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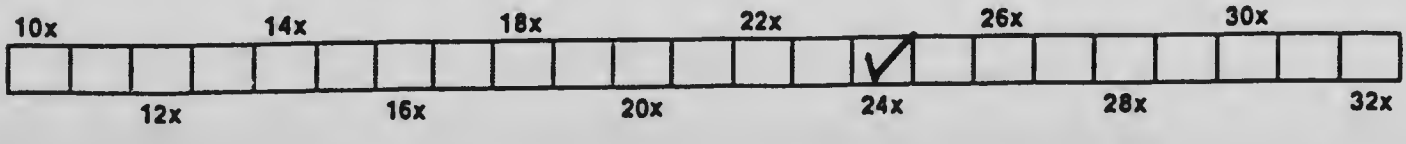

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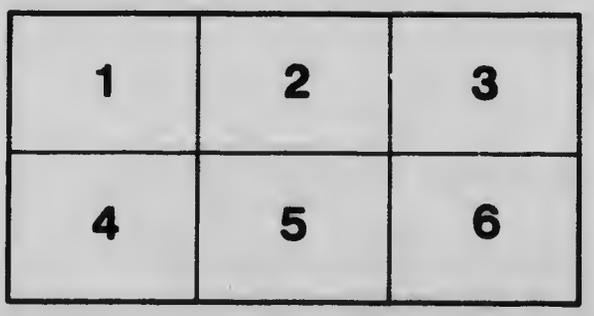

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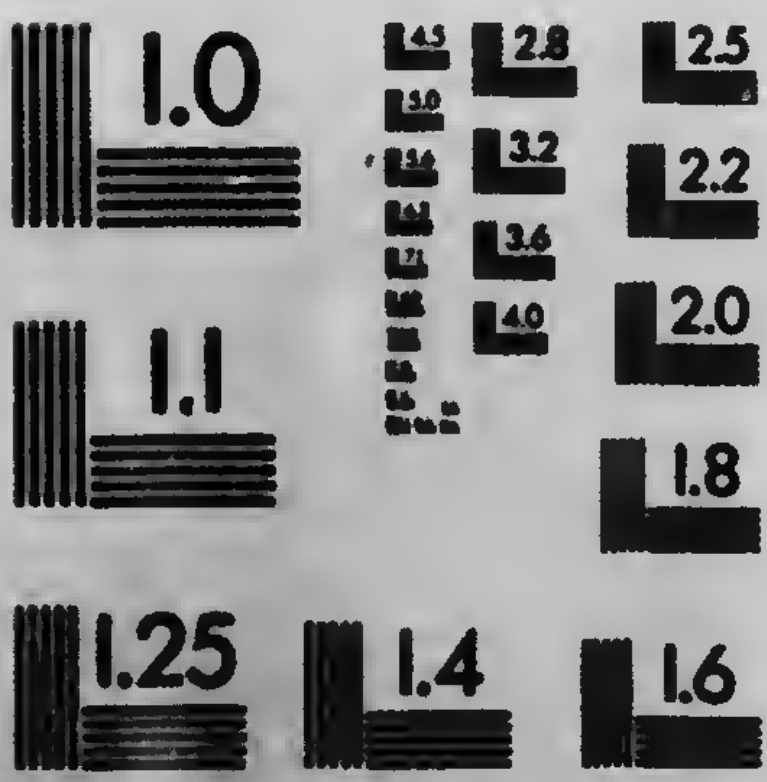

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Plato's
Logic
Intro.

A SYLLABUS OF LOGIC

WITH QUESTIONS AND EXERCISES FOR THE USE OF STUDENTS

BY

F. TRACY, B.A., Ph.D.

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A SYLLABUS OF LOGIC.

CHAPTER 1.

Nature and Scope of Logic.

1. Logic as Science. Science is systematised knowledge concerning some form of reality. Logic has to do with Judgment and Belief. These are a part of "Reality," if we use that word in its widest sense. Hence Logic is Science.

2. Logic as Mental Science. If we arrange the sciences into two great groups, *physical and mental*, according as they deal with reality in the form of material things, or in that of psychic events, Logic, as dealing with thought, will find its place in the classification as *mental science*.

3. Logic, as related to Psychology. Though a mental science, Logic differs from Psychology.

(*a*) in *scope*. (Psychology deals with all mental states, Logic only with discursive thought).

(*b*) in *purpose*. (Psychology deals with thought merely as psychic fact; Logic examines into its validity).

4. The question of validity arises only when something is believed concerning reality. Hence

5. Logic defined. Logic investigates in a general and formal way, the grounds of belief concerning reality and the validity of judgment. (Discussion of this definition, showing meaning of "Reality" and other terms used, and bringing out the relation of Logic to thoughts, words and things).

6. Logic as Philosophy. Logic, then, is regulative in regard to all thinking that involves belief and judgment touching any form of reality; and this fact determines its relation to all other sciences. Logic is science, and yet more than science. It is the Philosophy of Knowledge.

7. Other definitions examined. *E.g.*:—Science of Reasoning, Science and Art of Reasoning, Science of Thought, Science of the Operations of the Understanding in the pursuit of Truth, Science of Inference, etc.

8. See Questions and Exercises 1-11.

CHAPTER II.

History of Logic.

The student who wishes to acquaint himself with the History of Logic is advised to consult the following works:

Adamson: "Logic" in Encyclopedia Britannica.
Creighton: Introductory Logic (Cap. 2).
Hamilton: Lectures on Logic.
Harms: Geschichte der Logik.
Prantl: Geschichte der Logik.
Ueberweg: System der Logik.

CHAPTER III.

Deduction and Induction.

1. These are not different Logics, nor are they actually separable in discursive thought. All Logic deals with Belief or Judgment, based upon certain data.

2. If the conclusion is based upon an accepted principle or law, the reasoning is deductive; if upon observed facts, it is inductive.

3. Hence the distinction between Formal and Inductive Logic is invalid. All Logic is equally formal, inquiring into the formal validity of judgments. On the other hand, no Logic is *merely* formal, but stands in the closest relation to the real, since it is regulative regarding our Judgments and Beliefs, and these always have direct reference to reality in some of its forms.

4. See Questions and Exercises 12-13.

CHAPTER IV.

First Principles of Logic.

1. These are the fundamental, regulative principles of thought. They neither require, or are capable of, proof in the ordinary sense of the word; but upon their acceptance all proof depends. Since

Thought and Being are in essential correlation, these principles are as truly the principles of being as of thought.

2. Principle absolutely fundamental to all coherent thought:

Consistency { Identity. / Contradiction. / Excluded Middle.

3. Principles governing all inference about the real, whether Deductive or Inductive:

Sufficient Reason (referring more specially to the relation of judgments to one another).

Causation (referring more specially to our beliefs about the real).

4. The Dictum de Omni et Nullo. This is really a corollary from the Principle of Identity, and applies to deductive reasoning from one special point of view, viz., that of genus and species.

5. The Uniformity of Nature. As the Principle of Consistency formulates the demand of reason that all valid thought *about* reality shall avoid contradiction, so the Principle of the Uniformity of Nature formulates the demand of reason that reality itself shall be a self-consistent, intelligible system, a true unity.

6. Of all these principles it may be said, that while they dominate all valid thinking from the outset, they come into explicit recognition only upon somewhat mature reflection.

7. See Questions and Exercises 14-17.

CHAPTER V.

Analysis of the Deductive Syllogism.

1. Ordinarily our reasonings are expressed in a more or less elliptical form. In other words, the "grounds of our beliefs" are not fully stated, but are partially understood. Ordinary reasoning is usually in the form of the Enthymeme.

E.g., Some fruits are not suitable for export, because they decay rapidly. Kings, being men, are fallible. All is not gold that glitters; brass glitters. Cogito, ergo sum.

The logician must take account of every part of the argument, and all that is involved in it. The above arguments, and others like them, should be completed and carefully analyzed, so as to answer the following questions: What is it that is believed on the strength of something else? In other words, find conclusion and premises. Examine the relation of these to one another. What is the nature

of this conclusion, and of these premises, as acts of thought? (judgment). Of what elements is each of these judgments composed? (Bring out the character of the notion or concept, term, subject, predicate, copula, etc.). What is the unit of thought here, the concept, or the judgment? Give special attention to that term which is common to the premises; this is called the Middle term. It is of the greatest importance in deductive reasoning.

2. See Questions and Exercises 18-20.

CHAPTER VI.

The Concept and the Term.

1. The Concept or Notion and its Kinds: (*a*) The Individual Concept; (*b*) The General Notion; (*c*) The Abstract Idea.

2. Discussion of the relation of the Notion to reality. Realism, Nominalism, Conceptualism.

3. The Concept and the process of its development. The Concept is developed, from a vague whole to a definite whole, by the double process of analysis and synthesis; by the discovery of characters involved in the whole, and by the clear recognition of each of these characters in its relation to the others, and to the whole of which it forms a part. The concept develops, therefore, by a series of acts of judgment.

4. Conception, Judgment and Reasoning; their true relation, and essential unity in the process of thought.

5. Terms and their kinds. A Term is the expression in language of a concept or notion. To express a concept may require one word or many. Hence terms may be single-worded, or many-worded. Terms are also:

(*a*) Singular, General or Collective.
(*b*) Concrete or Abstract.
(*c*) Positive or Negative.
(*d*) Relative or Non-Relative.

6. Denotation and Connotation of Terms, or Extension and Intension of Notions. Denotation means the range of the application of the term or name, to objects. Connotation signifies the quality or qualities, the possession of which entitles a thing to be called by the name.

7. The Predicables. Division, Classification, Definition.

8. Predication may be made of a subject with respect to its Genus, the Species to which it belongs under that genus, the Difference or distinguishing quality that marks off that species from other

species of the same genus, the Property or quality which, though not a part of the connotation, is nevertheless essentially connected therewith, and the Accident, or quality that is not in any way fundamental or constant. These are the Predicables.

9. Division is the process of distinguishing the species of which a genus is composed. The rules of Division are:

(*a*) Each act of division must have only one basis.

(*b*) The constituent species, taken together, must be co-extensive in denotation with the genus.

(*c*) If the Division be a continued one, then each step must be, so far as possible, a proximate one.

10. Dichotomy and other forms of Division.

11. Classification (of things). Its rules:

(*a*) It should be adapted to the purpose in view. Artificial *vs.* Natural Classification.

(*b*) The classes should differ from each other by as many characters as possible.

(*c*) The more important characters should be made the differentiæ of the higher groups or classes.

(*d*) The classes should be so arranged that those which have the closest affinities shall stand nearest to one another.

12. Definition is the explicit statement of the connotation of a term. It distinguishes the species from all other species. It gives the genus to which the species belongs, and the difference that marks the species as such.

13. Rules of Logical Definition:

(*a*) State the true connotation, or essential attributes, of the thing defined.

(*b*) Do not employ the term you are defining, nor its synonym, in your definition.

(*c*) See that the definition covers the whole denotation of the species defined.

(*d*) Avoid obscure, figurative, or ambiguous language in your definition.

(*e*) Couch your definition in positive, rather than negative terms, so far as possible.

14. See Questions and Exercises 21-31.

CHAPTER VII.

The Judgment and the Proposition.

1. Judgment is of fundamental importance in Logic. The concept is the product of a judgment or series of judgments. The

syllogism is the judgment accompanied by its grounds. These grounds are also judgments.

2. Judgment is the mental act of apprehending relations in the real. Proposition is the expression, in language, of a judgment.

3. Kinds of Judgment:

As to Substance,
- Categorical
  - Analytic.
  - Synthetic.
- Conditional
  - Hypothetical.
  - Disjunctive.

As to Quality,
- Affirmative.
- Negative.

As to Quantity,
- Universal
  - General.
  - Singular.
- Particular.

4. Subject, Predicate, Copula, their nature and relations.

5. Four kinds of Categorical Judgments:—
A Universal Affirmative: All x is y or $x > y$.
E Universal Negative: No x is y or $x \times y$.
I Particular Affirmative: Some x is y or $x - y$.
O Particular Negative: Some x is not y or $x < y$.

6. Distribution. A term in a judgment is distributed when the entire denotation of the term is included in the assertion made in the judgment. Consider the distribution of the terms in the type judgments given above.

7. Opposition or compatibility of judgments. Take a judgment (*e. g.*, Men are fallible), write it out in each of the four type forms, and consider how the truth of each one of these forms, taken separately, would affect that of each of the others. A and E are Contraries; A and O are Contradictories, as also are E and I; A and I are Subalternans and Subalternate respectively, as are also E and O; I and O are Sub-contraries.

8. See Questions and Exercises 32-49.

CHAPTER VIII.

Inference and the Syllogism.

1. Nature of Inference explained and illustrated fully. In its essence it consists in believing something, on the strength of something else, already believed.

2. Inference is of two sorts: Immediate and Mediate.

3. Immediate inference consists in passing from *one* premise to a conclusion.

(*a*) Subalternation

from $x > y$ to $x - y$;
from $x \times y$ to $x < y$.

(*b*) Obversion

from $x > y$ to $x \times \bar{y}$;
from $x \times y$ to $x > \bar{y}$;
from $x - y$ to $x < \bar{y}$;
from $x < y$ to $x - \bar{y}$.

(*c*) Conversion

Simple

from $x \times y$ to $y \times x$;
from $x - y$ to $y - x$.

Per Accidens

from $x > y$ to $y - x$.

(*d*) Contraposition (not really a separate form of Immediate Inference, but a combination of Obversion and Conversion)

from $x > y$ to $x \times \bar{y}$, then to $\bar{y} \times x$;
from $x \times y$ to $x > \bar{y}$, then to $\bar{y} - x$;
from $x < y$ to $x - \bar{y}$, then to $\bar{y} - x$.

(*e*) Qualification

from x is y to mx is my.

(*f*) Complex Conception

from x is y to (m of x) is (m of y).

4. Mediate Inference or Syllogism. Here the conclusion is drawn from *two* premises, not from *one*. Note the importance of the Middle Term, and the part it plays in the syllogism. Observe the relation of the syllogism to the principles of Identity, Contradiction, etc.

5. Syllogism, its Parts. The syllogism is made up of propositions, viz: Major Premise, Minor Premise and Conclusion. Each proposition, on analysis, reveals two terms (Subject and Predicate) and a Copula. The cogency of the reasoning depends upon the fact that each term occurs twice; so that the relation, asserted in the conclusion, between the major and the minor term, arises out of the relation between each of these and the middle term, which occurs in both premises but not in the conclusion.

6. Syllogism, its Axioms or Canons.

(*a*) Two terms which agree with one and the same third term, agree with each other.

(*b*) Two terms, one of which agrees while the other does not agree, with one and the same third term, do not agree with each other.

(*c*) Two terms, both disagreeing with one and the same third term, may or may not agree with each other.

7. Syllogism, its Rules.

(1) It must have three and only three terms.

(2) It must have three and only three propositions.

(3) The middle term must be distributed once at least.

(4) No term may be distributed in the conclusion unless it has already been distributed in a premise.

(5) From two negative premises no conclusion can be drawn.

(6) If one premise be negative the conclusion must be negative, and conversely, to prove a negative conclusion, one of the premises must be negative.

(7) From two particular premises no conclusion can be drawn.

(8) If one premise be particular, the conclusion must be particular.

8. Syllogism, its Moods or Modes.

The Mood of a syllogism depends on the special combination of the propositions of which it is made up. The major premise may be of any one of the type forms, A, E, I, O; similarly with minor premise and conclusion. This gives 64 possible combinations or Moods. Upon examination 53 of these will be found to violate one or more of the rules of the syllogism (see par. 7 above), leaving only 11 valid Moods.

9. Syllogism, its Figures.

Each mood may be arranged in four different ways, according to the relative positions of the terms in its premises. *E.g.* Taking the Mood AAA we may have

1st Fig.		*2nd Fig.*		*3rd Fig.*		*4th Fig.*
$y > x$		$x > y$		$y > x$		$x > y$
$z > y$	or	$z > y$	or	$y > z$	or	$y > z$
$z > x$		$z > x$		$z > x$		$z > x$

As each mood may be written in all four of these figures, there are 44 possible syllogistic forms. But, as before, the majority of these violate some rules of the syllogism, and are therefore invalid.

10. Reduction of the syllogistic figures.

Any argument in the second, third, or fourth figure may be reduced to the first figure by the application of certain processes of immediate inference to its propositions. Thus, to reduce EAE of the second figure, to the first figure, convert its major premise simply:

2nd Fig.		*1st Fig.*
x × y z > y z × x	becomes	y × x z > y z × x.

11. See Questions and Exercises 50-68.

CHAPTER IX.

Irregular and Compound Syllogisms.

1. Enthymeme is an incompletely stated syllogism.

(*a*) Major premise omitted. *E.g.* Socrates was a Greek, and therefore a learned man (1st order).

(*b*) Minor premise omitted. *E.g.* All Greeks were learned and therefore Socrates was learned (2nd order).

(*c*) Conclusion omitted. *E.g.* The Greeks were learned, and Socrates was a Greek (3rd order).

(*d*) Minor and conclusion omitted. *E.g.* People who live in glass houses shouldn't throw stones.

2. Prosyllogism is an argument whose conclusion provides a premise for another argument. Episyllogism is an argument, one of whose premises is the conclusion of a preceding syllogism.

3. Sorites, or chains of reasoning. Two sorts:

(*a*) a > b
b > c
c > d
d > e .... ∴ a > e.

Supply the missing judgments, and this Sorites will be found to consist of several syllogisms in the ~~fourth~~ figure.

Rules:

(1) No premise, save the first, may be particular.

(2) No premise, save the last, may be negative.

(*b*) b > a
c > b
d > c
e > d ..... ∴ e > a.

Supply the missing judgments, and this Sorites will be found to consist of several syllogisms in the first figure.

Rules:

(1) No premise, save the first, may be negative.

(2) No premise, save the last, may be particular.

CHAPTER X.

The Conditional Syllogism.

1. Hypothetical. In this the major premise is a hypothetical judgment, and the minor and conclusion are categorical judgments.

(*a*) If the minor is affirmative, the conclusion is affirmative (see rule 6 of the syllogism), and the syllogism is then called a Constructive Hypothetical syllogism.

E.g. If A is B, then C is D.
But A is B,
∴ C is D.

(*b*) If the minor is negative, the conclusion is negative (*ib.*) and the syllogism is then called a Destructive Hypothetical syllogism.

E.g. If A is B, then C is D.
But C is not D,
∴ A is not B.

Rule: The minor premise must either affirm the antecedent of the major, or deny the consequent, never vice versa.

2. Disjunctive. In this the major premise is a disjunctive judgment, while the minor and conclusion are categorical.

(*a*) Modus Ponendo Tollens, which by affirming, denies. *E.g.*
Either A is B, or C is D.
But A is B,
∴ C is not D.

(*b*) Modus Tollendo Ponens, which by denying, affirms. *E.g.*
Either A is B, or C is D.
But A is not B,
∴ C is D.

3. Dilemma. In this the major premise is a double hypothetical judgment, the minor is a disjunctive judgment, and the conclusion is either categorical or disjunctive.

(*a*) Simple Constructive Dilemma:
If A is B, C is D, and if E is F, C is D.
But either A is B, or E is F,
∴ C is D.

(*b*) Complex Constructive Dilemma:
If A is B, C is D, and if E is F, G is H.
But either A is B, or E is F,
∴ Either C is D, or G is H.

(*c*) Complex Destructive Dilemma:
If A is B, C is D, and if E is F, G is H.
But either C is not D, or G is not H,
∴ either A is not B, or E is not F.

4. See Questions and Exercises 69-73.

CHAPTER XI.

The Inductive Syllogism.

1. Induction is the scientific account of the true way in which reason must proceed in its endeavors to understand or explain a given fact, by bringing it under some general law, or by connecting it with some other fact or facts in a regular and intelligible way.

2. Special axiom of science: Nature is uniform; *i.e.*, orderly and regular in her behavior.

3. The principal form which this uniformity takes, the form to which most others may be reduced, is expressed in the Law of Causation.

4. Full explanation of what constitutes a cause. Different sorts of causes and effects.

5. The Inductive Methods. Full discussion of these, as the forms of the mind's procedure in its search for causes.

6. Method of Agreement. If, in a complex event, fact, or series of events or facts, abcdefghjklmpst, there are elements a and k, which not only are found together in the total, but whose juxtaposition persists throughout changes in the context, the *possibility* of their causal connection passes over into *probability*, and this into practical working *certainty*, according to the nature and degree of that persistence.

7. Method of Difference. If, in a complex event, fact, or series of events or facts, abcdefghjklmpst, there are elements, a and k, and it is found impossible to remove the one without removing the other (or to introduce the one without introducing the other), reason is constrained to ascribe some causal relationship to these two elements or facts.

Here we have really eight cases, as follows:

(1) Where a is removed and k disappears;

(2) Where a is removed and k appears (in this case we have causal repugnance, instead of causal connection. Or, the causal connection is negative, rather than positive. So also in cases 4, 6, and 8, below).

(3) Where a is introduced and k appears.

(4) Where a is introduced and k disappears.

(5) Where k is removed and a disappears.

(6) Where k is removed and a appears.

(7) Where k is introduced and a appears.

(8) Where k is introduced and a disappears.

8. Method of Residues. If, in a complex event or fact, or series of events or facts, certain elements are found to be antecedents, and certain other elements found to be consequents, and if certain of these antecedents are shown to be causally connected with certain of these consequents, in either of the ways already explained, then the remaining antecedents must be causally related to the remaining consequents.

9. Method of Concomitant Variations. If, in a complex event or fact, or series of events or facts, abcdefghklmpst, there are elements a and k, so related that changes in the one are regularly accompanied by changes in the other, reason is constrained to ascribe some causal connection to these two elements or facts.

10. Joint Method. If, in a complex event or fact, or series of events or facts, abcdefghjklmpst, there are elements a and k, whose juxtaposition persists, not only in the positive but also in the negative sense (so that not only is the *presence* of the one accompanied by that of the other, but the *absence* of the one is accompanied by that of the other, throughout a changing context) the conviction of their causal connection is by so much strengthened.

11. Weaknesses of the Method of Agreement:

(*a*) It assumes causal relation between a and k on account of their constant association. But this constant association *may* be due, in some instances, to the presence of an unsuspected phenomenon x, which may be the cause of both a and k.

(*b*) It assumes that the cause of a phenomenon must be in every case the same. This assumption is unwarranted. There is such a thing as a Plurality of Causes.

Both these weaknesses may be largely overcome, in applying the method, by further multiplication and variation of instances.

12. Caution regarding all the methods. Great care must be taken to make our observation of the phenomena under investigation accurate and complete, so as to be certain that we have, in the phenomena before us, only those elements and facts which we suppose ourselves to have there. There is no short and easy road to scientific knowledge.

13. See Questions and Exercises 74-86.

CHAPTER XII.

Subsidiary Processes, So-called.

1. The processes explained below are not really "subsidiary" at all. They enter into the methods and constitute their very essence.

2. Observation and Experiment. These processes explained fully. The complex series of facts and events, which serve as the material for the methods, are revealed as such to the observer, and more definitely understood in their relations by virtue of experiment. Observation enters into all experiment. We may *observe* the thunder storm, and *experiment* with electricity. Consider the respective advantage of observation and experiment.

3. Hypothesis. This has its source in the tendency of the human mind to leap to conclusions before the evidence is all in. Imagination outruns evidence. An hypothesis is a supposition, made on evidence which is avowedly insufficient, in order to deduce conclusions in accordance with known facts.

4. The conditions of a legitimate hypothesis are:

(*a*) It must be based upon facts.

(*b*) It must give a self-consistent account of the facts, as they are understood at the time.

(*c*) It must furnish a basis for deductive calculations.

(*d*) It must be of such a character that these conclusions which we deduce from it, harmonize with known facts.

5. Consider when, and under what conditions an hypothesis becomes established, and passes over into a law.

6. See Questions and Exercises 87-90.

CHAPTER XIII.

Imperfect Inductions.

1. Induction by Simple Enumeration. Here the number of instances is taken as the ground of conclusion. This process has a certain amount of validity

(*a*) If a relatively large number of instances are known to us.

(*b*) If there is a strong probability that we should know of the negative instances, did any such exist.

2. The Argument from Analogy. Here we argue that because things resemble one another in a certain number of qualities, they will resemble one another in other qualities. The argument is based on the number of points of resemblance between things.

3. Conditions of the validity of the argument from analogy:

(*a*) The inferred property must not be known to be causally connected with any of the observed properties. Otherwise the argument is more than a mere analogy.

(*b*) The inferred property must not be known to be entirely unconnected with the observed properties.

(*c*) The observed properties must not be known to be causally connected with one another.

(*d*) We must be acquainted with a relatively large proportion of the properties of the two objects.

4. See Questions and Exercises 91-93.

CHAPTER XIV.

Fallacy.

1. Beliefs are sometimes entertained, conclusions reached, judgments expressed, on insufficient grounds. Logic investigates, in a general way, the whole subject of the grounds of belief or the validity of judgment. This subject may be treated negatively (by exposing the chief forms of fallacious reasoning) as well as positively. Such negative treatment is a doctrine of fallacy.

2. Whenever we think about the real we are liable to err. Hence fallacy is possible in all forms of our thought. We may err in the so-called subsidiary processes, or in the process of inference itself. We may err in the construction of our concepts, since the concept is produced by acts of judgment, and is supposed to represent the real. In so far as it fails to represent the real, it is fallacious. We may err in observing, in defining, in dividing, in classifying, in framing hypotheses, in concluding from analogies, as well as in the processes of inference proper.

3. Fallacies of Observation:

(*a*) Non-observation. We may overlook some fact or some material circumstance.

(*b*) Mal-observation. We may suppose ourselves to be actually observing, when we are in reality inferring.

4. Fallacies of Definition, etc. A circulus in definiendo, a cross division, an artificial classification, etc., are logical fallacies.

5. Fallacy in Hypothesis. Constructing an hypothesis regardless of the facts (gratuitous hypothesis) or some essential facts; an hypothesis which overlooks, ignores, or defies, an established fact, is a logical fallacy.

6. Fallacy in the argument from Analogy. Drawing hasty conclusions regarding resemblances of things, on too slender analogies, or overlooking the causal connection or repugnance of the observed properties, is a logical fallacy.

7. Fallacy in the Induction by Simple Enumeration. Here the error may consist either in overestimating the value of the number

of facts observed, as a proof of a law, in any particular case, or in overestimating, as Mill did, the value of the Inductio per enumerationem simplicem, as a ground of belief in general.

8. Fallacies of Immediate Inference:

(*a*) In Subalternation. Concluding that because the particular is true, the corresponding universal is true. Concluding from the proposition I to the proposition A, or from O to E, with the same subject and predicate.

(*b*) ~~Inversion~~ In Obversion.

(*c*) In Conversion. *E. g.*, Applying the process of Simple Conversion to the proposition A, which should only be converted Per Accidens.

9. Fallacies of Mediate Inference, or Syllogism. Error may occur either in Deductive or in Inductive reasoning.

10. Fallacies in Deductive reasoning.

(*a*) The fallacy of Four Terms.

(*b*) The fallacy of Undistributed Middle.

(*c*) The fallacy of Illicit Process of Major or Minor Term.

(*d*) The fallacy of Negative Premises.

(*e*) The fallacy of Particular Premises.

(*f*) The fallacy of a Universal conclusion from a Particular premise.

11. Fallacies in Inductive reasoning.

(*a*) Mistaking a joint cause for the sole cause.

(*b*) Mistaking joint effects for cause and effect.

(*c*) Mistaking remote cause for proximate cause or vice versa.

(*d*) Overlooking cases where cause and effect are mutually convertible.

(*e*) Mistaking cause for effect, or vice versa.

(*f*) Mistaking a mere consequent for an effect, a mere antecedent for a cause. (Post hoc ergo propter hoc).

12. The following fallacies, described in all text-books of Logic consist of some confusion in the application of a term, or in the apprehension of the relation of judgments to one another. Hence the majority of them will be found to belong to some of the forms of fallacy already explained. Many of them arise through a loose and ambiguous use of names, and are therefore, strictly speaking, fallacies of Four Terms.

(*a*) Equivocation. The same term used in different senses in the same argument.

(*b*) Amphibology. An ambiguous grammatical structure.

(*c*) Composition and Division. Passing from a distributive to a collective use of a general term, or vice versa.

(*d*) Accent. Ambiguity arising from shifting emphasis in a proposition.

(*e*) Figure of Speech. Confusion between literal and figurative meanings of terms.

(*f*) Accident. Arguing from a general rule to a special case, or vice versa.

(*g*) Irrelevant Conclusion (Ignoratio Elenchi). An argument not to the point. The arguments *ad hominem*, *ad populum* and *ad ignorantiam*, come under this head.

(*h*) Petitio Principii (also called Begging the question, or *Circulus in probando.*) That which is to be proved is assumed in some way in the premises.

(*i*) Fallacy of the Consequent (*non-sequitur.*) An argument so verbose or so loosely put together as to have no such force as is claimed for it.

(*j*) Many Questions. The asking of several questions in such a way as to appear to be asking only one.

13. See Questions and Exercises 94-100.

Questions and Exercises.

The following questions and exercises, collected from a variety of sources, are numbered consecutively for convenience of reference. The sources are usually indicated, in the case of books, by the name of the author; in the case of examination papers of the University of Toronto, simply by the date of the paper from which the question is taken; in the case of examination papers of other Universities, by the name of the University.

1. What is Logic? How is it related to other sciences, especially to Psychology? (1899).

2. Explain the nature of those mental operations with which Logic is especially concerned, and show clearly the way in which it is concerned with them. (1902).

3. In defining the nature and scope of Logic, in what way, if at all, would you employ such words as *Thought*, *Reasoning*, *Belief*, *Judgment?*

4. What is meant by a *Law* in Logic? Compare the use of the term in Ethics and in Civil Polity. (1900).

5. Discuss fully the relation of Logic to Judgment, Belief, and Reality. What is the bearing of the Principle of Identity on all these? (1899).

6. Is Logic a *formal* science?

7. "Both Logic and Psychology are *mental sciences;* they differ in

their *scope* and *purpose*." Explain this statement, with special reference to the scope and purpose of Logic. (1898).

8. "Logic has to do with the grounds of belief and the validity of judgment." Explain this statement fully, showing in what way it is a true statement of the function of Logic. (1903).

9. What do you understand by *Reasoning?* Show clearly the relation of Logic to the process of reasoning. (1901).

10. "Logic is the science of Inference" (*Mill*). What is Inference? How does it differ from judgment? How is it related to belief? What are the two chief forms of inference; and how are they related to each other? (1903).

11. What relation do you consider to exist between the study of Logic and that of (1) Mathematics, (2) History? (1901).

12. Distinguish Deductive from Inductive reasoning, and show clearly their mutual relation.

13. Are Deduction and Induction two divisions of reasoning, or different ways of considering the thought process? (1897).

14. What do you understand to be the exact meaning of the principles of Identity, Contradiction, and Excluded Middle?

15. Do the laws of Identity, Contradiction, and Excluded Middle apply equally to Inductive and Deductive reasoning? (1896).

16. Various views have been held as to the real meaning of the Principle of Identity. Discuss (1900).

17. Distinguish Rationalism and Empiricism in the Theory of knowledge. (1902).

18. Explain fully the place and function of the syllogism in our reasoning processes. (1903).

19. Define "Concept," "Term," "Judgment," "Proposition," "Reasoning," "Syllogism," "Premise," "Major Term," "Middle Term," "Conclusion." (1895).

20. Complete the following arguments by supplying any unexpressed parts; write down in logical form, showing which is conclusion, which is major premise, and which is minor premise. State each term in full, and point out major, minor and middle terms. Give full explanations:

(*a*) Books, being human productions, are liable to error.

(*b*) He could not expect to avert financial disaster, for he was reckless in his investments.

(*c*) Philosophers are not omniscient, for they are mortal like the rest of us.

(*d*) Blessed are the merciful, for they shall obtain mercy.

21. Explain the nature of conception and judgment and their mutual relation. Shew the exact meaning of the principles of identity, contradicton and excluded middle, using the judgment "Snow is white" by way of illustration. (1901).

22. Distinguish between Positive and Negative names. What ambiguity is there in the use of such a name as "not-white"? (*Cambridge*).

23. Explain what is meant by the connotation of a name. Has it any connection with the etymology of the name? (*Cambridge*).

24. Distinguish the extension and the intension of terms. What is the law of the relation between extension and intension? Illustrate that law by the series: Socrates, Athenian, Greek, European, Man. (1880).

25. Illustrate Logical Definition and Division, using the concept "Government" as Summum Genus. Also with the same example, show the relation of Extension and Intension to each other, and to Definition and Division. (1895).

26. What do you understand by logical division? Show the necessity for a *fundamentum divisionis*, and classify the mental states according to some such principle. Bodies of water are classified as oceans, seas, lakes, ponds, rivers, tributaries, streams, creeks, springs, wells. Discuss, criticise and correct this division. (1897).

27. A tree consists of root, trunk, branches, and leaves.
A cannon ball is round, heavy and black.
Triangles are equilateral, isosceles, and scalene.

State the logical process involved in each of the above propositions. Explain in each the relation of the subject to the terms predicated, and the relation of these to one another. (1887).

28. Criticise the following divisions:

(*a*) Religions into true and false. (*Creighton*).

(*b*) Animals into bipeds, quadrupeds, birds, monkeys, and creeping things. (*Aikins*).

(*c*) Quadrilateral figures into squares, rectangles, parallelograms, and rhomboids. (*Fowler*).

(*d*) The fine arts into painting, drawing, sculpture, architecture, poetry and photography. (*Ib*).

(*e*) Governments into monarchies, tyrannies, oligarchies and democracies. (*Ib*).

(*f*) The sciences into physical, social, ethical, logical and metaphysical. (*Ib*).

(*g*) Actions into good, bad, and indifferent.

(*h*) The cardinal virtues into wisdom, courage, temperance, and justice.

(*i*) Mental states into feeling, volition, and cognition.

(*j*) Students into the idle, the diligent, and the athletic.

29. What is Classification? How does a natural differ from an artificial classification? (1900).

30. Give the rules for logical definition, and inquire whether any rule is violated in the following:

(*a*) Life is the sum of the vital functions.

(*b*) A straight line is a line with a direction constant in itself.

(*c*) Conscience is the internal court of justice, which has taken up its abode in every man.

(*d*) A triangle is a figure contained by three straught lines, and containing three angles.

(*e*) Parallel lines are straight lines in the same plane, which, produced infinitely, will never meet.

(*f*) Creighton's Logic, p. 352, question 6.

31. Distinguish Definition from Description.

32. "The essential characteristics of the thinking process may be discovered in its simplest and most elementary form" (Creighton). What is this simplest form of the thinking process; and what are the characteristics referred to? Explain fully (1900).

33. Discuss the principal characteristics of the judgment, its chief types or forms, and its place in the development of knowledge (1902).

34. What do you consider to be the real character of the assertion made in the Judgment, and expressed in the Proposition? Criticise other views. (1899).

35. Explain and discuss carefully the following theories of the Judgment:

(*a*) "Judgment is the comparison of two ideas."

(*b*) "Judgment is the statement of a relation between attributes."

(*c*) "Judgment is the reference of a significant idea to Reality." (*St. Andrews.*)

36. Distinguish the Categorical from the Hypothetical Judgment. Determine the number of forms of the Categorical Judgment. Show the quantity and quality of the Judgment "Triangles are three-sided figures"; and write down its contrary, contradictory, subalternate, obverse, and converse. (1900).

37. For each of the following judgments (*a*) assign quality and quantity, (*b*) write three logical opposites, (*c*) show how its truth affects that of each of these opposites, (*d*) convert, indicating the method of conversion:

(1) The quality of mercy is not strained.

(2) Not every unjust law is repealed.

(3) Several species of flowering plants are to be found in this region.

(4) Blessed are the pure in heart.

38. In the absence of any explicit statement of the quantity of a judgment, (*E.g.* "Canadians are intelligent") how would you determine the quantity?

39. Explain fully and technically the relation between the first of the following propositions and each of the others:

(*a*) All *x* is *y*.
(*b*) No *x* is *non-y*.
(*c*) No *non-y* is *x*.
(*d*) Some *y* is *x*.
(*e*) No *x* is *y*.
(*f*) Some *x* is not *y*.

40. "He that withholdeth not from the poor shall not lack." What information does this give concerning the conditions under which we may infer as to (*a*) those who lack (*b*) those who withhold from the poor (*c*) those who give to the poor (*d*) those who have a sufficiency. (1887).

41. Given a proposition of the universal affirmative form (all *m* is *s*); (*a*) show the exact relation of its terms to each other, (*b*) write out all its logical "opposites," (*c*) obvert and convert, with explanations, all the propositions thus obtained. (1902).

42. Draw as many immediate inferences as you can from the judgment: "Parallel lines do not meet"; and write down all its logical opposites. (1898).

43. All substances lighter than water, float upon it. Draw from this all the inferences you can. Give the contradictory of its converse, and the converse of its contradictory. (1887).

44. Show how to get the converse of the contrary of the contradictory of the proposition: "Some crystals are cubes." (*London*).

45. Give (1) the obverse, (2) the converse, (3) the subaltern, (4) the contrary, (5) the contradictory, (6) the contrapositive, of the proposition "all wise acts are lawful acts. (1885).

46. Give the obverse and contrapositive of "The virtuous alone are brave."

47. Give the converse, obverse and contrapositive of *all A is B*, and of *no A is B*, with explanations. (1901).

48. Give the logical opposites of the following proposition and the converse of its contradictory: "He cannot become rich who will not labor." (*Jevons*).

49. Prove by means of the contradictory propositions, that subcontrary propositions cannot both be false, and by means of the sub-

contrary propositions, that contrary propositions may both be false. (1894).

50. Show fully the nature of inference, and explain such terms as *immediate inference*, *mediate inference*, *inductive inference*, *deductive inference*. Give examples. Define logic with special reference to inference. (1901).

51. Define, analyse and illustrate the syllogistic process, so as to show the elements of which it is composed and the rules by which it is governed. (1901).

52. Construct a simple concrete syllogism in the first figure. Analyse it, showing its judgments, their quantity and quality; its terms, their distribution and their classification; explain the function and importance of the middle term; and test the validity of your syllogism by reference to the rules relating thereto. (1902).

53. What do you understand by "Syllogism," "Mood," "Figure"? Show how to determine the number and nature of the valid moods.

54. How many kinds of categorical judgments are there? Determine what pairs of such judgments will yield valid conclusions. Refer to the rules of the Syllogism. (1901).

55. "Comets must consist of heavy matter; for they obey the law of gravitation."

Arrange the above in logical order, supplying any unexpressed judgment, and showing major premise, minor premise, and conclusion; indicate the "mood" to which the argument belongs; point out the quality and quantity of each of its propositions, and write down the contradictory, obverse, and converse of each; show which is middle term, which is major, and which is minor; and explain carefully which of these terms are distributed, and which undistributed. (1901).

56. What is a Syllogism? A Mood? A Figure? Show how to determine the number of Moods and Figures. Point out any peculiarities in the different figures. What is the Mood and Figure of: "No dishonest man is deserving of confidence; AB is deserving of confidence; therefore he is not a dishonest man"? Is it valid? Reduce it, if necessary, to the First Figure. (1900).

57. Upon what principle have the terms *major*, *middle*, and *minor*, been applied to the terms of a Syllogism? How far are these names generally applicable? (*Oxford*).

58. If it be known, concerning a syllogism, that the middle term is twice distributed, what do you know concerning the conclusion? Prove your answer. (*London*).

59. Supply premises to the following conclusions:

(*a*) Some logicians are not good reasoners.

(*b*) All fixed stars obey the law of gravitation. (1889).

60. Throw the following argument into syllogistic form. Give the contradictory of the major premise, and the obverse of its contradictory: The world had a beginning. It must therefore have had a cause, for everything that begins to be must have a cause. (1891).

61. "All wise men are good; John is not wise; therefore he is not good." Examine the validity of this argument. If fallacious, explain the nature of the fallacy. (1903).

62. Test the moods EAE, AAI, EIO in each of the four figures. (1889).

63. Reduce every mood of the Second, Third and Fourth Figures, to the First Figure.

64. Throw the following arguments into syllogistic form, pointing out the fallacy where unsound:

Only elementary substances are metals. Iron is a metal, therefore iron is an elementary substance.

His imbecility of character might have been inferred from his proneness to favorites; for all weak princes have this failing.

Mind is active, accordingly matter is passive, since it is not mind.

Peel's remission of taxes was beneficial; the taxes remitted by Peel were indirect, therefore the remission of indirect taxes is beneficial.

If this medicine is valuable, those who take it will improve in health. It must, therefore, be valuable, since A. B. has taken it, and has improved in health. (1887).

65. Arrange the following in logical form; give mood and figure if valid; if invalid, give the rule or rules which are broken:

(*a*) We know that the policy was mistaken; for otherwise it would not have failed. (*Mellone*).

(*b*) The case of Shakespere proves that a man may be a great poet and yet no fool in business matters. (*St. Andrews*).

(*c*) "We know that thou art a teacher come from God, for no man can do these signs that thou doest, except God be with him."

(*d*) There are some zealous persons who seek no earthly reward; for the apostles, who certainly were zealous in their work, sought no earthly reward (adapted from Thomson).

(*e*) "I never held it my forte to be a severe reasoner, but I can see that if whatever is best is A, and B happens to be best, B must be A, however little you might have expected it beforehand. (*George Eliot*).

(*f*) No secret trial is expedient; for it invariably casts a suspicion on the integrity of the Judges. (*Lafleur*).

66. Deduce a conclusion from the following premises, and show mood and figure: "All planets are heavenly bodies, no planets are self-luminous." (*Jevons*).

67. "The European powers do not expect any practical results from the Peace Congress; for they all are busily engaged in increasing their armaments."

(*a*) Supply the missing proposition, and write out the argument in complete logical form.

(*b*) Investigate its formal validity.

(*c*) Determine its Mood and Figure, and reduce, if necessary, to the first figure.

(*d*) Write out its propositions separately, showing quantity and quality of each.

(*e*) Write down three logical opposites and two immediate inferences from each of these propositions.

(*f*) Write out all the terms involved in the argument, and show whether each is General or Singular, Concrete or Abstract, Relative or Absolute. (1899).

68. Prove the following theorems:

(*a*) In the First Figure, the major premise is Universal. (1896).

(*b*) In the Second Figure the conclusion is Negative. (1899).

(*c*) In the Third Figure the conclusion is Particular. (1899).

(*d*) In the First Figure the minor premise is Affirmative. (1898).

(*e*) In the Second Figure one premise must be Negative. (1896).

(*f*) In the Second Figure the major premise is Universal.

(*g*) In the Third Figure the minor premise is Affirmative.

(*h*) In the Fourth Figure, if the major premise be Affirmative, the minor is Universal.

(*i*) In the Fourth Figure, if the minor premise be Affirmative, the conclusion is Particular. (1898).

(*j*) In the Fourth Figure, if either premise be Negative, the major is Universal.

(*k*) A particular affirmative major premise, with a negative minor, can warrant no conclusion in any figure. (1898).

(*l*) In any figure, if O be a premise, the middle term holds a like position in both premises. (1891).

69. What are the rules of the Hypothetical Syllogism? Illustrate the fallacies arising from their violation, using this major premise: "If the doctor's orders are obeyed, the patient will recover." (1898).

70. "If he is benevolent, he will subscribe to this fund." Supply minor premise and conclusion; explaining the nature and rules of the Hypothetical Syllogism. (1902).

71. Show by examples that the fallacy of *affirming the consequent* is equivalent to the fallacy of *undistributed middle*, and that the fallacy of *denying the antecedent* is equivalent to the fallacy of *illicit process of the major term*. (1890).

72. Test the following arguments, and throw them into the categorical form:

(*a*) "I am sure he will not come, for he is not well; and if well he would come." (1882).

(*b*) If there are sharpers in the company, we ought not to gamble;
But there are no sharpers in the company;
Therefore we ought to gamble. (*Hamilton*).

73. Determine the nature, and examine the cogency of the following arguments:

(*a*) Giving advice is useless. For you either advise a man what he means to do, in which case the advice is superfluous; or you advise him what he does not mean to do, and the advice is ineffectual. (*London*).

(*b*) We must either gratify our vicious propensities or resist them; the former course will involve us in sin and misery; the latter requires self-denial; ∴ We must either fall into sin and misery or practice self-denial. (*Jevons*).

74. "The Principle of the Uniformity of Nature is the ultimate major premise of every Inductive Syllogism" (*Mill*). Explain and examine this statement. What are the chief forms which this uniformity of nature assumes? (1898).

75. What is the principal aim of Inductive investigations? Explain fully, and illustrate by reference to the "Methods" of Induction. Indicate the strength and weakness of each of the Methods; and show which of them yield demonstrative conclusions. (1898).

76. Critically discuss the following definitions of Induction:

(*a*) "It is inference from the known to the unknown."

(*b*) "It is concluding because some things have a certain property, that other things which resemble them have the same property." (1897).

(*c*) "It is the legitimate inference of the general from the particular." (1892).

(*d*) "It is the legitimate inference of the more general from the less general." (*Ib*).

(*e*) "It is concluding that because a thing has manifested a certain property at a certain time, it will manifest that property at other times." (*Mill*).

77. "All inference is from particulars to particulars." What does this statement mean? Is it true? Give reasons for your answers. (1902).

78. What do you understand by a cause? And what by the Law of Universal Causation? What is the real ground of belief in such a law? (1893).

79. What is a *Cause?* Correct any conceptions of the causal relation that seem to you inadequate. Can other Uniformities, such as Co-existence, Resemblance, etc., be reduced to Causation? Explain "Composition of Causes," "Plurality of Causes," and the bearing of the doctrine of Causation on Belief and Disbelief. (1899).

80. In what sense may it be affirmed, and in what other sense may it be denied, that "a phenomenon can have only one cause"? (*London*).

81. "The cause must be contiguous to the effect"; "The cause precede the effect"; "Cessante cause, cessat effectus." Discuss these statements. (*St. Andrews*).

82. Explain the "methods" of induction, and give your opinion as to which of these methods would be employed in reaching the conclusion that the climate of Colorado is good for consumptives. (1902).

83. Which of the Methods are employed in reaching the following general statements? (*a*) Water quenches thirst; (*b*) The mercury indicates the temperature; (*c*) Intelligence and the cerebrum develop hand in hand. (1894).

84. A new microbe is discovered which is present whenever a certain disease is present, and absent when it is absent. What other theories are logically tenable beside the theory that the microbe is the cause of the disease? (1890).

85. Show how the Inductive methods are applied:

(*a*) in the investigation of the conversion of solids into liquids, and of liquids into gases. (*Bain, altd.*).

(*b*) in establishing the first law of motion.

86. Epicurus said the soul is material, because its growth and decay are parallel with those of the body. Explain and criticise the method of reasoning here employed.

87. What are Observation and Experiment, and in what sense may they be styled "subsidiary operations"? (1903).

88. Indicate the place occupied by Observation and Experiment respectively, in scientific pursuits, and lay down rules for their employment. (1894).

89. What is an Hypothesis? Show its importance in scientific investigation, and point out the conditions of its validity as an Hypothesis. (1899).

90. Distinguish hypothesis from theory. Explain the use of hypothesis in scientific procedure. Show, by a concrete example, how far the imagination, and how far the reason, has entered into the construction of a workable hypothesis. (*London*).

91. What do you understand by the *Inductio per enumerationem simplicem?* Can it ever yield sure conclusions? (1894).

92. Explain, illustrate, and estimate the value of Analogical Reasoning. (*Glasgow*).

93. Describe the logical characters of the following inferences, and discuss their validity:

(*a*) "Sir D. Brewster proved that the colors seen upon mother-of-pearl are not caused by the nature of the substance, but by the form of the surface. He took impressions of mother-of-pearl in wax, and found that, though the substance was entirely different, the colors were exactly the same." (*Jevons*).

(*b*) "A person is in sound health mentally and physically. The breaking of a minute blood-vessel in the brain causes a clot of blood there, which is followed immediately by unconsciousness, and soon after by death. Hence the existence of mind depends on the healthy functioning of the brain." (*Mellone*).

(*c*) "There are no great nations of antiquity but have fallen by the hand of time; and England must join them to complete the analogy of the ages." (*Edinburgh*).

94. What fallacy do you find in the following?

(*a*) In classifying all books into English, French, German and scientific.

(*b*) In trusting the predictions of a weather-prophet because several of his former predictions have been correct.

(*c*) In concluding that all *C* is *A* because you have found that all *A* is *B* and that all *C* is *B*.

(*d*) In reasoning from the premises:

"If the sun comes out the room will be light,
But the room has become light,"
to the conclusion:
"The sun has come out." (1901).

95. Determine exactly what was meant by each of the Ten Commandments, and show where we might commit a fallacy of Accident or Accent in interpreting them. (*Aikins*).

96. Examine the validity of the Induction that a certain form of government (say Democracy) produces certain national characteristics (*e.g.*, self-respect). (1894).

97. Examine the validity of the following:

(*a*) "Do you eat eggs?" said the pigeon to Alice in Wonderland. "Yes," replied Alice, "all little girls eat eggs." "Then," answered the pigeon, "all little girls are serpents."

(*b*) Our neighbour has a small brain, therefore he could not be a great thinker, since great thinkers usually have large brains.

(*c*) If a strike were declared, wages would be advanced. But the employees have decided not to strike. Hence there will be no advance in wages.

(*d*) "Whom I now
Of force believe Almighty, since no less
Than such could have o'erpowered such force as ours."
(1895).

98. Test the following argument: "All studies are useful which tend to advance a man in life, or to increase national and private wealth; but the course of studies pursued at Oxford has no such tendency; therefore it is not useful. (*Whately*).

99. Test the validity of the following arguments, throwing them into syllogistic form, and naming any fallacies that occur:

(*a*) Whatever thinks exists; matter does not think; ∴ matter does not exist.

(*b*) That which thinks is active; that which is active has strength; that which has strength is a substance; the soul thinks; ∴ the soul is a substance.

(*c*) He who calls you a man speaks truly; he who calls you a fool calls you a man; ∴ he who calls you a fool speaks truly.

(*d*) No one should be punished if he is innocent; this man should not be punished; ∴ he is innocent. (1889).

100. What fallacy, if any, is to be found in the following arguments:

(*a*) It is right to help the needy; therefore it is right to give to this beggar, for he is needy.

(*b*) Whatever restricts liberty is bad; government restricts liberty; ∴ government is bad. (*Aikins*).

(*c*) Books are a source both of instruction and amusement; a table of logarithms is a book ∴ it is a source both of instruction and amusement. (*Jevons*).

(*d*) "No reason, however, can be given, why the general happiness is desirable, except that each person, so far as he believes it to be attainable, desires his own happiness. This being a fact, we have not only all the proof which the case admits of, but all which it is possible to require, that happiness is a good." (*Mill*).

(*e*) To allow every man an unbounded freedom of speech must always be, on the whole, advantageous to the state; for it is highly conducive to the interests of the community, that each individual should enjoy a liberty perfectly unlimited, of expressing his sentiments. (*Aikins*).