1. The propositions p, q and r are defined as follows:

p: this is a good course
q: the course is worth taking
r: the grading is lenient

(a) Write a symbolic statement for each of the following sentences.

(i) *If this is a good course, then it is worth taking.*

(ii) *Either the grading is lenient, or the course is not worth taking.*

(2)

(b) Write the following argument using p, q, r and logic symbols or connectives only.

If this is a good course, then it is worth taking. Either the grading is lenient, or the course is not worth taking. But the grading is not lenient. Therefore, this is not a good course.

(2)
(Total 4 marks)

2. If each of the following compound propositions is true, what conclusions can be made?

(a) $x < 7$ or $x \geq 3$, and $x \not< 7$

(b) $p = 3$ if and only if $q = 5$, and if $q \neq 5$ then $r \neq 12$.

(Total 4 marks)

3. Three propositions p, q and r are defined as follows:

p: the water is cold. q: the water is boiling. r: the water is warm.

(a) Write one sentence, in words, for the following logic statement:

$$(\neg p \wedge \neg q) \Rightarrow r$$

(b) Write the following sentence as a logic statement using symbols only.

"The water is cold if and only if it is neither boiling nor warm"

(Total 4 marks)

4. Three propositions are defined as follows:

p: The oven is working.

q: The food supply is adequate.

r: The visitors are hungry.

(a) Write one sentence, in words only, for each of the following logic statements.

(i) $q \wedge r \wedge \neg p$

(2)

(ii) $\neg r \vee (p \wedge q)$

(2)

(b) Write the sentence below using only the symbols p, q and logic connectives.

"If the oven is working and the food supply is adequate then the oven is working or the food supply is adequate."

(2)

(c) A tautology is a compound statement which is always true. Use a truth table to determine whether or not your answer to part (b) is a tautology.

Hint: Begin by writing the first two columns of your truth table in the following format:

p	q
T	T
T	F
F	T
F	F

(3)
(Total 9 marks)