

KENYA CERTIFICATE OF BASIC EDUCATION

SENIOR SCHOOL ASSESSMENT

DECEMBER ASSIGNMENT 2026

GRADE 10 – PHYSICS

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ School: _____

Assessment Number: _____ Date: _____

School Code: _____ Signature: _____

INSTRUCTIONS TO LEARNERS

1. This paper consists of **TWO sections: A and B.**
2. Answer **ALL questions** in both sections.
3. Show **all working** in numerical questions.
4. Give answers to numerical questions to an appropriate number of significant figures where necessary.
5. Use the following values unless otherwise stated:

- ☉ $g = 10 \text{ N/kg}$
- ☉ Density of water = 1000 kg/m^3
- ☉ Speed of sound in air = 340 m/s
- ☉ Speed of light = $3.0 \times 10^8 \text{ m/s}$
- ☉ Take $\pi = 3.14$.

6. Non-programmable calculators may be used where necessary.

FOR OFFICIAL USE ONLY (EXAMINER'S USE)

SECTION	SECTION A	SECTION B	% SCORE	EE1	EE2	ME1	ME2	AE1	AE2	BE1	BE2
SCORE RANGE	30 MARKS	60 MARKS		90-100	75-89	58-74	41-57	31-40	21-30	11-20	1-10
	POINTS			8 POINTS	7 POINTS	6 POINTS	5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT
LEARNER'S TOTAL SCORE											

SECTION A (30 MARKS)

Answer ALL questions in this section.

1.

- a) Explain why Physics is considered a fundamental science. (1 mark)

- b) State **two ways in which Physics is related to other fields of study.** (2 marks)

i. _____

ii. _____

2. A student descends in a swimming pool to a depth of **4.5 m**.

a) Calculate the pressure exerted by the water at this depth. (2 marks)

b) State **one factor**, apart from depth, that affects pressure in a liquid. (1 mark)

2. A hydraulic press has a small piston of area 0.015 m^2 and a large piston of area 0.60 m^2 .

A force of **250 N** is applied to the small piston.

a) Calculate the pressure transmitted through the liquid. (1 mark)

b) Calculate the force produced by the large piston. (2 marks)

3. A spring is **25 cm** long when unloaded. When a force of **40 N** is applied, its length increases to **33 cm**.

a) Calculate its extension in metres. (1 mark)

b) Determine the spring constant. (2 marks)

4.

- a) Explain why a metal lid on a glass jar can sometimes be loosened by placing the lid in warm water. (2 marks)

- b) State the unusual property of water between 0°C and 4°C . (1 mark)

5. A **30 N** force acts perpendicular to a spanner at a distance of **0.25 m** from the pivot.

- a) Calculate the moment of the force. (1 mark)

- b) State **two ways** of increasing the turning effect of the force. (2 marks)

- i.

- ii.

6. A machine raises a **200 kg** load through a vertical height of **12 m** in **8 seconds**.

- a) Calculate the useful work done. (1 mark)

- b) Calculate the useful power output of the machine. (2 marks)

7. A wave has a frequency of **25 Hz** and wavelength **1.2 m**.

- a) Calculate its speed. (2 marks)

b) Distinguish between a **progressive wave** and a **stationary wave**. (1 mark)

8. A radioactive substance has a half-life of **5 hours**. Its initial activity is **9600 counts per minute**. Determine its activity after **15 hours**. (3 marks)

9. A 12 V battery is connected to a resistor of $4\ \Omega$.

a) Calculate the current through the resistor. (1 mark)

b) Determine the electrical energy converted to heat when the circuit operates for **5 minutes**. (2 marks)

SECTION B: 50 MARKS

Answer ALL questions.

10. A hydraulic lifting system is used in a garage to raise a vehicle. The small piston has a diameter of **4 cm**, while the large piston has a diameter of **40 cm**.

The vehicle has a mass of **1,600 kg**.

a)

State the principle that explains the operation of the hydraulic system. **(1 mark)**

b)

Calculate the weight of the vehicle. **(1 mark)**

c)

Calculate the area of:

i. the small piston;

ii. the large piston.

(3 marks)

d) Determine the minimum force that must be applied to the small piston to raise the vehicle.
(3 marks)

e) The small piston moves downwards through 0.80 m. Assuming no energy losses, calculate the distance through which the large piston rises. (2 marks)

11. A metal wire has an original length of **2.5 m** and a cross-sectional area of $2.0 \times 10^{-6} \text{ m}^2$.

The following measurements are obtained:

Force/N	Extension/mm
0	0
50	1.0
100	2.0
150	3.0
200	4.0
250	5.0

a) State Hooke's law. (1 mark)

b) Using the data, determine the spring constant of the wire. (2 marks)

c) Calculate the stress in the wire when a force of 200 N is applied. (2 marks)

d) Calculate the strain produced when the force is 200 N. (2 marks)

e) Hence calculate the Young's modulus of the material. (2 marks)

f) Explain what would happen to the wire if the force were increased beyond its elastic limit. (1 mark)

12. A uniform beam of length 5.0 m and weight 300 N is supported at points A and B.

- A is **0.5 m** from the left end.
- B is **1.0 m** from the right end.
- A load of **800 N** is placed **1.5 m** from the left end.

a) State the two conditions required for the beam to remain in equilibrium. (2 marks)

b) Calculate the distance of the 800 N load from support A. (1 mark)

c) Calculate the distance of support B from support A. (1 mark)

d) The beam is uniform. Determine the position of its centre of gravity measured from A. (1 mark)

e) Taking moments about A, calculate the reaction force at B. (3 marks)

f) Hence determine the reaction force at A. (2 marks)

13. A construction company uses a machine to raise a load of **750 kg** from the ground to a platform **8 m** above the ground.

The machine requires an input force of **2,500 N**. During the operation, the effort moves through a distance of **32 m**.

a) Calculate the weight of the load. (1 mark)

b) Calculate the useful work done in raising the load. (2 marks)

c) Calculate the work input to the machine. (2 marks)

d) Determine the efficiency of the machine. (2 marks)

e) Calculate the mechanical advantage. (1 mark)

f) Calculate the velocity ratio. (1 mark)

g) Explain, using energy considerations, why the mechanical advantage is not necessarily equal to the velocity ratio in a real machine. (1 mark)

14. A remote weather station is powered by a **24 V battery** having an internal resistance of **2 Ω** . The battery is connected to an external resistor of **10 Ω** .

The station transmits a radio signal with a frequency of **1.5×10^8 Hz**.

A radioactive source used for calibration has an initial activity of **12,800 Bq** and a half-life of **3 hours**.

a)

i. Calculate the total resistance of the circuit. **(1 mark)**

ii. Determine the current supplied by the battery. **(2 marks)**

iii. Calculate the terminal potential difference of the battery. **(1 mark)**

b)

Assuming the radio signal travels at **3.0×10^8 m/s**, calculate its wavelength. **(2 marks)**

c)

Calculate the activity of the radioactive source after **12 hours**. **(2 marks)**

d)

The weather station records a long-term increase in average temperature.

- i. Explain how increased concentration of greenhouse gases can contribute to this observation. **(1 mark)**

- ii. State **one practical technological measure** that can help reduce greenhouse-gas emissions. **(1 mark)**

GRADE 10 PHYSICS

ANSWERS / MARKING SCHEME

SECTION A: 30 MARKS

1. Introduction to Physics (3 marks)

a)

Physics is a fundamental science because it studies the **basic laws and principles governing matter, energy, forces and their interactions**, which form the basis of many other sciences and technologies.

(1 mark)

b)

Any two:

- Physics and Mathematics — mathematics is used to express physical laws and perform calculations.
- Physics and Chemistry — physics explains energy changes, atomic structure and properties of matter.
- Physics and Biology — physics is applied in medical imaging, movement and biological processes.
- Physics and Geography — physics explains weather, climate, earthquakes and planetary processes.
- Physics and Engineering — engineering applies physical principles to design machines and structures.

(1 mark each = 2 marks)

2.

a)

$$P = \rho gh$$

$$P = 1000 \times 10 \times 4.5$$

$$\boxed{P = 45,000 \text{ Pa}}$$

(2 marks)

b)

Any one:

- Density of the liquid.
- Acceleration due to gravity.

(1 mark)

3.

Given:

$$A_1 = 0.015 \text{ m}^2$$

$$A_2 = 0.60 \text{ m}^2$$

$$F_1 = 250 \text{ N}$$

a)

$$P = \frac{F}{A}$$

$$P = \frac{250}{0.015}$$

$$\boxed{P = 16,666.7 \text{ Pa}}$$

(1 mark)

b)

Using Pascal's principle:

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

Therefore,

$$F_2 = \frac{F_1 A_2}{A_1}$$

$$F_2 = \frac{250 \times 0.60}{0.015}$$

$$F_2 = \frac{150}{0.015}$$

$$\boxed{F_2 = 10,000 \text{ N}}$$

(2 marks)

4.

Original length:

$$25 \text{ cm}$$

Final length:

$$33 \text{ cm}$$

a)

$$\text{Extension} = 33 - 25 = 8 \text{ cm}$$

$$8 \text{ cm} = 0.08 \text{ m}$$

$$\boxed{0.08 \text{ m}}$$

(1 mark)

b)

$$F = kx$$

$$k = \frac{F}{x}$$

$$k = \frac{40}{0.08}$$

$$\boxed{k = 500 \text{ N/m}}$$

(2 marks)

5.

a)

When the lid is placed in warm water, the **metal lid expands**. Since the lid expands slightly more than the glass, it becomes loose and can be removed more easily.

(2 marks)

b)

Water has its **maximum density at** 4°C . Between 0°C and 4°C , water contracts when heated.

(1 mark)

6.

a)

$$M = Fd$$

$$M = 30 \times 0.25$$

$$\boxed{M = 7.5 \text{ Nm}}$$

(1 mark)

b)

Any two:

- Increase the force applied.
- Increase the perpendicular distance from the pivot.

(2 marks)

7.

Given:

$$m = 200 \text{ kg}$$

$$h = 12 \text{ m}$$

$$t = 8 \text{ s}$$

a)

$$W = mgh$$

$$W = 200 \times 10 \times 12$$

$$\boxed{W = 24,000 J}$$

(1 mark)

b)

$$P = \frac{W}{t}$$

$$P = \frac{24,000}{8}$$

$$\boxed{P = 3,000 W}$$

(2 marks)

8.

a)

$$v = f\lambda$$

$$v = 25 \times 1.2$$

$$\boxed{v = 30 m/s}$$

(2 marks)

b)

A **progressive wave** transfers energy from one place to another, while a **stationary wave** has fixed nodes and antinodes and does not transfer energy progressively along the medium.

(1 mark)

9.

Initial activity:

$$9600 \text{ counts/min}$$

Half-life:

$$5 \text{ hours}$$

Time:

$$15 \text{ hours}$$

Number of half-lives:

$$n = \frac{15}{5} = 3$$

Therefore:

After 5 hours:

$$9600 \div 2 = 4800$$

After 10 hours:

$$4800 \div 2 = 2400$$

After 15 hours:

$$2400 \div 2 = 1200$$

$$\boxed{1200 \text{ counts/min}}$$

(3 marks)

10.

Given:

$$V = 12 \text{ V}$$

$$R = 4 \, \Omega$$

a)

$$I = \frac{V}{R}$$

$$I = \frac{12}{4}$$

$$\boxed{I = 3 \text{ A}}$$

(1 mark)

b)

Time:

$$5 \text{ minutes} = 5 \times 60 = 300 \text{ s}$$

Electrical energy:

$$E = VIt$$

$$E = 12 \times 3 \times 300$$

$$\boxed{E = 10,800 \text{ J}}$$

(2 marks)

SECTION B: 50 MARKS

11.

Given:

- Diameter of small piston = 4 cm
- Diameter of large piston = 40 cm
- Mass of vehicle = 1600 kg

a)

The hydraulic system operates according to **Pascal's principle**, which states that pressure applied to an enclosed liquid is transmitted equally and undiminished in all directions.

(1 mark)

b) Weight of vehicle

$$W = mg$$

$$W = 1600 \times 10$$

$$W = 16,000\text{ N}$$

(1 mark)

c) Areas of the pistons

Small piston

Diameter:

$$4\text{ cm} = 0.04\text{ m}$$

Radius:

$$r = \frac{0.04}{2} = 0.02\text{ m}$$

$$A = \pi r^2$$

$$A_1 = 3.14(0.02)^2$$

$$A_1 = 3.14 \times 0.0004$$

$$A_1 = 0.001256\text{ m}^2$$

Large piston

Diameter:

$$40\text{ cm} = 0.40\text{ m}$$

Radius:

$$r = \frac{0.40}{2} = 0.20\text{ m}$$

$$A_2 = 3.14(0.20)^2$$

$$A_2 = 3.14 \times 0.04$$

$$\boxed{A_2 = 0.1256 \text{ m}^2}$$

(3 marks)

d) Force on small piston

Using:

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$F_1 = \frac{F_2 A_1}{A_2}$$

$$F_1 = \frac{16,000 \times 0.001256}{0.1256}$$

Since:

$$\frac{0.001256}{0.1256} = 0.01$$

$$F_1 = 16,000 \times 0.01$$

$$\boxed{F_1 = 160 \text{ N}}$$

(3 marks)

e) Distance moved by large piston

For an ideal hydraulic system:

$$A_1 d_1 = A_2 d_2$$

Therefore:

$$d_2 = \frac{A_1 d_1}{A_2}$$

$$d_2 = \frac{0.001256 \times 0.80}{0.1256}$$

$$d_2 = 0.008 \text{ m}$$

$$\boxed{d_2 = 0.008 \text{ m}}$$

or

$$\boxed{d_2 = 8 \text{ mm}}$$

(2 marks)

12.

Given:

$$L = 2.5 \text{ m}$$

$$A = 2.0 \times 10^{-6} \text{ m}^2$$

At 200 N:

$$x = 4.0 \text{ mm}$$

$$x = 0.004 \text{ m}$$

a) Hooke's law

Hooke's law states that **the extension of an elastic material is directly proportional to the applied force, provided the elastic limit is not exceeded.**

(1 mark)

b) Spring constant

Using the data:

$$F = kx$$

$$k = \frac{F}{x}$$

Using 200 N and 0.004 m:

$$k = \frac{200}{0.004}$$

$$\boxed{k = 50,000 \text{ N/m}}$$

(2 marks)

c) Stress

$$\text{Stress} = \frac{F}{A}$$

$$= \frac{200}{2.0 \times 10^{-6}}$$

$$\boxed{\text{Stress} = 1.0 \times 10^8 \text{ Pa}}$$

(2 marks)

d) Strain

$$\text{Strain} = \frac{\text{extension}}{\text{original length}}$$

$$= \frac{0.004}{2.5}$$

$$\boxed{\text{Strain} = 1.6 \times 10^{-3}}$$

(2 marks)

e) Young's modulus

$$Y = \frac{\text{stress}}{\text{strain}}$$

$$Y = \frac{1.0 \times 10^8}{1.6 \times 10^{-3}}$$

$$Y = 0.625 \times 10^{11}$$

$$\boxed{Y = 6.25 \times 10^{10} \text{ Pa}}$$

(2 marks)

f)

If the elastic limit is exceeded, the wire will undergo **permanent deformation** and will not return to its original length when the force is removed.

(1 mark)

13.

Given:

Beam length:

$$5.0 \text{ m}$$

Weight:

$$300 \text{ N}$$

Position of A:

$$0.5 \text{ m}$$

Position of B:

$$5.0 - 1.0 = 4.0 \text{ m}$$

Load:

$$800 \text{ N}$$

Load position:

$$1.5 \text{ m}$$

a) Conditions for equilibrium

15. The resultant force acting on the body must be zero. **(1 mark)**

16. The resultant moment about any point must be zero. **(1 mark)**

b) Distance of 800 N load from A

$$1.5 - 0.5$$

$$\boxed{1.0 \text{ m}}$$

(1 mark)

c) Distance of B from A

$$4.0 - 0.5$$

$$\boxed{3.5 \text{ m}}$$

(1 mark)

d) Centre of gravity

The beam is uniform, so its centre of gravity is at its midpoint.

Midpoint:

$$\frac{5.0}{2} = 2.5 \text{ m}$$

Distance from A:

$$2.5 - 0.5 = 2.0 \text{ m}$$

$$\boxed{2.0 \text{ m}}$$

(1 mark)

e) Reaction at B

Take moments about A.

Clockwise moment:

$$800 \times 1.0$$

Weight of beam acts 2.0 m from A:

$$300 \times 2.0$$

Anticlockwise moment due to R_B :

$$R_B \times 3.5$$

Therefore:

$$R_B(3.5) = 800(1.0) + 300(2.0)$$

$$3.5R_B = 800 + 600$$

$$3.5R_B = 1400$$

$$R_B = \frac{1400}{3.5}$$

$$\boxed{R_B = 400 \text{ N}}$$

(3 marks)

f) Reaction at A

For vertical equilibrium:

$$R_A + R_B = 800 + 300$$

$$R_A + 400 = 1100$$

$$\boxed{R_A = 700\text{ N}}$$

(2 marks)

14.

Given:

$$m = 750\text{ kg}$$

$$h = 8\text{ m}$$

$$E = 2500\text{ N}$$

$$d_E = 32\text{ m}$$

a) Weight

$$W = mg$$

$$W = 750 \times 10$$

$$\boxed{W = 7500\text{ N}}$$

(1 mark)

b) Useful work

$$W = mgh$$

$$W = 750 \times 10 \times 8$$

$$\boxed{W = 60,000\text{ J}}$$

(2 marks)

c) Work input

$$W = Fd$$

$$W = 2500 \times 32$$

$$\boxed{W = 80,000\text{ J}}$$

(2 marks)

d) Efficiency

$$\text{Efficiency} = \frac{\text{useful output work}}{\text{input work}} \times 100$$

$$= \frac{60,000}{80,000} \times 100$$

$$= 0.75 \times 100$$

$$\boxed{75\%}$$

(2 marks)

e) Mechanical advantage

$$MA = \frac{\text{Load}}{\text{Effort}}$$

$$MA = \frac{7500}{2500}$$

$$\boxed{MA = 3}$$

(1 mark)

f) Velocity ratio

Distance moved by effort:

$$32\text{ m}$$

Distance moved by load:

$$8\text{ m}$$

$$VR = \frac{32}{8}$$

$$\boxed{VR = 4}$$

(1 mark)

g)

For a real machine, some energy is lost through **friction, heat, sound and deformation**.

Therefore:

$$\text{Efficiency} < 100\%$$

and generally:

$$MA < VR$$

(1 mark)

15.

Given:

$$E = 24\text{ V}$$

$$r = 2\ \Omega$$

$$R = 10\ \Omega$$

Frequency:

$$f = 1.5 \times 10^8\text{ Hz}$$

Speed of radio wave:

$$v = 3.0 \times 10^8\text{ m/s}$$

Initial activity:

$$A_0 = 12,800 \text{ Bq}$$

Half-life:

$$3 \text{ hours}$$

Time:

$$12 \text{ hours}$$

a)

i) Total resistance

$$R_T = R + r$$

$$R_T = 10 + 2$$

$$\boxed{R_T = 12 \Omega}$$

(1 mark)

ii) Current supplied

Using:

$$E = I(R + r)$$

$$I = \frac{E}{R + r}$$

$$I = \frac{24}{12}$$

$$\boxed{I = 2 \text{ A}}$$

(2 marks)

iii) Terminal potential difference

$$V = E - Ir$$

$$V = 24 - (2 \times 2)$$

$$V = 24 - 4$$

$$\boxed{V = 20 \text{ V}}$$

(1 mark)

b)

Using:

$$v = f\lambda$$

Therefore:

$$\lambda = \frac{v}{f}$$

$$\lambda = \frac{3.0 \times 10^8}{1.5 \times 10^8}$$

$$\lambda = 2$$

$$\boxed{\lambda = 2.0 \text{ m}}$$

(2 marks)

c)

Initial activity:

$$12,800 \text{ Bq}$$

Half-life:

$$3 \text{ hours}$$

Elapsed time:

$$12 \text{ hours}$$

Number of half-lives:

$$n = \frac{12}{3} = 4$$

Successive decay:

$$12,800 \rightarrow 6,400$$

$$\rightarrow 3,200$$

$$\rightarrow 1,600$$

$$\rightarrow 800$$

Therefore:

$$\boxed{800 \text{ Bq}}$$

(2 marks)

d)

i)

An increase in greenhouse gases such as carbon dioxide and methane causes more outgoing infrared radiation to be absorbed and re-radiated back towards Earth. This increases atmospheric warming and can contribute to **climate change/global warming**.

(1 mark)

ii)

Any one:

- Use solar, wind or other renewable energy.
- Improve energy efficiency.

- Reduce dependence on fossil fuels.
- Plant and protect forests.
- Use electric/public transport where appropriate.
- Reduce unnecessary burning of fuels.

(1 mark)

KENYA CERTIFICATE OF BASIC EDUCATION

SENIOR SCHOOL ASSESSMENT

TERM 3: PROJECT BASED ASSESSMENT 2026

GRADE 10 – PHYSICS

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ School: _____

Assessment Number: _____ Date: _____

School Code: _____ Signature: _____

GENERAL INSTRUCTIONS

1. This project shall be completed individually and/or in groups as indicated in each task.
2. You are required to investigate an energy-related problem within your school or community.
3. Design and construct a simple device that demonstrates energy transformation and produces a useful mechanical output.
4. Use locally available, affordable, recycled or environmentally friendly materials where possible.
5. Observe all safety requirements during designing, construction and testing.
6. Keep evidence of your work, including research notes, sketches, measurements, photographs and observations.
7. The completed device shall be presented to the teacher for demonstration.
8. Submit a written project report together with the completed device.
9. The project is assessed out of **90 marks**.

TASK 1: RESEARCH AND INVESTIGATION 12 MARKS

A school in your community experiences challenges related to energy use. The school would like learners to develop a simple device that demonstrates how one form of energy can be transformed into another useful form of energy.

(a) Individual Research – 4 marks

Conduct research on energy sources and energy transformations.

In your research notes:

1. Identify **at least five sources of energy**.
2. Describe the form of energy associated with each source.
3. Give examples of energy transformations involving the identified sources.
4. Identify the sources used in everyday devices.
5. Record the sources of information used in your research.

Your research should include information from relevant **books, class notes, educational websites, journals or other reliable sources**.

[4 marks]

(b) Group Brainstorming Activity – 4 marks

Working as a group, brainstorm possible devices that can demonstrate energy transformation.

Prepare a table showing:

Energy Source	Energy Transformation	Possible Device
1.		
2.		
3.		
4.		
5.		

Identify **at least five suitable energy sources, five energy transformations and five related devices.**

[4 marks]

(c) Selection of the Device – 4 marks

As a group, discuss the devices identified in part (b).

1. Select **one device** that your group can realistically design and construct.
2. State the name of the device.
3. Give **at least three reasons** for selecting the device.
4. Explain how the selected device can address an energy need in your school or community.
5. Explain why the device is suitable in terms of **cost, availability of materials, safety, practicality and energy transformation.**

Selected device: _____

[4 marks]

TASK 2: DESIGNING THE DEVICE 15 MARKS

After completing your research, develop a design for the selected energy-conversion device.

(a) Design Drawing – 6 marks

Draw a **clear, neat and well-proportioned diagram** of your proposed device.

Your drawing should:

1. Show all the major components.
2. Show how the components are connected or arranged.
3. Show the direction of movement or energy flow using arrows where appropriate.
4. Give suitable dimensions to important parts.

5. Label all major components correctly.
6. Ensure that the drawing represents the device you intend to construct.

[6 marks]

DESIGN DRAWING SPACE

(b) How the Device Will Work – 4 marks

Describe how your proposed device will operate.

Your description should:

1. Explain what happens when the device receives its input energy.
2. Describe the sequence of operation from the input to the final output.
3. Explain the function of the major components.
4. State any important operating conditions and safety precautions.

[4 marks]

(c) Energy Transformation – 5 marks

Show the energy transformation taking place in your proposed device.

Present your answer in the form:

Input energy → Intermediate transformation(s) → Useful mechanical output

Then explain:

1. The input energy.
2. The intermediate energy transformations.
3. The final mechanical output.
4. How energy is transferred between the components.
5. Possible energy losses such as heat, sound or friction.

[5 marks]

TASK 3: CONSTRUCTION OF THE DEVICE 40 MARKS

Using your approved design, construct the selected device.

(a) Materials and Tools

(i) Selection of Materials and Tools – 4 marks

Prepare a list of the materials and tools required to construct your device.

For each major item, indicate:

- Name of material/tool
- Quantity
- Purpose
- Reason for selecting it

No.	Material/Tool	Quantity	Purpose
1.			
2.			
3.			
4.			
5.			

[4 marks]

(ii) Local, Affordable and Environment-Friendly Materials – 4 marks

Identify the materials in your project that are:

- locally available;
- affordable;
- reusable or recycled; and
- environmentally friendly.

Explain how your choice of materials helps to:

1. Reduce the cost of construction.
2. Reduce waste.
3. Promote reuse or recycling.
4. Protect the environment.

[4 marks]

(b) Construction and Development

(i) Construction Procedure, Measurements and Assembly – 5 marks

Construct the device according to your approved design.

Record the construction process in the correct sequence.

Your record should include:

1. Preparation of materials and tools.
2. Measurements taken.
3. Preparation of individual components.
4. Assembly of the components.
5. Testing and adjustment of the device.

Attach **photographic evidence** showing important stages from the beginning to the completed device.

[5 marks]

(ii) Functionality – 7 marks

Test the completed device.

Demonstrate that the device can:

1. Receive the intended input energy.
2. Transfer energy through its components.
3. Produce the intended mechanical output.
4. Operate consistently.
5. Operate repeatedly.
6. Produce a visible or measurable output.
7. Operate safely.

Record your test observations in a table.

Test	Input Applied	Observation	Output Produced
1.			
2.			
3.			

[7 marks]

(iii) Strength and Durability – 7 marks

Examine the completed device for strength and stability.

1. Identify the main joints and connection points.
2. Explain how the parts have been secured.
3. Test whether the device can withstand repeated normal operation.
4. Identify any weak points.
5. Make suitable improvements where necessary.
6. Explain how your improvements increase the durability of the device.

[7 marks]

(iv) Innovation – 7 marks

Improve your device beyond a basic design.

1. Identify one or more features that make your device different from an ordinary version.
2. Explain the problem your innovation solves.
3. Describe how your modification improves the performance of the device.
4. Suggest how the device could be improved or developed for larger-scale use.

[7 marks]

(v) Neatness and Aesthetic Value – 6 marks

Prepare the final device for presentation.

Ensure that:

1. Components are properly arranged.
2. Joints and connections are secure.
3. Surfaces and materials are reasonably clean.
4. Labels are clear where necessary.
5. The device is safe to handle and demonstrate.
6. The completed device has an attractive and presentable appearance.

[6 marks]

TASK 4: DEMONSTRATING HOW THE DEVICE WORKS 10 MARKS

Present your completed device to the teacher or assessment panel.

(a) Scientific Explanation – 5 marks

During the demonstration:

1. Identify the input energy.
2. Explain how energy enters the device.
3. Explain the function of the major components.
4. Describe the energy transformation taking place.
5. Identify possible energy losses such as friction, heat or sound.

Use appropriate **Physics terminology** throughout your explanation.

[5 marks]

(b) Applications and Energy Solutions – 5 marks

Explain the possible applications of your device.

In your presentation:

1. Give at least two possible uses of the device in everyday life.
2. Explain the energy problem that the device could help address.
3. Explain how the device could benefit a school or community.
4. Explain how its use could reduce dependence on fossil fuels.
5. State at least one benefit and one limitation of the device.

[5 marks]

TASK 5: PROJECT REPORT 13 MARKS

Prepare and submit a well-organised **Physics Project Report** based on your investigation, design and construction activities.

(a) Project Report – 10 marks

Your report should contain the following sections:

1. **Cover page**
2. **Project title**
3. **Names of group members**
4. **Introduction/background**
5. **Statement of the energy problem**
6. **Objectives of the project**
7. **Research findings**
8. **Possible energy sources and transformations**
9. **Selected device and justification**
10. **Design drawing**
11. **Description of how the device works**
12. **Materials and tools used**
13. **Construction procedure**
14. **Measurements taken**
15. **Testing and observations**
16. **Challenges encountered**
17. **Solutions and improvements made**
18. **Applications of the device**
19. **Benefits and limitations**
20. **Contribution to sustainable energy use**
21. **Photographic evidence**
22. **Conclusion**
23. **Recommendations**
24. **References**

[10 marks]

(b) Project Submission – 3 marks

Submit the following:

1. **The completed energy-conversion device.**
2. **The final design drawing together with a description of how the device operates.**
3. **The completed project report containing photographic evidence of the constructed device.**

[3 marks]

PROJECT SUBMISSION CHECKLIST

Before submitting your project, confirm that you have provided:

- ☐ Research notes and sources
- ☐ Group brainstorming work
- ☐ Selected device and justification
- ☐ Final design drawing
- ☐ Energy transformation explanation
- ☐ List of materials and tools
- ☐ Construction procedure
- ☐ Measurements
- ☐ Photographic evidence
- ☐ Completed device
- ☐ Testing observations
- ☐ Improvements made
- ☐ Demonstration
- ☐ Project report

MARK DISTRIBUTION

Task	Activity	Marks
1	Research and Investigation	12
2	Designing the Device	15
3	Constructing the Device	40
4	Demonstrating How the Device Works	10
5	Writing and Submitting the Project Report	13
	TOTAL	90

TOTAL SCORE: 90 MARKS

TEACHER'S RECORD

Learner's Name: _____

Assessment No.: _____

Task	Maximum Marks	Score
Task 1: Research	12	
Task 2: Design	15	
Task 3: Construction	40	
Task 4: Demonstration	10	
Task 5: Report	13	
TOTAL	90	

Teacher's Name: _____

Signature: _____ **Date:** _____

GRADE 10 SCHOOL-BASED ASSESSMENT

PROJECT 2026

PROJECT ASSESSMENT AND SCORING RUBRIC

Total Marks: 90

GENERAL SCORING GUIDELINES

1. Assess the learner throughout the project rather than relying only on the final product.
2. Award marks according to the evidence demonstrated by the learner.
3. Consider evidence from the learner's research notes, sketches, calculations, photographs, construction process, finished device, demonstration and written report.
4. For each criterion, select **only one performance level** that best describes the learner's achievement.
5. Use the descriptors provided under **PL4, PL3, PL2 and PL1** to determine the appropriate score.
6. Do not award marks simply because an activity has been attempted. The quality and completeness of the evidence should determine the score.
7. Ensure that the same standards are applied consistently to all learners or groups.
8. Where appropriate, assess individual contribution separately from group achievement.
9. Record the marks immediately after each stage of assessment.
10. The maximum score for the complete project is **90 marks**.

TASK 1: EXPLORING AND PLANNING THE PROJECT

Maximum: 12 Marks

A. Investigation and Use of Information

Maximum: 4 Marks

PL4 – 4 Marks

- Conducts detailed investigation using several appropriate sources.
- Collects relevant information about energy sources, energy conversion and possible devices.
- Presents information in clear, organised notes using own words.
- Sources of information are acknowledged appropriately.
- Research directly supports the proposed project.

PL3 – 3 Marks

- Uses a number of relevant sources.
- Records useful information about energy and possible devices.
- Most information is presented in the learner's own words.
- Sources are identified, although some references may be incomplete.
- Research generally supports the project.

PL2 – 2 Marks

- Uses only a limited number of sources.
- Records some relevant information but important areas are omitted.
- Notes may be poorly organised or contain considerable copied material.
- References are few or incomplete.

PL1 – 1 Mark

- Provides little evidence of investigation.
- Information is very limited, inaccurate or largely copied.
- Sources are not properly identified.
- Research provides little support for the project.

B. Generation and Analysis of Energy Ideas

Maximum: 4 Marks

PL4 – 4 Marks

- Generates at least five suitable examples of energy sources.
- Identifies at least five accurate energy transformations.
- Suggests at least five devices related to the identified transformations.
- Correctly connects the energy input, transformation and useful output.
- Uses appropriate physics terminology.

PL3 – 3 Marks

- Identifies at least four suitable energy sources.
- Gives at least four correct transformations.
- Identifies at least four suitable devices.
- Most energy relationships are correct.
- Uses scientific vocabulary with only minor errors.

PL2 – 2 Marks

- Identifies approximately three suitable examples in each area.
- Some energy transformations are incorrectly matched.
- Demonstrates partial understanding of energy conversion.
- Scientific terminology is used inconsistently.

PL1 – 1 Mark

- Provides one or no suitable example in most areas.
- Shows little understanding of energy conversion.
- Connections between energy sources, transformations and devices are mostly incorrect.

C. Selection of the Project Device

Maximum: 4 Marks

PL4 – 4 Marks

- Selects a practical device that directly addresses an identified energy need.
- Gives at least three convincing reasons for the selection.
- Considers factors such as cost, availability of materials, safety, usefulness and environmental impact.
- Clearly explains why the selected device is suitable for the intended users.

PL3 – 3 Marks

- Selects a suitable device.
- Gives at least two reasonable reasons for the choice.

- Makes a clear connection between the device and an energy-related need.
- Considers some practical factors.

PL2 – 2 Marks

- Selects a device but provides limited justification.
- Gives only one weak or general reason.
- Connection to the identified energy need is not sufficiently developed.

PL1 – 1 Mark

- Device selection is unclear or unsuitable.
- Gives no convincing reason for the choice.
- Shows little awareness of the energy problem being addressed.

TASK 2: DEVELOPING THE DEVICE DESIGN

Maximum: 15 Marks

A. Quality of the Design Drawing

Maximum: 6 Marks

PL4 – 6 Marks

- Produces a clear, accurate and complete working drawing.
- Includes all major components.
- Correctly shows connections, movement and direction of energy flow where applicable.
- Components are accurately labelled.
- Drawing corresponds closely to the proposed device.
- Uses appropriate drawing conventions.

PL3 – 4 Marks

- Produces a generally accurate drawing.
- Includes most important components.
- Most connections and labels are correct.
- Minor omissions do not prevent understanding of the design.

PL2 – 2 Marks

- Drawing is incomplete or contains several errors.
- Important components or connections are missing.
- Some labels are absent or incorrectly placed.
- The intended operation is difficult to determine.

PL1 – 1 Mark

- Drawing is very incomplete or poorly presented.
- Few components are shown.
- Connections and labels are largely missing or incorrect.

B. Explanation of the Proposed Operation

Maximum: 4 Marks

PL4 – 4 Marks

- Clearly explains the operation from energy input to useful output.
- Correctly describes the role of each major component.
- Presents the sequence of operation logically.
- Identifies relevant conditions necessary for the device to operate.
- Includes appropriate safety precautions.

PL3 – 3 Marks

- Gives a mostly correct explanation.
- Describes the operation in a generally logical order.
- Explains the purpose of most major components.
- Includes limited safety information.

PL2 – 2 Marks

- Provides a partially correct explanation.
- Several stages are omitted or incorrectly arranged.
- Functions of important components are not clearly explained.
- Requires considerable prompting.

PL1 – 1 Mark

- Gives only a very general description.
- Does not explain the interaction of the main components.
- Operation is largely unclear or incorrect.

C. Energy Conversion and Output

Maximum: 5 Marks

PL4 – 5 Marks

- Accurately identifies the original energy input.
- Correctly describes every major transformation.
- Identifies the final useful mechanical output.
- Clearly traces the movement of energy through the device.
- Recognises possible energy losses such as friction, sound or heat.

PL3 – 3 Marks

- Correctly identifies the input and useful output.
- Describes at least one intermediate transformation.
- Energy flow is generally consistent with the proposed design.
- Minor omissions are present.

PL2 – 2 Marks

- Correctly identifies only part of the energy chain.
- Some forms of energy are confused.
- Transformation sequence is incomplete.
- Explanation has a weak connection to the proposed device.

PL1 – 1 Mark

- Identifies little or no correct energy transformation.
- Energy input and output are confused.
- Explanation does not correspond to the device.

TASK 3: MAKING AND IMPROVING THE DEVICE

Maximum: 40 Marks

A. Selection and Preparation of Materials and Tools

Maximum: 4 Marks

PL4 – 4 Marks

- Identifies all or nearly all required materials and tools.
- Selects items that are appropriate for the proposed design.
- Uses tools correctly and safely.
- Gives sound reasons for important material and tool choices.

PL3 – 3 Marks

- Identifies most required materials and tools.
- Selected items are generally suitable.
- Uses equipment safely with minor weaknesses.
- Provides some justification.

PL2 – 2 Marks

- Identifies about half of the required materials and tools.
- Some choices are unsuitable.
- Several important items are missing.
- Safety and suitability are only partly considered.

PL1 – 1 Mark

- Provides very few suitable materials or tools.
- Several essential items are missing.
- Shows limited awareness of safe tool use.

B. Sustainable and Locally Available Materials

Maximum: 4 Marks

PL4 – 4 Marks

- Makes extensive use of locally available, reused or recyclable materials.
- Demonstrates careful control of project costs.
- Minimises unnecessary material wastage.
- Makes environmentally responsible choices throughout construction.

PL3 – 3 Marks

- Uses a substantial proportion of local or recycled materials.
- Shows some awareness of cost.
- Makes reasonable efforts to minimise waste.

PL2 – 2 Marks

- Uses only a small proportion of local or recycled materials.
- Cost considerations are limited.
- Waste reduction is inconsistent.

PL1 – 1 Mark

- Makes little or no use of locally available or recycled materials.
- Does not demonstrate concern for cost or environmental impact.

C. Construction Technique and Work Procedure

Maximum: 5 Marks

PL4 – 5 Marks

- Follows a well-organised construction sequence.
- Takes accurate measurements.
- Cuts, joins and assembles components appropriately.
- Maintains good workmanship throughout.
- Provides clear evidence of the different stages of construction.

PL3 – 3 Marks

- Follows a generally appropriate procedure.
- Measurements are mostly accurate.
- Assembly is functional with minor workmanship problems.
- Provides evidence of several construction stages.

PL2 – 2 Marks

- Construction sequence is poorly organised.
- Measurements contain noticeable errors.
- Several assembly problems are evident.
- Evidence of the construction process is limited.

PL1 – 1 Mark

- Construction procedure is poorly followed or absent.
- Measurements are inaccurate or missing.
- Device remains incomplete or poorly assembled.
- Little evidence of actual construction is presented.

D. Performance and Operation

Maximum: 7 Marks

PL4 – 7 Marks

- Device performs the intended task successfully.

- Produces a clear and reliable output.
- Operates repeatedly with minimal intervention.
- Demonstrates stable operation under suitable conditions.
- Can be operated safely.

PL3 – 4 Marks

- Device performs its intended function.
- Output is observable but may vary.
- Requires occasional adjustment.
- Minor operating problems are present.

PL2 – 3 Marks

- Device performs only part of the intended function.
- Output is weak or inconsistent.
- Requires frequent adjustment or assistance.

PL1 – 2 Marks

- Device demonstrates very limited functionality.
- Output is rarely achieved.
- Requires substantial assistance or fails to perform the intended task.

E. Strength and Reliability

Maximum: 7 Marks

PL4 – 7 Marks

- Device is strong, stable and securely assembled.
- Joints and connections are firm.
- Components remain in position during repeated operation.
- Construction can withstand normal handling.
- No obvious structural or operational hazards are present.

PL3 – 4 Marks

- Device is generally stable and strong.
- Most connections remain secure.
- A few minor weak points are visible.
- Device can withstand normal use.

PL2 – 2 Marks

- Device has several weak points.
- Some components become loose during operation.
- Repairs or adjustments may be required.

PL1 – 1 Mark

- Device is weak or unstable.
- Components detach easily.
- Device is unsuitable for repeated operation.

F. Creativity and Improvement

Maximum: 7 Marks

PL4 – 7 Marks

- Demonstrates a distinctive and creative approach.
- Improves an existing idea or develops an original solution.
- Shows effective problem-solving during construction.
- Suggests realistic ways of improving or expanding the device.

PL3 – 4 Marks

- Shows some creative modification of an existing idea.
- Makes useful improvements to the basic design.
- Suggests possible future improvements.

PL2 – 3 Marks

- Device follows a common design with limited modification.
- Creativity is evident only to a small extent.
- Suggested improvements are general or poorly developed.

PL1 – 2 Marks

- Device is largely copied without meaningful improvement.
- Little evidence of creative thinking.
- No practical improvement is suggested.

G. Presentation and Finish

Maximum: 6 Marks

PL4 – 6 Marks

- Device is exceptionally neat and well finished.
- Components are properly positioned and securely fixed.
- Surfaces and connections are clean.
- The final product is safe, attractive and easy to understand.

PL3 – 4 Marks

- Device is neat and presentable.
- Most components are properly arranged.
- Minor finishing problems are visible.
- Device is safe to handle.

PL2 – 3 Marks

- Device has an acceptable but basic finish.
- Some components are poorly arranged.
- Several unfinished areas are visible.

PL1 – 2 Marks

- Device is untidy or poorly finished.
- Components are loosely arranged.
- Poor presentation interferes with safe or effective use.

TASK 4: PRESENTING AND EXPLAINING THE DEVICE

Maximum: 10 Marks

A. Scientific Presentation

Maximum: 5 Marks

PL4 – 5 Marks

- Gives a logical and accurate explanation of the device.
- Correctly explains the function of the major components.
- Clearly describes the energy transformation process.
- Uses appropriate physics terminology.
- Explains energy losses such as friction, sound or heat where applicable.

PL3 – 3 Marks

- Gives a generally correct scientific explanation.
- Correctly identifies the main energy transformation.
- Explains most component functions.
- Minor scientific errors or omissions are present.

PL2 – 2 Marks

- Gives a partly correct explanation.
- Some component functions or energy transformations are confused.
- Scientific vocabulary is used inconsistently.

PL1 – 1 Mark

- Gives only a basic description.
- Contains several scientific errors.
- Does not adequately explain the energy transformation.

B. Practical Application and Energy Benefits

Maximum: 5 Marks

PL4 – 5 Marks

- Gives clear examples of how the device could be used in everyday life.
- Explains its relevance to a school or community energy need.
- Clearly discusses how the idea can support cleaner energy use or reduce dependence on fossil fuels.
- Identifies both advantages and limitations.

PL3 – 3 Marks

- Gives at least one suitable practical application.
- Explains generally how the device can contribute to an energy solution.

- Provides some discussion of its benefits.

PL2 – 2 Marks

- Gives a vague or general application.
- Connection to an energy challenge is weak.
- Benefits are poorly explained.

PL1 – 1 Mark

- Application is unclear or inappropriate.
- Makes little or no connection between the device and an energy solution.

TASK 5: PROJECT DOCUMENTATION AND REPORT

Maximum: 13 Marks

A. Quality and Completeness of the Project Report

Maximum: 10 Marks

PL4 – 10 Marks

The report:

- Clearly identifies a specific energy-related problem.
- Explains the background and purpose of the project.
- Clearly identifies the selected device and gives strong reasons for its selection.
- Presents the design and construction procedure in the correct sequence.
- Describes materials and tools used.
- Explains testing procedures and observations.
- Identifies challenges encountered during construction.
- Suggests realistic improvements.
- Explains practical applications of the device.
- Discusses the contribution of the device to sustainable energy use.
- Includes appropriate photographic evidence.

PL3 – 6 Marks

The report:

- Identifies the energy problem.
- Describes the selected device.
- Gives at least one reason for its selection.
- Provides most construction stages.
- Includes testing observations.
- Identifies either challenges or suggested improvements.
- Gives relevant applications.
- Includes most required photographs and supporting evidence.

PL2 – 4 Marks

The report:

- Mentions an energy problem but does not explain it clearly.
- Gives limited information about the device.
- Construction stages are incomplete.
- Testing information is brief.
- Challenges and improvements are poorly developed or missing.
- Applications are only generally discussed.
- Photographic evidence is limited.

PL1 – 2 Marks

The report:

- Does not clearly state the energy problem.
- Fails to identify the device adequately.
- Provides little or no construction information.
- Does not meaningfully document testing.
- Lacks photographs or other supporting evidence.
- Gives little information about applications.

B. Submission of Project Evidence

Maximum: 3 Marks

PL4 – 3 Marks

The learner/group submits:

1. The completed physical device.
2. The final design drawing with labels.
3. A clear explanation of operation.
4. A complete project report.
5. Appropriate photographs showing the device and project process.

PL3 – 2 Marks

- Submits the completed device.
- Provides the design and explanation.
- Submits a mostly complete report with supporting evidence.

PL2 – 1 Mark

- Submits some project components but important evidence is missing.

PL1 – 0 Marks

- Fails to provide the required project evidence.

OVERALL PERFORMANCE LEVEL GUIDE

Task	Maximum	PL4 – Exceeding Expectation	PL3 – Meeting Expectation	PL2 – Approaching Expectation	PL1 – Below Expectation

Task 1: Exploring and Planning	12	11–12	9–10	6–8	0–5
Task 2: Developing the Design	15	14–15	10–13	5–9	0–4
Task 3: Making the Device	40	37–40	25–36	12–24	0–11
Task 4: Presenting the Device	10	9–10	7–8	4–6	0–3
Task 5: Documentation and Report	13	12–13	9–11	6–8	0–5
TOTAL	90				

Performance Level Descriptions

PL4 – Exceeding Expectation:

The learner demonstrates a high level of understanding, independence, creativity, accuracy and practical competence.

PL3 – Meeting Expectation:

The learner demonstrates the expected knowledge, skills and competencies with only minor weaknesses.

PL2 – Approaching Expectation:

The learner demonstrates developing competence but requires improvement, guidance or additional practice.

PL1 – Below Expectation:

The learner demonstrates limited achievement of the expected competencies and requires substantial support.

LEARNER SCORE SHEET

School Name: _____

School Code: _____

Teacher's Name: _____

No.	Assessment No.	Learner's Name	Task 1 /12	Task 2 /15	Task 3 /40	Task 4 /10	Task 5 /13	Total /90
1								
2								
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Teacher's Signature: _____

Date: _____

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