**REPUBLIC OF RWANDA**

**EASTRERN PROVINCE**

**PHYSICS II**

**2023-2024**

**...../03/2024**

**8:30am-11:30am**

**RWAMAGANA DISTRICT**

**ADVENCED LEVEL DISTRICT COMPREHENSIVE**

**ASSESSMENT FOR THE SECOND TERM,2023-2024.**

**SUBJECT: PHYSICS**

**LEVEL: SENIOR FOUR (S4)**

**DURATION :3 HOURS**

**COMBINATIONS:**

**PHYSICS-CHEMISTRY-MATHEMATICS (PCM)**

**MATHEMATICS- PHYSICS- COMPUTER SCIENCE (MPC)**

**PHYSICS –CHEMISTRY- BIOLOGY (PCB)**

**MATHEMATICS –PHYSICS- GEOGRAPHY (MPG)**

**ASSOCIATED NURSING PROGRAM (ANP)**

**/100**

**INSTRUCTIONS:**

1) Do not open this question paper until you are told to do so.

2) This paper consists of TWO sections: **A** and **B**

**SECTION A:** Attempt all questions **(70marks)**

**SECTION B:** Attempt any three questions **(30marks)**

**3)** Use only a blue or black pen**.**

**SECTION A:** Attempt all questions **(70marks)**

**Qn1.** Most generators have a wired loop or coil that is rotated in a magnetic field to produce a current, this is called **(2marks)**

(a) Electric field
(b) Magnetic field induction
(c) electromagnetic induction.

**Qn2.(a)** Explain the term **'lens'. (1mark)**

**(c)** State the properties of two types of lenses **(2marks)**

**(i)** What is the power of a 20.5cm focal- length lens? **(1mark)**

**(ii)** What is the focal length of a $-6.25$ *diopter* lens? **(1mark)**

**(iii)** Are these lenses converging or diverging? **(1mark)**

**Qn3.** Differentiate between spherical aberration and chromatic aberration. **(2marks)**

**Qn4.** Write "**True"** if the statement is correct or **"False**" if the statement is not correct.

a. For every action there is an opposite and equal reaction. **(1mark)**

b. In statics if all forces acting on a body are in balance, the body is said to be in equilibrium. **(1mark)**

c. Mass is the effect of gravity on the amount of matter in a body. **(1 mark)**

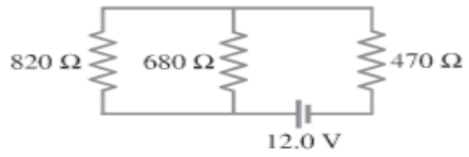
**Qn5.**List four sources of energy found in Rwanda**. (4 marks)**

**Qn6.** (a) What do you understand by Energy degradation: **(1mark)**

**(b)** Describe energy degradation/dilapidation which occurs when a 70W electric light bulbs is in use. **(2marks)**

**Qn7. (a)** Differentiate between linear and angular velocity**. (2marks)**
**(b)** Let $\theta = 5 + 4t - t^2$ be the equation of a circular motion of radius 0.05m.
(i) determine the angular velocity at t = 2. **(1mark)**
(ii) determine its angular acceleration. **(1mark)**
(iii) determine its acceleration at t = 0 **(1mark)**
(iv) determine its linear velocity at t = 0 **(1mark)**

**Qn8.** Given electric circuit below;

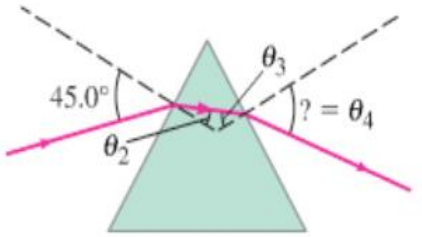



Determine:

**(a)** the equivalent resistance of the circuit shown in figure below. **(2marks)**

(b) the voltage across each resistor. **(3marks)**

**Qn9.**Light is incident on an equilateral glass prism at a $45.0^0$ angle to one face as shown on figure below. Calculate the angle at which light emerges from the opposite face. Assume that $n = 1.58$. **(4marks)**




**Qn10**. **(a)** Differentiate between astronomical telescope and compound microscope. **(2marks)**

**(b)**A microscope has a 12.0× eyepiece and 59.0× objective lens 20.0cm apart. Calculate

(i) The total magnification. **(2marks)**

**(ii)** The focal length of each lens. **(2marks)**

**(iii)** Where the object must be for a normal relaxed eye to see it in focus**. (2marks)**

**Qn11. (a)** Identify and explain the types of static equilibrium. **(6marks)**

**(b)**What are the conditions required for static equilibrium to occur? **(2marks)**

**Qn12.** People can watch a cinema where the pictures are seen on the white wall**.**

i) What device can they use to throw the pictures on the screen (wall or white cloth)? **(1mark)**

**ii)** ii) Are the images diminished or magnified? **(1mark)**

**Qn13.** An object is 16.0cm to the left of a lens. The lens forms an image 36.0cm to the right of the lens.

(a) What is the focal length of the lens? **(2marks)**

Is the lens converging or diverging? **(1mark)**

(b)If the object is 8.00mm tall, how tall is the image**? (1mark)** Is it erect or inverted? **(1mark)**

(Draw a principal – ray diagram. **(2marks)**

**Qn14.**In different parts of a complex electrical network, currents are determined using Kirchhoff's laws.

(a) State Kirchhoff's current law/junction rule. **(1mark)**

**(b)** State Kirchhoff's voltage law/loop rule **(1mark)**

**(c)**Which of the Kirchhoff's laws is consequence of the principle of conservation of energy? (**1mark)**

**(d)** Which of the Kirchhoff's laws is based on a principle of conservation of charge? (**1mark)**

**Qn15. (a)(i)** State work energy theorem. **(1mark)**

**(ii)**A 6.0kg box moving at 3.0m/s on a horizontal, frictionless surface runs into a light spring of force constant 75Ncm. Use the work-energy theorem to find the maximum compression of the spring**. (2marks)**

**(b)(i)** Distinguish between elastic collision and inelastic collision **(1mark)**

**(ii)** A bullet of mass 20g is fired horizontally into a suspended stationary wooden block of mass 380g with a velocity of 200m/s. What is the common velocity of the bullet and block if the bullet is embedded (stays inside) in the block? **(2marks)**

**SECTION B: ATTEMPT ANY THREE QUESTIONS ( 30 MARKS)**

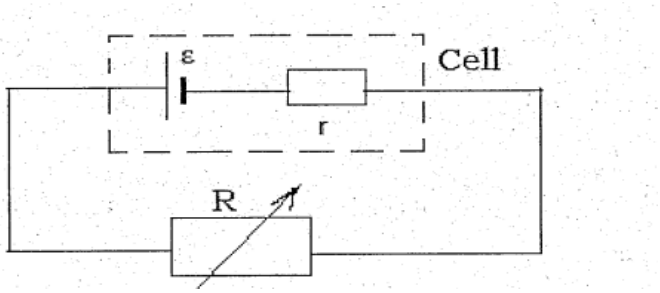
**Qn16.** Discuss as fully as you can the different strategies of reducing global warming through awareness and education **(10marks)**

**Qn17. (a)** What do you understand by the following terms?

**(i)** Electromotive force(emf) of a cell. **(1mark)**

**(ii)** Internal resistance of a cell **(1mark)**

**(b)**A cell has an electromotive force $\varepsilon$ of 1.52V and internal resistance of 0.45Ω. The figure below shows the cell connected to a variable resistor R.

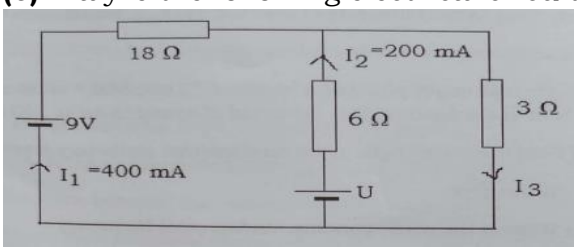



The resistance of R is set to a value of 2.55Ω. Calculate:

(i) The terminal potential difference across the cell. **(2marks)**

(ii) The power dissipated in R **(2marks)**

**(c)**Analyze the following electrical circuit given below;




Apply Kirchhoff's laws to find:

(i) The current $I_3$ **(2 marks)**

(ii) The potential difference $U$ **(2 marks)**

**Qn18.** A body is projected at an angle of $30^0$ to the horizontal with velocity of 25m/s. Find:

**(a)** The horizontal and vertical components of velocity **(2marks)**

**(b)** The horizontal and vertical velocities after 3 seconds **(2marks)**

**(c)** The horizontal and vertical displacements after 5 seconds. What does the result of the vertical displacement tell us? **(2marks)**

**(d)** The maximum height reached **(1mark)**

**(e)** The time of flight **(1mark)**

**(f)** The time to reach the maximum height **(1mark)**

**(g)** The horizontal range **(1mark)**

**Qn19. (a)** What do you mean by the term **'momentum'? (1mark)**
**(b)** Prove an expression which shows the relationship between impulse and momentum **(2marks)**
**(c)**Two bodies of mass of 3kg and 5kg travelling in opposite directions on a horizontal surface collide. The velocities of the 3kg and 5kg bodies before collision are 6m/s and 5m/s respectively. They separate after collision and move in the same direction in which the 5kg block was moving before collision. Given that the velocity of the 5kg body after collisions is 1m/s.
**(i)** find the speed of the 3kg body after impact and the percentage loss energy (if at all is there). **(5marks)**
**(ii)** Find the coefficient of restitution (**1mark)**
**(d)**If the resultant force acting on a body of constant mass is zero, the body's momentum is **(1mark**)

(a) Increasing
(b) Decreasing
(c) Always zero
(d) constant

**Qn20. (a)** ALL fossil fuels are non- renewable but not all non- renewable energy sources are fossil fuels.

(i) Differentiate between fossil fuels and renewable energy sources **(2marks)**
(ii)From the list of non- renewable energy sources, select one example which is not a fossil fuel. **(2marks)**
**(iii)**Give any two examples of a renewable energy. **(1mark)**
**(iv)**Provide any two fossil fuels. **(2marks)**
**(b)**State two Advantages of using solar cell. **(2marks)**
**(c)** Out line at least two Causes of global warming. **(1mark)**

**……END……**