United International **University**

School of Science and Engineering

Final Exam; Year 2021; Trimester: Spring

Course: PHY 106; Title: Physics Lab

Full Marks: 15(experiment) +5(viva); Section: D; Time: 120 Min

Q1a. Determine the current and corresponding resistance in a series circuit with a constant resistance of 20__ Ω and 30__ Ω using Ammeter by increasing supply voltage by an amount 5V, 10V, 15 V, 20 V, 25V, and with a constant supply voltage of 30 V__ for a total resistance of two resistors is (20+30 Ω =) 50 Ω__ and a consecutive increment order is 5 Ω__ [Take maximum 5 observations]. Determine the resistance from *I-V* graph of current-voltage data. Also calculate the error and accuracy in Ohm's law Experiment.

Q1b. Determine the current and corresponding resistance in a series circuit with a constant resistance of 15__ Ω and 10__ Ω using Ammeter by increasing supply voltage by an amount 5V, 10V, 15 V, 20 V, 25V, and with a constant supply voltage of 25 V__ for a total resistance of two resistors is (10+15 Ω =) 25 Ω__ and a consecutive increment order is 8 Ω__ [Take maximum 5 observations]. Determine the voltage and Verify Ohm's law from I-R_T graph. Also calculate the error and accuracy in Ohm's law Experiment.

Q1c. Determine the current and corresponding resistance in a series circuit with a constant resistance of 10__ Ω and 30__ Ω using Ammeter by increasing supply voltage by an amount 7V, 12V, 17 V, and with a constant supply voltage of 40 V__ for a total resistance of two resistors is (18+12 Ω =) 30 Ω__ and a consecutive increment order is 6 Ω__ [Take maximum 3 observations]. Determine the resistance from *I-V* graph of current-voltage data and the voltage from I-R_T graph to verify Ohm's law. Also calculate the error and accuracy in Ohm's law Experiment.

Q1d. Determine the current and resistance for 10V__supply for a circuit (given) with a total series resistance of 78 Ω__ and a consecutive increment order is 3 Ω__ Plot I-R_T graph to verify Ohm's law. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 7 observations]

Q1e. Determine the current and resistance for 15V__supply for a circuit (given) with a total series resistance of 60 Ω. The increment order of voltage is 8V__. Plot *I-V* graph to find out resistance. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 7 observations]

Q1f. Determine the current and resistance for 23V__supply for a circuit (given) with a total series constant resistance of 45 Ω. The increment order of voltage is 15V__. Plot *V-I* graph to find out resistance. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 7 observations]

Q1g. Determine the current and resistance for 13V__supply for a circuit (given) with a total series constant resistance of 35 Ω. The increment order of voltage is 20V__. Plot *I-V* graph to find out resistance. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 6 observations]

Q1h. Determine the current and corresponding resistance in a series circuit with a constant resistance of 15__Ω and 50__Ω using Ammeter by increasing supply voltage by an amount 13V, 23V, 33V, 43V, 53V, and with a constant supply voltage of 63V__ for a total resistance of two resistors is (40+25 Ω =) 65 Ω__ and a consecutive increment order is 11 Ω__ [Take maximum 4 observations]. Determine the resistance from *I-V* graph of current-voltage data. Also calculate the error and accuracy in Ohm's law Experiment.

Q1i. Determine the current and corresponding resistance in a series circuit with a constant resistance of 25__Ω and 35__Ω using Ammeter by a given supply voltage of 25 V__, the increasing supply voltage order is 12V__, and with a constant supply voltage of 37V__ for a total resistance of two resistors is (25+8 Ω =) 33 Ω__ and a consecutive increment order is 4Ω__ [Take maximum 5 observations]. Determine the voltage and Verify Ohm's law from I-R_T graph. Also calculate the error and accuracy in Ohm's law Experiment.

Q1j. Determine the current and resistance for 35V__supply for a circuit (given) with a total series constant resistance of 35 Ω. The increment order of voltage is 17V__. Plot *V-I* graph to find out resistance. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 6 observations]

Q1k. Determine the current and resistance for 55V__supply for a circuit (given) with a total series resistance of 48 Ω__ and a consecutive increment order is 17Ω__ Plot I-R_T graph to verify Ohm's law. Also calculate the error and accuracy in Ohm's law Experiment. [Take maximum 5 observations]

Q1*l*. Determine the current and corresponding resistance in a series circuit with a constant resistance of 10__Ω and 17__Ω using Ammeter by increasing supply voltage by an amount 11V, 17V, 23V, and with a constant supply voltage of 28.7 V__ for a total resistance of two resistors is (28+15 Ω =) 43 Ω__ and a consecutive increment order is 10.4 Ω__ [Take maximum 3 observations]. Determine the resistance from *I-V* graph of current-voltage data and the voltage from I-R_T graph to verify Ohm's law. Also calculate the error and accuracy in Ohm's law Experiment.

Q2a. Determine the value of the average time period of oscillation for 5___no of oscillations and the value of "g" using "L=60cm" of the Compound pendulum [Take at least 4 observations]. Find the error and accuracy in Compound pendulum with standard gravitational constant in ''Earth''.

Q2b. Determine the time period of oscillation of 1st, 2nd, 4th, 6th, and 8th no holes from the knife-edge on only one side of C.G of the bar (one observation per hole is enough) for 8___no of oscillations and draw the *T-d* graph (only one side of C.G). Also compare your result, if any, with standard gravitational constant 'g' in ''Earth'' environment.

Q2c. Determine the value of the time period of oscillation for 13___no of oscillations for the holes no 2, 4, 6 (take at least one observation per hole) and draw the *T-d* graph (draw at least two lines). Find out the value of "g" of the Compound pendulum and also find the error and accuracy in Compound pendulum compared with standard gravitational constant in ''Earth''.

Q2d. Determine the value of the average time period of oscillation for 3__no of oscillations and the value of "g" using "L=48.5cm" of the Compound pendulum [Take at least 6 observations]. Find the error and accuracy in Compound pendulum with standard gravitational constant in ''Uranus'' environment.

Q2e. Determine the time period of oscillation of 2nd, 3rd, 4th, 5th, and 7th no holes from the knife-edge on only one side of C.G of the bar (one observation per hole is enough) for 12__no of oscillations and draw the *T-d* graph (only one side of C.G). Using "L=56cm" and the time period obtained from 5th__no hole, determine the value of "g". Also compare your result with standard gravitational constant 'g' in ''Earth'' environment.

Q2f. Determine the value of the time period of oscillation for 7___no of oscillations for the holes no 1, 3, 5 (take at least one observation per hole) and draw the *T-d* graph (draw at least two lines). Find out the value of "g" of the Compound pendulum and also find the error and accuracy in Compound pendulum compared with standard gravitational constant in ''Earth''.

Q2g. Determine the value of the time period of oscillation for 14___no of oscillations for the holes no 3, 5, 8 (take at least one observation per hole) and draw the *T-d* graph (draw at least two lines). Find out the value of "g" of the Compound pendulum and also find the error and accuracy in Compound pendulum compared with standard gravitational constant in ''Neptune''.

Q2h. Determine the time period of oscillation of 1st, 2nd, 5th, 6th, and 7th no holes from the knife-edge on only one side of C.G of the bar (one observation per hole is enough) for 6__no of oscillations and draw the *T-d* graph (only one side of C.G). Using "L=53cm" and the time period obtained from 2nd__no hole, determine the value of "g". Also compare your result with standard gravitational constant 'g' in ''Venus'' environment.

Q2i. Determine the value of the time period of oscillation for 4___no of oscillations for the holes no 1, 2, 3, (take at least one observation per hole) and draw the *T-d* graph (draw at least two lines). Find out the value of "g" of the Compound pendulum and also find the error and accuracy in Compound pendulum compared with standard gravitational constant in ''Uranus''.

Q3a. Determine the gravitational acceleration 'g' by finding time period and its square for time of 7___ oscillations while the length variation of 0.65___m, 0.75___m, 0.85___m, and 0.95___m of a simple pendulum. The constant mass is 0.45 kg. Draw T^2 vs L graph and finding the slope and 'g'. Also compare your result with standard gravitational constant 'g' in ''Earth'' environment.

Q3b. Determine the effect of length on time period for time of 17___ oscillations and the time period for the length variation of 0.58 m___, 0.68 m___, 0.78 m___, and 0.98 m___ of a simple pendulum while the constant mass is 0.85 kg. Also, Verify of the formula $T=2\pi\sqrt{(L/g)}$ for the length of 0.35 m____ and time of 5___ oscillations of a simple pendulum. Compare your result with obtained time period and the theoretical time period.

Q3c. Determine the gravitational acceleration 'g' by finding time period and its square for time of 4____ oscillations while the length variation of 0.27___m, 0.37___m, 0.47___m, 0.57___m, 0.67___m, and 0.77___m of a simple pendulum. Take the average of both the

length and T^2 for finding the slope. Also compare your result with standard gravitational constant ‘g’ in ‘‘Earth’’ environment.

Q3d. Determine the effect of mass variation on time period for time of 12___ oscillations and the time period for the mass variation of 0.58 kg___, 0.68 kg___, 0.78 kg___, and 0.98 kg__ of a simple pendulum while the constant length is 0.85m. Also, Verify of the formula $T=2\pi\sqrt{(L/g)}$ for the length of 0.97 m__ and time of 9__ oscillations of a simple pendulum. Compare your result with obtained time period and the theoretical time period.

Q3e. Determine the gravitational acceleration ‘g’ by finding time period and its square for time of 6___ oscillations while the length variation of 0.33___m, 0.43___m, 0.53___m, and 0.63___m of a simple pendulum. The constant mass is 0.77 kg. Draw T^2 vs L graph and finding the slope and ‘g’. Also compare your result with standard gravitational constant ‘g’ in ‘‘Earth’’ environment.

Q3f. Determine the effect of length on time period for time of 13___ oscillations and the time period for the length variation of 0.35 m___, 0.45 m___, 0.55 m___, and 0.65 m___ of a simple pendulum while the constant mass is 0.65 kg. Also, Verify of the formula $T=2\pi\sqrt{(L/g)}$ for the length of 0.65 m____ and time of 10___ oscillations of a simple pendulum. Compare your result with obtained time period and the theoretical time period.

Q3g. Determine the gravitational acceleration ‘g’ by finding time period and its square for time of 3___ oscillations while the length variation of 0.26___m, 0.36___m, 0.46___m, and 0.56___m of a simple pendulum. The constant mass is 0.56 kg. Draw T^2 vs L graph and finding the slope and ‘g’. Also compare your result with standard gravitational constant ‘g’ in ‘‘Earth’’ environment.

Q3h. Determine the gravitational acceleration ‘g’ by finding time period and its square for time of 11____ oscillations while the length variation of 0.53___m, 0.63___m, 0.73___m, 0.83___m, 0.93___m, and 1.0___m of a simple pendulum. Take the average of both the length and T^2 for finding the slope. Also compare your result with standard gravitational constant ‘g’ in ‘‘Jupiter’’ environment.

Q4a. Determine the effective mass ‘m’ for a given spring (use graph after collecting data to determine ‘m’) by drawing necessary graph. Given the initial load 100 gm___, increment order of the load 40 gm___ and no of complete vibrations 9___. The mass of the spring is 32 gm. Also compare your result with obtained effective mass from graph. [Take 5 observations]

Q4b. Determine the spring constant ‘k’ for a given spring (use graph after collecting data to determine ‘k’) by drawing necessary graph. Given the initial load 64 gm___, increment order of the load 30 gm___. [Take 8 observations]

Q4c. Determine the spring constant ‘k’ and effective mass ‘m’ for a given spring (use graph after collecting data to determine ‘k’ and ‘m’) by drawing necessary graphs. Given the initial load 75 gm___, increment order of the load 60 gm___. The mass of the spring is 40 gm. Also compare your result with obtained effective mass from graph. [Take 3 observations]

Q4d. Determine the spring constant ‘k’ and effective mass ‘m’ for a given spring (use graph after collecting data to determine ‘k’ and ‘m’) by drawing necessary graphs. Given the initial load 75 gm___, increment order of the load 60 gm___. [Take 4 observations]

Q4e. Determine the spring constant ‘k’ and the effective mass ‘m’ of a spring for the given data of sample no ___ and sample no ___. The mass of the spring is 35 gm. Also compare your result.

Q4f. Determine the effective mass ‘m’ for a given spring (use graph after collecting data to determine ‘m’) by drawing necessary graph. Given the initial load 85 gm___, increment order of the load 23 gm___ and no of complete vibrations 6___. The mass of the spring is 45 gm. The dead load is 25 gm___. Also compare your result with obtained effective mass from graph. [Take 5 observations]

Q4g. Determine the spring constant ‘k’ and effective mass ‘m’ for a given spring (use graph after collecting data to determine ‘k’ and ‘m’) by drawing necessary graphs. Given the initial load 67 gm___, increment order of the load 57 gm___. [Take 4 observations]

Q4h. Determine the spring constant ‘k’ for a given spring (use graph after collecting data to determine ‘k’) by drawing necessary graph. Given the initial load 104 gm___, increment order of the load 21 gm___. [Take 8 observations]

Q5a. Find the voltage drops in three resistances of 20Ω, 37Ω and 57 Ω for 15V supply in a given series circuit. Also compare your result obtained from VDR.

Q5b. Determine the measured voltage drop across resistor in KVL Experiment for the resistances of 15Ω, 25Ω, and 65 Ω and Supply voltage 30V. Also compare your result.

Q5c. Determine R_T, voltage drop, and apply VDR if R_1=40 Ω, R_2=60 Ω, and R_3=80 Ω. Given the source voltage is 40V ___ in KVL Experiment. Also compare your result.

Q5d. Determine the measured current across resistor in KCL Experiment for the resistances of 15Ω___, 35Ω___, and 55 Ω___ and Supply voltage 18V___. Also compare your result obtained from CDR.

Q5e. Determine the measured current through resistor and also with CDR if R_1=10 Ω, R_2=20 Ω, and R_3=30 Ω. Given the Total current is 7.4A ___ in KCL Experiment and the source voltage is 39.6 V. Also calculate the error and accuracy in KCL Experiment.

Q5f. Prove KVL for a given data/circuit of sample 2 …..…...

Q5g. Prove KVL for a given data/circuit of sample 4 …..…...

Q5h. Prove KVL for a given data/circuit of sample 6 …..…...

Q5i. Prove KVL for a given data/circuit of sample 8 …..…...

Q5j. Prove KCL for a given data/circuit of sample 2 …..…...

Q5k. Prove KCL for a given data/circuit of sample 4 …..…...

Q5*l*. Prove KCL for a given data/circuit of sample 6 …..……...

Q5m. Prove KCL for a given data/circuit of sample 8 …..……...

Q5n. Determine the measured current through resistor and also with CDR if R_1=56.3 Ω, R_2=76.3 Ω, and R_3=96.3 Ω. Given the Total current is 1.09A ___ in KCL Experiment and the source voltage is 26V. Also calculate the error and accuracy in KCL Experiment.

Q5o. Determine R_T, voltage drop, and apply VDR if R_1=62.4 Ω, R_2=72.4 Ω, and R_3=82.4 Ω. Given the source voltage is 23.7V ___ in KVL Experiment. Also compare your result.

Q6a. Determine the diameters of Newton's 6 to 8 no rings and draw n-D^2 graph for these 3 observations.

Q6b. Determine the radius of curvature of a lens by drawing n-D^2 graph using Newton's ring method. Find the diameters of Newton's 2, 4, to 6 no rings observations. Given the radius of a lens is 70 cm___. Also compare your result with obtained radius of curvature from the graph. Given wavelength of light=5893 A^o.

Q6c. Determine the diameters of Newton's 5^{th} and 7^{th} no ring also determine the radius of curvature of a lens for the obtained data by drawing n-D^2 graph. Given the radius of a lens is 80 cm___. Also compare your result with obtained radius of curvature from graph. Given wavelength of light=5890 A^o.

Q6d. Determine the diameters of Newton's 1^{st}, 2^{nd} and 3^{rd} no ring also determine the radius of curvature of a lens for the obtained data. Given the radius of a lens is 90 cm___. Also compare your result with obtained radius of curvature from graph. Given wavelength of light=5896 A^o.

Q6e. Determine the diameters of Newton's 9 to 11 no rings and draw D^2 vs *ring no* graph for these 3 observations with 'Air' medium and ''Sodium light'' source.

Q6f. Determine the radius of curvature of a lens by drawing n-D^2 graph using Newton's ring method in 'Air' medium. Find the diameters of Newton's 1, 2, 4, 5 no rings observations. Given the radius of a lens is 63 cm___. Also compare your result with obtained radius of curvature from the graph. Given wavelength of Sodium light=5896 A^o.

Q6g. Determine the diameters of Newton's 3rd and 8th no ring also determine the radius of curvature of a lens for the obtained data in 'Water' medium with ''Green light'' source. Given the radius of a lens is 50 cm___. Also compare your result with obtained radius of curvature from graph. Given wavelength of light=5320 A^o.

Q6h. Determine the diameters of Newton's 1^{st}, 3^{rd} and 5^{th} no ring also determine the radius of curvature of a lens for the obtained data in 'Acetone' medium with ''Red light'' source. Given the radius of a lens is 95 cm___. Also compare your result with obtained radius of curvature from graph. Given wavelength of light=6700 A^o.

Q6i. Determine the diameters of Newton's 7^{th}, 9^{th} and 11^{th} no ring and also determine the wavelength of light for the obtained data in 'Kerosene' medium with ''Neon light''

source. Given the radius of a lens is 75 cm___. Also compare your result with obtained wavelength from graph.

Q6j. Determine the diameters of Newton's 2^{nd}, 3^{rd} and 4^{th} no ring and also determine the wavelength of light for the obtained data in 'Air' medium with ''Sodium light'' source. Given the radius of a lens is 100cm___. Also compare your result with obtained wavelength from graph.

Q7a. Determine the Young's modulus of a given material for the thickness of the material bar 0.5 cm__, breadth of the material bar 2 cm__, for a distance of 20, 30, 40, 50 cm____ of the knife edges and corresponding mass 50, 100, 150, 200 gm___. Use the mean value of l^3/e . Also compare your result if standard value of ''Steel'' is $19x10^{10}$ N/m^2.

Q7b. Determine the Young's modulus of a given material for the thickness of the material bar 0.6 cm__, breadth of the material bar 1.8 cm__, for a distance of 14.6 cm, 24.6 cm, 34.6 cm, and 44.6 cm____ of the knife edges and for a starting load 50 gm____ with load increment order 50 gm___. Draw *e* vs *m* graph. Also compare your result with standard value of ''Steel''. [Take 4 observations]

Q7c. Determine the Young's modulus of a given material for the thickness of the material bar 0.45 cm__, breadth of the material bar 1.2 cm__, for the initial distance 18cm___ and the consecutive distance 7cm____, for a starting load 150gm___ with load increment order 50 gm___. Draw *e* vs *m* graph. Also compare your result with standard value of ''Aluminium''. [Take 4 or 6 observations]

Q7d. Determine the Young's modulus of a given material for the thickness of the material bar 0.4 cm__, breadth of the material bar 2.8 cm__, for the initial distance 30 cm___ and the consecutive distance 4 cm____, for a starting load 100gm___ with load increment order 50 gm___. Draw *e* vs l^3 or, *e* vs *m* graph to find out Young's modulus. Also compare your result with standard value of ''Copper''. [Take 4 or 6 observations]

Q7e. Determine the Young's modulus of a given material for the thickness of the material bar 0.55 cm__, breadth of the material bar 2.6 cm__, for a distance of 17 cm, 27 cm, 37 cm, and 47 cm___ of the knife edges and for a starting load 150 gm___ with load increment order 50 gm___. Draw *e* vs l^3 graph. Also compare your result with standard value of ''Steel''. [Take 4 observations]

Q7f. Determine the Young's modulus of a given material for the thickness of the material bar 0.5 cm__, breadth of the material bar 2.3 cm__, for the initial distance 34.6 cm___ and the consecutive distance 3.2 cm____, for a starting load 100gm___ with load increment order 50 gm___. Draw *e* vs *m* graph. Also compare your result with standard value of ''Aluminium''. [Take 4 observations]

Q7g. Determine the Young's modulus of a given material for the thickness of the material bar 0.45 cm__, breadth of the material bar 2.5 cm__, for the initial distance 14.3 cm___ and the consecutive distance 4.5 cm____, for a starting load 200gm___ with load increment order 50 gm___. Use the mean value of l^3/e . Also compare your result if standard value of ''Aluminium'' is $6.9x10^{10}$ N/m^2. [Take 4 observations]

Q8a. Determine the Moment of inertia of a disc by finding out the period of oscillation for 10___ no of oscillations given length of suspension of the wire 35 cm___with distance increment order 20 cm___, Mass of each identical masses 5 gm ___, Radius of the suspension wire 0.05 cm___, d1= 1.5 cm____ and d2= 4 cm____, Radius of the disc 5.5 cm____, and Mass of the disc or cylinder 1 kg ___. Also compare your result with standard value of ‘‘Cast Steel’’. [Take at least 2 observations]

Q8b. Determine the Moment of inertia of a disc by finding out the period of oscillation for 15___ no of oscillations given length of suspension of the wire 45 cm___with distance increment order 12 cm___, Mass of each identical masses 20 gm ___, Radius of the suspension wire 0.06 cm___, d1= 1.5 cm____ and d2= 4 cm____, Radius of the disc 5.7 cm____, and Mass of the disc or cylinder 1.4 kg ___. Also compare your result with standard value of ‘‘Aluminium’’. [Take at least 2 observations]

Q8c. Determine the Moment of inertia of a disc by finding out the time period of oscillation for 8___ no of oscillations given length of suspension of the Copper wire, for the initial suspension distance 47___ cm and the distance increment order 10 cm___. Repeat 3 observations. Also compare your result with standard value of ‘‘Copper’’.

Q8d. Determine the Moment of inertia of a disc by finding out the period of oscillation for 6___ no of oscillations given length of suspension of the wire 40 cm___with distance increment order 15 cm___, Mass of each identical masses 10 gm ___, Radius of the suspension wire 0.06 cm___, d_1= 1.5 cm____ and d_2= 4 cm___, Radius of the disc 5.9 cm___, and Mass of the disc or cylinder 1.3 kg ___. Also compare your result with standard value of ‘‘Brass’’. [Take at least 2 observations]

Q8e. Determine the Moment of inertia of a disc by finding out the time period of oscillation for 4___ no of oscillations given length of suspension of the ‘‘Bronze’’ wire, for the initial suspension distance 67___ cm and the distance increment order 8 cm___. Repeat 3 observations. Also compare your result with standard value of ‘‘Bronze’’. [Take at least 2 observations]

Q8f. Determine the Moment of inertia of a disc by finding out the period of oscillation for 5___ no of oscillations given length of suspension of the wire 45cm___with distance increment order 25 cm___, Mass of each identical masses 15 gm ___, Radius of the suspension wire 0.07 cm___, d_1= 1.5 cm____ and d_2= 4 cm___, Radius of the disc 5.3 cm___, and Mass of the disc or cylinder 1.7 kg ___. Also compare your result with standard value of ‘‘Cast Iron’’. [Take at least 2 observations]

Q8g. Determine the Moment of inertia of a disc by finding out the period of oscillation for 7___ no of oscillations given length of suspension of the wire 65cm___with distance increment order 11 cm___, Mass of each identical masses 25 gm ___, Radius of the suspension wire 0.04 cm___, d_1= 1.5 cm____ and d_2= 4 cm___, Radius of the disc 6 cm___, and Mass of the disc or cylinder 2 kg ___. Also compare your result with standard value of ‘‘Zinc’’. [Take at least 2 observations]