PHYSICS I

08:30AM-11:30AM

S_3 ALL

2nd TERM

REPUBLIC OF RWANDA

KAYONZA DISTRICT

ORDINARY LEVEL DISTRICT ASSESSMENT, 2023-2024

SUBJECT: Physics I

Class: S_3 ALL

DURATION: 3HOURS

Instructions:

- This exam consists of Three sections,

✓ **Section A:** Answer all questions of Section A. **(55marks)**

✓ **Section B:** Answer only three questions for your choice. **(30 marks)**

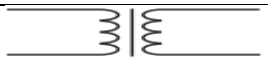
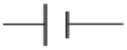
✓ **Section C:** Consist one question which is compulsory. **(15marks)**

- Question in section C should be answered on graph paper.
- ALL question should be answered by using blue or blank pen.
- Scientific calculator and mathematical set may be used.

SECTION A

1) Use the words provided to answer the questions below: Electric field intensity, Electric field Potential, Coulomb's force, Distance, Negative charge, Positive charge. **(2.5 marks)**
   a) …….is a region of space around an electrically charged particle or object in which an electric charge would feel an electric force.
   b) The work done per unit electric charge required to move an electric charge from a reference point to a specified point is called…….
   c) ……between two charged object is directly proportional to the product of the quantity of the charges on the objects and inversely proportional to the square of the……between the two objects.
   d) Field lines always emerge from ……...……...
2) Answer True or False. **(2.5marks)**
   a) Frictional force by a solid is directly proportional to the area of surfaces in contact.
   b) There are more than two states of friction force between solids
   c) At higher voltage, cost of transmission is reduced
   d) Energy transformation takes place when an object burns is it Electrical → mechanical
   e) The direction of induced current in a conductor moving in a magnetic field can be predicted by applying Faraday's law
3) Choose a correct statement **(2.5marks)**
   a) A body moves with uniform acceleration if
      i) Its momentum remains constant
      ii) It covers equal distances in equal time.
      iii) The velocity changes by equal amount in equal times.
      iv) The net force on the body is zero.
   b) Radiation in a thermos flask is minimized by
      i) Cork ii) Vacuum iii) Felt pad iv) Silvered glass water
   c) The following processes happen at the boiling point except
      i) change in density ii) change in state iii) gain in heat energy
      iv) change in temperature
   d) The following are factors influencing atmospheric pressure. Which one is not? i) Temperature ii) Cloud cover iii) Water vapor concentration iv) Altitude
   e) A cyclist travelling at a constant acceleration of 2 m s^{-2} passes through two points A and B in a straight line. If the speed of A is 10 ms^{-1} and the points are 75 m apart, the speed at B is
      i) 15.8 m s^{-1} ii) 17.3 m s^{-1} iii) 20.0 m s^{-1} iv) 400.0 m s^{-1}

4) Match the sentence corresponding with the symbol **(2.5marks)**

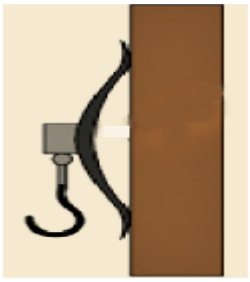
1. Battery	A. 
2. Galvanometer	B. 
3. Cell	C. 
4. Capacitor	D. 
5. Transformer	E. 

5) The first law of thermodynamics can be summarized using the expression $\Delta U=W+Q$.
Where all symbols have the usual meanings.
a) What do the symbols Q and W stand for? **(1mark)**
b) What is the change in internal energy for a system that performs a work of 140KJ on its surroundings and loses 60KJ of heat? **(1marks)**
c) State any one real life application of the principle of thermodynamics. **(1mark)**

6) In collision as we know is referring to the contact of two or more objects. It has main different types and using this information above as below sub-questions:
a) Explain those types of collision **(2marks)**
b) A trolley of mass 2 kg travelling from left to right at 4 m/s collides elasticity with another trolley of mass 4 kg travelling from right to left at 1 m/s. If the speed of the 2 kg trolley after collision is 0.8 m/s, what is the speed of the 4 kg trolley? **(3marks)**

7) In motion of bodies, there are two impacts (**acceleration** and **deceleration**) occur caused by different suddenly situations.
a) Contrast those two bolded terms in bracket **(2marks)**
b) A 1000 kg car start from rest accelerate uniformly to a speed of 72 km/h during 50 seconds.
i) Express the car's speed in (m/s) **(1mark)**
ii) Calculate acceleration of that car **(1mark)**

8) a) What does it mean "atmospheric pressure" **(1mark)**
b) Explain at least two proof(existence) of atmospheric pressure (**2mark)**
c) Name a liquid that is used for constructing instruments that measures atmospheric pressure. Give a reason why the liquid is preferred over others. **(1.5marks)**
d) The figure (1) below shows a rubber sucker as an application of atmospheric pressure. Explain why the sucker sticks on a flat surface. **(2marks)**



9) Discuss the energy transformation in Rusumo hydroelectric power station. **(2.5marks)**

10) a) Distinguish between heat and temperature. **/2marks**
b) On a day when the temperature reaches 50°F, what is the temperature in degrees Celsius and in Kelvin? **(2marks)**
c) State any three applications of heat transfer **(1.5marks)**

11) a) What do you understand by the phrase "coefficient of linear expansion" (**2marks)**
b) State any three physical properties that change when heating a solid. **(1.5marks**)
c) A vertical steel antenna tower is 400 m high. Calculate the change in height of the tower hence its new height that takes place when the temperature changes from –15 °C on winter day to 35 °C on a summer day.
(Take $\alpha = 0.00000645$/K **(2.5marks)**

12) State any three of the assumptions of the kinetic theory of matter. Explain at least one of them **(3marks)**

13) a) In electromagnetic induction there are three laws discovered by different people. One of them is called **"Fleming's right hand rule**" State this **(2marks)**

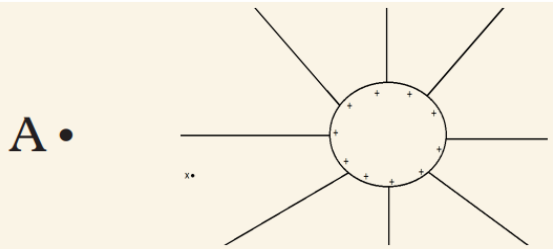
b) Give one application of electromagnetic induction. **(1mark)**

14) a) Transformer is classified into two categories: State and Explain the difference between them **(2marks)**

b) State one factor that contributes to power loses in a transformer **(1mark)**

c) State any one way through which power loss in transmission cables is minimized (**1mark)**

15) Figure (2) below shows electric field lines around a charged metal sphere (in air)



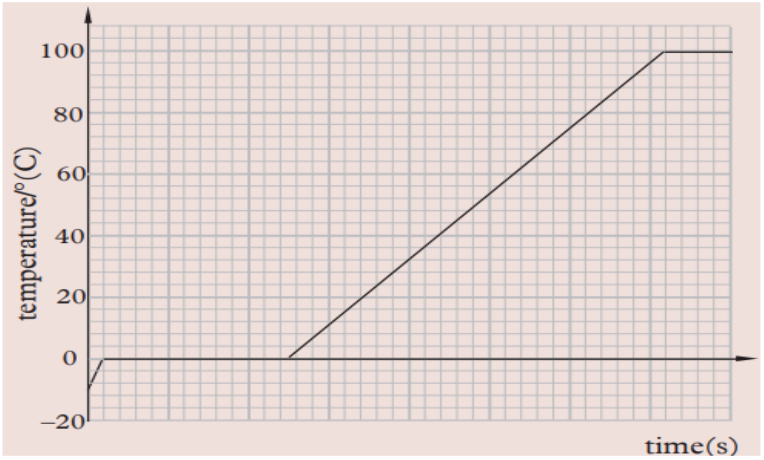
a) Copy the diagram. Draw an arrow on each line to show the direction of the electric field if a: **(1.5marks)**
i) positive point charge is placed at A. ii) negative point charge is placed at A.

b) A charge of magnitude - 4.0×10^{-6} C is moved through a potential difference of 70 volts. Calculate the work done on the charge. **(2marks)**

SECTION B

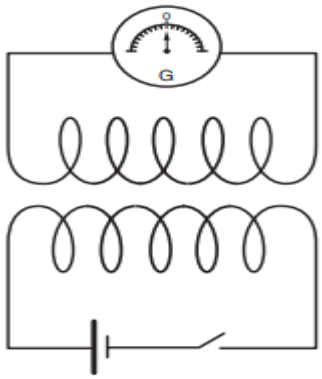
16) a) A transformer is a device based on the principle of electromagnetic induction.
(i) Give the meaning of the term ‘’transformer’’. **(1mark)**
(ii) Name one electrical device that uses transformer. **(1mark)**
(iii) What is the benefit of using transformers in the transmission of electrical power? **(1mark)**
b) Why is electricity transmitted at high voltage? **(1mark)**
c) The secondary circuit of a transformer is connected to a bulb rated at 12V, 40W. The input coil has 5000turns and the output coil has 250turns.
Find: i) The input voltage **(1.5marks)**
ii) The current flowing through the bulb. **(1.5marks)**
iii) The power taken from the supply if the efficiency of a transformer is 90% **(2marks)**
iv) After your own analysis of this equation. What kind of this transformer? (**1mark)**

17) a) Differentiate between specific latent heat of fusion from specific latent heat of vaporization **(2marks)**
b) The graph in Figure (3) below shows how temperature varies with time when 1 kg of ice at –10 °C is converted into 1 kg of steam at 100 °C under standard atmospheric pressure. Calculate the heat energy required to convert ice into steam given: 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 × 105 J/kg, specific latent heat of vaporization of water = 2.26 × 106 J/kg **(8marks)**



18) a) Contrast between induced electromotive force and induced current **(2marks)**

b) Two coils are placed near each other as shown in figure (4) below



b) What happens to the needle of the galvanometer?

(i) On closing the switch? **(1mark)**

(ii) If the switch is kept closed? **(1mark)**

(iii) On opening the switch? **(1mark)**

(c) Give three possible ways of increasing the deflection in the galvanometer **(3marks)**

d) A conducting circular loop having a radius of 5.0 cm, is placed perpendicular to a magnetic field of 0.50 T. It is removed from the field in 0.50 s. Find the average electromotive force produced in the loop during this time. **(2marks)**

19) All living thing need energy. You learned that energy is one of requirements for life. However, it is not only living things that need energy to move and carry out various processes and also the machines and appliances in the world that around us need in order to work. So as we know energy sources were classified two categories such as renewable energy sources and non –renewable energy sources (fossil fuels and nuclear energy sources from power production). Then from this text above answer the sub-questions below:

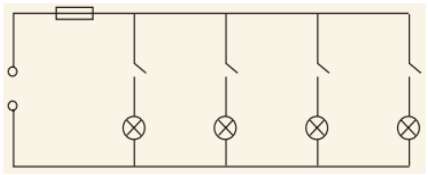
a) Identify three examples of fossil fuels **(1mark)**

b) where do fossil fuels come from **(2marks)**

c) Give any four renewable energy sources **(4marks)**

d) Identify any three reason why the government of Rwanda is encouraging people to use renewable energy sources instead others **(3marks)**

20) a) Name four electrical components used in house wiring. **(2 marks)**
b) In the circuit shown in Figure (5) below each bulb is rated 6 V, 3 W.



i) Calculate the current through each bulb when the bulbs are working normally. (**2 marks**)

ii) ii) Is a 3 A fuse suitable for the circuit when all the switches are closed? if Yes or No Why? (**2marks)**

iii) Calculate the power delivered by the power supply (**2marks)**

d) State any two advantages of connecting all the bulbs in parallel rather than in series? **(2marks)**

SECTION C

21) DAVID carried out an experiment with a car moving at different the instantaneous speed at intervals of 1 second and then different speeds and times are recorded as shown on the table below

Time/s	0.0	1.0	2.0	3.0	4.0	5.0	6.0
Speed m/s	10.0	12.4	14.8	17.2	19.6	22.0	24.4

(a) Plot a graph of speed against time **(8marks)**

(b) Use your graph to determine:

(i) How fast the vehicle is travelling at 2.6 s and 4.8 s**.** **(2marks)**
(ii) How far the vehicle travelled between the two instants in part (i) **(2marks)**
(iii) Slope of the graph**.** **(2marks**)