

College of Industrial Technology
King Mongkut's University of Technology North Bangkok

Seat No.

Final Examination of Semester 1

Year: 2020

Subject: 340151 Electrical Materials and Calculation

Section: 5-6

Date: 3 November 2020

Time: 08.00-10.00

Name: _____ ID: _____ Class: _____

Directions: The test is designed to measure your comprehension. The test is divided into 1 section. There will be 9 pages (including this page) and they are worth 70 points.

- This exam paper contains no errors. If a suspected error is found, it is the student's discretion to correct it.
- Answer the questions on this test paper.
- Books, documents and lecture notes are not allowed.
- You must be in the room for one hour after the exam is started and, while taking the exam, you cannot go out except in an emergency case.
- Before leaving, make sure you do not bring this test outside.
- Do not use any electronic communication device.
- Calculators can be used in this test.

Now begin the test.

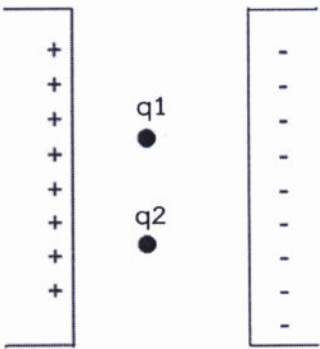
Cheating in the exam is considered an extremely serious offence which will result in expulsion from the University.

1. Match the function as written in the table below with the alphabet as follows.
(9 points)

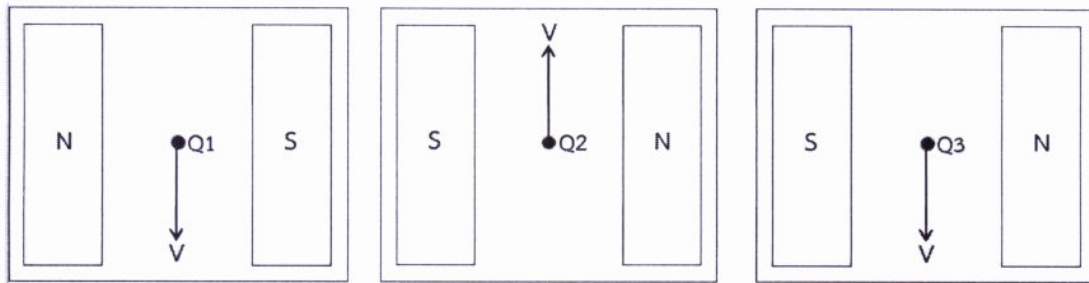
- A. Arsenic
- D. Conductor Screen
- G. Filter
- B. Bedding
- E. Conductor Sheath
- H. Insulation Screen
- C. Bolon
- F. Enamel
- I. Outer Sheath

Alphabet	Function
.....	To make P-type semiconductor
.....	To make N-type semiconductor
.....	To insulate magnet wire
.....	To minimize electrostatic stresses
.....	To protect conductor against each other
.....	To keep bundle together
.....	To keep electromagnetic radiation
.....	To control electric field
.....	To be weather, chemical and electrical protection

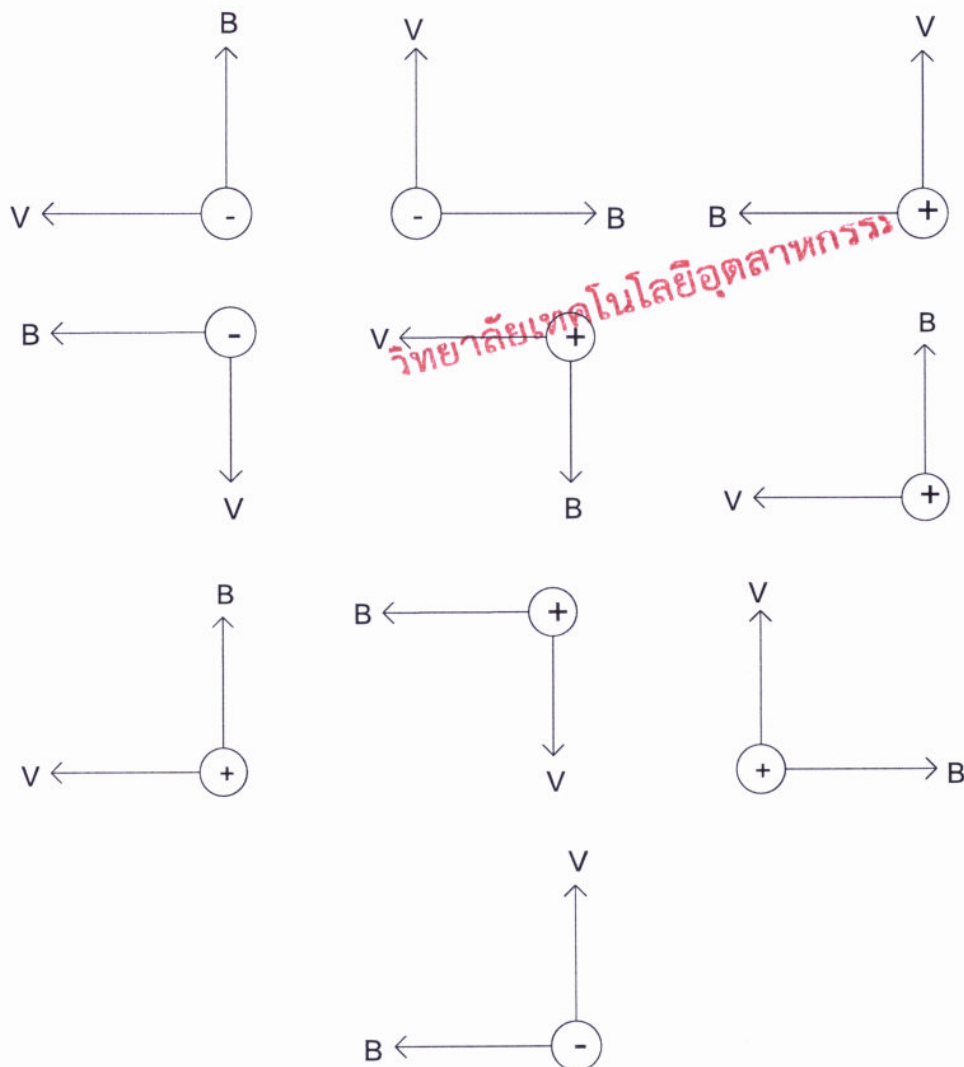
2. Draw the directions of “electric field (E)”, “electric force (Fe) of electron (q1)”, and “electric force (Fe) of proton (q2)”, as shown in the figure. (3 points)



3. Draw the directions of "magnetic field (B)", and "magnetic force (F_m)" of these three charges in the figure. Assume that Q_1 is proton; Q_2 and Q_3 are electron. (6 points)



4. Draw the directions of the magnetic force of the figure below. Also, state "in" or "out" on your force direction. Note: "in" means into the viewer, while "out" means out of the viewer. (10 points)



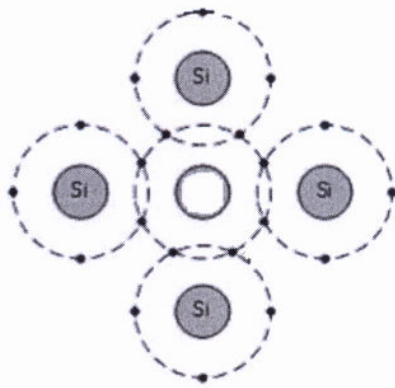
5. How can we make N-type and P-type semiconductor by doping? Answer by explain and draw the figure. (6 points)

N-type:

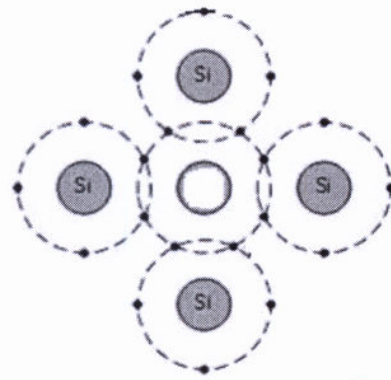
.....

P-type:

.....

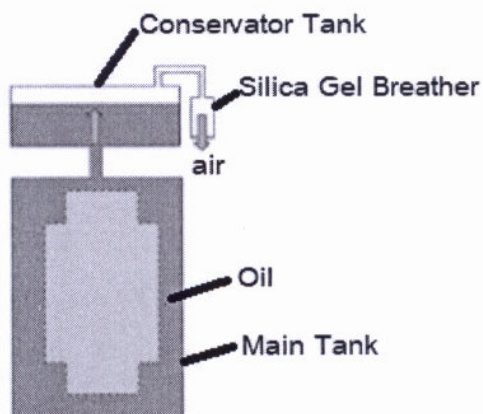


N-type



P-type

6. What happens when the temperature of the transformer oil changes? (6 points)

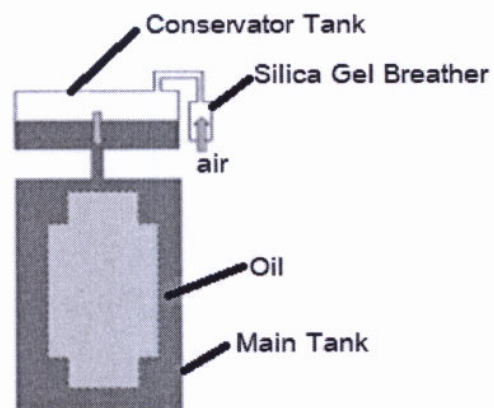


Oil temperature increases:

Oil quantity.....

Rubber bag size.....

Flow of air.....



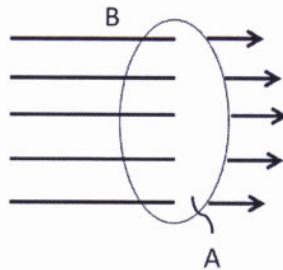
Oil temperature decreases:

Oil quantity.....

Rubber bag size.....

Flow of air.....

9. The magnetic field lines pass through the sphere with the area equal to 1.75 cm^2 . The magnetic flux is 82.39 weber. There is the charge with 8 pC that moves perpendicular to the magnetic field from top to bottom of the sphere with 9 m/s. (5 points)



9.1 What is the magnetic field?

.....

.....

9.2 What are the magnitude and the direction of the magnetic force?

.....

.....

.....

.....

.....

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10. The proton with 10 m/s moves into the magnetic field that passes through the sphere area with 2 cm^2 . The magnetic flux is 40 weber, while the magnetic force is 0.2 pN. (5 points)

10.1 What is the magnitude of magnetic field?

.....

.....

.....

10.2 What is the angle between the proton velocity and the magnetic field?

.....

.....

.....

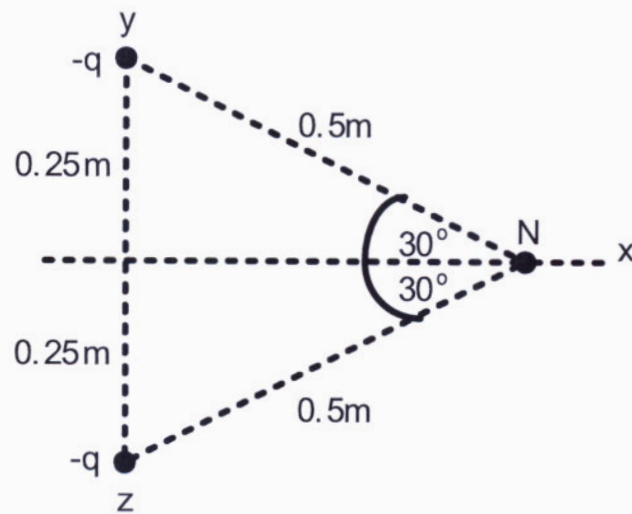
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.....

11. The two charges that are -30 nC and -90 nC are placed at two of the vertices of an equilateral triangle with sides 0.5 meter in length, as shown in the figure. Assume that $k=9 \times 10^9 \text{ N.m}^2/\text{C}^2$. (10 points)

11.1 What is the electric field at the "N" point with a negative charge? (8 points)

11.2 What is the force when a charge of $-5 \mu\text{C}$ is placed at the "N" point? (2 points)



Solution:

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