SMARTWIZ

GRADE 9 TECHNOLOGY EXAM

MARKS: 80

MARKS	

TIME: 2 hours

SCHOOL_____

CLASS (e.g. 4A) _____

SURNAME_____

NAME_____

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 & DESIGN (25 MARKS)

QUESTION 1: STRUCTURAL COMPONENTS (12 MARKS)

1.1 What is the difference between a **solid** and a **frame** structure?

_____ (2)

1.2 Name three forces that act on structures.
a) _____
b) _____
c) _____ (3)

1.3 Explain how a **cantilever** works. Give an example.

_____ (3)

1.4 Give two reasons why triangles are often used in structure design.
a) _____
b) _____ (2)

1.5 What is the purpose of a **foundation** in a building?

_____ (2)

QUESTION 2: STRUCTURAL DRAWING INTERPRETATION (13 MARKS)

Use the diagram of a roof truss provided by the teacher.

2.1 Identify the type of structure shown.
_____ (1)

2.2 Label the following parts:

- Tie beam: _____
- Rafter: _____
- King post: _____ (3)

2.3 Suggest two ways to strengthen the truss.
a) _____
b) _____ (2)

2.4 Explain how load is distributed across this type of structure.

_____ (3)

2.5 Give two examples of real-life structures that use trusses.
a) _____
b) _____ (2)

2.6 Why are joints important in frame structures?

_____ (2)

⚙ SECTION B: MECHANISMS & SYSTEMS (30 MARKS)

QUESTION 3: MECHANICAL ADVANTAGE (15 MARKS)

3.1 Define **mechanical advantage**.
_____ (2)

3.2 A wheelbarrow is an example of what class of lever?
_____ (1)

3.3 Explain how a **lever** helps reduce effort.
_____ (2)

3.4 What is the function of the **fulcrum**?
_____ (2)

3.5 Describe how a **gear ratio** affects speed and torque.

_____ (3)

3.6 In a two-pulley system, how is the effort affected?
_____ (2)

3.7 What is the benefit of compound gears in machines?

_____ (3)

QUESTION 4: SYSTEMS & CONTROLS (15 MARKS)

4.1 What is the difference between an **open** and **closed** system?
Open system: _____
Closed system: _____ (4)

4.2 Describe the control in a toaster.
_____ (2)

4.3 Give an example of a system that includes an automatic response.
_____ (1)

4.4 Identify the input, process, and output of a burglar alarm system.
Input: _____
Process: _____
Output: _____ (6)

4.5 Name two ways control systems improve daily life.
a) _____
b) _____ (2)

⚡ SECTION C: ELECTRICAL & ENERGY SYSTEMS (25 MARKS)

QUESTION 5: ENERGY CONVERSIONS (12 MARKS)

5.1 List three different types of energy.
a) _____
b) _____
c) _____ (3)

5.2 Describe the energy conversion in a wind turbine.

_____

_____ (2)

5.3 What is the difference between **potential** and **kinetic** energy?

_____

_____ (3)

5.4 Give two examples of devices that convert electrical energy into another form.
a) Device: _____ – Conversion: _____
b) Device: _____ – Conversion: _____ (4)

_____

QUESTION 6: ELECTRICAL SAFETY & COMPONENTS (13 MARKS)

6.1 Name and describe the function of the following:
a) Fuse – _____
b) Resistor – _____
c) Battery – _____ (6)

6.2 What is a **short circuit** and why is it dangerous?
_____ (2)

6.3 State two safety precautions when using electricity.
a) _____
b) _____ (2)

6.4 Why are conductors and insulators both important in a circuit?

_____

_____ (3)

TOTAL : 80

MEMO

📐 SECTION A: STRUCTURES & DESIGN (25 MARKS)

QUESTION 1 (12 MARKS)

1.1

- Solid structures are filled and heavy, e.g., bricks.
- Frame structures are made of joined parts forming a skeleton. ✓✓

1.2

- Compression
- Tension
- Torsion ✓✓✓

1.3

- A cantilever extends horizontally and is supported at only one end. Example: balcony, diving board. ✓✓✓

1.4

- Triangles are stable and don't deform easily.
- They evenly distribute force. ✓✓

1.5

- The foundation supports the structure and spreads the load into the ground. ✓✓

QUESTION 2 (13 MARKS)

2.1

- Frame structure ✓

2.2

- Tie beam ✓
- Rafter ✓
- King post ✓

2.3

- Add diagonal braces ✓
- Use gusset plates at joints ✓

2.4

- The load is transferred from the top to the supports at the ends, spreading weight through the truss components. ✓✓✓

2.5

- Bridges
- Roofs ✓✓

2.6

- Joints connect parts, allow flexibility, and distribute stress evenly. ✓✓

⚙ SECTION B: MECHANISMS & SYSTEMS (30 MARKS)

QUESTION 3 (15 MARKS)

3.1

- The advantage gained by using a mechanism to multiply force. ✓✓

3.2

- Second-class lever ✓

3.3

- A lever increases force by allowing a smaller input to move a larger load. ✓✓

3.4

- The fulcrum is the pivot point, determining balance and force needed. ✓✓

3.5

- A large gear turning a small one increases speed; a small gear turning a large one increases torque. ✓✓✓

3.6

- The effort is halved; you need less force to lift the load. ✓✓

3.7

- Compound gears allow changes in direction, increase/decrease in speed, and more efficient motion. ✓✓✓

QUESTION 4 (15 MARKS)

4.1

- Open system: no feedback or automatic control.
- Closed system: includes feedback and adjusts itself. ✓✓✓✓

4.2

- The thermostat detects heat and turns the toaster off. ✓✓

4.3

- Automatic doors / motion sensor lights ✓

4.4
Input: Movement detected ✓
Process: Sensor triggers control unit ✓
Output: Alarm sounds ✓ (2 marks each)

4.5

- Saves energy
- Improves safety ✓✓

⚡ SECTION C: ELECTRICAL & ENERGY SYSTEMS (25 MARKS)

QUESTION 5 (12 MARKS)

5.1

- Electrical, thermal, mechanical ✓✓✓

5.2

- Converts kinetic (wind) energy into electrical energy ✓✓

5.3

- Potential: stored energy (e.g., battery)
- Kinetic: energy of motion (e.g., moving fan) ✓✓✓

5.4
a) Kettle – electrical to heat ✓
b) Light bulb – electrical to light ✓ (4 marks total)

QUESTION 6 (13 MARKS)

6.1
a) Fuse – protects circuit by melting when current is too high ✓✓
b) Resistor – reduces current flow ✓✓
c) Battery – provides energy source ✓✓

6.2

- A short circuit occurs when current takes an unintended low-resistance path, causing overheating or fire. ✓✓

6.3

- Don’t overload plugs
- Keep water away from outlets ✓✓

6.4

- Conductors carry current; insulators protect users and prevent short circuits ✓✓✓

TOTAL : 80