

1. 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"

Working:

Answers:

(a)

(b)

(Total 4 marks)

2. The propositions p and q are defined as follows:

p : *you have understood this topic*

q : *you will be able to do this question*

- (a) Write the following proposition in symbols using p , q and logical connectives only.

"You have understood this topic, or you will not be able to do this question."

- (b) Explain, in words only, what the following symbolic proposition represents:

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

Working:

Answers:

(a)

(b)

(Total 4 marks)

3. Two propositions p and q are defined as follows.

p : *Jones passed this course*

q : *Smith passed this course*

- (a) Write in symbolic form

(i) *neither Jones nor Smith passed the course;*

(ii) *it is not the case that Jones and Smith both passed the course.*

- (b) Complete the following truth table for the logic statement $\neg p \vee q$.

p	q	$\neg p$	$\neg p \vee q$
T	T		
T	F		
F	T		
F	F		

Working:

Answers:

- (a) (i)
(ii)

(Total 4 marks)

4. Consider two propositions p and q . Complete the truth table below for the compound proposition.

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

p	q	$\neg p$	$\neg q$	$p \wedge \neg q$	$\neg p \vee q$	$(p \wedge \neg q) \Rightarrow (\neg p \vee q)$
T	T	F	F	F	(d)	T
T	F	F	T	(b)	F	(f)
F	T	(a)	F	(c)	T	(g)
F	F	T	T	F	(e)	(h)

Working:

(Total 8 marks)

5. Two logic propositions are given.

p : Paula eats chocolates.
 q : Paula watches television.

Write in words

- (a) $p \wedge \neg q$;
 (b) $p \vee q$;
 (c) $q \Rightarrow \neg p$.

Working:

Answers:

- (a)

 (b)

 (c)

(Total 6 marks)

6. Write down the values for **a**, **b**, **c**, **d**, **e** and **f** from the table below:

p	q	$\neg p$	$p \wedge q$	$p \vee q$	$p \vee q$	$p \Rightarrow q$	$p \Leftrightarrow q$
T	T	a			d		
T	F		b				f
F	T			c			
F	F					e	

(Total 6 marks)

1. (a) "If the water is not cold and not boiling then it is warm"
 (or equivalent statement)

(A2)

(b) $p \Leftrightarrow \neg(q \vee r)$ **or** $p \Leftrightarrow \neg q \wedge \neg r$ (A2)

Note: Award (A1) for $p \Leftrightarrow$ and (A1) for $\neg(q \vee r)$.

[4]

2. (a) $(p \vee \neg q)$ (A1)

(b) *If you have understood this topic and will not be able to do this question, then you have not understood this topic.* (A3)

Note: Award (A1) for each correct translation of $\neg q$, $\neg p$, and \Rightarrow . Maximum 3 marks.

[4]

3. (a) (i) $\neg(p \vee q)$ alternatively $\neg p \wedge \neg q$ (A1)

(ii) $\neg(p \wedge q)$ alternatively $\neg p \vee \neg q$ (A1)

(b)

p	q	$\neg p$	$\neg p \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

(A2)

Note: Award (A1) for each bold column.

[4]

4.

p	q	$\neg p$	$\neg q$	$p \wedge \neg q$	$\neg p \vee q$	$(p \wedge \neg q) \Rightarrow (\neg p \vee q)$
T	T	F	F	F	(d) T	T
T	F	F	T	(b) T	F	(f) F
F	T	(a) T	F	(c) F	T	(g) T
F	F	T	T	F	(e) T	(h) T

(A8)

Note: Award (A1) for each correct answer.

[8]

5. (a) Paula eats chocolates and does not watch television

For “and”

(A1)

For the rest correct

(A1) (C2)

(b)	Paula eats chocolates or watches television but not both	(A1)	
	For correct...or...	(A1)	(C2)
	For “but not both”		

(c)	If Paula watches television then she does not eat chocolates	(A1)	
	for if....then	(A1)	(C2)
	for antecedent and consequent both correct	[6]	

6.	a = F	(A1)	
	b = F	(A1)	
	c = T	(A1)	
	d = F	(A1)	
	e = T	(A1)	
	f = F	(A1)	
		[6]	