

# SMARTWIZ

## GRADE 9 TECHNOLOGY EXAM

**MARKS: 80**

MARKS	

**TIME: 2 hours**

**SCHOOL** \_\_\_\_\_

**CLASS (e.g. 4A)** \_\_\_\_\_

**SURNAME** \_\_\_\_\_

**NAME** \_\_\_\_\_

MYST PATHWORKS

### Instructions for Students:

- > Read all instructions carefully before beginning the exam.
- > Write your name and student ID clearly on the answer sheet/booklet.
- > Answer all questions unless otherwise stated.
- > Show all your work/calculations where applicable.
- > Write clearly and legibly.
- > Use blue or black ink only. \* Do not use correction fluid/tape.
- > No electronic devices (calculators, phones, etc.) are allowed unless explicitly permitted.
- > Raise your hand if you have any questions.
- > Do not talk to other students during the exam.
- > Any form of cheating will result in disqualification.

**This test consists of 8 pages, excluding the cover page.**

## SECTION A: STRUCTURES (20 MARKS)

### QUESTION 1: FUNCTIONS OF STRUCTURES (10 MARKS)

1.1 What is the **main function** of any structure?

(2)

1.2 Name two everyday structures and describe their purposes.

- a) \_\_\_\_\_ – \_\_\_\_\_  
 b) \_\_\_\_\_ – \_\_\_\_\_ (4)

1.3 What is the difference between a **mobile** and a **fixed** structure?

(2)

1.4 Give two reasons why engineers test models before building full-size structures.

- a) \_\_\_\_\_  
 b) \_\_\_\_\_ (2)

### QUESTION 2: STABILITY AND LOAD TYPES (10 MARKS)

2.1 Define the term **stability** in relation to a structure.

(2)

2.2 Match the type of load to its definition:

- i) Dead load
- ii) Live load
- iii) Dynamic load
- iv) Environmental load

- A. Force caused by wind, rain or snow
- B. Load that does not change
- C. Load that moves
- D. Temporary load due to people or furniture

- i → \_\_\_\_\_  
 ii → \_\_\_\_\_

iii → \_\_\_\_\_  
 iv → \_\_\_\_\_ (4)

2.3 Identify two ways to improve the stability of a tall structure.

a) \_\_\_\_\_  
 b) \_\_\_\_\_ (2)

2.4 Why is the base of tall buildings usually wider than the top?

\_\_\_\_\_  
 \_\_\_\_\_ (2)  
 \_\_\_\_\_

## SECTION B: MECHANICAL SYSTEMS & CONTROL (30 MARKS)

### QUESTION 3: LEVERS AND GEARS (15 MARKS)

3.1 What is a **lever**? \_\_\_\_\_ (2)

3.2 Classify the following as first-, second-, or third-class levers:

a) Tongs – \_\_\_\_\_  
 b) Nutcracker – \_\_\_\_\_  
 c) Crowbar – \_\_\_\_\_ (3)

3.3 Name one tool that uses each type of lever:

- First-class: \_\_\_\_\_
- Second-class: \_\_\_\_\_
- Third-class: \_\_\_\_\_ (3)

3.4 Define the following gear terms:

a) Driver gear – \_\_\_\_\_  
 b) Driven gear – \_\_\_\_\_  
 c) Gear ratio – \_\_\_\_\_ (3)

3.5 What happens to the speed and direction of movement when two gears of the same size mesh?

\_\_\_\_\_  
 \_\_\_\_\_ (2)

3.6 Explain why bicycles use gears.

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#### QUESTION 4: MECHANICAL ADVANTAGE & LINKAGES (15 MARKS)

4.1 What is **mechanical advantage**?

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4.2 If a pulley system has a mechanical advantage of 3, what does this mean?

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4.3 Name two tools or systems that use pulleys.

- a) \_\_\_\_\_  
b) \_\_\_\_\_ (2)

4.4 What is the function of a **linkage** in a mechanical system?

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4.5 Study this description:

*A linkage system moves a pen up and down as a motor rotates a camshaft.*

- a) What type of motion does the pen perform? \_\_\_\_\_  
b) What converts rotary motion into up-down motion? \_\_\_\_\_ (2)

4.6 Explain how a **bell-crank linkage** changes direction of motion.

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### SECTION C: ELECTRICAL SYSTEMS (30 MARKS)

#### QUESTION 5: CIRCUITS AND COMPONENTS (15 MARKS)

5.1 Define the following terms:

- a) Conductor – \_\_\_\_\_  
b) Insulator – \_\_\_\_\_ (2)

5.2 Complete the table:

Component	Symbol	Function
Battery	_____	Supplies electrical energy
Light bulb	_____	Converts electrical energy to light
Switch (open)	_____	Breaks the flow of current

(3)

5.3 Name one advantage and one disadvantage of a **parallel circuit**.

Advantage: \_\_\_\_\_

Disadvantage: \_\_\_\_\_ (2)

5.4 What is the purpose of a **fuse** in a circuit?

\_\_\_\_\_ (2)

5.5 Draw a circuit diagram including:

- One battery
- Two light bulbs in parallel
- One switch

Label all parts clearly. (6)

## QUESTION 6: ENERGY & SAFETY (15 MARKS)

6.1 List two **renewable** and two **non-renewable** energy sources.

Renewable: a) \_\_\_\_\_ b) \_\_\_\_\_

Non-renewable: a) \_\_\_\_\_ b) \_\_\_\_\_ (4)

6.2 Why is it important to switch off electrical appliances when not in use?

\_\_\_\_\_  
\_\_\_\_\_ (2)

6.3 Name one common energy transformation that occurs in:

a) A toaster: \_\_\_\_\_

b) A speaker: \_\_\_\_\_ (2)

6.4 What are two dangers of poor household wiring?

a) \_\_\_\_\_

b) \_\_\_\_\_ (2)

6.5 Define the term “energy conservation.”

\_\_\_\_\_ (2)

6.6 What is the purpose of **earthing** in electrical systems?

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(3)

**TOTAL : 80**



## **MEMO**



### **SECTION A: STRUCTURES (20 MARKS)**

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#### **QUESTION 1: FUNCTIONS OF STRUCTURES (10 MARKS)**

1.1

- To support or carry loads and provide stability and safety. ✓✓

1.2

- a) Bridge – To allow people or vehicles to cross obstacles like rivers or roads. ✓✓
- b) Roof – To protect a building and its occupants from weather elements. ✓✓

1.3

- Mobile structures can move or be moved (e.g., cranes).
- Fixed structures are stationary and permanent (e.g., buildings). ✓✓

1.4

- a) To test strength and identify design flaws. ✓
- b) To save costs by identifying problems early. ✓
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#### **QUESTION 2: STABILITY AND LOAD TYPES (10 MARKS)**

2.1

- Stability means the ability of a structure to remain upright and not topple or collapse under load. ✓✓

2.2

- i) Dead load – B ✓
- ii) Live load – D ✓
- iii) Dynamic load – C ✓
- iv) Environmental load – A ✓

2.3

- a) Widening the base ✓
- b) Adding support beams or braces ✓

2.4

- A wider base provides a larger area of support and lowers the centre of gravity, improving stability. ✓✓

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## ⚙️ SECTION B: MECHANICAL SYSTEMS & CONTROL (30 MARKS)

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### QUESTION 3: LEVERS AND GEARS (15 MARKS)

3.1

- A lever is a rigid bar that rotates around a fixed point (fulcrum) to move or lift loads using effort. ✓✓

3.2

- a) Tongs – Third-class ✓
- b) Nutcracker – Second-class ✓
- c) Crowbar – First-class ✓

3.3

- First-class: Crowbar ✓
- Second-class: Nutcracker ✓
- Third-class: Tongs ✓

3.4

- a) Driver gear: The gear connected to the power source that drives the system. ✓
- b) Driven gear: The gear that is moved by the driver gear. ✓
- c) Gear ratio: The ratio of teeth on the driver gear to teeth on the driven gear, determining speed and torque. ✓

3.5

- The speed remains the same, but the direction of rotation reverses. ✓✓

3.6

- Bicycles use gears to change speed and force, allowing easier pedaling uphill and faster speeds on flat surfaces. ✓✓
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## QUESTION 4: MECHANICAL ADVANTAGE & LINKAGES (15 MARKS)

4.1

- Mechanical advantage is the factor by which a machine multiplies the input force to do work. ✓✓

4.2

- The system multiplies the input force by 3, making lifting easier. ✓✓

4.3

a) Crane ✓

b) Flagpole pulley ✓

4.4

- A linkage transfers motion and force between machine parts, often changing direction or type of motion. ✓✓

4.5

a) Reciprocating (up-and-down) motion ✓

b) Camshaft ✓

4.6

- A bell-crank linkage changes the direction of motion through a lever arm that pivots, turning motion at a right angle. ✓✓✓

## ⚡ SECTION C: ELECTRICAL SYSTEMS (30 MARKS)

### QUESTION 5: CIRCUITS AND COMPONENTS (15 MARKS)

5.1

- a) Conductor: Material that allows electric current to flow through it easily (e.g., copper). ✓
- b) Insulator: Material that does not allow electric current to flow easily (e.g., rubber). ✓

5.2

Component	Symbol	Function
Battery	(cell symbol)	Supplies electrical energy
Light bulb	(circle with cross)	Converts electrical energy to light

Component	Symbol	Function
Switch (open)	(open switch)	Breaks the flow of current

5.3

Advantage: Each bulb operates independently; if one goes out, others stay on. ✓

Disadvantage: More wiring and energy consumption. ✓

5.4

- A fuse protects the circuit by breaking the flow of current if it becomes too high, preventing damage or fire. ✓✓

5.5

- Correctly drawn circuit with battery, two bulbs in parallel, switch, and labels (6 marks)

## QUESTION 6: ENERGY & SAFETY (15 MARKS)

6.1

Renewable:

a) Solar ✓

b) Wind ✓

Non-renewable:

a) Coal ✓

b) Oil ✓

6.2

- To save energy and reduce electricity costs and prevent overheating or accidents. ✓✓

6.3

a) Toaster: Electrical energy → Heat energy ✓

b) Speaker: Electrical energy → Sound energy ✓

6.4

a) Electric shocks ✓

b) Fire hazards ✓

6.5

- Energy conservation means using less energy or using energy more efficiently to reduce waste. ✓✓

6.6

- Earthing provides a safe path for electric current to flow into the ground in case of a fault, preventing electric shocks. ✓✓✓

**TOTAL : 80**

