# **Scientific and Social Values MOT1442 Q2 2022/23 – Scientific Values Exam - (3 Hours) 13th December 2022 – 13:30-16:30**

**Please write your name in BLOCK CAPITALS, using the format ‘SURNAME, FORENAME.’**

**STUDENT NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**STUDENT NUMBER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructions**

* The use of course materials – printed or digital – is not allowed.
* The use of a calculator is permitted.
* Any communication with other persons during the exam time is forbidden.
* Please complete answers to the multiple-choice portion of the exam (Question 1 to Question 20) using the multiple-choice answer sheet provided.
* Write your answer (to the final 3 open questions only) by pen on the separate answer booklet provided.
* We recommend sketching answers to the final question first on the note paper provided, before transferring a clean, legible answer to your answer sheet.
* At the end of the exam, please submit this booklet, your multiple-choice answer sheet, *and* your separate answer sheet for the open questions, *together*.
* Ensure that your student name and student number are recorded on everything you submit.
* **Questions 1 to 9 are worth 2 marks per question.**
* **Questions 10 to 25 are worth 4 marks per question.**
* **Questions 26, 27, and 28 are worth 6 marks per question.**
* There are **13 pages** in this booklet, with **28 questions** in total. Please notify an invigilator if any pages are missing.

**MOT1442 Exam Questions**

**True or false questions (2 marks each)**

**For the following true or false questions (Questions 1-9), please mark A for true, and B for false, of the four options available (A, B, C, and D) in the multiple-choice answer sheet provided.**

**Question 1.**

Consider the following statement:

1. ‘If an argument is deductively valid, we can be sure that the conclusion of that argument is true’

Is this statement true, or false?

1. True
2. False

**Question 2.**

Consider the following argument:

P1. If it’s raining, then it’s cloudy

P2. It’s raining

P3. It’s cloudy

This argument is deductively valid. True or false?

1. True
2. False

**Question 3.**

Consider the following argument:

P1. I’m not cold, if and only if I’m warm

P2. I’m not warm

C. I’m cold

This argument is deductively valid. True or false?

1. True
2. False

**Question 4.**

Consider the following argument:

P1. It is raining

C. It is raining

This argument is deductively valid. True or false?

1. True
2. False

**Question 5.**

Consider the following argument:

P1. If the ball is red, then the ball is round

P2. If the ball is round, then the ball is not red

P3. The ball is red

C. The ball is red, and the ball is not red

This argument is deductively valid. True or false?

1. True
2. False

**Question 6.**

Consider the following argument:

P1. It’s 38 degrees Celsius if and only if it’s 38 degrees Fahrenheit

P2. It’s 38 degrees Celsius

C. It’s 38 degrees Fahrenheit.

This argument is deductively valid. True or false?

1. True
2. False

**Question 7.**

P1. If the earth is flat, then it is not spherical

P2. The earth is not flat

C. The earth is spherical

This argument is deductively valid. True or false?

1. True
2. False

**Question 8.**

P1. If the earth is flat, then it is not spherical

P2. The earth is spherical

C. The earth is not flat

This argument is deductively valid. True or false?

1. True
2. False

**Question 9.**

Consider the following argument:

P1. If the moon is made of cheese, then today is not Friday

P2. The moon is not made of cheese

P3. Today is not Friday

This argument is deductively valid ***and***it is sound. True or false?

1. True
2. False

**Multiple Choice Questions (4 marks each)**

**Question 10.**

Consider the following statements:

1. ‘Scientists must provide good evidence for the claims that they make.’
2. ‘Photorealism is a style of art that was first popularised in the US in the 1960s and 70s.’

Is it the case that:

1. Both statements are normative
2. Statement (1) is normative, and statement (2) is descriptive
3. Statement (1) is descriptive, and statement (2) is normative
4. Both statements are descriptive

**Question 11.**

Consider the following statements:

1. If the premises of a deductive argument are true, we can be certain that the conclusion of that argument is also true.
2. If the premises of an inductive argument are valid, then there is a greater than 50% chance that the conclusion is true.

Are statements (a) and (b):

1. Both true
2. Both false
3. (a) is false, (b) is true
4. (a) is true, (b) is false

**Question 12.**

Consider the following argument:

P1. There are 10,000 tickets available for a lottery.

P2. One of those tickets will win the jackpot.

P3. If I buy a single ticket, I’ll have a 1/10,000 chance of winning the jackpot

P4. I buy a single ticket for the lottery

C. I have a 1/10,000 chance of winning the jackpot

This argument is:

1. Deductively valid
2. Deductively invalid
3. Inductively valid
4. Inductively invalid

**Question 13.**

P Q Q → P

1 1 1

1 0 0

0 1 1

0 0 1

In this truth table there is/are:

1. No errors
2. 1 error
3. 2 errors
4. 3 errors

**Question 14.**

Consider the following truth table.

P Q Q ∨ ¬P

1 1 (a) \_

1 0 (b) \_

0 1 (c) \_

0 0 (d) \_

The missing spaces, (a), (b), (c), and (d) should be filled by the following values, respectively:

1. 0, 1, 1, 1
2. 1, 0, 1, 1
3. 1, 1, 0, 1
4. 1, 1, 1, 0

**Question 15.**

Consider the following truth table:

P Q (P ∨ ¬Q) ↔ ¬P

1 1 (1) \_

1 0 (2) \_

0 1 (3) \_

0 0 (4) \_

The missing spaces, (1), (2), (3), and (4), should be filled by the following values, respectively:

1. 1, 0, 0, 0
2. 0, 1, 0, 0
3. 0, 0, 1, 0
4. 0, 0, 0, 1

**Question 16.**

Which of the following sentences in propositional logic is the best translation of the following English sentences:

“It’s sunny and it’s raining. If it’s sunny and it’s raining, then you can see a rainbow”

1. (S ∧ R) ∧ ((S ∧ R) → B)
2. (S ∨ R) → B
3. (S ∧ R) → B
4. (S ∧ R) → (S ∧ R ∧ B)

**Question 17.**

Which of the following statements is falsifiable?

1. At least one raven is white
2. All ravens are black
3. Both are falsifiable.
4. Neither are falsifiable.
5. Statement (1) is falsifiable, while statement (2) is *not* falsifiable.
6. Statement (1) is *not* falsifiable, while statement (2) is falsifiable.

**Question 18.**

Which of the following statements is falsifiable?

1. Given enough time, through evolution, intelligence will eventually occur on any planet with suitable conditions for life
2. There are no such things as ghosts
3. Both are falsifiable
4. Neither are falsifiable
5. Statement (1) is falsifiable, while statement (2) is *not* falsifiable
6. Statement (1) is *not* falsifiable, while statement (2) is falsifiable

**Question 19.**

Consider the following decision matrix. Note: this matrix will be used in the following four questions (Q. 19, Q. 20, Q. 21, and Q. 22).

|  |  |  |  |
| --- | --- | --- | --- |
|  | S1 | S2 | S3 |
| A1 | 3 | 8 | 5 |
| A2 | 4 | 7 | 9 |
| A3 | 10 | 1 | 11 |
| A4 | 2 | 6 | 12 |

What would the decision rule ‘maximax’ say to do, in this scenario?

1. Action A1
2. Action A2
3. Action A3
4. Action A4

**Question 20.**

What would the decision rule ‘maximin’ say to do, in this scenario?

1. Action A1
2. Action A2
3. Action A3
4. Action A4

**Question 21.**

What would the decision rule ‘minimax regret’ say to do, in this scenario?

1. Action A1
2. Action A2
3. Action A3
4. Action A4

**Question 22.**

Suppose the following probabilities apply: S1 has a probability of 0.1, S2 has a probability of 0.8, and S3 has a probability of 0.1. Given these probabilities, what would the decision rule ‘maximise expected utility’ say to do, in this scenario?

1. Action A1
2. Action A2
3. Action A3
4. Action A4

**Question 23.**

Which type of game best fits as a description of the following game?

Two participants in a game, A and B, will both suffer severely if they do not cooperate. If either one cooperates and the other doesn’t, then the non-cooperant enjoys a minor benefit, and the cooperant suffers a minor drawback (relative to the severe consequence of non-cooperation). If both cooperate, both cooperants suffer a minor drawback (again, minor relative to the severe consequence of non-cooperation).

1. A stag hunt
2. A prisoner’s dilemma
3. A chicken game
4. None of the above

**Question 24.**

Where are the pure Nash Equilibria in the following game:

|  |  |  |
| --- | --- | --- |
|  | Q1 | Q2 |
| P1 | 2,3 | 4,5 |
| P2 | 6,7 | 1,8 |

1. P1, Q2
2. P2, Q1
3. P2, Q1, and P2, Q1
4. There are no pure Nash Equilibria.

**Question 25.**

How many pure Nash Equilibria are in the following game:

|  |  |  |  |
| --- | --- | --- | --- |
|  | R1 | R2 | R3 |
| P1 | 2,3 | 4,4 | 1,3 |
| P2 | 2,5 | 3,5 | 2,6 |
| P3 | 3,4 | 3,3 | 1,3 |

1. There is 1 pure Nash Equilibrium in this game
2. There are 2 pure Nash Equilibria in this game
3. There are 3 pure Nash Equilibria in this game
4. There are no pure Nash Equilibria in this game.

**Open Questions (6 marks each)**

**Question 26.**

Construct a truth table for the following sentence: (A ∧ B) ↔ ¬((A → B) → C)

**Question 27.**

Construct a truth table for the following *argument,* and, using that truth table, demonstrate whether that argument is valid or not:

P1. A → B

P2. ¬B

C. ¬A

**Question 28.**

‘Science doesn’t teach us the way the world is, but rather, teaches us the way the world *isn’t*.’

Using the concept of *falsificationism,* in *no more than* *300 words*, explain why you agree or disagree with this statement.

Ensure in your answer that you: (1) give an accurate definition of the concept, and (2) provide a brief argument for your conclusion.

Do not worry if you are below this word count; answers of a word count of more than 100 words canbe entirely sufficient.

Please note: we are not assessing the quality of your English writing. The quality of your writing only matters to the extent that your argument is properly conveyed.