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 (10 x 2 = 20 marks)

Circle the correct letter (A–D)!!!

1.1 The unit of energy is:
A. Watt
B. Newton
C. Joule
D. Volt

1.2 A vector quantity must have:
A. Magnitude only
B. Direction only
C. Magnitude and direction
D. No units

1.3 Which of the following is a non-contact force?
A. Friction
B. Tension
C. Magnetic
D. Air resistance

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1.4 What happens to resistance if length of a wire increases?
A. It decreases
B. Stays the same
C. Increases
D. Doubles

1.5 Which wave can travel through a vacuum?
A. Sound
B. Water
C. Light
D. Seismic

1.6 Which of the following is an example of a transverse wave?
A. Sound
B. Water wave
C. Shock wave
D. Earthquake P-wave

1.7 What does Ohm's Law state?
A. Power = current × voltage
B. Current = resistance × voltage

C. Voltage = current × resistance
D. Energy = power × time

1.8 Which circuit element stores charge?
A. Switch
B. Resistor
C. Battery
D. Capacitor

1.9 Acceleration is:
A. Distance per time
B. Rate of change of speed
C. Mass × velocity
D. Force per mass

1.10 What is the gravitational field strength on Earth?
A. 5 N/kg
B. 9.8 N/kg
C. 1.6 N/kg
D. 0 N/kg

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QUESTION 2: MATCHING COLUMNS (10 x 1 = 10 marks)

Match **Column A** with the correct answer from **Column B**. Write only the letter of the correct answer (e.g., 2.1 – F).

COLUMN A	**COLUMN B**
2.1 Displacement	| A. Resistance to motion
	| B. Travels parallel to energy
2.2 Newton's 2nd Law |	| C. Push or pull
	| D. Rate of doing work
	| E. Measured in volts
2.3 Inertia	| F. Mass × acceleration
	| G. Opposes flow of current
2.4 Longitudinal wave	| H. Flow of electric charge
	| I. Vector quantity
	| J. SI unit of resistance
2.5 Power	
2.6 Electric current	

2.7 Ohm 2.8 Force 2.9 Potential difference 2.10 Resistor	

2.1_____
2.2_____
2.3_____
2.4_____
2.5_____
2.6_____
2.7_____
2.8_____
2.9_____
2.10_____

QUESTION 3: MOTION & FORCES (30 marks)

3.1 Define the term *acceleration*. (2)

_____

_____

_____

3.2 A car changes its speed from 8 $m \cdot s^{-1}$ to 20 $m \cdot s^{-1}$ in 6 seconds.
Calculate its acceleration. (3)

_____

_____

_____

3.3 A ball is dropped from a height of 25 m.
Use the formula v2=u2+2aΔxv^2 = u^2 + 2aΔxv2=u2+2aΔx to calculate its speed just before hitting the ground.
(Take g = 9.8 $m \cdot s^{-2}$) (4)

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_____

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_____

3.4 A crate of mass 12 kg is pushed with a net force of 60 N.
Use Newton's 2nd Law to calculate the acceleration. (3)

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_____

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3.5 Draw and label a free-body diagram showing the forces acting on a box on a flat surface. (4)

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3.6 Explain how seatbelts apply Newton's First Law during a car crash. (4)

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3.7 A ball is thrown upwards at 20 $m \cdot s^{-1}$. How long will it take to reach the top? ($g = 9.8$ $m \cdot s^{-2}$) (4)

_____

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_____

3.8 Name any two types of friction and give an example for each. (2)

_____

_____

_____

QUESTION 4: WAVES AND SOUND (20 marks)

4.1 Define a *transverse wave*. (2)

_____

_____

_____

4.2 A sound wave travels at 340 $m \cdot s^{-1}$ and has a frequency of 170 Hz. Calculate the wavelength. Use: $v = f\lambda$ $v = f\lambda$ (3)

_____

_____

_____

MYST PATHWORKS

4.3 State **one** difference between mechanical and electromagnetic waves. (2)

_____

_____

_____

4.4 Label the following parts on the wave diagram below: (4)

- Crest
- Trough
- Wavelength
- Amplitude

(You may draw a basic wave below and label it.)

4.5 Give two ways in which the speed of sound can change. (2)

_____

_____

_____

4.6 A submarine uses sonar to detect fish 680 m below. If the signal takes 2 seconds to return, what is the speed of sound in water? (4)

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4.7 Name two uses of ultrasonic sound in real life. (3)

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QUESTION 5: ELECTRICITY (30 marks)

5.1 Define resistance. (2)

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5.2 A circuit has a voltage of 12 V and current of 3 A.
Calculate resistance using Ohm's Law. (3)

_____

_____

_____

5.3 Draw a simple series circuit with a battery, a bulb, and a switch. Label all components. (4)

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_____

_____

5.4 In a circuit with two resistors ($R_1 = 4\ \Omega$, $R_2 = 6\ \Omega$) in series, calculate:
a) Total resistance (2)

_____

_____

_____

b) Total current if connected to 10 V battery (3)

_____

_____

_____

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5.5 State two differences between a series and parallel circuit. (4)

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_____

_____

5.6 Give two safety features used in household wiring. (2)

_____

_____

_____

5.7 A 60 W bulb is on for 5 hours. Calculate the total energy used in kWh. (Use $E = P \times t$) (4)

_____

_____

_____

5.8 If electricity costs R2.00 per kWh, calculate the cost for 3 such bulbs running for 2 hours. (3)

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_____

QUESTION 6: ENERGY & WORK (30 marks)

6.1 Define work and give its formula. (2)

_____

_____

_____

6.2 A man pushes a box with a force of 80 N over 5 m.
Calculate the work done. (3)

_____

_____

_____

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6.3 A 3 kg object is lifted to a height of 4 m.
Calculate the potential energy. Use: PE=mghPE = mghPE=mgh ($g = 9.8\ m \cdot s^{-2}$) (3)

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6.4 A car has 5000 J of kinetic energy and a speed of 10 $m \cdot s^{-1}$.
Calculate the mass of the car. Use: KE=12mv2KE = \frac{1}{2}mv^2KE=21mv2 (4)

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6.5 Draw a labelled energy conversion diagram for a coal power station. (5)

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6.6 Give two advantages and two disadvantages of solar energy. (4)

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6.7 Explain the **law of conservation of energy** using an example. (3)

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6.8 A 100 W iron is used for 3 hours.
a) How much energy is used in kWh? (3)

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b) If electricity costs R1.80 per kWh, what is the total cost? (3)

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TOTAL: 150 MARKS

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✅ PHYSICAL SCIENCES MEMO – PHYSICS PAPER (GRADE 10)

Total: 150 Marks

QUESTION 1: MULTIPLE CHOICE (10 x 2 = 20 marks)

1.1 C ✓
1.2 C ✓
1.3 C ✓
1.4 C ✓
1.5 C ✓
1.6 B ✓
1.7 C ✓
1.8 D ✓
1.9 B ✓
1.10 B ✓

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QUESTION 2: MATCHING COLUMNS (10 x 1 = 10 marks)

2.1 I ✓
2.2 F ✓
2.3 A ✓
2.4 B ✓
2.5 D ✓
2.6 H ✓
2.7 J ✓
2.8 C ✓
2.9 E ✓
2.10 G ✓

QUESTION 3: MOTION & FORCES (30 marks)

3.1 Acceleration: The rate of change of velocity. ✓✓
3.2 $a = (v - u)/t = (20 - 8)/6 = 2\ m \cdot s^{-2}$ ✓✓✓
3.3 $v^2 = u^2 + 2a\Delta x \rightarrow v^2 = 0 + 2(9.8)(25) = 490$
$v = \sqrt{490} = 22.14\ m \cdot s^{-1}$ ✓✓✓✓
3.4 $a = F/m = 60/12 = 5\ m \cdot s^{-2}$ ✓✓✓
3.5 Free-body diagram showing:

- Weight (down) ✓
- Normal force (up) ✓
- Friction (left) ✓
- Applied force (right) ✓

3.6 Seatbelts stop the person from continuing to move forward when the car stops. Demonstrates Newton's First Law ✓✓✓✓

3.7 $v = u + at$; at top $v = 0$

$0 = 20 - 9.8t \rightarrow t = 20/9.8 = 2.04$ s ✓✓✓✓

3.8 Examples:

- Static friction: Holding an object in place ✓
- Kinetic friction: Pushing a sliding box ✓

QUESTION 4: WAVES AND SOUND (20 marks)

4.1 Transverse wave: A wave where particles move perpendicular to direction of wave ✓✓

4.2 $\lambda = v/f = 340/170 = 2$ m ✓✓✓

4.3 Mechanical waves need a medium; EM waves do not ✓✓

4.4

- Crest ✓
- Trough ✓
- Amplitude ✓
- Wavelength ✓

4.5 Speed changes due to:

- Medium ✓
- Temperature ✓

4.6 Total distance = 680 × 2 = 1360 m

Speed = distance/time = 1360 / 2 = 680 $m \cdot s^{-1}$ ✓✓✓✓

4.7 Any two:

- Medical imaging (ultrasound) ✓
- SONAR ✓
- Cleaning small parts ✓

QUESTION 5: ELECTRICITY (30 marks)

5.1 Resistance: Opposition to current flow ✓✓

5.2 $R = V/I = 12 / 3 = 4\ \Omega$ ✓✓✓

5.3 Correct series diagram with labels:

- Battery ✓
- Bulb ✓
- Switch ✓

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- Wires ✓

5.4 a) R_total = $R_1 + R_2 = 4 + 6 = 10\ \Omega$ ✓✓

b) I = V/R = 10 / 10 = 1 A ✓✓✓

5.5 Differences:

- Series: one path; Parallel: multiple ✓
- Series: same current; Parallel: same voltage ✓✓✓✓

5.6 Any two:

- Fuse ✓
- Circuit breaker ✓
- Earth wire ✓

5.7 E = P × t = 60 × 5 = 300 Wh = 0.3 kWh ✓✓✓✓

5.8 Total E = 60 × 3 × 2 = 360 Wh = 0.36 kWh

Cost = 0.36 × R2.00 = R0.72 ✓✓✓

QUESTION 6: ENERGY & WORK (30 marks)

6.1 Work: Force × distance ✓ Formula: W = F × d ✓

6.2 W = 80 × 5 = 400 J ✓✓✓

6.3 PE = mgh = 3 × 9.8 × 4 = 117.6 J ✓✓✓

6.4 KE = ½mv² → 5000 = ½m(100)

→ m = 5000 ÷ 50 = 100 kg ✓✓✓✓

6.5 Diagram includes:

- Coal → Heat ✓
- Boiler → Steam ✓
- Turbine → Generator ✓
- Generator → Electrical energy ✓
- Labeled flow diagram ✓

6.6 Advantages: renewable, clean ✓✓

Disadvantages: expensive, depends on weather ✓✓

6.7 Energy cannot be created or destroyed, only transferred or transformed (e.g. toaster: electrical → heat) ✓✓✓

6.8 a) 100 W = 0.1 kW × 3 h = 0.3 kWh ✓✓✓

b) 0.3 × 1.80 = R0.54 ✓✓✓

✅ TOTAL: 150 MARKS