# SMARTWIZ

## GRADE11 PHYSICAL SCIENCE EXAM

**MARKS: 100**

| MARKS | |
|---|---|

**TIME: 2 HOURS**

**SCHOOL** _____

**CLASS (eg. 4A)** _____

**SURNAME** _____

**NAME** _____

**Instructions for Learners:**

- Read all instructions carefully before you begin the exam.
- Write your full name and student number clearly on the answer sheet/book.
- Answer all questions unless otherwise instructed.
- Show all your work/calculations where necessary.
- Write neatly and clearly.
- Use only a blue or black pen. Do not use correction fluid or tape.
- Electronic devices (calculators, cell phones, etc.) are not allowed unless explicitly permitted.
- Raise your hand if you have any questions.
- Do not talk to other learners during the exam.
- Any form of dishonesty will result in immediate disqualification from the exam.

**This exam consists of five pages, including the cover page.**

# SECTION A: MULTIPLE CHOICE

**(10 × 2 = 20 marks)**
Circle the correct letter for each question.

1. A scalar quantity has:
   a) Magnitude only
   b) Direction only
   c) Magnitude and direction
   d) No measurable quality
2. The SI unit of power is:
   a) Joule
   b) Newton
   c) Watt
   d) Pascal
3. Which of these is NOT a vector quantity?
   a) Velocity
   b) Acceleration
   c) Force
   d) Speed
4. A car is moving at constant velocity. The net force acting on it is:
   a) Zero
   b) Equal to weight
   c) Maximum
   d) Unknown
5. A 6 N force is applied to an object of 3 kg. What is its acceleration?
   a) 2 $m/s^2$
   b) 3 $m/s^2$
   c) 18 $m/s^2$
   d) 0.5 $m/s^2$
6. The area under a velocity-time graph represents:
   a) Speed
   b) Acceleration
   c) Distance
   d) Displacement
7. The resistance of a wire increases when:
   a) Its length decreases
   b) Its thickness increases
   c) Its temperature increases
   d) It is cooled
8. Electric current is defined as:
   a) Energy per unit charge
   b) Charge per unit time
   c) Voltage per resistance
   d) Force per unit charge
9. The slope of a displacement-time graph gives:
   a) Acceleration
   b) Force

c) Speed
d) Work

10. A body in free fall has:
    a) Constant velocity
    b) No acceleration
    c) Constant acceleration
    d) Increasing mass

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# SECTION B: SHORT DEFINITIONS & THEORY

**(5 × 4 = 20 marks)**

1. Define **momentum** and state its formula.

2. What is meant by **electrical power**? Include the formula.

3. Explain **Newton's First Law of Motion** with an example.

4. Define **work** and explain when work is said to be zero.

5. Differentiate between **series** and **parallel** circuits.

# SECTION C: CALCULATIONS

**(5 × 6 = 30 marks)**
**Show all work clearly and include units.**

1. A 4 kg object is pushed with a force of 12 N. Calculate:
   a) The acceleration of the object
   b) The distance it covers in 3 seconds

*Work:*

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Answer a: _____
Answer b: _____

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2. A box is lifted vertically with a force of 200 N over a height of 2.5 m. Calculate the work done.

*Work:*

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Answer: _____

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3. A 60 W bulb operates for 4 hours.
   a) Calculate the energy in kWh
   b) Convert that energy to joules

*Work:*

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Answer a: _____
Answer b: _____

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4. A 1.5 A current flows through a 10 Ω resistor. Find the voltage across the resistor.

*Work:*

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Answer: _____

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5. An object travels with uniform acceleration from 5 m/s to 25 m/s in 10 s.
   Calculate the distance covered.

*Work:*

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Answer: _____

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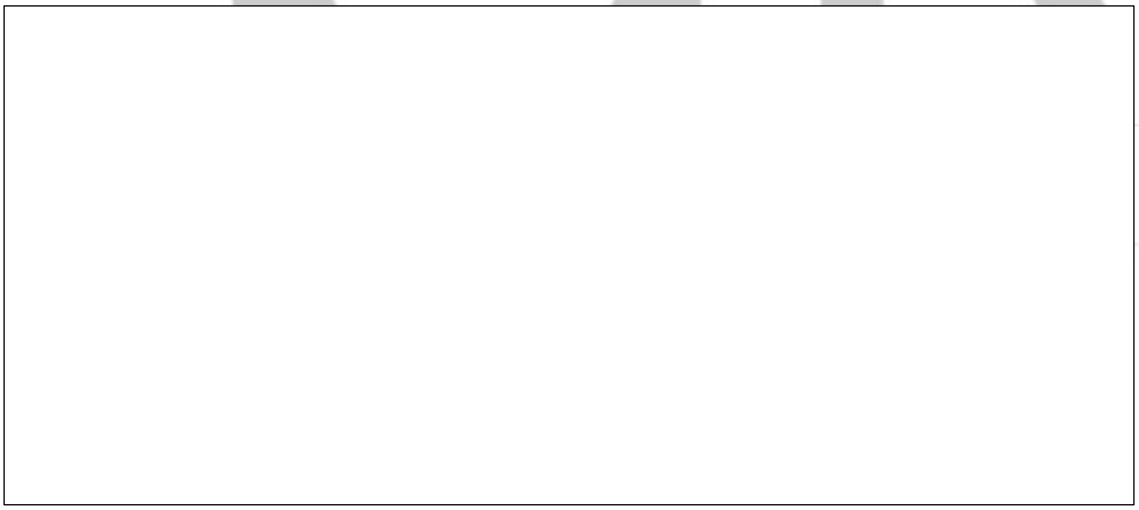
# SECTION D: APPLICATION & DIAGRAMS

**(3 × 10 = 30 marks)**

1. **Draw a free-body diagram** of a crate sliding across a rough surface with a constant velocity.

- Label all forces.
  (Diagram must include friction, applied force, weight, and normal force.)
  ✅ *(10 marks)*



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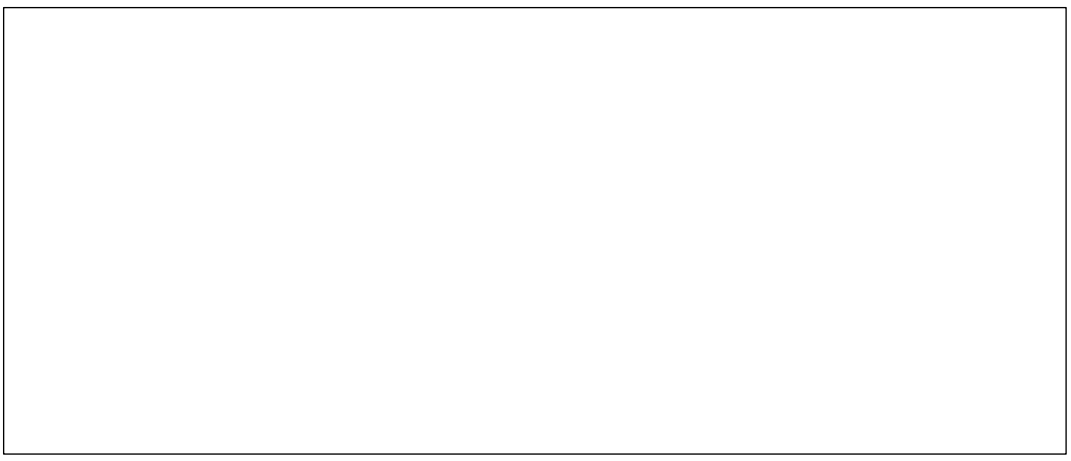
2. A velocity-time graph shows a body accelerating from rest to 15 m/s in 5 seconds.
   a) Draw and label the graph on a grid.



b) Calculate the acceleration.
c) Calculate the distance covered during this time.

*Work:*

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Answer b: _____
Answer c: _____

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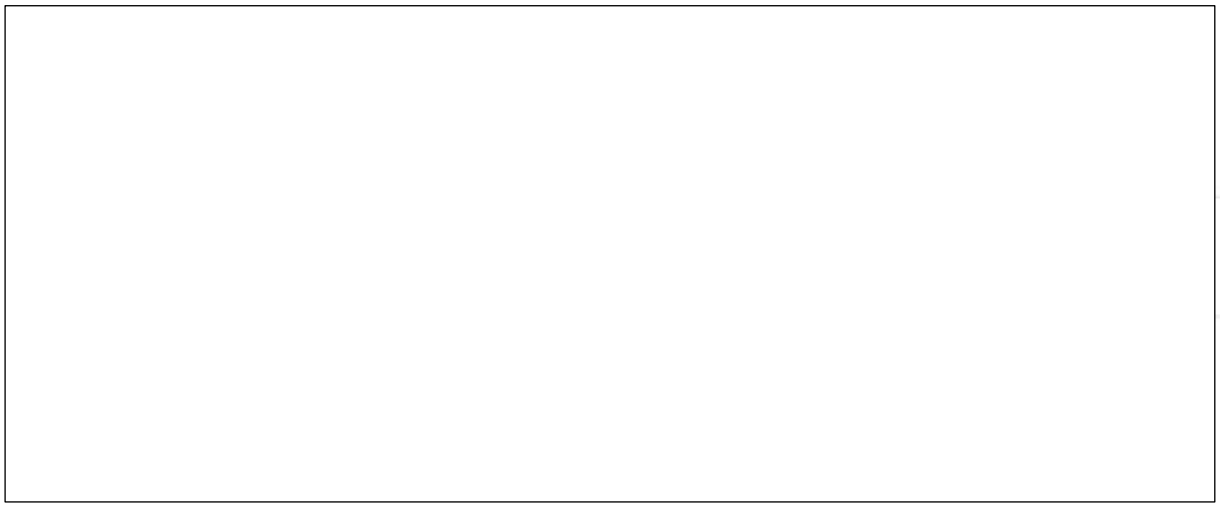
3. A 9 V battery is connected in series with two resistors (3 Ω and 6 Ω).
   a) Draw the circuit diagram with proper symbols.



b) Calculate the total resistance.
c) Calculate the current in the circuit.

*Work:*

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Answer b: _____
Answer c: _____

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**End of Examination**

**MEMO**

# SECTION A: MULTIPLE CHOICE

**(10 × 2 = 20 marks)**

| No. | Answer |
|---|---|
| 1 | a |
| 2 | c |
| 3 | d |
| 4 | a |
| 5 | a |
| 6 | c |
| 7 | c |
| 8 | b |
| 9 | c |
| 10 | c |

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# SECTION B: SHORT DEFINITIONS & THEORY

**(5 × 4 = 20 marks)**

1. **Momentum:**

- Momentum is the product of an object's mass and velocity.
- Formula: p=mvp = mvp=mv
  ✅ *(2 marks for definition, 2 marks for formula)*

2. **Electrical Power:**

- Power is the rate at which electrical energy is transferred.
- Formula: P=VIP = VIP=VI or P=I2RP = I^2RP=I2R
  ✅ *(2 for definition, 2 for formula)*

3. **Newton's First Law:**

- An object remains at rest or in uniform motion unless acted upon by a net external force.
- Example: A ball on a flat surface remains still unless pushed.
  ✅ *(2 for law, 2 for example)*

4. **Work:**

- Work is done when a force causes displacement in the direction of the force.
- Work is zero when there is no displacement or force is perpendicular to displacement.
  ✅ *(2 for definition, 2 for explanation)*

5. **Series vs Parallel Circuits:**

- Series: One path; current is the same.
- Parallel: Multiple paths; voltage is the same across branches.
  ✅ *(2 marks per distinction)*

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# SECTION C: CALCULATIONS

**(5 × 6 = 30 marks)**

1. **Force & Distance**

- a) a=Fm=124=3 m/s2a = \frac{F}{m} = \frac{12}{4} = 3 \, m/s^2a=mF=412=3m/s2 ✅ (3 marks)
- b) d=ut+12at2=0+0.5×3×32=13.5 md = ut + \frac{1}{2}at^2 = 0 + 0.5 \times 3 \times 3^2 = 13.5 \, md=ut+21at2=0+0.5×3×32=13.5m ✅ (3 marks)

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2. **Work Done**

- W=F×d=200×2.5=500 JW = F \times d = 200 \times 2.5 = 500 \, JW=F×d=200×2.5=500J ✅ (6 marks)

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3. **Energy from Bulb**

- a) E=60 W×4 h=0.06 kW×4=0.24 kWhE = 60 \, \text{W} \times 4 \, \text{h} = 0.06 \, \text{kW} \times 4 = 0.24 \, \text{kWh}E=60W×4h=0.06kW×4=0.24kWh ✅ (3 marks)
- b) E=0.24×3.6×106=864 000 JE = 0.24 \times 3.6 \times 10^6 = 864\,000 \, JE=0.24×3.6×106=864000J ✅ (3 marks)

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4. **Voltage**

- V=IR=1.5×10=15 VV = IR = 1.5 \times 10 = 15 \, VV=IR=1.5×10=15V ✅ (6 marks)

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5. **Distance with Uniform Acceleration**

- First, find acceleration:
  $a = \frac{v - u}{t} = \frac{25 - 5}{10} = 2 \, m/s^2$ ✅
- Then use:
  $d = ut + \frac{1}{2}at^2 = 5 \times 10 + 0.5 \times 2 \times 100 = 50 + 100 = 150 \, m$ ✅ (6 marks total)

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# SECTION D: APPLICATION & DIAGRAMS

**(3 × 10 = 30 marks)**

1. **Free-Body Diagram**

- Must include:
  - Downward force: Weight (W = mg)
  - Upward force: Normal force
  - Left/right force: Friction (opposes motion)
  - Applied force (opposite direction to friction)

  ✅ *(2 marks per correctly labeled force)*



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2. **Velocity-Time Graph & Calculations**

- a) Graph: Straight line from (0,0) to (5,15)
  ✅ *(5 marks for correct, neat, labeled graph)*
- b) $a = \frac{v - u}{t} = \frac{15 - 0}{5} = 3 \, m/s^2$
  ✅ (2 marks)
- c) $d = \frac{1}{2}(v+u)t = 0.5 \times (0 + 15) \times 5 = 37.5 \, m$ ✅ (3 marks)

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3. **Circuit with 9 V Battery and Two Resistors (3 Ω + 6 Ω)**

- a) Circuit Diagram:
  - Correct symbols for battery, resistors in series
  - Clear labeling and correct direction of current

  ✅ *(5 marks)
- b) $R_{total} = 3 + 6 = 9 \, \Omega$ ✅ (2 marks)
- c) $I = \frac{V}{R} = \frac{9}{9} = 1 \, A$ ✅ (3 marks)

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✅ **TOTAL: 100 MARKS**