Rules, tips, and errors when writing examination questions

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Sources

- "Tips for Writing Tests"
  (R. Owens, V. Clegg; KSU Center for Teaching)

- *Constructing Written Test Questions for the Basic and Clinical Sciences*
  (National Board of Medical Examiners)

- Experience
  - Years of learning by doing; mistakes are great teachers
  - Proctor for ACVP Examination

Before you start writing:

- What is the purpose of the exam?
- What are the time constraints?
- What should the student/candidate be able to do?
- What emphasis should be given to each topic and level of learning?
- What types of items are best for the examination situation?

What is the purpose of the exam?

- Assist or reinforce learning
  - For self-assessment and assessing progress
- Determining grades
  - Vary difficulty (easy to hard)
  - Assess multiple levels of learning
- Assess mastery of content or skills
  - Focus on the skills, competences, or definite body of knowledge
  - Focus on required minimum

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- **What are the time constraints?**
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Slide 1

What should the student/candidate be able to do?

Bloom's Taxonomy of Educational Objectives

Cognitive domain levels

- Information, Ideas, Concepts

Knowledge | Comprehension | Application | Analysis | Synthesis | Evaluation

- **Recall Recognize**
- **Restate or reorganize**
- **Problem-solve or apply ideas**
- **Separate and examine ideas**
- **Combine ideas into something new**
- **Judge by criteria or standards**

Slide 2

Before you start writing:

- What is the purpose of the exam?
- What are the time constraints?
- What should the student/candidate be able to do?
- **What emphasis should be given to each topic and level of learning?**
  - What types of items are best for the examination situation?

Examination Committee Plan

Realistic distribution of topics
(If hematology, not 95% RBC, 3% WBC, & 2% platelets)
Level of learning (mixture of cognitive levels)

Knowledge	Comp.	Application	Analysis	Synthesis	Evaluation

Veterinary students

ACVP / ECVCP Candidates

Slide 3

Before you start writing:

- What is the purpose of the exam?
- What are the time constraints?
- What should the student/candidate be able to do?
- What emphasis should each topic and level of learning be given?
- **What types of items (questions) are best for the examination situation?**

Slide 4

What types of items (questions) are best for the examination situation?

Cognitive domain levels

- Information, Ideas, Concepts

Knowledge | Comprehension | Application | Analysis | Synthesis | Evaluation

Matching
True/False
Best Choice
Short Answer
Problem Solving
Essay

? ? ? ? ?

Slide 5

What types of items (questions) are best for the examination situation?

Cognitive domain levels

- Information, Ideas, Concepts

Knowledge | Comprehension | Application | Analysis | Synthesis | Evaluation

Matching
True/False
Best Choice
Short Answer
Problem Solving
Essay

Glass Slides
• Blood films
• Cytopreparations

Case Data
• CBC, Chem, etc

Laboratory Issues
• QA, Method principles

Slide 6

Multiple Choice:
True/False or Best Choice

- **Stem**
  - a. Response / Option
  - b. Response / Option
  - c. Response / Option
  - d. Response / Option
  - e. Response / Option

  • Answer
  • Distractors

- **True/False**
  - Stem includes "true" "false"
    "correct" "incorrect"
    "it is" "it is not"

- **Best Choice**
  - Stem includes "most likely" "best explanation"
    "most appropriate" "most consistent"

Multiple Choice: True/False or Best Choice

True/False
- An increased serum creatinine concentration is caused by:
  - (a) Decreased glomerular filtration rate.
  - b. Increased creatine kinase activity in muscle.
  - c. Increased hepatocyte production of creatinine.
  - d. Increased renal tubular resorption of creatinine.

Best Choice
- A dehydrated dog's serum creatinine concentration was 4.0 mg/dL (RI: 0.5-1.5); the specific gravity of voided urine was 1.008. The azotemia is most likely due to:
  - a. Acute muscle necrosis.
  - b. Ruptured urinary bladder.
  - c. Poor renal perfusion caused by hypovolemia.
  - d. Increased hepatocyte production of creatinine.
  - (e) Marked reduction in number of functional glomeruli.

What should the student/candidate be able to do?
Cognitive domain levels
- Information, Ideas, Concepts

Knowledge — Comprehension — Application — Analysis — Synthesis — Evaluation

True/False
Best Choice

M/C Rule #1: KISS Rule

KISS principle: Keep It Simple, Stupid
- The examination should assess the knowledge and skills of a clinical pathologist, not the ability to take an examination.

1st M/C: Which ... is correct?

2nd M/C: Which ... is incorrect?

3rd M/C: Which ... is not incorrect?

4th M/C: Which ... is correct EXCEPT?

5th M/C: The correct order of the following events is:

Tip #1: If you have multiple types of M/C questions, group & separate them.

Does this violate the KISS rule?

A dog was presented because of PU/PD of 1 month duration and recent vomiting. Laboratory results included moderate azotemia. The dog's azotemia may be due to:

1. Dehydration
2. Metabolic alkalosis
3. Chronic renal failure
4. Hepatic insufficiency
5. Hyperadrenocorticism

a. 1, 2
(b) 1, 3
c. 2, 3, 4
d. 2, 3, 5
e. 4, 5

Minor Violation

Tip #2 : If use number combinations, list numbers sequentially.
- a. 1, 2
- b. 5, 2, 3   **Not**
- c. 3, 2, 4
- d. 3, 1
- e. 4, 3, 2

Major Violations of KISS Rule

a.	1, 2	a.	1, 2, 3	a.	1
b.	1, 3	b.	1, 3	b.	1, 4
c.	2, 3, 4	c.	2, 3, 4, 5	c.	2, 4, 5
d.	2, 3, 5	d.	3, 4	d.	2, 5
e.	4, 5	e.	5	e.	4, 5

a.	1, 2, & 3 are correct	a.	1, 2, 3, 4, 5
b.	1 & 3 are correct	b.	1, 3, 4, 2, 5
c.	2 & 4 are correct	c.	2, 1, 4, 3, 5
d.	4 is correct	d.	3, 1, 2, 4, 5
e.	1, 2, 3, & 4 are correct	e.	4, 5, 1, 3, 2

M/C: True/False or Best Choice
Rule #2: Cover-the-Options

- The stem should provide enough information so that the question can be answered without seeing the responses.

Example:
There are seven days of the week and each has a name. Today is:
- a. Friday
- b. Tuesday
- c. Saturday
- d. Thursday
- e. Wednesday

Cover-the-Options

M/C: True/False

Rules? KISS
Cover-the-Options

Which one of the following abnormal analyte concentrations would be caused by excessive secretion of parathyroid hormone by a parathyroid adenoma?

a. Hyperferremia
ⓑ Hypercalcemia
c. Hypernatremia
d. Hyperglycemia
e. Hypocholesterolemia

Cover-the-Options

Rule #3 for T/F: Definitely true or false

• Tend to assess lower cognitive skills
  • Knowledge, Comprehension, Application (simple)
• Promote memorization of facts and basic relationships

M/C: Best Choice

Rules? KISS
Cover-the-Options

A dog was presented because of PU/PD of 1 month duration and recent vomiting. Laboratory results included moderate azotemia, normoglycemia, and urine specific gravity of 1.010. The dog's illness is most likely due to:

a. Diabetes mellitus
b. Acute renal failure
ⓒ Chronic renal failure
d. Hypoadrenocorticism
e. Hyperadrenocorticism

a b e   d   c

Least Correct ⟵ Experts agree ⟶ Most Correct

Knowledge	Comp.	Application	Analysis	Synthesis	Evaluation

Can access higher cognitive skills

Which rule is violated?

A dog was presented because of PU/PD of 1 month duration and recent vomiting. Laboratory results included moderate azotemia, normoglycemia, and urine specific gravity of 1.010. The dog's illness is most likely due to:

a. Diabetes mellitus
b. Acute renal failure
c. Chronic renal failure
d. Hypoadrenocorticism
e. Hyperadrenocorticism

Rule #3 for T/F: Definitely true or false

Tip #3: Arrange responses by length

A dog was presented because of PU/PD of 1 month duration and recent vomiting. Laboratory results included moderate azotemia, normoglycemia, and urine specific gravity of 1.010. The dog's illness is most likely due to:

a. Diabetes mellitus   Shortest   Longest
b. Acute renal failure
c. Chronic renal failure
d. Hypoadrenocorticism
e. Hyperadrenocorticism   Longest   Shortest

• Distributes the answer among the distractors
• Easier to read

Which rule is violated?

A PU/PD dog most likely has:

a. Acute renal failure if it is azotemic but not isosthenuric.
b. Chronic renal failure if the PU/PD state has been present for over a week and the dog is azotemic and isosthenuria.
c. Diabetes mellitus if it is azotemic, normoglycemic, and glucosuric.
d. Diabetes insipidus if it is azotemic, hyperglycemic, and glucosuric.
e. Hypoadrenocorticism if the dog is azotemic, has a serum Na:K ratio less than 25, and the urine specific gravity is greater than 1.040.

Rule #2: Cover-the-Options
Rule #1: KISS Rule (use long stem & short options)

M/C: True/False or Best Choice

Rule #4: Avoid grammatical errors

Which of the following is an even number?
ⓐ 2
b. 2 and 4
c. 2, 4, and 6
d. 2, 4, 6, and 8
e. 2, 4, 6, 8, and 10

M/C: True/False or Best Choice

Rule #5: Avoid multiple truths

Which of the following is an (are) even number(s)?
a. 2
b. 2 and 4
c. 2, 4, and 6
d. 2, 4, 6, and 8
e. 2, 4, 6, 8, and 10

> Question is not "which is the most complete or best"

M/C: True/False

Rule #6: Avoid "All of the above" & "None of the above"

Which of the following is an even number?
a. 2
b. 4
c. 6
d. 8
e. All of the above

> "All of the above" is not a number.

M/C: True/False

Rule #6: Avoid "All of the above" and "None of the above"

Which of the following is an even number?
a. 1
b. 3
c. 5
d. 7
e. None of the above

> "None of the above" is not a number.

M/C: True/False or Best Choice

Rule #7: Avoid absolute terms (always, never); especially regarding clinical issues.

A regenerative anemia is always a feature of:
a. Renal failure
b. Iron deficiency
c. Marrow disease
d. Hemolytic disease
e. External hemorrhage

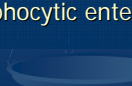> "Always" and "Never" usually translate to True or False
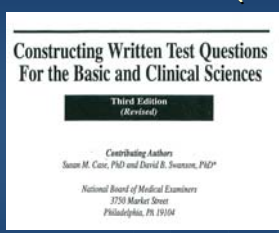
M/C: Best Choice

Rule #8: Avoid frequency questions

Protein-losing enteropathy in dogs is most frequently due to:
a. Histoplasmosis
b. Lymphangiectasia
c. Whipworm disease
d. Intestinal lymphoma
e. Plasmacytic lymphocytic enteritis
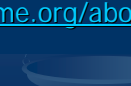
> Says who?
> Where?
> When?
> Which breed?
> What age?

Best Choice Rules (NBME)

Constructing Written Test Questions For the Basic and Clinical Sciences

Third Edition
(Revised)

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http://www.nbme.org/about/itemwriting.asp

M/C: Best Choice Rules (NBME)

#1: Each item should focus on an important concept; especially common or catastrophic (not trivial facts or concepts).

- Problems and situations encountered frequently in "real life"
- "Choice" should relate to decisions

M/C: Best Choice Rules (NBME)

#2: Each item should assess application of knowledge, not recall of isolated facts.

- Stem relatively long; options short
- Clinical vignettes provide context
- Information provided in consistent format.

M/C: Best Choice Rules (NBME)

#3: The stem of the item must pose a clear question (Cover-the-Options).

- Stem provides sufficient information for the question.
- Question is similar to a "short answer" question or "fill-in-the-blank" question.
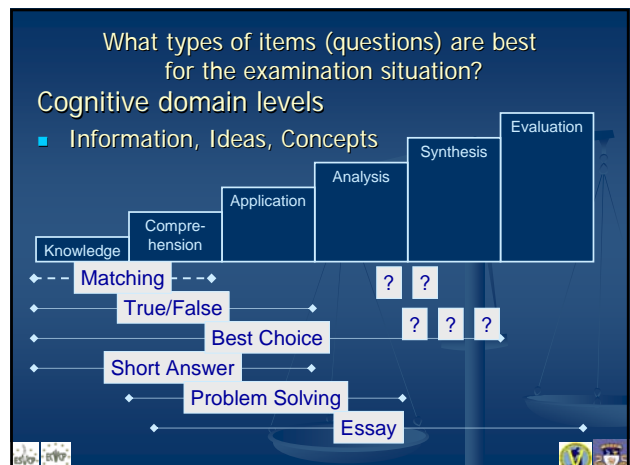
M/C: Best Choice Rules (NBME)

#4: Answer and all distractors should be homogeneous.

- Similar categories (i.e., diseases, processes, results of tests, pathologic states)
- Distractors grammatically correct, logical, plausible, and similar length to answer

M/C: Best Choice Rules (NBME)

#5. Do not write -

"Which of the following statements is correct?"

"Each of the following statements is correct EXCEPT:"

- Not a "Best Choice", it is a "True/False"
- Violates "Cover-the-Options" Rule
- Questions frequently not focused
- Distractors usually not homogenous

What types of items (questions) are best for the examination situation?

Cognitive domain levels

- Information, Ideas, Concepts

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

Matching
True/False
Best Choice
Short Answer
Problem Solving
Essay

? ?
? ? ?

6

Extended-Matching Items (questions)
Serum calcium concentrations (theme)

Options

A.	Acute renal failure	G.	Hypervitaminosis D
B.	Acute tumor lysis syndrome	H.	Hypoadrenocorticism
C.	Blastomycosis	I.	Lymphoma
D.	Chronic renal failure	J.	Multiple myeloma
E.	Diuretic toxcosis	K.	Primary hyperparathyroidism
F.	Ethylene glycol toxicosis	L.	Primary hypoparathyroidism

Case #1 vignette. ... Select most likely diagnosis is _____

Case #2 vignette. ... Select most likely diagnosis is _____

Multiple Choice Rules
#1: KISS Rule
#2: Cover-the-Options (Long stem / Short options)
#3: Definitely true or false (T/F type)
#4: Avoid grammatical errors
#5: Avoid multiple truths (T/F type)
#6: Avoid "All of the above" & "None of the above"
#7: Avoid absolute terms (always, never); especially
    regarding clinical issues
#8: Avoid frequency questions

Multiple Choice Tips
#1: If you have multiple types of M/C questions, group &
    separate them.
#2 : If use number combinations, list numbers sequentially.
#3: Arrange responses by length

What should the student/candidate be able to do?

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