

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: CONCEPTUAL KNOWLEDGE (15 marks)

Choose the correct answer. Write the letter only. (1 mark each)

1. The change in velocity per unit time is called:

- a) Speed
- b) Acceleration
- c) Inertia
- d) Force

Answer: _____

2. Which of the following is a contact force?

- a) Gravity
- b) Magnetic force
- c) Friction
- d) Electrostatic force

Answer: _____

3. One kilowatt-hour (kWh) equals:

- a) 3600 J
- b) 1,000 J
- c) 3.6×10^6 J
- d) 6000 J

Answer: _____

4. The unit of momentum is:

- a) $\text{kg} \cdot \text{m/s}$
- b) $\text{N} \cdot \text{m}$
- c) m/s^2
- d) J/s

Answer: _____

5. Which law states: *"The rate of change of momentum is directly proportional to the net force acting on an object?"*

- a) Newton's First Law
- b) Newton's Second Law
- c) Newton's Third Law
- d) Law of Conservation of Momentum

Answer: _____

SECTION B: MATCHING ITEMS (10 marks)

Match Column A with Column B by writing the correct letter (A–E) next to the number.

Column A	Column B
1. Ohm's Law	A. Force \times displacement
2. Hooke's Law	B. $V = IR$
3. Work done	C. $m \times v^2 / 2$
4. Kinetic Energy	D. $F = kx$
5. Weight	E. mg

Answers:

- 1: _____
2: _____
3: _____
4: _____
5: _____

SECTION C: EXPLANATION AND THEORY

(5 × 4 = 20 marks)

1. State the **difference** between *mass* and *weight*.

2. Explain why passengers feel a jolt forward when a moving bus suddenly stops.

3. Describe two **ways to reduce energy loss** in an electrical appliance.

4. State the **law of conservation of charge** and give one practical example.

5. Why does a metal rod feel colder than a wooden stick at the same temperature?

SECTION D: CALCULATIONS (30 marks)

Show all steps and units clearly.

1. A car of mass 800 kg moves with a velocity of 20 m/s. Calculate:

- a) Its momentum
- b) Its kinetic energy

Work:

Answer a: _____

Answer b: _____

2. A 2 m long spring stretches by 5 cm when a 10 N weight is attached. Calculate the spring constant.

Formula: _____

Work:

Answer: _____

3. A 1000 W heater runs for 3 hours. Calculate the energy consumed in kWh and J.

a) Energy in kWh: _____

b) Energy in J: _____

4. An object falls freely from rest. Find the distance it travels in 4 seconds.

(Use $g=9.8 \text{ m/s}^2$ $g = 9.8 \text{ \, m/s}^2$ $g=9.8 \text{ m/s}^2$)

Formula: _____

Work:

Answer: _____

5. A lightbulb has a resistance of $240\ \Omega$ and is connected to a $120\ \text{V}$ source. Calculate the current.

Formula: _____

Work: _____

Answer: _____

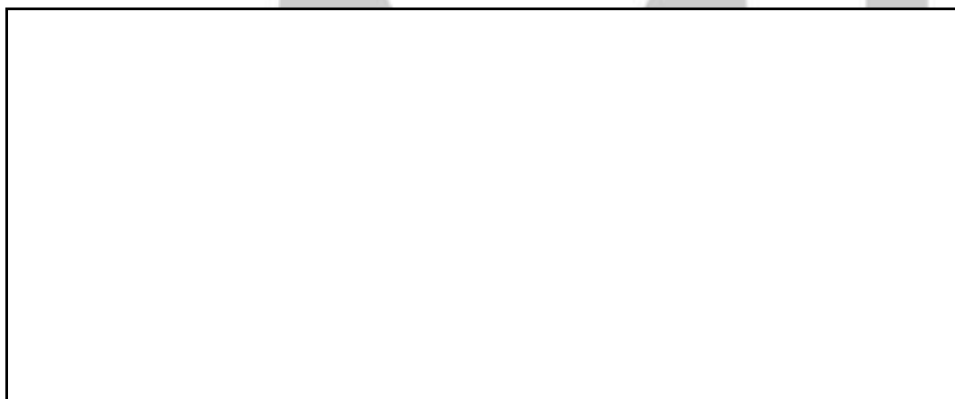
SECTION E: DIAGRAMS & DATA APPLICATION (25 marks)

1. The graph below shows the velocity of a cyclist over time:

(Teacher to draw or attach velocity-time graph if printed; for text version, describe it as follows):

"A cyclist accelerates from 0 to $10\ \text{m/s}$ in 5 seconds, maintains speed for 5 seconds, then decelerates to $0\ \text{m/s}$ over 5 seconds."

a) Sketch and label the graph on the grid. (10 marks)



b) Calculate the total distance travelled in the 15 seconds. (5 marks)

2. Draw and label a simple series circuit with:

- A battery
- A switch
- Two resistors

(Diagram must be neat and correct with symbols.) (10 marks)

End of Paper

MEMO

SECTION A: MULTIPLE CHOICE QUESTIONS

(5 × 1 = 5 marks)

1. b) Acceleration
2. c) Friction
3. c) $3.6 \times 10^6 \text{ J}$
4. a) $\text{kg}\cdot\text{m/s}$
5. b) Newton's Second Law

SECTION B: MATCHING ITEMS

(5 × 2 = 10 marks)

Question	Answer
1	B
2	D
3	A
4	C
5	E

✓ 2 marks each = 10 marks

SECTION C: EXPLANATION AND THEORY

(5 × 4 = 20 marks)

1. Mass vs Weight

- Mass is the amount of matter in an object (kg); it remains constant.
 - Weight is the force due to gravity ($W = mg$), and it varies with gravitational field strength.
- ✓ (2 marks each)

2. Bus Stop Inertia Explanation

- Due to inertia, the passenger's body tends to remain in motion.
 - When the bus stops suddenly, the lower part stops, but the upper body continues forward.
- ✓ (4 marks: concept + example)

3. Ways to Reduce Energy Loss

- Use better insulation to prevent heat loss.
- Use low-resistance wires or efficient components.

✓ (2 marks per valid method)

4. Conservation of Charge

- Total electric charge in an isolated system remains constant.
- Example: Charging by friction — electrons are transferred, not created.

✓ (2 marks for principle, 2 for example)

5. Metal Feels Colder

- Metal conducts heat away from the skin faster than wood.
- This rapid heat transfer makes it feel colder.

✓ (2 marks for conduction, 2 marks for heat transfer concept)

SECTION D: CALCULATIONS

(5 × 6 = 30 marks)

1. Momentum and KE of Car

- a) $p = mv = 800 \times 20 = 16\,000 \text{ kg} \cdot \text{m/s}$ $p = mv = 800 \times 20 = 16\,000$
- b) $KE = \frac{1}{2}mv^2 = \frac{1}{2} \times 800 \times 400 = 160\,000 \text{ J}$ $KE = \frac{1}{2}mv^2 = \frac{1}{2} \times 800 \times 400 = 160\,000$

✓ (3 marks each)

2. Spring Constant

- $F = kx \Rightarrow k = \frac{F}{x} = \frac{10}{0.05} = 200 \text{ N/m}$ $F = kx \Rightarrow k = \frac{F}{x} = \frac{10}{0.05} = 200$

✓ (1 mark formula, 2 substitution, 3 correct answer)

3. Heater Energy Use

- a) $E = Pt = 1 \text{ kW} \times 3 \text{ h} = 3 \text{ kWh}$
 $E = Pt = 1 \text{ kW} \times 3 \text{ h} = 3 \text{ kWh}$
 - b) $E = 1000 \times 3600 \times 3 = 10\,800\,000 \text{ J}$
 $E = 1000 \times 3600 \times 3 = 10\,800\,000 \text{ J}$
- ✓ (3 marks each)

4. Free Fall Distance

- $d = \frac{1}{2}gt^2 = 0.5 \times 9.8 \times 16 = 78.4 \text{ m}$
 $d = \frac{1}{2}gt^2 = 0.5 \times 9.8 \times 16 = 78.4 \text{ m}$
- ✓ (1 mark formula, 2 for substitution, 3 for correct answer)

5. Current in Circuit

- $I = \frac{V}{R} = \frac{120}{240} = 0.5 \text{ A}$
 $I = \frac{V}{R} = \frac{120}{240} = 0.5 \text{ A}$
- ✓ (6 marks total)

SECTION E: DIAGRAMS & APPLICATION

(25 marks total)

1. Velocity-Time Graph & Distance

- a) **Graph:**
 - Straight line from (0,0) to (5,10) → acceleration
 - Horizontal line from (5,10) to (10,10) → constant speed
 - Straight line from (10,10) to (15,0) → deceleration

✓ (10 marks: 2 per phase, 2 for labels and scale)
- b) **Distance travelled:**
 - Triangle 1: $\frac{1}{2} \times 5 \times 10 = 25$
 - Rectangle: $5 \times 10 = 50$
 - Triangle 2: $\frac{1}{2} \times 5 \times 10 = 25$
 - **Total = 25 + 50 + 25 = 100 m** ✓ (5 marks)

2. Series Circuit Diagram

- Must include:

- Correct symbols for battery, switch, and two resistors
 - Components in one continuous loop
 - Neat layout and labels
- ✓ (10 marks: 2 per symbol, 2 for correct connections, 2 for labels)
-

✓ **Total: 100 marks**

