	100	63.09	16.58
2022	1		60	36.56	12.64
	2		40	30.34	4.77
	Overall	270	100	66.9	16.5

The table reveals that the performance in Power Mechanics has been improving for the last five years. In 2022 there was a remarkable improvement (from 63.09 in 2021 to 66.9 in 2022). This improvement was also noted in individual subject performance. It is also worth noting that the candidature increased from 255 in 2021 to 270 in 2022, which is about **5.56%**.

3.5.2 Power Mechanics Paper 1 (447/1)

Most of the questions were well performed with most of the student performing above average. However, questions **12 (a)(iii), 12(b), 13 (a)(iii) and 14(b)** were reported to have been poorly performed. They are analyzed below.

Question 12 a (iii), b

(iii) Distinguish between 'wet' and 'dry' liners or sleeves used in aluminium engine blocks. (2 marks)

(b) Explain five operational differences between a two-stroke cycle and a four-stroke cycle petrol engine. (10 marks)

Weakness

A good percentage of the candidates had difficulties in coming up with the accurate distinction between 'wet' and 'dry' liners or sleeves used in aluminium engine blocks. On the other hand providing operational differences between a two-stroke cycle and a four-stroke cycle petrol engine posed a challenge to most students.

Advice to teachers

Teachers are advised to provide more related sample tests and employ practical approaches during teaching and learning.

Expected response

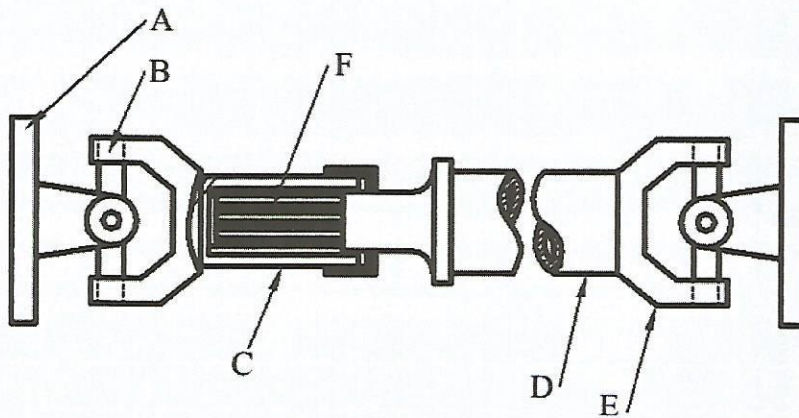
(a) (iii) Wet liners are in direct contact with engine coolant while dry liners are not. Dry liners are pressed into the completed block.

12(b)

2 - stroke	4 - stroke
<ul style="list-style-type: none">- Piston performs two tasks: Acts as a valve and is the compressor in primary and secondary compression.- Mixture comprises of petrol air and lubricating oil- Engine has two compression; Primary and secondary- Engine produces ONE power stroke for every revolution of crankshaft- Not all exhaust gases are cleared from the combustion chamber, hence preventing fresh charge from entering the cylinder- Highest fuel consumption because of high scavenging	<ul style="list-style-type: none">- Piston only acts as a compressor because the engine has valves- Mixture comprises of petrol and air only- Engine has only one compression- Engine produces ONE power stroke for every two revolutions of the crankshaft- Nearly all burnt gases are cleared, thus allowing more fresh charge to enter the cylinder- Lower fuel consumption because of lower scavenging

Question 13 (a)(iii)

Figure 2 shows a motor vehicle component



- (i) Name the component and the vehicle system it belongs to. (1 mark)
- (ii) Identify the parts labelled A to F. (3 marks)
- (iii) Explain how each component operates. (7 marks)

Weakness

Most of the candidate were unable to correctly explain how each of propeller shaft used in a transmission system component operates.

Advice to teachers

Teachers are advised to expose the learners to more related tasks including practical approaches.

Expected responses

- (i) Propeller shaft: transmission system
- (ii)

A - Drive plate	B - Cross or spider
C - Sliding joint	D - Tube
E - Yoke	F - Splines
- (iii) Operation
 - Since the gearbox and the differential drive pinion are installed at an angle to the horizontal (1), the propeller shaft, being the linking member between the two, is also installed at an angle called universal joint operating angle (1)
 - As the final drive moves up and down due to road irregularities, the drive shaft length changes (1) thus changing the operating angle (1)
 - To allow for up and down movement of the final drive, the propeller shaft must flex (1) and this is facilitated by the universal joint (1)
 - The drive shaft also lengthens and shortens due to road conditions. This is facilitated by the slip joint (1)

Question 14 (b)

With the aid of a labelled diagram, explain the operation of a cam-operated drum brake system. (12 marks)

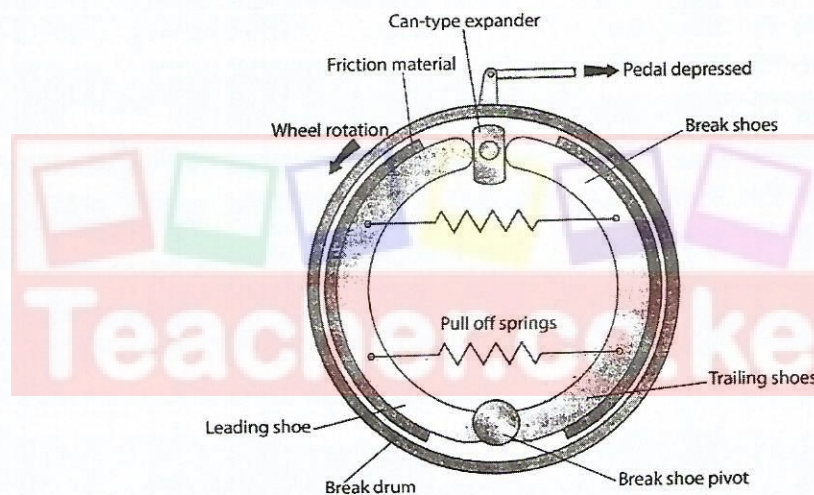
Weakness

Most of the candidate were unable to come up with accurate and a well labeled diagram of cam-operated drum brake system.

Advice to teachers

Teachers are advised to use practical approach and more exercises.

Expected responses



Operation

- When the brake pedal is depressed, it pulls the operating levers, which in turn rotate the cam(1)
- The rotating cam forces the two brake shoes apart until they press against the inside of the drum (1)
- The friction caused between the shoe linings and the drum slows down the vehicle (1)
- When the brake pedal is released, the cam returns to its original position (1) and the shoes are pulled away from the drums by the return springs (1)

3.5.3 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 a sectional longitudinal view of a sparking plug and identifying four main parts.
- b) Fabricating a metal bracket.
- c) Identifying vehicle parts, stating the vehicle system in which each is used, naming the material each part is made of and stating the use of each part in the vehicle.
- d) Performing start up checks and starting the engine, and adjust to attain the smoothest idling speed in a single cylinder engine.
- e) Using the tools and materials provided,
- f) Using the tools, materials and components provided to connect a twin headlight parallel circuit controlled by a single switch.
- g) Identifying engine parts, the defect and stating one possible cause, and effect of the identified defect on vehicle performance.
- h) Performing checks on the brake drum of the motor vehicle by performing each of the following tasks: (a) removing the return spring (b) measuring the tension of the spring and (c) replacing the return spring.
- i) Identifying tools and substances stating one use of the tools and substances in a motor vehicle.
- j) Using oxy-acetylene equipment to braze a hole on parts of a vehicle.
- k) Demonstrating how to identify a misfiring plug in a multi-cylinder engine.

NB: Most of the competencies were well exhibited by the candidates during the exam.