



**UNIVERSITI KUALA LUMPUR
MALAYSIA ITALY DESIGN INSTITUTE**

**FINAL EXAMINATION
FEBRUARY 2026 SEMESTER**

COURSE CODE : KPP 01204
COURSE NAME : PHYSICS 2
PROGRAMME NAME : FOUNDATION IN SCIENCE AND TECHNOLOGY
DATE : 25 JUNE 2026
TIME : 02.00 PM – 4.30 PM
DURATION : 2.5 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer ANY FOUR (4) questions.
5. Please write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English language ONLY.
7. Formulae and constants table has been appended for your reference.

THERE ARE 11 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 20 marks)

INSTRUCTION: Answer ALL questions.**Please use the OMR sheet provided.**

1. The SI unit for electric charge is _____.

- | | |
|---------|------------|
| A. Volt | C. Coulomb |
| B. Ohm | D. Ampere |

2. Figure 1 shows two point charges $+Q$ and $-Q$ fixed at the points X and Y. The direction of the electric field at the point Z which is equidistant from X and Y is

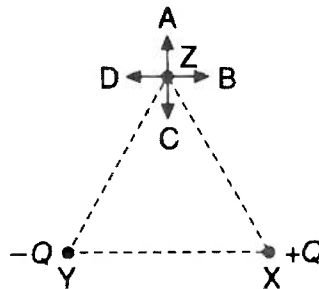


Figure 1

- | | |
|------|------|
| A. A | C. C |
| B. B | D. D |

3. The capacitance of a parallel-plate capacitor can be increased by reducing the

- | | |
|----------------------------------|--|
| A. charge on the capacitor | C. permittivity of dielectric material |
| B. separation between the plates | D. area of each plate |

4. A parallel-plate air capacitor of capacitance 6.0 pF consists of two parallel plates which are separated by a distance of 2.0 mm . What is the area of each plate?

- | | |
|--------------------------------------|-----------------------------------|
| A. $2.95 \times 10^{-3} \text{ m}^2$ | C. $7.38 \times 10^2 \text{ m}^2$ |
| B. $1.36 \times 10^{-3} \text{ m}^2$ | D. $2.66 \times 10^4 \text{ m}^2$ |

5. The resistivity of an ohmic material varies with

- | | |
|----------------|-------------------------|
| A. current | C. electric field |
| B. temperature | D. potential difference |

6. Two identical filament lamps, P and Q, and a switch S are connected to a battery as shown in Figure 2. With the switch S opened, both lamps will light up with normal brightness. Assume that the lamps do not fuse. When the switch S is closed?

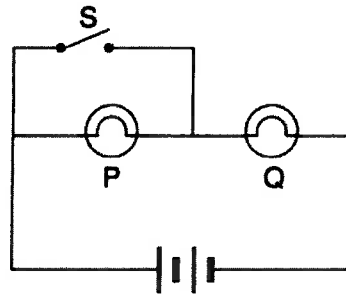


Figure 2

- A. P is not lighted, but Q is brighter
 - B. Both lamps become dimmer
 - C. P is brighter, but Q is dimmer
 - D. Both lamps become brighter
7. Calculate the total capacitance for the circuit shown in Figure 3 below.

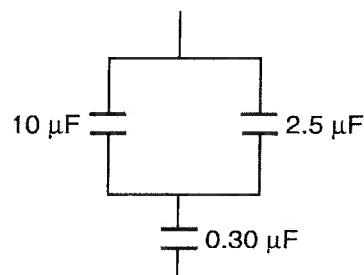
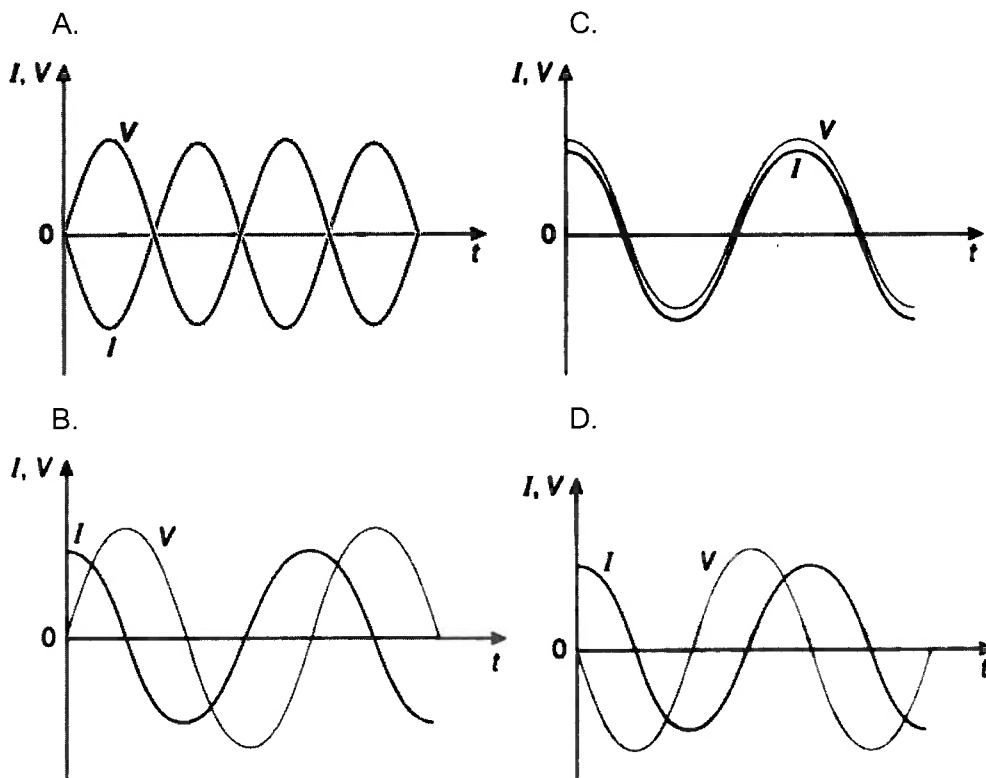


Figure 3

- | | |
|------------------------|----------------------|
| A. $0.293 \mu\text{F}$ | C. $2.0 \mu\text{F}$ |
| B. $0.12 \mu\text{F}$ | D. $293 \mu\text{F}$ |

8. Which of the following graphs shows the phase relationship between voltage, V , and current, I , when a sinusoidal current flow through a pure inductor?



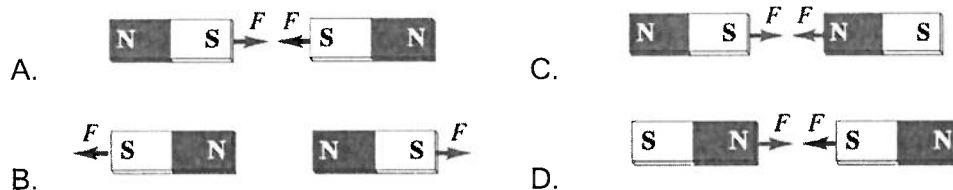
9. An inductor with $L = (1/2\pi) \text{ H}$ carries $I_{rms} = 2.0 \text{ A}$ at $f = 60.0 \text{ Hz}$. What is its V_{rms} ?

A. 120 V
B. 160 V
C. 140 V
D. 95 V

10. Determine the value of the capacitor if the capacitive reactance is 230Ω , with frequency of 100 Hz .

A. $3.43 \mu\text{F}$
B. $6.92 \mu\text{F}$
C. $7.56 \mu\text{F}$
D. $2.39 \mu\text{F}$

11. Which of the following is **NOT TRUE**?



12. A long straight wire carrying a large current I lies in the N-S direction as shown in Figure 4. A compass P is placed above the wire, and another compass Q is below the wire.

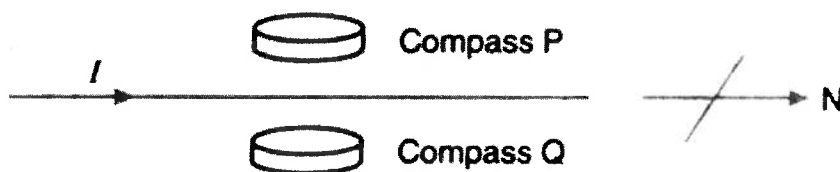


Figure 4

In which direction will the compasses P and Q point?

- A. Compass P = East, Compass Q = West
 - B. Compass P = South, Compass Q = North
 - C. Compass P = West, Compass Q = East
 - D. Compass P = North, Compass Q = South
13. A proton enters a uniform electric field perpendicular to the field lines as shown in Figure 5. What must be the direction of the magnetic field in order to cancel the electric force effect?

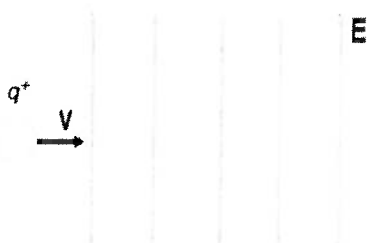


Figure 5

What must be the direction of the magnetic field in order to cancel the electric force effect?

- A. Left
 - B. Right
 - C. Into the page
 - D. Out of the page
14. A circular coil has 250 turns and radius 1.50 cm. When a current of 5.00 A flows in the coil, the magnetic flux density produced inside the coil is 0.050 T. What is the value of the self-inductance of the coil?
- A. 1.85 mH
 - B. 1.18 mH
 - C. 0.589 mH
 - D. 2.36 mH

15. Which one is NOT true for electromagnetic induction?
- A. The conductor must cut through magnetic field lines.
 - B. The conductor must experience a changing magnetic field.
 - C. The conductor must experience a magnetic field.
 - D. The emf induced in the conductor is directly proportional to the rate of changing magnetic flux

16. Figure 6 shows the side view of a circular coil of N turns and area A in a magnetic field B .

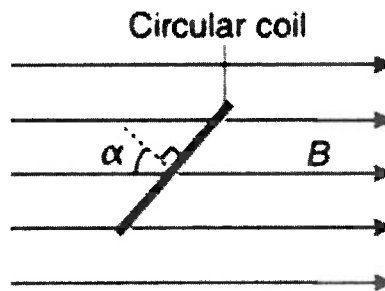


Figure 6

If the normal to the plane of the coil makes an angle α with the magnetic field, the total magnetic flux through the coil is

- A. $BA \sin \alpha$
 - B. $BA \cos \alpha$
 - C. $NBA \sin \alpha$
 - D. $NBA \cos \alpha$
17. What is the difference between the pressure on the bottom of a pool and the pressure on the water surface?
- A. ρhg
 - B. $\rho h/g$
 - C. ρ/hg
 - D. $1/2 \rho hg$
18. Water flows at a constant speed of 16 m/s through narrow section of the pipe. What is the speed of water in the section of the pipe where its radius is twice of the initial radius?
- A. 16 m/s
 - B. 12 m/s
 - C. 8 m/s
 - D. 4 m/s

19. A sample of ideal gas has an internal energy, U , and is then compressed to one-half of its original volume while the temperature stays the same. What is the new internal energy of the ideal gas?
- A. Same
 - B. Quadruples
 - C. Doubles
 - D. Decreased to one-half
20. Kinetic Theory is based on an ideal gas model. The following statements about the ideal gas are true **EXCEPT**
- A. The average molecular kinetic energy is directly proportional to the absolute temperature
 - B. All molecules move with the same speed
 - C. All molecules make elastic collisions with each other and the walls of the container
 - D. The attractive force between the molecules can be ignored

SECTION B (Total: 80 marks)

INSTRUCTION: Answer ANY FOUR (4) questions.

Please use the answer booklet provided.

Question 1

- (a) Three-point charges $q_1 = 2.0 \mu\text{C}$, $q_2 = -3.0 \mu\text{C}$ and $q_3 = 5.0 \mu\text{C}$ are fixed at their respective positions as shown in Figure 4.

- Sketch the electric force diagram on charge q_1 .
- Calculate the resultant force on charge q_1 .

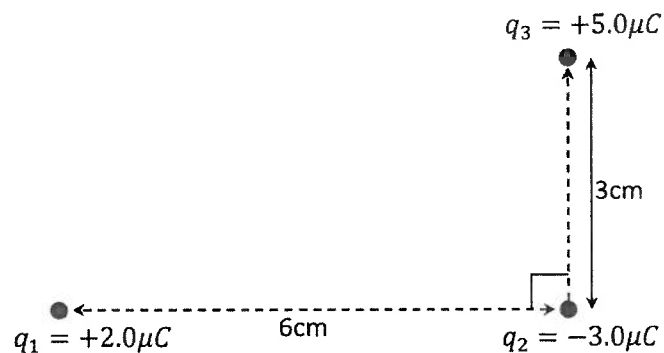


Figure 4

(12 marks)

- (b) Figure 5 shows charges $q_A = +2 \mu\text{C}$ and $q_B = -1 \mu\text{C}$ placed at point A and B, respectively. Calculate The electric field, E (magnitude and direction) at point C.

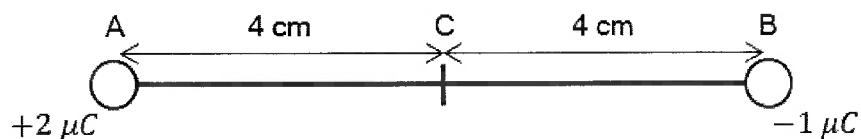


Figure 5

(8 marks)

Question 2

Figure 6 shows the combination of series and parallel resistors with 12 V voltage supply.

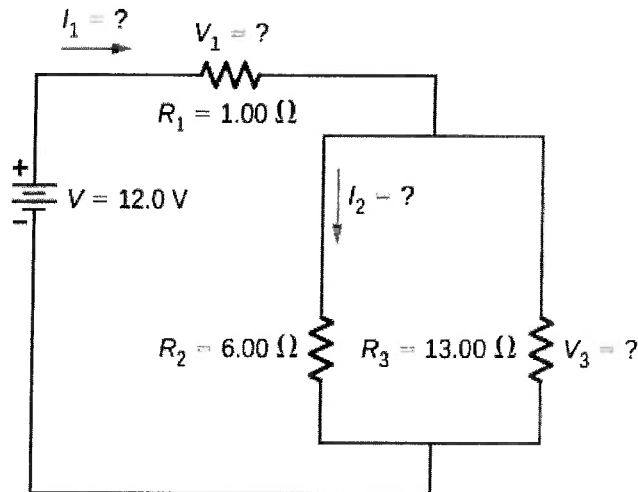


Figure 6

- (a) Define the meaning of Ohm's Law. (3 marks)
- (b) Find the equivalent resistance of the circuit. (4 marks)
- (c) Calculate the total current I_T of the circuit. (3 marks)
- (d) Calculate the potential drop V_1 across resistor R_1 . (3 marks)
- (e) Find the current I_2 through resistor R_2 . (3 marks)
- (f) Calculate the total power dissipated at 12 V supply. (4 marks)

Question 3

- (a) A 240 V, 50 Hz AC supply is applied a coil of 0.08 H inductance and $4\ \Omega$ resistance connected in series with a capacitor of $8\ \mu\text{F}$ as shown in Figure 7.

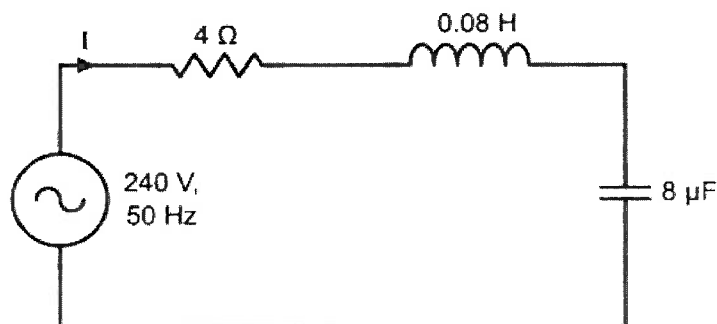


Figure 7

- i. Calculate the total impedance, Z .
(6 marks)
 - ii. Calculate the total current.
(4 marks)
- (b) An RLC series circuit has a $40.0\ \Omega$ resistor, a $3.00\ \text{mH}$ inductor, and a $5.00\ \mu\text{F}$ capacitor.
- i. Find the circuit's impedance at $60.0\ \text{Hz}$.
(6 marks)
 - ii. If the voltage source has $V_{\text{rms}} = 120\ \text{V}$, what is I_{rms} at that frequency?
(4 marks)

Question 4

(a) A solenoid carries a current, as shown in Figure 8 below.

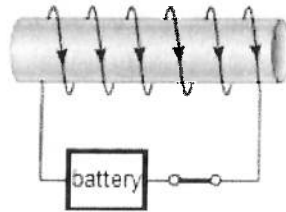


Figure 8

- i. Describe the shape of the magnetic field around the solenoid when the current passes through it. (6 marks)
- ii. Which side of the solenoid (left or right) will be the north pole of the solenoid? (2 marks)
- iii. What rule can be used to predict the direction of this magnetic field? (2 marks)

(b) A magnet is brought near a coil of wire as shown in Figure 9.

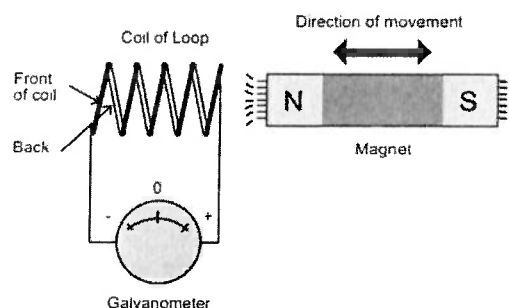


Figure 9

- i. When the magnet is brought towards the coil, which side of the coil (left or right) will be a north pole? (2 marks)
- ii. Which way (left to right OR right to left) will the induced current pass through the galvanometer? (6 marks)
- iii. When the magnet is moved away from the coil, how will the direction of the current compare to that in b (ii)? (2 marks)

Question 5

- (a) Figure 10 shows a large tank, 20 m in height and open at the top, is completely filled with saltwater (density = 1025 kg/m^3). A small drain plug with a cross-sectional area of $4.0 \times 10^{-5} \text{ m}^2$ is located 5.0 m from the bottom of the tank. The plug breaks loose from the tank, and water flows from the drain.

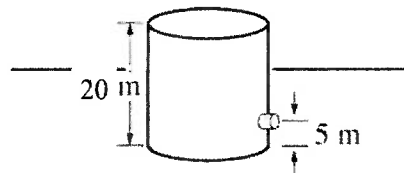


Figure 10

- Calculate the pressure exerted by the water on the plug before the plug breaks free.
- Calculate the speed of the water as it leaves the hole in the side of the tank.
- Calculate the volume flow rate of the water from the hole.
- Suppose that there is now less liquid in the container so the height h is reduced to $h/2$. Determine the location of the liquid would land compared to the original point (shorter/same/further).

(12 marks)

- (b) A pipe gradually tapers from a diameter of 0.3 m to 0.1 m over the length shown in Figure 11. It conveys water at 50 L/s with the pressure at the bottom end at 196,000 Pa.

If the pressure at the upper end is 98.1 kPa, find the value of Z .

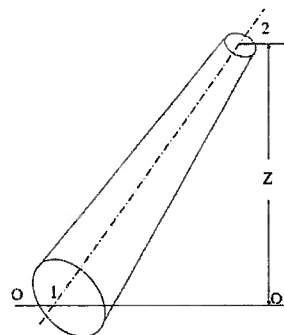


Figure 11

(8 marks)

END OF EXAMINATION PAPER

FORMULAE & CONSTANTS

Electrostatics

1. $Q = ne$, $e = 1.6 \times 10^{-19} \text{ C}$
2. $F = k \frac{q_1 q_2}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$
3. $E = \frac{F}{q_0}$
4. $E = k \frac{q}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$
5. $\Phi_E = EA$
6. $E = \frac{1}{2\pi\epsilon r} \frac{\lambda}{\sigma}$
7. $E = \frac{\sigma}{2\epsilon_0}$
8. $W = k \frac{q_1 q_2}{r} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r}$
9. $V = \frac{W}{q_0} = k \frac{q}{r} = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$
10. $k = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$
11. $\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 / \text{N.m}^2$

Capacitors and Dielectrics

12. $V = Ed$
13. $C = \frac{Q}{V}$
14. $C_0 = \frac{\epsilon_0 A}{d}$
15. $K = \frac{C}{C_0} = \frac{\epsilon}{\epsilon_0} = \frac{V_0}{V} = \frac{E_0}{E}$
16. $C = \epsilon \frac{A}{d} = K\epsilon_0 \frac{A}{d}$
17. $C_T = \sum_{j=1}^n C_j = C_1 + C_2 + C_3 + \dots$
18. $\frac{1}{C_T} = \sum_{j=1}^n \frac{1}{C_j} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$
19. $U = \frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} QV = \frac{1}{2} CV^2$

Electricity and Direct Current

20. $I = \frac{Q}{t}$
21. $V_d = \frac{I}{nAe}$
22. $J = \frac{I}{A} = nV_d e = \frac{E}{\rho}$
23. $V = IR = Ed$
24. $R = \rho \frac{L}{A}$
25. $\rho = \rho_0 [1 + \alpha(T - T_0)]$
26. $\epsilon = I(R + r)$
27. $V_1 = \left(\frac{R_1}{R_1 + R_2} \right) V$
28. $W = VIt$
29. $P = VI$

Step-by-step solution (Electric Force)

1. Draw diagram of all forces on the charge Q.
2. Find magnitude of each forces. (ignore +/- sign)
3. Resolve each force to F_x and F_y . (if force does not lie on the x-y axis)
4. Make a table for x-component and y-component.
5. Find magnitude and angles of F_R .

Alternating Currents

30. $V_{\text{rms}} = \frac{V_0}{\sqrt{2}}$, $I_{\text{rms}} = \frac{I_0}{\sqrt{2}}$
31. $\omega = 2\pi f$
32. $R = \frac{V_R}{I}$, $X_C = \frac{1}{\omega C}$, $X_L = \omega L$
33. $V = I\sqrt{R^2 + X_C^2}$, $Z = \sqrt{R^2 + X_C^2}$, $\tan \phi = \frac{X_C}{R}$
34. $V = I\sqrt{R^2 + X_L^2}$, $Z = \sqrt{R^2 + X_L^2}$, $\tan \phi = \frac{X_L}{R}$
35. $V = I\sqrt{R^2 + (X_L - X_C)^2}$, $Z = \sqrt{R^2 + (X_L - X_C)^2}$
 $\tan \phi = \frac{X_L - X_C}{R}$

Magnetism

36. $F = qvB \sin \theta = IlB \sin \theta$
37. $B = \frac{\mu_0 I}{2\pi r}$
38. $B = \frac{\mu_0 NI}{2R}$
39. $B = \frac{\mu_0 NI}{l} = \mu_0 nI$
40. $B = \frac{1}{2} \mu_0 nI$
41. $\frac{F}{l} = \frac{\mu_0 I_1 I_2}{2\pi d}$
42. $\mu_0 = 4\pi \times 10^{-7} \text{ T.m.A}^{-1}$

Electromagnetic Induction

43. $\Phi = BA \cos \phi$
44. $\epsilon = -N \frac{d\Phi}{dt} = -L \frac{dI}{dt}$
45. $\epsilon = Nl v B \sin \theta$
46. $\epsilon = NBA \omega \sin \phi$
47. $L = \frac{N\phi}{I}$
48. $L = \frac{\mu_0 N^2 A}{l}$
49. $L = \frac{\mu_0 N^2 A}{2r}$
50. $U = \frac{1}{2} LI^2$
51. $M = \frac{\mu_0 N_1 N_2 A}{l}$
52. $\frac{\epsilon_P}{\epsilon_S} = \frac{V_P}{V_S} = \frac{N_P}{N_S} = \frac{I_S}{I_P}$

Fluid & Thermodynamics

53. $P = \rho hg$
54. $A_1 v_1 = A_2 v_2$
55. $p_1 + \rho g y_1 + \frac{1}{2} \rho v_1^2 = p_2 + \rho g y_2 + \frac{1}{2} \rho v_2^2$
56. $PV = nRT$
57. $\Delta U = \Delta Q - \Delta W$
58. $W = Fx$
59. $1 \text{ atm} = 101.3 \text{ kPa} = 760 \text{ mmHg}$

Step-by-step solution (Electric Field)

1. Draw diagram of all electric fields on the location.
2. Find magnitude of each electric field. (ignore +/- sign)
3. Resolve each force to E_x and E_y . (if does not lie on the x-y axis)
4. Make a table for x-component and y-component.
5. Find magnitude and angles of E_R .