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 QUESTIONS

(10 × 2 = 20 marks)
Circle the correct answer.

1. The **mass** of an object is measured in:
   a) Newtons
   b) Joules
   c) Kilograms
   d) Pascals
2. The force that resists motion between two surfaces is:
   a) Gravity
   b) Normal force
   c) Friction
   d) Tension
3. The energy stored in a stretched spring is:
   a) Kinetic energy
   b) Elastic potential energy
   c) Chemical energy
   d) Electrical energy
4. An object accelerating uniformly from rest has an initial velocity of:
   a) 0 m/s
   b) 5 m/s
   c) 10 m/s
   d) It depends on the force
5. The formula for **momentum** is:
   a) Force × time
   b) Mass × velocity
   c) Energy ÷ time
   d) Acceleration × mass
6. What does the slope of a **displacement-time** graph represent?
   a) Acceleration
   b) Speed
   c) Distance
   d) Time
7. Which law explains how rockets are launched?
   a) Newton's First Law
   b) Newton's Second Law
   c) Newton's Third Law
   d) Law of Gravitation
8. What is the unit for **electrical resistance**?
   a) Ohm (Ω)
   b) Ampere (A)
   c) Volt (V)
   d) Watt (W)
9. The work done when a 20 N force moves an object 4 m is:
   a) 24 J
   b) 80 J

c) 5 J
d) 16 J

10. Which of the following is **not** an example of uniform acceleration?
    a) Free fall
    b) A car slowing at a steady rate
    c) Circular motion at constant speed
    d) Object sliding down a frictionless ramp

SECTION B: DEFINITIONS & EXPLANATIONS

(5 × 4 = 20 marks)

1. Define acceleration and explain what it means if acceleration is negative.

2. What is meant by "net force" in a system of multiple forces?

3. State the principle of conservation of mechanical energy.

4. Distinguish between series and parallel electrical circuits.

5. Describe how kinetic energy changes as an object goes down a hill.

SECTION C: PROBLEM SOLVING & CALCULATIONS

(5 × 6 = 30 marks)
Show all working and include units.

1. A car of mass 1200 kg accelerates from 10 m/s to 25 m/s in 5 seconds. Find:
a) The acceleration
b) The net force acting on the car

Work:

Answer a: _____
Answer b: _____

2. A 5 kg object is lifted 8 m upward. Calculate the gravitational potential energy gained.
(Use g=9.8 m/s2g = 9.8 \, m/s^2g=9.8m/s2)

Work:

Answer: _____

3. A 60 W light bulb is used for 2.5 hours. How much energy does it consume in joules?
(Remember: 1 hour = 3600 s)

Work:

Answer: _____

4. A circuit contains a 9 V battery and a 3 Ω resistor. Calculate the current.

Work:

Answer: _____

5. An object accelerates at 2 m/s² for 6 seconds from an initial velocity of 4 m/s. Calculate its final velocity.

Work:

Answer: _____

SECTION D: DIAGRAMS & APPLICATION

(2 × 15 = 30 marks)

1. Draw and label a free-body diagram for a book resting on a table.

- Include the weight, normal force, and any other applicable forces.
- Use arrows to indicate direction.
  (Diagram must be neat, correct, and labeled)

2. An object is dropped from a 20 m tall building.
a) Calculate the time it takes to reach the ground.
b) What is its speed just before impact?
c) Explain how energy conservation applies here.

Work:

Answer a: _____
Answer b: _____
Answer c:

End of Examination

MEMO

SECTION A: MULTIPLE CHOICE QUESTIONS

(10 × 2 = 20 marks)

1. **c) Kilograms**
2. **c) Friction**
3. **b) Elastic potential energy**
4. **a) 0 m/s**
5. **b) Mass × velocity**
6. **b) Speed**
7. **c) Newton's Third Law**
8. **a) Ohm (Ω)**
9. **b) 80 J**
10. **c) Circular motion at constant speed**

SECTION B: DEFINITIONS & EXPLANATIONS

(5 × 4 = 20 marks)

1. **Acceleration & Negative Acceleration**

- Acceleration is the rate of change of velocity.
- Negative acceleration (deceleration) means the object is slowing down.

✅ *(2 marks definition, 2 marks explanation)*

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2. **Net Force**

- The net force is the vector sum of all forces acting on an object.
- It determines whether the object will accelerate or remain in equilibrium.

✅ *(2 marks for definition, 2 marks for understanding)*

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3. **Conservation of Mechanical Energy**

- The total mechanical energy (kinetic + potential) of an isolated system remains constant, assuming no friction or external forces.

✅ *(4 marks total for complete and correct definition)*

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4. **Series vs Parallel Circuits**

- In a series circuit, components share the same current.
- In a parallel circuit, the voltage across each branch is the same.
- Series: one path; Parallel: multiple paths.
  ✅ *(2 marks each comparison, 1 mark examples if given)*

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5. **Kinetic Energy on a Hill**

- As the object goes downhill, potential energy is converted into kinetic energy, increasing its speed.
  ✅ *(4 marks for clear energy transformation description)*

SECTION C: CALCULATIONS

(5 × 6 = 30 marks)

1. **Car acceleration and force**
   a) a=v−ut=25−105=3 m/s2a = \frac{v - u}{t} = \frac{25 - 10}{5} = 3 \, \text{m/s}^2a=tv−u =525−10=3m/s2 ✅ (3 marks)
   b) F=ma=1200×3=3600 NF = ma = 1200 \times 3 = 3600 \, \text{N}F=ma=1200×3=3600N ✅ (3 marks)

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2. **Gravitational Potential Energy**

- PE=mgh=5×9.8×8=392 JPE = mgh = 5 \times 9.8 \times 8 = 392 \, \text{J}PE=mgh=5×9.8×8=392J ✅ (6 marks)

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3. **Energy Used by Light Bulb**

- Time = 2.5×3600=9000 s2.5 \times 3600 = 9000 \, \text{s}2.5×3600=9000s
- E=Pt=60×9000=540000 JE = Pt = 60 \times 9000 = 540000 \, \text{J}E=Pt=60×9000=540000J ✅ (6 marks)

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4. **Current from Voltage and Resistance**

- I=VR=93=3 AI = \frac{V}{R} = \frac{9}{3} = 3 \, \text{A}I=RV=39=3A ✅ (6 marks)

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5. **Final Velocity**

- $v=u+at=4+(2\times6)=4+12=16$ m/s$v = u + at = 4 + (2 \times 6) = 4 + 12 = 16$ \, \text{m/s}$v=u+at=4+(2×6)=4+12=16$m/s ✅ (6 marks)

SECTION D: DIAGRAMS & APPLICATION

(2 × 15 = 30 marks)

1. **Free-Body Diagram (Book on Table)**

- Downward force: Weight (W = mg)
- Upward force: Normal force
- No horizontal forces (assuming no friction or push)
  ✅ (5 marks for forces, 5 marks for labels, 5 marks for neat, correct arrows and layout)

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2. **Dropped Object from 20 m**

Given:

- $h=20$ mh = 20 \, mh=20m, $g=9.8$ m/s2g = 9.8 \, m/s^2g=9.8m/s2

a) **Time to reach ground:**
$h=12gt2\Rightarrow20=0.5\times9.8\times t2h = \frac{1}{2}gt^2 \Rightarrow 20 = 0.5 \times 9.8 \times t^2h=21gt2⇒20=0.5×9.8×t2$
$t2=204.9\Rightarrow t=4.08\approx2.02$ st^2 = \frac{20}{4.9} \Rightarrow t = \sqrt{4.08} \approx 2.02 \, st2=4.920 ⇒t=4.08≈2.02s ✅ (5 marks)

b) **Speed before impact:**
$v=gt=9.8\times2.02=19.8$ m/sv = gt = 9.8 \times 2.02 = 19.8 \, m/sv=gt=9.8×2.02=19.8m/s ✅ (5 marks)

c) **Energy Conservation:**

- At the top: Maximum potential energy
- As it falls: PE converts to KE
- Just before impact: KE is maximum, PE is zero (no loss if ignoring air resistance) ✅ (5 marks)

✅ **Total: 100 Marks**