REPUBLIC OF RWANDA

MINISTRY OF EDUCATION

SOUTHERN PROVINCE

MUHANGA DISTRICT

PHYSICS
ORDINARY LEVEL
CLASS: S3
DATE:18 MARCH 2026
PERIOD: 8H30AM - 11:30AM

PHYSICS SECOND TERM EXAM

MAXIMUM MARKS :100 MARKS

INSTRUCTIONS:

1. Write your names and class on your answer sheet
2. This exam consists of THREE sections: **A, B** and **C**
   SECTION A: This section is **compulsory. / 55 marks**
   SECTION B: Attempt any **three** questions**. / 30 marks**
   SECTION C: This section is **compulsory/ 15 marks**

3. Calculations and mathematical instruments may be used**.**

4. Use only a **blue or black pen .**

SECTION A: ATTEMPT ALL QUESTIONS / 55 marks

1. For each of the following statements, state whether they are **true** or **false** when a liquid is heated: **/ 3 marks**
   a) It freezes.
   b) Its molecules vibrate at their fixed position
   c) Its internal energy increases.

2. Use **True** if the statement is correct and **false** if the statement is wrong about friction force / **2 marks**
   a) Friction can only act on moving objects.
   b) Friction acts in the direction of motion.

3. Complete each of the following sentences using appropriate term from the box. You may use word once or not at all. **/ 3 marks**

Charges	Electric field intensity	Decreases	Electric potential	Attract
Increases	Repel			

a) Like electric charges …….
b) …… is electrostatic force experienced by a unit positive charge at a point in electric field.

c) The increase of separation distance between two charged bodies …… electrostatic force between them.

4.a). 40 N block exerts 20 Pa of pressure on table. What is the area of the block that is touching on the table?

(i) 40 m^2 (ii)20 m^2 (iii) 800 m^2 (iv) 2 m^2 / **1 mark**

b).A small piston of hydraulic press has an area of 20 cm^2. If the applied force to the piston is 75 N, what must the area of the connected large piston be to exert a force of 6000 N?

(i) 25 cm^2 (ii) 1600 cm^2 (iii)40 cm^2 (iv) 22500 cm^2 / **1 mark**

5. a) Name any one factors influencing atmospheric pressure **/ 1 mark**

b) Calculate the pressure that water exerts at 9 m below the surface of the water in a lake. The density of water is 1000 kg/$m^3$and acceleration due to gravity is 9.81 N/ kg. / **2 marks**

6. Fill in blanks with the appropriate word: / **3 marks**

a. The mode of heat transfer which takes place in Solid is (i)…… while in liquid is (ii) ……..

b. When a car suddenly stops, the passengers are jerked forward.This experience is due to the (i)……..Newton's law of motion also known as the law of (ii) ……

c. To speed up a car you press the accelerator, the engine produces more force then the car accelerates. This proves the (i)…….. Newton's law of motion also known as the law of(ii)……

7. Study the table below and match the items given in column **I** with the those in column **II. / 4 marks**

Column I	**Column II**
a)Specific heat capacity	i)The amount of heat required to change 1 kg of a substance from solid to liquid at constant temperature
b)Specific latent heat of fusion	ii)The amount of heat energy required to raise the temperature of 1kg of a substance by 1 K(or 1^0C)
c)Specific latent heat of vaporization	iii)The amount of heat required to raise the temperature of a substance by 1K (or1^0C).
d)Heat capacity	iv)The amount of heat require to change 1kg of a substance from liquid to gas at constant pressure

8. Choose the best alternative that completes each of the following statements below:

a) The rate at which electric charge flows past a point in a circuit is measured in
i. watts ii. volts iii. Amperes *iv. Coulombs* / ***1 mark***

b) The commercial unit of electrical energy is
i. kilowatt ii. Kilojoules iii. mega joule *iv. kilowatt hour* / ***1 mark***

c) A charge of 30 C flows through a coil for one sixth of a minute. If the resistance of the coil is 4.0Ω, find the p.d across it.

i)10.0 V ii)12.0 V iii)2.0 V iv)0.4 V / **1 mark**

d) Two resistors of resistance 2Ω and 5Ω are connected end to end with each other and then to a cell. Find the equivalent resistance of the two resistors.

i)2.5Ω ii)1.4Ω iii)3.5Ω iv)7.0Ω / **1 mark**

e. A suitable material for the filament of a bulb should have / **1 mark**
i. high melting point and low resistance ii. low melting point but high resistance
iii. high melting point and high resistance iv. low melting point and low resistance

f. A lighting circuit is supplied through a 5A fuse. What is the maximum number of 75W, 240V bulbs that can be fixed in the circuit?
i. 10 *ii. 16* . iii.48 iv. 3600 / **1 mark**

9. A bus is uniformly retarded and brought to rest from a velocity of 108 km /h in 15 seconds. Calculate: a) deceleration of the car/ **1 mark**

b) Distance travelled in 15 seconds/ **2 marks**

10.a) Differentiate linear momentum from impulse/**2 marks**

b) The velocity of an object of mass 10 kg increases from 4m/s to 8 m/s when a force acts on it. What is the impulse applied to the objects? / **2 marks**

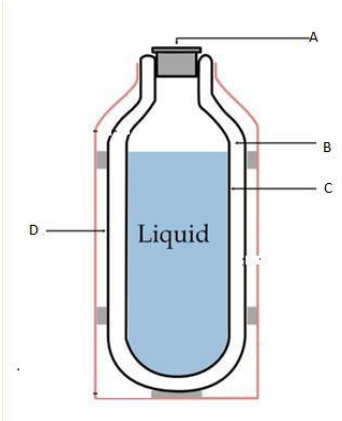
c**)** A car of mass 600 kg moving at 4 m/s collides head-on with a stationary truck of mass 1200 kg .If after collision both move together ;

i) Which type is this collision / **1 mark**

ii) find their common velocity after collision / **2 marks**

11. a) Convert each of the following temperature scales. (i) 34 °C (ii) 300 K / **1 mark**

b) Below is a diagram of a vacuum flask.(Fig.1) / **4 marks**



i) From diagram above, name the parts of vacuum flask labelled A,B,C and D.

ii) Which part of vacuum flask prevents heat loss by conduction and convection.

iii) Which part of vacuum flask prevents heat loss by radiation.

12.a) Give any one example of a luminous object / **1 mark**

b) State any one property of image formed by :(i) convex mirror / **1 mark**

(ii) plane mirror / **1 mark**

c) Give any one application of spherical mirrors./ **1 mark**

13.Select the correct answer among the given alternatives: / **3 marks**

a) Boyle's law states that for a fixed mass of gas at constant temperature:

(i) Pressure is directly proportional to volume. (ii) Pressure is inversely proportional to volume.

(iii) Pressure is directly proportional to temperature. (iv) Volume is independent of pressure.

b) When the volume of a gas decreases, its pressure will (temperature constant):

(i) Decrease (ii) Remain constant (iii) Increase (iv) Become zero

(c) According to Charles' law, if the temperature of a gas increases, its volume will:

(i) Decrease (ii) Stay the same (iii) increase (iv) disappear

14. Name the simple machine for each object:

a) Axe b) Flagpole c) Bottle opener /**3 marks**

15.a) The surroundings loses 500 J of heat to the system. During the process, the system does 200 J of work on the surroundings. Calculate internal energy of the system. / **2 marks**

b) Name the four (4) main parts of refrigerator / **2 marks**

SECTION B : ATTEMPT ANY THREE QUESTIONS / 30 marks

16 a) Which diagram correctly shows the electric field lines between two point charges. / **1mark**

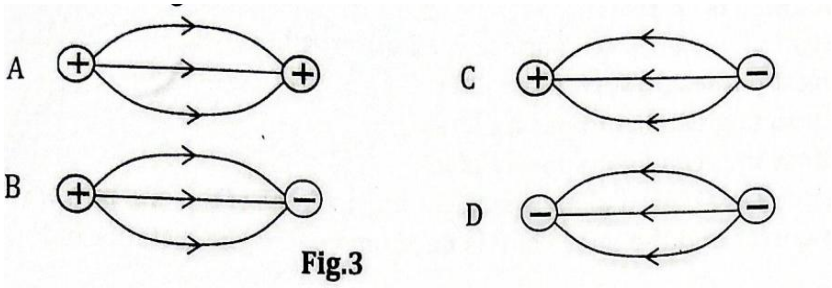
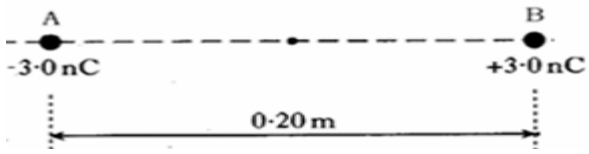


Fig.3

b) What is the magnitude of electric field potential V at a distance d away from an electric charge./ **1 mark**

i. $\frac{Q}{kd}$ ii.$9\times10^{9}\frac{Q}{d}$ iii. $9\times10^{9}\frac{Q}{\mathrm{d2}}$ iv. . $9\times10^{-9}\frac{Q}{\mathrm{d}}$

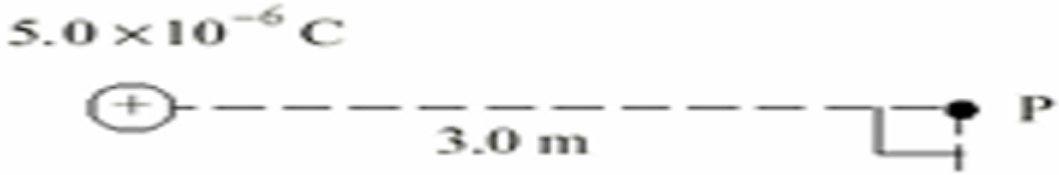
c) Two opposite electric point charges A and B of -3.0 nC and +3.0 nC respectively are situated 0.20 m apart in air, as shown in the figure below



i) Copy the diagram and apply Coulomb's law to draw the electrostatic force (F_1) exerted by charge A on charge B and electrostatic force (F_2) exerted by B on A. Note that the electrostatic force is a vector quantity. / **2 marks**

ii) Determine the magnitude of the electrostatic force between charge A and charge B. Coulomb's constant k=$9.0\times10^{9}Nm^2/C^2$ **/ 2 marks**

d) An electric charges Q = $5.0x10^{-6}C$ is placed at 3.0 m from the point P as shown below. Coulomb's constant k= $9x10^{9}$N m^2/C^2



i) Copy the figure and show the direction of electric field on point P. / **2 marks**

ii)Calculate the magnitude of electric field. Coulomb's constant k= $9x10^{9}$N m^2/C^2/**2 marks**

17. a) Compare renewable and non-renewable energy sources. (at least four comparisons)./ **2 marks**

b) List energy changes for hydro electrical power station to produce electricity. / **2 marks**

c) Name a device that can convert the energy forms below:

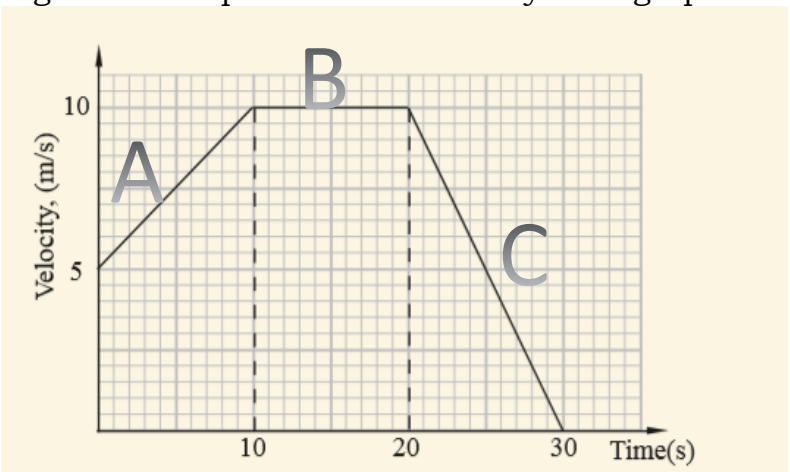
i. sound into electrical energy / **1 mark**

ii. Mechanical into electrical energy / **1 mark**

d)A motor raised a block of mass 72 kg through a vertical height of 2.5 m in 25 s. Calculate the: (a) work done on the block. / **2 marks**

(b) useful power supplied by the motor. Take g= 10 N /Kg / **2 marks**

18.Fig.4 below represents the velocity-time graph of a body during a period of 30 s.



From the graph :a) What is initial velocity of the motion / **1 mark**

b) calculate the acceleration of the body / **2 marks**

c) calculate the retardation of the body. / **2 marks**

d) describe the motion in sections A, B,C as shown on above graph / **3 marks**

e) determine the total displacement of the body in 30 seconds**. / 2 marks**

19.a) Define the terms: i)melting ii) boiling iii)melting point iv)boiling point. **(2 marks)**

b) Write an equation which relates the coefficient of linear expansion and volume expansion./ **2 marks**

c) i. How much heat energy is required to convert 2.0 kg of ice at –10°C to water at 20°C? **(3marks)**

ii. If an electric heater rated 1.0 kW is used, calculate the time taken to heat ice at –10 °C to water at 20°C? State the assumption you have made in arriving at your answer. **(3 marks)**

Where necessary, take:

Specific heat capacity of ice = 2 100 J/kg K

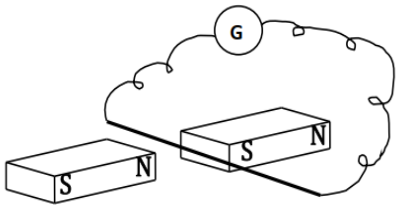
Specific heat capacity of water = 4 200 J/kg K

Specific latent heat of fusion of ice = 3.36×10^5 J/kg K

Specific latent heat of vaporization of water = 2.26×10^6 J/kg K

20. a) A wire placed between the poles of two permanent magnets is connected a galvanometer G as shown in figure below.

(a)



i.State what is observed when the wire is moved up and down. / **2 marks**

ii.Suggest two ways of altering the magnitude of the effect you have stated in (i). / **2 marks**

b) A 240 V step-down mains transformer is designed to light 12V, 20 W box lamps and draws a current of 1A in the primary coil. Calculate the:

i. Power supplied to the primary coil. **2 marks**
ii. Power developed in the secondary coil**. 2 marks**
iii. Efficiency of the transformer./ **2 marks**

SECTION C: COMPULSORY QUESTIONS / 15 marks

21. A group of students carried out an experiment to investigate how the electric current flowing through a constant resistor increases when the voltage applied to its ends increases gradually. The following table shows the results obtained

Voltage V(V)	1.0	3.0	5.0	7.0	9.0	11.0
Current I(mA)	1.0	2.9	5.0	6.9	9.0	11.0

a. **Name** and **draw** the symbol of an instrument that is used to measure electric current / **1mark**

b)Plot a graph of Voltage V (along y-axis) against Current I (along x-axis). Draw the best-fit straight line./ **8 marks**

c)From the graph, **determine** the slope (gradient) of the graph and **state** what does the slope represent?**(2 marks)**

d)Give any two factors affecting the heating effect of electric current/ **2 marks**

e)State any two precautions that can be taken by the student while they are carrying this experiment./ **2 marks**

END