# PHYSICAL SCIENCES GRADE 11

## QUESTION 1

1.1 Faraday (1)

1.2 mutual induction (1)

1.3 polarity (1)

1.4 doping (1)

1.5 Boyles law (1)

[5]

## QUESTION 2

2.1 per unit potential difference that... (2)

2.2 decrease voltage and ...increasing capacitance / decrease E-field and increase capicutance (2)

2.3 repulsion between lone pairs and H-S bonds / lone pairs on Sulfur atom (2)

2.4 ...semiconductor increases as the temperature.../ conductor / resistance (2)

2.5 pressure decreases ... / or temperature increases .., collisions increases (2)

[10]

## QUESTION 3

| | | | | |
|---|---|---|---|---|
| 3.1 | A | B | C | ■ |
| 3.2 | A | ■ | C | D |
| 3.3 | A | B | ■ | D |
| 3.4 | A | B | ■ | D |
| 3.5 | A | B | C | ■ |

[5 X 2 = 10]

**TOTAL SECTION A : 25 MARKS**

4.1 $F = \frac{kQ_1Q_2}{r^2} = \frac{(9\times10^9)(5\times10^{-9})(-10\times10^{-9})}{(0,006)^2} = -0,0125\ N$

$= 0,0125\ N$ (repel)

$= 12,5\times10^{-3}$

$= 1,25\times10^{-2}$

4.2 attraction

4.3 $Q = \frac{5\times10^{-9} + (-10\times10^{-9})}{2} = -2,5\times10^{-9}\ C$

4.4 Charge difference on $Q_1 = 5\times10^{-9} - (-2,5\times10^{-9})$

$= 7,5\times10^{-9}$

# electrons $= \frac{7,5\times10^{-9}}{1,6\times10^{-19}} = 4,69\times10^{10}$

from $Q_2 \rightarrow Q_1$ OR to the left. (same values as 4.3)

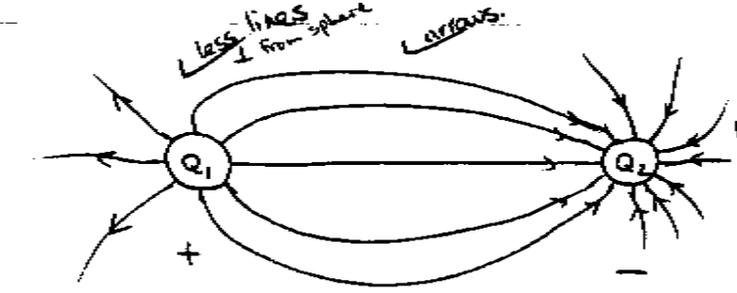
4.5 $F_2 = \frac{kQ_1Q_2}{r^2} = \frac{(9\times10^9)(-2,5\times10^{-9})(2,5\times10^{-9})}{(0,006)^2}$

$= 1,56\times10^{-3}\ N$ (repel)

$\frac{F_2}{F_1} = \frac{1,56\times10^{-3}}{0,01025} = \frac{1}{8}$ (from 4.1)

$\therefore F_2 = \frac{1}{8} \times F_1$ or $F_1 = 8 \times F_2$

4.6




4.7 $E = \frac{kQ}{r^2} = \frac{(9\times10^9)(2,5\times10^{-9})}{(0,006)^2} = -6,25\times10^5\ N\cdot C^{-1}$

$= 6,25\times10^5\ N\cdot C^{-1}$ away from eac other.

or $E = \frac{F}{Q} = \frac{1,56\times10^{-3}}{2,5\times10^{-9}} = 6,4\times10^5$

5.1 high ✓
5.2 decrease strength / weaker / slows down ✓
5.3 0 V ✓
5.4 330 V ✓
5.5 $Q = CV = (370 \times 10^{-6})(330) = 0,1221\ C$ ✓ [

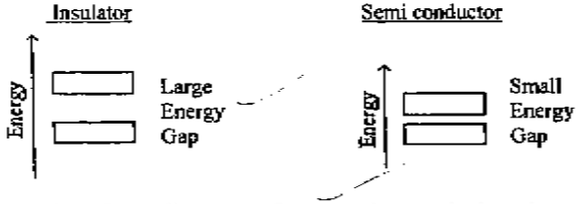
6.1 RH solenoid rule ✓ : Hold solenoid in RH wi curled fingers in the conventional current ✓ direction. The stretched thumb points to nort pole.

6.2 The motor effect : combination of magnetic ✓ field and the charge's magnetic field has a force resulting, causing the direction cha

6.3 $\theta$ is the angle between the magnetic field and the normal on the area (A). (We need the ⊥ of magn field on area
$B \parallel A \Rightarrow \theta = 90°$ ∴ $\phi = 0$ Wb. ✓ compa

6.4 The $V_s > V_p$ or $N_s > N_p$ ✓ [8

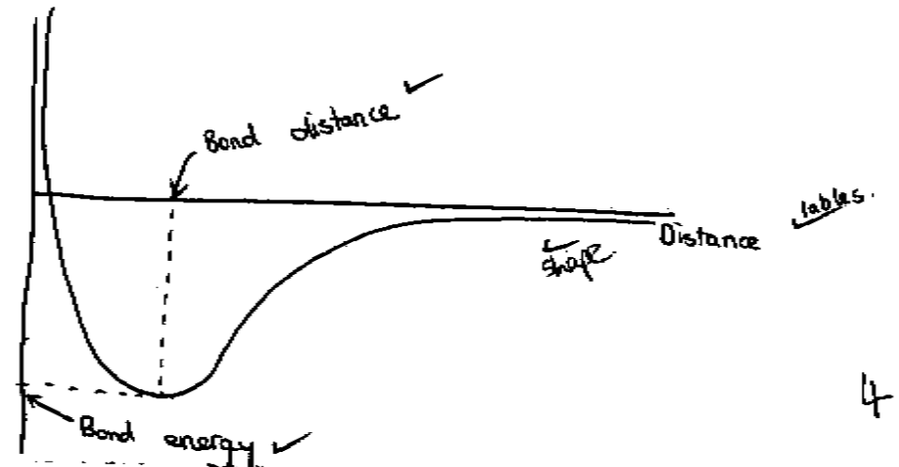
7.1)



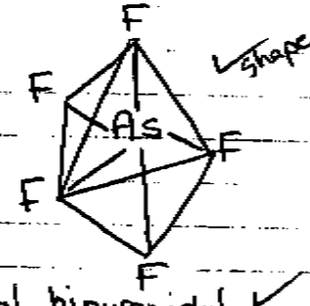

With the addition of a small amount of energy, electrons in the valence band can move into empty states at the bottom of the conduction band in the semi conductor. The energy gap is too large in the case of the insulator to excite electrons into the conduction band

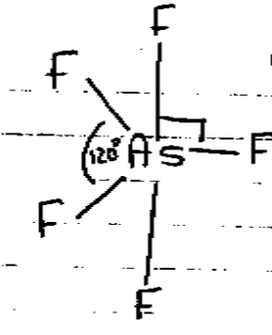
7.2) a) p
b) n
c) n

8.1




8.2 $kJ \cdot mol^{-1}$ ✓
8.3 Energy = 2 ✓ x 707 ✓ = 1414 $kJ \cdot mol^{-1}$ ✓ (unit as in 8.2
8.4

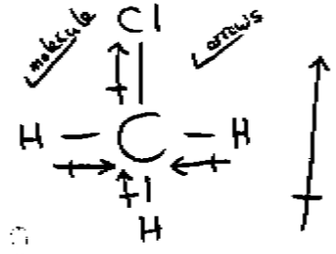



Trigonal bipyramidal ✓ (3)

8.5 polar ✓

8.8




8.9

| Atom | ON |
|---|---|
| K | +1 |
| Cr | +6 |
| O | -2 |

$K_2Cr_2O_7$ : $(+1)(2) + 2x + 7(-2) = 0$
$x = +6$

0 0 1 0 7 0

(3

9.1.1) Low temp. ✓ & high pressure ✓ (2)

9.1.2) $V_1 = 200\ cm^3$
$T_1 = 27 + 273 = 300\ K$
$P_1 = 1,5 \times 10^5\ Pa$
$V_2 = ?$
$T_2 = 273\ K$
$P_2 = 101,3\ kPa = 101,3 \times 10^3\ Pa$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \checkmark$$

$$\frac{1,5 \times 10^5 \times 200 \checkmark}{300} = \frac{101,3 \times 10^3\ V_2}{273 \checkmark}$$

$V_2 = 269,50\ cm^3$ ✓ (4)

9.2.1) absolute zero ✓ (1)
9.2.2) 0 kPa ✓ (1)
9.2.3) $-273\ ^\circ C$ ✓ (1)

9.3) $P = 99,3\ kPa = 99,3 \times 10^3\ Pa$
$V = 65\ dm^3 = 65 \times 10^{-3}\ m^3$
$T = 25 + 273 = 298\ K$
$R = 8,31$

$pV = nRT$ ✓

$$n = \frac{99,3 \times 10^{+3} \times 65 \times 10^{-3} \checkmark}{8,31 \times 298 \checkmark}$$

$= 2,61\ mol$ ✓

$n = \frac{m}{M}$

$m = nM$ ✓
$= 2,61 \times 28$ ✓
$= 73,08\ g$ ✓ (7)