

# SMARTWIZ

## GRADE 10 Physical Science EXAM

**MARKS: 150**

MARKS	

**TIME: 2 hour**

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

**CLASS (e.g. 10A)** \_\_\_\_\_

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

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

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### 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.

# QUESTION 1: MULTIPLE CHOICE

(CIRCLE THE CORRECT ANSWER.)

(10 × 2 = 20 marks)

1.1 A scalar quantity has:

- A. Only magnitude
- B. Only direction
- C. Both magnitude and direction
- D. No magnitude and no direction

1.2 Which unit represents acceleration?

- A. m
- B. m/s
- C.  $\text{m/s}^2$
- D.  $\text{s}^2$

1.3 The area under a velocity-time graph represents:

- A. Displacement
- B. Force
- C. Acceleration
- D. Energy

1.4 Which is not an example of a contact force?

- A. Friction
- B. Tension
- C. Magnetic
- D. Normal force

1.5 Which of the following travels fastest in a vacuum?

- A. Sound
- B. Water wave
- C. Light
- D. Seismic wave

1.6 What does Ohm's Law state?

- A.  $V = IR$
- B.  $F = ma$
- C.  $E = mc^2$
- D.  $Q = It$

1.7 If frequency increases, the wavelength will:

- A. Increase
- B. Stay the same
- C. Decrease
- D. Multiply

1.8 The SI unit for work is:

- A. Watt
- B. Newton

- C. Joule
- D. Volt

1.9 A generator converts:

- A. Electrical to chemical
- B. Mechanical to electrical
- C. Light to electrical
- D. Heat to mechanical

1.10 The energy stored due to an object's height is:

- A. Kinetic energy
- B. Elastic potential energy
- C. Chemical energy
- D. Gravitational potential energy

## QUESTION 2: MATCHING DEFINITIONS (TABLE)

Match the terms in **Column 1** with the correct definitions from **Column 2**. Write the correct letter from Column 2 next to the number.

(10 × 1 = 10 marks)

Column 1	Term	Column 2	Definition
2.1	Acceleration	A	A force that opposes motion
2.2	Frequency	B	Energy of motion
2.3	Friction	C	Stored energy due to position
2.4	Power	D	Change in velocity per unit time
2.5	Current	E	Number of waves per second
2.6	Voltage	F	Energy used per unit time
2.7	Kinetic energy	G	Flow of charge
2.8	Potential energy	H	Force per unit area
2.9	Pressure	I	Push that moves charge
2.10	Work	J	Force applied over a distance

**Answer:**

- 2.1 \_\_\_\_\_
- 2.2 \_\_\_\_\_
- 2.3 \_\_\_\_\_
- 2.4 \_\_\_\_\_
- 2.5 \_\_\_\_\_
- 2.6 \_\_\_\_\_
- 2.7 \_\_\_\_\_
- 2.8 \_\_\_\_\_

2.9 \_\_\_\_\_  
2.10 \_\_\_\_\_

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## QUESTION 3: MECHANICS – MOTION & FORCES

(30 marks)

3.1 Define Newton's Second Law of Motion.

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(2)

3.2 A car accelerates from rest to 25 m/s in 10 seconds. Calculate its acceleration.  
Formula:  $a = (v - u) / t$

Working:

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Answer: \_\_\_\_\_  $\text{m} \cdot \text{s}^{-2}$  (3)

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3.3 A 1.5 kg ball falls from a height of 5 m. Calculate its gravitational potential energy.  
Use:  $\text{PE} = mgh$  ( $g = 9.8 \text{ m} \cdot \text{s}^{-2}$ )  
(3 lines)

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(3)

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3.4 Draw a free-body diagram for a box being pushed across the floor.  
Label all forces.

[Leave space for drawing]

(4)

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3.5 A trolley is pulled with a force of 15 N and moves 4 m. Calculate the work done.

Use:  $W = F \times d$

(3 lines)

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(3)

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3.6 Explain what inertia is and how seatbelts help during a crash.

(4 lines)

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(4)

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3.7 A ball is thrown upward with a velocity of 14 m/s. How long will it take to reach the top of its path?

Use:  $v = u + at$  (at top,  $v = 0$ )

(4 lines)

(4)

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## QUESTION 4: WAVES AND SOUND

(20 marks)

4.1 Name two types of mechanical waves.

(2)

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4.2 A sound wave travels at 340 m/s and has a frequency of 85 Hz. Calculate the wavelength.

Use:  $\lambda = v / f$

(3 lines)

(3)

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4.3 State two differences between transverse and longitudinal waves.

(4 lines)

(4)

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4.4 Label the parts of the wave below: (crest, trough, amplitude, wavelength)  
[Insert wave diagram space]

(4)

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4.5 Explain how bats use sound to detect objects in the dark.

(3 lines)

(3)

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4.6 What happens to sound when it moves from air into water?

(2 lines)

(2)

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4.7 State one application of ultrasound in medicine.

(1)

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## QUESTION 5: ELECTRICITY

(30 marks)

5.1 Define electrical resistance.

(2)

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5.2 A 10 V battery causes 2 A to flow in a circuit. Calculate the resistance.

Use:  $R = V / I$

(3)

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5.3 Draw a simple parallel circuit with a battery, two bulbs and a switch.

(4)

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5.4 A 60 W bulb is used for 5 hours. Calculate the energy consumed in kWh.

Use:  $E = P \times t$

(3)

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5.5 Calculate the cost if electricity is R1.50 per kWh.

(2)

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5.6 Give two advantages of parallel circuits in homes.

(2)

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5.7 Name two components in a circuit that protect users.

(2)

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5.8 A  $4\ \Omega$  and  $6\ \Omega$  resistor are connected in series. What is the total resistance?

(2)

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5.9 Calculate the current if a 12 V battery is connected across the series resistors above.

(3)

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## QUESTION 6: ENERGY AND POWER

**(30 marks)**

6.1 Define the Law of Conservation of Energy.

(2)

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6.2 A motor lifts a 20 kg box 3 m up in 5 seconds.

Calculate:

a) Work done ( $W = F \times d$ )

(3)

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b) Power used ( $P = W / t$ )

(3)

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6.3 Identify the energy conversions in:

a) A toaster

b) A wind turbine

(4)

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6.4 State two advantages and two disadvantages of using solar energy.  
(4)

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6.5 What is the difference between renewable and non-renewable energy?  
(3)

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6.6 List three ways to save electricity at home.  
(3)

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6.7 A hairdryer rated 2000 W runs for 30 minutes.  
Calculate energy in kWh.  
(Use:  $P \times \text{time (in hours)}$ )  
(3)

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**TOTAL: 150 MARKS**

**QUESTION 1: MULTIPLE CHOICE (20 MARKS)**

- 1.1 A
  - 1.2 C
  - 1.3 A
  - 1.4 C
  - 1.5 C
  - 1.6 A
  - 1.7 C
  - 1.8 C
  - 1.9 B
  - 1.10 D
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## QUESTION 2: MATCHING DEFINITIONS (10 MARKS)

- 2.1 D
  - 2.2 E
  - 2.3 A
  - 2.4 F
  - 2.5 G
  - 2.6 I
  - 2.7 B
  - 2.8 C
  - 2.9 H
  - 2.10 J
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## QUESTION 3: MECHANICS (30 MARKS)

- 3.1 The net force acting on an object is equal to the product of its mass and acceleration.
  - 3.2  $a = (25 - 0)/10 = 2.5 \text{ m/s}^2$
  - 3.3  $PE = mgh = 1.5 \times 9.8 \times 5 = 73.5 \text{ J}$
  - 3.4 Free-body diagram: Gravity (down), Normal force (up), Friction (left), Applied force (right)
  - 3.5  $W = F \times d = 15 \times 4 = 60 \text{ J}$
  - 3.6 Inertia is the resistance to change in motion; seatbelts prevent the body from continuing forward when the car stops suddenly.
  - 3.7  $0 = 14 + (-9.8)t \rightarrow t = 14 / 9.8 = 1.43 \text{ s}$
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## QUESTION 4: WAVES AND SOUND (20 MARKS)

- 4.1 Transverse wave, Longitudinal wave
- 4.2  $\lambda = v/f = 340/85 = 4 \text{ m}$
- 4.3 Transverse: particles move perpendicular; Longitudinal: particles move parallel
- 4.4 Crest (top), Trough (bottom), Amplitude (height from rest to crest), Wavelength (distance between crests)
- 4.5 Bats use echolocation by sending sound waves and detecting the echoes that bounce back.

- 4.6 Sound travels faster and further in water.  
4.7 Ultrasound scanning (e.g. during pregnancy)
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### QUESTION 5: ELECTRICITY (30 MARKS)

- 5.1 Resistance is the opposition to the flow of electric current.  
5.2  $R = V/I = 10 / 2 = 5 \Omega$   
5.3 Diagram includes: battery, two bulbs in parallel, and switch  
5.4  $E = P \times t = 60 \times 5 = 300 \text{ Wh} = 0.3 \text{ kWh}$   
5.5  $\text{Cost} = 0.3 \times 1.50 = R0.45$   
5.6 If one bulb goes off, others stay on; Voltage is the same across devices  
5.7 Fuse, circuit breaker  
5.8  $R = 4 + 6 = 10 \Omega$   
5.9  $I = V / R = 12 / 10 = 1.2 \text{ A}$
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### QUESTION 6: ENERGY AND POWER (30 MARKS)

- 6.1 Energy cannot be created or destroyed, only transferred or transformed.  
6.2 a)  $W = F \times d = (20 \times 9.8) \times 3 = 588 \text{ J}$   
b)  $P = W / t = 588 / 5 = 117.6 \text{ W}$   
6.3 a) Electrical  $\rightarrow$  Heat  
b) Kinetic  $\rightarrow$  Electrical  
6.4 Advantages: Renewable, no pollution  
Disadvantages: Expensive setup, depends on sunlight  
6.5 Renewable can be replaced naturally; Non-renewable will eventually run out  
6.6 Turn off unused lights, use energy-saving bulbs, unplug appliances  
6.7  $E = 2000 \text{ W} \times 0.5 \text{ h} = 1 \text{ kWh}$
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**TOTAL: 150 MARKS**