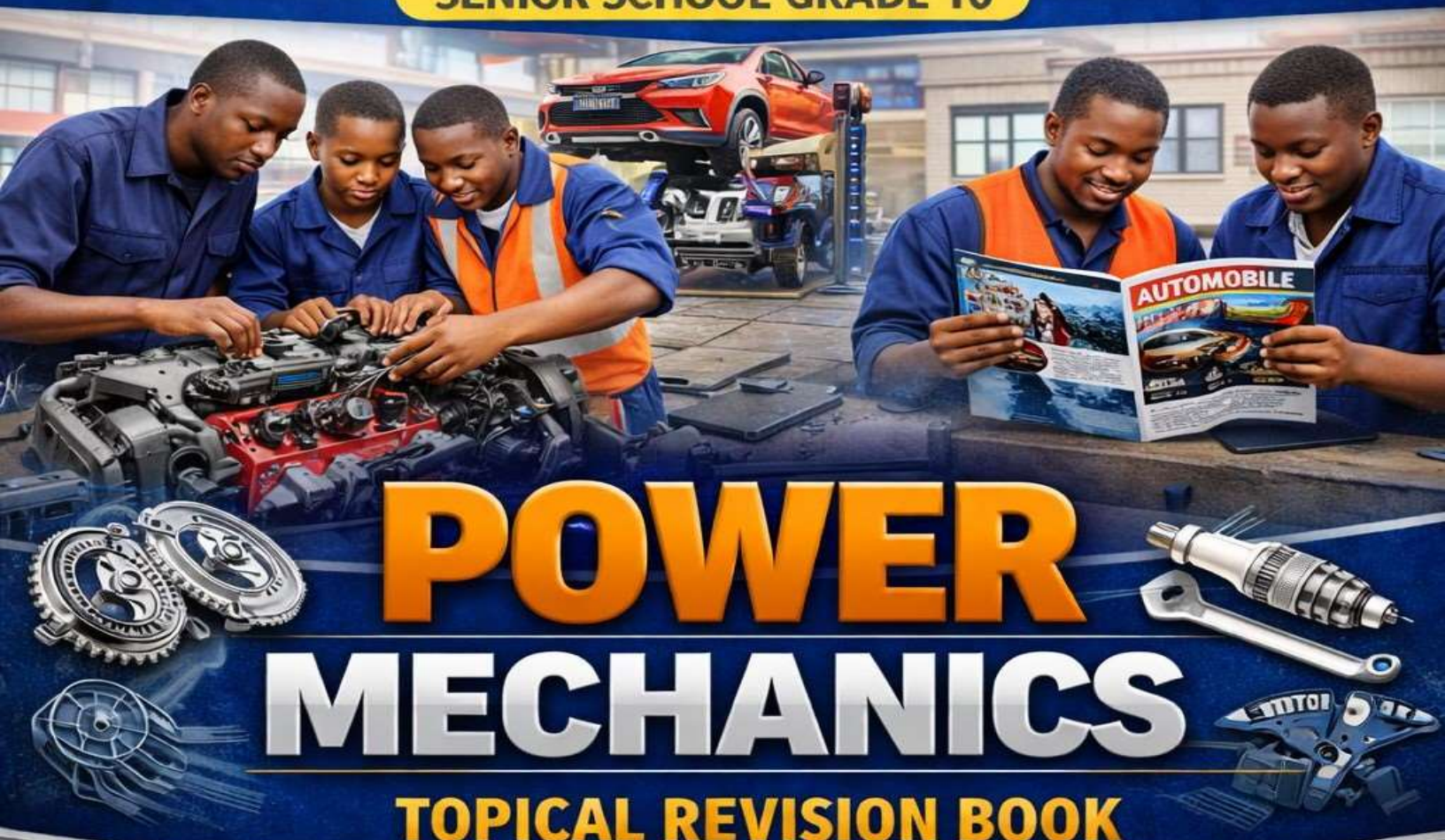
COMPETENCE BASED EDUCATION

SENIOR SCHOOL GRADE 10



POWER MECHANICS

TOPICAL REVISION BOOK

SENIOR SCHOOL – GRADE 10

POWER MECHANICS

TOPICAL REVISION QUESTIONS – FUNDAMENTALS OF POWER MECHANICS

SECTION A – (25 Marks)

1. Define **Power Mechanics** as a learning area. (2 marks)

_____

_____

2. List **two reasons** for studying Power Mechanics. (2 marks)

i. _____

ii. _____

3. Name **three career opportunities** available in the Power Mechanics field. (3 marks)

i. _____

ii. _____

iii. _____

4. Identify **two activities related to power mechanics** that can be observed in the local community. (2 marks)

i. _____

ii. _____

5. State **two reasons why learning Power Mechanics is important**. (2 marks)

i. _____

ii. _____

6. List **two tools or equipment** commonly used in power mechanics workshops. (2 marks)

i. _____

ii. _____

7. Name **two educational institutions** in Kenya that offer Power Mechanics courses. (2 marks)

i. ._____
ii. _____

8. Identify **two subfields of Power Mechanics**. (2 marks)

i. ._____
ii. _____

9. Mention **two sources of information** that learners can use to study Power Mechanics. (2 marks)

i. ._____
ii. _____

10. mention two **career opportunities in Power Mechanics**. (2 marks)

i. ._____

ii. _____

SECTION B (50 Marks)

11. Explain **three ways Power Mechanics contributes to national development**. (6 marks)

i. ._____

ii. _____

iii. ._____

12. Draw a **labeled diagram of a simple power mechanics workshop layout**, showing:

i. Workbench

ii. Machines (lathe, drill)

iii. Storage area

iv. Safety equipment (6 marks)

13. Describe **five activities learners can do in a Power Mechanics workshop** to enhance practical skills. (5 marks)

i. .
ii.
iii. .
iv.
v. .

14. (5 marks)

A local garage specializes in repairing motor vehicles:
a) Identify **three power mechanics activities** in the garage. (3 marks)

i. .
ii.
iii. .

b) Suggest **two ways the garage can enhance learners' practical learning**. (2 marks)

i. .
ii.

15. Explain **four safety precautions** learners must observe when handling power tools. (4 marks)

i. .
ii.

16. Differentiate between:
a) Mechanical power and electrical power (2 marks)

.

b) Manual and powered tools (2 marks)

.
.

17. Mention four branches of power mechanics. (4 marks)

i. .
ii.
iii. .
iv.

18. Discuss **four challenges learners may face while learning Power Mechanics**. (4 marks)

i. ._____
ii. ._____
iii. _____
iv. _____

19. Mention four importance of learning Power Mechanics. (4 marks)

i. ._____
ii. _____

20. A student visits a local workshop:
a) Identify **three observable activities related to Power Mechanics**. (3 marks)

i. ._____
ii. _____
iii. ._____

b) Suggest **two skills the student can acquire** from this visit. (2 marks)

i. ._____
ii. _____

SECTION C (25 Marks)

21. (6 marks)

A student is tasked to evaluate a Power Mechanics workshop in the locality:

a) Identify **three factors to assess the efficiency** of the workshop. (3 marks)

i. ._____
ii. _____
iii. ._____

b) Suggest **two recommendations** for improvement. (3 marks)

i. ._____
ii. ._____
iii. _____

22. Design Task: (6 marks)

Sketch a **simple garage layout** showing:

i. Vehicle inspection area
ii. Workbench
iii. Tool storage
iv. Safety signs
Label all parts clearly.

23. Problem Solving: (5 marks)

A learner wants to start a small Power Mechanics business:

a) List **three services that can be offered**. (3 marks)

i. ._____

ii. _____

iii. ._____

b) Explain **two ways the business contributes to the local economy**. (2 marks)

i. ._____

ii. _____

POWER MECHANICS

TOPICAL REVISION QUESTIONS – EVOLUTION OF MOTOR VEHICLES

SECTION A (25 Marks)

1. Define the term **motor vehicle**. (2 marks)

._____

_____

2. List **two pioneers in the development of motor vehicles globally**. (2 marks)

i. ._____

ii. _____

3. Identify **two major historical developments** in motor vehicle technology. (2 marks)

i. ._____

ii. _____

4. State **two reasons why motor vehicles are important in modern society**. (2 marks)

i. ._____

ii. _____

5. Name **two types of motor vehicles** based on fuel usage. (2 marks)

i. ._____

ii. _____

6. Mention **two innovations in motor vehicle design** that have improved safety. (2 marks)

i. ._____

ii. _____

7. Define **automotive innovation**. (2 marks)

._____

_____

8. List **two motor vehicle trends** in the last 50 years. (2 marks)

i. ._____

ii. _____

9. Identify **two materials commonly used in early motor vehicle construction**. (2 marks)

i. ._____

ii. _____

10. State **two differences between early and modern motor vehicles**. (2 marks)

i. ._____

ii. _____

SECTION B (50 Marks)

11. Explain **three ways motor vehicles have evolved globally** in terms of design and functionality. (6 marks)

i. ._____
ii. _____
iii. ._____

12. Draw and label a **timeline of motor vehicle evolution**, showing at least **five major developments**. (6 marks)

13. Compare **early motor vehicles and modern motor vehicles** in terms of:
a) Engine type (2 marks)

._____
_____

b) Fuel efficiency (2 marks)

_____
_____

c) Safety features (2 marks)

._____
_____

14. Explain **three trends in motor vehicle development** observed globally over the past century. (6 marks)

i. ._____
ii. _____
iii. ._____

15. (5 marks)

A Kenyan automotive workshop specializes in upgrading vehicles:
a) Identify **two innovations they might apply** to modernize vehicles. (2 marks)

i. ._____
ii. _____

b) Explain **two benefits of these innovations**. (3 marks)

i. ._____
ii. _____

16. Discuss **four impacts of motor vehicle evolution on the Kenyan economy**. (4 marks)

i. ._____
ii. _____
iii. ._____
iv. _____

17. Draw a **labeled diagram of an early motor vehicle** showing major parts such as engine, wheels, steering system, and chassis. (5 marks)

18. Explain **three factors that have driven innovation in motor vehicle development**. (3 marks)

i. ._____
ii. _____
iii. ._____

19. Describe **two trends in environmental sustainability** in motor vehicle technology. (3 marks)

i. ._____
ii. _____

20. Identify **three digital technologies** that have influenced modern motor vehicles and explain their use. (4 marks)

i. ._____
ii. _____
iii. ._____

SECTION C – (25 Marks)

21. Analysis: (6 marks)

A learner wants to present a project on the **evolution of electric cars in Kenya**.
a) Identify **three historical milestones** in electric vehicle development. (3 marks)

i. ._____
ii. _____
iii. ._____

b) Suggest **three innovations that could improve electric vehicles in Kenya**. (3 marks)

i. ._____
ii. _____
iii. ._____

22. (5 marks)

Draw a **modern motor vehicle with labeled innovative features** such as:

- Fuel system
- Safety devices
- Engine type
- Aerodynamic design

23. Evaluation: (5 marks)

Explain **how technological advancement has affected motor vehicles** in terms of:
a) Performance (2 marks)

i. ._____
ii. _____

b) Environmental impact (3 marks)

i. ._____
ii. _____

24. (4 marks)

A local mechanic wants to improve **fuel efficiency in older cars**:
a) Suggest **two modifications** that can be applied. (2 marks)

i. ._____
ii. _____

b) Explain **two benefits of these modifications**. (2 marks)

i. ._____
ii. _____

25. (5 marks)

Design a **poster showing the global evolution of motor vehicles**, including:

- Early steam-powered vehicles
- Internal combustion vehicles
- Electric and hybrid vehicles
- Modern innovations
  Label all parts clearly.

POWER MECHANICS

TOPICAL REVISION QUESTIONS – WORKSHOP LAYOUT

SECTION A (25 Marks)

1. Define a **power mechanics workshop**. (2 marks)

._____

_____

2. List **four main areas** found in a standard power mechanics workshop. (2 marks)

i. ._____
ii. _____
iii. ._____
iv. _____

3. Identify **two purposes of a storage area** in a power mechanics workshop. (2 marks)

i. ._____
ii. _____

4. State **two safety practices** in a power mechanics workshop. (2 marks)

i. ._____
ii. _____

5. Name **two types of floor markings** used in a workshop to guide safety. (2 marks)

i. ._____
ii. _____

6. Define the term **workshop layout**. (2 marks)

._____

_____

7. Mention **two benefits of having a well-organized workshop layout**. (2 marks)

i. ._____
ii. _____

8. Identify **two locations where workbenches are placed** in a power mechanics workshop. (2 marks)

i. ._____
ii. _____

9. List **two tools or equipment** typically stored in the workshop storage area. (2 marks)

i. ._____
ii. _____

10. State **two areas in a workshop meant for administrative work**. (2 marks)

i. ._____

ii. _____

SECTION B (50 Marks)

11. Draw and label a **simple layout of a power mechanics workshop** showing:

- Storage area
- Working area
- Workbenches
- Office
- Passage ways
- Tool area
(6 marks)

12. Explain **three reasons why the working area must be clearly marked and organized**. (3 marks)

i. ._____
ii. _____
iii. ._____

13. Compare **a well-laid out workshop and a poorly organized workshop** in terms of:
a) Safety (2 marks)

i. ._____
ii. _____

b) Efficiency (2 marks)

i. ._____
ii. _____

c) Maintenance of equipment (2 marks)

i. ._____
ii. _____

14. Describe **three roles of floor markings** in a power mechanics workshop. (3 marks)

15. (5 marks)

A learner visits a workshop and observes the layout:
a) Identify **two main safety risks** if passageways are blocked. (2 marks)
b) Suggest **two ways to minimize these risks**. (3 marks)

16. Explain **three reasons why storage areas should be properly labeled and arranged**. (3 marks)

17. Draw a **diagram showing a pedestrian crossing and lane lines** inside a workshop and label each part. (5 marks)

18. Explain **two differences between a working area and a storage area** in a power mechanics workshop. (2 marks)

19. Describe **three factors to consider when arranging workbenches** in a workshop. (3 marks)

20. Identify **three benefits of a clearly demarcated office area** within a workshop. (3 marks)

SECTION C (25 Marks)

21. : (5 marks)

A new workshop is being constructed:
a) Recommend **four areas that must be included in the workshop layout**. (2 marks)
b) Explain **why each area is important**. (3 marks)

22. Diagram Task: (5 marks)

Draw a **top-view workshop layout** showing all main areas and floor markings. Label at least:

- Storage area
- Workbenches

- Passageways
- Office
- Tool area
- Floor markings for safety

23. Evaluation: (5 marks)

Explain **how poor workshop layout affects**:
a) Safety (2 marks)
b) Productivity (3 marks)

24. Problem Solving: (5 marks)

A workshop has experienced frequent accidents:
a) Identify **three likely causes related to workshop layout**. (3 marks)
b) Suggest **two corrective measures**. (2 marks)

25. Creative Task: (5 marks)

Design a **poster showing a standard power mechanics workshop layout** highlighting:

- Safety features
- Main workshop areas
- Correct placement of workbenches
  Include **clear labels and illustrations**.

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS

TOPICAL REVISION QUESTIONS – WORKSHOP SAFETY & PPE

SECTION A (25 Marks)

1. Define the term **personal protective equipment (PPE)**. (2 marks)

._____

_____

2. List **four examples of PPE** used in a power mechanics workshop. (2 marks)

i. ._____
ii. _____
iii. ._____
iv. _____

3. State **two reasons why safety rules are important** in a workshop. (2 marks)

i. ._____
ii. _____

4. Identify **two types of workshop safety signs**. (2 marks)

i. ._____
ii. _____

5. Define **risk behaviour** in a workshop environment. (2 marks)

i. ._____
ii. _____

6. List **two general safety rules** observed in a power mechanics workshop. (2 marks)

i. ._____
ii. _____

7. Name **two areas outside workshops** where PPE is also used. (2 marks)

i. ._____
ii. _____

8. Identify **two fire safety signs** used in workshops. (2 marks)

i. ._____
ii. _____

9. Mention **two hazards** that may occur if PPE is not used properly. (2 marks)

i. ._____

ii. _____

10. State **two rules regarding safe handling of tools and equipment** in the workshop. (2 marks)

i. ._____

ii. _____

SECTION B (50 Marks)

11. Draw and label **four common workshop safety signs**: prohibition, warning, mandatory, and fire equipment. (6 marks)

12. Explain **three reasons why reflective clothing is important** when moving around workshop areas. (3 marks)

i. ._____

ii. _____

iii. ._____

13. (5 marks)

During a practical session, a student is observed:
a) Not wearing gloves while handling sharp tools. (2 marks)
b) Ignoring fire exit routes. (3 marks)

- Identify **two risks** associated with each behaviour.

i. ._____

ii. _____

14. Explain **three consequences of ignoring workshop safety rules**. (3 marks)

i. ._____
ii. _____
iii. ._____

15. Describe **three correct practices when using PPE in a workshop**. (3 marks)

i. ._____
ii. _____
iii. ._____

16. Draw a **simple labelled sketch of a student wearing complete PPE** in a power mechanics workshop. Include:

- Helmet
- Gloves
- Eye protection
- Safety boots
- Overall / reflective jacket
  (5 marks)

17. Explain **two ways to prevent risk behaviours** in a workshop environment. (2 marks)

i. ._____

ii. _____

18. Identify **three risk behaviours** that could lead to accidents in a workshop. (3 marks)

i. ._____

ii. _____

iii. ._____

19. (5 marks)

Match the safety sign to its meaning:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

20. Explain **two reasons why it is important to keep walkways clear in a workshop**. (2 marks)

i. ._____

ii. _____

SECTION C (25 Marks)

21. (5 marks)

A new power mechanics workshop is being opened:

a) Recommend **four general safety rules** to be observed. (2 marks)

i. ._____

ii. _____

iii. ._____

iv. _____

b) Explain **why each rule is important for students and workers**. (3 marks)

i. ._____

ii. _____

iii. ._____

iv. _____

22. (5 marks)

Draw and label a **safe workshop layout showing PPE zones and safety signs**. Include at least:

- Fire exit
- PPE storage area
- Workbenches
- Tool storage
- Walkways
- Floor markings

23. (5 marks)

Explain **three consequences of risk behaviours in a workshop** on:
a) Safety (2 marks)

i. ._____
ii. _____
iii. ._____

b) Productivity (3 marks)

i. ._____
ii. _____
iii. ._____
iv. _____

24. Problem Solving: (5 marks)

A student often ignores wearing gloves, eye protection, and safety boots:
a) Identify **three possible injuries** they could sustain. (3 marks)
b) Suggest **two preventive measures** to reduce these risks. (2 marks)

25. Creative Task: (5 marks)

Design a **poster promoting workshop safety rules and proper PPE use**. Include:

- Illustrations of students using PPE
- Safety signs
- Key rules written clearly

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS – RELATED DRAWING

TOPICAL REVISION QUESTIONS – DIAGONAL SCALE

SECTION A(25 Marks)

1. Define a **diagonal scale** in technical drawing. (2 marks)

2. List **four technical drawing instruments** used in drawing a diagonal scale. (2 marks)

3. State **two purposes of a diagonal scale** in technical drawing. (2 marks)

4. Identify **two types of set squares** commonly used in technical drawing. (2 marks)

5. Define the term **divider** in technical drawing. (2 marks)

6. List **two advantages of using a T-square** on a drawing board. (2 marks)

7. State **two real-life applications of a diagonal scale**. (2 marks)

8. Name **two uses of a compass** in drawing. (2 marks)

9. Mention **two precautions to observe when using drawing instruments**. (2 marks)

10. Identify **the main unit divisions** commonly represented on a diagonal scale. (2 marks)

SECTION B (50 Marks)

11. Draw and **label four technical drawing instruments** used in making a diagonal scale. (6 marks)

12. Explain **three steps in constructing a simple diagonal scale** for a given measurement. (3 marks)

13. Scenario: (5 marks)

A student wants to construct a diagonal scale to measure 6 meters on a drawing with a scale of 1:100:
a) Identify the **main lines required**. (2 marks)
b) Explain how the **diagonal divisions are drawn**. (3 marks)

14. Draw a **neat labeled diagram of a diagonal scale showing main and subsidiary divisions**. (5 marks)

15. Explain **two reasons for interpreting a diagonal scale correctly** in technical drawings. (2 marks)

16. Construct a **diagonal scale** to represent 10 meters in 10 cm on paper with 10 main divisions. Show **subsidiary divisions**. (5 marks)

17. Scenario-based interpretation: (5 marks)

From a given diagonal scale, the distance between points A and B is measured as 4.3 cm on paper. Calculate the **actual distance** if the scale is 1:50.

18. Explain **two ways a diagonal scale improves accuracy** in technical drawings. (2 marks)

19. Identify **three possible errors** when constructing a diagonal scale. (3 marks)

20. Draw a **diagonal scale showing 5 main divisions and 10 subdivisions**, label all parts. (5 marks)

SECTION C (25 Marks)

21. (5 marks)

A designer is tasked to make a furniture plan using a diagonal scale:
a) Explain **three advantages of using a diagonal scale** in this task. (3 marks)
b) Suggest **two precautions** to avoid errors. (2 marks)

22. Creative Task: (5 marks)

Draw a **diagonal scale suitable for a 1:200 drawing** showing at least **6 main divisions** and **10 subsidiary divisions**. Label clearly.

23. Problem-Solving: (5 marks)

A diagonal scale is divided into 8 main units with 10 subdivisions each. If the actual length is 12 meters:
a) Determine the **length of one main unit on the paper**. (2 marks)
b) Calculate the **length represented by each subdivision**. (3 marks)

24. Evaluation Task: (5 marks)

Compare **diagonal scale** with **plain scale**. Give **three differences** and **two advantages** of the diagonal scale over the plain scale.

25. Real-Life Application: (5 marks)

Design a **mini-project** showing how a diagonal scale can be used to:

- Measure a small workshop layout (show measurements)
- Indicate distances of machines, benches, and passages
  Include a **diagram** and label distances clearly.

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS – RELATED DRAWING

TOPICAL REVISION QUESTIONS – LOCI

SECTION A(25 Marks)

1. Define the term **loci** as used in technical drawing. (2 marks)

2. List **four types of loci** commonly used in drawing. (2 marks)

3. Identify **two main tools** required for drawing loci. (2 marks)

4. Name **two types of curves** used in loci that can be applied in power mechanics. (2 marks)

5. Define the term **ellipse** in relation to loci. (2 marks)

6. Mention **two examples of loci applications** in real-life mechanical systems. (2 marks)

7. State **two safety precautions** to observe when using drawing instruments for loci. (2 marks)

8. Identify **one difference** between an involute and a cycloid curve. (2 marks)

9. Name **two types of points** whose loci can be traced in link mechanisms. (2 marks)

10. State **one reason why loci are important in technical drawing**. (1 mark)

SECTION B (50 Marks)

11. Draw and label the **tools required to draw a locus** of a point. (5 marks)

12. Draw **an ellipse using the string and pins method**, label the foci and major/minor axes. (5 marks)

13. Construct a **cycloid** for a rolling circle of radius 3 cm. Show at least **three positions**. (5 marks)

14. Draw an **involute of a circle** with radius 4 cm. (5 marks)

15. Draw a **parabola using the locus method**, label the focus and directrix. (5 marks)

16. Draw the **hyperbola using loci**, label the foci and asymptotes. (5 marks)

17. (5 marks)

A two-link mechanism has links of 6 cm and 4 cm. Construct the **locus of a point on the second link** when the first link rotates through 90°.

18. Explain **two reasons why the locus of a point is important** in designing mechanical systems. (2 marks)

19. Draw the **locus of a point on a 3-link mechanism**, label all link points clearly. (5 marks)

20. Construct a **locus of a crank-pin on a slider-crank mechanism**, mark maximum and minimum displacements. (5 marks)

SECTION C (25 Marks)

21. (5 marks)

An engineer wants to design a cam follower mechanism:
a) Identify **two types of loci** suitable for designing the cam profile. (2 marks)
b) Explain why the loci of the follower point must be accurately drawn. (3 marks)

22. Problem-solving: (5 marks)

A crank of length 5 cm rotates fully, and a connecting rod of 8 cm is attached. Construct the **locus of a point at the junction of the crank and connecting rod**. Label all link positions.

23. Comparative Task: (5 marks)

Compare the **involute and cycloid** as loci in mechanical systems:

- Three differences (3 marks)
- Two advantages of each in power mechanics (2 marks)

24. Real-Life Application: (5 marks)

Draw the **locus of a point on a pedal of a bicycle** as it rotates. Show **four key positions** and label angles of rotation.

25. Creative/Project Task: (5 marks)

Design a **simple mechanical linkage for a water pump** and construct the **loci of the points on the moving link**. Include a labeled diagram and explain how the loci determine the pump motion.

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS – RELATED DRAWING

TOPICAL REVISION QUESTIONS – TANGENCY

SECTION A(25 Marks)

1. Define the term **tangent** as used in technical drawing. (2 marks)

2. Identify **two points from which a tangent can be drawn** to a circle. (2 marks)

3. List **two tools** commonly used to construct tangents in technical drawing. (2 marks)

4. State **two differences** between internal and external tangents. (2 marks)

5. Mention **two real-life applications** of tangency in mechanical drawing. (2 marks)

6. Define **external tangent** to two circles. (2 marks)

7. Define **internal tangent** to two circles. (2 marks)

8. State **one reason why tangency is important** in design of mechanical components. (1 mark)

9. Identify **two cases** where tangents to circles are needed in power mechanics linkages. (2 marks)

10. Name **two types of circles** where tangents are commonly constructed in mechanical drawing exercises. (2 marks)

SECTION B (50 Marks)

11. Draw a circle of radius 4 cm and construct a **tangent from a point 6 cm from the centre**. Label all points. (5 marks)

12. Construct an **external tangent to two equal circles** of radius 3 cm with centres 10 cm apart. (5 marks)

13. Construct an **internal tangent to two equal circles** of radius 3 cm with centres 10 cm apart. (5 marks)

14. Construct an **external tangent to two unequal circles** of radii 3 cm and 5 cm, centres 12 cm apart. (5 marks)

15. Construct an **internal tangent to two unequal circles** of radii 3 cm and 5 cm, centres 12 cm apart. (5 marks)

16. (5 marks)

A wheel of radius 5 cm is placed 10 cm from a stationary point. Draw **tangents from the point to the wheel** and mark all construction points.

17. Explain **two practical uses of tangency** in power mechanics drawings. (2 marks)

18. Draw a circle and a line **tangent to the circle** at a given point on its circumference. (5 marks)

19. Draw **two circles of radius 4 cm each**, centre distance 9 cm. Construct **both external and internal tangents**. Label clearly. (5 marks)

20. Construct a **tangent from a point to a circle**, then construct a **normal at the point of contact**. Label all lines. (5 marks)

SECTION C (25 Marks)

21. (5 marks)

A mechanical linkage uses **two pulleys of unequal radii**.
a) Construct the **external tangent** connecting the pulleys. (3 marks)
b) Explain why the tangent is critical in designing a belt or chain drive. (2 marks)

22. (5 marks)

Draw **two unequal circles of radius 3 cm and 6 cm** with centres 12 cm apart. Construct **internal tangents** and explain **how the tangents determine the path of a connecting rod**.

23. Comparative Task (5 marks)

Compare **internal and external tangents** in terms of:
a) Construction procedure (2 marks)
b) Applications in mechanical systems (3 marks)

24. Real-Life Application (5 marks)

A car belt system uses **two pulleys of radius 4 cm and 6 cm**. Draw the **external tangent representing the belt path**. Label all key points.

25. Creative/Project Task (5 marks)

Design a simple **linkage system for a reciprocating pump**. Draw the **tangents required between circular cam and follower wheels**. Explain **how tangency ensures smooth motion**.

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS – RELATED DRAWING

TOPICAL REVISION QUESTIONS – BLENDING OF LINES AND CURVES

SECTION A(25 Marks)

1. Define **blending of lines and curves** as used in technical drawing. (2 marks)

2. State **two tools** used in constructing blended curves. (2 marks)

3. Mention **two purposes** of blending lines and arcs in mechanical drawing. (2 marks)

4. Identify **two situations** where a line can be blended with an arc in power mechanics. (2 marks)

5. State **one difference** between blending an arc with a line and blending two arcs. (2 marks)

6. Define **internal blending** of two equal circles. (2 marks)

7. Define **external blending** of two equal circles. (2 marks)

8. Give **one example of blending used in pulley systems**. (1 mark)

9. State **two advantages** of blending in mechanical drawing. (2 marks)

10. Identify **two types of shapes** that can be constructed using blending. (2 marks)

SECTION B (50 Marks)

11. Draw two straight lines meeting at an angle of 60° and construct an **arc to blend the lines**. Label all points. (5 marks)

12. Draw a straight line and a circle of radius 4 cm. Construct an **arc blending the line and circle**. (5 marks)

13. Draw **two equal circles of radius 3 cm**, centres 10 cm apart. Construct **internal blending arc** between the circles. (5 marks)

14. Draw **two equal circles of radius 3 cm**, centres 10 cm apart. Construct **external blending arc** between the circles. (5 marks)

15. Draw **two unequal circles of radius 3 cm and 5 cm**, centres 12 cm apart. Construct **internal blending arc**. (5 marks)

16. Draw **two unequal circles of radius 3 cm and 5 cm**, centres 12 cm apart. Construct **external blending arc**. (5 marks)

17. Draw **two straight lines meeting at 90°**, construct a **tangent arc to blend the lines**, and label points of contact. (5 marks)

18. Draw a circle of radius 5 cm and a tangent line. Construct an **arc that blends with both**. (5 marks)

19. Draw **two circles of radius 4 cm each**, centres 8 cm apart. Construct **both internal and external blending arcs**. (5 marks)

20. Draw a **rectangular shape**, then **blend the corners with arcs of radius 1 cm**. Label all arcs. (5 marks)

SECTION C (25 Marks)

21. (5 marks)

A belt passes over **two pulleys of radius 4 cm and 6 cm**. Construct **the external blending arc representing the belt path**. Explain why blending ensures **smooth motion of the belt**.

22. (5 marks)

Design a **cam and follower mechanism**. Draw **the blending arcs required between the cam and follower**. Explain how blending prevents **jerky motion**.

23. Comparative Task (5 marks)

Compare **internal and external blending arcs** in terms of:
a) Construction steps (2 marks)
b) Applications in mechanical systems (3 marks)

24. Real-Life Application (5 marks)

A road wheel system has **two circular tracks of radius 5 cm and 8 cm**. Draw **the blended arc connecting the two tracks** to show smooth movement of the wheel. Label all points.

25. Creative/Project Task (5 marks)

Design a simple **mechanical frame for a reciprocating pump**. Use **blending of lines and arcs** to connect:
a) the piston rod guide (line) to the cylinder (circle)
b) two link wheels (circles)
Explain how blending improves **mechanical efficiency**.

STRAND 3.0: MOTOR VEHICLE SYSTEMS

SUB-STRAND 3.1: ROAD WHEELS

SECTION A: (25 MARKS)

Question 1 (5 Marks)

a) Define the term **road wheel**. (1 mark)

b) State FOUR functions of wheels in a motor vehicle. (4 marks)

Question 2 (5 Marks)

a) Name TWO main types of vehicle tires. (2 marks)

b) State ONE advantage of tubeless tires over tube tires. (1 mark)

c) State TWO components found in a tire structure. (2 marks)

Question 3 (5 Marks)

Study the diagram below and answer the questions.

a) Identify the labeled part shown above. (1 mark)

b) State TWO functions of this part. (2 marks)

c) State TWO effects of worn-out tread. (2 marks)

Question 4 (5 Marks)

Match the following tire terms with their correct meaning:

Column A	Column B
(i) Aspect Ratio	A. Maximum weight tire can carry
(ii) Load Index	B. Ratio of tire height to width
(iii) Speed Rating	C. Maximum safe speed

(3 marks)

b) What does the number **205** represent in tire size 205/65R15? (2 marks)

Question 5 (5 Marks)

List FIVE types of abnormal tire wear. (5 marks)

SECTION B: AVERAGE ORDER QUESTIONS (50 MARKS)

Question 6 (8 Marks)

a) Explain THREE functions of wheels in relation to vehicle movement. (6 marks)

b) Explain how tires contribute to road safety. (2 marks)

Question 7 (6 Marks)

Differentiate between tube and tubeless tires under the following headings:

a) Structure (2 marks)

b) Maintenance (2 marks)

c) Safety (2 marks)

Question 8 (8 Marks)

Study the illustrations below showing tire ply orientations.

Figure A

Figure B

a) Identify each ply type. (2 marks)

b) Describe how the layers are arranged in each type. (4 marks)

c) State ONE advantage of radial ply over cross ply. (2 marks)

Question 9 (8 Marks)

The tire specification reads:

225/60R16 98H

a) What does 225 represent? (2 marks)

b) What does 60 represent? (2 marks)

c) What does R stand for? (1 mark)

d) What does 98 indicate? (2 marks)

e) What does H indicate? (1 mark)

Question 10 (6 Marks)

A vehicle manufacturer recommends 32 PSI tire pressure.

a) Explain what PSI means. (2 marks)

b) State TWO effects of under-inflation. (2 marks)

c) State TWO effects of over-inflation. (2 marks)

Question 11 (6 Marks)

Study the diagram below:

a) Identify the type of abnormal wear shown. (2 marks)

b) State TWO causes of this wear. (2 marks)

c) Suggest TWO corrective measures. (2 marks)

Question 12 (8 Marks)

a) Describe the procedure for checking tire pressure. (4 marks)

b) Outline the steps involved in repairing a punctured tubeless tire. (4 marks)

SECTION C: (25 MARKS)

Question 13 (10 Marks)

A driver replaces original tires (195/65R15) with larger tires (245/45R17) without consulting the manufacturer.

a) Analyze TWO mechanical effects this may have on the vehicle. (4 marks)

b) Discuss TWO safety risks associated with this change. (4 marks)

c) Advise the driver professionally. (2 marks)

Question 14 (8 Marks)

A vehicle shows the following problems:

- Excessive fuel consumption
- Uneven outer-edge tire wear
- Steering pulling to one side

a) Diagnose TWO possible tire-related causes. (4 marks)

b) Explain how each problem is linked to tire condition. (4 marks)

Question 15 (7 Marks)

You are assigned to educate motorists in your community about tire safety.

a) Identify THREE hazards of ignoring tire specifications. (3 marks)

b) Propose THREE strategies to improve awareness of proper tire maintenance. (4 marks)

COMPETENCE BASED EDUCATION (CBE)

SENIOR SCHOOL – GRADE 10

POWER MECHANICS – MOTOR VEHICLE SYSTEMS (VEHICLE BODY)

TOPICAL REVISION QUESTIONS

SECTION A(25 Marks)

1. Define the function of a motor vehicle body. (2 marks)

2. State **two types of vehicle bodies** used in motor vehicles. (2 marks)

3. Identify **three interior parts** of a motor vehicle. (3 marks)

4. List **two exterior body parts** of a motor vehicle. (2 marks)

5. Give two **types of vehicles according to their uses**. (2 marks)

6. Match the following vehicle types to their descriptions: (4 marks)

Vehicle Type	Description
Sedan	___
Pickup	___
Bus	___
Convertible	___

7. Name **two emergency response vehicles** commonly used in Kenya. (2 marks)

8. Identify **two safety-related interior parts** of a vehicle. (2 marks)

9. Define **PSV** as used in vehicle classification. (2 marks)

10. State **two functions of bumpers** on a vehicle. (2 marks)

SECTION B (50 Marks)

11. Explain **three functions of a vehicle body** in relation to safety and comfort. (6 marks)

12. Draw and **label a diagram** of a sedan and a pickup vehicle. (4 marks)

13. Classify the following vehicles according to their uses: ambulance, school bus, cargo truck, fire engine, taxi. (5 marks)

14. Sketch and **label five interior parts** of a motor vehicle that contribute to passenger safety. (5 marks)

15. Sketch and **label five exterior body parts** of a motor vehicle. (5 marks)

16. Explain the **importance of seat belts, airbags, and headrests** in a motor vehicle. (6 marks)

17. Differentiate between a **station wagon and a convertible** in terms of body design and usage. (5 marks)

18. Draw a **chart showing types of vehicles according to their uses** (emergency response, passenger service vehicles, commercial vehicles). (5 marks)

19. Identify the **roles of three emergency vehicles** and their emergency response numbers. (4 marks)

20. Explain **how the design of a vehicle body contributes to fuel efficiency and aerodynamics**. (5 marks)

SECTION C (25 Marks)

21. A vehicle has the following features: airbags, padded dashboard, child safety seats, roof rails. Explain how each feature contributes to **passenger safety and comfort**. (6 marks)

22. You are tasked to **design a multipurpose vehicle** for passenger and cargo transport. Sketch your design and label: body type, interior features, and exterior parts. Justify your design choices. (6 marks)

23. Discuss **the importance of proper vehicle body maintenance** and how neglecting it can affect safety and performance. (4 marks)

24. Compare and contrast **a pickup and a station wagon** in terms of functionality, capacity, and economic use. (4 marks)

25. Evaluate how **innovative vehicle body designs** have improved emergency response efficiency in Kenya. (5 marks)

GRADE 10 POWER MECHANICS

TOPICAL REVISION QUESTIONS

SECTION A: SHORT QUESTIONS (30 MARKS)

Answer ALL questions.

1. Define the following terms (6 marks)

a) Engine classification
b) Method of combustion
c) Alternative fuel
d) Air cooling
e) Liquid cooling
f) Engine size

2. State FOUR methods used to classify engines (4 marks)

3. Give ONE example of an engine that is: (4 marks)

a) Small
b) Medium
c) Large
d) Alternative fuel engine

4. Identify the correct engine type from the descriptions (6 marks)

a) Uses petrol and spark plugs to ignite fuel-air mixture.
b) Uses diesel and ignition happens by heat due to compression.
c) Uses fins and air movement for cooling.
d) Uses water/coolant and radiator for cooling.
e) Uses biogas, ethanol or electricity as fuel.
f) Often found in heavy machines like trucks and tractors.

5. Fill in the blanks (5 marks)

a) Engines may be classified by the _____of combustion.
b) Petrol engines are also called _____ignition engines.
c) Diesel engines are called _____ignition engines.
d) A radiator is used in _____cooled engines.
e) Air cooled engines have _____on the cylinder block.

6. List FIVE places you can visit locally to identify different engine classes (5 marks)

(Examples: garage, farm workshop, etc.)

SECTION B: STRUCTURED QUESTIONS (50 MARKS)

Answer ALL questions.

7. Engine Classification Table (10 marks)

Study the table below and complete it.

Table 1: Engine classification methods

Method of Classification	Classes/Types
(a) Type of fuel	_____(2 marks)
(b) Cooling system	_____(2 marks)
(c) Size	_____(2 marks)
(d) Method of combustion	_____(2 marks)
(e) Any other method	_____(2 marks)

8. Classification by Method of Combustion (8 marks)

a) Explain what is meant by "method of combustion" in engines. (2 marks)
b) Differentiate between **spark ignition** and **compression ignition** engines. (4 marks)
c) Give ONE advantage of each combustion method. (2 marks)

9. Classification by Engine Size (8 marks)

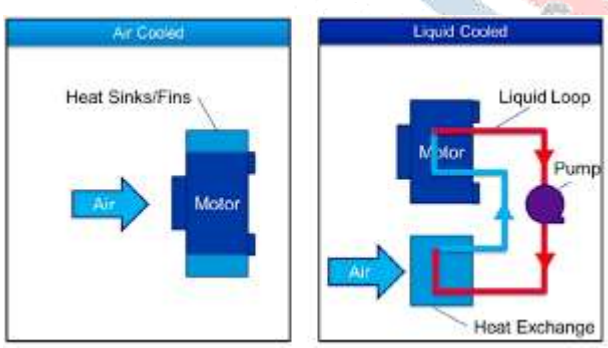
a) State THREE factors that can be used to decide whether an engine is small, medium or large. (3 marks)
b) Give TWO examples of machines that use **small engines**. (2 marks)
c) Give TWO examples of machines that use **large engines**. (2 marks)
d) Explain why large engines are rarely used in motorcycles. (1 mark)

10. Classification by Type of Fuel (8 marks)

a) List FOUR fuels used in engines. (4 marks)
b) Explain TWO reasons why alternative fuels are being encouraged today. (2 marks)
c) State TWO dangers of using the wrong fuel in an engine. (2 marks)

11. Classification by Cooling System (8 marks)

Illustration 1: Cooling systems



A B

a) Identify the cooling system shown in Diagram A. (1 mark)
b) Identify the cooling system shown in Diagram B. (1 mark)
c) State THREE parts associated with liquid cooling. (3 marks)
d) State THREE advantages of liquid cooling over air cooling. (3 marks)

12. Practical Workplace-Based Question (8 marks)

You visited a local garage and observed the following engines:

- Motorcycle engine
- Generator engine
- Tractor engine
- Bus engine

a) Classify each engine by **size**. (4 marks)
b) Classify each engine by **type of fuel** (assume common fuel used). (4 marks)

SECTION C: (20 MARKS)

Answer ALL questions.

13. Data Classification Task (10 marks)

Study the engines below and classify them using the table.

Engines Given

1. A petrol motorcycle engine with cooling fins
2. A diesel truck engine with radiator and coolant
3. A biogas engine used for a small farm generator
4. A large marine diesel engine used in a ship
5. An electric motor used to drive a small water pump

Table 2: Classification of given engines (10 marks)

Engine	Fuel Type	Cooling Type	Size	Combustion Method
1				
2				
3				
4				
5				

14. Evaluation Question (6 marks)

Your school plans to buy an engine for a **workshop training unit**.

a) Suggest the best engine type for training learners: petrol or diesel. (1 mark)
b) Give THREE reasons for your choice. (3 marks)

c) Suggest ONE alternative fuel option the school can consider. (1 mark)
d) State ONE challenge of using that alternative fuel in school. (1 mark)

15. Creativity and Values Question (4 marks)

Engines can be classified in many ways.

a) Explain why it is important for learners to acknowledge and value different engine classes. (2 marks)
b) Give TWO ways students can use digital or print media responsibly when researching engine classification. (2 marks)

GRADE 10 POWER MECHANICS – VEHICLE BODY JOINING PROCESSES

SECTION A – THREAD FASTENERS (30 MARKS)

Q1. (4 marks)
Define the following terms:
a) Bolt
b) Nut
c) Screw
d) Stud

Q2. (5 marks)
Sketch a **hex bolt** and label the following parts: **head, thread, diameter, pitch, length, crest, root**.

Q3. (5 marks)
List **four types of screws** and **state one specific use** of each in motor vehicle body joining.

Q4. (6 marks)
Explain the difference between the following types of nuts:
a) Hex nut
b) Wing nut
c) Dome nut

Q5. (5 marks)
A technician is joining two vehicle panels using a bolt and nut. Explain **why the choice of nut type and bolt type is important** for safety and durability.

Q6. (5 marks)
You are required to join the fender to the chassis using a threaded fastener. Suggest the **best combination of bolt and nut** and justify your choice.

SECTION B – LOCKING DEVICES (10 MARKS)

Q7. (4 marks)
Define **locking device** and give **two examples** used in motor vehicles.

Q8. (6 marks)
Illustrate **two common locking devices** (e.g., split pin and spring washer) and explain **how each prevents loosening of threaded fasteners**.

SECTION C – RIVETING (15 MARKS)

Q9. (5 marks)
Describe **riveting** as a joining process in motor vehicle bodies and list **two types of rivets** commonly used.

Q10. (5 marks)
Illustrate the process of **solid riveting** showing the **head formation** and **panel alignment**.

Q11. (5 marks)
Explain the advantages and disadvantages of using **rivets instead of threaded fasteners** in a motor vehicle body.

SECTION D – ADHESIVES (15 MARKS)

Q12. (4 marks)
Define the following terms:
a) Adhesive
b) Bond
c) Cohesion

Q13. (5 marks)
List **three types of adhesives** used in motor vehicle body joining and state **one application for each**.

Q14. (6 marks)
A motor vehicle panel is joined using adhesive. Explain the **factors affecting bond strength** and how improper adhesion can lead to **vehicle body failure**.

SECTION E – PRACTICAL AND OBSERVATION (20 MARKS)

Q15. (5 marks)
Visit a motor vehicle workshop and **list four joining processes observed** on vehicle bodies.

Q16. (5 marks)
Perform **riveting on two thin metal sheets**. Draw and label the completed joint.

Q17. (5 marks)
You are tasked with joining two vehicle panels using **adhesive and bolts simultaneously**. Explain **why combining these joining methods might be more effective than using a single method**.

Q18. (5 marks)
From your observations, **discuss the role of joining processes in enhancing vehicle safety, durability, and appearance**.

SECTION F – SKETCHING AND IDENTIFICATION (10 MARKS)

Q19. (5 marks)
Sketch and label the following threaded fasteners:
a) Hex bolt
b) Carriage bolt
c) Phillips head screw
d) Flathead screw

Q20. (5 marks)
From a given diagram of a motor vehicle door, **identify the joining methods** used at:
a) Hinges
b) Door panel joints
c) Locking mechanisms

SECTION G (20 MARKS)

Q21. 20 marks)

A motor vehicle manufacturer wants to **improve the body assembly process** to reduce production time while maintaining quality and durability.

a) Suggest **three joining processes** that can be used. (3 marks)

b) For each process, explain **one advantage** in vehicle production. (3 marks)

c) Sketch a **combined joining method** (adhesive + bolt or rivet) used in modern vehicle panels. (6 marks)

d) Discuss how **threaded fasteners and locking devices contribute to vehicle safety**. (4 marks)

e) Explain **why adhesives alone may not be sufficient** for structural panels. (4 marks)

GRADE 10 POWER MECHANICS – MOTOR VEHICLE SYSTEMS

Sub-Strand: Vehicle Body Joining Processes

SECTION A – THREADED FASTENERS (30 MARKS)

Q1. (4 marks)
Define the following terms:
a) Bolt
b) Nut
c) Screw
d) Stud

Q2. (5 marks)
Sketch a **hex bolt** and label the following parts: **head, thread, diameter, pitch, length, crest, root**. *(Insert diagram)*

Q3. (5 marks)
List **four types of screws** (Phillips head, flathead, hex, Torx) and state **one application of each** in motor vehicle body joining.

Q4. (5 marks)
Explain the difference between the following types of nuts:
a) Hex nut
b) Wing nut
c) Dome nut
d) Flange nut
e) Slotted nut

Q5. (5 marks)
A technician is joining two vehicle panels using a bolt and nut. Explain **why the correct choice of bolt and nut type is crucial for safety and durability**.

Q6. (6 marks)
You are required to join a fender to the chassis using a threaded fastener. Suggest **the best combination of bolt and nut**, justify your choice, and illustrate the joint. *(Insert diagram)*

SECTION B – LOCKING DEVICES (10 MARKS)

Q7. (4 marks)
Define a **locking device** and give **two examples** used in motor vehicle body joining.

Q8. (6 marks)
Illustrate **two common locking devices** (e.g., split pin and spring washer) and explain **how each prevents loosening of threaded fasteners**.

SECTION C – RIVETING (15 MARKS)

Q9. (5 marks)
Describe **riveting** as a joining process in motor vehicle bodies and list **two types of rivets commonly used**.

Q10. (5 marks)
Illustrate the process of **solid riveting**, showing the **head formation** and **panel alignment**. *(Insert diagram)*

Q11. (5 marks)
Explain the **advantages and disadvantages of using rivets instead of threaded fasteners** in motor vehicle body joining.

SECTION D – ADHESIVES (15 MARKS)

Q12. (4 marks)
Define the following terms:
a) Adhesive
b) Bond
c) Cohesion

Q13. (5 marks)
List **three types of adhesives** used in motor vehicle body joining and state **one application for each**.

Q14. (6 marks)
A motor vehicle panel is joined using adhesive. Explain **factors affecting bond strength** and how improper adhesion can lead to **vehicle body failure**.

SECTION E – PRACTICAL & OBSERVATION (20 MARKS)

Q15. (5 marks)
Visit a local motor vehicle workshop and **list four joining processes** you observe on vehicle bodies.

Q16. (5 marks)
Perform **riveting on two thin metal sheets**, draw the completed joint, and label **head and shank**. *(Insert diagram/photo)*

Q17. (5 marks)
You are tasked with joining two vehicle panels using **adhesive and bolts simultaneously**. Explain **why combining these methods might be more effective** than using a single method.

Q18. (5 marks)
From your observations, **discuss the role of joining processes in enhancing vehicle safety, durability, and appearance**.

SECTION F – SKETCHING & IDENTIFICATION (10 MARKS)

Q19. (5 marks)
Sketch and label the following threaded fasteners:
a) Hex bolt
b) Carriage bolt
c) Phillips head screw
d) Flathead screw

Q20. (5 marks)
From a given diagram of a motor vehicle door, **identify the joining methods** used at:
a) Hinges
b) Door panel joints
c) Locking mechanisms

SECTION G – INTEGRATED (20 MARKS)

Q21. (High Order, 20 marks)

A motor vehicle manufacturer wants to **improve body assembly** to reduce production time while maintaining quality and durability.

a) Suggest **three joining processes** that can be used. (3 marks)

b) For each process, explain **one advantage in vehicle production**. (3 marks)

c) Sketch a **combined joining method** (adhesive + bolt or rivet) used in modern vehicle panels. (6 marks)

d) Discuss how **threaded fasteners and locking devices contribute to vehicle safety**. (4 marks)

e) Explain **why adhesives alone may not be sufficient for structural panels**. (4 marks)

GRADE 10 POWER MECHANICS – ENGINES

Strand 4.0 – Engines (Sub-Strand 4.1: Introduction)

SECTION A – DEFINITIONS AND USES (20 MARKS)

Q1. (4 marks)
Define an **engine** as used in power mechanics.

Q2. (4 marks)
List **four uses of engines** in day-to-day life.

Q3. (6 marks)
Match the engine types on the left with their common applications on the right:

Engine Type	Application
i) Diesel engine	a) Lawn mower
ii) Petrol engine	b) Tractors
iii) Steam engine	c) Motorcycles
iv) Electric engine	d) Trains

Q4. (6 marks)
Explain **why engines are important** in daily life. Provide at least **three examples**.

SECTION B – ENGINE TERMINOLOGIES (25 MARKS)

Q5. (5 marks)
Define the following terms as used in engines:
a) Bore
b) Stroke
c) Capacity
d) Horsepower
e) TDC

Q6. (5 marks)
Explain the difference between **TDC (Top Dead Center)** and **BDC (Bottom Dead Center)** in an engine. *(Insert diagram showing piston movement)*

Q7. (5 marks)
An engine has a **bore of 80 mm** and a **stroke of 90 mm** in a single cylinder. Calculate the **engine capacity in cubic centimeters (cc)**. *(Formula: Capacity = $\pi/4 \times Bore^2 \times Stroke$)*

Q8. (5 marks)
List **three other common terminologies** used in engines besides bore, stroke, capacity, TDC, BDC, and define each.

Q9. (5 marks)
Explain how **engine capacity, bore, and stroke affect the performance** of a vehicle engine. Provide examples for **high-performance and low-performance engines**.

SECTION C – ENGINE PARTS AND SKETCHING (25 MARKS)

Q10. (5 marks)
Sketch a **sectioned single-cylinder engine** and label the following parts:

- Cylinder block
- Cylinder head
- Piston
- Valves
- Crankshaft

Q11. (5 marks)
Identify the **function of each part** labeled in Q10.

Q12. (5 marks)
Explain how the **piston, cylinder, and valves work together** to allow the engine to perform its intake, compression, combustion, and exhaust strokes.

Q13. (5 marks)
A motor vehicle engine overheats frequently. Based on the engine components, suggest **three possible causes** related to engine parts and explain your reasoning.

Q14. (5 marks)
Illustrate the **piston movement from TDC to BDC** in a single cylinder engine and label the **intake, compression, power, and exhaust strokes**.

SECTION D – ENGINE APPLICATIONS AND ANALYSIS (15 MARKS)

Q15. (5 marks)
List **three types of fuels** used in engines and give **one advantage for each**.

Q16. (5 marks)
Compare **diesel and petrol engines** in terms of:
a) Efficiency
b) Power output
c) Common applications

Q17. (5 marks)
Explain how **engine power (horsepower)** is calculated and why it is important when selecting an engine for a vehicle.

SECTION E – ENGINE CALCULATIONS (15 MARKS)

Q18. (5 marks)
An engine has a bore of 75 mm and stroke of 100 mm. It is a **four-cylinder engine**. Calculate the **total engine capacity in cc**.

Q19. (5 marks)
If a 2-cylinder engine has a bore of 85 mm and stroke of 90 mm, calculate:

a) Capacity of one cylinder
b) Total engine capacity

Q20. (5 marks)
A single-cylinder engine produces **5 kW of power** at 3000 rpm. Calculate the **torque produced** using the formula:

$$\text{Torque (Nm)} = \frac{\text{Power(W)} \times 60}{2\pi \times \text{RPM}}$$

SECTION F –APPLICATION (25 MARKS)

Q21. (High Order, 25 marks)
A motor vehicle manufacturer wants to **design an engine for city cars**. Answer the following:
a) Suggest **three suitable engine types** for city cars and justify your choice. (6 marks)
b) Sketch a **sectioned single-cylinder engine** suitable for this application and label **major parts**. (5 marks)
c) Explain **why engine capacity and bore-stroke ratio** are important in selecting the engine. (5 marks)
d) Discuss the **role of engine terminologies** such as TDC, BDC, and horsepower in engine maintenance and performance. (5 marks)
e) Suggest **two everyday life applications** where this engine could be used besides motor vehicles. (4 marks)

GRADE 10 POWER MECHANICS – END TERM TEST

STRAND: 4.0 ENGINES

SUB-STRAND: 4.2 CLASSIFICATIONS OF ENGINES

SECTION A: (25 MARKS)

Answer ALL questions in this section.

1. Define the term engine classification. (2 marks)

2. State FOUR methods used to classify engines in power mechanics. (4 marks)

3. Name the TWO main methods of combustion used to classify engines. (2 marks)

4. State THREE engine size categories used in classification. (3 marks)

5. State TWO types of engine cooling systems. (2 marks)

6. Identify TWO main fuel types used in internal combustion engines. (2 marks)

7. List THREE examples of alternative fuels used in engines. (3 marks)

8. Write TRUE or FALSE for each statement. (4 marks)

a) Petrol engines use spark ignition.
b) Diesel engines use compression ignition.
c) Air cooling requires a radiator.
d) Engines cannot be classified by size.

9. Match Column A with Column B (3 marks)

Column A	Column B
i) Spark ignition	A) Diesel engine
ii) Compression ignition	B) Petrol engine
iii) Liquid cooling	C) Radiator system

SECTION B: AVERAGE ORDER QUESTIONS (50 MARKS)

Answer ALL questions in this section.

10. (Table Completion) Engine classification by fuel type (6 marks)

Complete the table below by placing each engine into the correct fuel category.

Engines:

- Motorcycle engine
- Diesel generator engine
- Petrol lawn mower engine
- Biogas engine
- Electric hybrid car engine

- Solar-assisted engine

Fuel type category	Engines (fill correctly)
Petrol	
Diesel	
Alternative fuel	

11. Explain FOUR reasons why engine classification is important in power mechanics. (8 marks)

12. Study the diagram below then answer the questions (6 marks)

Illustration: Cooling systems

ENGINE A: ENGINE B:

[Cooling fins] [Radiator]

[Air flow] [Coolant pipes]

(No coolant) [Water pump]

a) Identify the cooling system used in Engine A. (1 mark)
b) Identify the cooling system used in Engine B. (1 mark)
c) Give TWO advantages of Engine B cooling system over Engine A. (2 marks)
d) State TWO examples of machines that commonly use Engine A cooling. (2 marks)

13. Categorize engines by method of combustion (6 marks)

Below are engines found in a local workshop:

- Petrol car engine
- Diesel truck engine
- Petrol generator engine
- Diesel tractor engine

a) Classify each engine as **spark ignition** or **compression ignition**. (4 marks)
b) State ONE main difference between the two combustion methods. (2 marks)

14. Engine size classification (5 marks)

A mechanic visits a workplace and finds the following engines:

- 50cc motorcycle engine
- 1500cc car engine
- 12000cc bus engine

a) Classify them as **small**, **medium**, or **large**. (3 marks)
b) Give TWO reasons why size classification is useful in selecting an engine. (2 marks)

15. (Data-based question) Workplace observation (7 marks)

During a visit to a nearby power mechanics workplace, learners record the engines below:

- Water pump engine
- Tractor engine
- Chainsaw engine
- Generator engine
- Bus engine

a) Classify any THREE engines by size. (3 marks)
b) Classify any THREE engines by fuel type. (3 marks)
c) State ONE engine that can be classified in more than one way and explain why. (1 mark)

16. (Structured) Engine classification chart (6 marks)

Complete the flow chart below:

ENGINES

|

|-- By Fuel Type: _____, _____, _____

|

|-- By Cooling System: _____, _____

|

|-- By Size: _____, _____, _____

17. Explain how you would use digital or print media to research engine classification. (4 marks)

(Your answer should include at least TWO sources and TWO steps.)

18. Engine sorting task (7 marks)

Sort the engines below into the correct class.

Engines:

- Diesel truck engine
- Petrol motorbike engine
- LPG engine
- Air-cooled generator engine
- Liquid-cooled car engine

a) Classify them by fuel type. (3 marks)
b) Classify them by cooling system. (2 marks)
c) Classify them by combustion method. (2 marks)

SECTION C: (25 MARKS)

Answer ALL questions in this section.

19. (Application) Engine selection (6 marks)

A school wants to buy an engine for a **water pump** to irrigate the school farm.

a) Suggest the most suitable fuel type for the engine and justify your answer. (3 marks)
b) Suggest the most suitable cooling system and justify your answer. (3 marks)

20. (Problem solving) Misclassification case (6 marks)

A learner classifies a **diesel engine** as a **spark ignition engine**.

a) Explain why this classification is wrong. (2 marks)
b) Describe what happens in the combustion process of a diesel engine. (2 marks)
c) State TWO consequences of misunderstanding engine classifications in a workshop. (2 marks)

21. (Analysis) Compare engine classes (7 marks)

Compare petrol engines and diesel engines using the table below:

Feature	Petrol engine	Diesel engine
Combustion method		
Fuel used		
Common use		
Maintenance cost		

a) Complete the table. (4 marks)
b) From the comparison, recommend which engine is better for heavy vehicles and explain why. (3 marks)

22. (Evaluation) Workplace learning (6 marks)

During a workplace visit, students observe engines and classify them.

a) Explain TWO ways workplace visits improve understanding of engine classification. (4 marks)
b) State TWO safety rules learners must observe when visiting a power mechanics workshop. (2 marks)

BONUS ILLUSTRATION QUESTION (Included in 100 Marks)

23. Engine classification by observation (6 marks)

Look at the engine sketches below:

ENGINE X: ENGINE Y:

[Fuel injector] [Spark plug]

[No spark plug] [Carburetor]

a) Identify which engine is diesel. (1 mark)
b) Identify which engine is petrol. (1 mark)
c) Give TWO reasons for your answer. (2 marks)
d) State TWO machines where Engine X is commonly used. (2 marks)

GRADE 10 POWER MECHANICS

TOPICAL REVISION: 4.3 TYPES OF ENGINES

SECTION A: (25 MARKS)

1. (2 marks)

Define the following terms:
a) Internal combustion engine
b) External combustion engine

2. (2 marks)

State **two examples** of machines that use:
a) Internal combustion engines
b) External combustion engines

3. (2 marks)

List **two types of engines** based on the number of cylinders.

4. (2 marks)

State **two classifications** of engines based on number of strokes.

5. (2 marks)

Give **two examples** of engines commonly used in day-to-day life.

6. (3 marks)

State **three features** of an internal combustion engine.

7. (3 marks)

State **three features** of an external combustion engine.

8. (3 marks)

Name the following cylinder configurations:
a) Straight arrangement
b) Two banks of cylinders angled together
c) Circular arrangement with rotating motion

9. (3 marks)

State **three categories** of engines based on operation characteristics.

10. (1 mark)

Which type of engine is mostly used in motorcycles: **two-stroke or four-stroke**?

SECTION B: (50 MARKS)

11. (4 marks)

Explain the difference between internal combustion and external combustion engines using **two clear points**.

12. (4 marks)

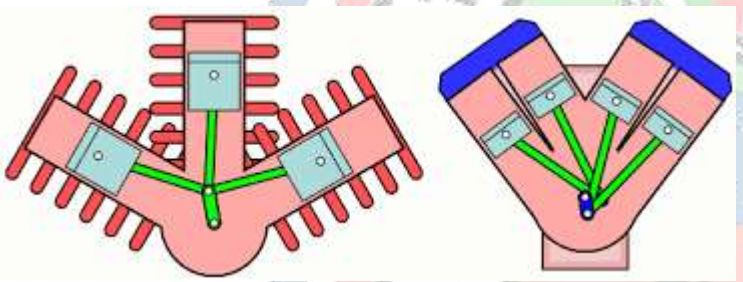
A learner observes that a certain engine burns fuel in a separate chamber and uses steam to drive a piston.
a) Identify the type of combustion process (1 mark)
b) Give one example of such an engine (1 mark)
c) State two reasons why it is classified that way (2 marks)

13. (4 marks)

Describe the types of engines based on **number of cylinders** and give one example for each.
a) Single cylinder engine
b) Multi-cylinder engine

14. (4 marks)

Study the illustration below and answer the questions.



(A) (B)

a) Identify configuration A (1 mark)
b) Identify configuration B (1 mark)
c) State one advantage of configuration A (1 mark)
d) State one advantage of configuration B (1 mark)

15. (3 marks)

Explain **three reasons** why multi-cylinder engines are preferred in vehicles compared to single cylinder engines.

16. (4 marks)

Describe how cylinder configuration affects:
a) Engine balance (2 marks)
b) Space occupied in the engine bay (2 marks)

17. (3 marks)

Classify each of the following as **high speed, medium speed or low speed engines**:
a) Generator engine

b) Motorcycle engine
c) Ship engine

18. (3 marks)

Explain **three characteristics** of a high-speed engine.

19. (3 marks)

Explain **three characteristics** of a low-speed engine.

20. (4 marks)

Use a labelled sketch to illustrate a **V-engine cylinder arrangement**.

21. (4 marks)

Use a labelled sketch to illustrate an **inline engine cylinder arrangement**.

22. (4 marks)

Use a labelled sketch to illustrate a **rotary engine layout**.

23. (5 marks)

Compare two-stroke and four-stroke engines using the table below. Fill in the missing parts.

Feature	**Two-stroke engine**	**Four-stroke engine**
Power stroke frequency	(i) _____	(ii) _____
Fuel economy	(iii) _____	(iv) _____
Lubrication	(v) _____	(vi) _____

(5 marks)

24. (5 marks)

The diagram below represents a 4-stroke engine cycle.

ILLUSTRATION 2: Four-stroke cycle

1. Intake 2. Compression

↓ piston ↑ piston

valve open valves closed

3. Power 4. Exhaust

↓ piston ↑ piston

ignition exhaust valve open

a) Name stroke 1 (1 mark)
b) Name stroke 2 (1 mark)
c) Name stroke 3 (1 mark)

d) Name stroke 4 (1 mark)
e) Which stroke produces useful work? (1 mark)

25. (5 marks)

Explain how a two-stroke engine completes a cycle in **two strokes** using the following headings:
a) First stroke (upward stroke)
b) Second stroke (downward stroke)

26. (4 marks)

State **four ways** the types of engines are applied in daily life (home, transport, agriculture, industry).

27. (4 marks)

A learner wants to choose an engine for a water pump used in a rural farm.
a) Suggest a suitable engine type based on strokes (1 mark)
b) Suggest the suitable type based on cylinders (1 mark)
c) Give two reasons for your choices (2 marks)

SECTION C: (25 MARKS)

(Analysis, Evaluation & Creativity)

28. (8 marks)

A company is designing two engines:

- Engine X for a **motorcycle**
- Engine Y for a **cargo truck**

Answer the following:
a) Recommend the best combustion type for each engine (2 marks)
b) Recommend number of cylinders for each engine (2 marks)
c) Recommend cylinder configuration for each engine (2 marks)
d) Justify your recommendations with two strong reasons (2 marks)

29. (9 marks)

Study the below and answer the questions.

A mechanic receives three engines with the following properties:

- Engine A: Single cylinder, two-stroke, high speed
- Engine B: Multi-cylinder, four-stroke, medium speed
- Engine C: Multi-cylinder, four-stroke, low speed

a) Match each engine to the most suitable use:
i) Ship propulsion
ii) Motorcycle
iii) Passenger vehicle (3 marks)

b) Explain why each match is correct (3 marks)

c) State three disadvantages of using Engine A in a passenger vehicle (3 marks)

30. (8 marks)

Design a simple poster (sketch) titled:
"Types of Engines in Daily Life"

Your poster must include:
a) At least **4 engine types** (2 marks)
b) At least **2 drawings/illustrations** (2 marks)
c) Clear labels (2 marks)
d) Correct examples for each engine type (2 marks)

GRADE 10 POWER MECHANICS

TOPICAL TEST: ENGINE COMPONENTS (4.4)

SECTION A: (25 MARKS)

Answer ALL questions in this section.

1. (1 mark)

Define the term **engine component**.

2. (2 marks)

State **two** main engine components found in the cylinder block.

3. (2 marks)

Name the component that:
a) Converts reciprocating motion to rotary motion.
b) Opens and closes the inlet and exhaust valves.

4. (2 marks)

List **any two** components found in the cylinder head assembly.

5. (2 marks)

Name the component that:
a) Connects the piston to the crankshaft.
b) Covers the top of the cylinder head.

6. (3 marks)

Write the correct engine component name for each description:
a) Holds the cylinders and crankcase.
b) Stores engine oil.
c) Pushes down due to combustion pressure.

7. (3 marks)

State **three** engine components that are used in valve operation.

8. (5 marks)

Match the engine component in Column A with the correct function in Column B.

Column A	Column B
i) Camshaft	A) Stores lubricating oil
ii) Sump	B) Seals combustion chamber
iii) Piston rings	C) Controls valve timing
iv) Cylinder block	D) Supports moving parts
v) Rocker arms	E) Transfers motion to valves

SECTION B: AVERAGE ORDER QUESTIONS (50 MARKS)

Answer ALL questions in this section.

9. (4 marks)

Using a labelled diagram, draw a **simple piston and connecting rod assembly**.

10. (5 marks)

Explain the functions of the following components:
a) Cylinder head
b) Valves
c) Piston
d) Crankshaft
e) Sump

11. (4 marks)

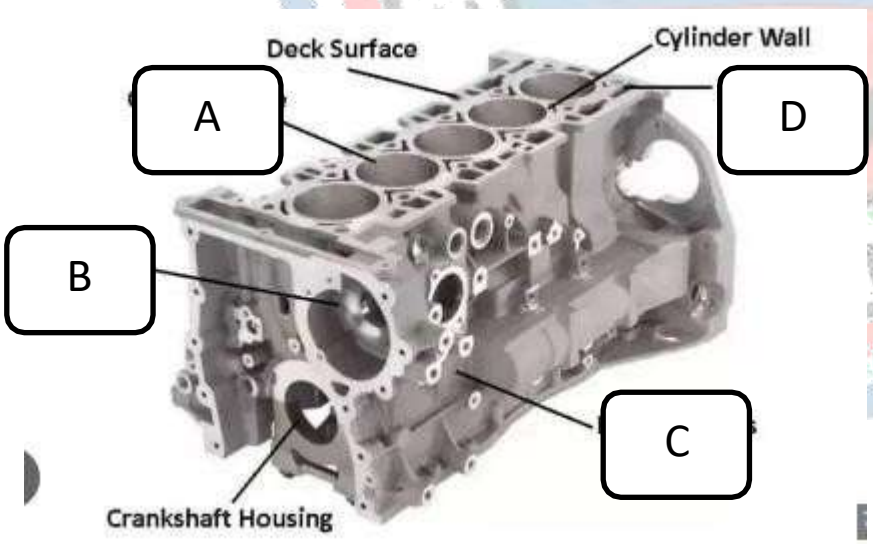
Differentiate between:
a) Crankshaft and camshaft
b) Cylinder block and cylinder head

12. (4 marks)

Describe **four** ways a learner can use **online and print resources** to search for information about engine components.

13. (5 marks)

Study the illustration below and answer the questions.



a) Identify the part labelled **sump area**. (1 mark)
b) State the main function of the sump. (1 mark)
c) Name **two** components found in the cylinder head area. (2 marks)
d) State **one** reason why the cylinder block must be strong. (1 mark)

14. (6 marks)

Describe the role of the following in the working of an engine:
a) Piston rings
b) Connecting rod
c) Valves
d) Rocker arms
e) Camshaft
f) Cylinder head gasket

15. (4 marks)

A learner is asked to identify engine components using **regalia and visual aids**.
State **four** examples of regalia/visual aids that can be used in a workshop or classroom.

16. (4 marks)

Explain **four** safety precautions that should be followed when handling engine components during identification and measurement.

17. (6 marks)

A piston is removed from an engine.
a) State **two** measurements that can be done on the piston. (2 marks)
b) Name the tools used for each measurement. (2 marks)
c) Explain why accurate measurement is important. (2 marks)

18. (5 marks)

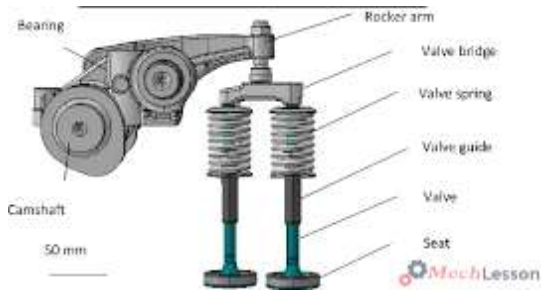
Describe how a learner would measure:
a) Cylinder bore
b) Piston ring gap
(Include the tool used in each case.)

19. (4 marks)

Explain the importance of **engine clearances** in:
a) Cylinder bore
b) Piston rings

20. (5 marks)

The diagram below shows a simplified valve mechanism.



a) Identify the component that covers the rocker arms. (1 mark)
b) State the function of the rocker arm. (2 marks)
c) Name one part that drives the rocker arms in an engine. (1 mark)
d) State one effect of incorrect valve timing. (1 mark)

21. (4 marks)

State **four** signs that engine components may be worn out.

22. (5 marks)

Explain the functions of:
a) Rocker cover
b) Cylinder block
c) Crankshaft bearings
d) Valves
e) Sump plug

23. (4 marks)

A student sketches engine components but forgets to label them.
State **four** reasons why labelling is important in technical drawings.

SECTION C: (25 MARKS)

Answer ALL questions in this section.

24. (6 marks)

An engine is producing **blue smoke** and using too much oil.

a) Identify **two** possible engine components that could be faulty. (2 marks)
b) Explain how each component causes the problem. (4 marks)

25. (6 marks)

A mechanic finds that the engine has **low compression**.

a) State **three** components that may cause low compression. (3 marks)
b) Explain how each one contributes to compression loss. (3 marks)

26. (4 marks)

A learner measures the cylinder bore and finds it is **larger than standard**.

a) State one reason why this happens. (1 mark)
b) Suggest **two** corrective actions. (2 marks)
c) State one danger of continuing to use the engine without repair. (1 mark)

27. (5 marks)

Explain why the following engine components must be properly matched and installed:

a) Piston and cylinder bore
b) Crankshaft and bearings
c) Camshaft and valves
d) Piston rings and ring gap
e) Connecting rod and crankshaft journal

28. (4 marks)

A school workshop has only one engine model.

Explain **four** creative ways learners can still learn engine components effectively using online and print resources.

29. (4 marks)

Explain how engine components contribute to:
a) Efficient fuel use
b) Reduced engine wear
c) Smooth engine operation
d) Engine safety

30. (6 marks)

Engine components are necessary for proper engine performance.

Write a short technical explanation showing why an engine cannot operate if any of the following are missing:
a) Piston
b) Crankshaft
c) Valves
d) Cylinder block
e) Camshaft
f) Sump