

EDUZEDCO

232/2 PHYSICS

Paper 2

Form 1 End Term Examination

Time: 2 ½ Hours

Name:

Adm No:

School:

Class:

Signature:

Date:

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided at the top of this page.
- (b) Write your school name, sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **Two** sections: **Section I** and **Section II**.
- (d) Answer all questions as instructed in each section.
- (e) Marks may be given for correct working, relevant points, and clear presentation.
- (f) Non-programmable silent electronic calculators may be used where necessary.
- (h) This paper consists of **6 printed pages**.
- (i) Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.
- (j) Candidates should answer the questions in English.

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	Total

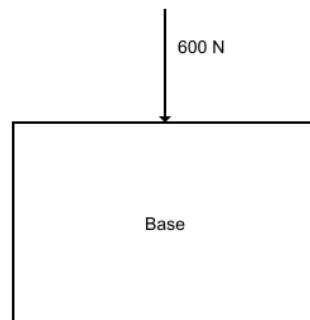
SECTION II

14	15	16	17	18	Total	Grand Total

SECTION I (50 Marks)

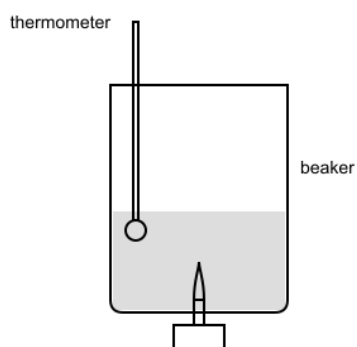
Answer **all** questions in this section in the spaces provided.

1. While working at a tea estate, a student observes the use of a lever to lift heavy crates. This is a practical application of which branch of science that deals with matter and energy? (1 mks)
2. A shopkeeper uses a vernier caliper to measure the inner diameter of a container. The diagram below shows the caliper reading. Record the measurement in centimetres. (2 mks)
3. A market trader uses a spring balance to weigh vegetables. What type of force is exerted by the spring when stretched? (1 mks)
4. A rectangular wooden box used for transporting coffee beans weighs 600 N and has a base of dimensions 1.2 m by 0.8 m. Calculate the pressure exerted by the box on the ground. (2 mks)



5. M-Pesa agents store airtime scratch cards in a sealed container. The air inside the container consists of particles. How do the particles in air (gas) differ in arrangement from those in a solid like the plastic card? (2 mks)

6. On a tea estate, steel rails are laid with gaps between them. Why are these gaps necessary? (2 mks)
7. A trader in a market wants to measure the amount of flour. What is the SI unit of mass? (1 mks)
8. During market day transport, a boda-boda rider travels 5 km east then 3 km north. The distance is 8 km. State why distance is a scalar quantity while displacement is a vector quantity. (2 mks)
9. A technician uses a U-tube manometer to measure gas pressure in a M-Pesa agent's airtime dispensing machine. The diagram shows the manometer. If the liquid in the left arm is 4 cm higher than in the right arm, and the density of the liquid is 13600 kg/m^3 , calculate the pressure difference ($g = 10 \text{ N/kg}$). (2 mks)
10. In a tea processing factory, a worker notices that the smell of tea leaves spreads quickly through the room. (3 mks)
- (a) Identify the process responsible. (1 mark)
- (b) Explain why the smell spreads faster on a hot day than on a cold day. (2 marks)
11. A coffee estate worker heats a beaker of water. The diagram shows a thermometer placed in the water. (3 mks)



(a) State the observation on the thermometer reading as water is heated. (1 mark)

(b) Explain this observation in terms of particle behaviour. (2 marks)

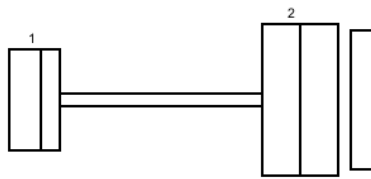
12. A shopkeeper uses a sharp knife to cut vegetables. Explain why a sharp knife cuts more easily than a blunt one. (2 mks)

13. A boda-boda rider wants to time a journey from the market to the estate. Describe how to use a stopwatch to measure the time accurately. (2 mks)

SECTION II (50 Marks)

*Answer any **five** questions from this section in the spaces provided.*

- 14.** A student is investigating the factors affecting friction on a coffee estate. A block of wood of weight 5 N is pulled along a horizontal surface with a spring balance. The force required to just move the block is recorded for different loads placed on it. The data obtained is shown in the table below. (10 mks)
- (a) Define friction and state two factors that affect it. (2 marks)
- (b) Describe the experiment the student should perform to obtain the data. (2 marks)
- (c) Plot a graph of frictional force against normal force using the data. (4 marks)
- (d) Determine the gradient of the graph and state what it represents. (2 marks)
- 15.** A hydraulic brake system in a market delivery van uses Pascal's principle. The diagram shows a simplified system with a master cylinder of area 0.005 m² and a slave cylinder of area 0.015 m². (12 mks)



(a) State Pascal's principle. (2 marks)

(b) Explain how the hydraulic brake system multiplies force. (4 marks)

(c) If a force of 200 N is applied to the master piston, calculate the force exerted on the brake pads by the slave piston. (4 marks)

(d) Label the parts numbered 1 and 2 on the diagram. (2 marks)

- 16.** A student at a tea estate sets up an experiment to show that air expands when heated. The apparatus includes a round-bottomed flask with a rubber bung and a glass tube. A drop of coloured water is placed in the tube. (11 mks)

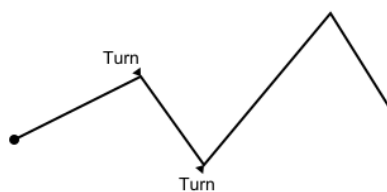
(a) Describe how the experiment is performed. (2 marks)

(b) Draw a labelled diagram of the set-up. (3 marks)

(c) Explain the observation in terms of kinetic theory. (3 marks)

(d) Predict what would happen if the flask is placed in ice water. (3 marks)

17. An M-Pesa agent observes dust particles floating in a beam of light. This reminds a student of Brownian motion. The diagram shows the random path of a smoke particle seen under a microscope. (10 mks)



(a) What is Brownian motion? (2 marks)

(b) Describe how the experiment to demonstrate Brownian motion in air is carried out. (2 marks)

(c) Explain the observed zig-zag movement of the smoke particle in terms of air molecules. (4 marks)

(d) What conclusion can be drawn about the nature of matter from this experiment? (2 marks)

18. A shopkeeper has an irregular stone that cannot be measured directly. He uses (12 mks)
the displacement method to find its volume.

(a) Describe the procedure to determine the volume of the stone using a displacement can and a measuring cylinder. (2 marks)

(b) Draw a labelled diagram of the set-up. (3 marks)

(c) The initial reading of water in the measuring cylinder is 50 cm^3 . After immersing the stone, the reading is 68 cm^3 . Calculate the volume of the stone. (4 marks)

(d) Explain two sources of error in this method and how to minimise them. (3 marks)

232/2 PHYSICS MARKING SCHEME

Form 1 Paper 2

SECTION I (50 marks)

1. While working at a tea estate, a student observes the use of a lever to lift heavy crates. This is a practical application of which branch of science that deals with matter and energy? (1 marks)

■ Correct definition: Physics is the branch of science that deals with matter and energy. (B1) (1)

Alt:

— Physics is the science of matter and energy.

2. A shopkeeper uses a vernier caliper to measure the inner diameter of a container. The diagram below shows the caliper reading. Record the measurement in centimetres. (2 marks)

■ Read main scale just before zero: 2.4 cm (B1) (1)

■ Identify the 7th vernier division coincides: 0.07 cm (B1) (1)

■ Total = 2.4 + 0.07 = 2.47 cm (A1 – implicit in previous steps) (0)

Alt:

— Accept any equivalent reading of 2.47 cm with correct reasoning.

3. A market trader uses a spring balance to weigh vegetables. What type of force is exerted by the spring when stretched? (1 marks)

■ Tension (or elastic force) (B1) (1)

Alt:

— Restoring force

4. A rectangular wooden box used for transporting coffee beans weighs 600 N and has a base of dimensions 1.2 m by 0.8 m. Calculate the pressure exerted by the box on the ground. (2 marks)

■ Area = 1.2 m × 0.8 m = 0.96 m² (M1) (1)

■ Pressure = Force / Area = 600 N / 0.96 m² = 625 Pa (A1) (1)

Alt:

— If candidate uses correct formula but arithmetic error, award M1 only.

5. M-Pesa agents store airtime scratch cards in a sealed container. The air inside the container consists of particles. How do the particles in air (gas) differ in arrangement from those in a solid like the plastic card? (2 marks)

■ In gases: particles are far apart and move randomly (B1) (1)

■ In solids: particles are closely packed in fixed positions (B1) (1)

Alt:

— Accept any description of particles in gas having no fixed arrangement and in solid having regular arrangement.

6. On a tea estate, steel rails are laid with gaps between them. Why are these gaps necessary? (2 marks)

- Steel expands when heated (B1) (1)
- Gaps allow expansion without buckling (B1) (1)

Alt:

— To prevent warping or damage due to expansion.

7. A trader in a market wants to measure the amount of flour. What is the SI unit of mass? (1 marks)

- Kilogram (kg) (B1) (1)

Alt:

— kg

8. During market day transport, a boda-boda rider travels 5 km east then 3 km north. The distance is 8 km. State why distance is a scalar quantity while displacement is a vector quantity. (2 marks)

- Scalar: has magnitude only (B1) (1)
- Vector: has both magnitude and direction (B1) (1)

Alt:

— Accept correct examples with explanation.

9. A technician uses a U-tube manometer to measure gas pressure in a M-Pesa agent's airtime dispensing machine. The diagram shows the manometer. If the liquid in the left arm is 4 cm higher than in the right arm, and the density of the liquid is 13600 kg/m³, calculate the pressure difference ($g = 10 \text{ N/kg}$). (2 marks)

- Height difference $h = 4 \text{ cm} = 0.04 \text{ m}$ (B1) (1)
- Pressure = $h\rho g = 0.04 \times 13600 \times 10 = 5440 \text{ Pa}$ (A1) (1)

Alt:

— Accept calculation using correct formula even if unit conversion omitted but still correct answer.

10. In a tea processing factory, a worker notices that the smell of tea leaves spreads quickly through the room. (3 marks)

- (a) Diffusion (B1) (1)
- (b) Higher temperature increases kinetic energy of particles (B1) (1)
- Particles move faster, leading to faster diffusion (B1) (1)

Alt:

— For (b): On a hot day particles have more energy so they mix more quickly.

11. A coffee estate worker heats a beaker of water. The diagram shows a thermometer placed in the water. (3 marks)

- (a) Thermometer reading rises (B1) (1)
- (b) Particles gain kinetic energy (B1) (1)
- Particles move faster and liquid expands, causing temperature rise (B1) (1)

Alt:

— Accept: water expands and mercury/alcohol rises.

12. A shopkeeper uses a sharp knife to cut vegetables. Explain why a sharp knife cuts more easily than a blunt one. (2 marks)

■ Sharp knife has smaller area of contact (B1) (1)

■ Same force gives higher pressure, making cutting easier (B1) (1)

Alt:

— Due to higher pressure from smaller area.

13. A boda-boda rider wants to time a journey from the market to the estate. Describe how to use a stopwatch to measure the time accurately. (2 marks)

■ Reset stopwatch and start at beginning of journey (B1) (1)

■ Stop at end and read elapsed time (B1) (1)

Alt:

— Press start, then stop; read display.

SECTION II (50 marks)

14. A student is investigating the factors affecting friction on a coffee estate. A block of wood of weight 5 N is pulled along a horizontal surface with a spring balance. The force required to just move the block is recorded for different loads placed on it. The data obtained is shown in the table below. (10 marks)

■ (a) Friction: force opposing relative motion (B1). Factors: roughness of surfaces and normal force (any two, 1 mark each) (B2). (3)

■ (b) Place block on horizontal surface, add different loads, pull with spring balance, record force when block just moves (M1 for method, A1 for clear description). (2)

■ (c) Graph: Plot points (5,2), (6,2.4), (7,2.8), (8,3.2) accurately (1 mark), axes labelled (force/N and normal force/N) (1 mark), line of best fit (1 mark), title (1 mark). (4)

■ (d) Gradient = $(3.2 - 2) / (8 - 5) = 1.2 / 3 = 0.4$ (A1). Represents coefficient of friction (B1). (1)

Alt:

— For graph: Accept any reasonable straight line. For gradient: Accept value between 0.38 and 0.42 if plotting slightly different.

15. A hydraulic brake system in a market delivery van uses Pascal's principle. The diagram shows a simplified system with a master cylinder of area 0.005 m² and a slave cylinder of area 0.015 m². (12 marks)

■ (a) Pascal's principle: Pressure applied to an enclosed fluid is transmitted equally to all parts of the fluid (B2). (2)

■ (b) Pressure in master cylinder is same as slave cylinder (B1). Force = Pressure $\times$ Area (B1). Larger area of slave gives larger force (B2). (4)

■ (c) Pressure on master = $200 \text{ N} / 0.005 \text{ m}^2 = 40000 \text{ Pa}$ (M1). Force on slave = $40000 \text{ Pa} \times 0.015 \text{ m}^2 = 600 \text{ N}$ (A1). (4)

■ (d) 1: master piston/cylinder (B1). 2: slave piston/cylinder (B1). (2)

Alt:

— For (c): Using area ratio: Force multiplier = $0.015/0.005 = 3$, Force = $200 \times 3 = 600 \text{ N}$ (M1 A1).

16. A student at a tea estate sets up an experiment to show that air expands when heated. The apparatus includes a round-bottomed flask with a rubber bung and a glass tube. A drop of coloured water is placed in the tube. (11 marks)

■ (a) Heat the flask with a Bunsen burner (B1). Observe the coloured water drop moves away from the flask (B1). (2)

■ (b) Draw labelled diagram: flask, bung, glass tube with water drop, heat source (B3). (3)

■ (c) Heating increases kinetic energy of air particles (B1). Particles collide more frequently and with greater force (B1). Increase in pressure pushes the drop outward (B1). (3)

■ (d) The drop will move towards the flask (B1). Cooling decreases kinetic energy, pressure drops (B1). Atmospheric pressure pushes drop back (B1). (3)

Alt:

— Accept: air expands when heated, contracts when cooled.

17. An M-Pesa agent observes dust particles floating in a beam of light. This reminds a student of Brownian motion. The diagram shows the random path of a smoke particle seen under a microscope. (10 marks)

■ (a) Brownian motion: random motion of particles suspended in a fluid due to collisions with molecules (B2). (2)

■ (b) Set up a smoke cell under a microscope, observe smoke particles moving randomly (M1 for correct method, A1 for clear description). (2)

■ (c) Air molecules move randomly and collide with smoke particle (B1). Uneven number of collisions on different sides cause random changes in direction (B3). (4)

■ (d) Matter is made of tiny particles in continuous random motion (B2). (2)

Alt:

— For (c): Accept description that molecules hit the particle from all sides and cause zigzag path.

18. A shopkeeper has an irregular stone that cannot be measured directly. He uses the displacement method to find its volume. (12 marks)

■ (a) Fill displacement can to spout, place measuring cylinder under spout (B1). Gently lower stone into water, collect displaced water, read volume (B1). (2)

■ (b) Draw labelled diagram: displacement can with water, spout, measuring cylinder, stone on string (B3). (3)

■ (c) Volume = $68 \text{ cm}^3 - 50 \text{ cm}^3 = 18 \text{ cm}^3$ (M1 for subtraction, A1 for correct answer and unit). (4)

■ (d) Error 1: Parallax in reading cylinder – read at eye level (1.5 marks). Error 2: Water splashing – lower stone gently (1.5 marks). (3)

Alt:

— Accept other errors like water clinging to stone (minimise by using thin string).